FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	BR 2020(319)		1
STATE	STATE DIST.	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT.	SECT.	JOB	HIGHWAY NO.
1191	03	033, ETC.	FM 1245, ETC.

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT: BR 2020(319)
CSJ: 1191-03-033, ETC.

LIMESTONE COUNTY

FM 1245, ETC.

LIMITS: @ CHRISTMAS CREEK (STR #006), ETC.

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

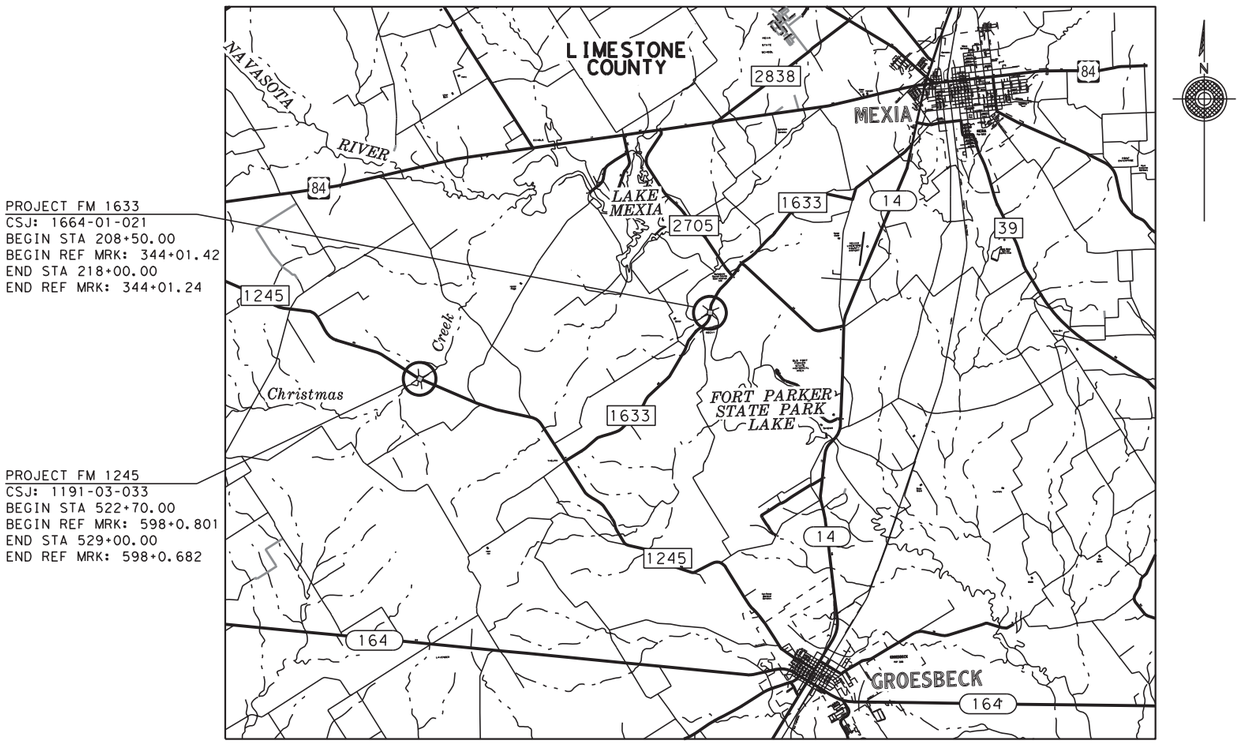
INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	INDEX OF SHEETS

FM 1245
DESIGN SPEED = 60 MPH
CURRENT A.D.T. (2019) = 1021
FUTURE A.D.T. (2039) = 2042

FM 1633
DESIGN SPEED = 60 MPH
CURRENT A.D.T. (2019) = 631
FUTURE A.D.T. (2039) = 820

CSJ	FM	ROADWAY	BRIDGE	TOTAL
1191-03-033	1245	495.00 FT = 0.093 MI	135.00 FT = 0.026 MI	630.00 FT = 0.119 MI
1664-01-021	1633	560.00 FT = 0.106 MI	390.00 FT = 0.074 MI	950.00 FT = 0.180 MI
TOTAL PROJECT LENGTH		1055.00 FT = 0.200 MI	525.00 FT = 0.099 MI	1580.00 FT = 0.299 MI



PROJECT FM 1633
CSJ: 1664-01-021
BEGIN STA 208+50.00
BEGIN REF MRK: 344+01.42
END STA 218+00.00
END REF MRK: 344+01.24

PROJECT FM 1245
CSJ: 1191-03-033
BEGIN STA 522+70.00
BEGIN REF MRK: 598+0.801
END STA 529+00.00
END REF MRK: 598+0.682

SCALE: 1"=15,000'
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE
EXCEPTIONS: NONE

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY 1, 2012).

SUBMITTED FOR LETTING 5/12/2021
W. Richard Rath Jr., P.E.
PROJECT MANAGER

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

TEXAS DEPARTMENT OF TRANSPORTATION

RECOMMENDED FOR LET 5/19/2021
DocuSigned by: Josh Voiles
AC8604F84EC2483...
, P.E.
AREA ENGINEER

RECOMMENDED FOR LETTING 05/28/2021
Victor Starkey, P.E.
DIRECTOR OF TRANSPORTATION PLANNING & DEVELOPMENT

APPROVED FOR LETTING 6/2/2021
DocuSigned by: Stanley Swiatek
B69BD796DD564C8...
, P.E.
DISTRICT ENGINEER

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MODEL:Design

GENERAL

	1	TITLE SHEET
	2	INDEX OF SHEETS
	3-4	EXISTING TYPICAL SECTIONS
	5-8	PROPOSED TYPICAL SECTIONS
	9, 9A-9F	GENERAL NOTES
	10, 10A	ESTIMATE AND QUANTITIES
	11-12	SUMMARY SHEET
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	16	TRAFFIC CONTROL PLAN DETOUR LAYOUT AT NAVASOTA RIVER

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ⒸⒹ	98	PCP-FAB
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ⒸⒹ	99-100	PMDF
ⒸⒹ	101-102	SD-EBR
ⒸⒹ	103	SEJ-M
Ⓓ	104-105	SIG-32-15
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Ⓐ	154	EC(1)-16
Ⓐ	155	EC(2)-16
Ⓐ	156-165	TA-BMP (WACO DISTRICT STANDARD)

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

STATE OF TEXAS
CHRISTIAN L. MOORMAN
93828
LICENSED PROFESSIONAL ENGINEER
MAY 17, 2021

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

STATE OF TEXAS
W. RICHARD RENTON JR.
84792
REGISTERED PROFESSIONAL ENGINEER
5/17/2021

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

STATE OF TEXAS
TAMARA M. CORTEZ
134001
LICENSED PROFESSIONAL ENGINEER
5/17/2021

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

5/17/2021
STATE OF TEXAS
JAMES P. MILLER
113116
LICENSED PROFESSIONAL ENGINEER

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

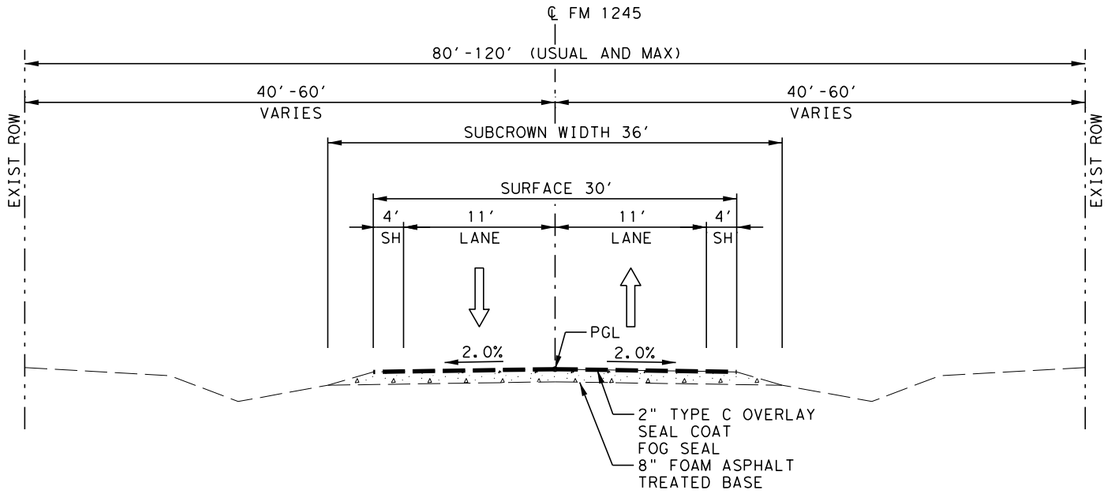
FM 1245 & FM 1633
INDEX OF SHEETS

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	2

STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

002 INDEX OF SHEETS.dgn



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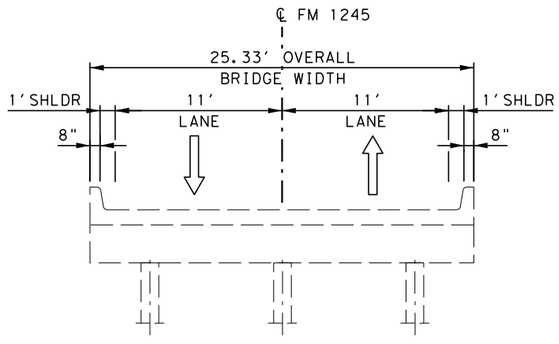
EXISTING TYPICAL SECTION
(NTS)

STA 522+70.00 TO STA 525+30.00
STA 526+17.96 TO STA 529+00.00



FM 1245 EXISTING BRIDGE
TYPICAL SECTION
(NTS)

STA 525+30.00 TO STA 526+17.96

W. RICHARD RENTON JR.
84792
STATE OF TEXAS
REGISTERED PROFESSIONAL ENGINEER
5/12/2021

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FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633

EXISTING TYPICAL SECTIONS

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		3
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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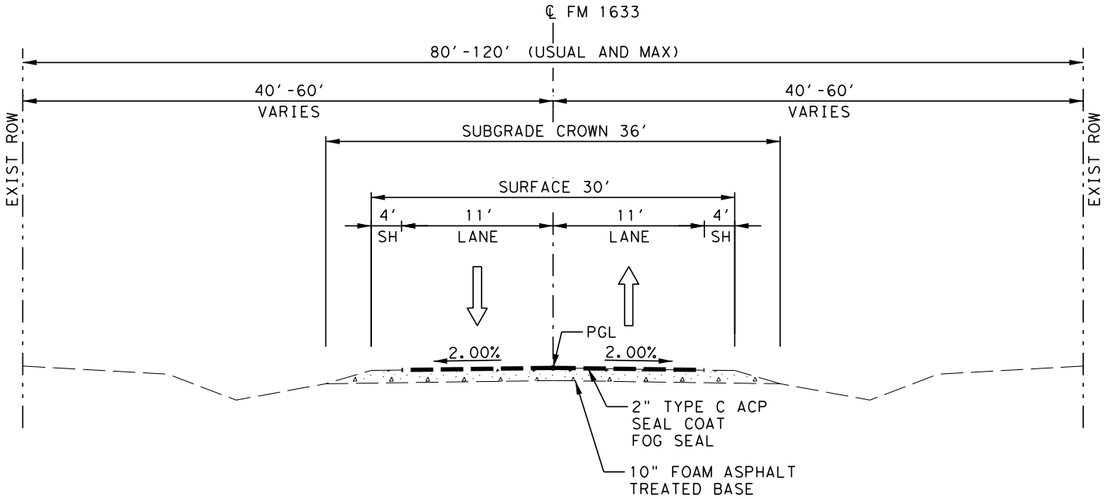

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EXISTING TYPICAL SECTION
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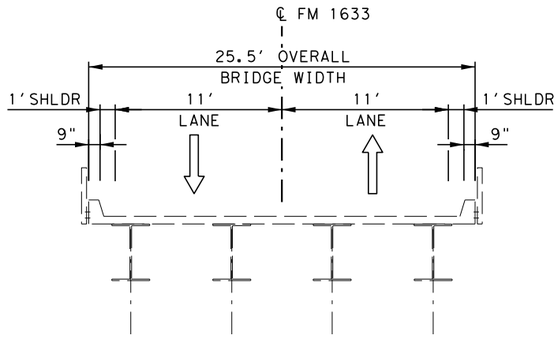
STA 214+20.58 TO STA 218+00.00



FM 1633 EXISTING BRIDGE
TYPICAL SECTION
(NTS)

STA 211+27.26 TO STA 215+17.26

W. RICHARD RENTON JR.
84792
STATE OF TEXAS
REGISTERED PROFESSIONAL ENGINEER
5/12/2021

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FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633

EXISTING TYPICAL SECTIONS

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		4
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

004 FM 1633 EXIST TYP SECT.dgn

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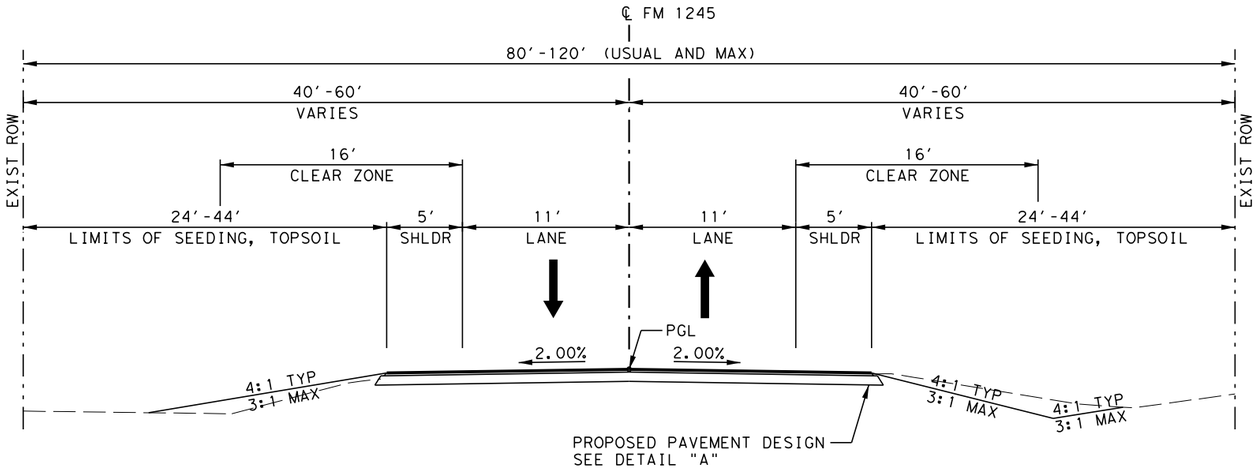

FM 1245
PROPOSED TYPICAL SECTION
(NTS)

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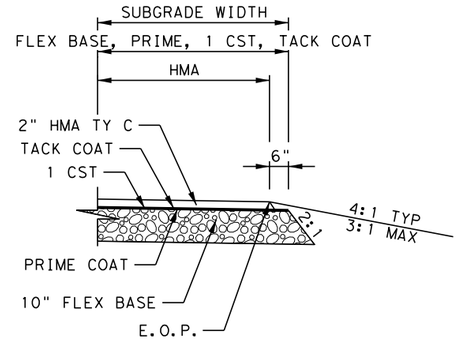
STA 528+71.58 TO STA 529+00.00



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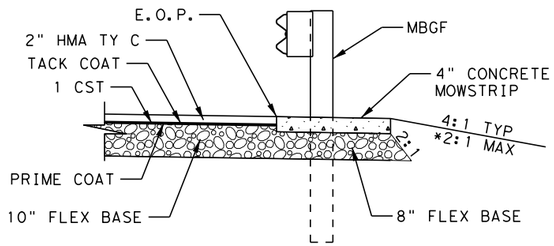

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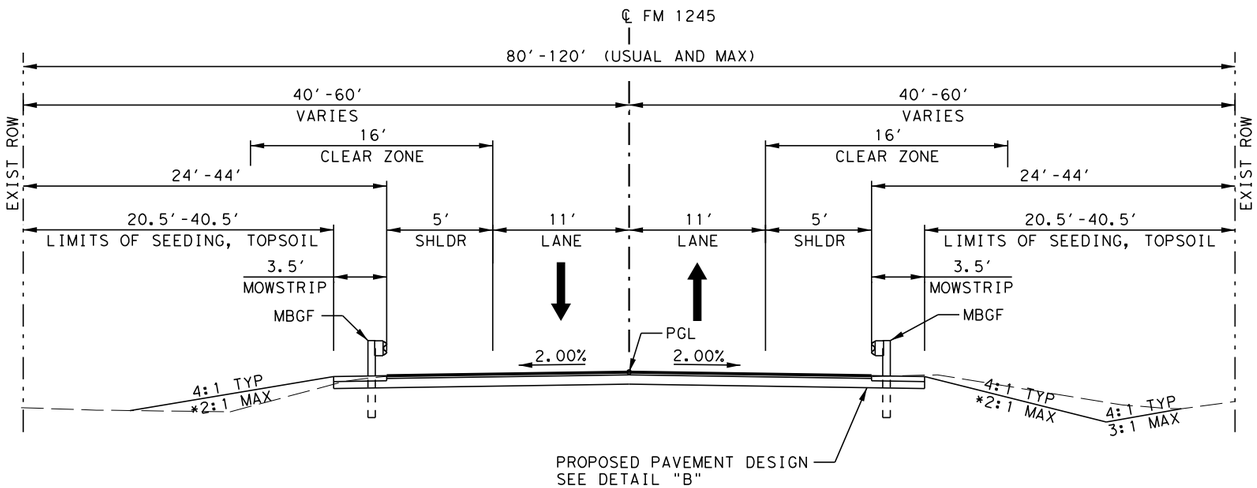

FM 1245
PROPOSED TYPICAL SECTION
(NTS)

STA 523+22.55 TO STA 525+05.00
STA 526+40.00 TO STA 528+71.58

5/12/2021

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Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633

PROPOSED TYPICAL SECTIONS

SHEET 1 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	5
STATE	DISTRICT	COUNTY
TEXAS	WACO	LIMESTONE
CONT	SECT	JOB / HIGHWAY NO
1191	03	033, ETC. / FM 1245, ETC.

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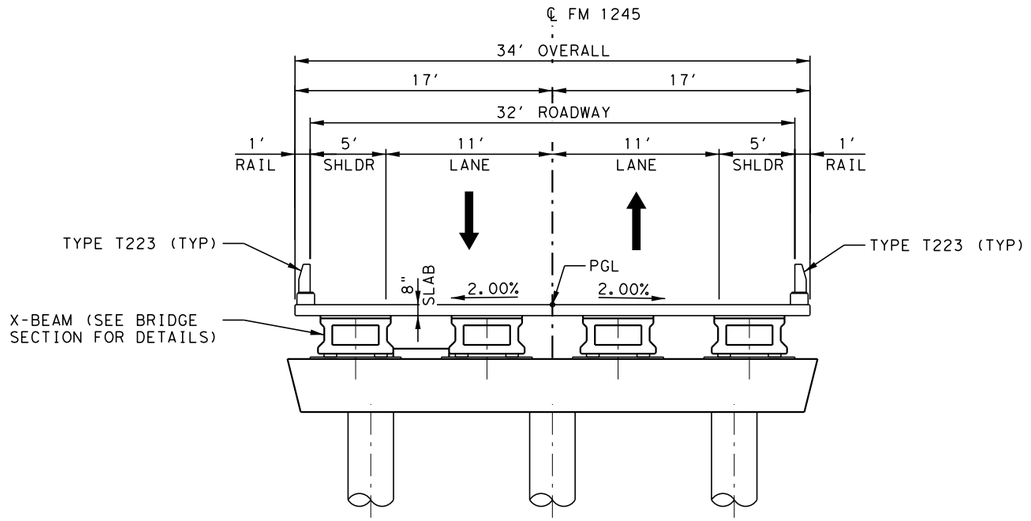

FM 1245 PROPOSED BRIDGE TYPICAL SECTION

(NTS)

STA 525+05.00 TO STA 526+40.00

W. RICHARD RENTON JR.
84792
REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS

5/12/2021

NO.	REVISION	DATE

Texas Department of Transportation

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SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633

PROPOSED TYPICAL SECTIONS

SHEET 2 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		6
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

006 FM 1245 PROP TYP SECT.dgn

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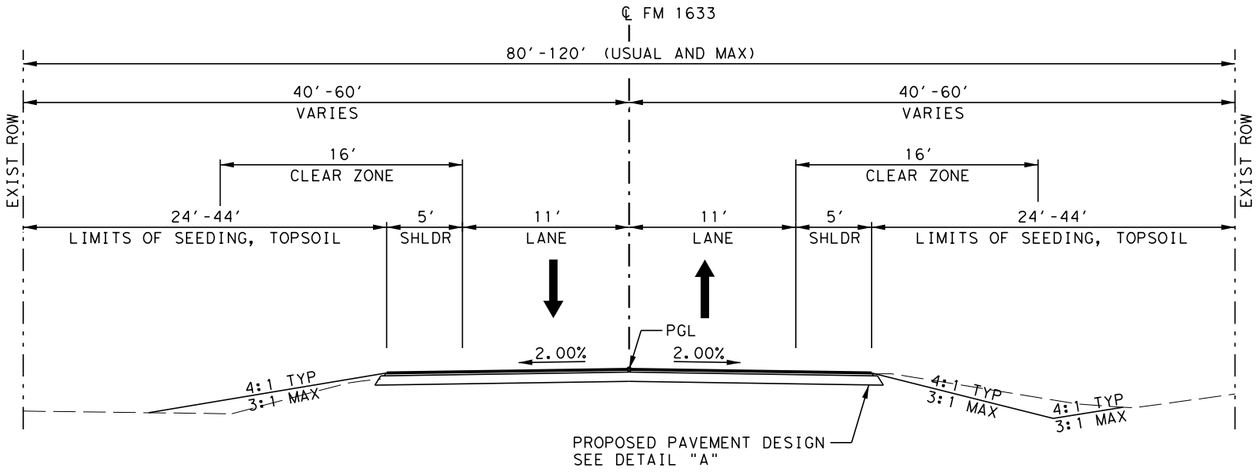

FM 1633
PROPOSED TYPICAL SECTION
(NTS)

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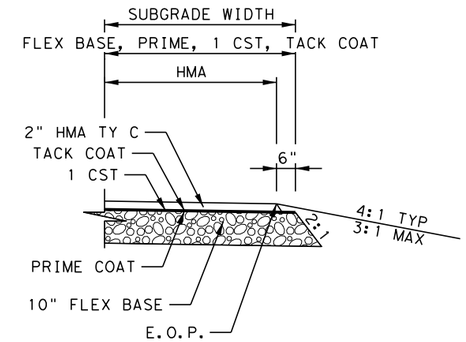
STA 217+04.34 TO STA 218+00.00



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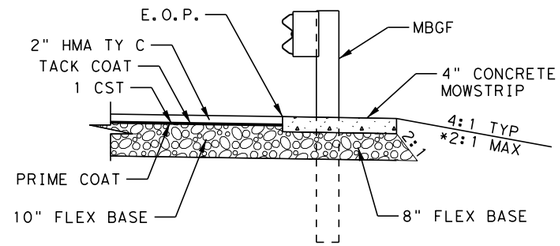
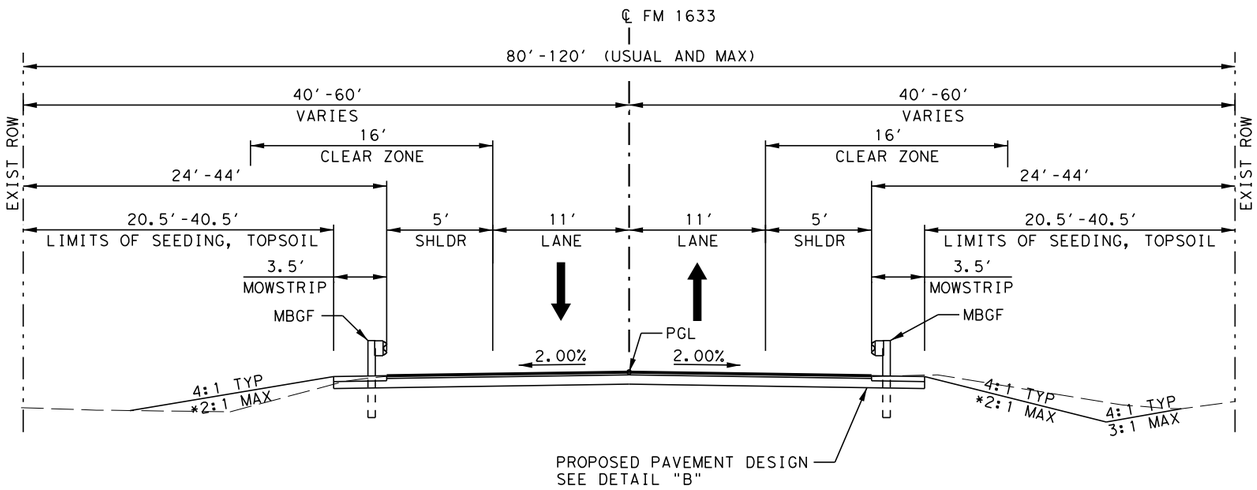


DETAIL "B"

* SLOPES STEEPER THAN 3:1 WILL REQUIRE STONE RIPRAP FOR GLOBAL STABILITY.



FM 1633
PROPOSED TYPICAL SECTION
(NTS)

STA 208+67.38 TO STA 211+27.26
STA 215+17.26 TO STA 217+04.34

W. RICHARD RENTON JR.
84792
REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS
5/12/2021

NO.	REVISION	DATE

Texas Department of Transportation

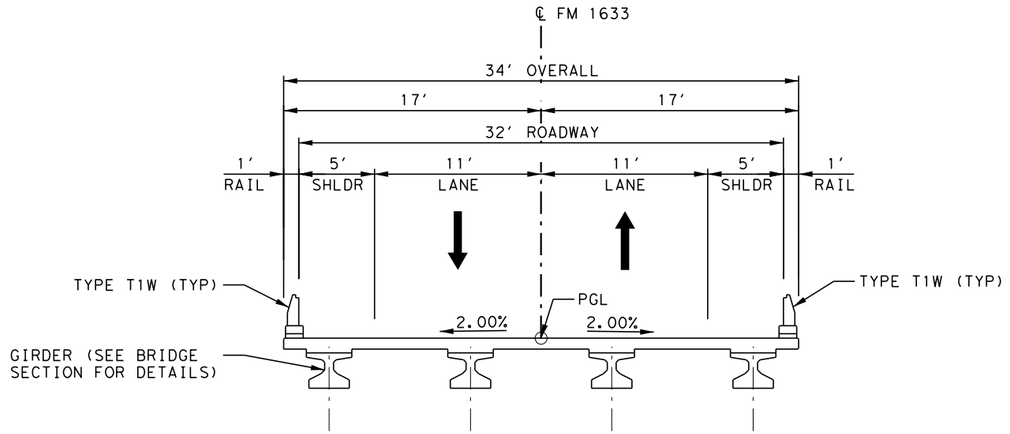
IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633
PROPOSED TYPICAL SECTIONS

SHEET 3 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		7
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

007 FM 1633 PROP TYP SECT.dgn



PROPOSED BRIDGE
TYPICAL SECTION
(NTS)

STA 211+27.26 TO STA 215+17.26

W. RICHARD RENTON JR.
84792
REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS

5/12/2021

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633

PROPOSED TYPICAL SECTIONS

SHEET 4 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		8
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

008 FM 1633 PROP TYP SECT.dgn

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MODEL:Design

BASIS OF ESTIMATE TABLES

Table 1: Basis of Estimate for Erosion Control Items

Item	Description	Rate	Basis	Quantities
*166	FERTILIZER			
	FERTILIZER (20-10-10) (PERMANENT)	300 LBS / AC	2.08 AC	0.3 TON
	FERTILIZER (20-10-10) (TEMPORARY)	300 LBS / AC	2.08 AC	0.3 TON
168	VEGETATIVE WATERING			
	(3 APPLICATIONS - PERM)	13,100 GAL/AC/APP	2.08 AC	82.5 MG
	(3 APPLICATIONS - TEMP)	13,100 GAL/AC/APP	2.08 AC	82.5 MG

* FOR CONTRACTOR'S INFORMATION ONLY

Table 2: Basis of Estimate for Base Work

Item	Description	Rate	Basis	Quantities
247	FLEXIBLE BASE			
	(TY D GR 1-2 FNAL POS)	138 LB/CF	32,481 CF	1,203 CY *83TON
310	PRIME COAT			
	PRIME COAT (MC-30 OR AE-P)	0.20 GAL / SY	3,765 SY	753 GAL

Table 3: Basis of Estimate for Seal Coats

Item	Description	Rate	Basis	Quantities
316	**SEAL COAT**			
	FIRST COURSE			
	ASPH (CRS-2)	0.45 GAL / SY	3,767 SY	1,695 GAL
	AGGR (TY-D GR-4 OR TY-L GR-4)	1 CY / 135 SY	3,767 SY	29 CY

Table 4: Basis of Estimate for Asphalt Pavements

Item	Description	Rate	Basis	Quantities
3076	**DENSE-GRADED HOT MIX ASPHALT**			
	TY-C PG 64-22	220 LB / SY / IN	3,739 SY	412 TON
	TACK COAT	0.25 GAL/SY	3,767 SY	942 GAL

GENERAL

The construction, operation and maintenance of the proposed project will be consistent with the state implementation plan as prepared by the Texas Commission on Environmental Quality.

The disturbed area for this project, as shown on the plans are 0.93 and 1.24 acres. However, the Total Disturbed Area (TDA) will establish the required authorization for storm water discharges. The TDA of this project will be determined by the sum of the disturbed area in all project locations in the contract, and all disturbed area on all Project-Specific Locations (PSL) located in the project limits and/or within 1 mile of the project limits. The department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction site as shown on the plans, according to the TDA of the project. The contractor will obtain any required authorization from the TCEQ for the discharge of storm water from any PSL for construction support activities on or off of the project row according to the TDA of the project. When the TDA for the project exceeds 1 acre, provide a copy of the appropriate application of permit (NOI, or Construction Site Notice) to the engineer, for any PSL located in the project limits or within 1 mile of the project limits. Follow the directives and adhere to all requirements set forth in the TCEQ, Texas Pollution Discharge Elimination System, Construction General Permit (TPDES, CGP).
There is a high probability that an environmentally sensitive area could be encountered on the contractor designated Project-Specific Locations (PSL) for this project (haul roads, equipment staging areas, borrow pits, disposal sites, field offices, storage areas, parking areas, etc.). Item 7.6 "Project-Specific Locations", provides a listing of regulatory agencies that may need to be contacted regarding this project.

Contractor questions on this project are to be emailed to the Waco District at the following address:

Bill Compton - Wacoprebid@txdot.gov, 254-867-2707, 100 S. Loop Dr., Waco, TX
Carmen Chau - Wacoprebid@txdot.gov, 254-867-2794, 100 S. Loop Dr., Waco, TX

Or Via phone or in person to the following individual(s):
Area Engineer's: Josh Voiles – josh.voiles@txdot.gov, 254-582-5432
Assistant Area Engineer's: Anel Rivera Rosado – anel.riverarosado@txdot.gov, 254-582-5432

All contractor questions will be reviewed by the Area Engineer or Assistant Area Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address: https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20 Responses/

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.

Paper copies of cross-sections may be produced by using the provided .pdf file located on the above FTP Website at the bidders' expense and at copying companies. This data is for non-construction purposes only and it is the responsibility of the prospective bidder to validate the enclosed data with appropriate plans, specifications and estimate for the project(s).

GENERAL NOTES

ITEM 5: CONTROL OF THE WORK

Submit all fabrication and shop drawings per TxDOT's online shop drawing submittal system and copy the Area Engineer on the email submittal, unless otherwise directed.

Where a precast or cast-in-place concrete element is shown in the plans, Contractor may submit a precast concrete alternate in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at:
https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design.
Acceptance or denial of an alternate is at the sole discretion of the Department. Contractor is responsible for impacts to the project schedule and cost resulting from the use of alternates.

Prior to beginning work in the area of existing utilities, the contractor will consult with the utility companies for exact locations to prevent any damage or interference with present facilities. This action will in no way be interpreted as relieving the contractor of his responsibilities, under the terms of the contract and as set out in the plans and specifications. The contractor will repair any damage caused by his operations, at his own expense and will restore facilities to service in a timely manner.

ITEM 6: CONTROL OF MATERIALS

References to manufacturer's trade name or catalog numbers are for the purpose of identification only and the contractor will be permitted to furnish like materials of other manufacturers provided they are of equal quality and comply with specifications for this project.

This project has existing bridges with surface coatings which contain hazardous constituent which is lead paint. Contractor is responsible for the health and safety of his employees and compliance with all OSHA standards and regulations.

Mixing of materials, storing of materials, storing of equipment, or repairing of equipment on top of bridge decks will not be permitted unless specifically authorized. Permission will be granted to

store materials on surfaces if, in the opinion of the Engineer, no damage or discoloration will result.

ITEM 7: LEGAL RELATIONS AND RESPONSIBILITIES

No significant traffic generator events identified.

If utilizing private property for waste disposal sites, field office sites, equipment storage sites or for any other purpose involved with this project, provide to the Engineer written proof of the property owner's approval of the use of this property. This proof may be in the form of a letter or agreement signed by the property owner or other documents acceptable to the Engineer.

Personal vehicles of the contractor's employees will not be parked within the right of way at any time including any section closed to public traffic, unless the vehicle is being utilized for construction procedures. However, the contractor's employees may park on the right of way at the sites where the contractor has his office, equipment and materials storage yard.

The contractor is alerted to the possible presence of swallows under the existing bridges or culverts. Because the migratory bird treaty act prohibits harm to swallows, their eggs or their nestlings, the contractor will not begin potentially disturbing activities on or near the bridge until the birds have abandoned any occupied nests (approximately September 1). Active nests may not be removed regardless of the date.

Prior to the swallows returning to the nests (approximately March 1), abandoned nests will be removed from the bridge. The contractor will prevent the establishment of new nests on any portion of the structure. Methods for preventing the establishment of new nests must be approved by the project Engineer. Examples of acceptable nest prevention methods are bird-deterrent netting and bird-repelling sprays and/or gels to be applied to the structure. This work will not be paid for directly, but will be subsidiary to the various bid items.

The Contractor will submit detailed site-specific plans for work in each "water of the United States" designated on the EPIC sheet. These plans must be approved by the TxDOT Engineer prior to starting any work in these areas. The plans must also describe facilities and work activities adjacent the Ordinary High-Water Marks. The plan must show actual dimensions and materials for:

- Proposed construction roads and work areas leading to or in close proximity to the Ordinary High-Water Marks
- Temporary material or equipment storage areas in close proximity to the Ordinary High-Water Marks
- Locations of proposed sediment and erosion control devices
- Identification of construction equipment and construction techniques to accomplish the work

Once this drawing and supporting information is reviewed and approved by TxDOT, all construction workers should be made aware of the limits designated on the drawings by the Contractor's supervision. Work in all waters of the US will be limited to the minimum necessary required to construct the bridge, culvert or roadway fills. Work will also include all activities needed for bridge and culvert demolitions. Working or disturbing soil in the stream channel outside

the limits of the work plan will not be allowed. Orange fencing will be provided and maintained to establish the TxDOT approved boundaries in which work may be conducted between the Ordinary High-Water Marks. Orange fencing will not be paid for but will be considered subsidiary to Item 502, “Barricades, Signs and Traffic Handling”.

ITEM 8: PROSECUTION AND PROGRESS

This Project will be a Standard Workweek in accordance with Article 8.3.1.4.

Meet bi-weekly or at intervals as agreed upon with the engineer to notify him or her of planned work for the upcoming 3-week period.

For this project, provide a Bar Chart progress schedule.

ITEM 100: PREPARING RIGHT OF WAY

The limits of preparing right of way will be measured at the following locations:

FM 1245 From Sta. 522+70.00 to Sta. 529+00.00
FM 1633 From Sta. 208+50.00 to Sta. 218+00.00
along the centerline of construction.

Remove the existing roadway delineators and object markers within the project limits listed above, or as directed, during construction within the right of way. Delineator and object marker removals are subsidiary to this Item.

The removal of trees and vegetation will be subsidiary to Item 100, “Preparing Right Of Way”. Contractor will preserve all trees designated for preservation by whatever means necessary.

The removal of any existing fence will not be paid for directly, but will be considered subsidiary to the bid Item 100, “Preparing Right Of Way”.

All trees and brush removed each day will be disposed of within the same day of removal unless otherwise approved. If removed vegetation is burned, ashes from burned vegetation will not be placed or allowed to be transported by storm water into any stream. Burn locations, if approved, will be no closer than 300 feet from a stream. Earth berms must be used around burn areas to keep ash in place.

Prior to starting bridge removals, the Contractor will remove all driftwood and all public trash and dumped materials within the stream channel and property boundaries, with all work and disposal being subsidiary to Item 100, “Preparing Right Of Way” and /or Item 496 “Removing Structures”.

The existing stone riprap in the channel shall remain in place except as needed for the Contractor to perform work such as building abutments, placing drilled shafts, form work for bent construction, etc. The removal of the stone riprap will be considered subsidiary to Item 100, “Preparing Right Of Way”.

ITEMS 105: REMOVING TREATED AND UNTREATED BASE AND ASPHALT PAVEMENT

Saw existing asphalt along neat lines where portions are to be left in place temporarily or permanently. Sawing is not paid for directly, but is subsidiary to this item.

Take possession of recycled asphalt pavement from the project and recycle the material.

Properly dispose of unsalvageable material at Contractor’s expense.

Remove the loose material from the roadway before opening to traffic.

ITEM 110: EXCAVATION

In a cut section, when soils are encountered at subgrade depths that are unstable and are deemed unsuitable by the Engineer, undercut this material for a minimum depth of one (1.0) foot below the maximum depth as determined and replace with a material having a plasticity index less than 25 and a liquid limit of less than 50.

ITEMS 110 & 132: EXCAVATION & EMBANKMENT

Excavation and embankment for driveways will not be paid for directly, but will be considered subsidiary to these items.

In those cases where fixed features require, the governing slopes indicated herein and on the cross sections may be varied between the limits and to the extent determined.

ITEM 132: EMBANKMENT

The Ty C embankment material for this project must meet the following requirements:

Properties	Test Method	Specification Limits
LIQUID LIMITS	TEX-104-E	≤ 50
PLASTICITY INDEX (PI)	TEX-106-E	10 ≤ PI ≤ 25

Excavated material from the project site has not been determined to be suitable for embankment. The bidder assumes all risk for the use of excavated materials for embankment and is expected to meet all material requirements for embankment regardless of the source.

Perform Tex-106-E (Plasticity Index) by an approved laboratory on excavated soils from sources outside right of way when used in roadway embankment. Provide the test results at no expense to the department. The engineer will sample and test soils produced by the construction project for specification requirements or material sources specified in the plans.

Type C Embankment will consist of suitable earthen material such as rock, loam, clay or other materials that will form a stable embankment. In addition, the top two (2) feet of embankment, including material used to complete front slopes after final surfacing will meet the physical requirements listed herein. Shale will not be allowed

ITEM 160: TOPSOIL

Salvage the existing topsoil from the cut/fill areas. Topsoil not stored in small windrows will be stockpiled in locations with heights no greater than four (4) feet and dumped loose from Contractor equipment. The Contractor will minimize topsoil compaction and limit equipment being driven over stockpiled topsoil.

Additional Topsoil will come from approved sources outside of the ROW. Topsoil must come from a location within six (6) inches of the natural ground surface to ensure it contains nutrients and is not sterile soil. Off ROW top soil will contain a minimum organic content of three & one-half (3.5%) percent, based on soil test results.

ITEM 164: SEEDING FOR EROSION CONTROL

Temporary seeding mixtures (cool and warm) will also include three (3) lbs of Bermuda grass seed per acre, with all seeds being planted concurrently.

Contractor will mow or disc wheat and or oats in spring prior to vegetation going to seed.

Permanent seed mixes for both urban and rural projects including sand or clay soils in the Waco District will be bid and installed to include a minimum of one & one-half (1.5) pounds per acre Green Sprangletop seed and four (4) pounds per acre Bermudagrass seed, with other seed types also being included and quantities remaining unchanged.

ITEM 169: SOIL RETENTION BLANKETS

Hydraulically apply Flexterra FGM, CocoFlex ET-FGM, Earth Guard or other spray applied soil retention as approved by the Engineer for erosion control on the specified slopes or areas in the construction plan. Apply as required per manufacturer's recommendations.

Use Tables under Item 164 to determine type of seeds to be used. Water for application, seeding, labor, equipment, tools, supplies, materials, fertilizer and incidentals will not be paid for directly but will be subsidiary to this Item.

ITEM 247: FLEXIBLE BASE

Construct uniform layer thickness of 6 inches, or less with the required density and moisture content.

Minimum PI is equal to three (3) for all grades, or a minimum Bar Linear Shrinkage of 2%.

RAP may not be incorporated into Flexbase Material

ITEM 310: PRIME COAT

When cutback asphalt is used, a minimum curing time of seven (7) days will be required before application of Item 316, "Seal Coat", unless otherwise approved in writing.

ITEM 316: SEAL COAT

No AC or Emulsion for surface treatment items will be placed between September 15 and May 1 unless approved in writing.

ITEM 320: EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT

Use a self-propelled wheel mounted MTV capable of receiving mix from the haul trucks, separate from the paver. It shall have a minimum storage capacity of approximately 25 tons. It shall be equipped with a pivoting discharge conveyor and shall completely and thoroughly remix the material prior to placement. The effectiveness of the MTV's remixing ability is subject to the approval of the Engineer. In addition, the paver shall have a surge storage insert with a minimum capacity of 20 tons.
The use of windrow pick-up equipment is allowed except on the first course of roadway material placed over the subgrade.

ITEM 400: EXCAVATION AND BACKFILL OF STRUCTURES

Aggregate for cement stabilized backfill will be coarse aggregates, GRADE 3, 4 or 5 and fine aggregate, as shown in Item 421, "Hydraulic Cement Concrete". The ratio of course aggregate to sand should not contain more than sixty percent (60%) sand unless otherwise approved.

CLASS B bedding is required if rock is encountered.

ITEM 416: DRILLED SHAFT FOUNDATIONS

Provide a minimum of one core per bent, regardless of placement method.

Soil from foundation drilling will be removed immediately from the stream channel area to higher ground above the Ordinary High Water Marks. No earth drill spoil material will be deposited into water of a stream. If used, drilling mud will not be allowed to enter into any stream.

ITEM 420 CONCRETE SUBSTRUCTURES

Form columns to a point a minimum of one foot below the proposed future or existing bottom of channel elevation indicated on the bridge layouts by an acceptable method. This form work is not paid for directly, but is considered subsidiary to this item.

BENT NUMBERING:
For bridges with four or more spans, number every third bent (counting the abutments) on the up-station and down-station faces of the outside column(s) at approximately the mid height of the column. For structures with three columns or less per bent, place numbers on column A. Where there are four or more columns per bent, place numbers on both outside columns. Bent numbers shall be as shown on the bridge layout.

Provide block numbers with a height of 6". Place numbers using appropriate die cut stencils and black paint. All materials, labor and incidentals associated with placing bent numbers are subsidiary to the various bid items.

NATIONAL BRIDGE INVENTORY NUMBERS:
Provide National Bridge Inventory (NBI) numbers on all bridge structures and bridge class culverts.

Where beam types allow access to the face of abutment backwall, place NBI numbers on the face of each abutment backwall using 3" block numbers. Locate NBI numbers between the outside beams at opposite corners of the bridge.

Where beam types do not allow access to the face of abutment backwall, place NBI numbers on the face of each abutment cap using 3" block numbers. Locate NBI numbers below the outside beams at opposite corners of the bridge.

Where a bridge begins, ends or contains a bent common to multiple structures, place NBI numbers on both faces near both ends of the common bent cap. The number placed at each of the four locations will correspond to the NBI number assigned to the bridge immediately above the number. Locate NBI numbers below the outside beam. Place using 3" Block Numbers.

For all conditions, use appropriate die cut stencils and black paint for placement. All materials, labor and incidentals associated with placing NBI numbers are subsidiary to the various bid items.

Reduce headwall heights, if necessary, to provide a maximum of three (3) inches projection above the roadway slope. No increase or decrease will be made in plan quantities of concrete or reinforcing steel for this work.

All construction products used to construct concrete structures and bridges including but not limited to plastics, Styrofoam, grease, glues, caulking, adhesives, solvents, paints, cleaning agents and rubber will be handled in a manner that the construction products or empty containers/tubes will not be allowed into any stream. Construction debris developed from the cutting, grinding or sizing of solid construction products including plastics and Styrofoam will not be allowed on the ground or to blow into a stream.

Concrete curing compounds will not be applied in a manner that the chemical will be spilled, dripped or be discharged into streams. Containers and rags used during application of curing compound will be properly disposed of off project. Do not store curing compound containers and drums on TxDOT ROW.

Ensure steel forms are free of rust immediately prior to placing concrete.

ITEM 421: HYDRAULIC CEMENT CONCRETE

Furnish mix designs to the Engineer in a format compatible to the latest version of the Department's Construction Management System (Site Manager). Mix Design templates will be provided by the Engineer.

Provide High Performance Concrete (HPC) of the class specified for the following bridge components: abutments, bent caps, and columns.

Provide sulfate resistant concrete for all drilled shafts.

Supply the Engineer with a list of certified personnel and copies of their current ACI certificates before beginning production and when personnel changes are made. Supply hard copies of calibration reports for testing equipment when required by the Engineer.

ITEM 427: SURFACE FINISHES FOR CONCRETE

Provide bridge structures with a Surface Area II, rub finish.

ITEM 432: RIPRAP

Locations and quantities may be varied as directed to accommodate field conditions.

The sodium sulfate soundness requirement for material used in rock riprap is waived for this project.

ITEM 440: REINFORCEMENT FOR CONCRETE

Prior to concrete placement, all dried mortar and splashed concrete, in addition to any other contaminates, will be removed from all steel reinforcement.

Fiber Reinforced Concrete (FRC) can be used as a substitute for Non-Structural Class Reinforced Concrete in Mow-Strip and Rip Rap Items. FRC may also be used for other Non-Structural Class Reinforced Concrete Items as approved.

ITEMS 450: RAILING

Blast clean all railing installed as part of the project in accordance with Item 427, "Surface Finishes for Concrete", prior to final acceptance of the project. This work will be considered subsidiary to Items 450, "Railing".

Ensure slip formed barrier and cast-in-place barrier will be uniform in color and texture.

ITEM 496: REMOVING STRUCTURES

Submit to the Engineer for approval a detailed plan for bridge removal including methods, equipment and sequencing.

The Contractor will make every attempt to prevent debris and rubble from falling into the stream during the removal of the bridge. If any debris or rubble should fall into the stream it will be removed as soon as possible. Relocate large pieces of any demolished bridge structure or culvert to the high bank and outside of the Ordinary High Water Marks before processing into smaller pieces. Concrete fines will be minimized from entering a stream.

The Contractor must comply with any notification(s) dates made by TxDOT to the Texas Department of Health, for asbestos abatement and bridge demolitions.

ITEM 500: MOBILIZATION

Material On Hand (MOH) will not be used in calculating partial payments for Mobilization.

ITEM 502: BARRICADES, SIGNS, AND TRAFFIC HANDLING

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

Access will be provided to all business and residences at all times. Where turning radii are limited during phased construction at intersections, provide all weather surfaces such as RAP or base in turning movements to accommodate and to protect the traffic from edge drop-offs. Materials, labor, maintenance and removal for these temporary accesses and radii will not be paid for directly but will be considered subsidiary to the various bid items.

Place barricades and signs in locations that do not obstruct the sight distance of drivers entering the highway from driveways or side streets.

The Contractor Responsible Person(s) (CRP) for Work Zone Traffic Controls will inspect and ensure any deficiencies are corrected each and every day throughout the duration of this contract. Any misaligned or damaged traffic control devices will be repaired as soon as practical after deficiency is discovered.

In addition to providing a Contractor's Responsible Person and a phone number for emergency contact, have an employee(s) available to respond on the project for emergencies and for taking corrective measures within One (1) Hour.

ITEM 506: TEMPORARY EROSION, SEDIMENTATION AND ENVIRONMENTAL CONTROLS

Take all practicable precautions to prevent debris from being discharged into the Waters of Texas or a designated wetland. Install Best Management Practices before demolition begins and maintain them during the demolition. Remove any debris or construction material that escapes containment devices and are discharged into the restricted areas, before the next rain event or within 24 hours of the discharge.

If temporary construction stream crossings are allowed under a Nationwide Permit, submit in writing for approval the type and location of each temporary stream crossing. Use temporary bridges, timber mats, or other structurally sound and non-eroding material for temporary stream crossings. A temporary culvert crossing will consist of storm sewer pipes and 4- to 8-inch nominal size rock. Temporary stream crossings must not cause more than minimal changes to the hydraulic flow characteristics of the stream, increase flooding, or cause more than minimal degradation of water quality. Remove the temporary stream crossings in their entirety and return

the affected areas to their pre-existing elevation. All work and materials use for temporary construction stream crossings will not be paid for directly but are subsidiary to pertinent Items.

Provide SW3P Signs. Obtain from the Engineer a copy of the project's completed TPDES Storm Water Program Construction Site Notice and Contractor Site Notice. Laminate the sheets and bond with adhesive to 36" X 36" sign blanks. Ensure the sheets remain dry. Apply Type C Blue reflective sheeting as the background and add the text "SW3P" in 5" white lettering, centered at the top. Attach the signs to approved temporary mounts and locate at each of the project limits just inside the right of way line at a readable height or as directed by the Engineer. If the sign cannot be placed outside the clear zone, it must adhere to the TMUTCD. SW3P signs, maintenance, and reposting (for replacement or as needed to ensure readability) will be subsidiary to Item 502.

Leave all right of way areas undisturbed until actual construction is to be performed in said areas.

No soil disturbing activities will begin on any section of TxDOT ROW without adequate sedimentation controls first being installed and functioning at adjacent drainage outfalls. Begin and continuously prosecute the repairs, additions and maintenance of erosion and sedimentation control devices within seven days after the Contractor receives each Form 2118, Field Inspection and Maintenance Report, from the Engineer. Failure of the Contractor to fulfill either of the above requirements places TxDOT in potential non-compliance with permit requirements and may result in withholding estimates or stopping work or both until all environmental permit requirements are fulfilled.

Concrete Washouts are required per the CGP. The Concrete Washout Area(s) structural controls must consist of temporary berms, temporary shallow pits, and/or temporary storage tanks to prevent contaminated runoff and must be lined as to prevent contamination of underlying soil. Ensure pits properly maintained including removal of concrete as not to allow over flow. The location(s) of washout area will be approved by the Engineer. When washout pits are no longer needed, they will be removed and area will be restored to original condition. This work, materials and labor will not be measured or paid for directly but will be subsidiary to Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls."

Cleaning and sweeping of open roadways due to material spillage or loss from Contractor equipment or tires will be the responsibility of the Contractor at no cost to TxDOT. This work will not be charged as Item 738, "Cleaning and Sweeping Highways". Cleaning and sweeping of roadways will be completed as directed, including multiple times per day if necessary, to maintain acceptable roadways for the traveling public and to meet environmental regulations. Construction activities will cease when material deposited on the roadway is not properly removed or when equipment is not available as needed. Adequate construction exits will be planned, constructed and maintained by the Contractor per Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls".

ITEM 540: METAL BEAM GUARD FENCE

Furnish one type of post throughout the project except as specifically noted in the plans.

Wooden block outs will not be allowed.

ITEMS 542 & 544: REMOVING METAL BEAM GUARD FENCE & GUARDRAIL END TREATMENTS

W-Beam elements, steel posts and composite material blockouts will become the property of the contractor.

ITEM 544: GUARDRAIL END TREATMENTS
The use of wooden block-outs will not be allowed.

ITEM 585: RIDE QUALITY FOR PAVEMENT SURFACES

Use Surface Test Type A on all intersections and driveways.

Use Surface Test Type B pay adjustment schedule _3_ on the travel lanes.

Milling will not be allowed as a corrective action for excessive deviations in the surface layer.

ITEM 636: SIGNS

Verify all dimensions at the actual proposed sign location in order to maintain dimensions as shown on the Sign Mounting Details.

ITEM 644: SMALL ROADSIDE SIGN ASSEMBLIES

Bolt Clamp type will be used on Texas Triangular Slip Base System.

Do not leave any sign foundation holes open overnight. Ensure all holes drilled are at least the minimum required depth with no loose material remaining in the hole.

Stake proposed sign locations and receive approval before installation of sign foundations.

Expanded foam foundations are not permitted.

Cut the bottom of all posts square.

For sign types which design details are not shown on these plans, fabricate according to the "STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS".

Removed material that is deemed salvageable (signs and posts) will be the property of TxDOT. Deliver salvageable material to the TxDOT Maintenance Office. Remove unsalvageable material.

ITEM 658: DELINEATOR AND OBJECT MARKER ASSEMBLIES

All flexible and GF2 delineators will have a tubular body.

The delineator assembly BRF Class A (D-SW) and (D-SY) are to be single delineators (Class I) attached to a flat, plastic bracket to facilitate the mounting of the delineator on top of the bridge rail at the locations shown on the plans. Submit a sample for approval before ordering materials.

ITEM 666: RETROREFLECTORIZED PAVEMENT MARKINGS

The Contractor will layout the proposed striping in accordance with TxDOT Traffic Control Plan Standards and latest version Texas Manual on Uniform Traffic Control Devices (TMUTCD) and project striping layout sheets. The Engineer will verify proposed striping layout prior to the beginning of striping operations.

The Contractor will locate the beginning and ending points of No Pass Zones.

ITEM 3076: DENSE-GRADED HOT-MIX ASPHALT

Design for a target Laboratory-molded density of 97.0% when using the Texas Gyratory Compactor (TGC) (Tex-204-F, Part I).

Use aggregate that meets the Surface Aggregate Classification (SAC) requirement of Class B.

Maximum stripping of 0% is required.

RAP from Contractor owned sources may be used if the RAP is fractionated.

ITEM 6001: PORTABLE CHANGEABLE MESSAGE SIGN

This project will require "full matrix" type portable changeable message signs.

Ensure that the Contractor's Responsible Person for traffic control can revise messages within thirty (30) minutes of notification.

Furnish two (4) portable changeable message signs. The portable changeable message sign(s) will be used for all roadway closures as shown on the traffic control plan standard sheets.

Supply portable changeable message sign(s) in accordance with the Traffic Control Plan standard sheets and Article 6f.55 of the Texas Manual on Uniform Traffic Control Devices for Streets and Highways Part VI.

QUANTITY SHEET

CONTROLLING PROJECT ID 1191-03-033 **DISTRICT** Waco **COUNTY** Limestone
HIGHWAY FM 1245, FM 1633

			CONTROL SECTION JOB		**1191-03-033**		**1664-01-021**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00131376**		**A00131377**			
			COUNTY		**Limestone**		**Limestone**			
			HIGHWAY		**FM 1245**		**FM 1633**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW		STA	6.300		9.500		15.800	
	104-6009	REMOVING CONC (RIPRAP)		SY			559.000		559.000	
	104-6017	REMOVING CONC (DRIVEWAYS)		SY			83.000		83.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)		LF	820.000		1,045.000		1,865.000	
	105-6014	REMOVING STAB BASE & ASPH PAV (7"-12")		SY	1,691.000		1,819.000		3,510.000	
	110-6001	EXCAVATION (ROADWAY)		CY	298.000		409.000		707.000	
	110-6002	EXCAVATION (CHANNEL)		CY	60.000		100.000		160.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)		CY	690.000		723.000		1,413.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")		SY	4,488.000		5,577.000		10,065.000	
	164-6003	BROADCAST SEED (PERM) (RURAL) (CLAY)		SY	4,488.000		5,577.000		10,065.000	
	164-6071	BROADCAST SEED (TEMP)(WARM OR COOL)		SY	4,488.000		5,577.000		10,065.000	
	168-6001	VEGETATIVE WATERING		MG	74.000		91.000		165.000	
	169-6003	SOIL RETENTION BLANKETS (CL 1) (TY C)		SY	245.000		1,287.000		1,532.000	
	247-6053	FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS)		CY	574.000		629.000		1,203.000	
	310-6027	PRIME COAT(MC-30 OR AE-P)		GAL	354.000		399.000		753.000	
	316-6022	ASPH (CRS-2)		GAL	797.000		898.000		1,695.000	
	316-6397	AGGR(TY-D GR-4 OR TY-L GR-4)		CY	14.000		15.000		29.000	
	400-6005	CEM STABIL BKFL		CY	112.000		212.000		324.000	
	416-6001	DRILL SHAFT (18 IN)		LF			140.000		140.000	
	416-6004	DRILL SHAFT (36 IN)		LF	721.000		592.000		1,313.000	
	420-6011	CL B CONC (FLUME)		CY	5.400		9.400		14.800	
	420-6014	CL C CONC (ABUT)(HPC)		CY	37.800		64.300		102.100	
	420-6030	CL C CONC (CAP)(HPC)		CY	30.600		62.900		93.500	
	420-6038	CL C CONC (COLUMN)(HPC)		CY	15.000		40.900		55.900	
	422-6001	REINF CONC SLAB		SF	4,590.000		13,260.000		17,850.000	
	422-6015	APPROACH SLAB		CY	51.400		62.300		113.700	
	425-6020	PRESTR CONC BOX BEAM (5XB20)		LF	534.000				534.000	
	425-6039	PRESTR CONC GIRDER (TX54)		LF			1,550.000		1,550.000	
	432-6031	RIPRAP (STONE PROTECTION)(12 IN)		CY	224.000		887.000		1,111.000	
	432-6035	RIPRAP (STONE PROTECTION)(24 IN)		CY	720.000		1,501.000		2,221.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)		CY	40.000		42.000		82.000	
	450-6003	RAIL (TY T1W)		LF			856.000		856.000	
	450-6006	RAIL (TY T223)		LF	310.000				310.000	
	454-6018	SEALED EXPANSION JOINT (4 IN) (SEJ - M)		LF	66.000		102.000		168.000	
	496-6009	REMOV STR (BRIDGE 0 - 99 FT LENGTH)		EA	1.000				1.000	
	496-6010	REMOV STR (BRIDGE 100 - 499 FT LENGTH)		EA			1.000		1.000	
	500-6001	MOBILIZATION		LS	26.00%		74.00%		100.00%	

QUANTITY SHEET

CONTROLLING PROJECT ID 1191-03-033 **DISTRICT** Waco **COUNTY** Limestone
HIGHWAY FM 1245, FM 1633

			CONTROL SECTION JOB		**1191-03-033**		**1664-01-021**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00131376**		**A00131377**			
			COUNTY		**Limestone**		**Limestone**			
			HIGHWAY		**FM 1245**		**FM 1633**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO	14.000				14.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)		LF	48.000		84.000		132.000	
	506-6011	ROCK FILTER DAMS (REMOVE)		LF	48.000		84.000		132.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)		LF	1,369.000		1,876.000		3,245.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)		LF	1,369.000		1,876.000		3,245.000	
	530-6004	DRIVEWAYS (CONC)		SY			69.000		69.000	
	533-6001	RUMBLE STRIPS (SHOULDER)		LF	710.000		913.000		1,623.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)		LF	355.000		456.000		811.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)		LF	300.000		350.000		650.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)		EA	4.000		4.000		8.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE		LF	325.000		550.000		875.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)		EA	4.000		4.000		8.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)		EA	4.000		4.000		8.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)		EA	4.000		4.000		8.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)		EA	2.000		2.000		4.000	
	644-6076	REMOVE SM RD SN SUP&AM		EA	2.000		2.000		4.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)		EA	6.000		22.000		28.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)		EA	18.000		17.000		35.000	
	666-6302	RE PM W/RET REQ TY I (W)4"(SLD)(090MIL)		LF			1,900.000		1,900.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)		LF	1,260.000				1,260.000	
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)		LF	158.000				158.000	
	666-6314	RE PM W/RET REQ TY I (Y)4"(SLD)(090MIL)		LF			1,900.000		1,900.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)		LF	630.000				630.000	
	672-6009	REFL PAV MRKR TY II-A-A		EA	16.000		24.000		40.000	
	3076-6066	TACK COAT		GAL	443.000		499.000		942.000	
	3076-6069	D-GR HMA TY-C SAC-B PG64-22 (EXEMPT)		TON	194.000		218.000		412.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN		EA	2.000		2.000		4.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)		LS	1.000				1.000	

SUMMARY OF REMOVAL ITEMS

LOCATION	104 6009 REMOVING CONC (RIPRAP) SY	104 6017 REMOVING CONC (DRIVEWAYS) SY	104 6054 REMOVING CONCRETE (MOW STRIP) LF	105 6014 REMOVING STAB BASE & ASPH PAV (7"-12") SY	496 6009 REMOV STR (BRIDGE 0 - 99 FT LENGTH) EA	496 6010 REMOV STR (BRIDGE 100 - 499 FT LENGTH) EA	542 6001 REMOVE METAL BEAM GUARD FENCE LF	542 6004 RM MTL BM GD FENCE TRANS (THRIE-BEAM) EA	544 6003 GUARDRAIL END TREATMENT (REMOVE) EA
FM 1245 REMOVAL PLAN 1 OF 2	0	0	820	1691	1	0	325	4	4
FM 1633 REMOVAL PLAN 2 OF 2	559	83	1045	1819	0	1	550	4	4
PROJECT TOTALS	**559**	**83**	**1865**	**3510**	**1**	**1**	**875**	**8**	**8**

SUMMARY OF TRAFFIC CONTROL ITEMS

LOCATION	6001 6002 PORTABLE CHANGEABLE MESSAGE SIGN EA
FM 1245 TCP	2
FM 1633 TCP	2
PROJECT TOTALS	**4**

SUMMARY OF ROADWAY ITEMS

LOCATION	100 6002 PREPARING ROW STA	110 6001 EXCAVATION (ROADWAY) CY	110 6002 EXCAVATION (CHANNEL) CY	132 6006 EMBANKMENT (FINAL)(DENS CONT)(TY C) CY	247 6053 FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS) CY	310 6027 PRIME COAT(MC-30 OR AE-P) GAL	316 6022 ASPH (CRS-2) GAL	316 6397 AGGR(TY-D GR-4 OR TY-L GR-4) CY	432 6031 RIPRAP (STONE PROTECTION)(12 IN) CY	432 6045 RIPRAP (MOW STRIP)(4 IN) CY	530 6004 DRIVEWAYS (CONC) SY	540 6002 MTL W-BEAM GD FEN (STEEL POST) LF	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM) EA	544 6001 GUARDRAIL END TREATMENT (INSTALL) EA	3076 6066 TACK COAT GAL	3076 6069 D-GR HMA TY-C SAC-B PG64-22 (EXEMPT) TON
FM 1245 P&P SHEET 1 OF 2	6.3	298	60	690	574	354	797	14	224	40	0	300	4	4	443	194
FM 1633 P&P SHEET 2 OF 2	9.5	409	100	723	629	399	898	15	887	42	69	350	4	4	499	218
PROJECT TOTALS	**15.8**	**707**	**160**	**1413**	**1,203**	**753**	**1,695**	**29**	**1,111**	**82**	**69**	**650**	**8**	**8**	**942**	**412**

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	533 6001 RUMBLE STRIPS (SHOULDER) LF	533 6002 RUMBLE STRIPS (CENTERLINE) LF	666 6303 RE PM W/RET REQ TY I (W)4"(SLD)(100MIL) LF	666 6312 RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL) LF	666 6315 RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL) LF	672 6009 REFL PAV MRKR TY II-A-A EA
FM 1245 PAVEMENT MARKINGS	710	355	1260	158	630	16
FM 1633 PAVEMENT MARKINGS	913	456	1900	0	1900	24
PROJECT TOTALS	**1,623**	**811**	**3160**	**158**	**2530**	**40**

SUMMARY OF SIGNING ITEMS

LOCATION	644 6004 IN SM RD SN SUP&AM TY10BWG(1)SA(T) EA	644 6076 REMOVE SM RD SN SUP&AM EA	658 6062 INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI) EA	658 6014 INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI) EA
FM 1245 SIGNING	2	2	18	6
FM 1633 SIGNING	2	2	17	22
PROJECT TOTALS	**4**	**4**	**35**	**28**

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	160 6003 FURNISHING AND PLACING TOPSOIL (4") SY	164 6003 BROADCAST SEED (PERM) (RURAL) (CLAY) SY	164 6071 BROADCAST SEED (TEMP)(WARM OR COOL) SY	168 6001 VEGETATIVE WATERING MG	169 6003 SOIL RETENTION BLANKETS (CL 1) (TY C) SY	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2) LF	506 6011 ROCK FILTER DAMS (REMOVE) LF	506 6038 TEMP SEDMT CONT FENCE (INSTALL) LF	506 6039 TEMP SEDMT CONT FENCE (REMOVE) LF
FM 1245									
SHEET 1 OF 2: BEGIN TO 525+65	2,136	2,136	2,136	35.0	0	12	12	656	656
SHEET 2 OF 2: 525+65 TO END	2,352	2,352	2,352	39.0	245	36	36	713	713
FM 1245 SUBTOTAL	4,488	4,488	4,488	74.0	245	48	48	1,369	1,369
FM 1633									
SHEET 1 OF 2: BEGIN TO 213+00	2,516	2,516	2,516	41.0	961	36	36	913	913
SHEET 2 OF 2: 213+00 TO END	3,061	3,061	3,061	50.0	326	48	48	963	963
FM 1633 SUBTOTAL	5,577	5,577	5,577	91.0	1,287	84	84	1,876	1,876
PROJECT TOTALS	**10,065**	**10,065**	**10,065**	**165.0**	**1,532**	**132**	**132**	**3,245**	**3,245**

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633
SUMMARY SHEET

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	11

STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

010 SUMMARY SHEET.dgn

SUMMARY OF BRIDGE ITEMS															
LOCATION	400 6005	416 6001	416 6004	420 6011	420 6014	420 6030	420 6038	422 6001	422 6015	425 6020	425 6039	432 6035	450 6003	450 6006	454 6018
	CEM STABIL BKFL	DRILL SHAFT (18 IN)	DRILL SHAFT (36 IN)	CL B CONC (FLUME)	CL C CONC (ABUT)(HPC)	CL C CONC (CAP)(HPC)	CL C CONC (COLUMN)(HPC)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC BOX BEAM (5XB20)	PRESTR CONC GIRDER (TX54)	RIPRAP (STONE PROTECTION)(24 IN)	RAIL (TY T1W)	RAIL (TY T223)	SEALED EXPANSION JOINT (4 IN)(SEJ-M)
	CY	LF	LF	CY	CY	CY	CY	SF	CY	LF	LF	CY	LF	LF	LF
FM 1245 BRIDGE	112	0	721	5.4	37.8	30.6	15.0	4590	51.4	534	0	720	0	310	66
FM 1633 BRIDGE	212	140	592	9.4	64.3	62.9	40.9	13260	62.3	0	1550	1501	856	0	102
PROJECT TOTALS	324	140	1313	14.8	102.1	93.5	55.9	17850	113.7	534	1550	2221	856	310	168

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633
SUMMARY SHEET

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		12
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

011 SUMMARY SHEET.dgn

PLOT SCALE: 100.0000 ' / in.
5/12/2021 10:55:45 AM USER: rdelossantos MODEL:Design
\\pusscshr-f101\J-Jobs\2138 TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.01 General\1633-1245\011 SUMMARY SHEET.dgn

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
1	1	I-3	CHRISTMAS CREEK	36x96			10BWG	1	SA	T		
	2	I-3	CHRISTMAS CREEK	36x96			10BWG	1	SA	T		
2	1	I-3	NAVASOTA RIVER	36x96			10BWG	1	SA	T		
	2	I-3	NAVASOTA RIVER	36x96			10BWG	1	SA	T		

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).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC	FM 1245,ETC
4-16 8-16	DIST	COUNTY		SHEET NO.
	WAC	LIMESTONE		13

18

DATE: 5/12/2021 10:55:47 AM
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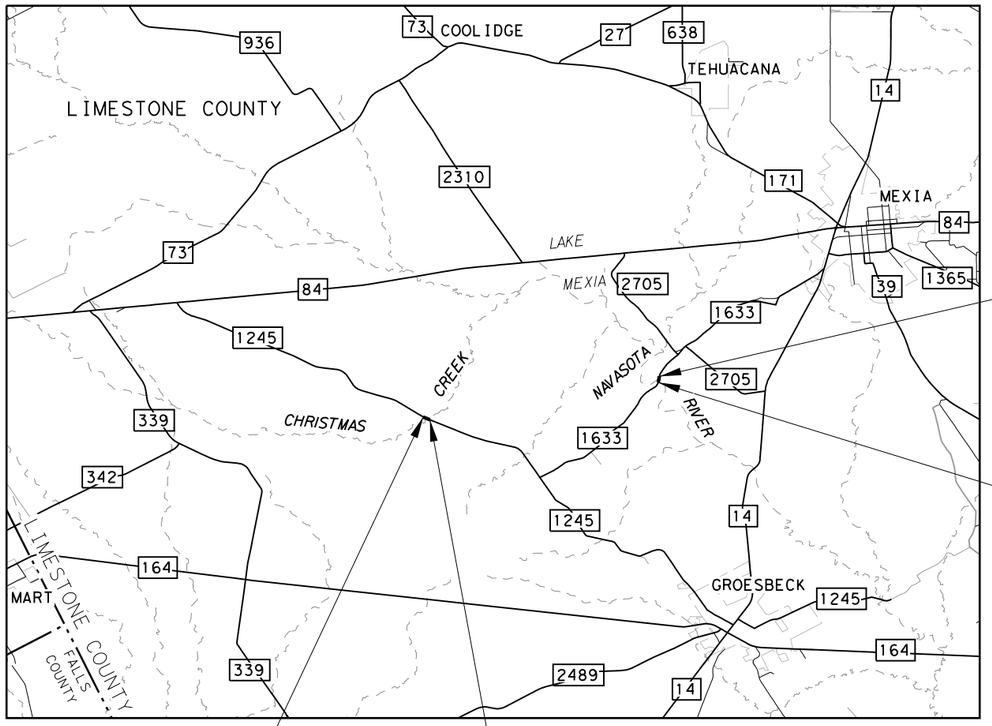

END PROJECT
FM 1633 AT NAVASOTA RIVER
CSJ: 1664-01-021
STA 218+00

BEGIN PROJECT
FM 1633 AT NAVASOTA RIVER
CSJ: 1664-01-021
STA 208+50

END PROJECT
FM 1245 AT CHRISTMAS CREEK
CSJ: 1191-03-033
STA 529+00

BEGIN PROJECT
FM 1245 AT CHRISTMAS CREEK
CSJ: 1191-03-033
STA 522+70

VICINITY MAP

SCALE: 1"=20,000'

TRAFFIC CONTROL PLAN GENERAL NOTES:

1) INSTALL ALL SIGNS, BARRICADES AND TRAFFIC CONTROL DEVICES AS SHOWN AND IN ACCORDANCE WITH THE STANDARD BC SHEETS AND AS DIRECTED BY THE ENGINEER. TEMPORARY SIGNS WILL HAVE PERMANENT MOUNTS AND/OR TEMPORARY BASE(S) AS APPLICABLE. ALL SIGNS SHOWN IN THIS TRAFFIC CONTROL PLAN ARE A MINIMUM REQUIREMENT OF THE SIGNS TO BE PLACED.

2) ADDITIONAL SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES OTHER THAN THOSE SPECIFIED MAY BE REQUIRED FOR THE SAFE MOVEMENT OF TRAFFIC THROUGH THE PROJECT. PAYMENT FOR ALL SUCH SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES SHALL BE CONSIDERED AS SUBSIDIARY TO THE ITEM 502, "BARRICADES, SIGNS AND TRAFFIC HANDLING".

3) ALL TRAFFIC CONTROL DEVICES WILL CONFORM WITH THE MOST CURRENT VERSION OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (TMUTCD) AND WILL BE MAINTAINED AS DIRECTED. ADDITIONAL GUIDELINES FOR TRAFFIC CONTROL DEVICES MAY BE FOUND IN THE TMUTCD.

4) WORK SITES SHOULD BE CAREFULLY MONITORED TO ENSURE THAT TRAFFIC CONTROL MEASURES ARE OPERATING EFFECTIVELY AND THAT ALL DEVICES USED ARE CLEARLY VISIBLE, CLEAN AND IN GOOD REPAIR.

5) THE CONTRACTOR SHALL PROVIDE SAFE ACCESS TO AND FROM ADJACENT PRIVATE PROPERTY AT ALL TIMES AND IN ALL WEATHER CONDITIONS.

6) PCMS LOCATIONS ARE TO BE APPROVED BY THE ENGINEER PRIOR TO ANY WORK COMMENCED AND ARE TO REMAIN SEVEN DAYS AFTER CLOSURE. PCMSs SHALL BE INSTALLED AND WORKING PROPERLY FOR A MINIMUM OF 7 DAYS PRIOR TO ANY ROAD CLOSURES OR COMMENCEMENT OF WORK.

7) THE CONTRACTOR IS RESPONSIBLE FOR COVERING ANY SIGNS IN CONFLICT WITH THE TRAFFIC CONTROL SIGNS AND DEVICES.

8) THE CONTRACTOR WILL BE REQUIRED TO SUBMIT A DETAILED SCHEDULE OF WORK TO THE PROJECT ENGINEER PRIOR TO THE BEGINNING OF CONSTRUCTION WHICH GENERALLY CONFORMS TO THE SEQUENCE SHOWN ON THE TCP SEQUENCE OF OPERATION. COMPLETE ALL WORK ON PROJECT AS SHOWN ON THE VARIOUS PLAN SHEETS AND IN COMPLIANCE WITH THE GENERAL NOTES OF THIS CONTRACT.

9) ANY REQUEST TO ALTER THE SEQUENCE OF OPERATION OR TRAFFIC CONTROL PLAN WILL BE SUBMITTED TO THE ENGINEER FOR HIS WRITTEN APPROVAL.

10) PORTABLE CHANGEABLE MESSAGE SIGN LOCATIONS ARE AS DIRECTED BY THE ENGINEER AND ARE TO REMAIN IN PLACE FOR THE DURATION OF THE PROJECT.

SIGNS G20-5T, G20-6T, G20-2, G20-2bT, CW20-1D, R20-3T, R20-5T, G20-9TP, G20-10T AND R20-5aTP WILL BE REQUIRED AT PROJECT LIMITS.

CW20-1D AND G20-2 WILL BE REQUIRED AT ALL CROSSROADS.

SEQUENCE OF OPERATION

CONCURRENT CONSTRUCTION OF FM 1245 (CHRISTMAS CREEK) AND FM 1633 (NAVASOTA RIVER) SHALL NOT BE PERMISSIBLE.

FM 1245 AT CHRISTMAS CREEK IS THE PREFERRED BRIDGE TO BE REPLACED FIRST.

1) INSTALL DETOUR ROAD CLOSURE SIGNS AND BARRICADES AS SHOWN IN THE TRAFFIC CONTROL PLAN AND TRAFFIC CONTROL STANDARD DRAWINGS.

2) INSTALL SW3P AND BMPs AS SHOWN AND AS DIRECTED.

3) SET UP DETOUR SIGNING AND CLOSE ROAD TO TRAFFIC.

4) REMOVE EXISTING BRIDGE.

5) CONSTRUCT NEW BRIDGE AND APPROACHES.

6) INSTALL MBGF, SGTs, SIGNS, DELINEATORS AND PAVEMENT MARKINGS.

7) INSTALL PERMANENT SEEDING AS SHOWN IN THE PLANS.

8) PERFORM PROJECT CLEAN UP AND OTHER WORK AS DIRECTED.

9) UPON APPROVAL FROM THE ENGINEER, REMOVE ALL BARRICADES, TEMPORARY SIGNS AND DETOUR SIGNS.

10) OPEN THE ROAD AND BRIDGE TO TRAFFIC.

REPEAT STEPS 1-10 FOR FM 1633 AT NAVASOTA RIVER.

STATE OF TEXAS
CHRISTIAN L. MOORMAN
93828
LICENSED PROFESSIONAL ENGINEER
5/7/2021

NO.	REVISION	DATE

Texas Department of Transportation

HUITT-ZOLLARS

HUITT-ZOLLARS, INC. ENGINEERING / SURVEYING
1717 McKINNEY AVENUE, SUITE 1400 DALLAS, TEXAS 75202-1236
Firm No. F-761

TRAFFIC CONTROL PLAN SEQUENCE OF OPERATION

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		14
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC

PLOT SCALE: 1:1
5/7/2021 9:25:08 AM cmoorman MODEL:$$MODEL$$
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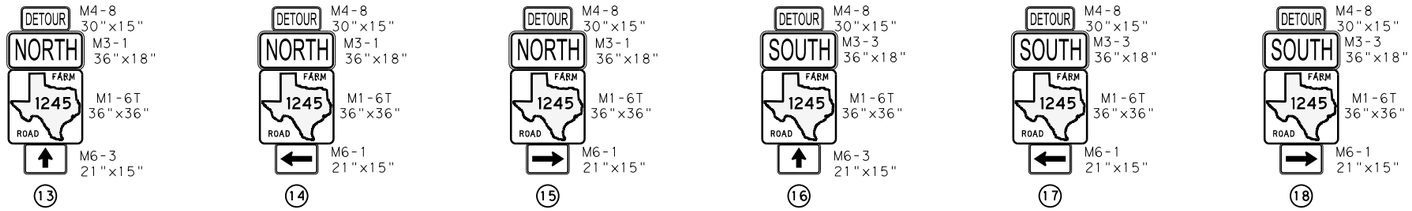

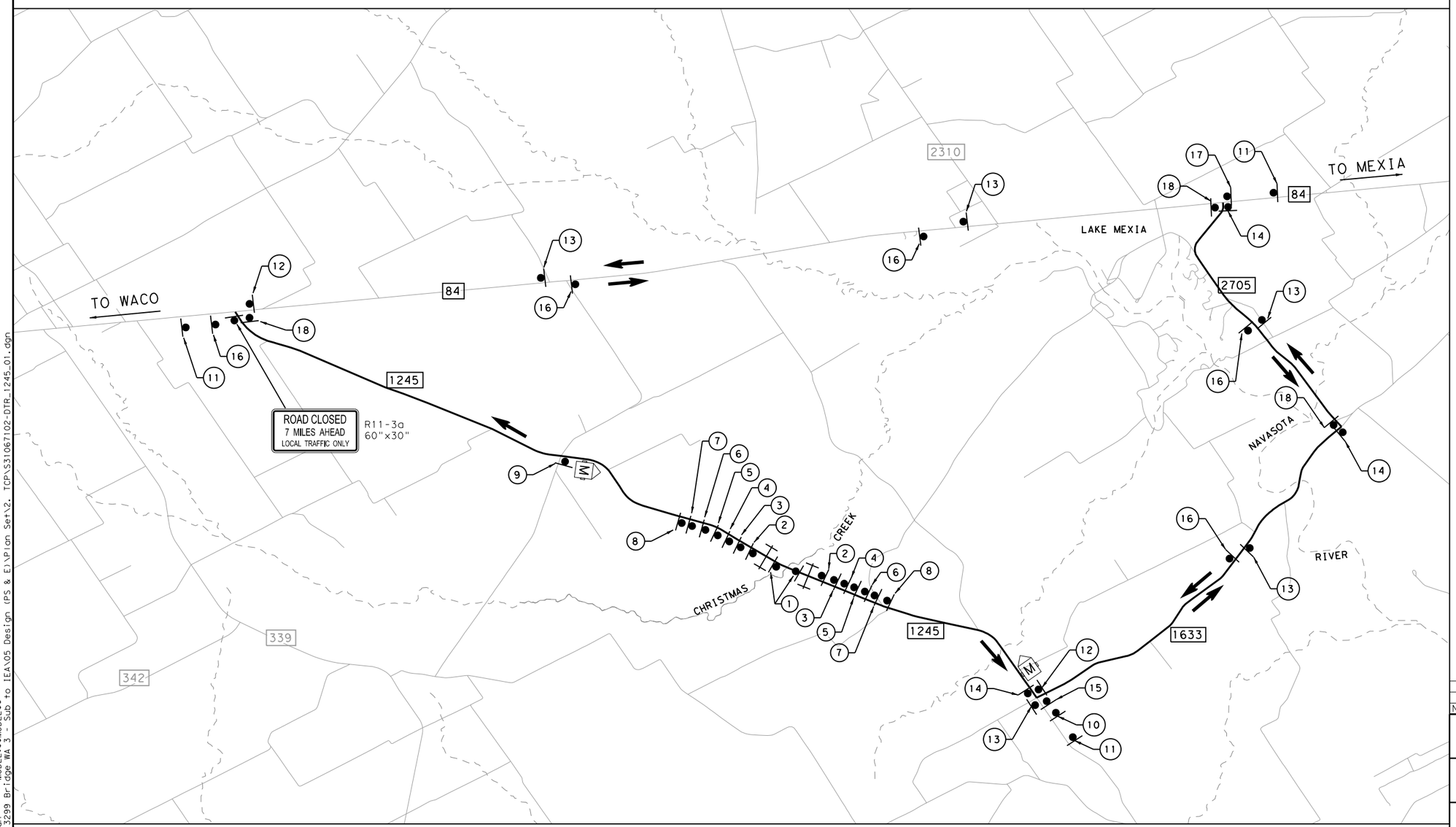

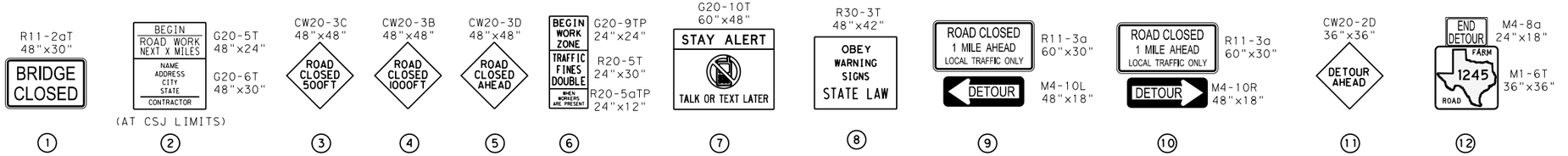

N

LEGEND:

- PORTABLE CHANGEABLE MESSAGE SIGN
- TYPE 3 BARRICADE
- CONSTRUCTION SIGN
- DIRECTION OF DETOUR TRAFFIC

0 1500 3000
HORIZONTAL SCALE IN FEET

NOTES:

1. DETOUR WILL REMAIN IN PLACE THROUGHOUT THE DURATION OF CONSTRUCTION.
2. SEE BC STANDARDS AND WZ(RCD) STANDARD FOR SIGN SPACING, DETAILS AND ADDITIONAL SIGNING NOT SHOWN. SIGNS MAY BE ADJUSTED TO FIT FIELD CONDITIONS OR AS DIRECTED.
3. USE EXISTING SIGNS AT INTERSECTIONS IF APPLICABLE FOR THIS DETOUR ROUTE. SIGNS THAT ARE IN CONFLICT WITH THESE SIGNS SHALL BE COVERED PER ENGINEER'S DIRECTION.

STATE OF TEXAS
CHRISTIAN L. MOORMAN
93828
LICENSED PROFESSIONAL ENGINEER
5/7/2021

NO.	REVISION	DATE

Texas Department of Transportation

HUITT-ZOLLARS
HUITT-ZOLLARS, INC. ENGINEERING / SURVEYING
1717 McKINNEY AVENUE, SUITE 1400 DALLAS, TEXAS 75202-1236
Firm No. F-761

FM 1245

TRAFFIC CONTROL PLAN DETOUR LAYOUT AT CHRISTMAS CREEK

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		15
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC

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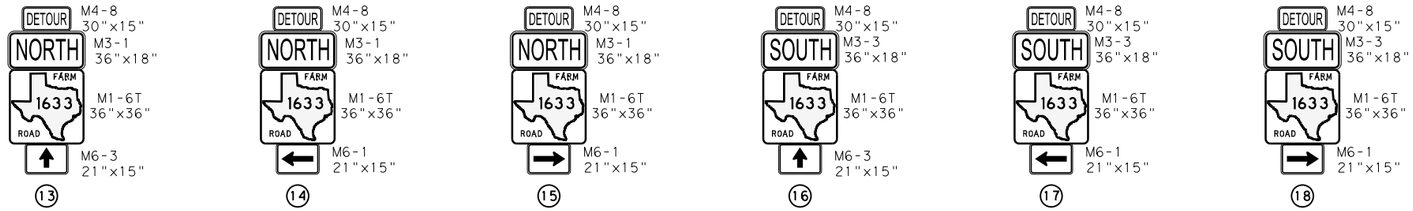

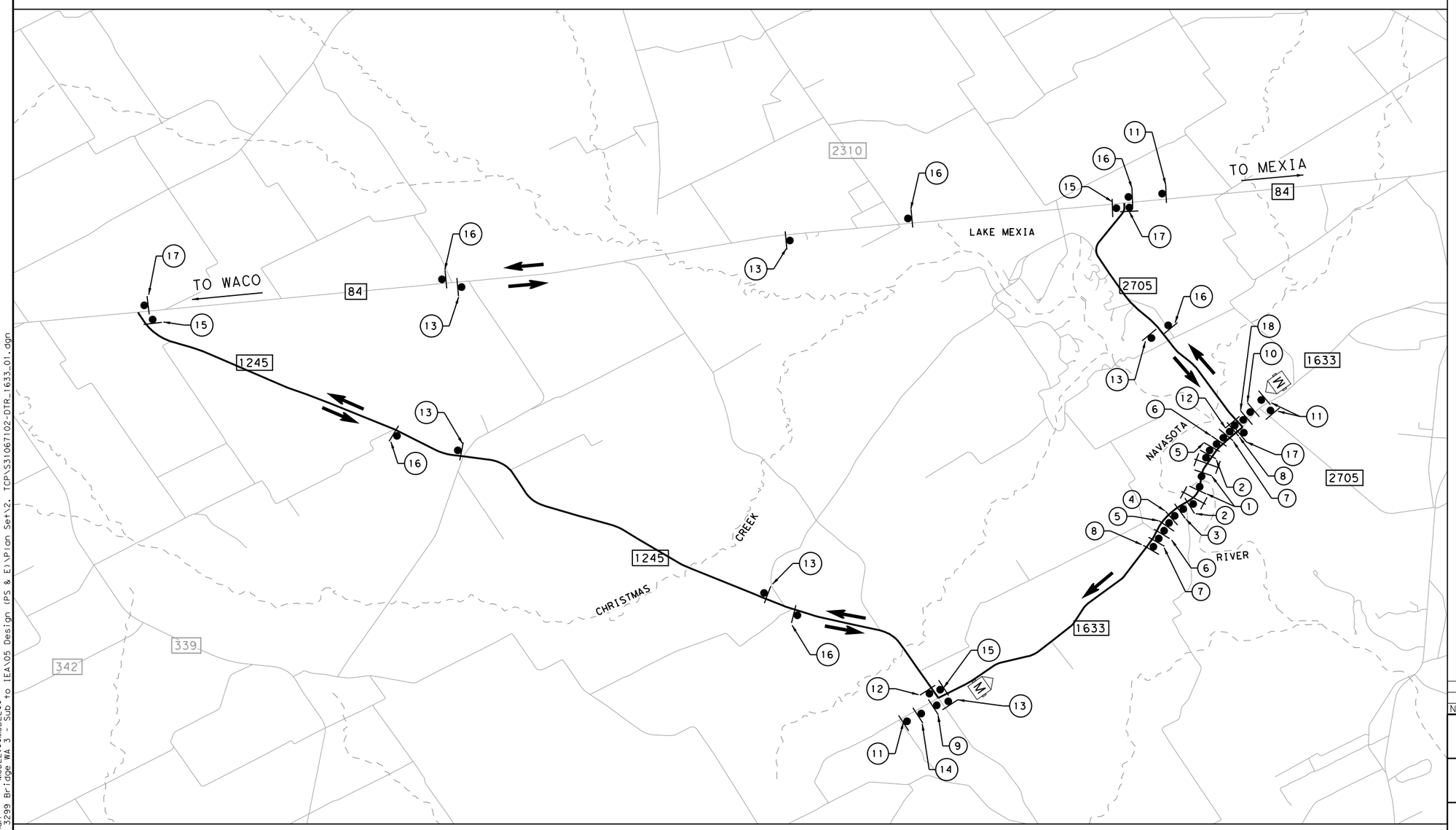

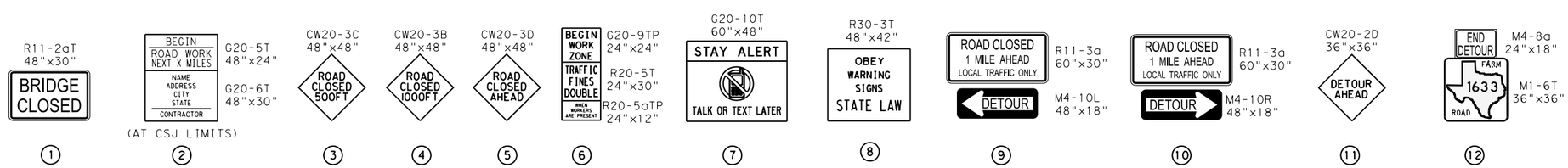

N

LEGEND:

- PORTABLE CHANGEABLE MESSAGE SIGN
- TYPE 3 BARRICADE
- CONSTRUCTION SIGN
- DIRECTION OF DETOUR TRAFFIC

0 1500 3000
HORIZONTAL SCALE IN FEET

NOTES:

1. DETOUR WILL REMAIN IN PLACE THROUGHOUT THE DURATION OF CONSTRUCTION.
2. SEE BC STANDARDS AND WZ(RCD) STANDARD FOR SIGN SPACING, DETAILS AND ADDITIONAL SIGNING NOT SHOWN. SIGNS MAY BE ADJUSTED TO FIT FIELD CONDITIONS OR AS DIRECTED.
3. USE EXISTING SIGNS AT INTERSECTIONS IF APPLICABLE FOR THIS DETOUR ROUTE. SIGNS THAT ARE IN CONFLICT WITH THESE SIGNS SHALL BE COVERED PER ENGINEER'S DIRECTION.

STATE OF TEXAS
CHRISTIAN L. MOORMAN
93828
LICENSED PROFESSIONAL ENGINEER
5/7/2021

NO.	REVISION	DATE

Texas Department of Transportation

HUITT-ZOLLARS
HUITT-ZOLLARS, INC. ENGINEERING / SURVEYING
1717 McKINNEY AVENUE, SUITE 1400 DALLAS, TEXAS 75202-1236
Firm No. F-761

FM 1633

TRAFFIC CONTROL PLAN DETOUR LAYOUT AT NAVASOTA RIVER

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		16
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC

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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. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

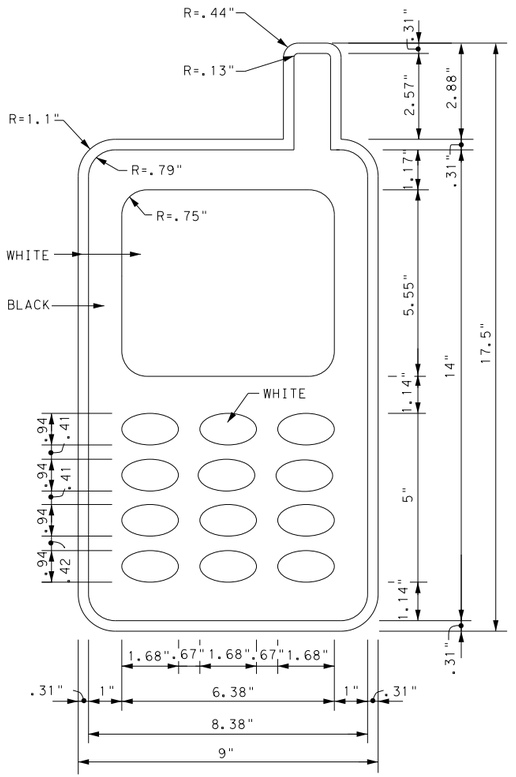
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

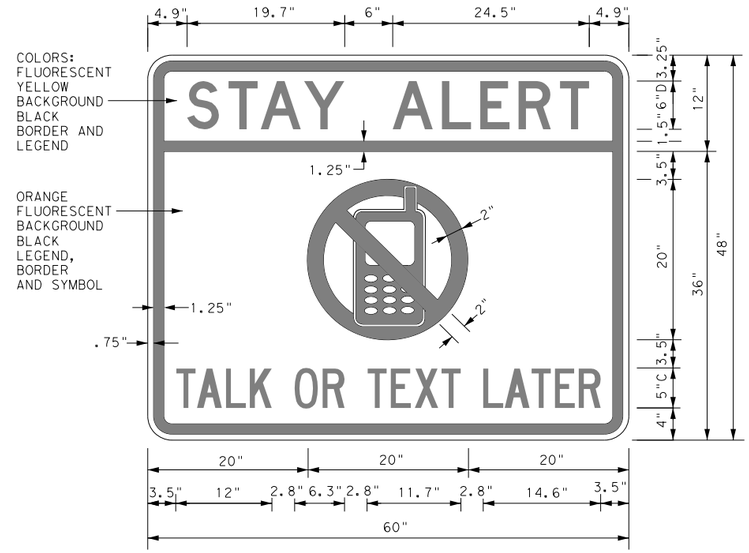
12. The Engineer has the final decision on the location of all traffic control devices.

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 APPAREL 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.





3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange;
[TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20-10T)

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
Traffic Operations Division - TE
Phone (512) 416-3118

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 Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 5-10 8-14 9-07 7-13	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		17

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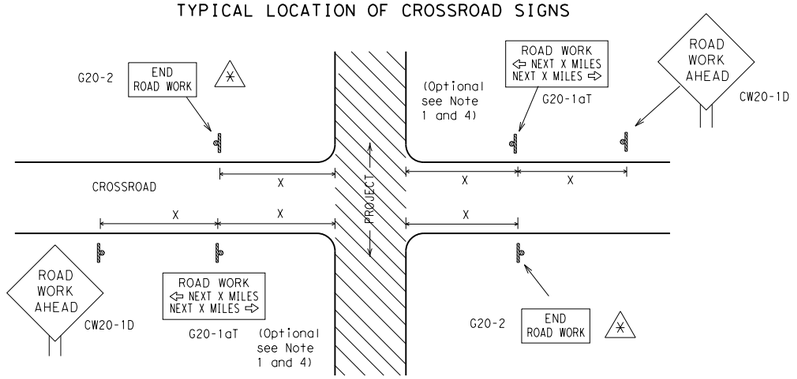
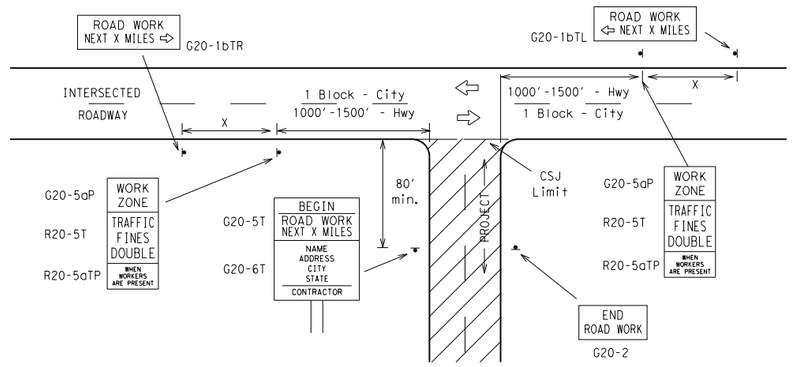
TYPICAL LOCATION OF CROSSROAD SIGNS



⁂ 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. 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]

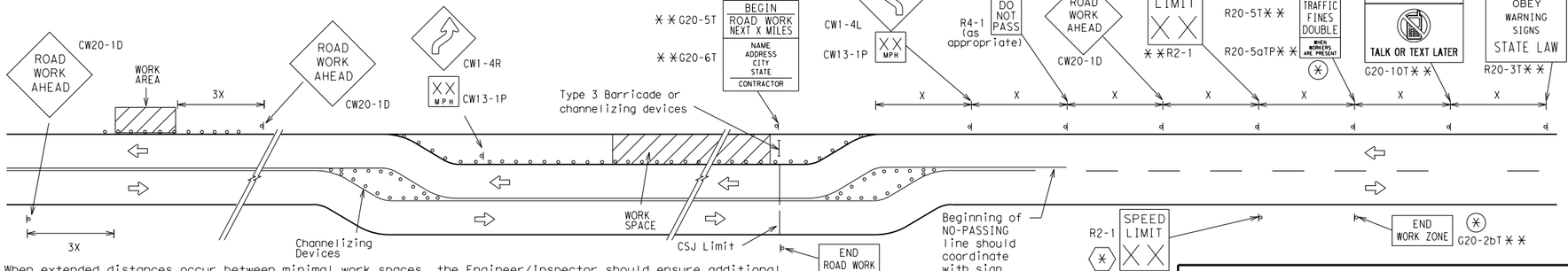
⁂ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

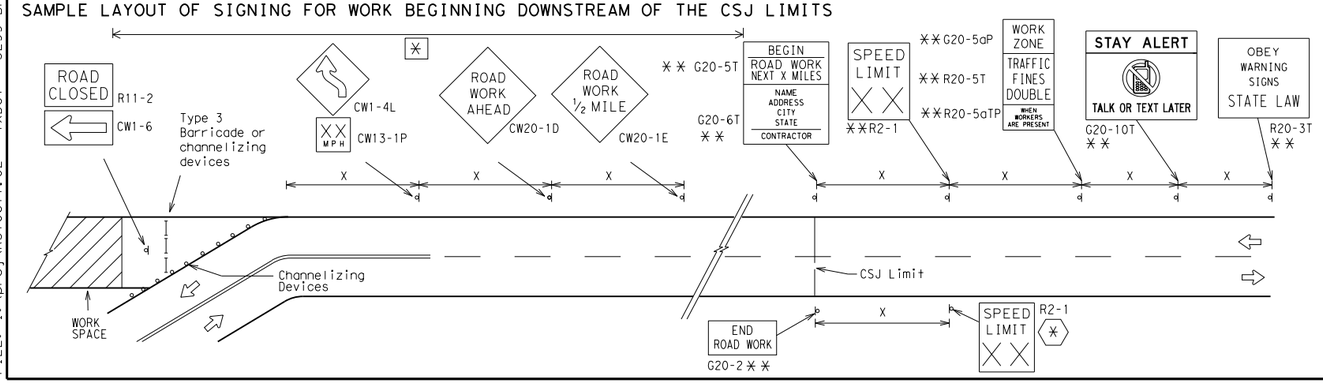
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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.

⁂⁂ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

⁂ 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 Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	WACO	LIMESTONE		18

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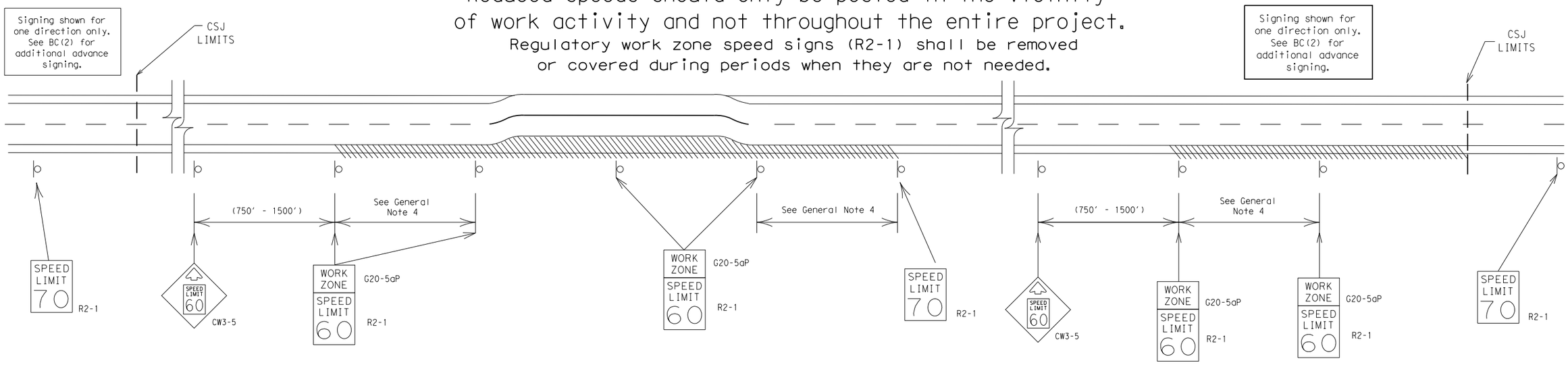
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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 travelled 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 Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		19

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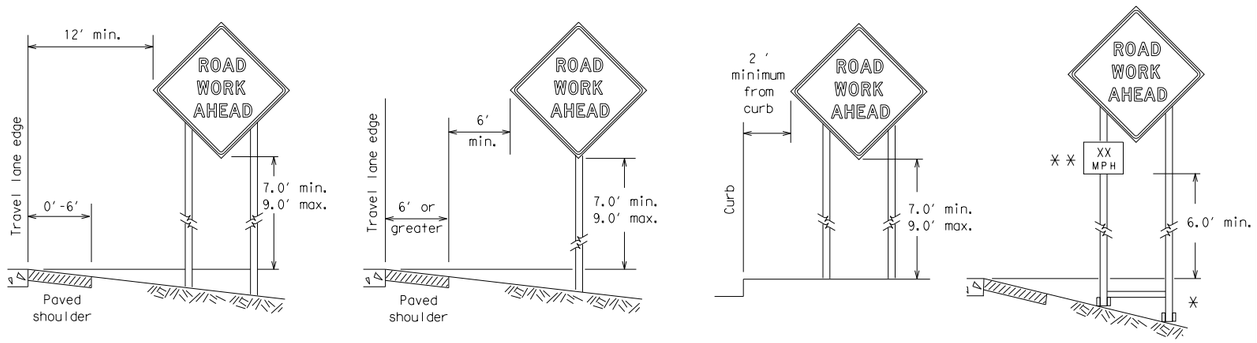
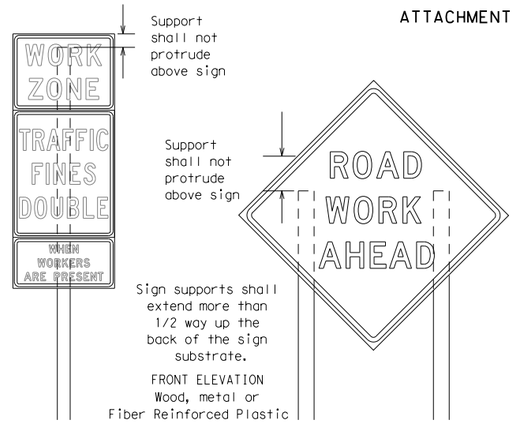
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

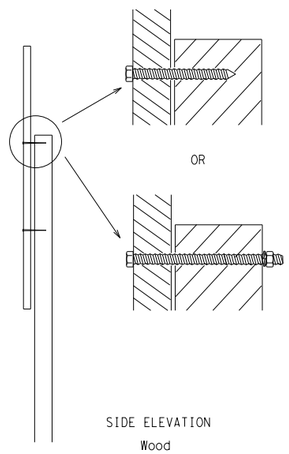


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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





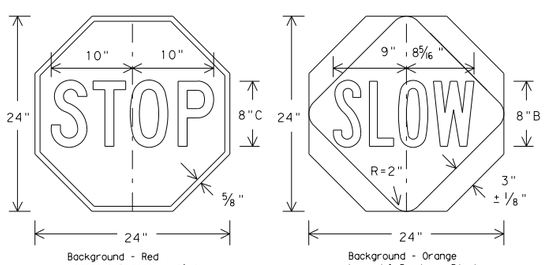
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
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.



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, 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.
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 sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards 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). 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 Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 9-07 8-14 7-13	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		20

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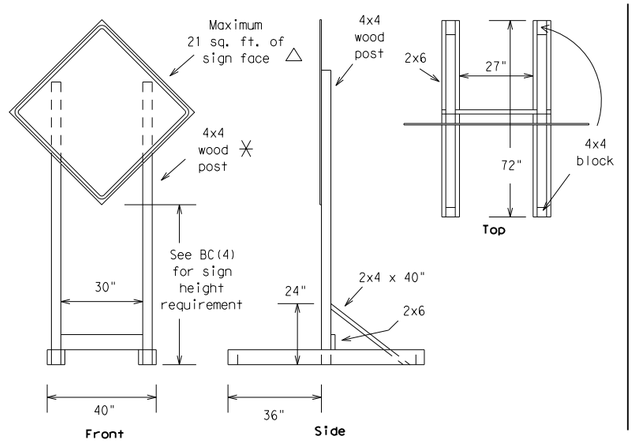
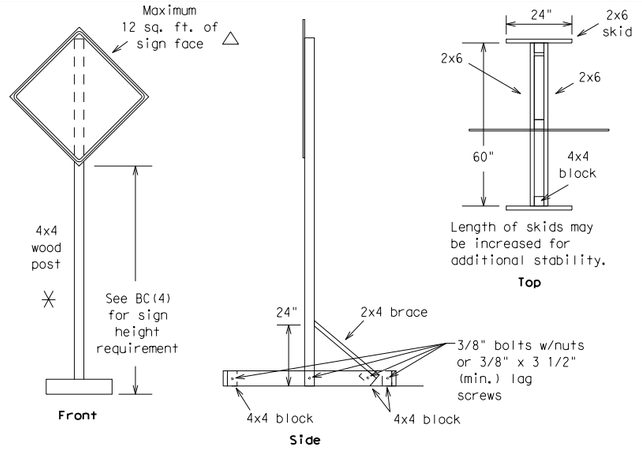
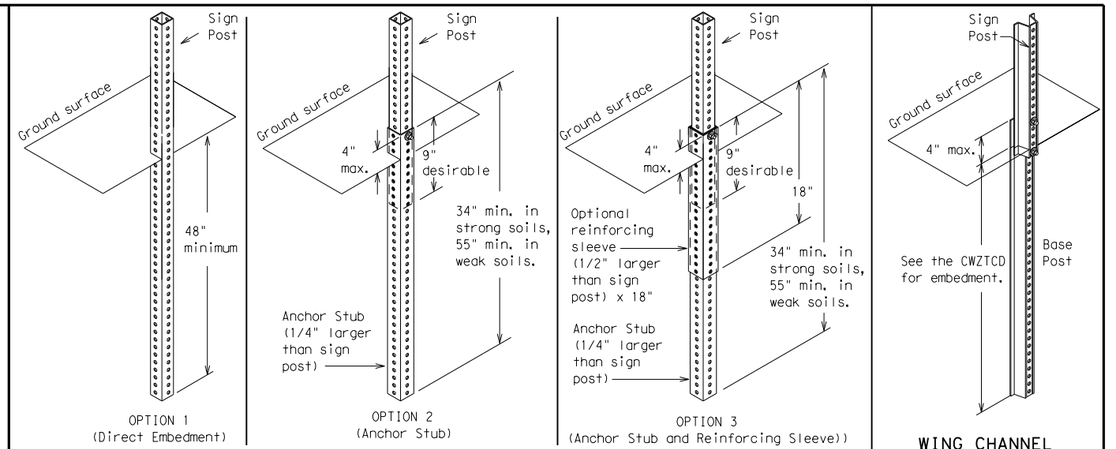




SKID MOUNTED WOOD SIGN SUPPORTS

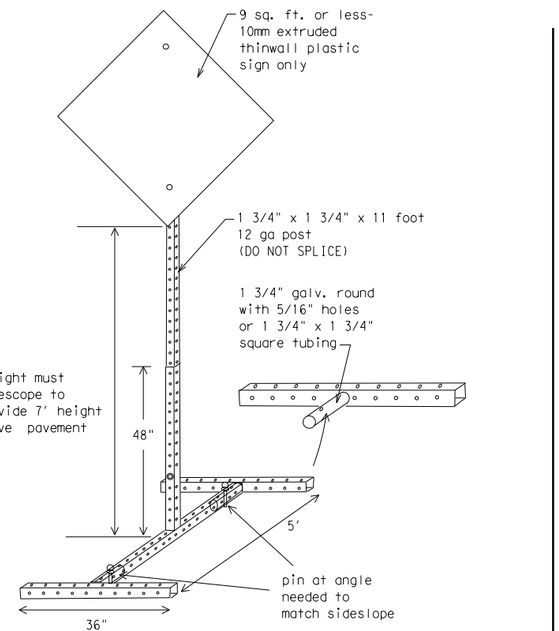
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

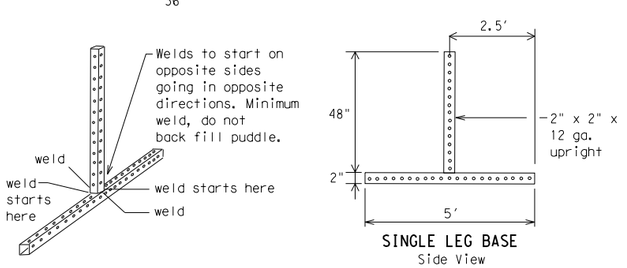


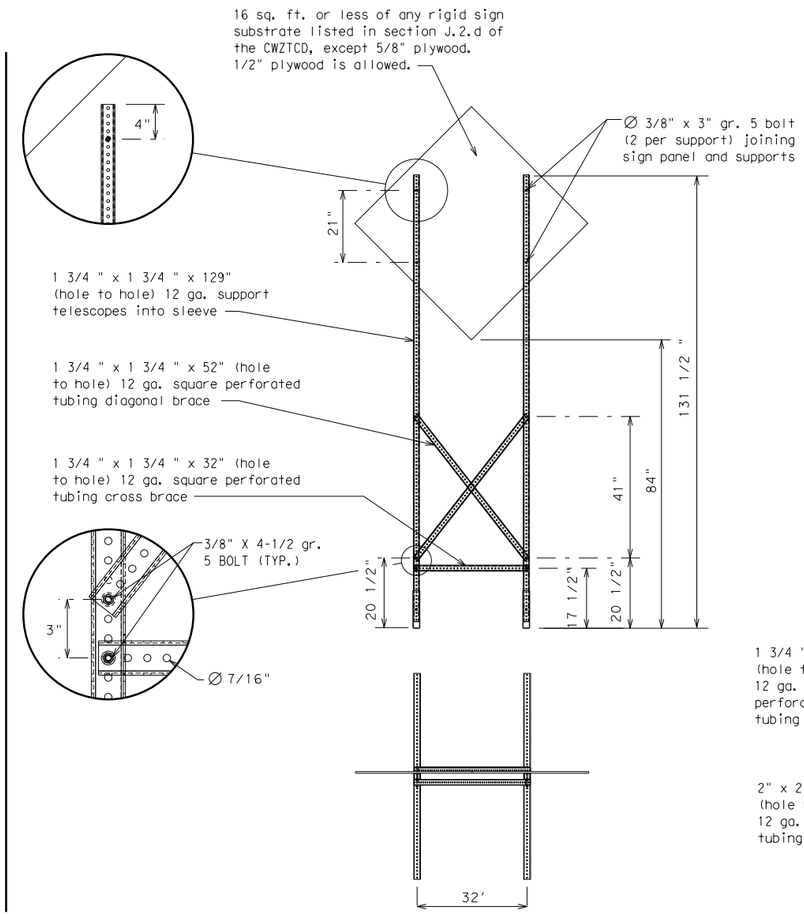
PERFORATED SQUARE METAL TUBING

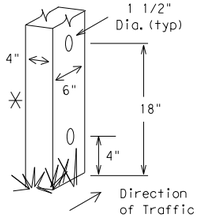
GROUND MOUNTED SIGN SUPPORTS

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.



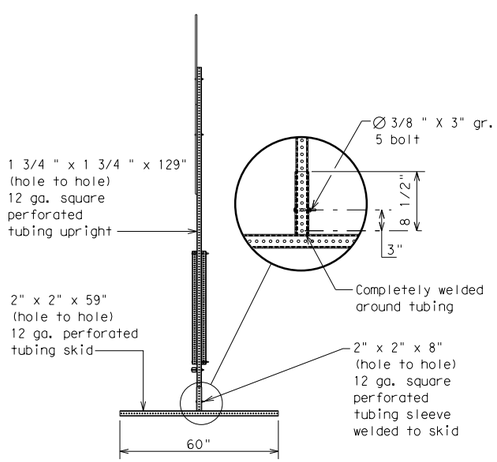






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



SKID MOUNTED PERFORATED SQUARE STEEL TUBING 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 Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 9-07 8-14 7-13	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		21

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	WACO	LIMESTONE		22

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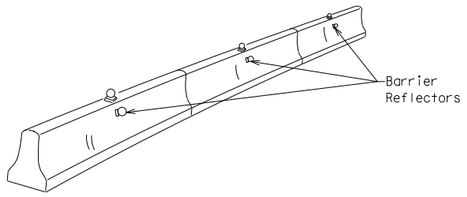
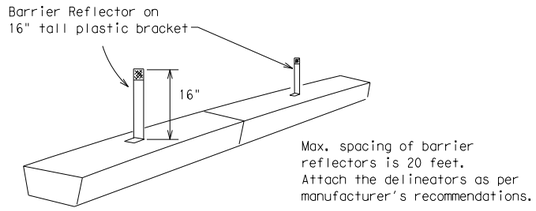
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

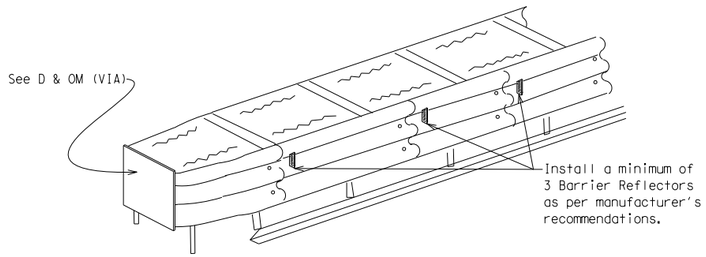


CONCRETE TRAFFIC BARRIER (CTB)

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.



LOW PROFILE CONCRETE BARRIER (LPCB)

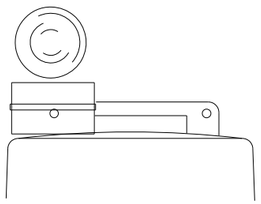


DELINEATION OF END TREATMENTS

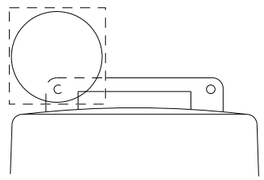
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

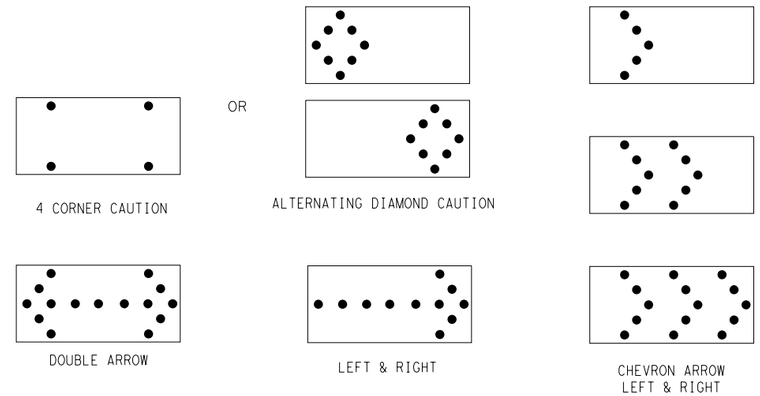
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

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

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
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7-13	WACO	LIMESTONE		23

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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:

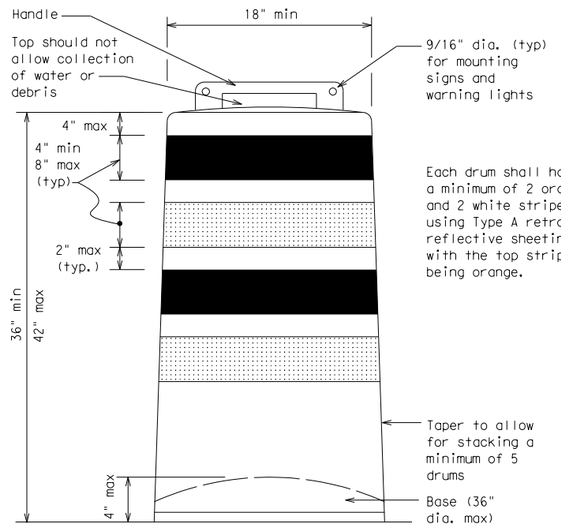
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

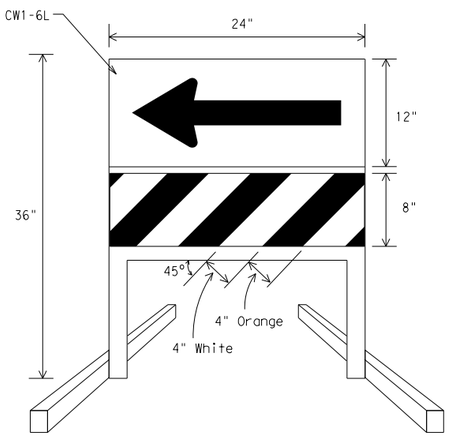
RETROREFLECTIVE SHEETING

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 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.

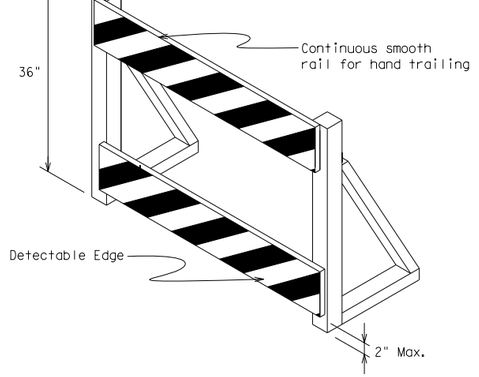




DIRECTION INDICATOR BARRICADE

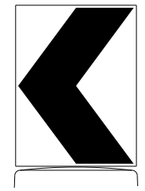
1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

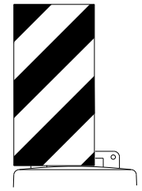


DETECTABLE PEDESTRIAN BARRICADES

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.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
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 for Buildings and Facilities (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 may 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 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 Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	WACO	LIMESTONE		24

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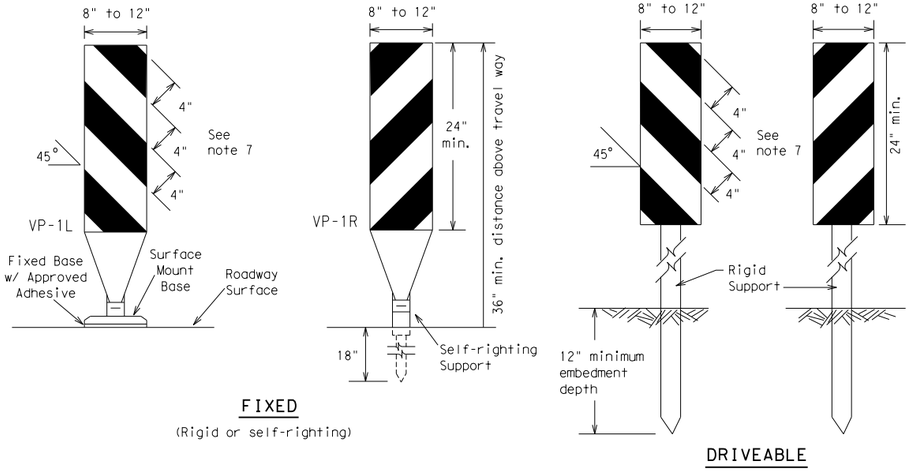
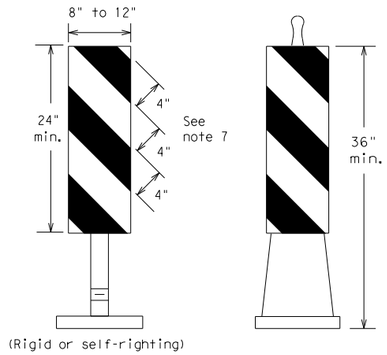


FIXED
(Rigid or self-righting)

DRIVEABLE

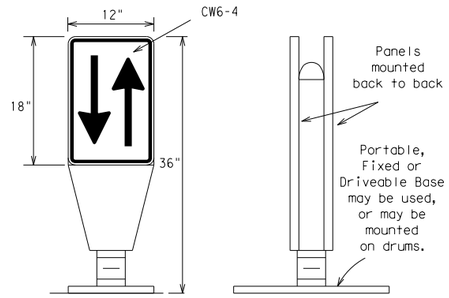


(Rigid or self-righting)

PORTABLE

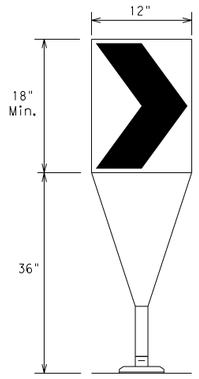
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of 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 conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



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)



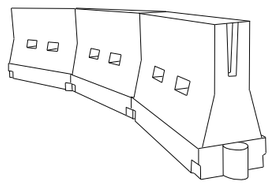
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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) placed 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 NCHRP 350 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 * * 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices 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 Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 9-07 8-14 7-13	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		25

DATE: 5/7/2021 9:25:37 AM
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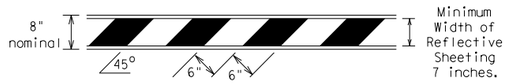
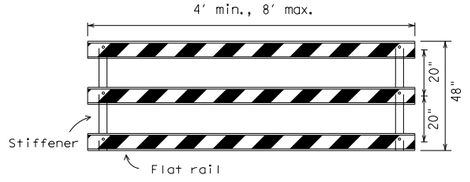
TYPE 3 BARRICADES

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 conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



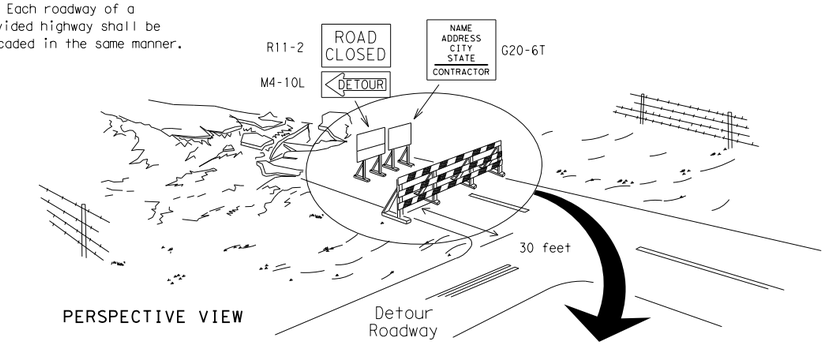
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

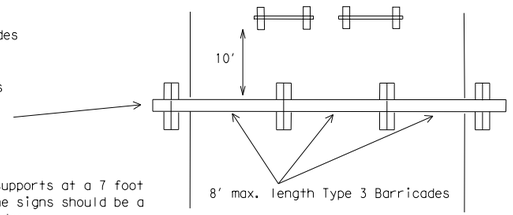
Each roadway of a divided highway shall be barricaded in the same manner.



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.

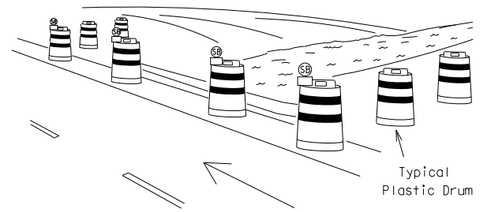
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

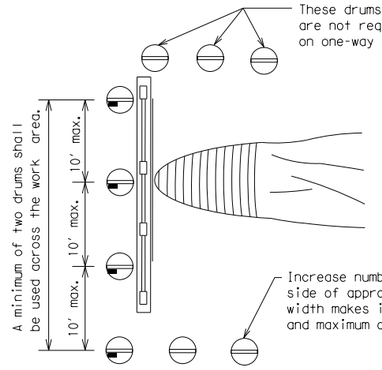
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

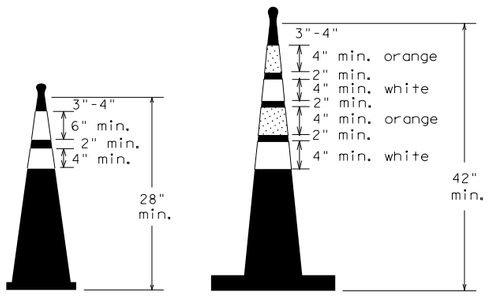
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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

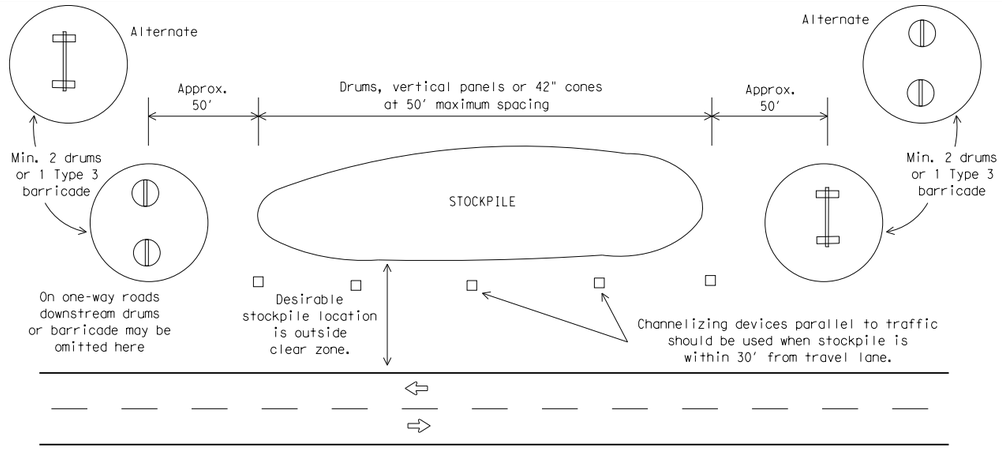
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

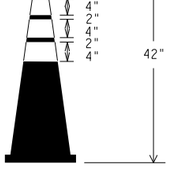
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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 used at night 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.
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

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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	WACO	LIMESTONE		26

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

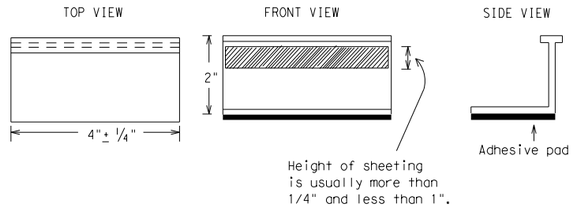
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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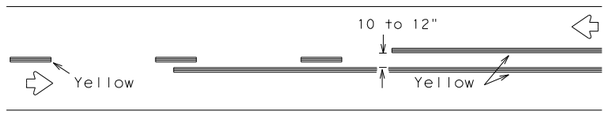
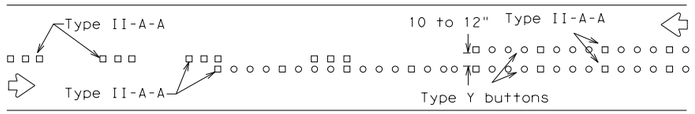
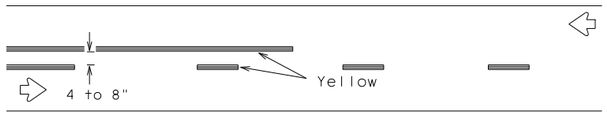
PAVEMENT MARKING PATTERNS



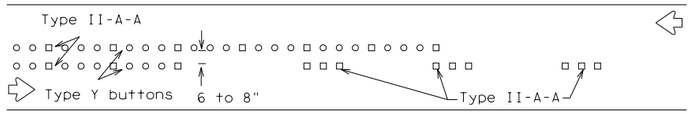
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



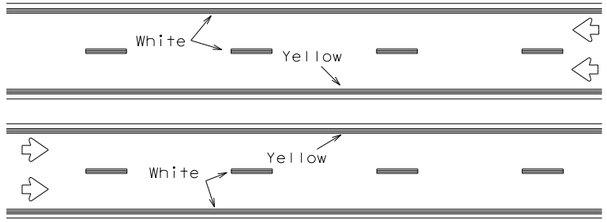
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



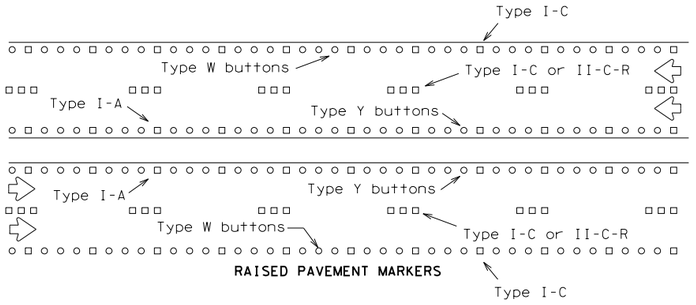
RAISED PAVEMENT MARKERS - PATTERN B

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

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



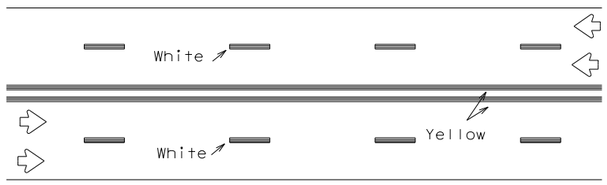
REFLECTORIZED PAVEMENT MARKINGS



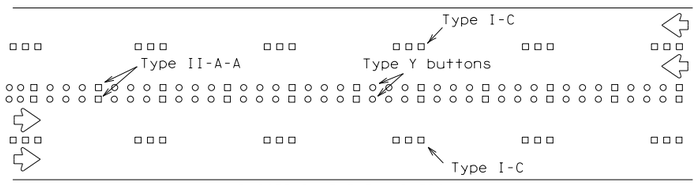
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



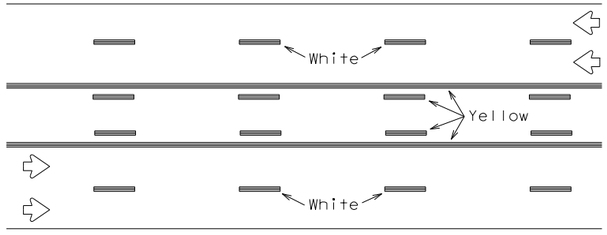
REFLECTORIZED PAVEMENT MARKINGS



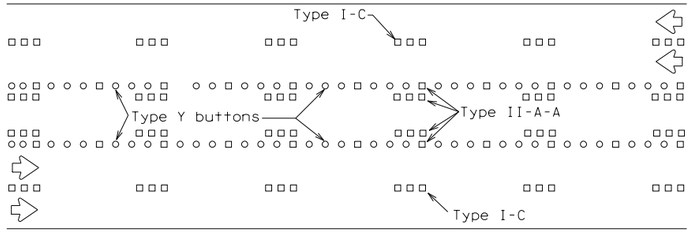
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

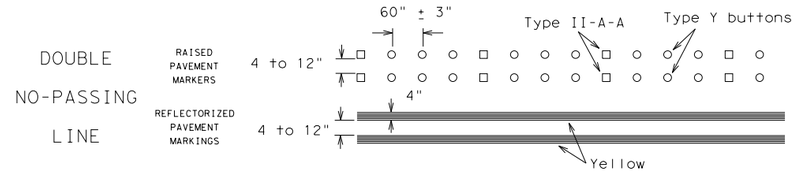
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

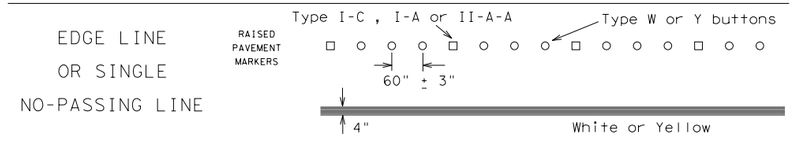
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

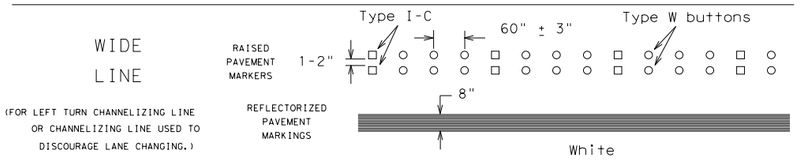


EDGE LINE OR SINGLE NO-PASSING LINE



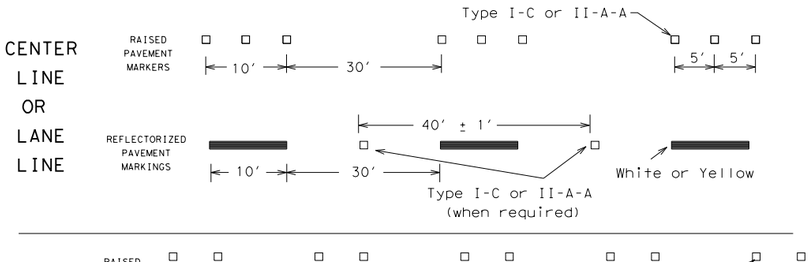
WIDE LINE

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

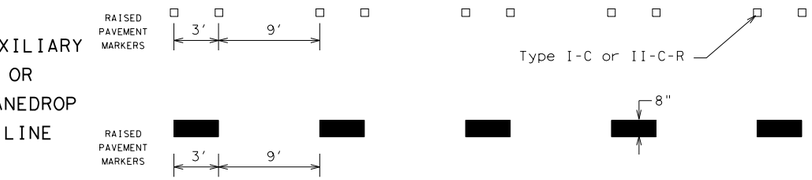


BROKEN LINES

CENTER LINE OR LANE LINE

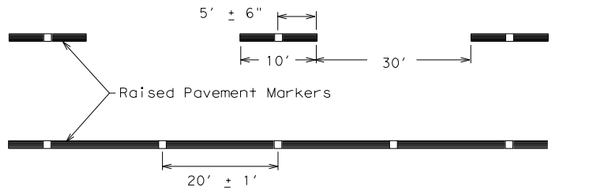


AUXILIARY OR LANEDROP LINE



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 Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

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11-02 8-14				

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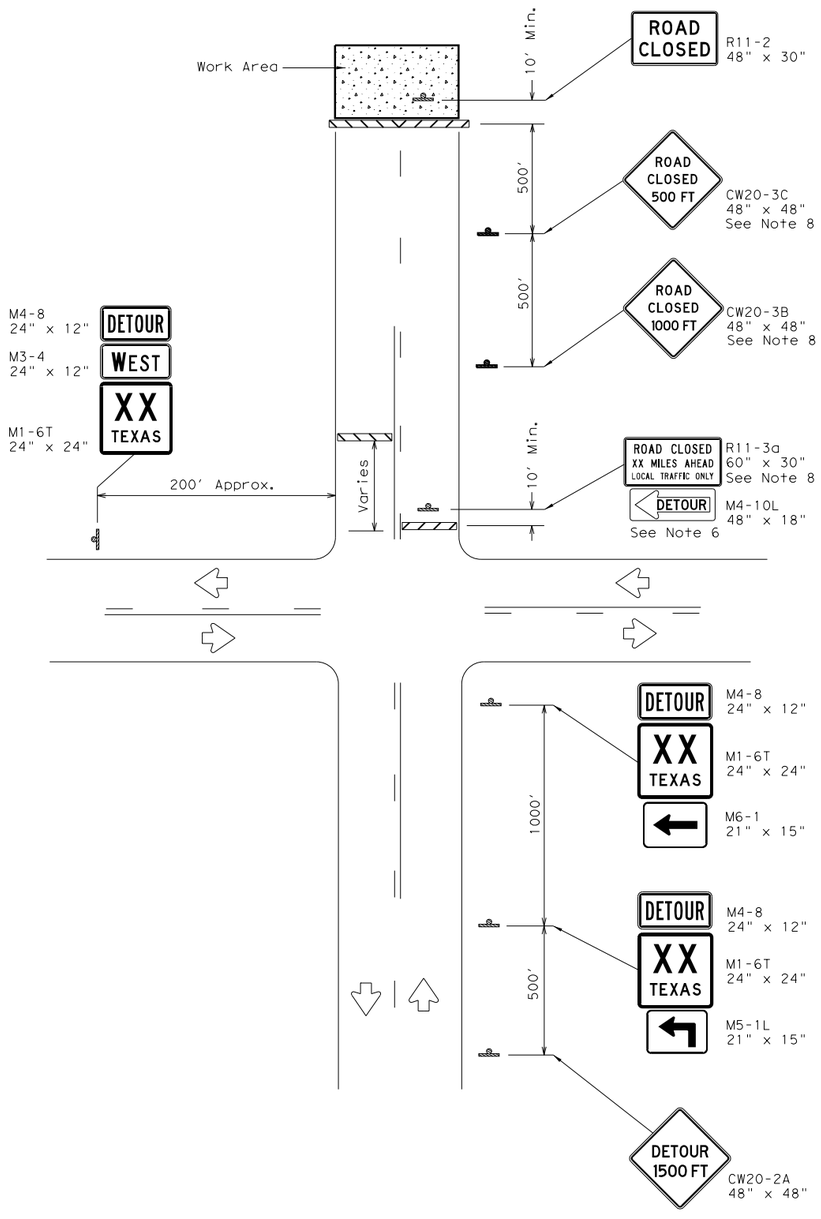
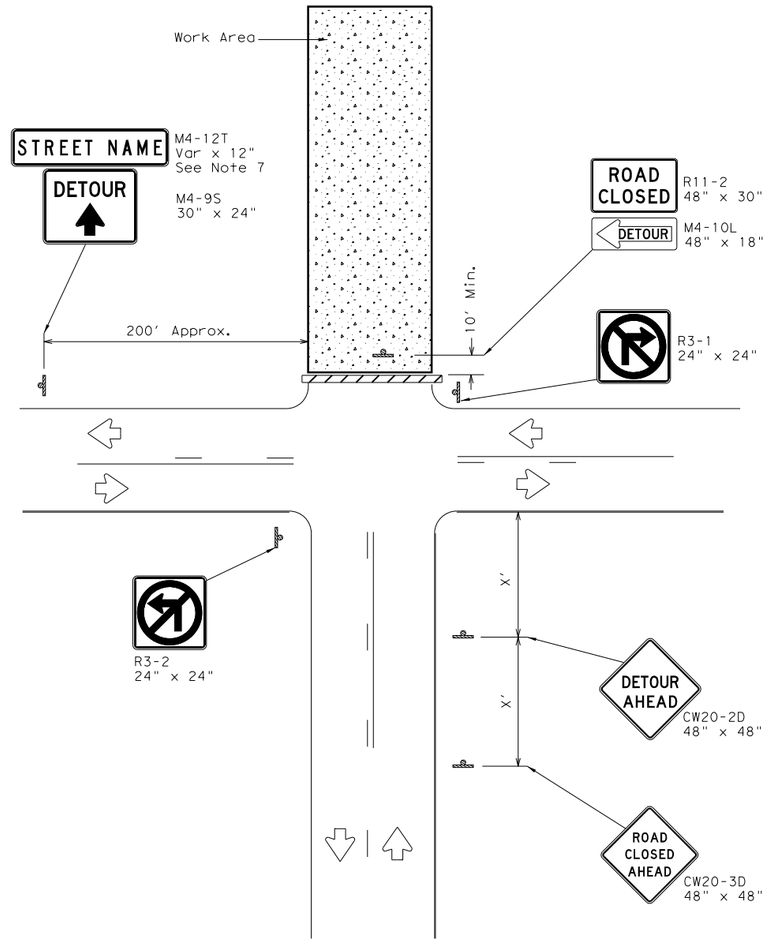


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

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

LEGEND	
	Type 3 Barricade
	Sign

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

* Conventional Roads Only

GENERAL NOTES

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

Texas Department of Transportation

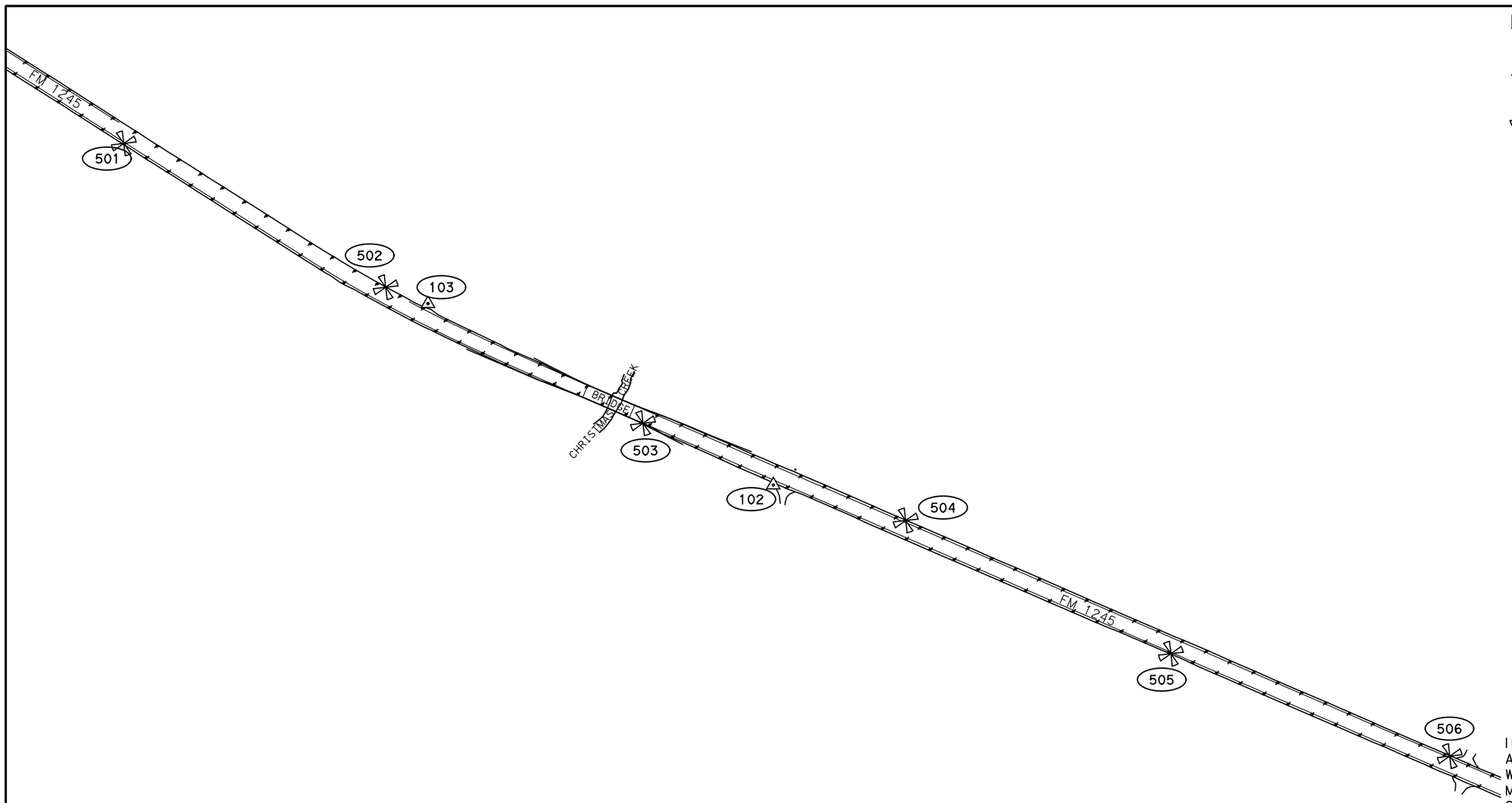
Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	WACO	LIMESTONE		29

113



MAG NAIL WITH "HALFF" WASHER

1/2IN-IRON ROD W/ RED CAP STAMPED "HALFF CNTL"

AERIAL TARGET

NOTES:
1. THE BASIS OF BEARING IS THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD83) 2011 ADJUSTMENT, EPOCH 2010.00
2. ALL COORDINATES AND DISTANCES ARE US SURVEY FEET, DISPLAYED IN GRID VALUES AND MAY BE CONVERTED TO GROUND (SURFACE) BY MULTIPLYING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00012000 (TxDOT LIMESTONE COUNTY SCALE FACTOR).
3. HORIZONTAL AND VERTICAL CONTROL VALUES WERE ESTABLISHED USING THE STATIC GPS METHOD AND BASED ON NGS OPUS SOLUTIONS.
4. BASE STATIONS USED: DO8863 TXC2, DM4157 TXHI, DM4151 TXBT AND DF8988 TXES

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E

STATE OF TEXAS
REGISTERED
ANDREW CHAVCHALOV
6708
PROFESSIONAL
LAND SURVEYOR

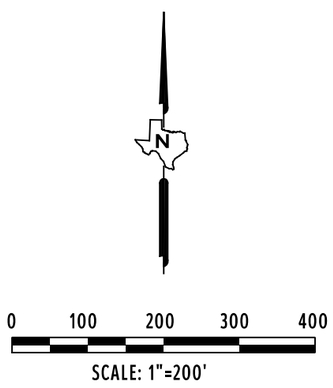
05/07/2021

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WERE DETERMINED USING GPS STATIC METHOD IN MARCH 2020, AND CORRECTLY SHOWN HEREON.

ANDREW CHAVCHALOV, R.P.L.S. TEXAS No. 6708

AERIAL TARGETS				
POINT #	NORTHING (Y)	EASTING (X)	ELEVATION	DESCRIPTION
501	10,567,603.4925	3,440,152.4278	483.414	AERIAL TARGET
502	10,567,354.4080	3,440,605.9849	481.717	AERIAL TARGET
503	10,567,118.8042	3,441,051.6589	481.402	AERIAL TARGET
504	10,566,950.4805	3,441,506.4568	480.193	AERIAL TARGET
505	10,566,719.7725	3,441,965.7469	480.245	AERIAL TARGET
506	10,566,542.2992	3,442,448.6554	481.717	AERIAL TARGET

PRIMARY CONTROL				
POINT #	NORTHING (Y)	EASTING (X)	ELEVATION	DESCRIPTION
102	10,574,181.6524	3,469,737.3792	435.028	MAG NAIL WITH "HALFF" WASHER
103	10,573,432.9132	3,469,607.7589	434.6661	1/2" IRON ROD WITH RED CAP STAMED "HALFF CNTL"



SCALE: 1"=200'

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633

SURVEY CONTROL INDEX

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	30
STATE	DISTRICT	COUNTY
TEXAS	WACO	LIMESTONE
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

FM1245_FM1633_CONTROL_11x17_S01.dgn

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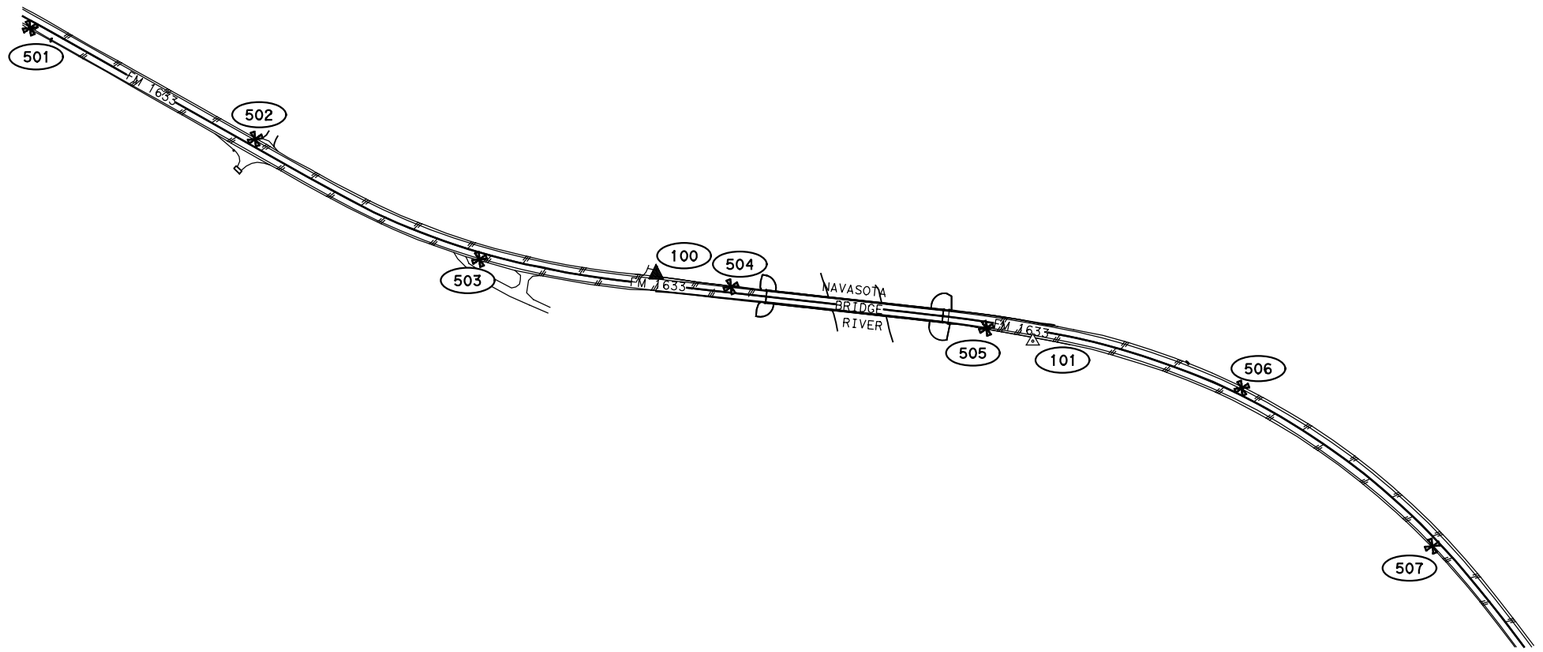

▲ MAG NAIL WITH "HALFF" WASHER

△ 1/2IN-IRON ROD W/ RED CAP STAMPED "HALFF CNTL"

✱ AERIAL TARGET

NOTES:
1. THE BASIS OF BEARING IS THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD83) 2011 ADJUSTMENT, EPOCH 2010.00
2. ALL COORDINATES AND DISTANCES ARE US SURVEY FEET, DISPLAYED IN GRID VALUES AND MAY BE CONVERTED TO GROUND (SURFACE) BY MULTIPLYING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00012000 (TxDOT LIMESTONE COUNTY SCALE FACTOR).
3. HORIZONTAL AND VERTICAL CONTROL VALUES WERE ESTABLISHED USING THE STATIC GPS METHOD AND BASED ON NGS OPUS SOLUTIONS.
4. BASE STATIONS USED: DN5858 TXPI, DG9808 TXWA, DM4157 TXHI AND DO8863 TXC2

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E

STATE OF TEXAS
REGISTERED
ANDREW CHAVCHALOV
6708
PROFESSIONAL
LAND SURVEYOR

05/07/2021

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WERE DETERMINED USING GPS STATIC METHOD IN MARCH 2020, AND CORRECTLY SHOWN HEREON.

ANDREW CHAVCHALOV, R.P.L.S. TEXAS No. 6708

AERIAL TARGETS				
POINT #	NORTHING (Y)	EASTING (X)	ELEVATION	DESCRIPTION
501	10,575,420.7303	3,470,223.4468	452.9766	AERIAL TARGET
502	10,574,975.3103	3,470,003.6621	442.2010	AERIAL TARGET
503	10,574,531.4272	3,469,765.4726	435.7696	AERIAL TARGET
504	10,574,033.6797	3,469,711.1879	436.5279	AERIAL TARGET
505	10,573,527.8857	3,469,629.0727	436.1011	AERIAL TARGET
506	10,573,022.2769	3,469,510.6081	436.5092	AERIAL TARGET
507	10,572,645.0802	3,469,197.9429	437.6015	AERIAL TARGET

PRIMARY CONTROL				
POINT #	NORTHING (Y)	EASTING (X)	ELEVATION	DESCRIPTION
100	10,574,181.6524	3,469,737.3792	435.0276	MAG NAIL WITH "HALFF" WASHER
101	10,573,432.9132	3,469,607.7589	434.6661	1/2" IRON ROD WITH RED CAP STAMED "HALFF CNTL"

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 600
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633

SURVEY CONTROL INDEX

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	31
STATE	DISTRICT	COUNTY
TEXAS	WACO	LIMESTONE
CONT	SECT	JOB / HIGHWAY NO
1191	03	033, ETC. / FM 1245, ETC.

FM1245_FM1633_CONTROL_11x17_S02.dgn

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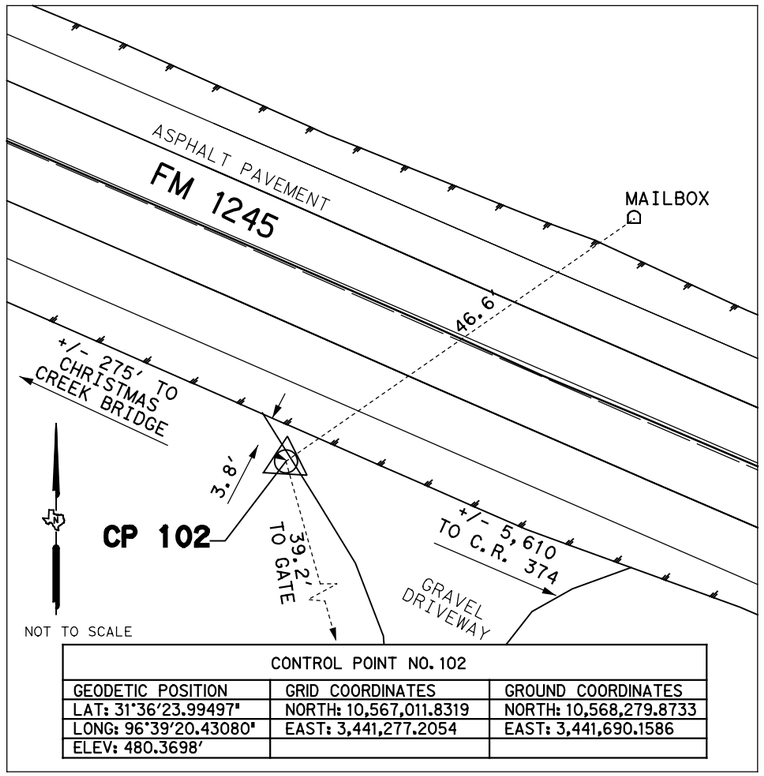
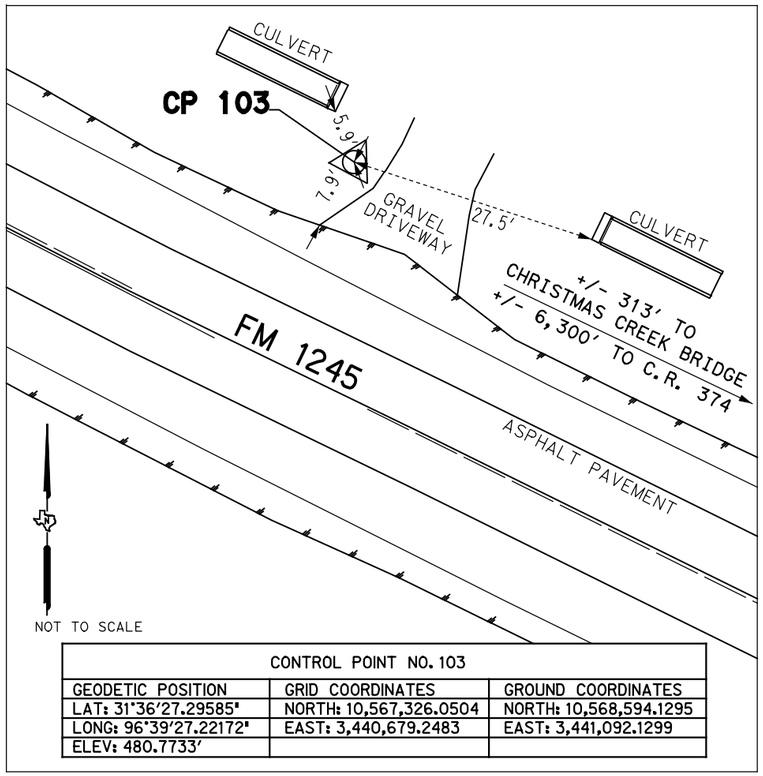


CONTROL POINT NO. 102		
GEODETIC POSITION	GRID COORDINATES	GROUND COORDINATES
LAT: 31°36'23.99497"	NORTH: 10,567,011.8319	NORTH: 10,568,279.8733
LONG: 96°39'20.43080"	EAST: 3,441,277.2054	EAST: 3,441,690.1586
ELEV: 480.3698'		



CONTROL POINT NO. 103		
GEODETIC POSITION	GRID COORDINATES	GROUND COORDINATES
LAT: 31°36'27.29585"	NORTH: 10,567,326.0504	NORTH: 10,568,594.1295
LONG: 96°39'27.22172"	EAST: 3,440,679.2483	EAST: 3,441,092.1299
ELEV: 480.7733'		

LEGEND

△ 1/2IN-IRON ROD W/ RED CAP STAMPED "HALFF CNTL"

EDGE OF ASPHALT

NOTES:
1. THE BASIS OF BEARING IS THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD83) 2011 ADJUSTMENT, EPOCH 2010.00
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3. HORIZONTAL AND VERTICAL CONTROL VALUES WERE ESTABLISHED USING THE STATIC GPS METHOD AND BASED ON NGS OPUS SOLUTIONS.
4. BASE STATIONS USED: DO8863 TXC2, DM4157 TXHI, DM4151 TXBT AND DF8988 TXES

STATE OF TEXAS
REGISTERED
ANDREW CHAVCHALOV
6708
PROFESSIONAL
LAND SURVEYOR
05/07/2021

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ANDREW CHAVCHALOV, R.P.L.S. TEXAS No. 6708

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633

HORIZONTAL & VERTICAL CONTROL SHEET

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
.	.		32
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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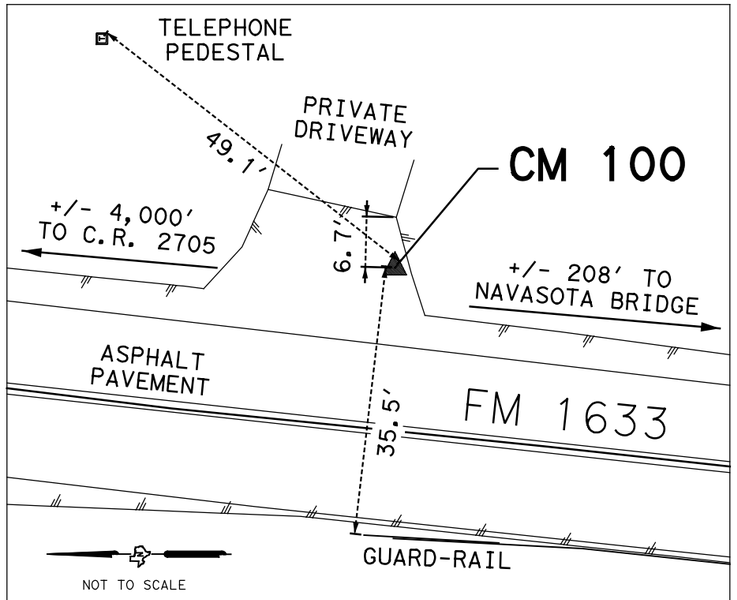
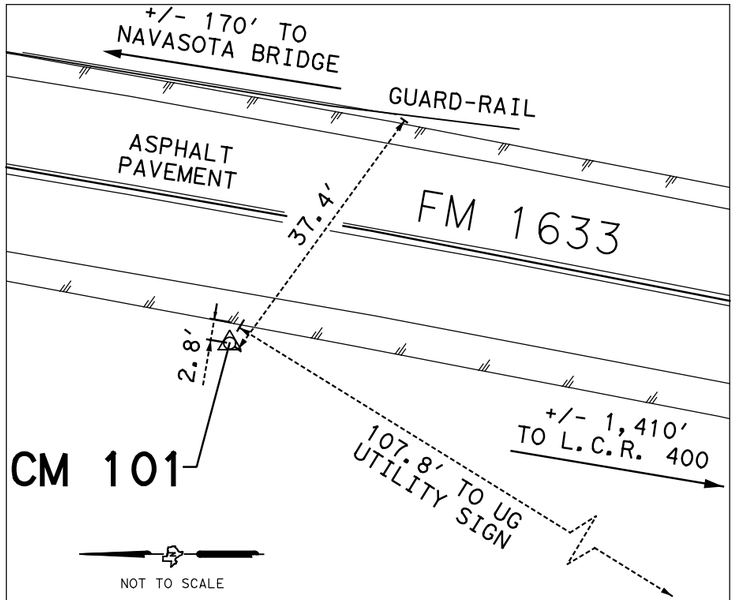


CONTROL POINT NO. 100		
GEODETIC POSITION	GRID COORDINATES	GROUND COORDINATES
LAT: 31°37'25.48621"	NORTH: 10,574,181.6524	NORTH: 10,575,450.5542
LONG: 96°33'48.69912"	EAST: 3,469,737.3792	EAST: 3,470,153.7477
ELEV: 435.0276'		



CONTROL POINT NO. 101		
GEODETIC POSITION	GRID COORDINATES	GROUND COORDINATES
LAT: 31°37'18.12389"	NORTH: 10,573,432.9132	NORTH: 10,574,701.7251
LONG: 96°33'50.49082"	EAST: 3,469,607.7589	EAST: 3,471,024.1119
ELEV: 434.6661'		

LEGEND

- 1/2IN-IRON ROD W/ RED CAP STAMPED "HALFF CNTL"
- MAG NAIL WITH "HALFF WASHER
- EDGE OF ASPHALT

NOTES:
1. THE BASIS OF BEARING IS THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD83) 2011 ADJUSTMENT, EPOCH 2010.00
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4. BASE STATIONS USED: DN5858 TXPI, DG9808 TXWA, DM4157 TXHI AND DO8863 TXC2

STATE OF TEXAS
REGISTERED
ANDREW CHAVCHALOV
6708
PROFESSIONAL
LAND SURVEYOR

05/07/2021

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ANDREW CHAVCHALOV, R.P.L.S. TEXAS No. 6708

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633

HORIZONTAL & VERTICAL CONTROL SHEET

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
.	.	33

STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

FM1245_FM1633_H&V_11x17_S02.dgn

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FM 1633

Beginning chain FM1633_CL description
Feature: ML_CL

Point 412 N 10,573,533.7923 E 3,469,149.5380 Sta 194+44.25

Course from 412 to PC FM1633_C1 N 52° 03′ 16.32" E Dist 465.2535

Curve FM1633_C1		Curve Data				
P.I. Station		205+14.07	N	10,574,191.6386	E	3,469,993.1967
Delta	=	45° 45′ 58.89"	(LT)			
Degree	=	4° 00′ 00.05"				
Tangent	=	604.5697				
Length	=	1,144.1554				
Radius	=	1,432.3900				
External	=	122.3594				
Long Chord	=	1,113.9797				
Mid. Ord.	=	112.7297				
P.C. Station		199+09.50	N	10,573,819.8819	E	3,469,516.4352
P.T. Station		210+53.66	N	10,574,792.5710	E	3,470,059.4147
C.C.			N	10,574,949.4595	E	3,468,635.6426
Back	= N	52° 03′ 16.32" E				
Ahead	= N	6° 17′ 17.43" E				
Chord Bear	= N	29° 10′ 16.87" E				

Course from PT FM1633_C1 to PC FM1633_C2 N 6° 17′ 17.43" E Dist 759.2207

Curve FM1633_C2		Curve Data				
P.I. Station		221+06.25	N	10,575,838.8274	E	3,470,174.7039
Delta	=	23° 08′ 57.90"	(RT)			
Degree	=	4° 00′ 00.05"				
Tangent	=	293.3686				
Length	=	578.7336				
Radius	=	1,432.3900				
External	=	29.7339				
Long Chord	=	574.8052				
Mid. Ord.	=	29.1292				
P.C. Station		218+12.88	N	10,575,547.2239	E	3,470,142.5715
P.T. Station		223+91.61	N	10,576,094.3196	E	3,470,318.8873
C.C.			N	10,575,390.3354	E	3,471,566.3436
Back	= N	6° 17′ 17.43" E				
Ahead	= N	29° 26′ 15.33" E				
Chord Bear	= N	17° 51′ 46.38" E				

Course from PT FM1633_C2 to 413 N 29° 26′ 15.33" E Dist 854.3910

Point 413 N 10,576,838.4016 E 3,470,738.7994 Sta 232+46.00

Ending chain FM1633_CL description

FM 1245

Beginning chain FM1245_CL description
Feature: ML_CL

Point 230 N 10,568,158.8194 E 3,442,020.9496 Sta 519+03.20

Course from 230 to PC FM1245_C1 N 66° 35′ 41.31" W Dist 827.8884

Curve FM1245_C1		Curve Data				
P.I. Station		529+58.50	N	10,568,578.0166	E	3,441,052.4827
Delta	=	9° 04′ 38.49"	(RT)			
Degree	=	2° 00′ 00.00"				
Tangent	=	227.4098				
Length	=	453.8679				
Radius	=	2,864.7890				
External	=	9.0118				
Long Chord	=	453.3934				
Mid. Ord.	=	8.9836				
P.C. Station		527+31.09	N	10,568,487.6824	E	3,441,261.1809
P.T. Station		531+84.96	N	10,568,700.1454	E	3,440,860.6500
C.C.			N	10,571,116.7526	E	3,442,399.1641
Back	= N	66° 35′ 41.31" W				
Ahead	= N	57° 31′ 02.82" W				
Chord Bear	= N	62° 03′ 22.06" W				

Course from PT FM1245_C1 to 231 N 57° 31′ 02.82" W Dist 217.6890

Point 231 N 10,568,817.0537 E 3,440,677.0174 Sta 534+02.65

Ending chain FM1245_CL description

W. Richard Renton Jr.
STATE OF TEXAS
W. RICHARD RENTON JR.
84792
REGISTERED PROFESSIONAL ENGINEER
5/12/2021

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

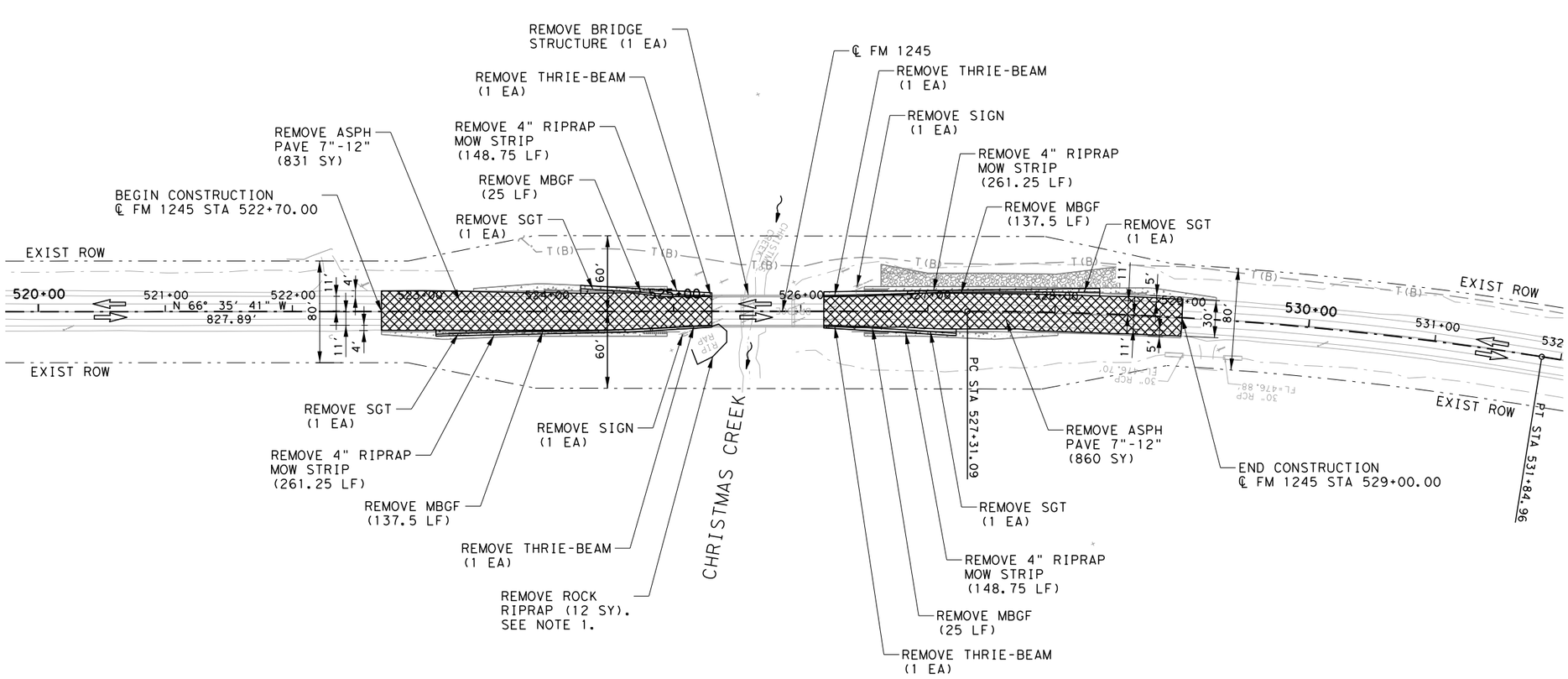
FM 1245 & FM 1633
HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	34

STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

FM1245-FM1633-HAD.dgn



LEGEND:

- PAVEMENT REMOVAL
- REMOVE CONCRETE DRIVEWAY
- T(B)— EXIST. TELEPHONE LINE
- G(B)— EXIST. GAS LINE
- EXIST. OVERHEAD UTILITY LINE

NOTES:

1. REMOVAL OF ROCK RIPRAP IS SUBSIDIARY TO BID ITEM 432-6031.

W. RICHARD RENTON JR.
84792
REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS
5/18/2021

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245
REMOVAL PLAN

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	35
STATE	DISTRICT	COUNTY
TEXAS	WACO	LIMESTONE
CONT	SECT	JOB / HIGHWAY NO
1191	03	033, ETC. / FM 1245, ETC.

FM1245-REMOVAL_1 of 2.dgn

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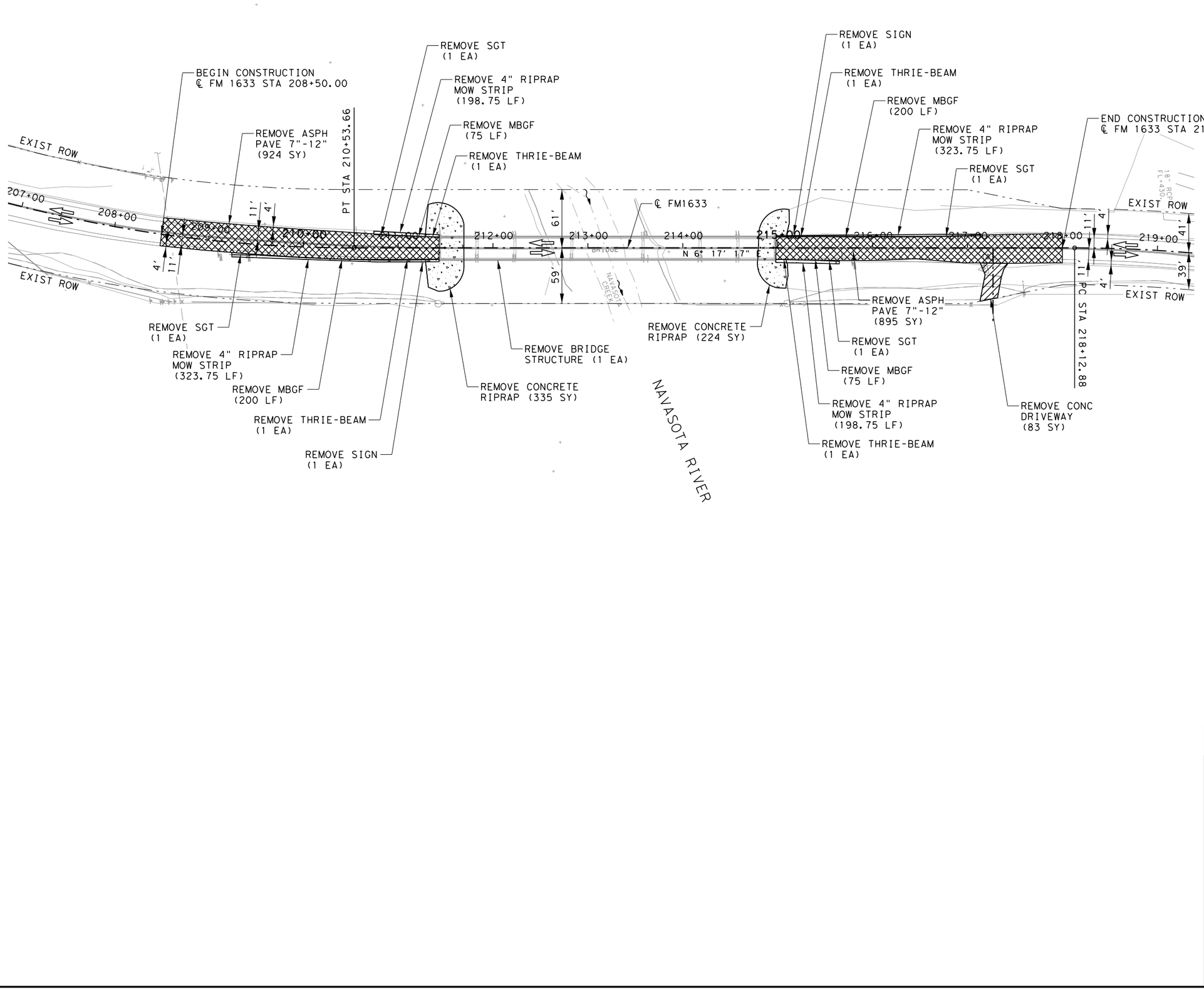

LEGEND:

- PAVEMENT REMOVAL
- REMOVE CONCRETE DRIVEWAY
- T(B)— EXIST. TELEPHONE LINE
- G(B)— EXIST. GAS LINE
- EXIST. OVERHEAD UTILITY LINE

NOTES:

1. REMOVAL OF ROCK RIPRAP IS SUBSIDIARY TO BID ITEM 432-6031.

W. RICHARD RENTON JR.
84792
REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS

5/18/2021

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SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No.
F-10161

FM 1633
REMOVAL PLAN

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	36

STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

FM1633-REMOVAL_2 of 2.dgn

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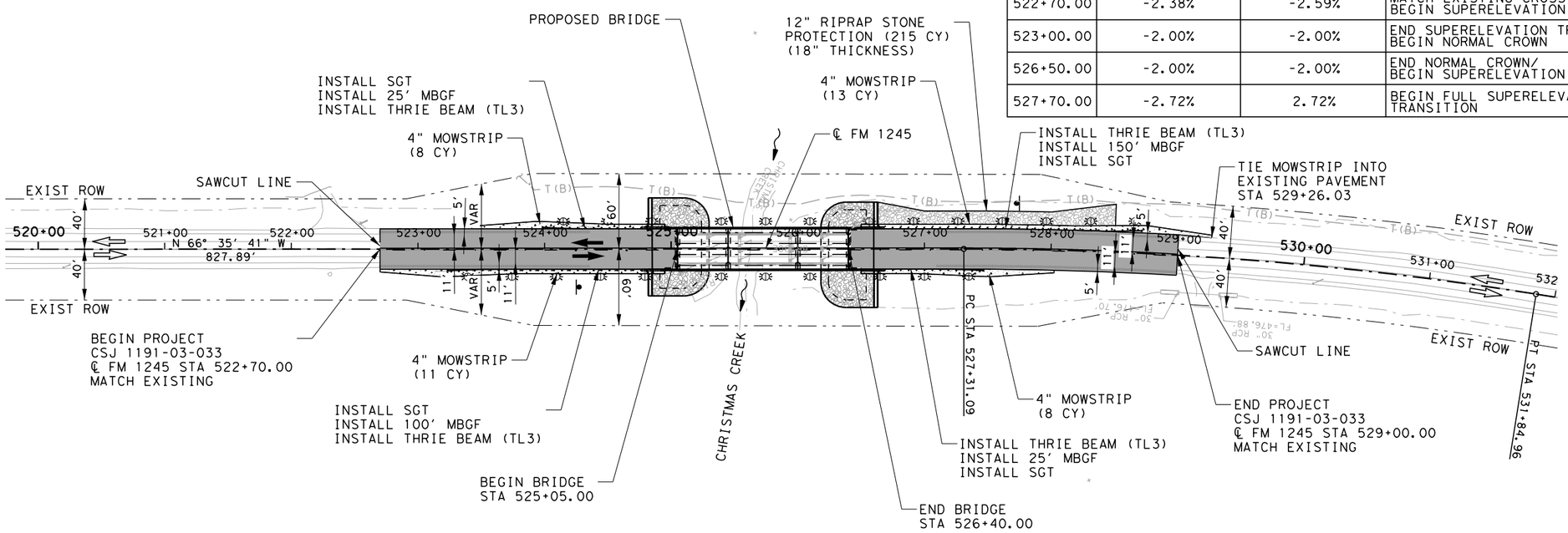
MODEL:Design

FM 1245 SUPERELEVATION TABLE			
STATION	CROSS SLOPE (LT)	CROSS SLOPE (RT)	DESCRIPTION
522+70.00	-2.38%	-2.59%	MATCH EXISTING CROSS SLOPE/ BEGIN SUPERELEVATION TRANSITION
523+00.00	-2.00%	-2.00%	END SUPERELEVATION TRANSITION/ BEGIN NORMAL CROWN
526+50.00	-2.00%	-2.00%	END NORMAL CROWN/ BEGIN SUPERELEVATION TRANSITION
527+70.00	-2.72%	2.72%	BEGIN FULL SUPERELEVATION TRANSITION



0 50 100
HORIZONTAL SCALE IN FEET
0 5 10
VERTICAL SCALE IN FEET

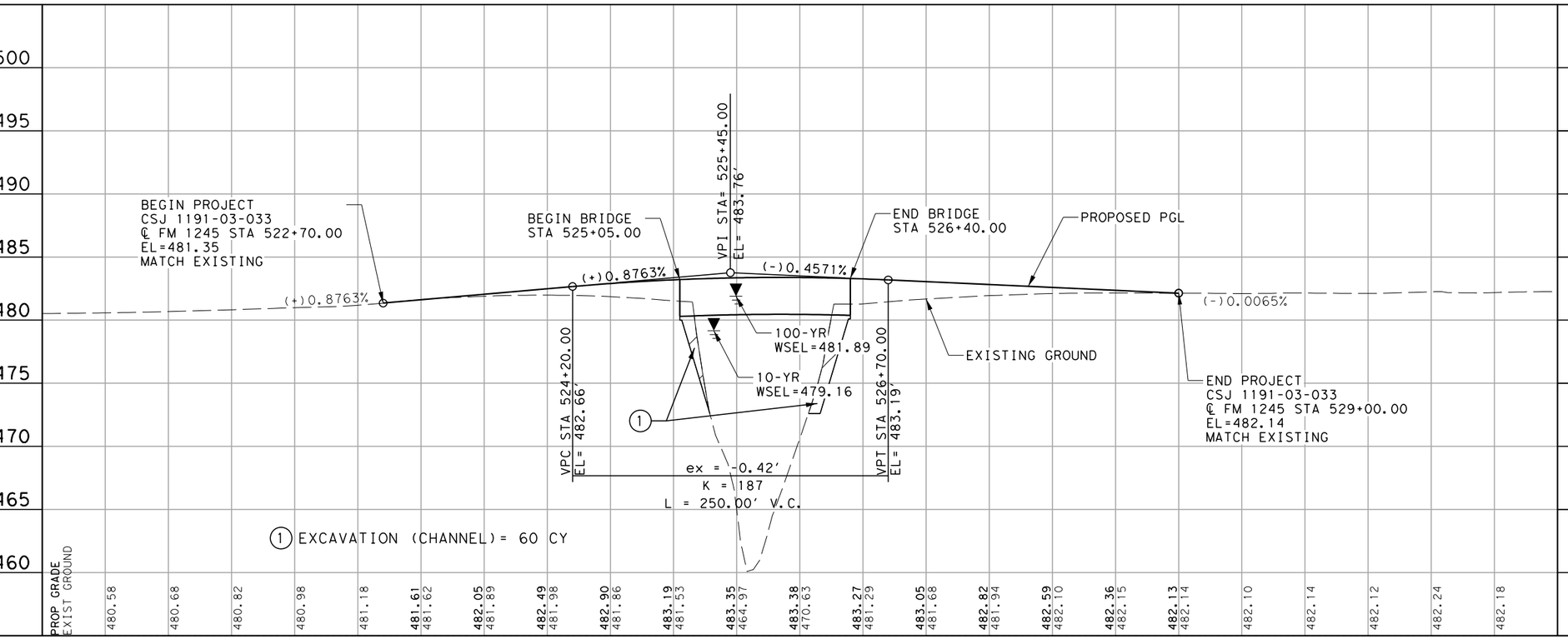
N

LEGEND:

- PROPOSED PAVEMENT
- PROPOSED CONCRETE DRIVEWAY
- TRAFFIC ARROW
- FLOW ARROW
- METAL BEAM GUARD FENCE
- THRIE BEAM
- RUMBLE STRIP
- T(B) EXIST. TELEPHONE LINE
- G(B) EXIST. GAS LINE
- EXIST. OVERHEAD UTILITY LINE

NOTES:

1. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION.
2. SEE TYPICAL SECTION SHEET FOR ADDITIONAL INFORMATION.
3. SEE CHRISTMAS CREEK BRIDGE LAYOUT FOR ADDITIONAL INFORMATION.
4. CONTRACTOR TO FIELD VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.



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5/12/2021

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FIRM REGISTRATION No. F-10161

FM 1245

PLAN & PROFILE (CHRISTMAS CREEK)

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	37
STATE	DISTRICT	COUNTY
TEXAS	WACO	LIMESTONE
CONT	SECT	JOB / HIGHWAY NO
1191	03	033, ETC. / FM 1245, ETC.

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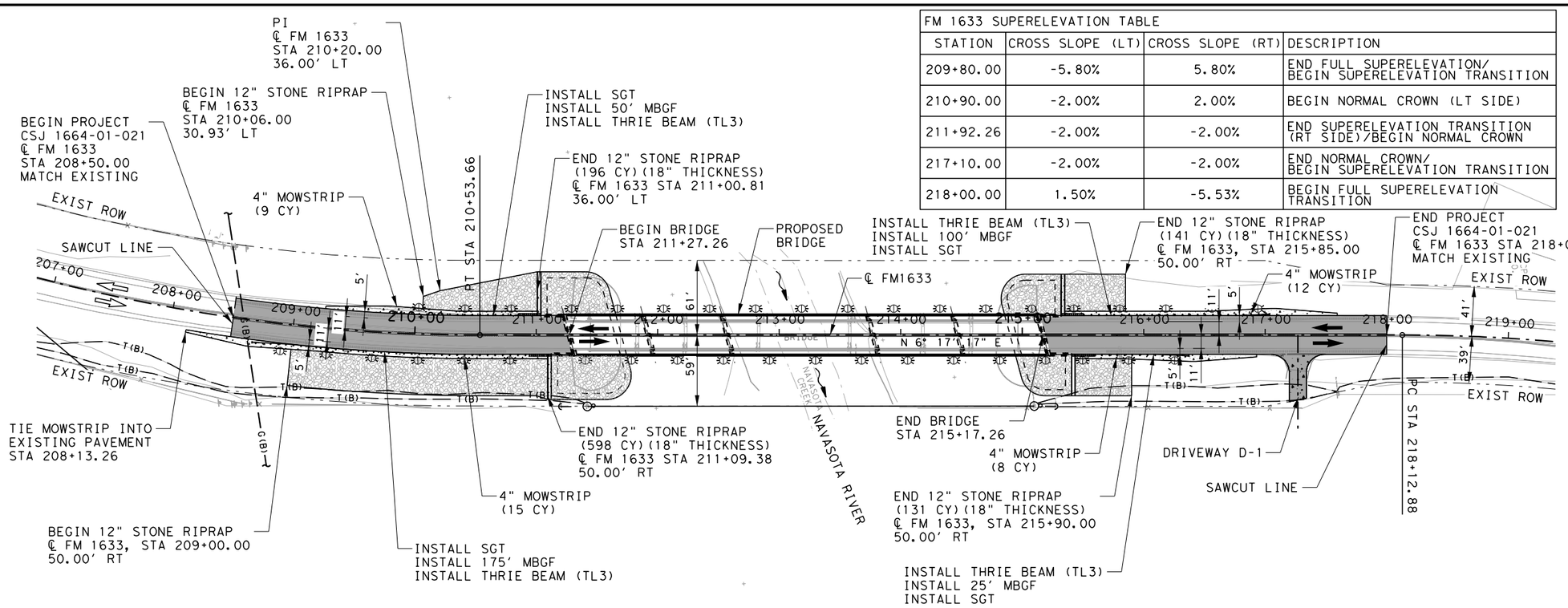
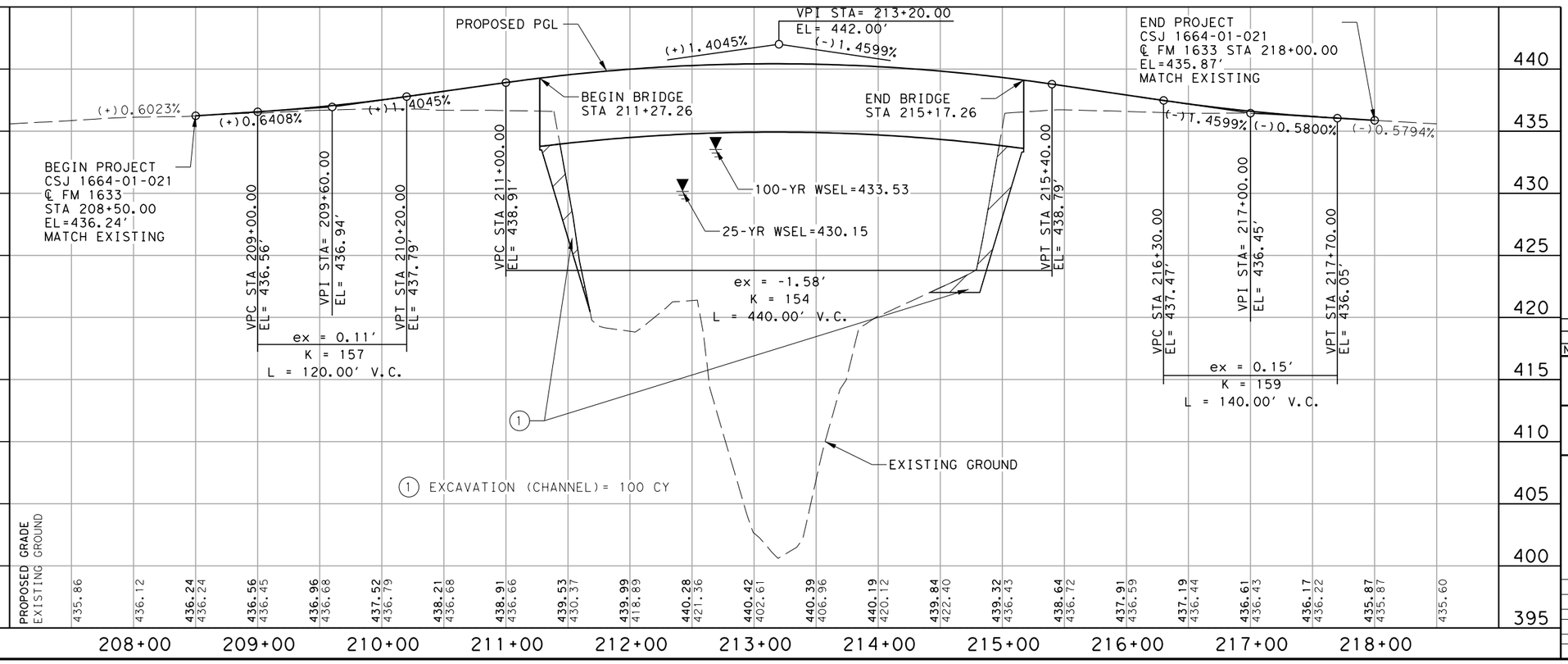
FM1245-RD-P&P_1 of 2.dgn

FM 1633 SUPERELEVATION TABLE			
STATION	CROSS SLOPE (LT)	CROSS SLOPE (RT)	DESCRIPTION
209+80.00	-5.80%	5.80%	END FULL SUPERELEVATION/ BEGIN SUPERELEVATION TRANSITION
210+90.00	-2.00%	2.00%	BEGIN NORMAL CROWN (LT SIDE)
211+92.26	-2.00%	-2.00%	END SUPERELEVATION TRANSITION (RT SIDE)/BEGIN NORMAL CROWN
217+10.00	-2.00%	-2.00%	END NORMAL CROWN/ BEGIN SUPERELEVATION TRANSITION
218+00.00	1.50%	-5.53%	BEGIN FULL SUPERELEVATION TRANSITION





HORIZONTAL SCALE IN FEET 0 50 100
VERTICAL SCALE IN FEET 0 5 10

N

LEGEND:

- PROPOSED PAVEMENT
- PROPOSED CONCRETE DRIVEWAY
- TRAFFIC ARROW
- FLOW ARROW
- METAL BEAM GUARD FENCE
- THRIE BEAM
- RUMBLE STRIP
- T(B) EXIST. TELEPHONE LINE
- G(B) EXIST. GAS LINE
- EXIST. OVERHEAD UTILITY LINE

NOTES:

1. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION.
2. SEE TYPICAL SECTION SHEET FOR ADDITIONAL INFORMATION.
3. SEE NAVASOTA RIVER BRIDGE LAYOUT FOR ADDITIONAL INFORMATION.
4. CONTRACTOR TO FIELD VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.

STATE OF TEXAS
W. RICHARD RENTON JR.
84792
REGISTERED PROFESSIONAL ENGINEER
5/12/2021

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FM 1633

PLAN & PROFILE
(NAVASOTA RIVER)

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	38
STATE	DISTRICT	COUNTY
TEXAS	WACO	LIMESTONE
CONT	SECT	JOB / HIGHWAY NO
1191	03	033, ETC. / FM 1245, ETC.

FM1633-RD-P&P_2 of 2.dgn

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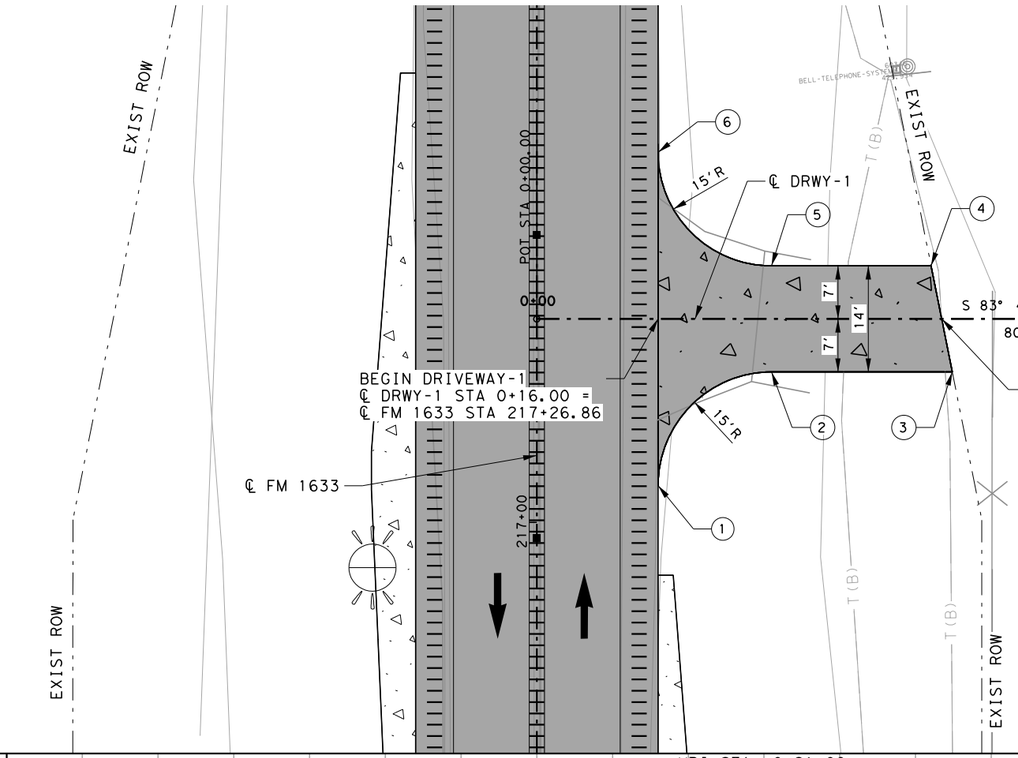
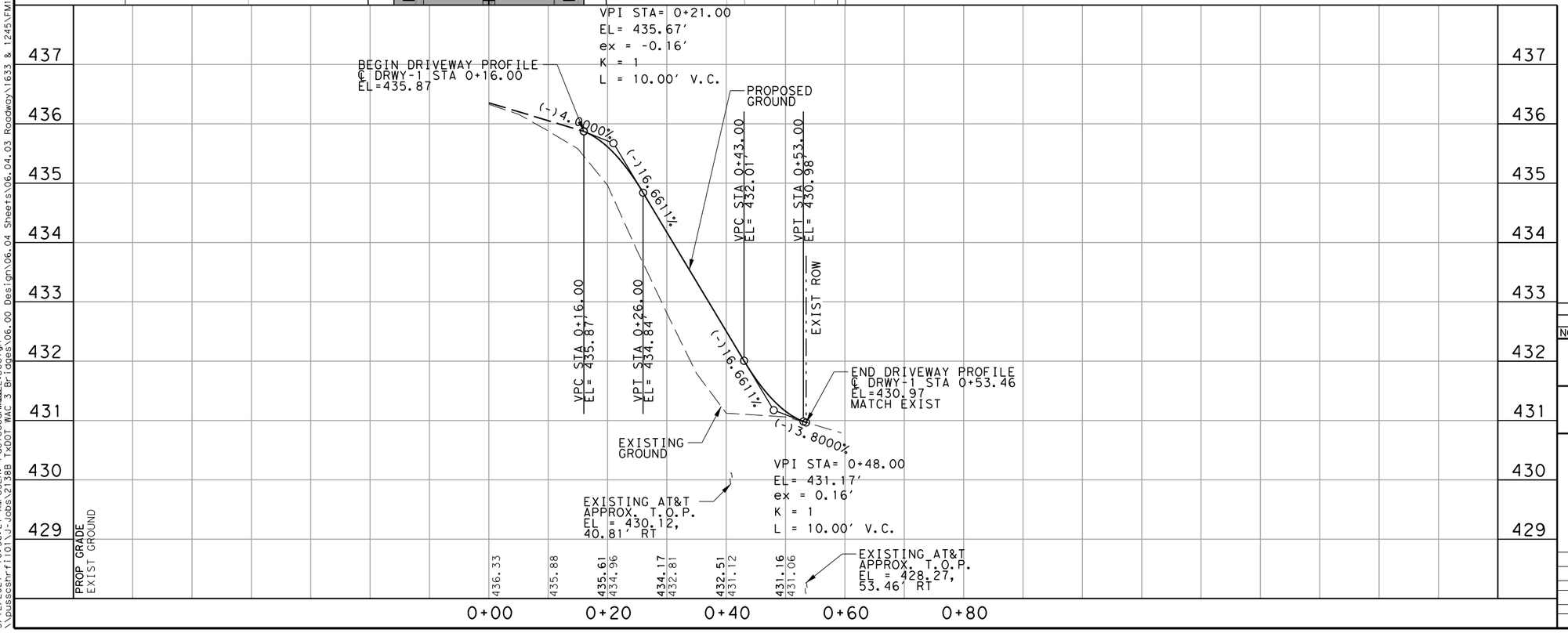
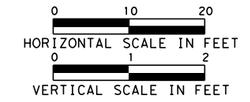


CONTRACTOR TO VERIFY UTILITIES PRIOR TO WORKING ON DRIVEWAY

POINT NO.	ALIGNMENT	STATION	OFFSET	ELEV	COMMENT
1	℄ FM 1633	217+04.86	16.00' RT	436.15	PC
2	℄ DRWY-1	0+31.00	7.00' RT	433.87	PT
3	℄ DRWY-1	0+54.85	7.00' RT	430.85	PI
4	℄ DRWY-1	0+52.06	7.00' LT	431.06	PI
5	℄ DRWY-1	0+31.00	7.00' LT	433.87	PC
6	℄ FM 1633	217+48.86	16.00' RT	435.63	PT





LEGEND:

- PROPOSED PAVEMENT
- PROPOSED CONCRETE DRIVEWAY
- TRAFFIC ARROW
- FLOW ARROW
- METAL BEAM GUARD FENCE
- IIIIII THRIE BEAM
- |||||||| RUMBLE STRIP
- — T(B)— EXIST. TELEPHONE LINE
- — G(B)— EXIST. GAS LINE
- EXIST. OVERHEAD UTILITY LINE

W. RICHARD RENTON JR.
84792
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STATE OF TEXAS
5/12/2021

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(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1633

DRIVEWAY P&P

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	39
STATE	DISTRICT	COUNTY
TEXAS	WACO	LIMESTONE
CONT	SECT	JOB / HIGHWAY NO
1191	03	033, ETC. / FM 1245, ETC.

FM1633-RD-DRWY PP.dgn

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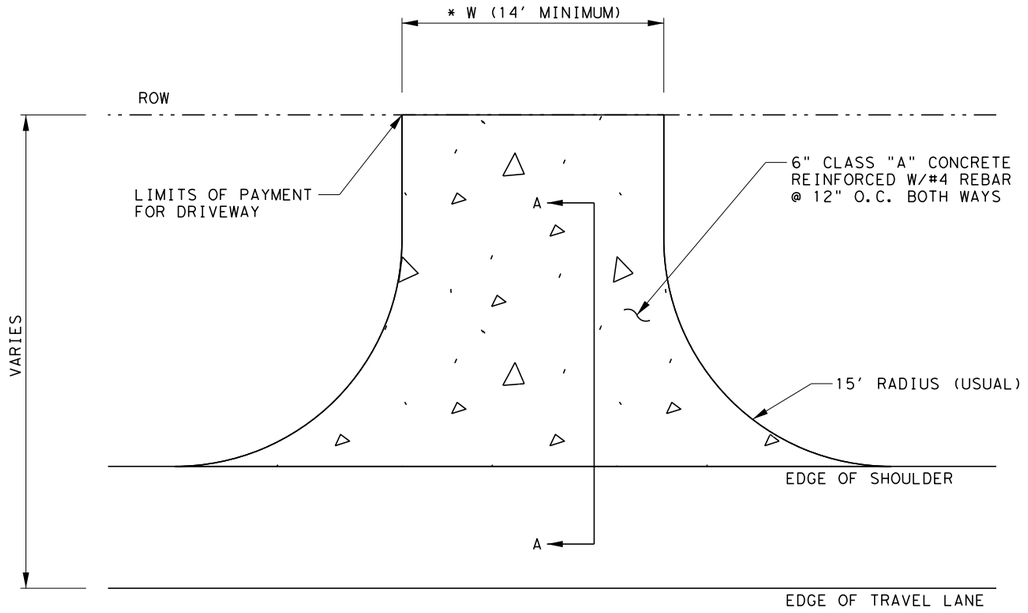
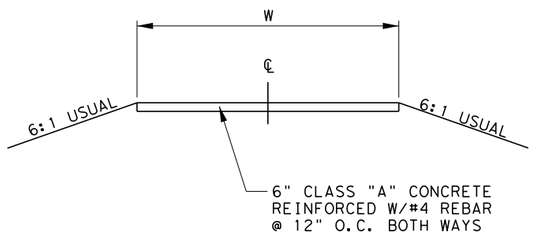
MODEL:Design

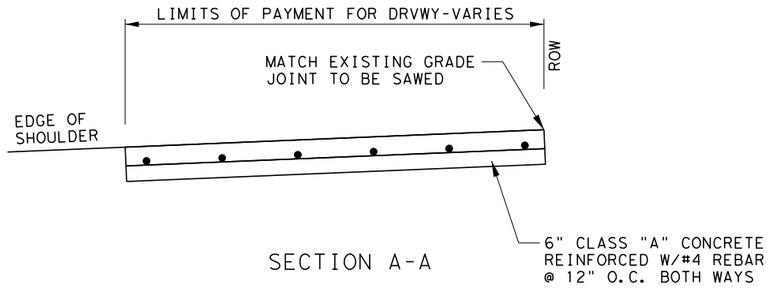


DRIVEWAYS (CONC)

DRIVEWAYS(CONC) SHALL CONSIST OF: BLADING AND RESHAPING THE SUBGRADE, ANY EXTRA EMBANKMENT MATERIAL NECESSARY TO ACHIEVE THE PROPER SUBGRADE WIDTH. THE PLACEMENT OF 6" CLASS "A" CONCRETE AND REMOVAL OF ANY EXISTING CONCRETE AND/OR CONC CURB AND GUTTER.



DRIVEWAY TYPICAL SECTION



SECTION A-A

5/12/2021

NO.	REVISION	DATE

Texas Department of Transportation

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SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245 & FM 1633
DRIVEWAY DETAIL

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		40
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

FM1245-FM1633-DRWY TRNOUT DETAIL.dgn

DATE: 5/7/2021 3:05:54 PM
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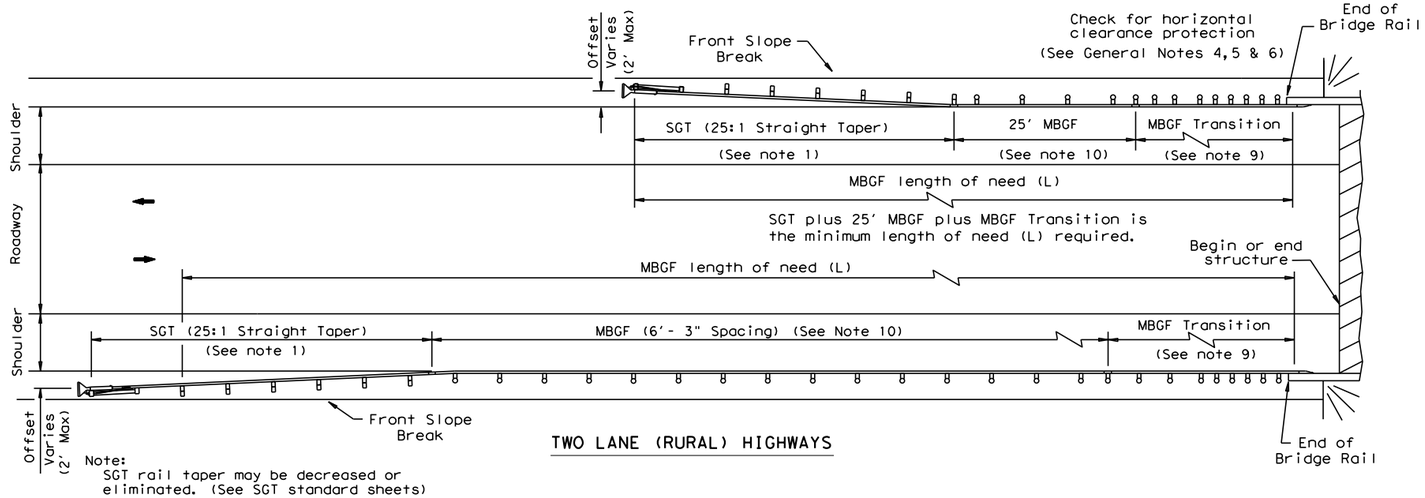
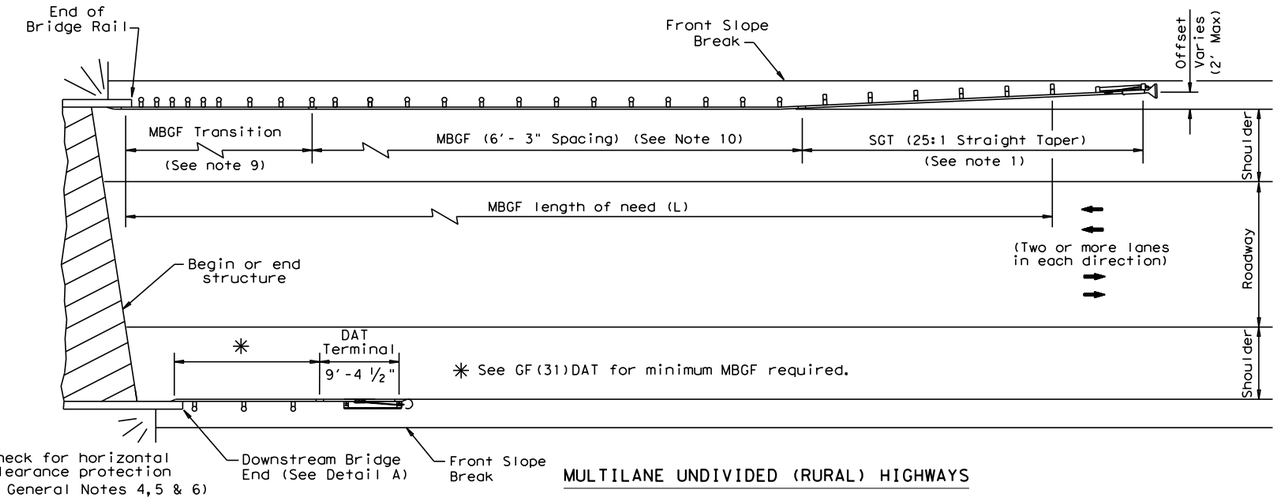
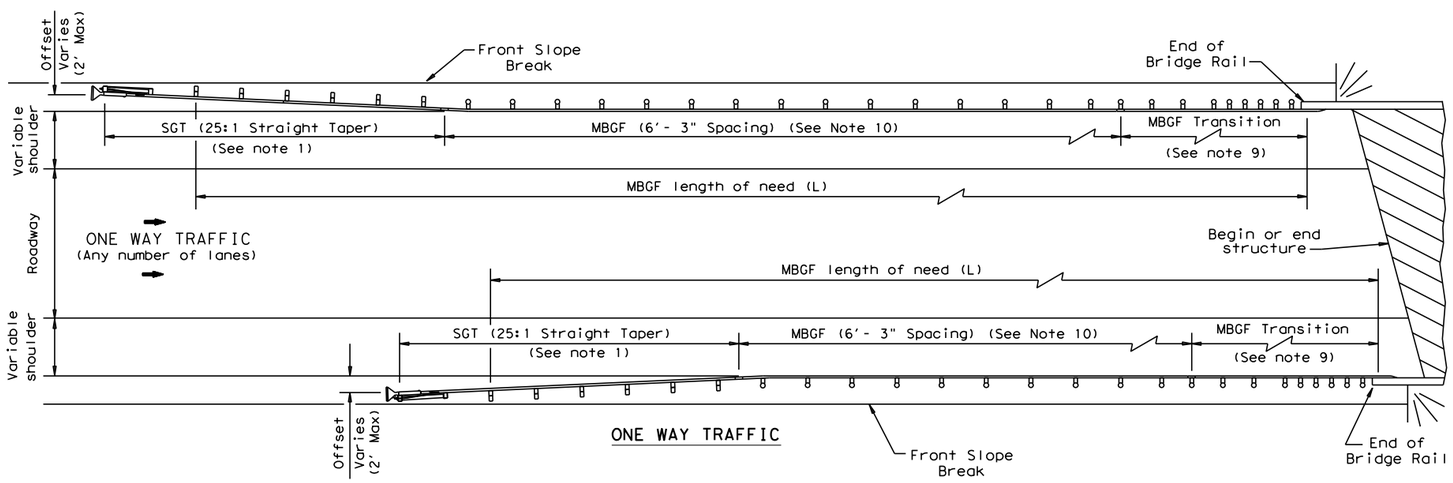


TWO LANE (RURAL) HIGHWAYS

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



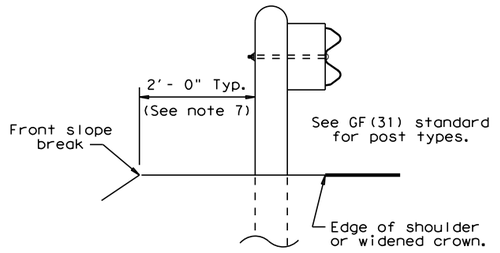
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



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

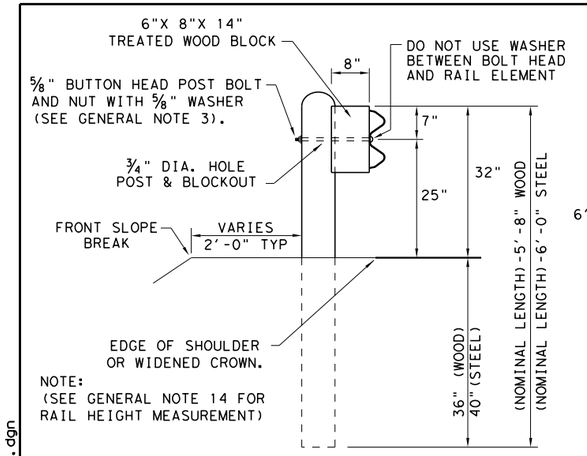
BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

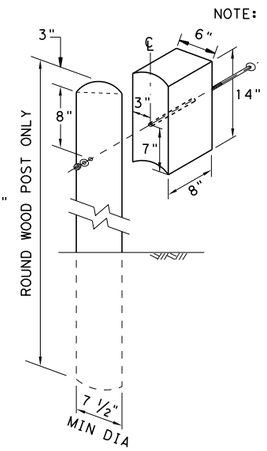
FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED APRIL 2014 SEE (MEMO 0414)	1191	03	033,ETC	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WAC	LIMESTONE		41

DATE: 5/7/2021
FILE: \\pusscshrf1101\J-Jobs\2138 TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.11 Standards\1633 & 1245\Roadway\gf3119.dgn



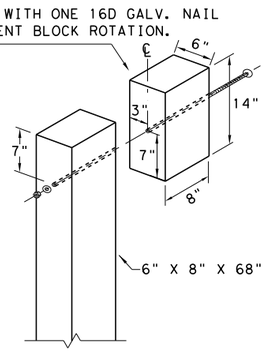
NOTE:
(SEE GENERAL NOTE 14 FOR RAIL HEIGHT MEASUREMENT)

TYPICAL POST PLACEMENT

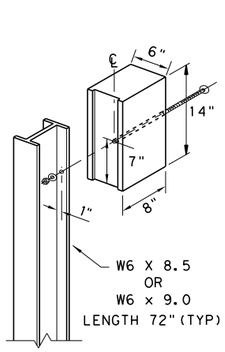


WOOD BLOCK TO ROUND WOOD POST

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

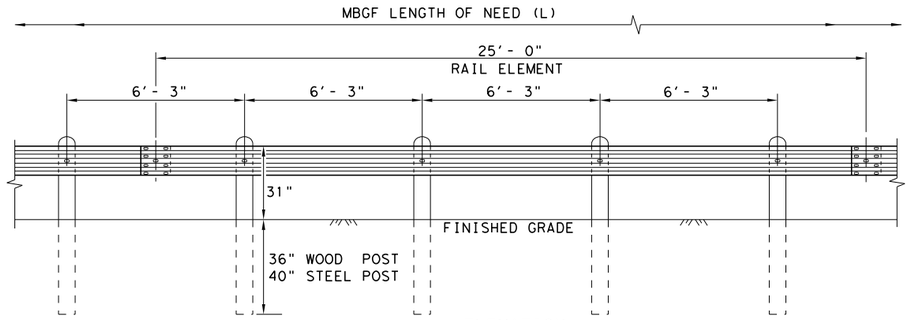


WOOD BLOCK TO RECTANGULAR WOOD POST



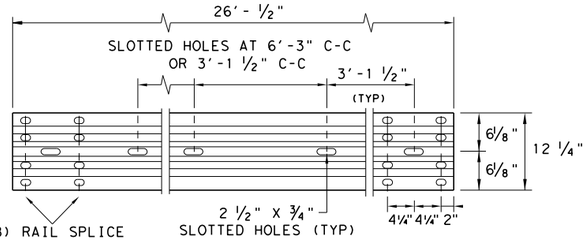
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

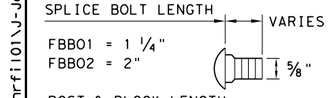
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

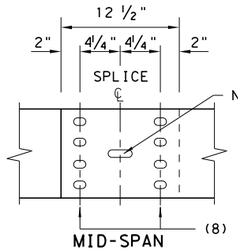
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECCESSED NUT.



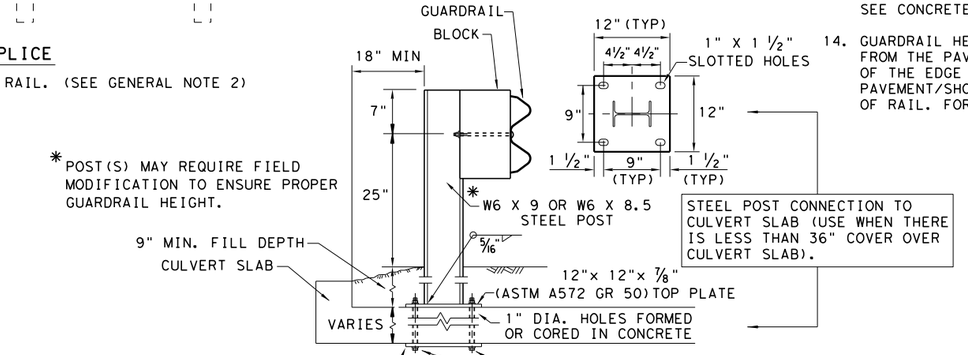
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



* 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).

12" X 12" X ¼" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

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.

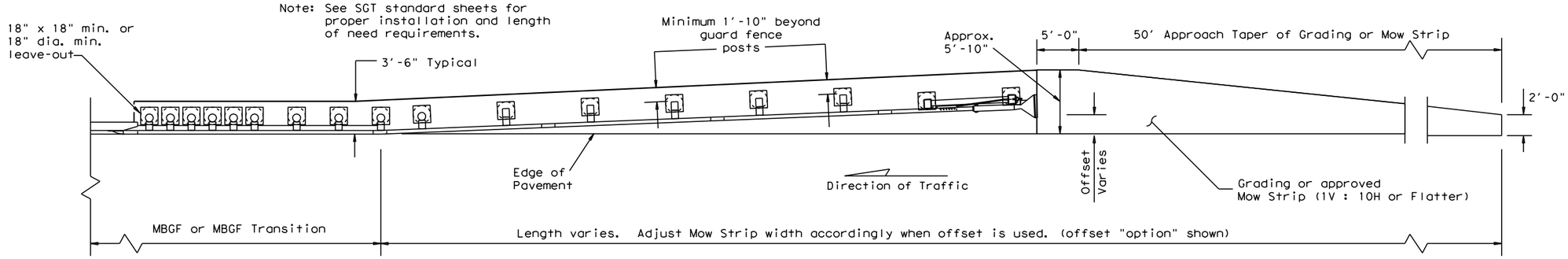
NOTE: TRANSISTIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS.
SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS.
SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

Texas Department of Transportation — Design Division Standard

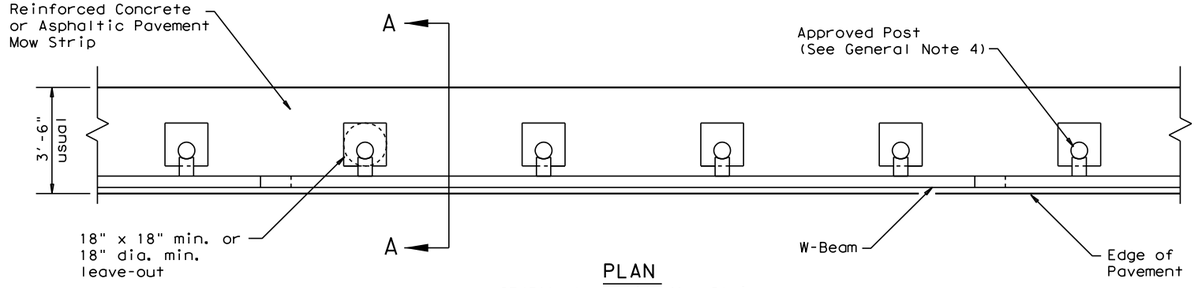
METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1191	03	033,ETC	FM 1245,ETC	
	DIST	COUNTY		SHEET NO.	
	WAC	LIMESTONE		42	

DATE: 5/7/2021
FILE: \\pusscshrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.11 Standards\1633 & 1245\Roadway\gf31ms19.dgn

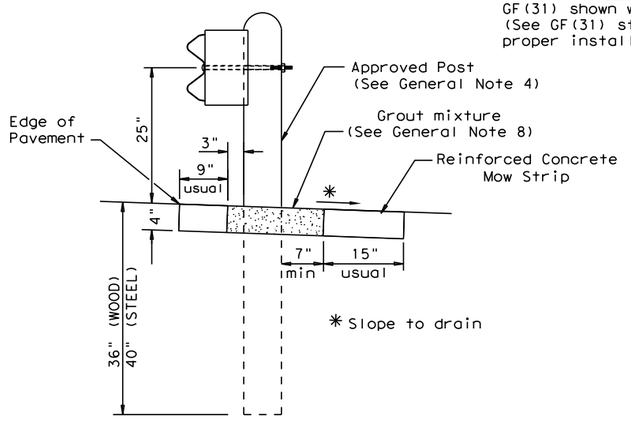


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



PLAN

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

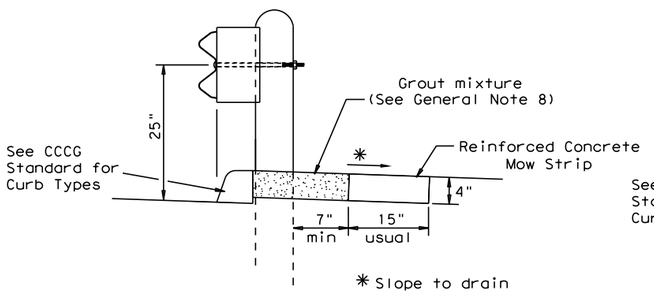


SECTION A-A

Typical

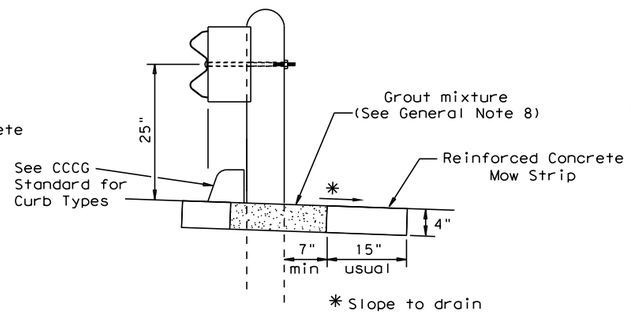
MOW STRIP DETAIL

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



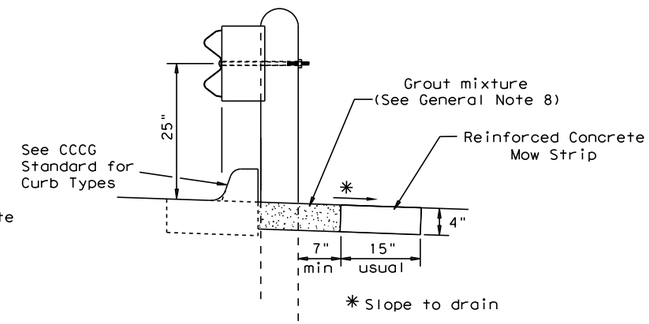
CURB OPTION (1)

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	1191	03	033,ETC	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WAC	LIMESTONE		43

DATE: 5/7/2021
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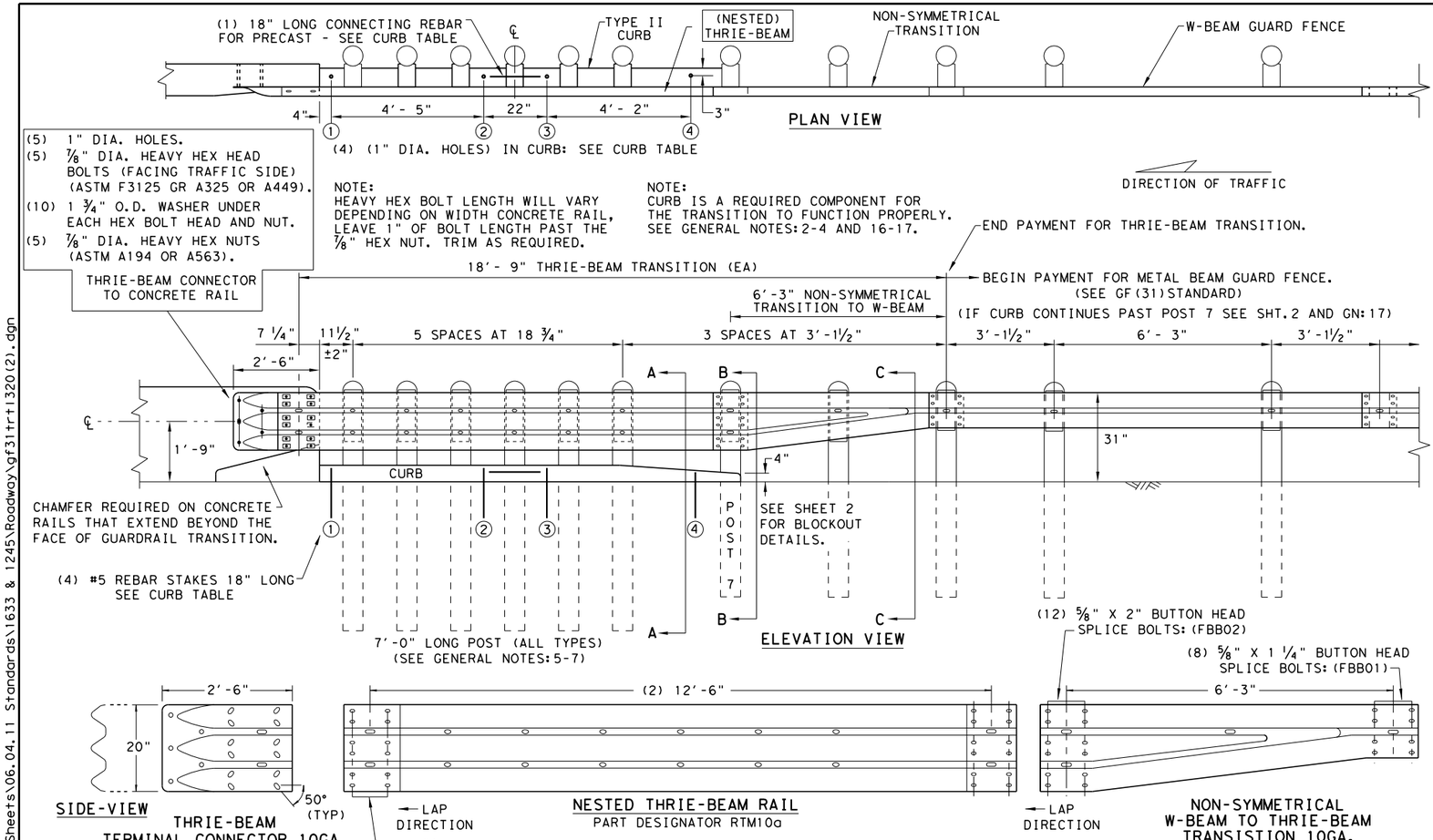


GENERAL NOTES

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

THRIE-BEAM TERMINAL - CURB TABLE

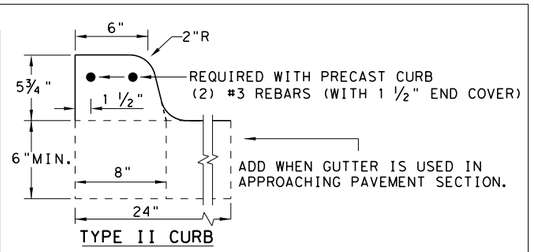
PRECAST CURB FULL LENGTH EQUALS 12'- 2"
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

CURB (1) LENGTH 5'- 8"
CURB (2) LENGTH 6'- 6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7

CONNECTING PRECAST CURB SECTIONS (1) & (2):
FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END.
USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.

SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *:
FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND ½" BELOW TOP OF CURB.
FILL HOLES WITH APPROVED GROUT MIXTURE.

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



TYPE II CURB

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

TYPE II CURB DETAILS

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	
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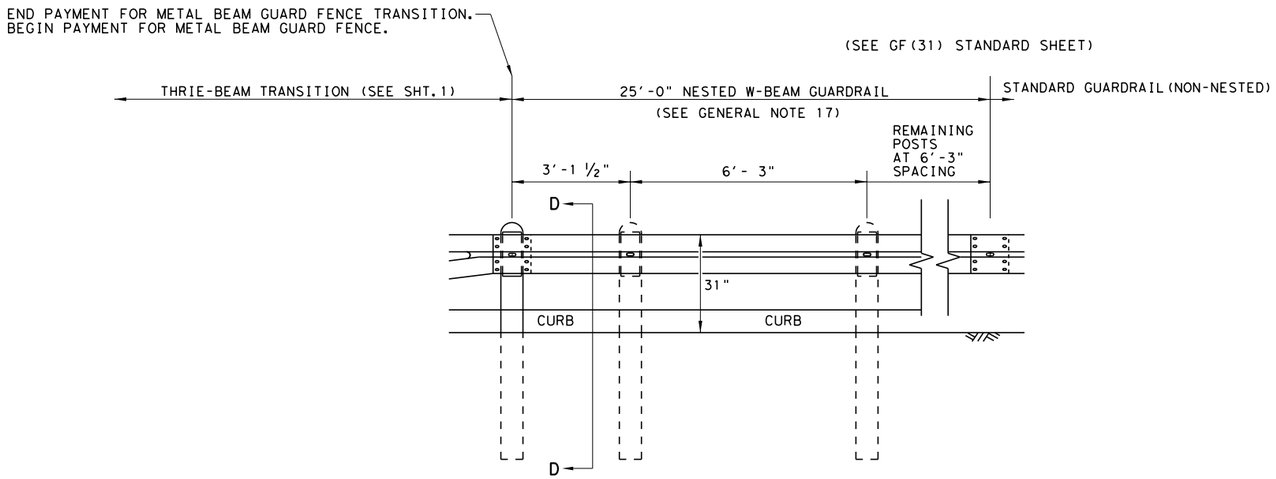
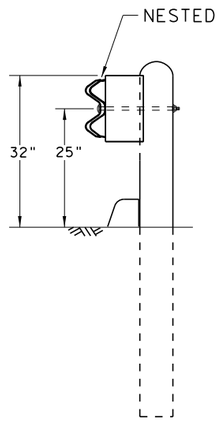
FILE: \\pussccshrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.11 Standards\1633 & 1245\Roadway\gf31tr1320(2).dgn

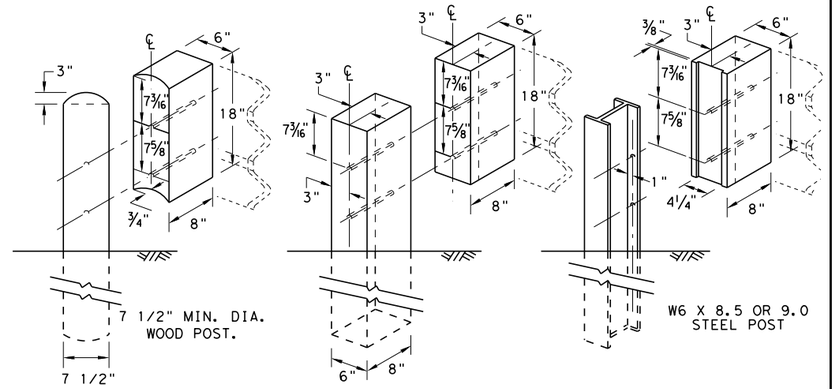
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



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		
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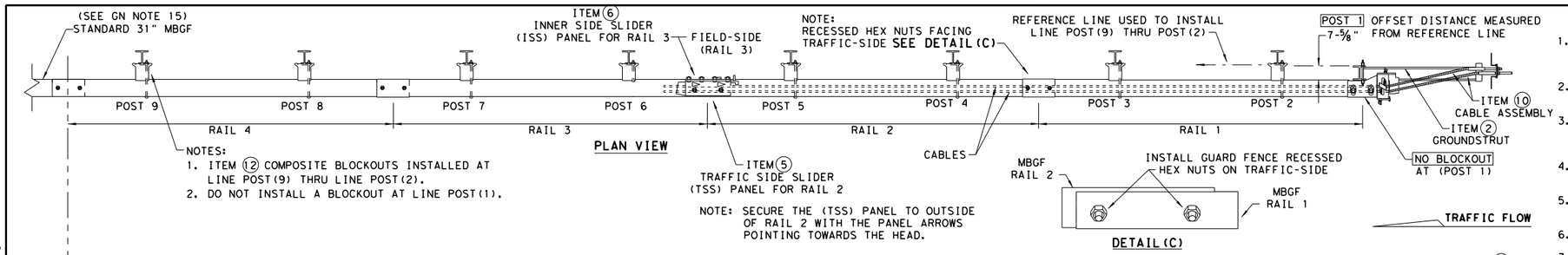
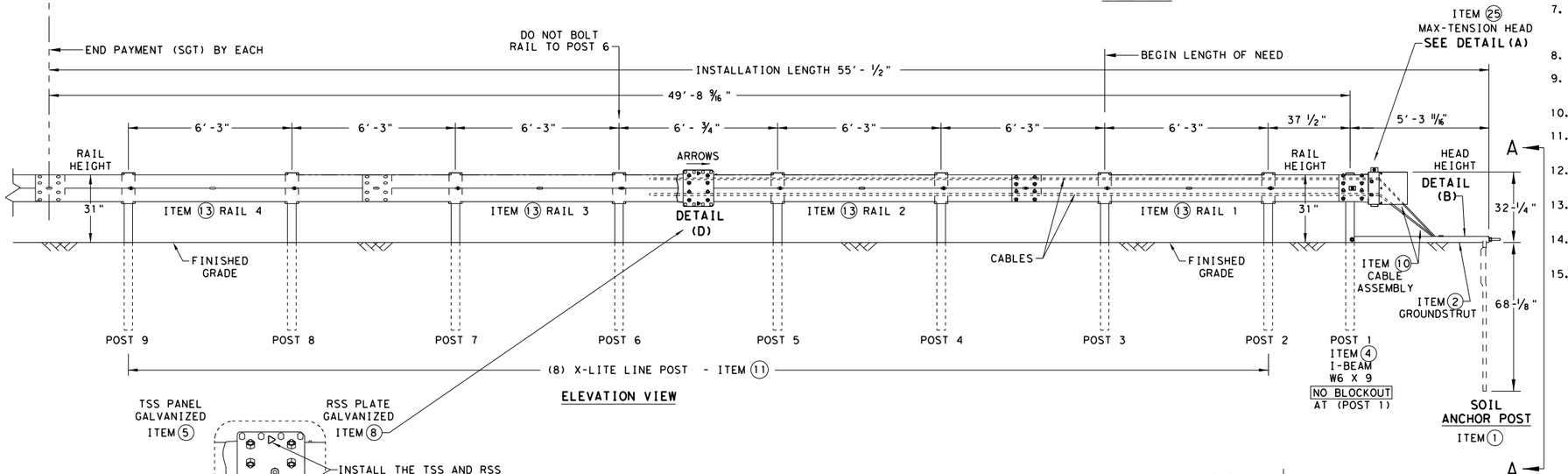
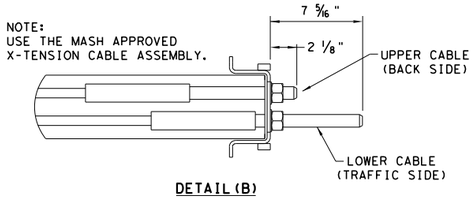
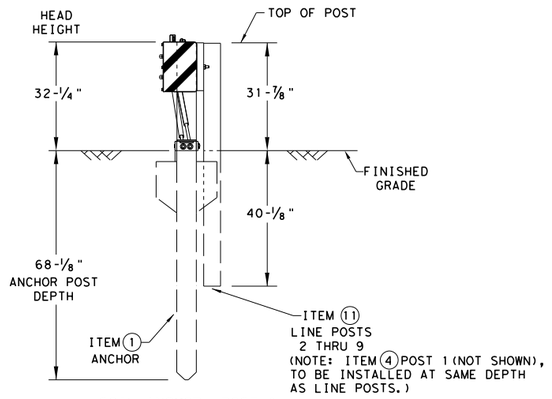
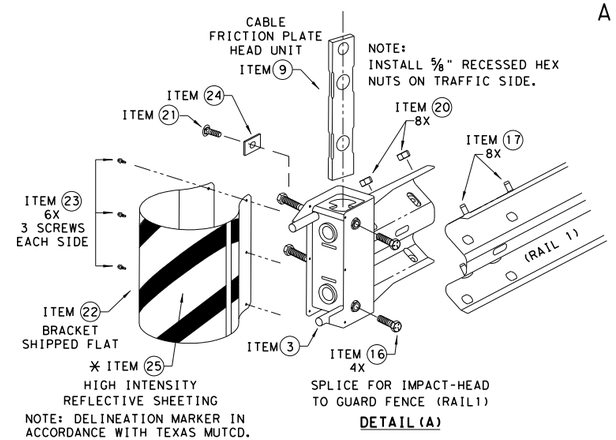
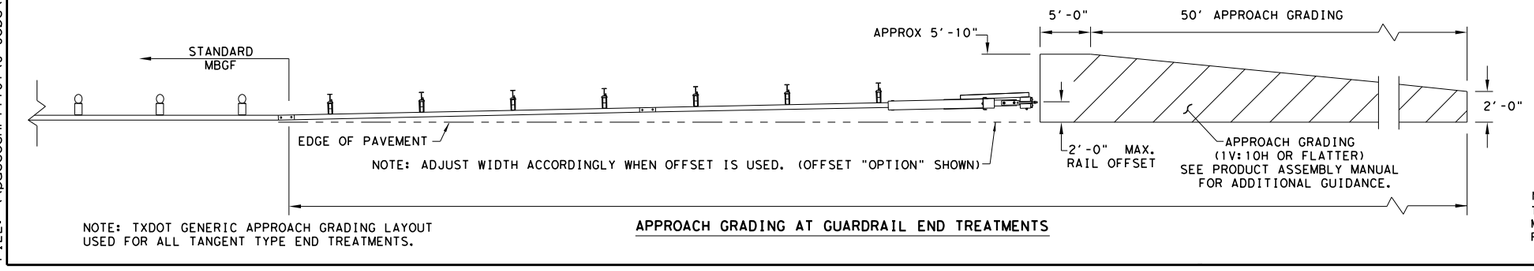












GENERAL NOTES

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-1701063-00	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

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

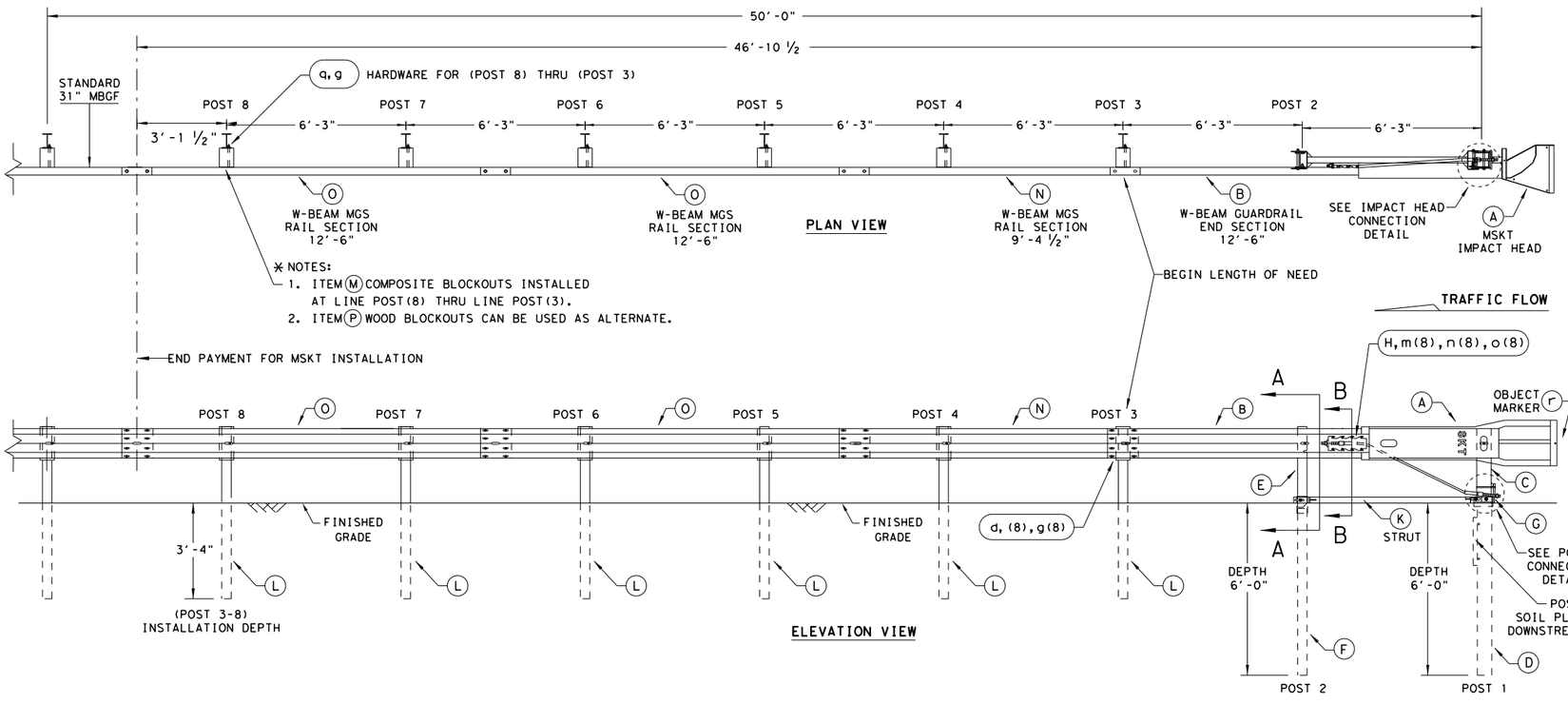
Texas Department of Transportation

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	1191	03	033,ETC	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WAC	LIMESTONE		46

DATE: 5/7/2021
FILE: \\pusscshrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.11 Standards\1633 & 1245\Roadway\sgt12s3118.dgn



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

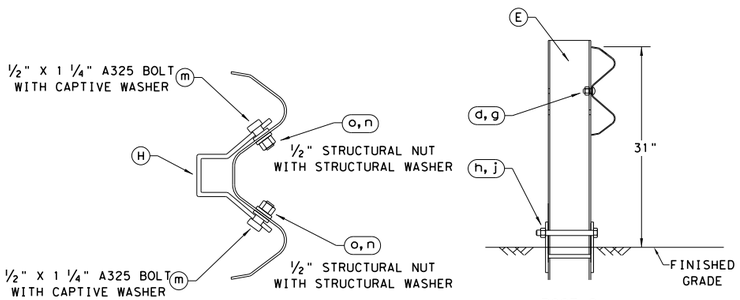
GENERAL NOTES

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.

SEE NOTES: *

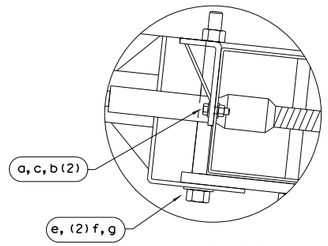
ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
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 ½")	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	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

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

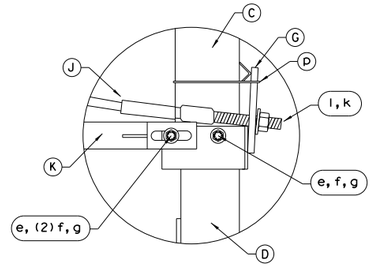


SECTION B-B
ANCHOR BRACKET

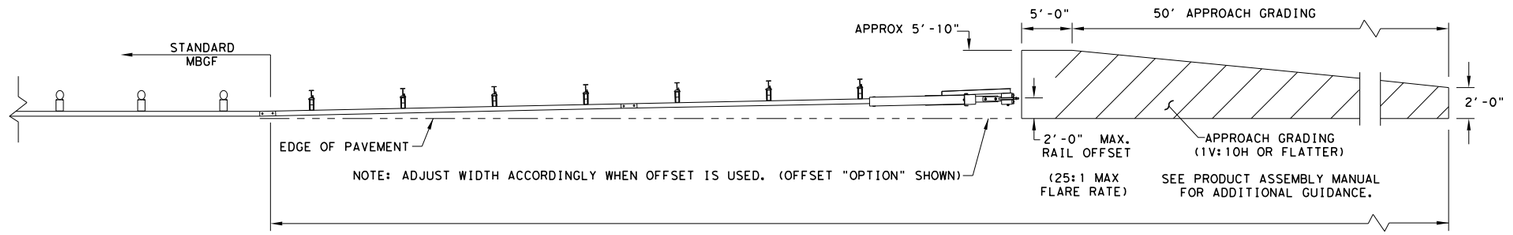
POST 2
SECTION A-A



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.

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

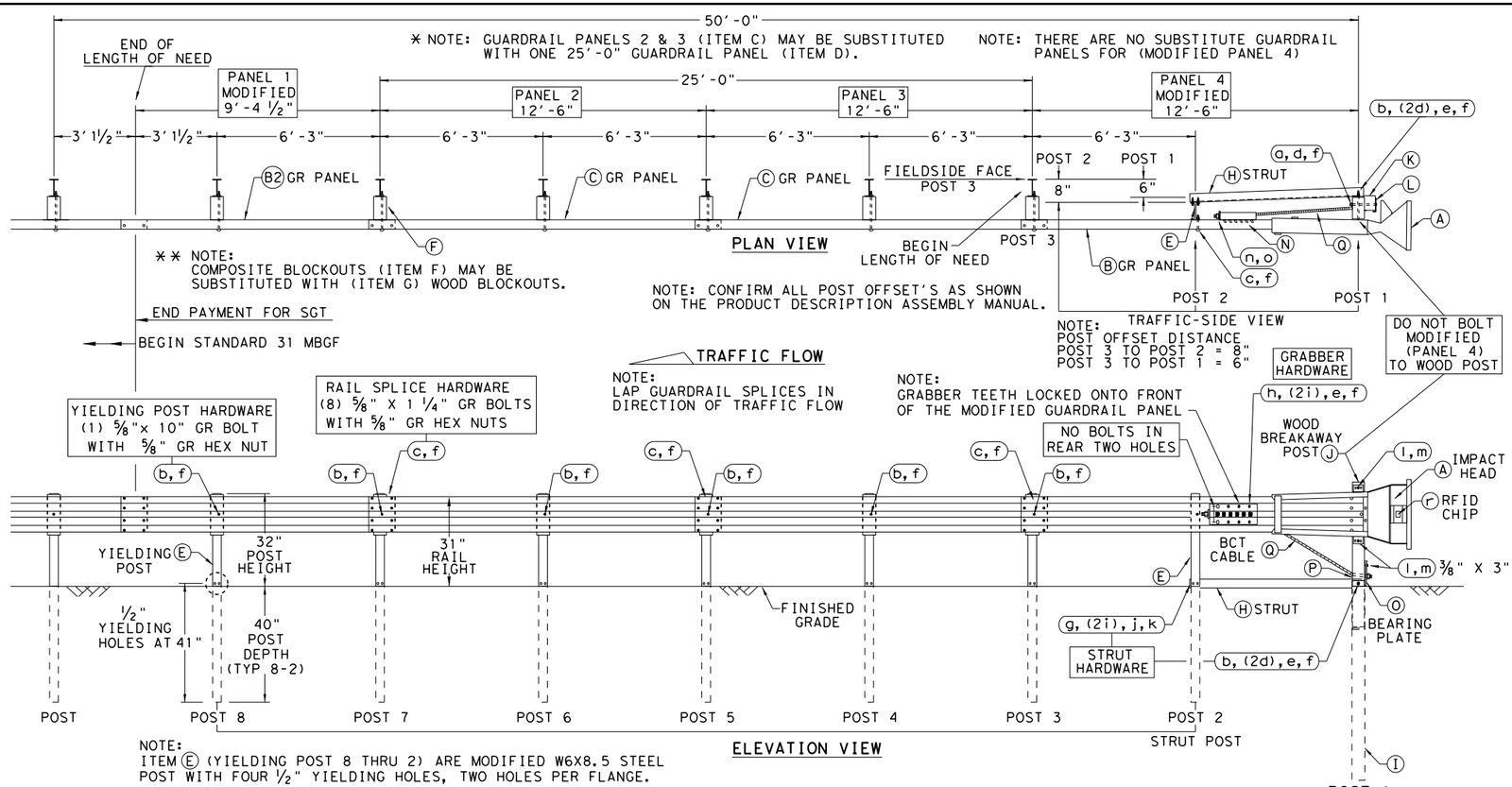
SINGLE GUARDRAIL TERMINAL

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	1191	03	033, ETC	FM 1245, ETC	
	DIST	COUNTY		SHEET NO.	
	WAC	LIMESTONE		47	

DATE: 5/7/2021
FILE: \\pussc$hrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.11 Standards\1633 & 1245\Roadway\sgt153120.dgn

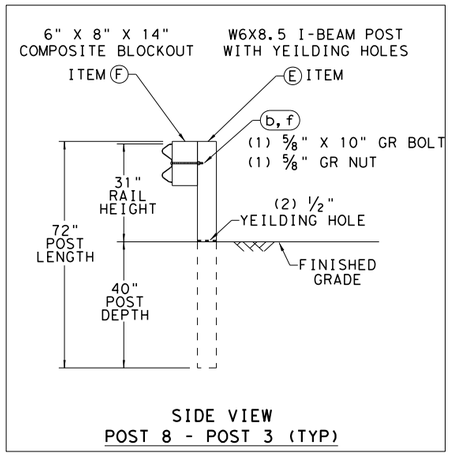


GENERAL NOTES

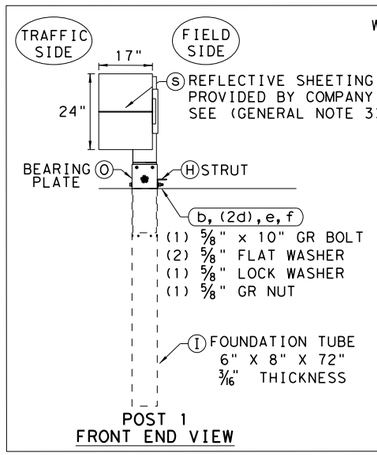
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY 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

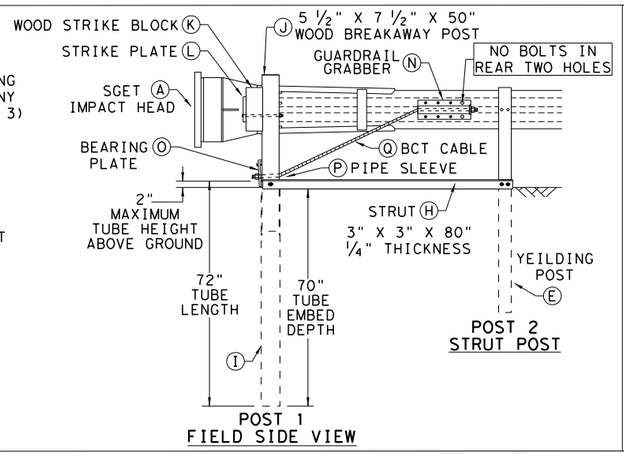
ALTERNATIVE ITEMS
* D
** G
NOTE: SEE PLAN VIEW



SIDE VIEW
POST 8 - POST 3 (TYP)

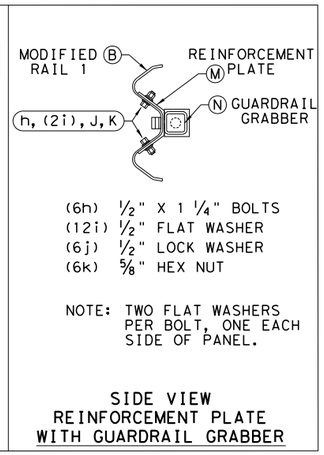


POST 1
FRONT END VIEW

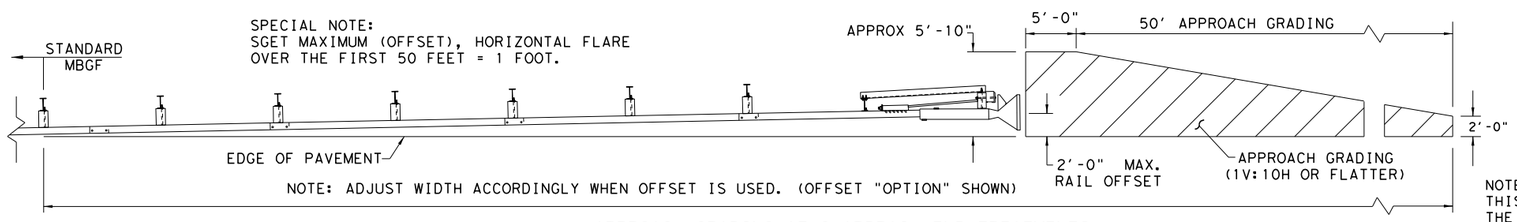


POST 1
FIELD SIDE VIEW

POST 2
STRUT POST



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	1191	03	033,ETC	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WAC	LIMESTONE		48

DATE: 5/7/2021
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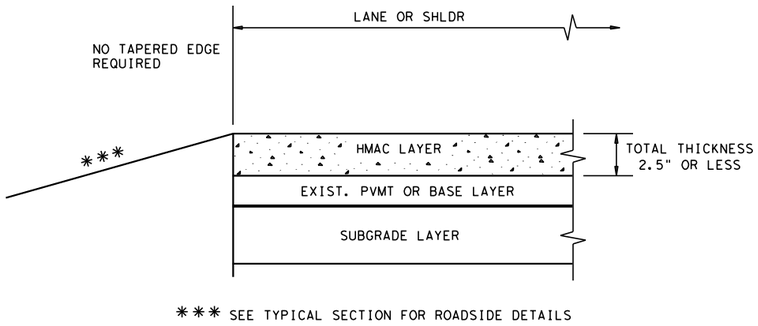
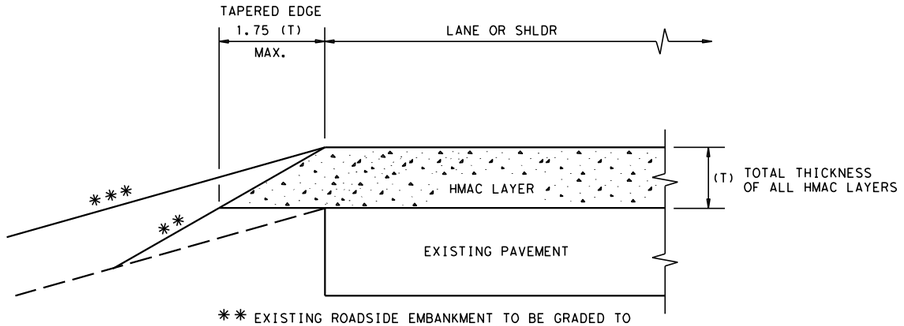


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

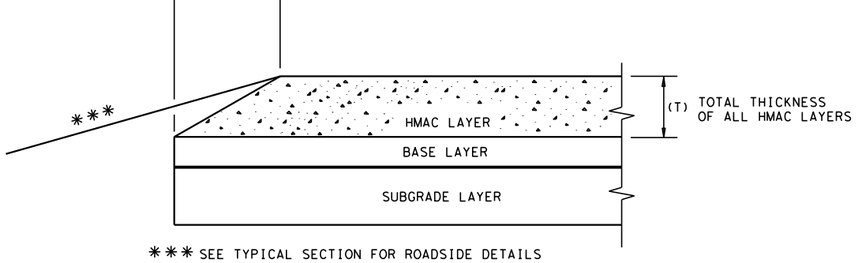
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY
WITH THICKNESS OF 2.5" OR LESS



** 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.

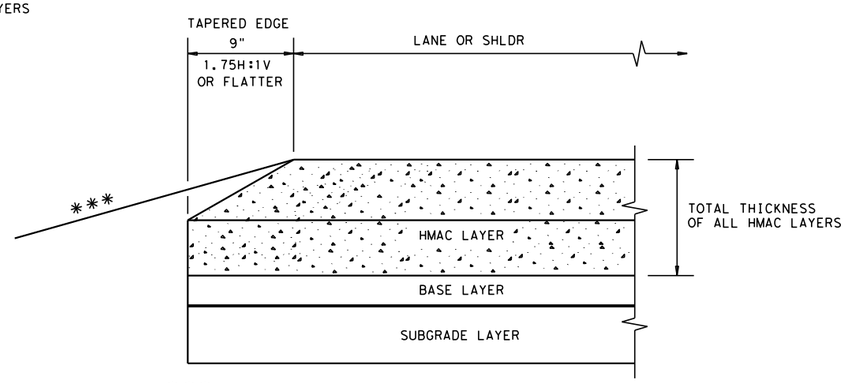
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

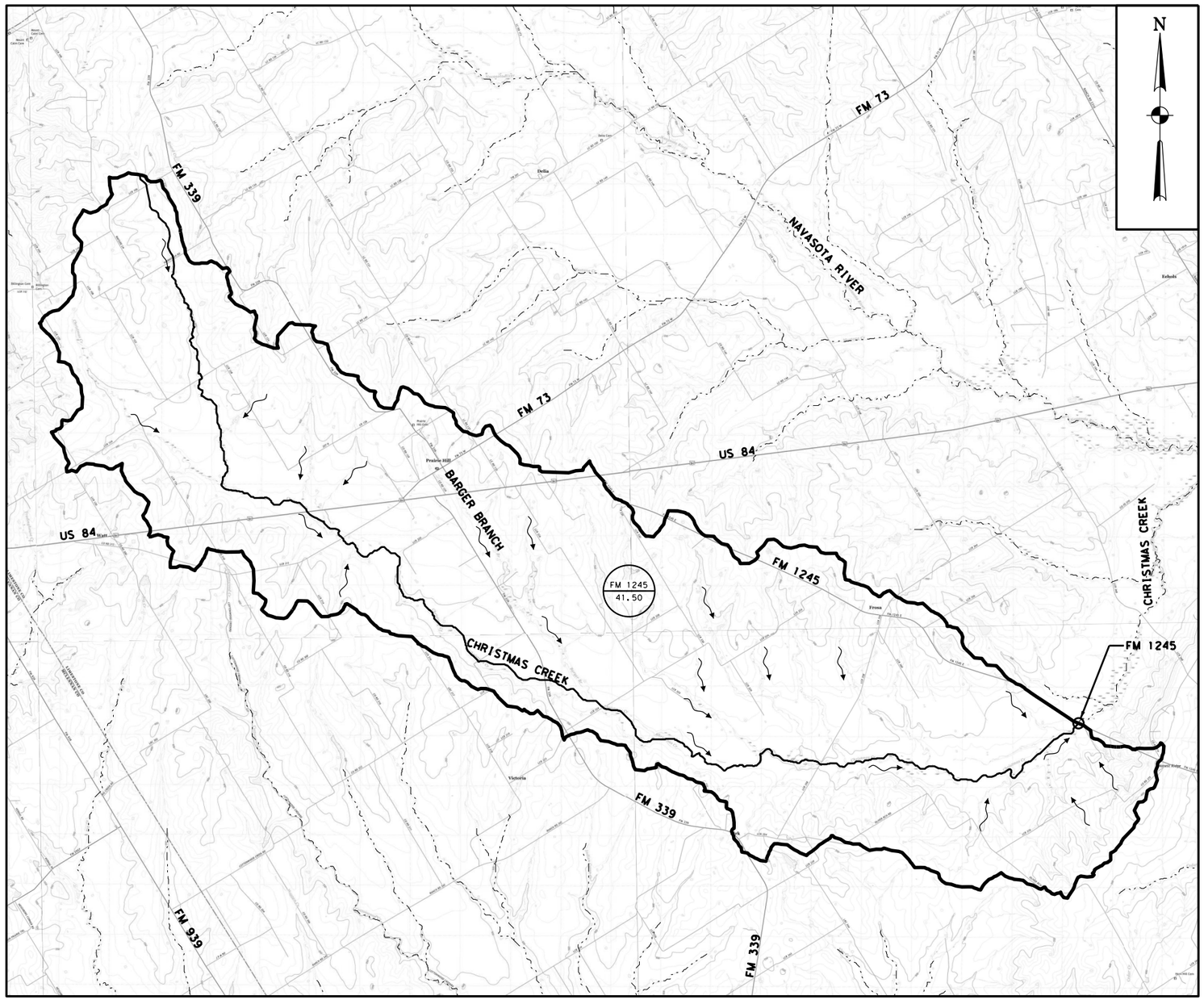
1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE 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	1191	03	033,ETC	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WAC	LIMESTONE		49



LEGEND

- DA-X / 0.0 — DRAINAGE AREA ID / DRAINAGE AREA (SQ MI)
- DRAINAGE AREA BOUNDARY
- PROP CROSSING
- FLOW ARROW

HYDROLOGIC METHOD:

HYDROLOGY COMPUTATIONS ARE DETAILED IN "ON-SYSTEM BRIDGE REPLACEMENT BRIDGE HYDRAULIC REPORT, LIMESTONE COUNTY, TX" DATED DRAFT JANUARY 2021 BY CIVIL SYSTEMS ENGINEERING, INC.
FLOWS WERE COMPUTED WITHIN HEC-HMS(V.4.2.1), FILENAME: 245069C_IEA_WACO_CHRIST_NAVA.HMS
DRAINAGE AREAS WERE DELINEATED USING LIDAR AND USGS DEM TOPOGRAPHY AND AERIALS WITHIN ARCGIS v10.7 USING ARCHYDRO TOOLS.
RAINFALL WAS TAKEN FROM NOAA ATLAS 14 "PRECIPIRATION-FREQUENCY ATLAS OF THE UNITED STATES", VOLUME 11, VERSION 2.3-TEXAS, DATED SEPTEMBER 27, 2018. GAGE STATION: GROESBECK, TX.
FLOWS COMPUTED USING NRCS HYDROGRAPH METHOD.
UNIT HYDROGRAPH PEAK RATING FACTOR (PRF) SET TO 484.
TIME OF CONCENTRATION WAS COMPUTED USING KERBY-KERPICH METHOD.
SOIL INFILTRATION COMPUTATION USED NRCS CN LOSS METHOD; CLIMATIC ADJUSTMENT OF CN -10 WAS APPLIED.

0′ 4,000′ 8,000′
SCALE: 1"=8,000′

STATE OF TEXAS
KURT E KILLIAN
95742
LICENSED PROFESSIONAL ENGINEER
5/12/2021

DRAINAGE AREA PARAMETERS

CROSSING ROAD	STREAM	AREA (AC)	AREA (SQ.MI.)	IMP (%)	CN	SCS PRF
FM 1245	CHRISTMAS CREEK	26,557	41.50	0%	73	484

TIME OF CONCENTRATION

CROSSING ROAD	STREAM	OVERLAND LENGTH (FT)	OVERLAND SLOPE (FT/FT)	OVERLAND RETARDANCE COEFF	CHANNEL LENGTH (FT)	CHANNEL SLOPE (FT/FT)	Tc (MIN)	LAG (MIN)
FM 1245	CHRISTMAS CREEK	835	0.0114	0.4	99,426	0.0018	662	397

COMPUTED FLOWS

CROSSING ROAD	STREAM	AREA (AC)	AREA (SQ.MI.)	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
FM 1245	CHRISTMAS CREEK	26,557	41.50	2,504	4,814	6,935	9,932	12,360	15,117

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

CSE CIVIL SYSTEMS ENGINEERING, INC.
TPBE REGISTRATION NO. F-5246

DRAINAGE AREA MAP
FM 1245 OVER CHRISTMAS CREEK
LIMESTONE COUNTY

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		50
STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

5/12/2021 2:54:57 PM BAYOU
C:\1CSE_PROJECTS\245069C_IEA_WACO\CAD\CHRISTMAS\FM1245-DAM-SHT.DGN

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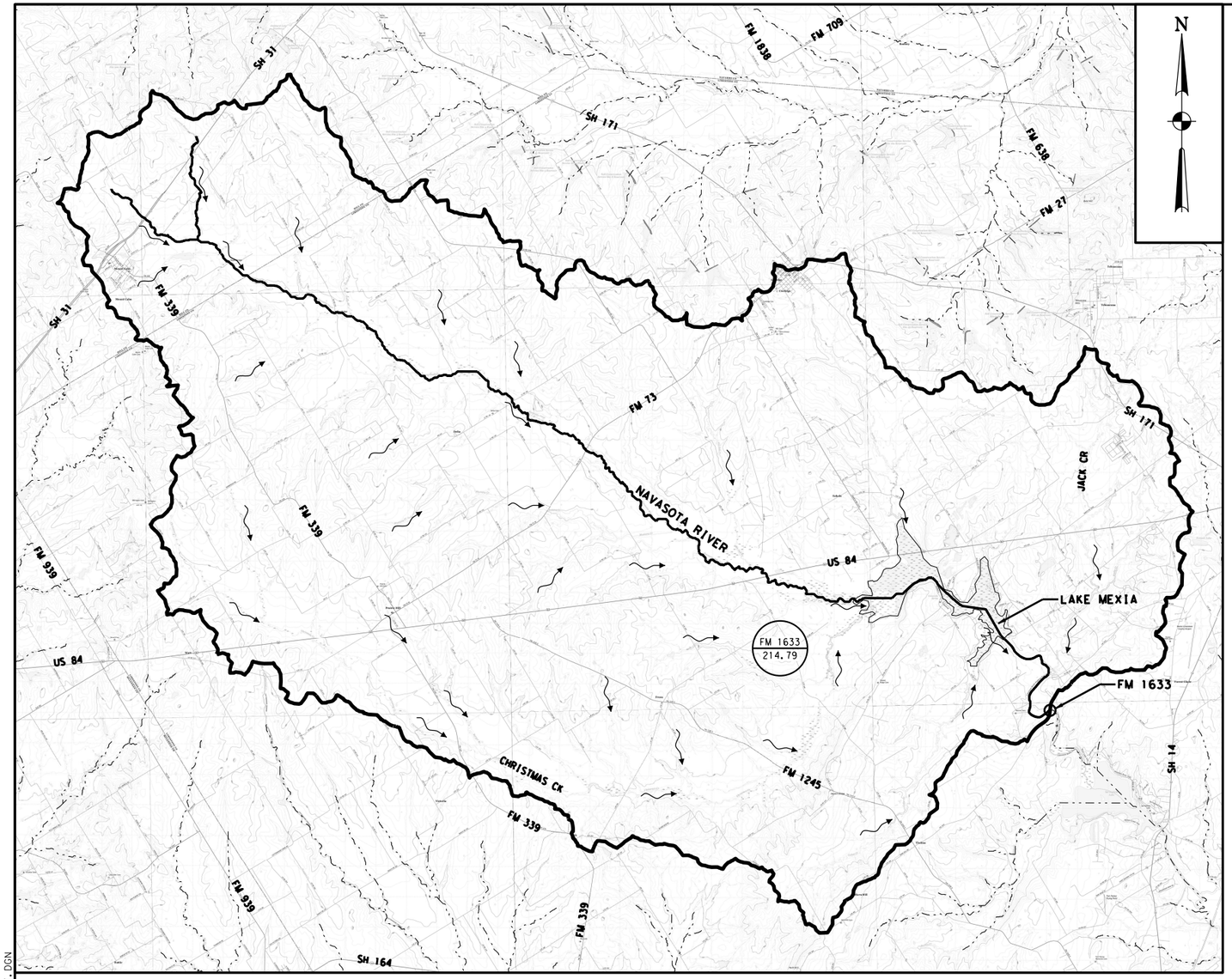

LEGEND

- DA-X / 0.0 — DRAINAGE AREA ID / DRAINAGE AREA (SQ MI)
- DRAINAGE AREA BOUNDARY
- PROP CROSSING
- FLOW ARROW

HYDROLOGIC METHOD:

HYDROLOGY COMPUTATIONS ARE DETAILED IN "ON-SYSTEM BRIDGE REPLACEMENT BRIDGE HYDRAULIC REPORT, LIMESTONE COUNTY, TX", DATED DRAFT JANUARY 2021 BY CIVIL SYSTEMS ENGINEERING, INC.
FLOWS WERE COMPUTED WITHIN HEC-HMS(V.4.2.1), FILENAME: 245069C_IEA_WACO_FISH.HMS
DRAINAGE AREAS WERE DELINEATED USING LIDAR AND USGS DEM TOPOGRAPHY AND AERIALS WITHIN ARCGIS v10.7 USING ARCHYDRO TOOLS.
RAINFALL WAS TAKEN FROM NOAA ATLAS 14 "PRECIPIRATION-FREQUENCY ATLAS OF THE UNITED STATES", VOLUME 11, VERSION 2.3-TEXAS, DATED SEPTEMBER 27, 2018.
FLOWS COMPUTED USING NRCS HYDROGRAPH METHOD.
UNIT HYDROGRAPH PEAK RATING FACTOR (PRF) SET TO 484.
TIME OF CONCENTRATION WAS COMPUTED USING KERBY-KERPICH METHOD.
SOIL INFILTRATION COMPUTATION USED NRCS CN LOSS METHOD.
CLIMATIC ADJUSTMENT OF CN -10 APPLIED.
WATERSHED WAS ROUTED THROUGH LAKE MEXIA WITHIN HEC-HMS; STORAGE-STAGE CURVE AND SPILLWAY DATA WERE TAKEN FROM TWDB REPORT: "VOLUMETRIC AND SEDIMENTATION SURVEY OF LAKE MEXIA APRIL 2008 SURVEY" AND LIDAR TOPO.

0′ 7,000′ 14,000′
SCALE: 1"=14,000′

5/12/2021

DRAINAGE AREA PARAMETERS

CROSSING ROAD	STREAM	AREA (AC)	AREA (SQ.MI.)	IMP (%)	CN	SCS PRF
FM 1633	NAVASOTA RIVER	137,468	214.79	0%	72	484

TIME OF CONCENTRATION

CROSSING ROAD	STREAM	OVERLAND LENGTH (FT)	OVERLAND SLOPE (FT/FT)	OVERLAND RETARDANCE COEFF	CHANNEL LENGTH (FT)	CHANNEL SLOPE (FT/FT)	Tc (MIN)	LAG (MIN)
FM 1633	NAVASOTA RIVER	935	0.0183	0.4	163,770	0.0015	1010	606

COMPUTED FLOWS

CROSSING ROAD	STREAM	AREA (AC)	AREA (SQ.MI.)	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
FM 1633	NAVASOTA RIVER	137,468	214.79	5,347	10,832	15,859	22,809	28,656	34,970

Texas Department of Transportation

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18383 PRESTON ROAD
SUITE 500
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(214) 884-4253
FIRM REGISTRATION No. F-10161

CSE CIVIL SYSTEMS ENGINEERING, INC.
TPBE REGISTRATION NO. F-5246

DRAINAGE AREA MAP

FM 1633 OVER NAVASOTA RIVER

LIMESTONE COUNTY

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		51
STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

5/12/2021 2:59:26 PM BAYOU
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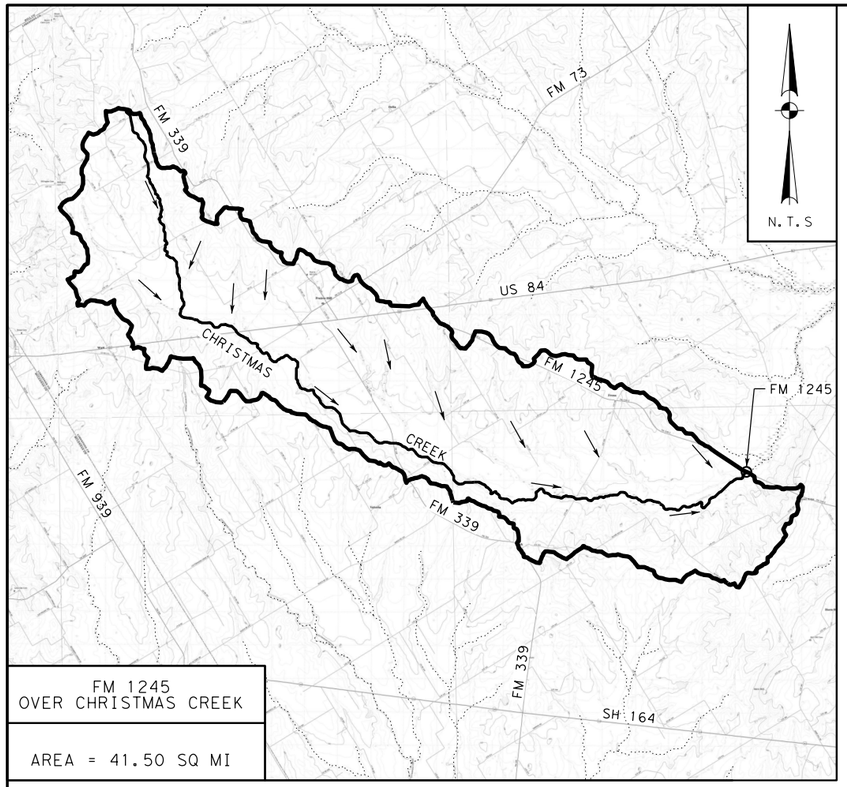


FM 1245
OVER CHRISTMAS CREEK

AREA = 41.50 SQ MI

HEC-RAS STATION	D/S REACH LENGTH (FT)	FREQUENCY	FLOWS (CFS)	COMPUTED WATER SURFACE ELEVATIONS (NAVD 1988) (FT)			VELOCITIES	
				EXISTING	PROPOSED	DIFFERENCE (PROP-EX)	EXISTING	PROPOSED
1647	727.5	10Y	6935	477.03	477.03	0.00	2.2	2.2
		25Y	9932	477.62	477.62	0.00	2.6	2.6
		50Y	12360	478.02	478.02	0.00	2.8	2.8
		100Y	15117	478.44	478.44	0.00	3.0	3.0
1919	272.5	10Y	6935	477.07	477.10	0.03	6.0	5.5
		25Y	9932	477.47	477.54	0.07	8.1	7.2
		50Y	12360	477.62	477.76	0.14	9.8	8.7
		100Y	15117	477.67	477.85	0.18	11.9	10.4
2037	PROPOSED FM 1245 BRIDGE							
2199	90.0	10Y	6935	478.97	479.16	0.19	4.1	3.6
		25Y	9932	481.33	479.73	-1.60	1.0	4.6
		50Y	12360	481.68	481.61	-0.07	1.1	1.6
		100Y	15117	482.05	481.89	-0.16	1.2	1.9
2379	179.4	10Y	6935	479.67	479.70	0.03	1.0	1.0
		25Y	9932	481.35	480.53	-0.82	0.9	1.1
		50Y	12360	481.71	481.68	-0.03	1.0	1.0
		100Y	15117	482.08	481.98	-0.10	1.2	1.2
4267	1888.1	10Y	6935	479.92	479.94	0.02	1.3	1.3
		25Y	9932	481.48	480.77	-0.71	1.2	1.4
		50Y	12360	481.86	481.83	-0.03	1.3	1.3
		100Y	15117	482.26	482.17	-0.09	1.5	1.5

NOTES:

1. STREAM MODELING DATA PRESENTED IS FROM "ON-SYSTEM BRIDGE REPLACEMENT BRIDGE HYDRAULIC REPORT, LIMESTONE COUNTY, TX" DATED FINAL APRIL 2021 BY CIVIL SYSTEMS ENGINEERING, INC.
2. PROPOSED BRIDGE IS LOCATED AT PROJECT STA. 525+05 - STA. 526+40.
3. PROPOSED BRIDGE CONSISTS OF A 3-SPAN (40'-55'-40') 5XB20 PRESTRESSED CONCRETE X-BEAM STRUCTURE WITH A TOTAL LENGTH OF 135 FEET.
4. PROPOSED BRIDGE WIDTH IS 34 FEET, NORMAL TO THE STREAM.
5. PROPOSED BRIDGE IS SUPPORTED BY 36-INCH CIRCULAR PIERS.
6. BOUNDARY CONDITION SET TO NORMAL DEPTH SLOPE = 0.0004 FT/FT.
7. ELEVATIONS PRESENTED ARE REFERENCED TO NAVD88 DATUM.
8. BRIDGE DESIGNED FOR 10YR STORM EVENT.
9. ROADWAY APPROACH IS OVERTOPPED DURING EVENTS GREATER THAN 10YR STORM EVENT.

FEMA:

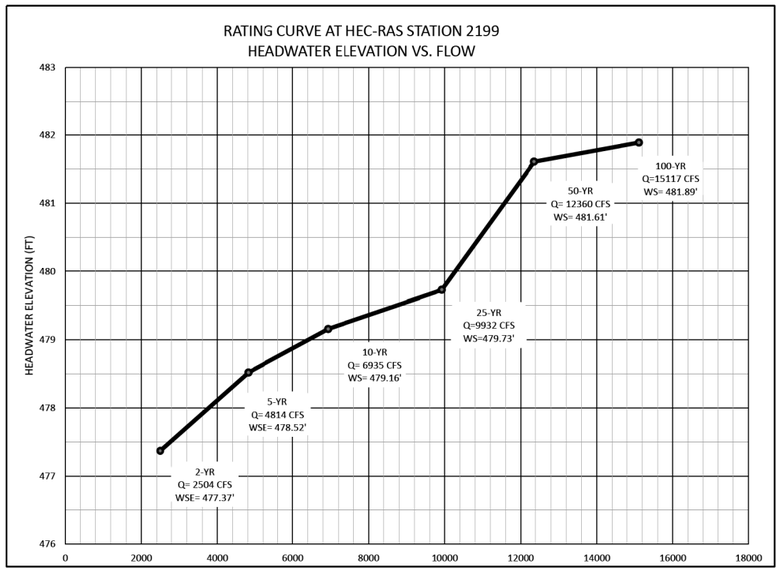
PROJECT IS LOCATED WITHIN THE UNINCORPORATED AREAS OF LIMESTONE COUNTY, A PARTICIPATING COMMUNITY WITHIN THE NATIONAL FLOOD INSURANCE PROGRAM.

PROJECT AT CHRISTMAS CREEK IS SHOWN ON FEMA FORM PANEL NO. 48293C0275C DATED EFFECTIVE SEPTEMBER 16, 2011. CHRISTMAS CREEK IS LOCATED WITHIN SHADED ZONE A FLOOD HAZARD AREA AT THE FM 1245 BRIDGE CROSSING.

FLOOD PLAIN ADMINISTRATOR NOTIFICATION WAS COMPLETED ON: 5/14/2021

HYDROLOGIC METHOD:

FLOWS WERE COMPUTED WITHIN HEC-HMS(V.4.2.1);
FILENAME: 245069C_IEA_WACO_CHRIST_NAVA.HMS.
DRAINAGE AREAS WERE DELINEATED USING LIDAR AND USGS DEM TOPOGRAPHY AND AERIALS WITHIN ARCGIS v10.7 USING ARCHYDRO TOOLS.
RAINFALL WAS TAKEN FROM NOAA ATLAS 14 "PRECIPIRATION-FREQUENCY ATLAS OF THE UNITED STATES", VOLUME 11, VERSION 2.3-TEXAS, DATED SEPTEMBER 27, 2018.
RAIN STATION: GROESBECK, TX.
FLOWS COMPUTED USING NRCS HYDROGRAPH METHOD.
UNIT HYDROGRAPH PEAK RATING FACTOR (PRF) WAS SET TO 484.
TIME OF CONCENTRATION WAS COMPUTED USING KERBY-KERPICH METHOD.
SOIL INFILTRATION COMPUTATION USED NRCS CN LOSS METHOD;
CLIMATIC ADJUSTMENT OF CN -10 WAS APPLIED.



STATE OF TEXAS
KURT E KILLIAN
95742
LICENSED PROFESSIONAL ENGINEER
5/12/2021

Texas Department of Transportation

IEA
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SUITE 500
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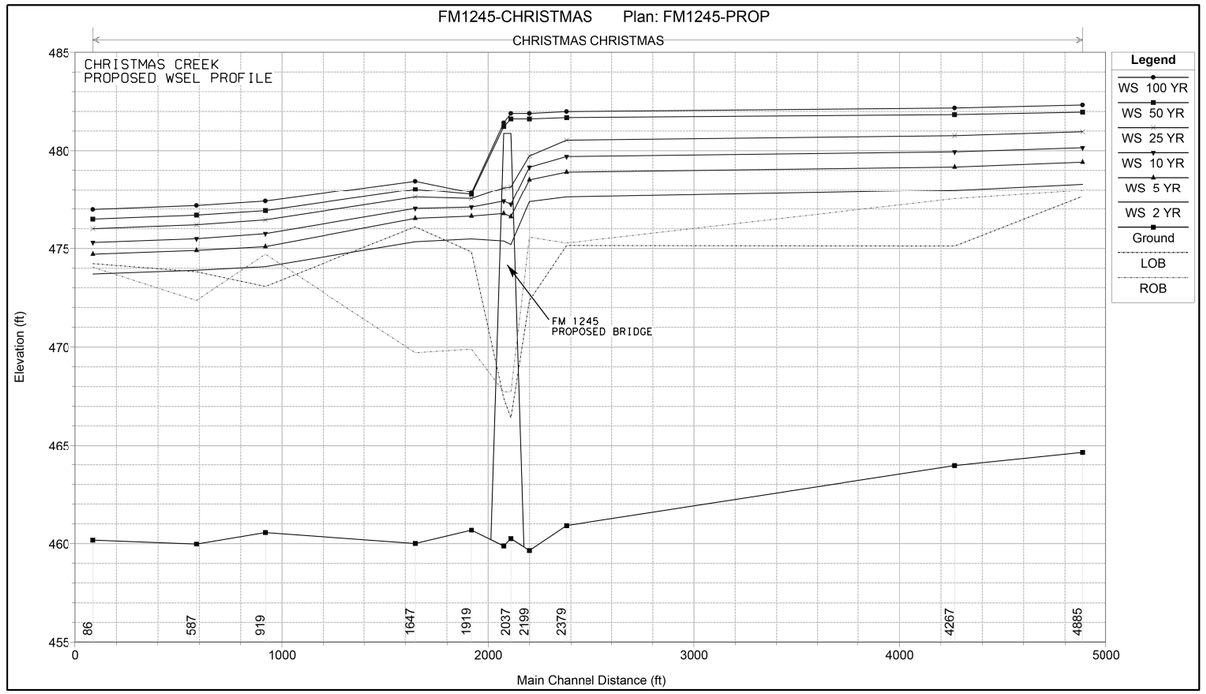
FIRM REGISTRATION No. F-10161

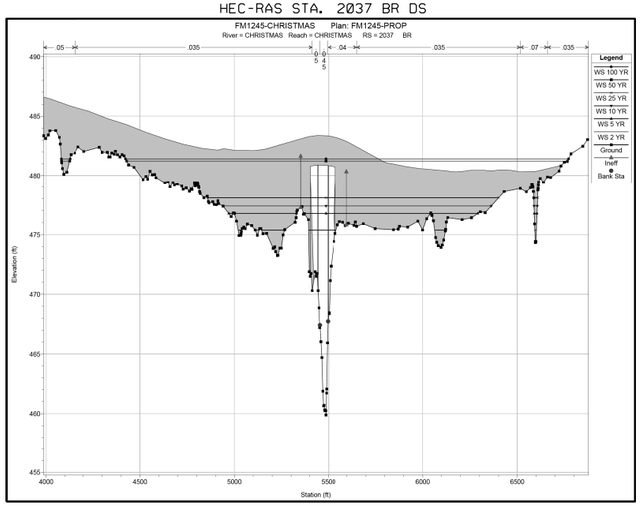
CSE CIVIL SYSTEMS ENGINEERING, INC.
TPBE REGISTRATION NO. F-5246

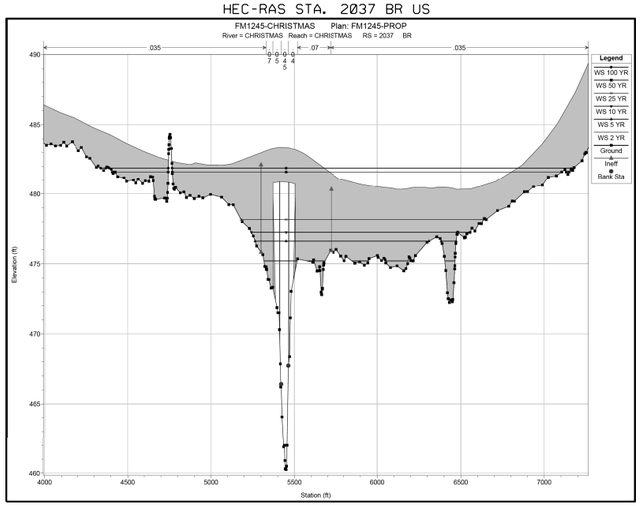
HYDRAULIC DATA SHEET

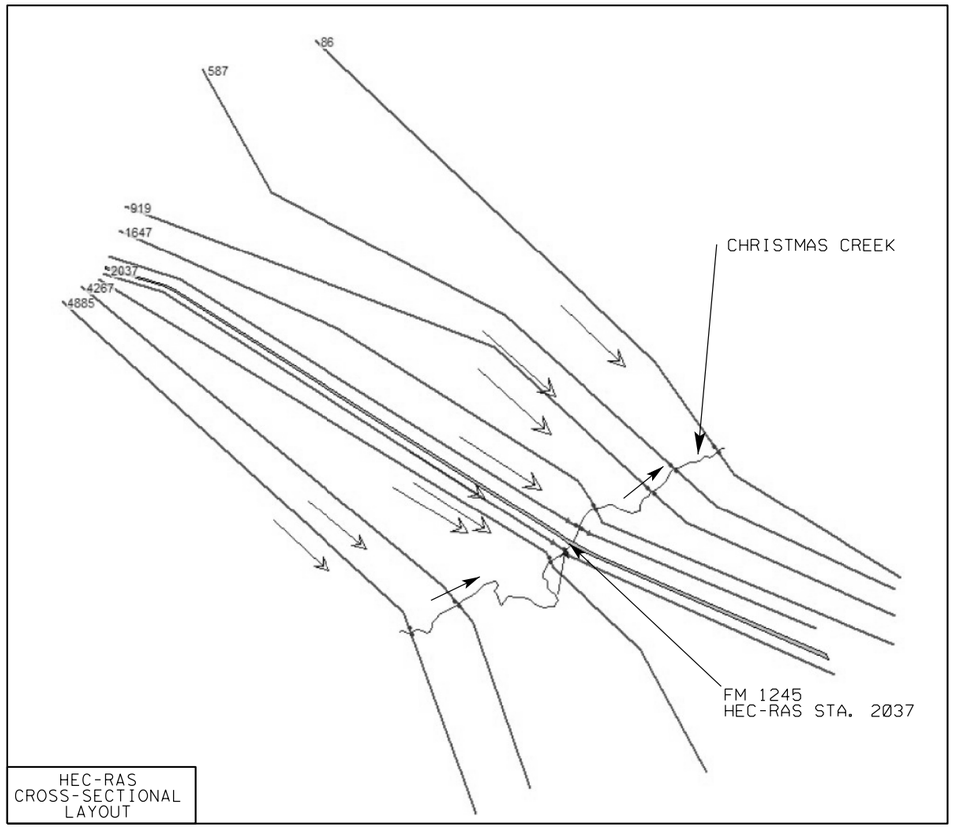
FM 1245
OVER CHRISTMAS CREEK

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		52
STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.









HYDRAULIC METHOD:

WATER SURFACE ELEVATION RESULTS FROM HYDRAULIC MODELING ANALYSIS PRESENTED WITHIN "ON-SYSTEM BRIDGE REPLACEMENT BRIDGE HYDRAULIC REPORT, LIMESTONE COUNTY, TX," DATED FINAL APRIL 2021 BY CIVIL SYSTEMS ENGINEERING, INC.

WATER SURFACE ELEVATIONS COMPUTED USING HEC-RAS (V.5.0.7). HEC-RAS MODEL WAS GENERATED FROM PROJECT FIELD SURVEY, LIDAR TOPO, AND BRIDGE LAYOUTS.

STARTING BOUNDARY CONDITION SET TO NORMAL DEPTH: SLOPE = 0.0004

HEC-RAS FILENAME: FM1245-CHRISTMAS.PRJ
EXISTING (PRE-PROJECT) CONDITION WATER SURFACE ELEVATIONS ARE FROM:
PLAN: "FM1245-EXIST", "*.P01"
GEOMETRY: "FM1245-EXIST", "*.G01"
FLOW: "FM1245-FLOW", "*.F01"
PROPOSED (POST PROJECT) CONDITION WATER SURFACE ELEVATIONS ARE FROM:
PLAN: "FM1245-PROP", "*.P02"
GEOMETRY: "FM-1245-PROP", "*.G02"
FLOW: "FM1245-FLOW", "*.F01"
STREAM MODELED WITH REPRESENTATIVE MANNING'S VALUES OF:
CHANNEL AREA: 0.045
OVERBANK AREA: 0.035 - 0.07

STATE OF TEXAS
KURT E KILLIAN
95742
LICENSED PROFESSIONAL ENGINEER
5/12/2021

Texas Department of Transportation

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FIRM REGISTRATION No. F-10161

CSE CIVIL SYSTEMS ENGINEERING, INC.
TPBE REGISTRATION NO. F-5246

HYDRAULIC DATA SHEET

FM 1245
OVER CHRISTMAS CREEK

SHEET 2 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		53
STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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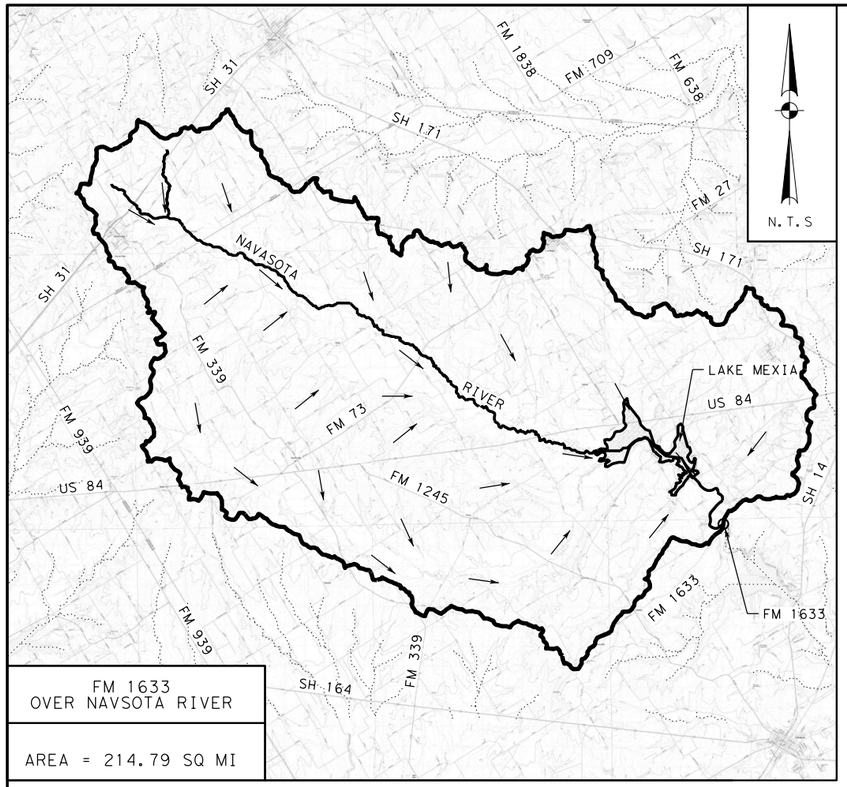


FM 1633
OVER NAVSOTA RIVER

AREA = 214.79 SQ MI

HEC-RAS STATION	D/S REACH LENGTH (FT)	FREQUENCY	FLOWS (CFS)	COMPUTED WATER SURFACE ELEVATIONS (NAVD 1988) (FT)			VELOCITIES	
				EXISTING	PROPOSED	DIFFERENCE (PROP-EX)	EXISTING	PROPOSED
3189	889.2	10Y	15859	426.91	426.91	0.00	3.7	3.7
		25Y	22809	429.24	429.24	0.00	4.0	4.0
		50Y	28656	430.93	430.93	0.00	4.1	4.1
		100Y	34970	432.75	432.75	0.00	4.1	4.1
3591	356.0	10Y	15859	427.08	427.10	0.02	4.3	3.9
		25Y	22809	429.39	429.41	0.02	4.7	4.3
		50Y	28656	431.06	431.09	0.03	5.0	4.6
		100Y	34970	432.86	432.89	0.03	5.3	4.8
3703	PROPOSED FM 1633 BRIDGE							
3799	83.5	10Y	15859	427.95	427.89	-0.06	3.3	3.7
		25Y	22809	430.20	430.13	-0.07	3.7	4.2
		50Y	28656	431.69	431.77	0.08	4.0	4.5
		100Y	34970	434.72	433.52	-1.20	3.9	4.8
4338	539.5	10Y	15859	428.32	428.36	0.04	1.8	1.8
		25Y	22809	430.61	430.66	0.05	1.8	1.8
		50Y	28656	432.14	432.34	0.20	1.9	1.8
		100Y	34970	435.10	434.13	-0.97	1.6	1.8
5683	1125.4	10Y	15859	428.58	428.61	0.03	1.4	1.4
		25Y	22809	430.79	430.84	0.05	1.2	1.2
		50Y	28656	432.30	432.49	0.19	1.2	1.1
		100Y	34970	435.20	434.26	-0.94	1.0	1.1

NOTES:

1. STREAM MODELING DATA PRESENTED IS FROM "ON-SYSTEM BRIDGE REPLACEMENT BRIDGE HYDRAULIC REPORT, LIMESTONE COUNTY, TX", DATED FINAL APRIL 2021 BY CIVIL SYSTEMS ENGINEERING, INC.
2. PROPOSED BRIDGE IS LOCATED AT PROJECT STA. 210+99 - STA. 214+57.
3. PROPOSED BRIDGE CONSISTS OF A 5-SPAN (65'-65'-120'-70'-70') TX54 PRESTRESSED CONCRETE I-GIRDER STRUCTURE WITH A TOTAL LENGTH OF 390 FEET.
4. PROPOSED BRIDGE WIDTH IS 34 FEET, NORMAL TO THE STREAM.
5. PROPOSED BRIDGE IS SUPPORTED BY 36-INCH CIRCULAR PIERS.
6. BOUNDARY CONDITION SET TO NORMAL DEPTH SLOPE = 0.001 FT/FT.
7. ELEVATIONS PRESENTED ARE REFERENCED TO NAVD88 DATUM.
8. BRIDGE DESIGNED FOR 25YR STORM EVENT.
9. ROADWAY OVERTOPPED DURING EVENTS GREATER THAN 100YR STORM EVENT.

FEMA:

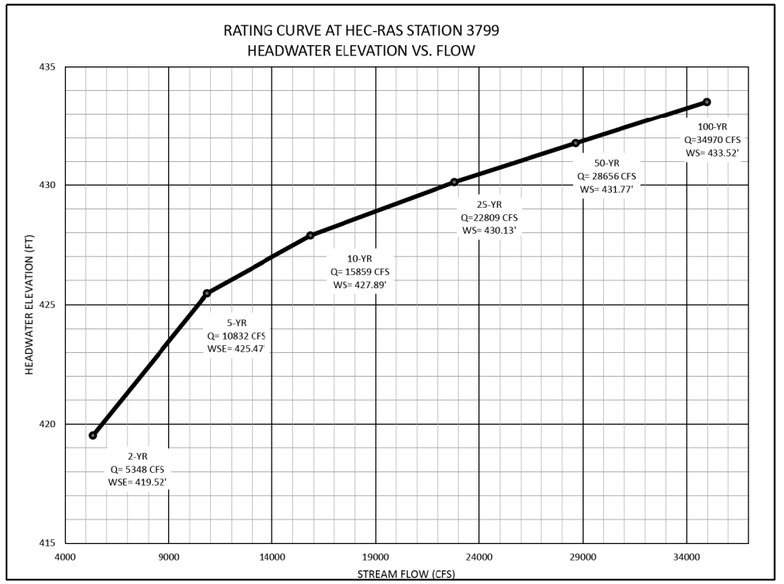
PROJECT IS LOCATED WITHIN THE UNINCORPORATED AREAS OF LIMESTONE COUNTY, A PARTICIPATING COMMUNITY WITHIN THE NATIONAL FLOOD INSURANCE PROGRAM.

PROJECT AT NAVASOTA RIVER IS SHOWN ON FEMA FORM PANEL NO. 48293C0300C DATED EFFECTIVE SEPTEMBER 16, 2011. NAVASOTA RIVER IS LOCATED WITHIN SHADED ZONE A FLOOD HAZARD AREA AT THE FM 1633 BRIDGE CROSSING.

FLOOD PLAIN ADMINISTRATOR NOTIFICATION WAS COMPLETED ON: 5/14/2021

HYDROLOGIC METHOD:

FLOWS WERE COMPUTED WITHIN HEC-HMS(V.4.2.1), FILENAME: 245069C_IEA_WACO_CHRIST_NAVA.HMS.
DRAINAGE AREAS WERE DELINEATED USING LIDAR AND USGS DEM TOPOGRAPHY AND AERIALS WITHIN ARCGIS v10.7 USING ARCHYDRO TOOLS.
RAINFALL WAS TAKEN FROM NOAA ATLAS 14 "PRECIPIRATION-FREQUENCY ATLAS OF THE UNITED STATES", VOLUME 11, VERSION 2.3-TEXAS, DATED SEPTEMBER 27, 2018
FLOWS COMPUTED USING NRCS HYDROGRAPH METHOD.
UNIT HYDROGRAPH PEAK RATING FACTOR (PRF) SET TO 484.
TIME OF CONCENTRATION WAS COMPUTED USING KERBY-KERPICH METHOD.
SOIL INFILTRATION COMPUTATION USED NRCS CN LOSS METHOD.
CLIMATIC ADJUSTMENT OF CN -10 APPLIED.
WATERSHED WAS ROUTED THROUGH LAKE MEXIA WITHIN HEC-HMS;
STORAGE-STAGE CURVE AND SPILLWAY DATA WERE TAKEN FROM LIDAR TOPOGRAPHY AND TWDB LAKE MEXIA SEDIMENTATION STUDY.



5/12/2021

Texas Department of Transportation

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(214) 884-4253
FIRM REGISTRATION No. F-10161

CSE CIVIL SYSTEMS ENGINEERING, INC.
TPBE REGISTRATION NO. F-5246

HYDRAULIC DATA SHEET

FM 1633
OVER NAVASOTA RIVER

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		54
STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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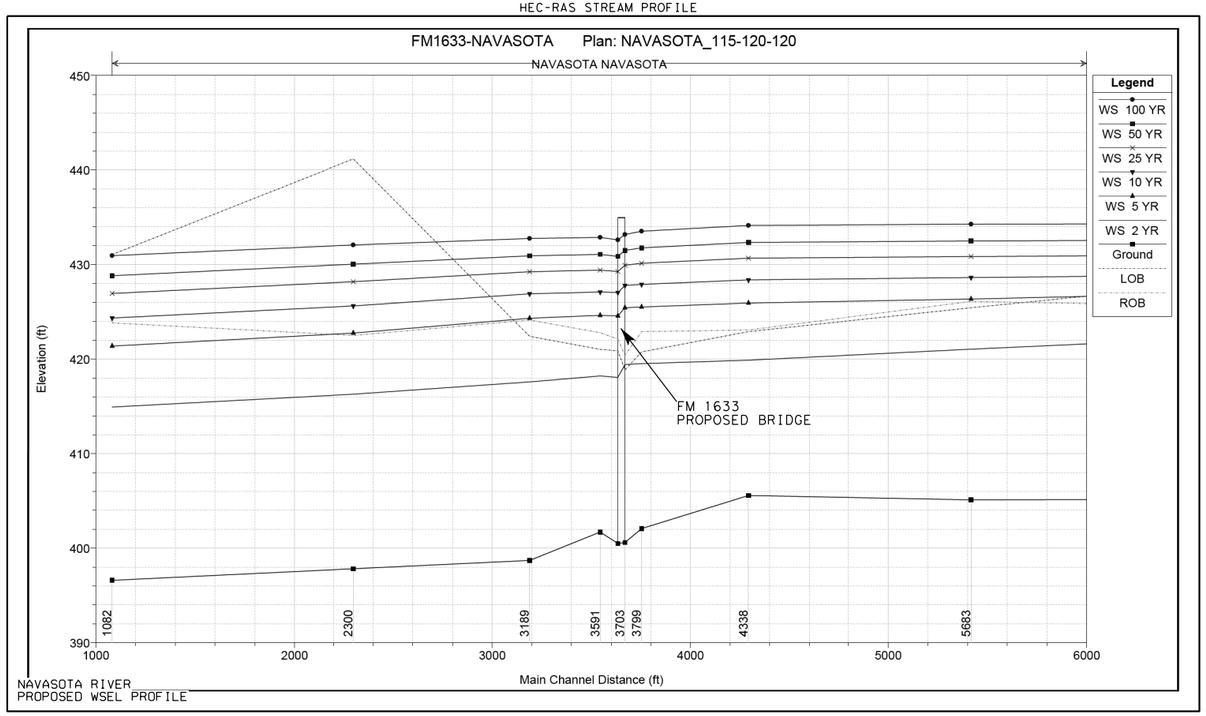
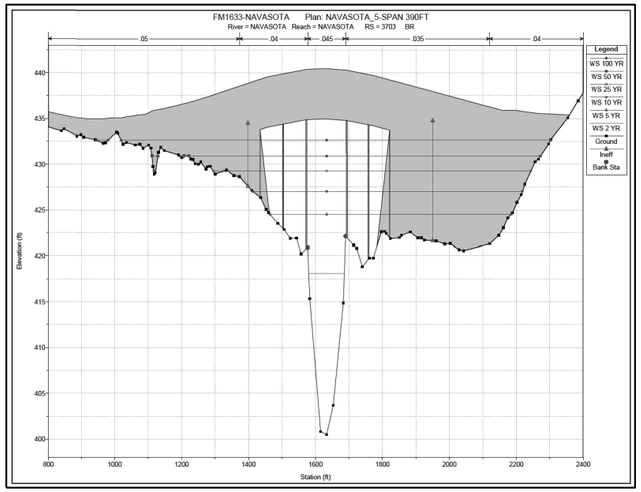
HEC-RAS STREAM PROFILE

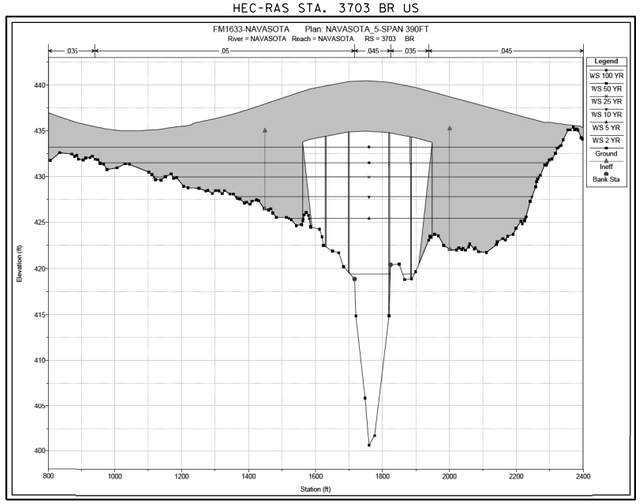


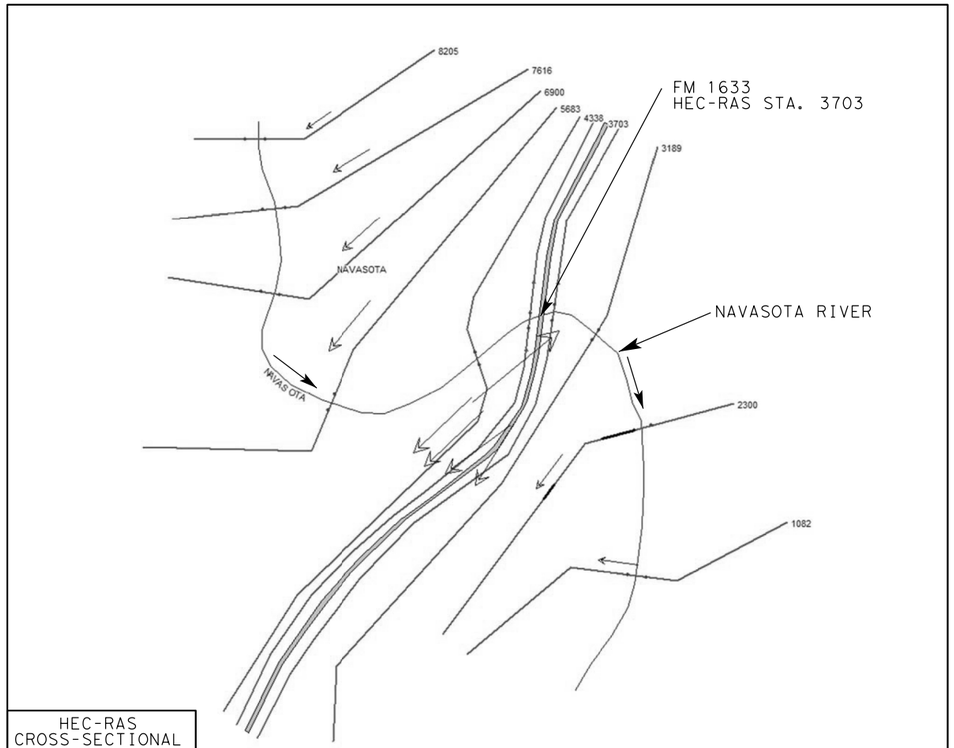
NAVASOTA RIVER
PROPOSED WSEL PROFILE

HEC-RAS STA. 3703 BR DS



HEC-RAS STA. 3703 BR US





HEC-RAS
CROSS-SECTIONAL
LAYOUT

HYDRAULIC METHOD:

WATER SURFACE ELEVATION RESULTS FROM HYDRAULIC MODELING ANALYSIS PRESENTED WITHIN "ON-SYSTEM BRIDGE REPLACEMENT BRIDGE HYDRAULIC REPORT, LIMESTONE COUNTY, TX," DATED FINAL APRIL 2021 BY CIVIL SYSTEMS ENGINEERING, INC.

WATER SURFACE ELEVATIONS COMPUTED USING HEC-RAS (V.5.0.7). HEC-RAS MODEL WAS GENERATED FROM PROJECT FIELD SURVEY, LIDAR TOPO, AND PRELIMINARY BRIDGE LAYOUTS.

HEC-RAS FILENAME: FM1633-NAVASOTA.PRJ
EXISTING (PRE-PROJECT) CONDITION WATER SURFACE ELEVATIONS ARE FROM:
PLAN: "NAVASOTA_EXIST", "*.P01"
GEOMETRY: "FM1633-NAVASOTA-EXIST", "*.G01"
FLOW: "NAVASOTA_FLW", "*.F01"
PROPOSED (POST PROJECT) CONDITION WATER SURFACE ELEVATIONS ARE FROM:
PLAN: "NAVASOTA_5-SPAN 390FT", "*.P03"
GEOMETRY: "FM1633-NAVASOTA-PROP-5-SPAN 390FT", "*.G03"
FLOW: "NAVASOTA_FLW", "*.F01"
STREAM MODELED WITH REPRESENTATIVE MANNING'S VALUES OF:
CHANNEL AREA: 0.045 - 0.07
OVERBANK AREA: 0.035 - 0.07

STATE OF TEXAS
KURT E KILLIAN
95742
LICENSED PROFESSIONAL ENGINEER
5/12/2021

Texas Department of Transportation

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FIRM REGISTRATION No. F-10161

CSE CIVIL SYSTEMS ENGINEERING, INC.
TPBE REGISTRATION NO. F-5246

HYDRAULIC DATA SHEET

FM 1633
OVER NAVASOTA RIVER

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		55
STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X             X      X   X    X    X   X
XXXXXXX  XXXX     X        XXX  XXXX    XXXXXX    XXXX
X     X  X        X             X  X    X    X       X
X     X  X        X    X        X   X   X    X       X
X     X  XXXXXX    XXXX        X    X  X    X   XXXXX
```

PROJECT DATA
Project Title: FM1245-CHRISTMAS
Project File : FM1245-CHRISTMAS.prj

Project in English units

PLAN DATA
Plan Title: FM1245-PROP
Plan File : FM1245-CHRISTMAS.p02

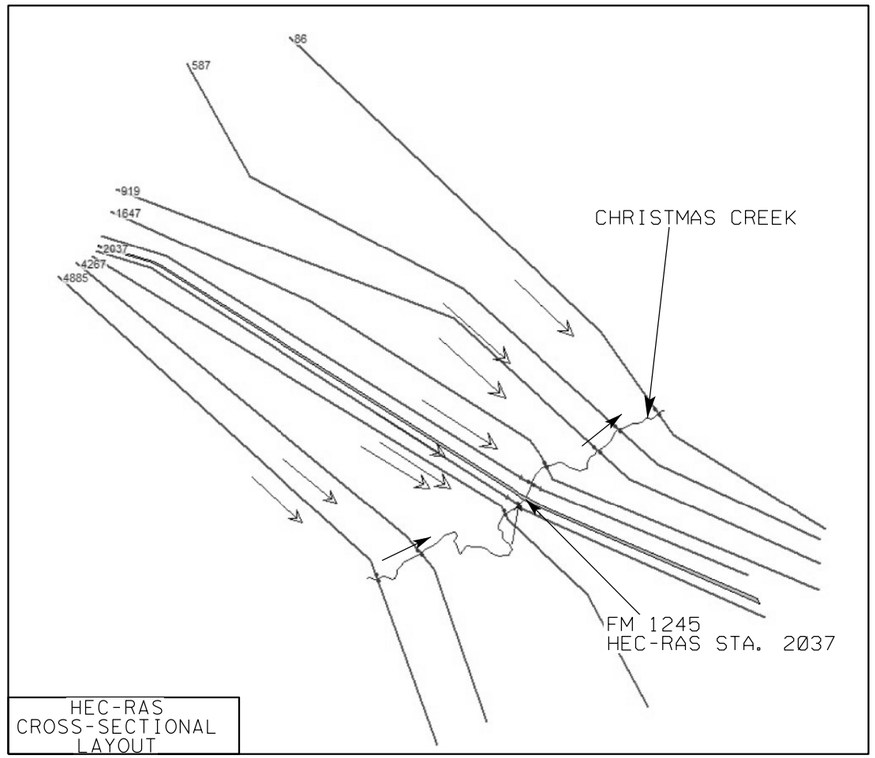
Geometry Title: FM-1245-PROP
Geometry File : FM1245-CHRISTMAS.g02

Flow Title : FM1245-FLOW
Flow File : FM1245-CHRISTMAS.f01

Plan Summary Information:
Number of: Cross Sections = 9 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 1 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow



HEC-RAS
CROSS-SECTIONAL
LAYOUT

FLOW DATA
Flow Title: FM1245-FLOW
Flow File : FM1245-CHRISTMAS.f01

Flow Data (cfs)

River	Reach	RS				
CHRISTMAS	CHRISTMAS	4885				
2 YR	5 YR	10 YR	25 YR	50 YR	100 YR	
2504	4814	6935	9932	12360	15117	

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
CHRISTMAS	CHRISTMAS	2 YR	Normal S = 0.0011	Normal S = 0.0004
CHRISTMAS	CHRISTMAS	5 YR	Normal S = 0.0011	Normal S = 0.0004
CHRISTMAS	CHRISTMAS	10 YR	Normal S = 0.0011	Normal S = 0.0004
CHRISTMAS	CHRISTMAS	25 YR	Normal S = 0.0011	Normal S = 0.0004
CHRISTMAS	CHRISTMAS	50 YR	Normal S = 0.0011	Normal S = 0.0004
CHRISTMAS	CHRISTMAS	100 YR	Normal S = 0.0011	Normal S = 0.0004

BRIDGE
RIVER: CHRISTMAS
REACH: CHRISTMAS RS: 2037

INPUT
Description: FM1245 OVER CHRISTMAS CREEK
Distance from Upstream XS = 90
Deck/Roadway Width = 34
Weir Coefficient = 2.6

Upstream Embankment side slope = 3 horiz. to 1.0 vertical
Downstream Embankment side slope = 3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 2
Yarnell KVal = 1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Pressure and Weir flow
Submerged Inlet Cd =
Submerged Inlet + Outlet Cd = .8
Max Low Cord =

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

Number of Abutments = 2

Abutment Data

Upstream num= 2			
Sta	Elev	Sta	Elev
5372	479.8	5391.6	470
Downstream num= 2			
Sta	Elev	Sta	Elev
5403.2	479.8	5422.8	470

Abutment Data

Upstream num= 2			
Sta	Elev	Sta	Elev
5486.06	470	5505.5	479.72
Downstream num= 2			
Sta	Elev	Sta	Elev
5518.26	470	5537.7	479.72

Number of Piers = 2

Pier Data
Pier Station Upstream= 5411.3 Downstream= 5442.5

Upstream num= 2			
Width	Elev	Width	Elev
3	460	3	483.5
Downstream num= 2			
Width	Elev	Width	Elev
3	460	3	483.5

Pier Data
Pier Station Upstream= 5466.3 Downstream= 5497.5

Upstream num= 2			
Width	Elev	Width	Elev
3	460	3	483.4
Downstream num= 2			
Width	Elev	Width	Elev
3	460	3	483.4

NOTES:

1. BRIDGE HYDRAULICS PERFORMED USING HEC-RAS (V.5.0.7) STEADY STATE MODEL.
2. CHANNEL GEOMETRY EXTRACTED FROM LIDAR TOPO, PROJECT FIELD SURVEY AND PRELIMINARY BRIDGE LAYOUTS.
3. ELEVATIONS REFERENCE TO NAVD88 DATUM.
4. SEE "DRAINAGE AREA MAP" SHEET FOR FLOWS AND COMPUTATION PARAMETERS.
5. STREAM MODELING & WATERSHED DATA DETAILED WITHIN "ON-SYSTEM BRIDGE REPLACEMENT BRIDGE HYDRAULIC REPORT, LIMESTONE COUNTY, TX", DATED FINAL APRIL 2021 BY CIVIL SYSTEMS ENGINEERING, INC.

STATE OF TEXAS
KURT E KILLIAN
95742
LICENSED PROFESSIONAL ENGINEER
5/12/2021

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

CSE CIVIL SYSTEMS ENGINEERING, INC.
TPBE REGISTRATION NO. F-5246

BRIDGE HYDRAULIC COMPUTATIONS

FM 1245 OVER CHRISTMAS CREEK

SHEET 1 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		56
STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

5/12/2021 2:58:08 PM BAYOU
C:\1CSE_PROJECTS\245069C_IEA_WACO\CAD\CHRISTMAS\FM1245-RAS.dgn

C:\1CSE_PROJECTS\245069C_IEA_WACO\CAD\CHRISTMAS\FM1245-RAS.dgn

BRIDGE REACH: CHRISTMAS RS: 2037

Upstream Deck/Roadway Coordinates num= 292

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-15.4	516.32		68	515.84		119.1	515.91	
217.7	515.8		364.1	515.22		425.3	514.75	
597.5	512.42		664.8	511.83		729.7	510.8	
778.5	509.63		1005.7	505.78		1160.1	503.6	
1227.3	503.09		1261	502.64		1435.9	499.1	
1555.3	497.03		1598.8	496.5		1685.2	496.05	
1766.8	495.29		1887.3	494.85		1896.4	494.7	
1904.7	494.76		1912.1	494.6		2099.1	493.83	
2142.9	493.47		2182.3	493.37		2240.6	492.98	
2299.4	492.86		2320.8	492.67		2396.7	492.5	
2438.7	492.16		2697.6	491.1		2709.7	490.91	
2795	490.52		2823	490.59		2878	490.43	
2979.5	489.84		3101	489.59		3193.5	489	
3252.3	488.91		3279.4	488.72		3431.2	488.31	
3457.4	488.07		3477.4	488.11		3664.9	487.31	
3780.2	487.18		3882	486.87		3982	486.47	
4092	485.85		4192	485.41		4292	484.79	
4392	484.29		4492	483.66		4592	483.11	
4692	482.64		4792	482.3		4872	482.15	
4877	482.15		4907	482.27		4977	482.12	
4997	482.13		5032	482.13		5057	482.1	
5082	482.12		5087	482.13		5127	482.21	
5132	482.23		5142	482.28		5147	482.3	
5172	482.41		5177	482.44		5187	482.48	
5192	482.5		5197	482.53		5202	482.55	
5207	482.57		5212	482.6		5217	482.62	
5222	482.64		5227	482.66		5232	482.69	
5237	482.71		5242	482.73		5247	482.76	
5257	482.8		5262	482.82		5267	482.85	
5272	482.87		5277	482.89		5282	482.92	
5287	482.94		5292	482.96		5297	482.98	
5302	483.01		5307	483.03		5312	483.05	
5317	483.08		5322	483.1		5327	483.12	
5332	483.14		5337	483.17		5342	483.19	
5347	483.21		5352	483.23		5357	483.25	
5362	483.27		5372	483.3		5372	483.3	480.8
5411.3	483.38	480.88	5466.3	483.34	480.84	5505.5	483.22	480.72
5505.5	483.22		5517	483.17		5537	483.06	
5547	483		5552	482.97		5557	482.93	
5562	482.9		5567	482.86		5572	482.82	
5577	482.78		5582	482.74		5597	482.61	
5607	482.52		5612	482.48		5617	482.44	
5622	482.39		5627	482.35		5632	482.3	
5637	482.26		5642	482.22		5647	482.17	
5652	482.13		5657	482.09		5662	482.04	
5667	482		5672	481.95		5677	481.91	
5682	481.87		5687	481.82		5692	481.78	
5697	481.74		5702	481.69		5707	481.65	
5712	481.6		5717	481.56		5722	481.52	
5727	481.47		5732	481.43		5737	481.39	
5742	481.34		5747	481.3		5752	481.26	
5757	481.21		5762	481.17		5767	481.14	
5772	481.11		5777	481.08		5782	481.06	
5787	481.05		5792	481.03		5797	481.02	
5802	481		5807	480.99		5812	480.98	
5817	480.96		5822	480.95		5827	480.93	
5832	480.92		5837	480.9		5842	480.89	
5847	480.87		5852	480.85		5857	480.84	
5862	480.82		5867	480.8		5872	480.79	
5877	480.77		5882	480.76		5887	480.74	
5892	480.73		5897	480.71		5902	480.7	
5907	480.69		5912	480.67		5917	480.66	
5922	480.65		5927	480.64		5932	480.63	
5937	480.62		5942	480.61		5947	480.6	
5952	480.59		5957	480.58		5962	480.57	
5967	480.57		5972	480.56		5977	480.56	
5982	480.55		5987	480.55		5992	480.54	
5997	480.53		6002	480.53		6007	480.52	
6012	480.51		6017	480.5		6022	480.49	
6027	480.49		6032	480.48		6037	480.47	
6042	480.46		6047	480.46		6052	480.45	
6057	480.44		6067	480.44		6072	480.43	
6077	480.43		6082	480.42		6087	480.41	
6092	480.4		6097	480.38		6102	480.37	
6107	480.36		6112	480.34		6117	480.33	
6122	480.33		6132	480.33		6137	480.32	
6142	480.32		6147	480.33		6152	480.34	
6157	480.34		6162	480.35		6167	480.35	
6172	480.36		6177	480.37		6182	480.38	
6187	480.38		6192	480.4		6197	480.41	
6202	480.43		6207	480.44		6212	480.44	
6217	480.45		6222	480.46		6232	480.46	
6237	480.45		6252	480.45		6257	480.46	
6272	480.46		6277	480.45		6292	480.45	
6297	480.44		6302	480.43		6307	480.43	
6312	480.42		6317	480.42		6332	480.42	
6337	480.43		6342	480.43		6347	480.44	
6352	480.45		6357	480.46		6362	480.47	
6367	480.48		6402	480.48		6407	480.47	
6412	480.47		6417	480.46		6422	480.46	
6427	480.45		6432	480.44		6437	480.43	
6442	480.42		6446.3	480.42		6475.6	480.32	
6562.4	480.36		6707.2	480.9		6866.9	482.09	
6989.2	483.63		7079.3	485.07		7186.3	487.31	
7279.3	489.78		7310.2	490.75		7488.3	497.27	
7607.8	501.99		7775.9	508.99		7882.6	512.97	
8093.3	521.15		8300.5	528.44		8450.6	533.07	
8515.4	534.82							

Manning's n Values num= 10

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.04	858.5	.035	3556.4	.05	3765.4	.035	5329.7	.07
5370.2	.05	5420.6	.045	5463.6	.04	5518.4	.07	5718.3	.035

Bank Sta: Left Right Coeff Contr. Expan.
5420.6 5463.6 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	5300	482.12	F
5722	8077.6	480.32	F

BRIDGE REACH: CHRISTMAS RS: 2037

Downstream Deck/Roadway Coordinates num= 293

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	516.32		21.2	516.32		104.6	515.84	
155.7	515.91		254.3	515.8		400.7	515.22	
461.9	514.75		634.1	512.42		701.4	511.83	
766.3	510.8		815.1	509.63		1042.3	505.78	
1196.7	503.6		1263.9	503.09		1297.6	502.64	
1472.5	499.1		1591.9	497.03		1635.4	496.5	
1721.8	496.05		1803.4	495.29		1923.9	494.85	
1933	494.7		1941.3	494.76		1948.7	494.6	
2135.7	493.83		2179.5	493.47		2218.9	493.37	
2277.2	492.98		2336	492.86		2357.4	492.67	
2433.3	492.5		2475.3	492.16		2734.2	491.1	
2746.3	490.91		2831.6	490.52		2859.6	490.59	
2914.6	490.43		3016.1	489.84		3137.6	489.59	
3230.1	489		3288.9	488.91		3316	488.72	
3467.8	488.31		3494	488.07		3514	488.11	
3701.5	487.31		3816.8	487.18		3918.6	486.87	
4018.6	486.47		4128.6	485.85		4228.6	485.41	
4328.6	484.79		4428.6	484.29		4528.6	483.66	
4628.6	483.11		4728.6	482.64		4828.6	482.3	
4908.6	482.15		4913.6	482.15		4943.6	482.27	
5008.2	482.12		5028.2	482.13		5063.2	482.13	
5088.2	482.1		5113.2	482.12		5118.2	482.13	
5158.2	482.21		5163.2	482.23		5173.2	482.28	
5178.2	482.3		5203.2	482.41		5208.2	482.44	
5218.2	482.48		5223.2	482.5		5228.2	482.53	
5233.2	482.55		5238.2	482.57		5243.2	482.6	
5248.2	482.62		5253.2	482.64		5258.2	482.66	
5263.2	482.69		5268.2	482.71		5273.2	482.73	
5278.2	482.76		5288.2	482.8		5293.2	482.82	
5298.2	482.85		5303.2	482.87		5308.2	482.89	
5313.2	482.92		5318.2	482.94		5323.2	482.96	
5328.2	482.98		5333.2	483.01		5338.2	483.03	
5343.2	483.05		5348.2	483.08		5353.2	483.1	
5358.2	483.12		5363.2	483.14		5368.2	483.17	
5373.2	483.19		5378.2	483.21		5383.2	483.23	
5388.2	483.25		5393.2	483.27		5403.2	483.3	
5403.2	483.3	480.8	5442	483.38	480.88	5497.5	483.34	480.84
5537.7	483.22	480.72	5537.7	483.22		5549.2	483.17	
5569.2	483.06		5579.2	483		5584.2	482.97	
5589.2	482.93		5594.2	482.9		5599.2	482.86	
5604.2	482.82		5609.2	482.78		5614.2	482.74	
5629.2	482.61		5639.2	482.52		5644.2	482.48	
5649.2	482.44		5654.2	482.39		5659.2	482.35	
5664.2	482.3		5669.2	482.26		5674.2	482.22	
5679.2	482.17		5684.2	482.13		5689.2	482.09	
5694.2	482.04		5699.2	482		5704.2	481.95	
5709.2	481.91		5714.2	481.87		5719.2	481.82	
5724.2	481.78		5729.2	481.74		5734.2	481.69	
5739.2	481.65		5744.2	481.6		5749.2	481.56	
5754.2	481.52		5759.2	481.47		5764.2	481.43	
5769.2	481.39		5774.2	481.34		5779.2	481.3	
5784.2	481.26		5789.2	481.21		5794.2	481.17	
5799.2	481.14		5804.2	481.11		5809.2	481.08	
5814.2	481.06		5819.2	481.05		5824.2	481.03	
5829.2	481.02		5834.2	481		5839.2	480.99	
5844.2	480.98		5849.2	480.96		5854.2	480.95	
5859.2	480.93		5864.2	480.92		5869.2	480.9	
5874.2	480.89		5879.2	480.87		5884.2	480.85	
5889.2	480.84		5894.2	480.82		5899.2	480.8	
5904.2	480.79		5909.2	480.77		5914.2	480.76	
5919.2	480.74		5928.6	480.73		5933.6	480.71	
5938.6	480.7		5943.6	480.69		5948.6	480.67	
5953.6	480.66		5958.6	480.65		5963.6	480.64	
5968.6	480.63		5973.6	480.62		5978.6	480.61	
5983.6	480.6		5988.6	480.59		5993.6	480.58	
5998.6	480.57		6003.6	480.57		6008.6	480.56	
6013.6	480.56		6018.6	480.55		6023.6	480.55	
6028.6	480.54		6033.6	480.53		6038.6	480.53	
6043.6	480.52		6048.6	480.51		6053.6	480.5	
6058.6	480.49		6063.6	480.49		6068.6	480.48	
6073.6	480.47		6078.6	480.46		6083.6	480.46	
6088.6	480.45		6093.6	480.44		6103.6	480.44	
6108.6	480.43		6113.6	480.43		6118.6	480.42	
6123.6	480.41		6128.6	480.4		6133.6	480.38	
6138.6	480.37		6143.6	480.36		6148.6	480.34	
6153.6	480.33		6158.6	480.33		6168.6	480.33	
6173.6	480.32		6178.6	480.32		6183.6	480.33	
6188.6	480.34		6193.6	480.34		6198.6	480.35	
6203.6	480.35		6208.6	480.36		6213.6	480.37	
6218.6	480.38		6223.6	480.38		6228.6	480.4	
6233.6	480.41		6238.6	480.43		6243.6	480.44	
6248.6	480.44		6253.6	480.45		6258.6	480.46	
6268.6	480.46		6273.6	480.45		6288.6	480.45	
6293.6	480.46		6308.6	480.46		6313.6	480.45	
6328.6	480.45		6333.6	480.44		6338.6	480.43	
6343.6	480.43		6348.6	480.42		6353.6	480.42	
6368.6	480.42		6373.6	480.43		6378.6	480.43	
6383.6	480.44		6388.6	480.45		6393.6	480.46	
6398.6	480.47		6403.6	480.48		6438.6	480.48	
6443.6	480.47		6448.6	480.47		6453.6	480.46	
6458.6	480.46		6463.6	480.45		6468.6	480.44	
6473.6	480.43		6478.6	480.42		6482.9	480.42	
6512.2	480.32		6599	480.36		6743.8	480.9	
6903.5	482.09		7025.8	483.63		7115.9	485.07	
7222.9	487.31		7315.9	489.78		7346.8	490.75	
7524.9	497.27		7644.4	501.99		7812.5	508.99	
7919.2	512.97		8129.9	521.15		8337.1	528.44	
8487.2	533.07		8552	534.82				

Manning's n Values num= 9

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	3827.6	.05	4153.7	.035	5412	.05	5453.4	.045
5496.4	.04	5651.3	.035	6516.5	.07	6660.1	.035		

Bank Sta: Left Right Coeff Contr. Expan.
5453.4 5496.4 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	5351.1	481.62	F
5597	8426.9	480.32	F

STATE OF TEXAS
KURT E KILLIAN
95742
LICENSED PROFESSIONAL ENGINEER

5/12/2021

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 600
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

CSE CIVIL SYSTEMS ENGINEERING, INC.
TPBE REGISTRATION NO. F-5246

BRIDGE HYDRAULIC COMPUTATIONS

FM 1245 OVER CHRISTMAS CREEK

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		57
STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
CHRISTMAS	86	10 YR	6935.00	460.18	475.30	473.36	475.34	0.000400	2.57	4951.02	2014.35	0.16
CHRISTMAS	86	100 YR	15117.00	460.18	476.98	474.24	477.03	0.000400	2.90	8552.79	2269.64	0.16
CHRISTMAS	587	10 YR	6935.00	459.97	475.49		475.60	0.000651	3.72	3498.91	1765.93	0.21
CHRISTMAS	587	100 YR	15117.00	459.97	477.18		477.27	0.000568	3.86	7018.48	2520.11	0.20
CHRISTMAS	919	10 YR	6935.00	460.56	475.75		476.01	0.002226	5.48	2373.71	1485.70	0.36
CHRISTMAS	919	100 YR	15117.00	460.56	477.40		477.58	0.001412	5.02	5135.69	1802.73	0.30
CHRISTMAS	1647	10 YR	6935.00	460.00	477.03		477.15	0.001212	4.03	3101.93	1197.92	0.21
CHRISTMAS	1647	100 YR	15117.00	460.00	478.44		478.62	0.001622	5.03	4969.39	1527.10	0.25
CHRISTMAS	1919	10 YR	6935.00	460.68	477.10	472.33	477.87	0.002264	7.48	1267.30	1269.12	0.39
CHRISTMAS	1919	100 YR	15117.00	460.68	477.85	477.68	480.67	0.007943	14.61	1451.64	1408.07	0.74
CHRISTMAS	2037		Bridge									
CHRISTMAS	2199	10 YR	6935.00	459.65	479.16	477.31	479.61	0.001868	6.95	1913.33	1891.09	0.32
CHRISTMAS	2199	100 YR	15117.00	459.65	481.89	479.43	481.96	0.000372	3.49	8059.19	2526.00	0.15
CHRISTMAS	2379	10 YR	6935.00	460.91	479.70		479.72	0.000123	1.72	7094.03	2289.54	0.09
CHRISTMAS	2379	100 YR	15117.00	460.91	481.98		482.01	0.000106	1.79	12729.54	2680.25	0.08
CHRISTMAS	4267	10 YR	6935.00	463.95	479.94		479.98	0.000336	2.47	5400.53	1893.61	0.14
CHRISTMAS	4267	100 YR	15117.00	463.95	482.17		482.21	0.000263	2.53	10079.18	2231.27	0.13
CHRISTMAS	4885	10 YR	6935.00	464.62	480.15		480.20	0.000419	2.72	5146.91	2310.27	0.16
CHRISTMAS	4885	100 YR	15117.00	464.62	482.32		482.35	0.000244	2.40	10414.53	2593.99	0.13

BRIDGE
RIVER: CHRISTMAS
REACH: CHRISTMAS RS: 2037

BRIDGE OUTPUT Profile #10 YR

			Inside BR US	Inside BR DS
E.G. US. (ft)	479.61	Element		
W.S. US. (ft)	479.16	E.G. Elev (ft)	478.24	478.28
Q Total (cfs)	6935.00	W.S. Elev (ft)	477.24	477.40
Q Bridge (cfs)	6935.00	Crit W.S. (ft)	472.12	472.75
Q Weir (cfs)		Max Chl Dpth (ft)	16.99	17.52
Weir Sta Lft (ft)		Vel Total (ft/s)	6.83	6.73
Weir Sta Rgt (ft)		Flow Area (sq ft)	1015.48	1029.84
Weir Submerg		Froude # Chl	0.41	0.39
Weir Max Depth (ft)		Specif Force (cu ft)	7585.75	7500.76
Min El Weir Flow (ft)	480.33	Hydr Depth (ft)	8.65	8.65
Min El Prs (ft)	480.88	W.P. Total (ft)	157.98	159.91
Delta EG (ft)	1.75	Conv. Total (cfs)	147681.2	134933.7
Delta WS (ft)	2.06	Top Width (ft)	117.43	119.07
BR Open Area (sq ft)	1458.94	Frctn Loss (ft)		
BR Open Vel (ft/s)	6.83	C & E Loss (ft)		
BR Sluice Coef		Shear Total (lb/sq ft)	0.88	1.06
BR Sel Method	Momentum	Power Total (lb/ft s)	6.04	7.15

Warning: The water surface upstream of the bridge computed by the Yarnell method was below critical depth. The Yarnell solution has been disregarded.
Note: Yarnell answer is not valid if the water surface is above the low chord or if there is weir flow. The Yarnell answer has been disregarded.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #100 YR

			Inside BR US	Inside BR DS
E.G. US. (ft)	481.96	Element		
W.S. US. (ft)	481.89	E.G. Elev (ft)	481.96	481.83
Q Total (cfs)	15117.00	W.S. Elev (ft)	481.89	481.41
Q Bridge (cfs)	10785.96	Crit W.S. (ft)	477.45	477.43
Q Weir (cfs)	4331.04	Max Chl Dpth (ft)	21.64	21.53
Weir Sta Lft (ft)	5703.09	Vel Total (ft/s)	5.33	6.59
Weir Sta Rgt (ft)	6797.12	Flow Area (sq ft)	2834.79	2295.58
Weir Submerg	0.00	Froude # Chl	0.27	0.33
Weir Max Depth (ft)	1.64	Specif Force (cu ft)	15900.75	15163.65
Min El Weir Flow (ft)	480.33	Hydr Depth (ft)	2.44	2.28
Min El Prs (ft)	480.88	W.P. Total (ft)	1474.46	1319.77
Delta EG (ft)	1.29	Conv. Total (cfs)		
Delta WS (ft)	4.04	Top Width (ft)	1161.25	1004.99
BR Open Area (sq ft)	1458.94	Frctn Loss (ft)		
BR Open Vel (ft/s)	7.39	C & E Loss (ft)		
BR Sluice Coef	0.35	Shear Total (lb/sq ft)		
BR Sel Method	Press/Weir	Power Total (lb/ft s)		

Note: Yarnell answer is not valid if the water surface is above the low chord or if there is weir flow. The Yarnell answer has been disregarded.
Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
Note: The downstream water surface is below the minimum elevation for pressure flow. The sluice gate equations were used for pressure flow.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.
Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

STATE OF TEXAS
KURT E KILLIAN
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STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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                    HEC-RAS HEC-RAS 5.0.7 March 2019
                          U.S. Army Corps of Engineers
                       Hydrologic Engineering Center
                            609 Second Street
                             Davis, California

                                    .

          X     X  XXXXXX    XXXX         XXXX        XX       XXXX
          X     X  X        X    X       X   X      X  X     X
          X     X  X             X      X    X     X    X    X
          XXXXXXX  XXXX         X   XXX  XXXX     XXXXXX     XXXX
          X     X  X            X       X  X     X      X         X
          X     X  X        X   X       X   X    X      X        X
          X     X  XXXXXX    XXXX       X    X   X      X   XXXXX


PROJECT DATA
Project Title: FM1633-NAVASOTA
Project File : FM1633-NAVASOTA.prj

Project in English units

PLAN DATA

Plan Title: NAVASOTA_5-SPAN 390FT
Plan File : \FM1633-NAVASOTA.p03

            Geometry Title: FM1633-NAVASOTA-PROP-5-SPAN 390FT
            Geometry File : \FM1633-NAVASOTA.g03

            Flow Title    : NAVASOTA_FLW
            Flow File     : \FM1633-NAVASOTA.f01

Plan Summary Information:
Number of:  Cross Sections =   10    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    1    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow


BRIDGE

RIVER: NAVASOTA
REACH: NAVASOTA           RS: 3703

INPUT
Description:
Distance from Upstream XS =    83.5
Deck/Roadway Width        =    35.2
Weir Coefficient          =     2.6

Upstream Embankment side slope              =  0 horiz. to 1.0 vertical
Downstream Embankment side slope            =  0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream      num=        3
     Sta     Elev      Sta     Elev      Sta     Elev
  1586.2   433.08    1587.2   433.08   1626.4      420
Downstream    num=        3
     Sta     Elev      Sta     Elev      Sta     Elev
  1459.7   433.08    1460.7   433.08   1499.9      420

Abutment Data
Upstream      num=        3
     Sta     Elev      Sta     Elev      Sta     Elev
  1898.7      420    1937.2   432.82   1938.2   432.82
Downstream    num=        3
     Sta     Elev      Sta     Elev      Sta     Elev
 1766.24      418    1810.7   432.82   1811.7   432.82


FLOW DATA
Flow Title: NAVASOTA_FLW
Flow File :  \FM1633-NAVASOTA.f01

Flow Data (cfs)
River           Reach           RS
NAVASOTA        NAVASOTA        8205

   2 YR            5 YR           10 YR           25 YR           50 YR          100 YR
5347.5         10831.9         15859.12        22809.4         28655.8         34969.8

Boundary Conditions
  River           Reach           Profile                 Upstream            Downstream

  NAVASOTA        NAVASOTA        2 YR                    Normal S = 0.0001   Normal S = 0.001
  NAVASOTA        NAVASOTA        5 YR                    Normal S = 0.0001   Normal S = 0.001
  NAVASOTA        NAVASOTA        10 YR                   Normal S = 0.0001   Normal S = 0.001
  NAVASOTA        NAVASOTA        25 YR                   Normal S = 0.0001   Normal S = 0.001
  NAVASOTA        NAVASOTA        50 YR                   Normal S = 0.0001   Normal S = 0.001
  NAVASOTA        NAVASOTA        100 YR                  Normal S = 0.0001   Normal S = 0.001
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Upstream Deck/Roadway Coordinates
num= 131

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	453.37		25	452.85		50	452.37	
75	451.9		100	451.38		125	450.87	
150	450.38		175	449.76		200	449.2	
225	448.63		250	448.06		275	447.49	
300	446.92		325	446.35		350	445.79	
375	445.23		400	444.69		425	444.14	
450	443.57		475	443		500	442.44	
525	441.88		550	441.35		575	440.83	
600	440.31		625	439.79		650	439.32	
675	438.84		700	438.43		725	438.01	
750	437.66		775	437.31		800	436.96	
825	436.62		850	436.31		875	436	
900	435.78		925	435.56		950	435.37	
975	435.18		1000	435.08		1025	434.98	
1050	434.99		1075	434.99		1100	435.07	
1125	435.09		1150	435.23		1175	435.38	
1200	435.48		1225	435.58		1239.9	435.87	
1250	435.94		1275	436.12		1300	436.32	
1325	436.54		1350	436.78		1375	437.04	
1400	437.32		1419.9	437.56		1425	437.62	
1450	437.93		1475	438.24		1500	438.55	
1525	438.85		1550	439.16		1560	439.28	
1561.5	439.28	433.78	1575	439.46	433.96	1586.2	439.58	434.08
1699.7	440.37	434.87	1748.8	440.45	434.95	1759.7	440.44	434.94
1819.7	440.28	434.78	1900.2	439.7	434.2	1938.2	439.32	433.82
1948.5	439.21	433.71	1950	439.21		1975	438.96	
2000	438.71		2025	438.46		2050	438.22	
2075	437.97		2100	437.72		2125	437.47	
2150	437.23		2175	436.98		2200	436.73	
2225	436.48		2250	436.24		2275	435.99	
2285.2	435.89		2300	435.91		2325	435.78	
2350	435.66		2375	435.54		2389.3	435.52	
2403.5	435.24		2427.5	435.22		2492.7	435.23	
2541.6	435.3		2568.1	435.36		2570.5	435.37	
2654	435.66		2821.1	436.74		2919.4	437.67	
2967.5	438.2		2970	438.23		3058.8	438.36	
3130.3	439.12		3177.4	439.41		3424.8	439.41	
3518.7	439.78		3708.5	441.34		3748.7	441.85	
3866.3	442.8		3962.5	443.08		4035.2	442.91	
4193.2	443.15		4306.2	443.71		4371.4	443.81	
4549.7	444.52		4692.6	445.8		4848.5	445.77	
5144.1	447.1		5345.2	447.55		5360.2	447.47	
5448.5	447.77		5541.3	448.58		5917.4	449.59	
5998.6	450.15		6105.3	450.47				

Upstream Bridge Cross Section Data
Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	941	.05	1716.9	.045	1824.3	.035	1938.2	.045
4615	.035								

Bank Sta: Left 1716.9 Right 1824.3 Coeff Contr. .3 Expan. .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	1449	434.99	F
2001	5965.9	435.22	F

Number of Piers = 4

Pier Data
Pier Station Upstream= 1630 Downstream= 1503

Upstream num= 4				Downstream num= 4			
Width	Elev	Width	Elev	Width	Elev	Width	Elev
3	390	3	431.38	3.5	431.38	3.5	434.87
3	390	3	431.38	3.5	431.38	3.5	434.87

Pier Data
Pier Station Upstream= 1700 Downstream= 1573

Upstream num= 4				Downstream num= 4			
Width	Elev	Width	Elev	Width	Elev	Width	Elev
3	390	3	431.38	3.5	431.38	3.5	434.87
3	390	3	431.38	3.5	431.38	3.5	434.87

Pier Data
Pier Station Upstream= 1820 Downstream= 1693

Upstream num= 4				Downstream num= 4			
Width	Elev	Width	Elev	Width	Elev	Width	Elev
3	400	3	431.27	3.5	431.27	3.5	434.78
3	400	3	431.27	3.5	431.27	3.5	434.78

Pier Data
Pier Station Upstream= 1885 Downstream= 1758

Upstream num= 4				Downstream num= 4			
Width	Elev	Width	Elev	Width	Elev	Width	Elev
3	390	3	431.38	3.5	431.38	3.5	434.87
3	390	3	431.38	3.5	431.38	3.5	434.87

BRIDGE REACH: NAVASOTA RS: 3703
Downstream Deck/Roadway Coordinates
num= 125

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-6.3	451.38		18.7	450.87		43.7	450.38	
68.7	449.76		93.7	449.2		118.7	448.63	
143.7	448.06		168.7	447.49		193.7	446.92	
218.7	446.35		243.7	445.79		268.7	445.23	
293.7	444.69		318.7	444.14		343.7	443.57	
368.7	443		393.7	442.44		418.7	441.88	
443.7	441.35		468.7	440.83		493.7	440.31	
518.7	439.79		543.7	439.32		568.7	438.84	
593.7	438.43		618.7	438.01		643.7	437.66	
668.7	437.31		693.7	436.96		718.7	436.62	
743.7	436.31		768.7	436		793.7	435.78	
818.7	435.56		843.7	435.37		868.7	435.18	
893.7	435.08		918.7	434.98		943.7	434.99	
968.7	434.99		993.7	435.07		1018.7	435.09	
1043.7	435.23		1068.7	435.38		1093.7	435.48	
1113.4	435.87		1123.5	435.94		1148.5	436.12	
1173.5	436.32		1198.5	436.54		1223.5	436.78	
1248.5	437.04		1273.5	437.32		1293.4	437.56	
1298.5	437.62		1323.5	437.93		1348.5	438.24	
1373.5	438.55		1398.5	438.85		1423.5	439.16	
1433	439.28		1434.5	439.28	433.78	1448.5	439.46	433.96
1459.7	439.58	434.08	1573.2	440.37	434.87	1622.3	440.45	434.95
1633.2	440.45	434.95	1693.2	440.28	434.78	1773.7	439.7	434.2
1811.7	439.32	433.82	1821.5	439.21	433.71	1823	439.21	
1848.5	438.96		1873.5	438.71		1898.5	438.46	
1923.5	438.22		1948.5	437.97		1973.5	437.72	
1998.5	437.47		2023.5	437.23		2048.5	436.98	
2073.5	436.73		2098.5	436.48		2123.5	436.24	
2148.5	435.99		2158.9	435.89		2193.7	435.91	
2218.7	435.78		2243.7	435.66		2268.7	435.54	
2283	435.52		2423.8	435.3		2450.3	435.36	
2452.7	435.37		2536.2	435.66		2703.3	436.74	
2801.6	437.67		2849.7	438.2		2852.2	438.23	
2941	438.36		3012.5	439.12		3059.6	439.41	
3307	439.41		3400.9	439.78		3590.7	441.34	
3630.9	441.85		3748.5	442.8		3844.7	443.08	
3917.4	442.91		4075.4	443.15		4188.4	443.71	
4253.6	443.81		4431.9	444.52		4574.8	445.8	
4730.7	445.77		5026.3	447.1		5227.4	447.55	
5242.4	447.47		5330.7	447.77		5423.5	448.58	
5799.6	449.59		5880.8	450.15		5987.5	450.47	
5999	450.47		6054.8	450.64				

Downstream Bridge Cross Section Data
Manning's n Values num= 10

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	341.1	.045	495.6	.035	608.6	.05	1372.9	.04
1576.5	.045	1690.1	.035	2120	.04	3244.2	.05	4552.8	.045

Bank Sta: Left 1576.5 Right 1690.1 Coeff Contr. .3 Expan. .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	1398	434.49	F
1950	6054.8	434.75	F

Number of Bridge Coefficient Sets = 1
Low Flow Methods and Data
    Energy
    Momentum   Cd   = 1.2
    Yarnell   KVal = 1.05
Selected Low Flow Methods = Highest Energy Answer
High Flow Method
    Energy Only

Additional Bridge Parameters
    Add Friction component to Momentum
    Do not add Weight component to Momentum
    Class B flow critical depth computations
        use critical depth inside the bridge
        at the upstream end
    Criteria to check for pressure flow =
        Upstream energy grade line

NOTES:

1. BRIDGE HYDRAULICS PERFORMED USING HEC-RAS (V.5.0.7) STEADY STATE MODEL.
2. CHANNEL GEOMETRY EXTRACTED FROM USGS DEM TOPO, PROJECT FIELD SURVEY AND PRELIMINARY BRIDGE LAYOUTS.
3. ELEVATIONS REFERENCE TO NAVD88 DATUM.
4. SEE "DRAINAGE AREA MAP" SHEET FOR FLOWS AND COMPUTATION PARAMETERS.
5. STREAM MODELING & WATERSHED DATA DETAILED WITHIN "ON-SYSTEM BRIDGE REPLACEMENT BRIDGE HYDRAULIC REPORT, LIMESTONE COUNTY, TX", DATED FINAL APRIL 2021 BY CIVIL SYSTEMS ENGINEERING, INC.

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5/12/2021

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BRIDGE HYDRAULIC COMPUTATIONS

FM 1633 OVER NAVASOTA RIVER

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		59
STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
NAVASOTA	1082	25 YR	22809.40	396.60	426.94	415.85	427.40	0.001001	6.55	5526.69	573.59	0.27
NAVASOTA	1082	100 YR	34969.80	396.60	430.94	422.78	431.37	0.001002	6.64	7914.43	632.74	0.27
NAVASOTA	2300	25 YR	22809.40	397.82	428.19		428.81	0.001331	7.44	4822.66	831.71	0.31
NAVASOTA	2300	100 YR	34969.80	397.82	432.06		432.50	0.000922	6.93	8662.68	1140.79	0.27
NAVASOTA	3189	25 YR	22809.40	398.71	429.24		429.55	0.000581	5.47	5781.81	690.85	0.21
NAVASOTA	3189	100 YR	34969.80	398.71	432.75		433.07	0.000518	5.72	8505.78	887.07	0.20
NAVASOTA	3591	25 YR	22809.40	401.70	429.41	417.86	429.76	0.000524	5.36	5329.26	960.64	0.21
NAVASOTA	3591	100 YR	34969.80	401.70	432.89	424.74	433.28	0.000494	5.77	7246.10	1417.99	0.21
NAVASOTA	3703		Bridge									
NAVASOTA	3799	25 YR	22809.40	402.08	430.13	418.31	430.49	0.000546	5.53	5487.54	1147.49	0.21
NAVASOTA	3799	100 YR	34969.80	402.08	433.52	425.02	433.95	0.000551	6.14	7360.14	1666.60	0.22
NAVASOTA	4338	25 YR	22809.40	405.58	430.66		430.73	0.000161	2.94	12734.00	1664.78	0.11
NAVASOTA	4338	100 YR	34969.80	405.58	434.13		434.19	0.000125	2.87	19131.98	2078.58	0.10
NAVASOTA	5683	25 YR	22809.40	405.12	430.84		430.87	0.000116	2.11	19253.58	3578.11	0.09
NAVASOTA	5683	100 YR	34969.80	405.12	434.26		434.28	0.000060	1.72	31942.44	3857.26	0.07
NAVASOTA	6900	25 YR	22809.40	405.18	430.98		431.07	0.000252	3.39	11326.35	2139.46	0.14
NAVASOTA	6900	100 YR	34969.80	405.18	434.32		434.39	0.000141	2.79	18980.67	2634.63	0.11
NAVASOTA	7616	25 YR	22809.40	405.09	431.09		431.36	0.000412	4.66	6564.96	864.92	0.19
NAVASOTA	7616	100 YR	34969.80	405.09	434.35		434.61	0.000380	4.97	10577.28	1715.30	0.18
NAVASOTA	8205	25 YR	22809.40	405.14	431.23		431.89	0.001573	7.31	3693.54	423.56	0.33
NAVASOTA	8205	100 YR	34969.80	405.14	434.38		435.15	0.001497	7.95	5184.73	529.16	0.33

RIVER: NAVASOTA
REACH: NAVASOTA RS: 3703

BRIDGE OUTPUT Profile #25 YR

		Element	Inside BR US	Inside BR DS
E.G. US. (ft)	430.49	E.G. Elev (ft)	430.46	429.86
W.S. US. (ft)	430.13	W.S. Elev (ft)	429.93	429.28
Q Total (cfs)	22809.40	Crit W.S. (ft)	419.54	417.78
Q Bridge (cfs)	22809.40	Max Chl Dpth (ft)	29.33	28.78
Q Weir (cfs)		Vel Total (ft/s)	5.28	5.49
Weir Sta Lft (ft)		Flow Area (sq ft)	4320.11	4158.12
Weir Sta Rgt (ft)		Froude # Chl	0.19	0.20
Weir Submerg		Specif Force (cu ft)	40160.50	40038.85
Weir Max Depth (ft)		Hydr Depth (ft)	12.27	11.94
Min El Weir Flow (ft)	435.00	W.P. Total (ft)	471.48	445.30
Min El Prs (ft)	434.95	Conv. Total (cfs)	757656.3	824975.4
Delta EG (ft)	0.73	Top Width (ft)	352.14	348.23
Delta WS (ft)	0.72	Frctn Loss (ft)		
BR Open Area (sq ft)	5984.32	C & E Loss (ft)		
BR Open Vel (ft/s)	5.49	Shear Total (lb/sq ft)	0.52	0.45
BR Sluice Coef		Power Total (lb/ft s)	2.74	2.44
BR Sel Method	Momentum			

Note: Multiple critical depths were found at this location.
The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #100 YR

		Element	Inside BR US	Inside BR DS
E.G. US. (ft)	433.95	E.G. Elev (ft)	433.95	433.44
W.S. US. (ft)	433.52	W.S. Elev (ft)	433.21	432.63
Q Total (cfs)	34969.80	Crit W.S. (ft)	424.16	423.64
Q Bridge (cfs)	34969.80	Max Chl Dpth (ft)	32.61	32.13
Q Weir (cfs)		Vel Total (ft/s)	6.35	6.53
Weir Sta Lft (ft)		Flow Area (sq ft)	5502.83	5356.37
Weir Sta Rgt (ft)		Froude # Chl	0.21	0.22
Weir Submerg		Specif Force (cu ft)	59561.82	59373.14
Weir Max Depth (ft)		Hydr Depth (ft)	14.88	14.62
Min El Weir Flow (ft)	435.00	W.P. Total (ft)	533.60	508.73
Min El Prs (ft)	434.95	Conv. Total (cfs)	1034269.0	1151969.0
Delta EG (ft)	0.67	Top Width (ft)	369.80	366.33
Delta WS (ft)	0.64	Frctn Loss (ft)		
BR Open Area (sq ft)	5984.32	C & E Loss (ft)		
BR Open Vel (ft/s)	6.53	Shear Total (lb/sq ft)	0.74	0.61
BR Sluice Coef		Power Total (lb/ft s)	4.68	3.95
BR Sel Method	Momentum			

Note: Multiple critical depths were found at this location.
The critical depth with the lowest, valid, water surface was used.

STATE OF TEXAS
KURT E KILLIAN
95742
LICENSED PROFESSIONAL ENGINEER
5/12/2021

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

CSE CIVIL SYSTEMS ENGINEERING, INC.
TPBE REGISTRATION NO. F-5246

BRIDGE HYDRAULIC COMPUTATIONS

FM 1633 OVER NAVASOTA RIVER

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		60
STATE	DISTRICT	COUNTY	
TX	WAC	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

5/12/2021 3:10:45 PM BAYOU
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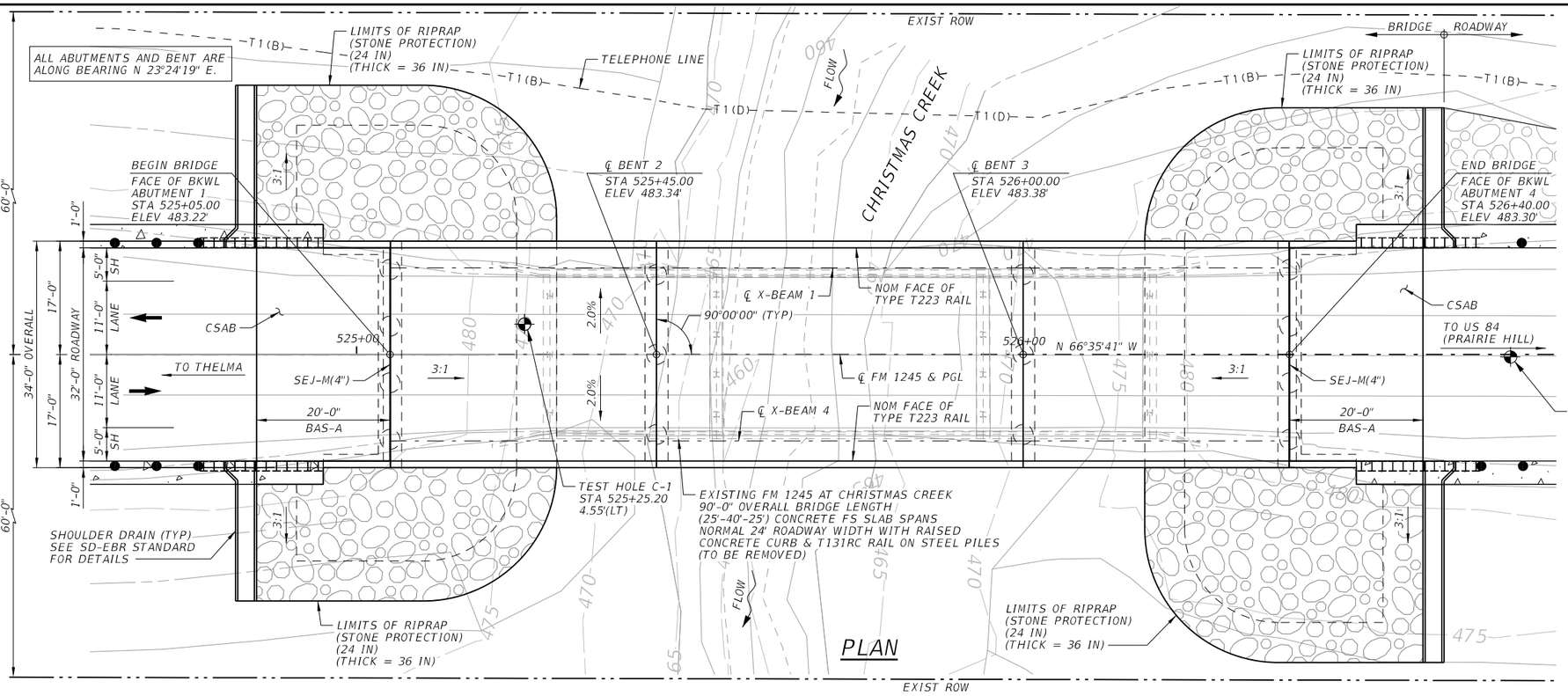
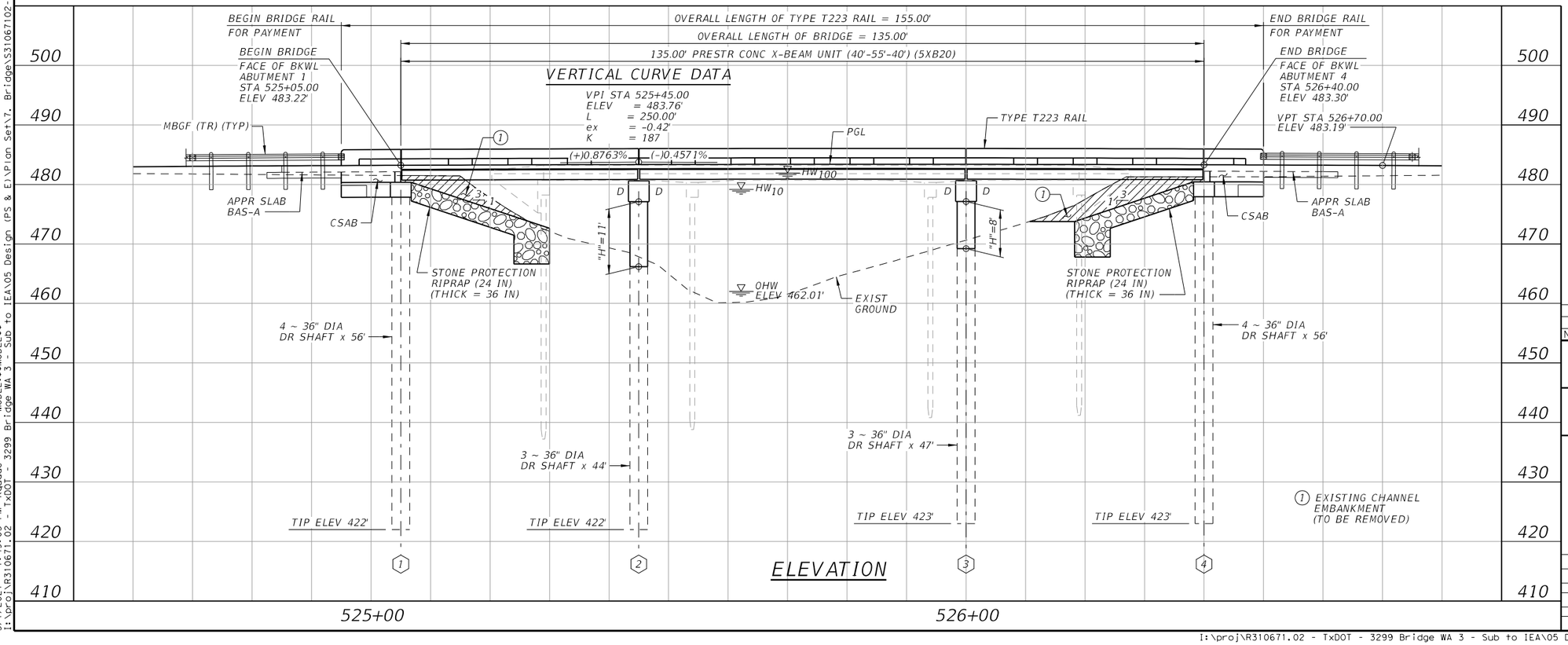
C:\ICSE_PROJECTS\245069C_IEA_WACO\CAD\NAVASOTA\FM1633-RAS.dgn





0 10 20
SCALE IN FEET

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS 8th EDITION, 2017.

ALL DIMENSIONS ARE EITHER HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR GRADE AND CROSS SLOPE.

SEE "BORING LOGS" SHEET FOR TEST HOLE DATA.

THE "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. CONTRACTOR IS RESPONSIBLE FOR CALCULATING ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.

CONTRACTOR SHALL CONFIRM FIELD LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.

SEE CEMENT STABILIZED ABUTMENT BACKFILL DETAILS SHEET.

DRILLED SHAFTS SHALL BE FOUNDED AT THE LENGTHS SHOWN OR DEEPER AS NECESSARY TO OBTAIN THE FOLLOWING MINIMUM PENETRATIONS INTO GRAY SHALE:

36" DIA (ABUT) = 9'-0"
36" DIA (BENT) = 9'-0"

DESIGN SPEED: 60 MPH
FUNCTIONAL CLASS: MAJOR COLLECTOR
2019 ADT: 1021
2039 ADT: 2042
EXIST NBI # 09-147-0-1191-03-006
NEW NBI # 09-147-0-1191-03-020

HYDRAULIC DATA:

10 YEAR DESIGN FREQUENCY
DRAINAGE AREA = 41.5 SQ MI

Q_{10} = 6,935 CFS
V_{10} = 3.60 FT/SEC
HW_{10} = 479.16 FT

Q_{100} = 15,117 CFS
V_{100} = 10.8 FT/SEC
HW_{100} = 481.89 FT

Tamara M. Cortez

STATE OF TEXAS
TAMARA M. CORTEZ
134001
LICENSED PROFESSIONAL ENGINEER

5/7/2021

HL93 LOADING

NO.	REVISION	DATE

Texas Department of Transportation

HUITT-ZOLLARS
HUITT-ZOLLARS, INC. ENGINEERING / SURVEYING
1717 McKINNEY AVENUE, SUITE 1400 DALLAS, TEXAS 75202-1236
Firm No. F-761

FM 1245

BRIDGE LAYOUT CHRISTMAS CREEK BRIDGE

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		61
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC

PLOT SCALE: 1:20
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MODEL:$$MODEL$$

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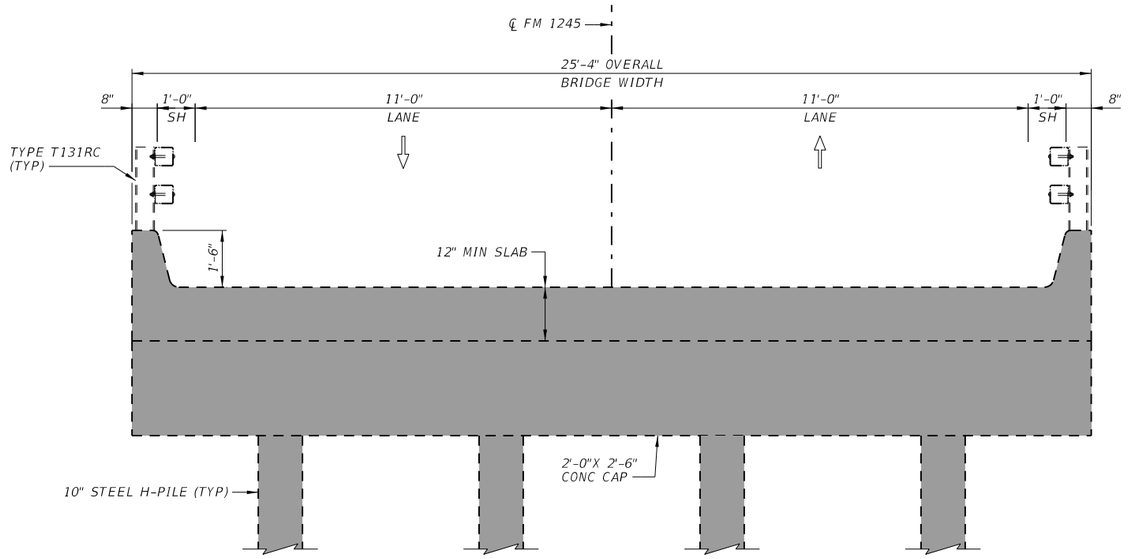
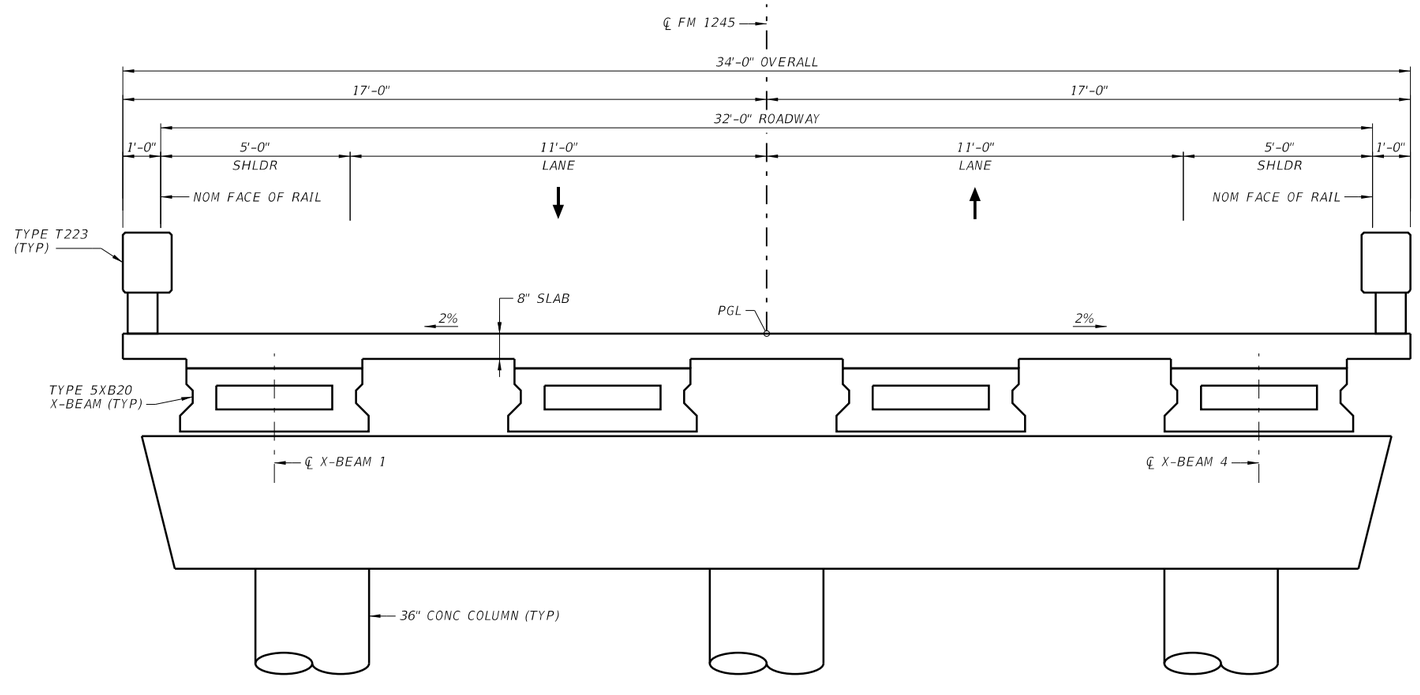


EXISTING TYPICAL SECTION

SCALE: 1/4" = 1'-0"



PROPOSED TYPICAL TRANSVERSE SECTION

SCALE: 1/4" = 1'-0"

Tamara M. Cortez

STATE OF TEXAS
TAMARA M. CORTEZ
134001
LICENSED PROFESSIONAL ENGINEER

5/7/2021

HL93 LOADING

NO.	REVISION	DATE

Texas Department of Transportation

HUITT-ZOLLARS
HUITT-ZOLLARS, INC. ENGINEERING / SURVEYING
1717 McKINNEY AVENUE, SUITE 1400 DALLAS, TEXAS 75202-1236
Firm No. F-761

FM 1245

BRIDGE TYPICAL SECTIONS CHRISTMAS CREEK BRIDGE

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		62
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC

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ESTIMATED BRIDGE QUANTITIES (CHRISTMAS CREEK BRIDGE)

ITEM	400	416	420	420	420	420	422	422	425	432	450	454
BID CODE	6005	6004	6011	6014	6030	6038	6001	6015	6020	6035	6006	6018
DESCRIPTION / BRIDGE ELEMENT	CEM STABIL BKFL	DRILL SHAFT (36 IN)	CL B CONC (FLUME)	CL C CONC (ABUT) (HPC)	CL C CONC (CAP) (HPC)	CL C CONC (COLUMN) (HPC)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC BOX BEAM (5XB20)	RIPRAP (STONE PROTECTION) (24 IN)	RAIL (TY T223)	SEALED EXPANSION JOINT (4 IN) (SEJ - M)
UNIT	CY	LF	CY	CY	CY	CY	SF	CY	LF	CY	LF	LF
2 - ABUTMENTS	112	448	5.4	37.8				51.4		720	40.0	66
2 - INTERIOR BENTS		273			30.6	15.0						
1 ~ 135.00' PRESTR CONC X-BEAM UNIT (5XB20)							4,590		534.00		270.0	
TOTAL	112	721	(1) 5.4	(2) 37.8	(3) 30.6	15.0	4,590	51.4	534.00	720	310.0	(4) 66

(1) QUANTITY SHOWN FOR SHOULDER DRAINS
(2) QUANTITY INCLUDES 0.2 CY/ABUT FOR SHEAR KEY
(3) QUANTITY INCLUDES 0.3 CY/BENT FOR SHEAR KEY
(4) QUANTITY BASED ON 33 LF PER ABUTMENT

BEARING SEAT ELEVATIONS

BEARING SEAT ELEVATIONS (FT)

DIST BETWN BRNG ELEVS ALONG CL BRNG (FT)

		BEAM 1 LEFT	BEAM 1 RIGHT	BEAM 2 LEFT	BEAM 2 RIGHT	BEAM 3 LEFT	BEAM 3 RIGHT	BEAM 4 LEFT	BEAM 4 RIGHT	
ABUT	1 (FWD)	480.171	480.291	480.345	480.465	480.465	480.345	480.291	480.171	6.0000
BENT	2 (BK)	480.291	480.411	480.465	480.585	480.585	480.465	480.411	480.291	6.0000
	(FWD)	480.296	480.416	480.469	480.589	480.589	480.469	480.416	480.296	6.0000
BENT	3 (BK)	480.328	480.448	480.502	480.622	480.622	480.502	480.448	480.328	6.0000
	(FWD)	480.327	480.447	480.500	480.620	480.620	480.500	480.447	480.327	6.0000
ABUT	4 (BK)	480.254	480.374	480.427	480.547	480.547	480.427	480.374	480.254	6.0000

BEARING PAD TAPER - FABRICATOR'S REPORT

BEARING PAD TAPER -- FABRICATOR'S REPORT
PERPENDICULAR TO THE CENTERLINE OF BEARING.
SUMMATION OF BEARING PAD TAPER DUE TO CROSS-SLOPE, GRADE, AND SKEW, MEASURED IN IN/IN.
A POSITIVE TAPER INDICATES INCREASING PAD THICKNESS IN DIRECTION OF INCREASING STATIONS.
A NEGATIVE TAPER INDICATES DECREASING PAD THICKNESS IN DIRECTION OF INCREASING STATIONS.

		BEAM 1	BEAM 2	BEAM 3	BEAM 4
ABUT	1 (FWD)	0.00315	0.00315	0.00315	0.00315
		BEAM 1	BEAM 2	BEAM 3	BEAM 4
BENT	2 (BK)	0.00315	0.00315	0.00315	0.00315
	(FWD)	0.00062	0.00062	0.00062	0.00062
		BEAM 1	BEAM 2	BEAM 3	BEAM 4
BENT	3 (BK)	0.00062	0.00062	0.00062	0.00062
	(FWD)	-0.00192	-0.00192	-0.00192	-0.00192
		BEAM 1	BEAM 2	BEAM 3	BEAM 4
ABUT	4 (BK)	-0.00192	-0.00192	-0.00192	-0.00192

Tamara M. Cortez

STATE OF TEXAS
TAMARA M. CORTEZ
134001
LICENSED PROFESSIONAL ENGINEER

5/7/2021

HL93 LOADING

NO.	REVISION	DATE

Texas Department of Transportation

HUITT-ZOLLARS
HUITT-ZOLLARS, INC. ENGINEERING / SURVEYING
1717 McKINNEY AVENUE, SUITE 1400 DALLAS, TEXAS 75202-1236
Firm No. F-761

FM 1245

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS CHRISTMAS CREEK BRIDGE

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		63
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC

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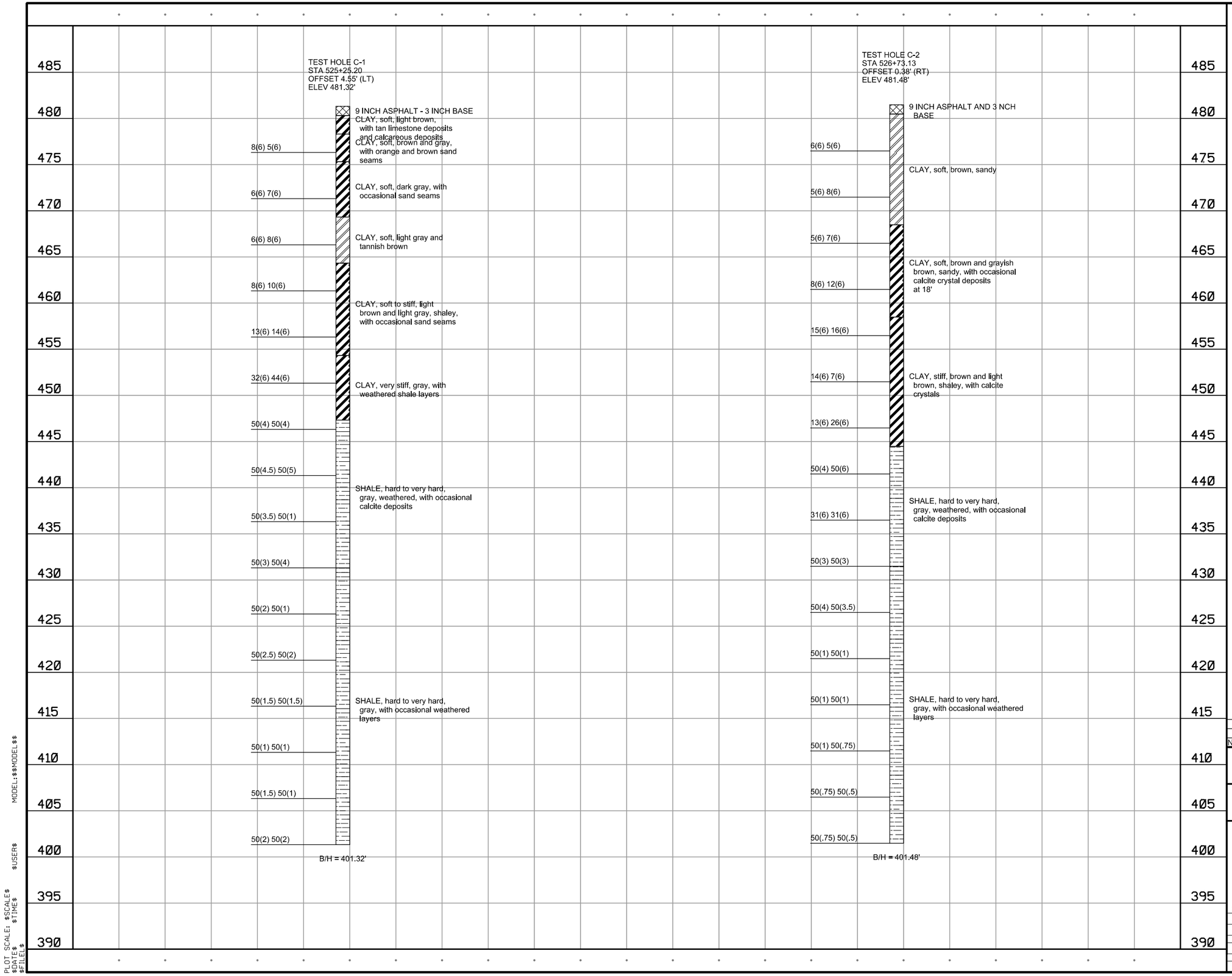


GENERAL NOTES:

BORE DATA PROVIDED BY TERRACON CONSULTANTS, INC.

ALI QAYS ABDULLAH
131059
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
05/10/2021

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

BORING LOGS
CHRISTMAS CREEK BRIDGE

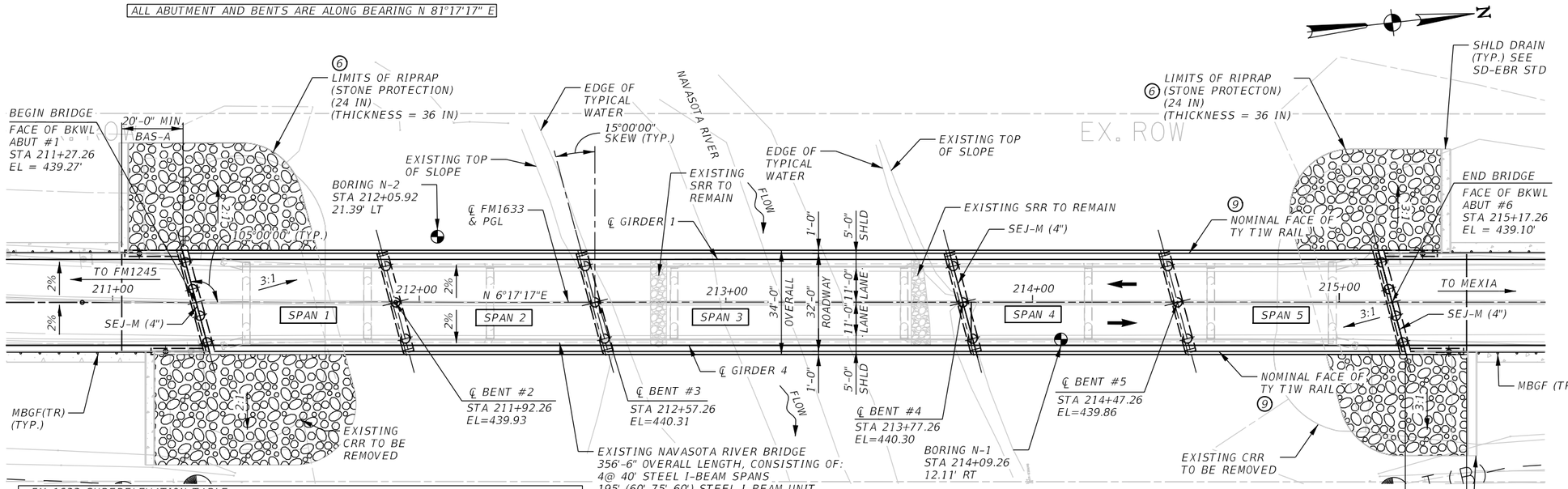
SCALE: 1" = 10'

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		64
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

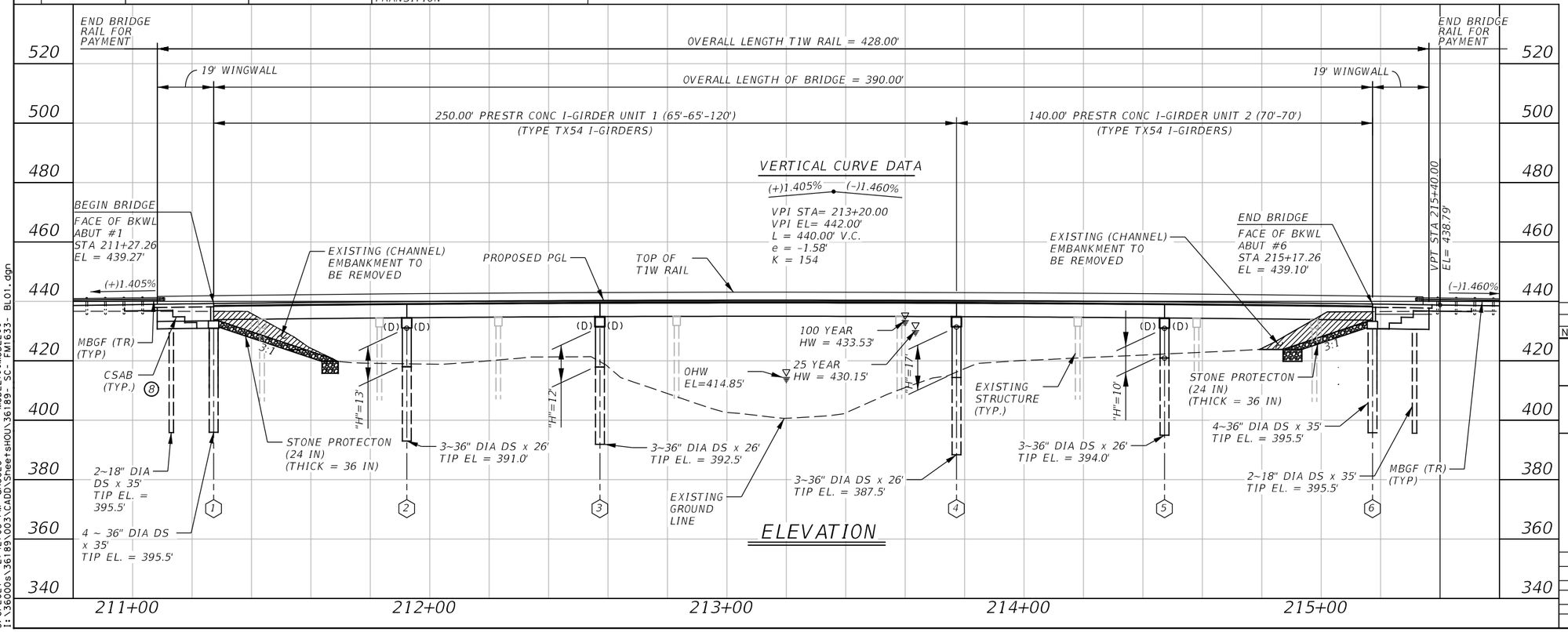
PLOT SCALE: $SCALE$
$DATE$
$FILE$
MODEL: $MODEL$
$USER$
$TIME$
$FILES$

ALL ABUTMENT AND BENTS ARE ALONG BEARING N 81°17'17" E



PLAN

FM 1633 SUPERELEVATION TABLE			
STATION	CROSS SLOPE (LT)	CROSS SLOPE (RT)	DESCRIPTION
209+80.00	-5.80%	5.80%	END FULL SUPERELEVATION/ BEGIN SUPERELEVATION TRANSITION
210+80.00	-2.00%	2.00%	BEGIN NORMAL CROWN (LT SIDE)
211+92.26	-2.00%	-2.00%	END SUPERELEVATION TRANSITION (RT SIDE)/BEGIN NORMAL CROWN
217+10.00	-2.00%	-2.00%	END NORMAL CROWN/BEGIN SUPERELEVATION TRANSITION
218+00.00	1.50%	-5.53%	BEGIN FULL SUPERELEVATION TRANSITION



ELEVATION

GENERAL NOTES:

0 20 40
HORIZONTAL SCALE IN FEET

1. BRIDGE DESIGNED FOR HL93 LOADING PER CURRENT AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND INTERIM REVISIONS THERETO.
2. TEST HOLE DATA PROVIDED BY TERRACON, PROJECT NO. 94205041, DATE 06/08/2020
3. CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.
4. "D" DENOTED CAPS WITH D BARS AND SLOTTED HOLES AT EXTERIOR BEAMS.
5. THE "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE ACTUAL COLUMN HEIGHTS BASED ON THE GRADING PLAN AND FIELD CONDITIONS.
6. SEE TxDOT SRR STANDARD AND ABUTMENT MISC DETAILS FOR STONE RIPRAP DETAILS.
7. REFER CEMENT STABILIZED ABUTMENT BACKFILL DETAILS.
8. REFER IGSK STANDARD FOR SHEAR KEY BETWEEN UPSTREAM FIRST AND SECOND GIRDER ON ALL BENTS AND ABUTMENTS.
9. INCORPORATE SIDE SLOT DRAINS IN T1W RAIL. 3 DRAINS PER SPAN AT EACH SIDE. OMIT DRAINS AT SPAN 1 (RT).

FOUNDATION NOTES:

FOUND DRILLED SHAFTS AT THE ELEVATION SHOWN OR DEEPER AS NECESSARY TO OBTAIN THE FOLLOWING MINIMUM PENETRATIONS INTO SANDSTONE LAYER:

36" DIA (ABUT) = 9'-0"
36" DIA (BENT) = 9'-0"

DESIGN SPEED: 60 MPH
FUNCTIONAL CLASSIFICATION: MAJOR COLLECTOR
EXISTING NBI# 09-147-0-1664-01-002
PROPOSED NBI# 09-147-0-1664-01-004
2019 ADT: 631
2039 ADT: 820

HYDRAULIC DATA

25 YEAR FLOOD	100 YEAR FLOOD
Q = 22,809 cfs	Q = 34,970 cfs
V = 4.2 fps	V = 4.8fps
HW = 430.15 ft	HW = 433.53 ft

05/07/2021
STATE OF TEXAS
JAMES P. MILLER
113116
LICENSED PROFESSIONAL ENGINEER

NO.	REVISION	DATE

HALFF
FIRM REGISTRATION No. F-312
14800 ST. MARY'S LANE, SUITE 160
HOUSTON, TX 77079-2943
(713) 588-2450

FM 1633
BRIDGE LAYOUT
NAVASOTA RIVER BRIDGE

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		65
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

PLOT SCALE: 40.00 ' / in.
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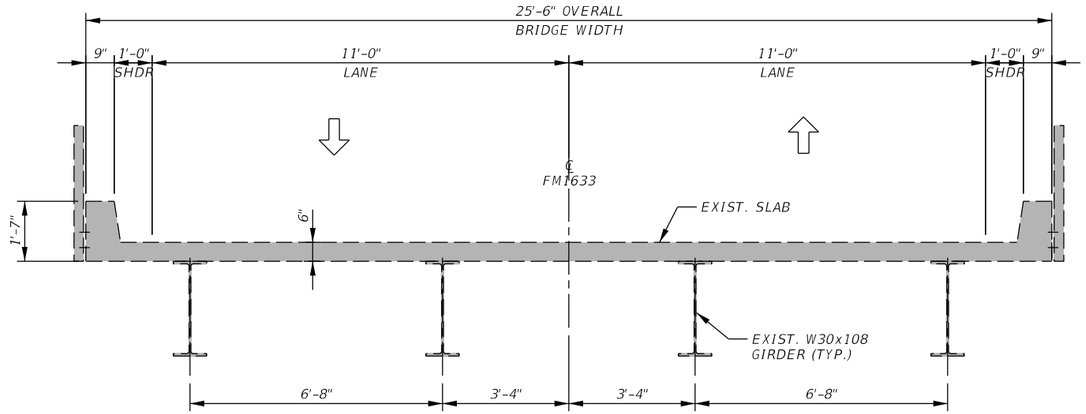
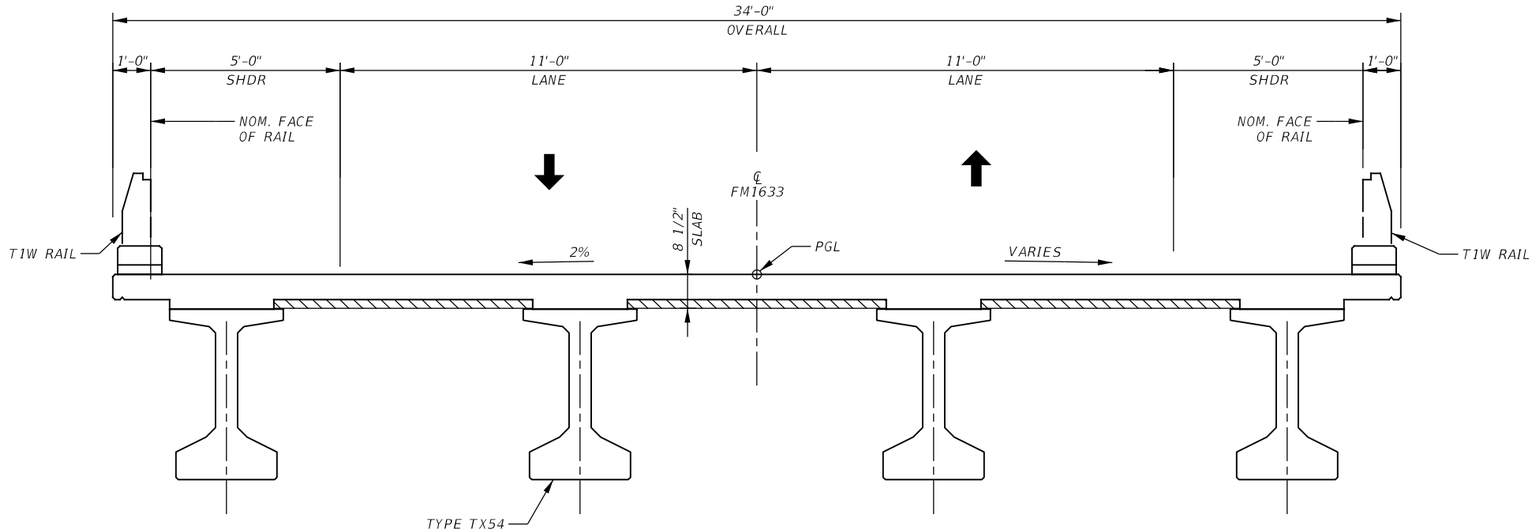
MODEL:$$MODEL$$



EXISTING TYPICAL SECTION

SCALE: 1/4"=1'-0"



PROPOSED TYPICAL TRANSVERSE SECTION

SCALE: 1/4"=1'-0"

05/07/2021
STATE OF TEXAS
JAMES P. MILLER
113116
LICENSED
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

HALFF
FIRM REGISTRATION No. F-312
14800 ST. MARY'S LANE,
SUITE 160
HOUSTON, TX 77079-2943
(713) 588-2450

FM 1633
BRIDGE TYPICAL SECTIONS
NAVASOTA RIVER BRIDGE

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		66
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

PLOT SCALE: 3:11.999904 ':" / in.
5/6/2021 2:42:36 PM dh3828 MODEL:$$MODEL$$
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SUMMARY OF ESTIMATED QUANTITIES

BRIDGE ELEMENT \ BID ITEM DESCRIPTION	400 6005 CEM STABIL BKFL	416 6001 DRILL SHAFT (18 IN DIA)	416 6004 DRILL SHAFT (36 IN DIA)	420 6011 CL "B" CONC (FLUME)	420 6014 CL "C" CONC (ABUT) (HPC)	420 6030 CL "C" CONC (CAP) (HPC)	420 6038 CL "C" CONC (COLUMN) (HPC)	422 6001 REINF CONC SLAB	422 6015 APPROACH SLAB	425 6039 PRESTR CONC GIRDER (Tx54)	432 6035 RIPRAP (STONE PROTECTION) (24 IN)	450 6003 RAIL (TY T1W)	454 6018 SEALED EXPANSION JOINT (4 IN) (SEJ-M)
	CY	LF	LF	CY	CY	CY	CY	SF	CY	LF	CY	LF	LF
2 - ABUTMENTS	212	140	280	9.4	64.3							76.0	
4 - INTERIOR BENTS			312			62.9	40.9						
1 - 250.00' PCG UNIT & 1 - 140.00' PCG UNIT								13,260	62.3	1,550	1,501	780.0	102
TOTAL	212	140	592	(1) 9.4	(2) 64.3	(3) 62.9	40.9	13,260	62.3	1,550	1,501	856.0	(4) 102

(1) QUANTITY SHOWN IS FOR SHOULDER DRAINS.

(2) QUANTITY INCLUDES .36 CY/ABUT FOR SHEAR KEY.

(3) QUANTITY INCLUDES .72 CY/BENT FOR SHEAR KEY.

(4) QUANTITY IS BASED ON 34 LF PER ABUTMENT AND INTERIOR BENT 4.

BEARING SEAT ELEVATIONS

			BEAM 1	BEAM 2	BEAM 3	BEAM 4
BENT	1	(FWD)	433.225	433.443	433.577	433.617
BENT	2	(BK)	433.880	434.087	434.108	433.941
		(FWD)	433.897	434.104	434.124	433.956
BENT	3	(BK)	434.285	434.482	434.492	434.314
		(FWD)	434.293	434.490	434.499	434.322
BENT	4	(BK)	434.311	434.488	434.478	434.281
		(FWD)	434.303	434.480	434.470	434.273
BENT	5	(BK)	433.893	434.059	434.037	433.829
		(FWD)	433.876	434.042	434.020	433.811
BENT	6	(BK)	433.156	433.310	433.278	433.058

05/07/2021

STATE OF TEXAS
JAMES P. MILLER
113116
LICENSED PROFESSIONAL ENGINEER

NO.	REVISION	DATE

Texas Department of Transportation

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SUITE 160
HOUSTON, TX 77079-2943
(713) 588-2450

FM 1633

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS NAVASOTA RIVER BRIDGE

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		67
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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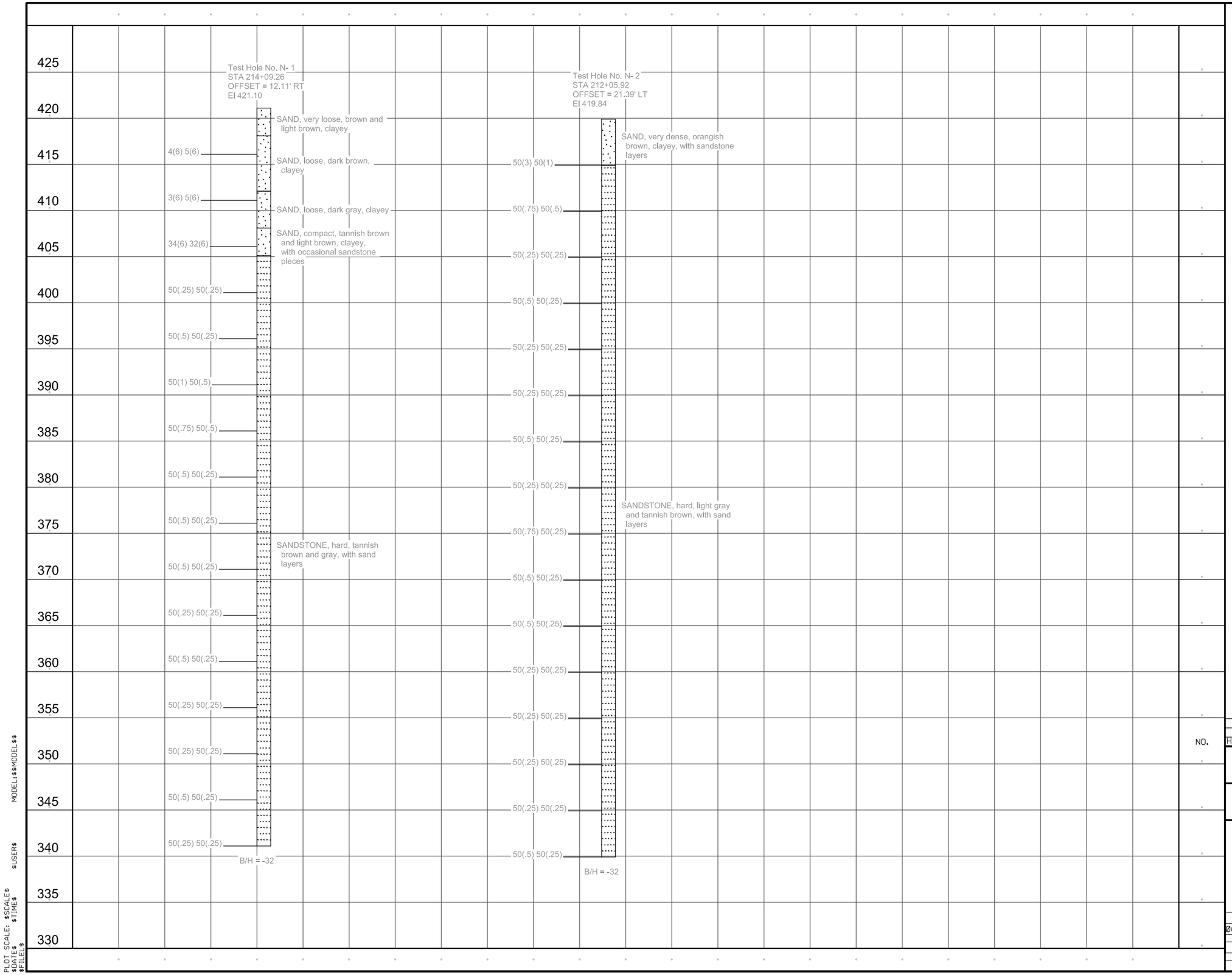

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$TIME$
$USER$
MODEL: $$MODEL$$

ALI QAYS ABDULLAH
131059
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

05/10/2021

NO.	REVISION	DATE
	HL93 LOADING	

Texas Department of Transportation

HALFF
FIRM REGISTRATION No. F-312
14800 ST. MARY'S LANE, SUITE 160
HOUSTON, TX 77079-2943
(713) 588-2450

FM 1633

BORING LOGS (NAVASOTA RIVER)

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		68
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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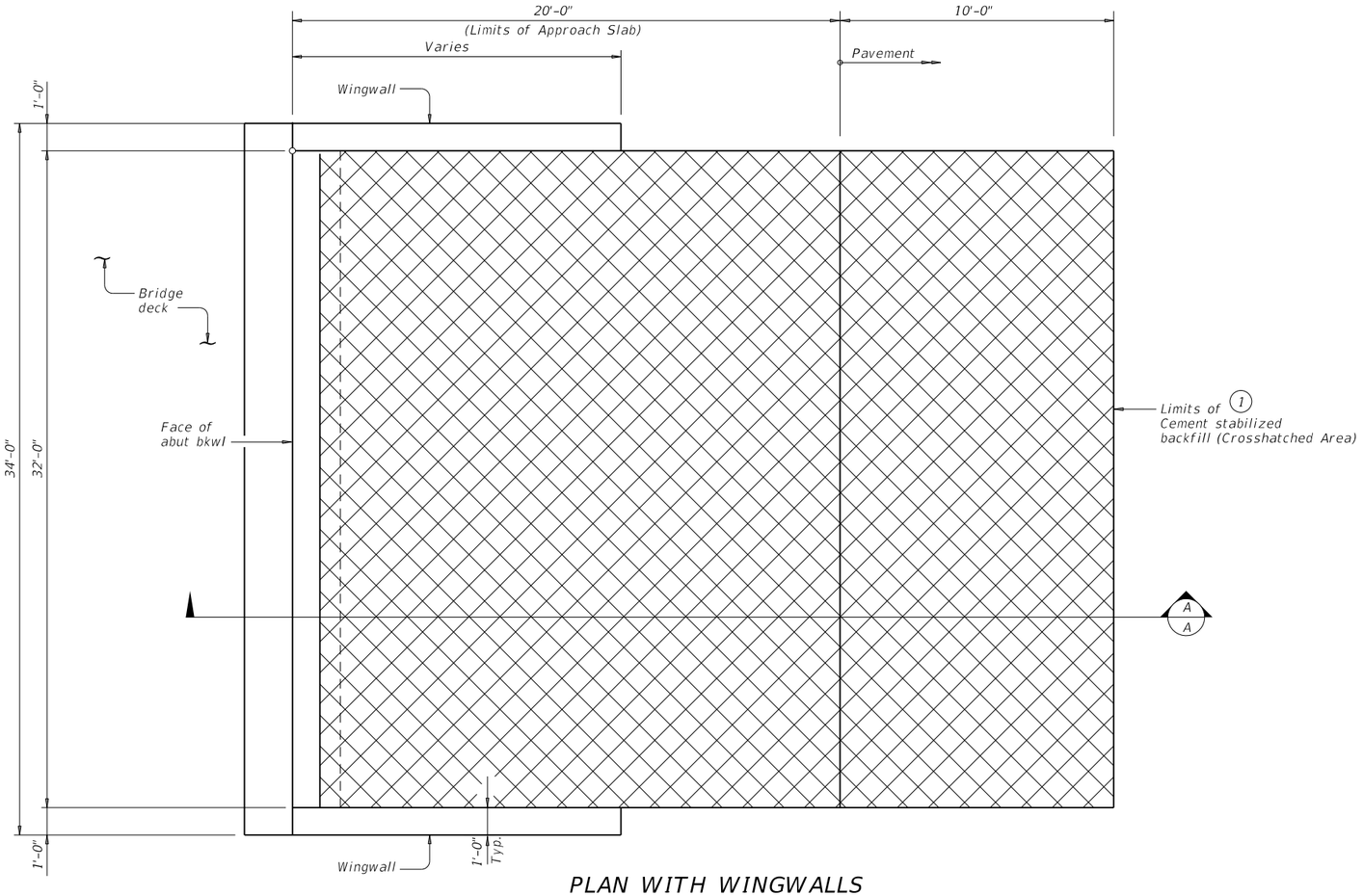
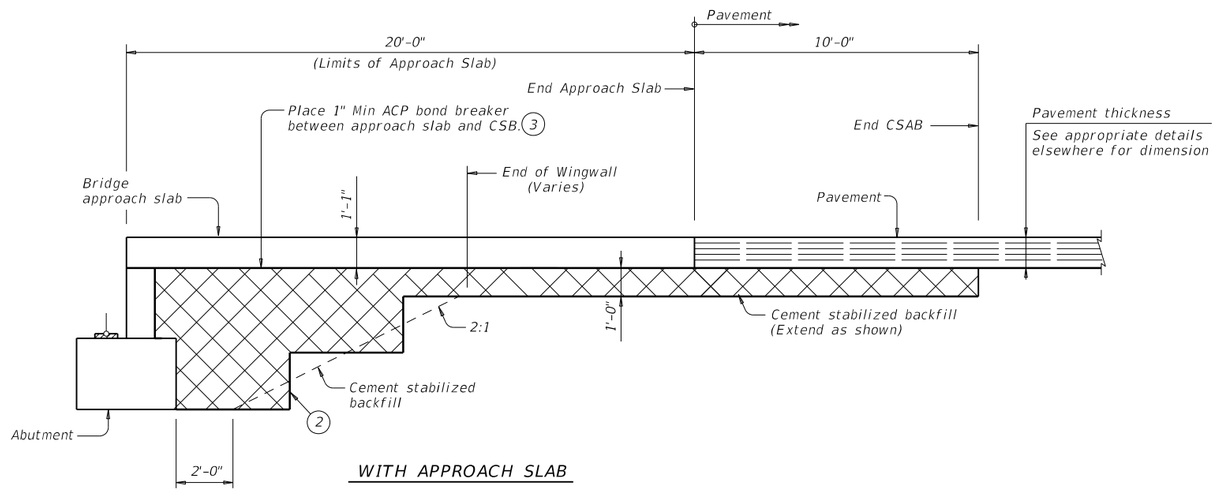


PLAN WITH WINGWALLS



WITH APPROACH SLAB

SECTION A-A

(1) Limits of Cement Stabilized Backfill is 30' from face of backwall. Paid for as a Bridge Item.

(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Other materials can 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.

GENERAL NOTES:

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

Tamara M. Cortez

STATE OF TEXAS
TAMARA M. CORTEZ
134001
LICENSED PROFESSIONAL ENGINEER

5/7/2021

Texas Department of Transportation

CEMENT STABILIZED ABUTMENT BACKFILL DETAILS

BRIDGE ABUTMENT

FILE: CSABDET.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC	FM 1245, ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		69

DATE: 5/7/2021 1:49:07 PM
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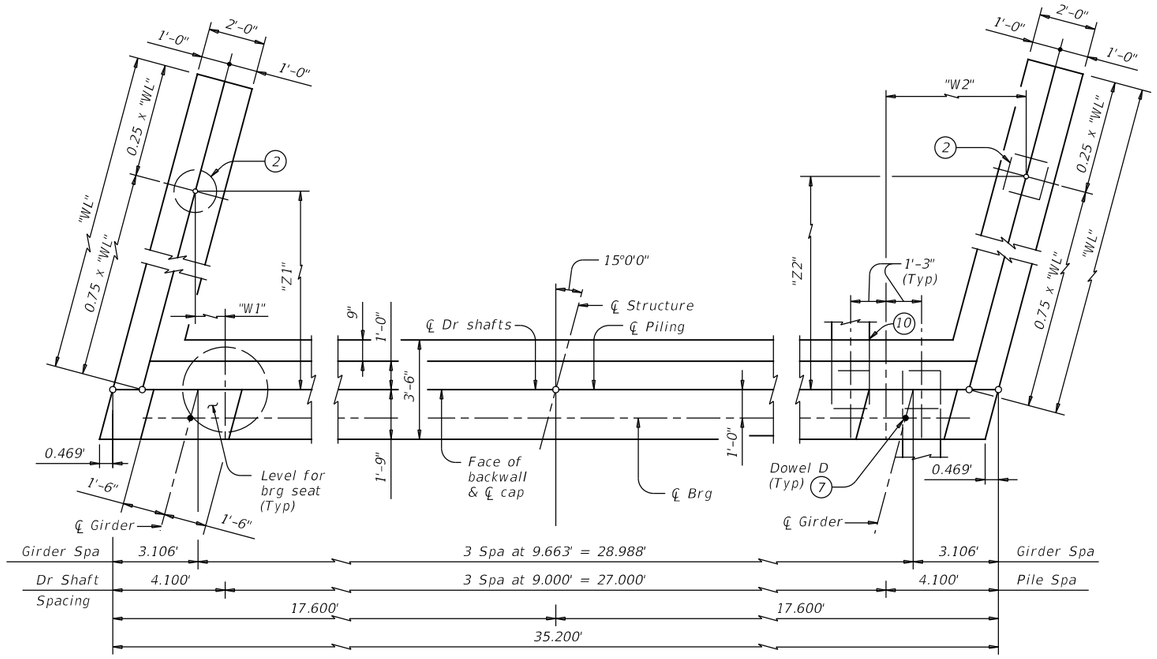
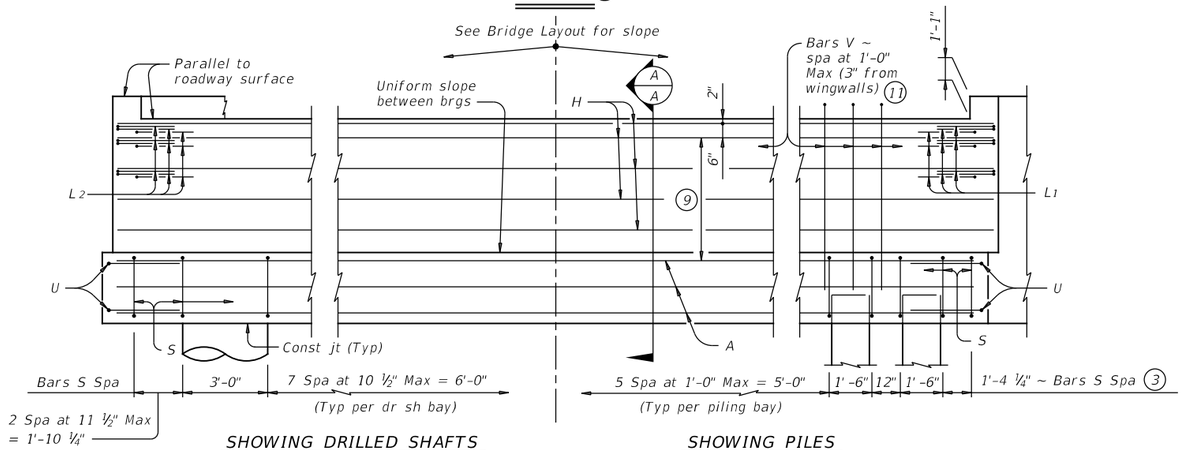
DATE:
FILE:



SHOWING DRILLED SHAFTS — SHOWING PILES

PLAN (1)

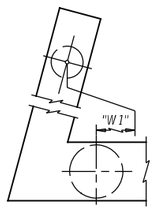


SHOWING DRILLED SHAFTS — SHOWING PILES

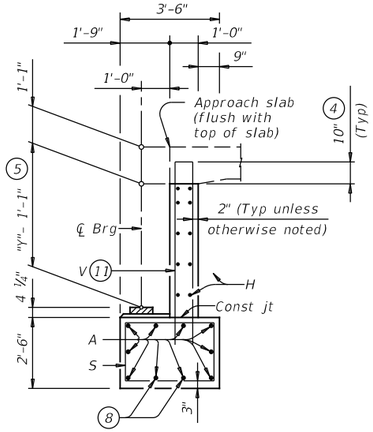
ELEVATION

TABLE A

Header Slope	Girder Type	Wingwall Type	Wingwall Lgth "WL"	"W1" (12)	"Z1"	"W2"	"Z2"
2:1	Tx28	Cantilevered	8.000'	Not Applicable			
	Tx34	Cantilevered	9.000'				
	Tx40	Cantilevered	10.000'				
	Tx46	Cantilevered	11.000'				
	Tx54	Founded	13.000'	0.541'	9.418'	5.588'	9.418'
3:1	Tx28	Cantilevered	12.000'	Not Applicable			
	Tx34	Founded	14.000'	0.347'	10.142'	5.782'	10.142'
	Tx40	Founded	15.000'	0.153'	10.867'	5.976'	10.867'
	Tx46	Founded	17.000'	-0.235'	12.316'	6.365'	12.316'
	Tx54	Founded	19.000'	-0.623'	13.764'	6.753'	13.764'

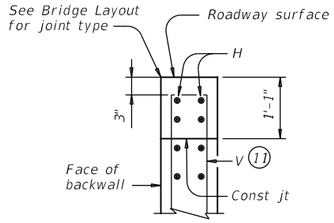


DETAIL A



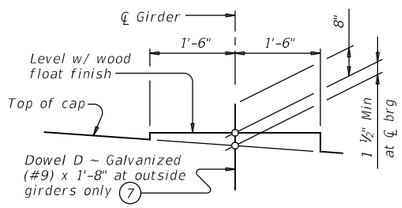
SECTION A-A

(With approach slab) (6)



BACKWALL DETAIL

(Without approach slab) (6)



BEARING SEAT DETAIL

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

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

TABLE OF FOUNDATION LOADS

Span Length	All Girder Types	
Ft	Tons/Shaft	Tons/Pile
40	53	49
45	57	50
50	60	52
55	63	54
60	67	56
65	70	57
70	73	59
75	76	61
80	80	62
85	83	64
90	86	65
95	89	67
100	92	69
105	95	70
110	98	72
115	101	73
120	105	75

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Bridge Layout for header slope and foundation type, size and length.

See Common Foundation Details (FD) standard sheet for all foundation details and notes.

See Concrete Riprap (CRR) standard sheet or Stone Riprap (SRR) standard sheet for riprap attachment details, if applicable.

See applicable rail details for rail anchorage in wingwalls.

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

These abutment details may be used with standard SIG-32-15 only.

Cover dimensions are clear dimensions, unless noted otherwise.

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

MATERIAL NOTES:

Provide Class C concrete (f'c = 3,600 psi).

Provide Class C (HPC) concrete if shown elsewhere in the plans.

Provide Grade 60 reinforcing steel.

Galvanize dowel bars D.

HL93 LOADING — SHEET 1 OF 3

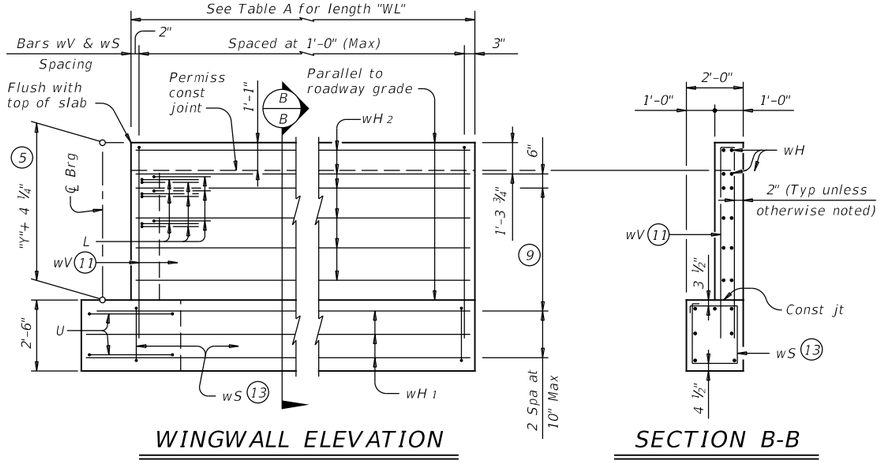
Texas Department of Transportation — Bridge Division Standard

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

AIG-32-15

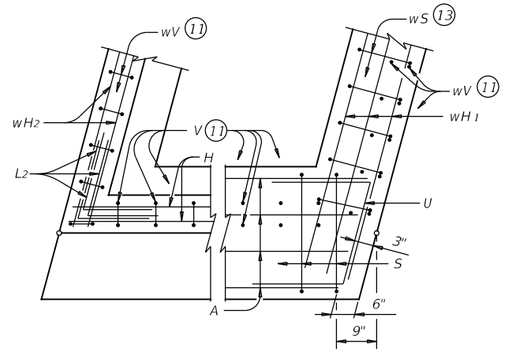
FILE: aig42sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		70

DATE:
FILE:



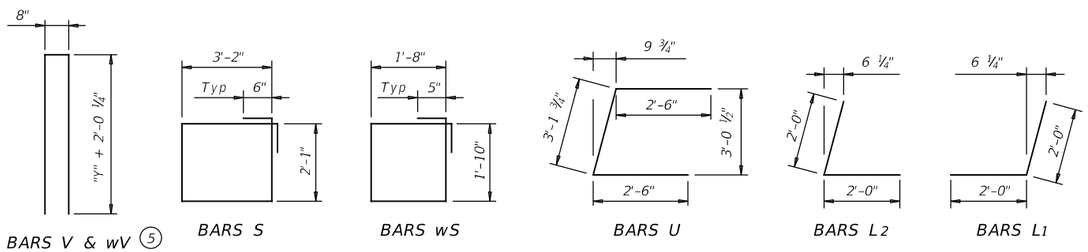
WINGWALL ELEVATION

SECTION B-B



BACKWALL CAP

CORNER DETAILS



(5) See Span details for "Y" value.

(9) Spacing based on girder type:
Tx28 ~ 3 spaces at 1'-0" Max
Tx34 ~ 3 spaces at 1'-0" Max
Tx40 ~ 4 spaces at 1'-0" Max
Tx46 ~ 4 spaces at 1'-0" Max
Tx54 ~ 5 spaces at 1'-0" Max

(11) Field bend as needed to clear piles.

(13) Adjust as required to avoid piling.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

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

AIG-32-15

FILE: aig42sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR			
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY			
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.			
	DIST	COUNTY		SHEET NO.			
	WACO	LIMESTONE		71			

DATE:
FILE:

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

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	8	#6	34'-10"	419
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	11'-4"	402
wH1	14	#6	9'-5"	198
wH2	20	#6	7'-8"	230
wS	18	#4	7'-10"	94
wV	18	#5	11'-4"	213

Reinforcing Steel	Lb	3,904
Class "C" Concrete	CY	19.0

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	8	#6	34'-10"	419
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	12'-4"	437
wH1	14	#6	10'-5"	219
wH2	20	#6	8'-8"	260
wS	20	#4	7'-10"	105
wV	20	#5	12'-4"	257

Reinforcing Steel	Lb	4,045
Class "C" Concrete	CY	20.6

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	10	#6	34'-10"	523
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	13'-4"	473
wH1	14	#6	11'-5"	240
wH2	24	#6	9'-8"	348
wS	22	#4	7'-10"	115
wV	22	#5	13'-4"	306

Reinforcing Steel	Lb	4,353
Class "C" Concrete	CY	22.3

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	10	#6	34'-10"	523
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	14'-4"	508
wH1	14	#6	12'-5"	261
wH2	24	#6	10'-8"	385
wS	24	#4	7'-10"	126
wV	24	#5	14'-4"	359

Reinforcing Steel	Lb	4,510
Class "C" Concrete	CY	24.0

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	12	#6	34'-10"	628
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	15'-8"	556
wH1	14	#6	14'-5"	303
wH2	28	#6	12'-8"	533
wS	28	#4	7'-10"	147
wV	28	#5	15'-8"	458

Reinforcing Steel	Lb	4,973
Class "C" Concrete	CY	27.0

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

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	8	#6	34'-10"	419
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	11'-4"	402
wH1	14	#6	13'-5"	282
wH2	20	#6	11'-8"	350
wS	26	#4	7'-10"	136
wV	26	#5	11'-4"	307

Reinforcing Steel	Lb	4,244
Class "C" Concrete	CY	21.6

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	8	#6	34'-10"	419
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	12'-4"	437
wH1	14	#6	15'-5"	324
wH2	20	#6	13'-8"	411
wS	30	#4	7'-10"	157
wV	30	#5	12'-4"	386

Reinforcing Steel	Lb	4,482
Class "C" Concrete	CY	24.0

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	10	#6	34'-10"	523
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	13'-4"	473
wH1	14	#6	16'-5"	345
wH2	24	#6	14'-8"	529
wS	32	#4	7'-10"	167
wV	32	#5	13'-4"	445

Reinforcing Steel	Lb	4,830
Class "C" Concrete	CY	25.9

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	10	#6	34'-10"	523
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	14'-4"	508
wH1	14	#6	18'-5"	387
wH2	24	#6	16'-8"	601
wS	36	#4	7'-10"	188
wV	36	#5	14'-4"	538

Reinforcing Steel	Lb	5,093
Class "C" Concrete	CY	28.5

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	34'-3"	1,820
D (7)	2	#9	1'-8"	11
H	12	#6	34'-10"	628
L1	9	#6	4'-0"	54
L2	9	#6	4'-0"	54
S	30	#5	11'-6"	360
U	4	#6	8'-2"	49
V	34	#5	15'-8"	556
wH1	14	#6	20'-5"	429
wH2	28	#6	18'-8"	785
wS	40	#4	7'-10"	209
wV	40	#5	15'-8"	654

Reinforcing Steel	Lb	5,609
Class "C" Concrete	CY	31.8

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

(14) Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.3 CY Class "C" concrete and 209 lbs reinforcing steel for 4 additional Bars H.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

ABUTMENTS

TYPE TX28 THRU TX54

PRESTR CONC I-GIRDERS

32' ROADWAY 15° SKEW

AIG-32-15

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY		
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.		
	DIST	COUNTY		SHEET NO.		
	WACO	LIMESTONE		72		

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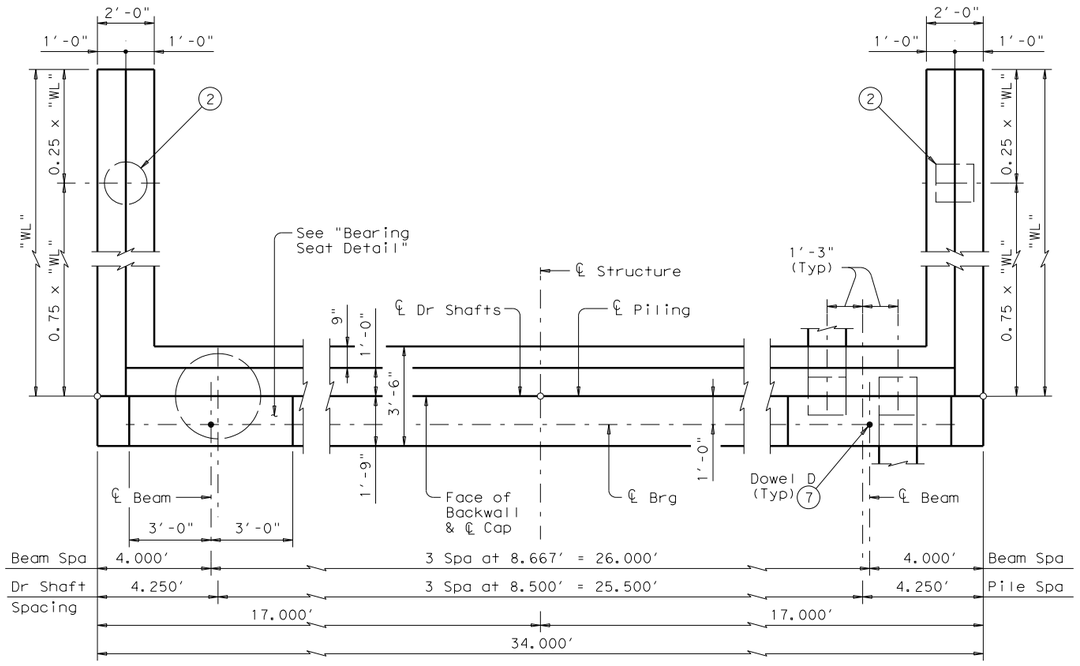
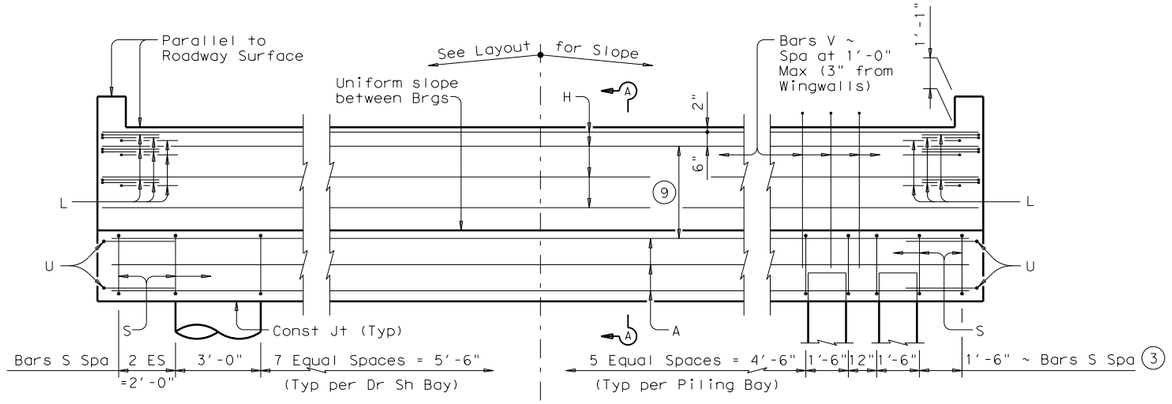


SHOWING DRILLED SHAFTS SHOWING PILES

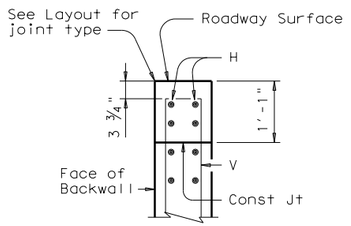
PLAN (1)



SHOWING DRILLED SHAFTS SHOWING PILES

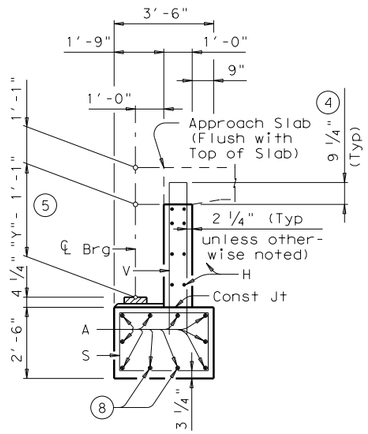
ELEVATION

TABLE A			
Header Slope	Beam Type	Wingwall Type	Wingwall Lgth "WL"
2:1	XB20	Cantilevered	7.000'
	XB28	Cantilevered	8.000'
	XB34	Cantilevered	9.000'
	XB40	Cantilevered	10.000'
3:1	XB20	Cantilevered	10.000'
	XB28	Cantilevered	12.000'
	XB34	Founded	13.000'
	XB40	Founded	15.000'



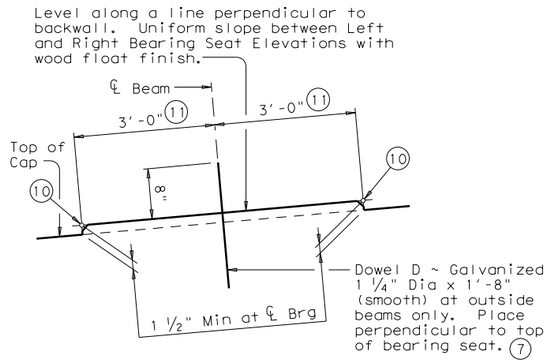
BACKWALL DETAIL

(Without Approach Slab) (6)



SECTION A-A

(With Approach Slab) (6)



BEARING SEAT DETAIL

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

TABLE OF FOUNDATION LOADS		
Span Length	Beam Types 5XB20 Thru 5XB40	
Ft	Tons/Shaft	Tons/Pile
40	55	42
45	59	44
50	63	46
55	67	48
60	70	49
65	74	51
70	78	53
75	81	55
80	85	57
85	88	59
90	92	61
95	95	62
100	99	64
105	102	66

(1) See Table A for variable dimensions based on header slope and beam type.

(2) See Table A to determine if wingwall foundations are required.

(3) For Piling larger than 16" adjust Bars S spacing as required to avoid Piling.

(4) Increase as required to maintain 3 ¾" from Finished Grade.

(5) See Span details for "Y" value.

(6) See Bridge Layout to determine if Approach Slab is present.

(7) Omit Dowels D at end of unit. Deduct 14 lbs from reinforcing steel total.

(8) With pile foundations, move Bars A shown to clear piles.

(9) Spacing based on beam type:
XB20 ~ 2 Equal Spaces
XB28 ~ 3 Equal Spaces
XB34 ~ 3 Equal Spaces
XB40 ~ 3 Equal Spaces

(10) Right and left elevations and locations are provided elsewhere.

(11) Measured along ℄ of Bearing.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

Concrete strength f'c = 3,600 psi.

All cap and wall reinforcing must be Grade 60.

Galvanize dowel bars D.

See Bridge Layout for header slope and foundation type, size and length.

See Foundation Detail Standard Sheet, FD, for all foundation details and notes.

See Concrete Riprap Standard Sheet, CRR, for riprap attachment details, if applicable.

See applicable rail details for rail anchorage in wingwalls.

These abutment details may be used with Standard SXB-32 only.

HL93 LOADING *SHEET 1 OF 2*

Texas Department of Transportation | Bridge Division Standard

ABUTMENTS

TYPE 5XB20 THRU 5XB40 PRESTR CONC X-BEAMS

32' ROADWAY

AXB-32

FILE: xbstde41.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
©TxDOT June 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		73

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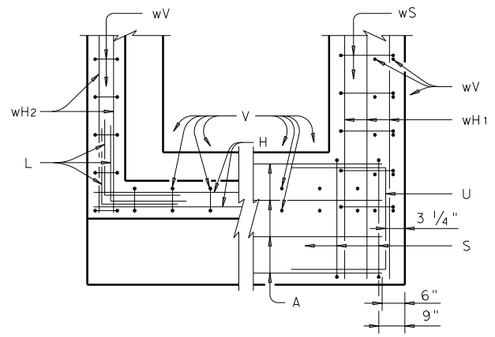
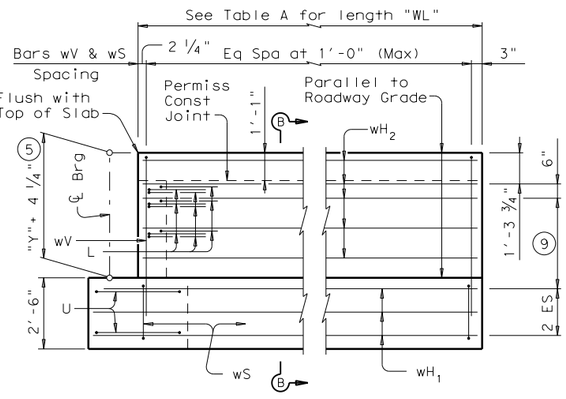
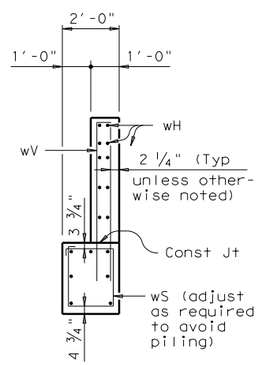


BACKWALL CAP

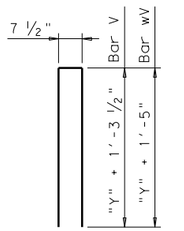
CORNER DETAILS



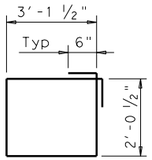
WINGWALL ELEVATION



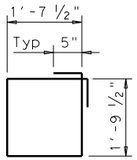
SECTION B-B



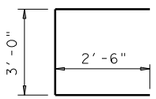
BARS V & wV (5)



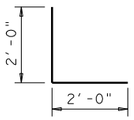
BARS S



BARS wS



BARS U



BARS L

TABLES OF ESTIMATED QUANTITIES WITH 2:1 HEADER SLOPE (12)

TYPE 5XB20 BEAMS

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	1¼"D	1'-8"	14
H	6	#6	33'-8"	303
L	18	#6	4'-0"	108
S	30	#5	11'-4"	355
U	4	#6	8'-0"	48
V	33	#5	8'-5"	290
wH1	14	#6	8'-5"	177
wH2	16	#6	6'-8"	160
wS	16	#4	7'-8"	82
wV	16	#5	8'-8"	145
Reinforcing Steel			Lb	3,435
Class "C" Concrete			CY	16.9

TYPE 5XB28 BEAMS

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	1¼"D	1'-8"	14
H	8	#6	33'-8"	405
L	18	#6	4'-0"	108
S	30	#5	11'-4"	355
U	4	#6	8'-0"	48
V	33	#5	9'-9"	336
wH1	14	#6	9'-5"	198
wH2	20	#6	7'-8"	230
wS	18	#4	7'-8"	92
wV	18	#5	10'-0"	188
Reinforcing Steel			Lb	3,727
Class "C" Concrete			CY	18.7

TYPE 5XB34 BEAMS

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	1¼"D	1'-8"	14
H	8	#6	33'-8"	405
L	18	#6	4'-0"	108
S	30	#5	11'-4"	355
U	4	#6	8'-0"	48
V	33	#5	10'-9"	370
wH1	14	#6	10'-5"	219
wH2	20	#6	8'-8"	260
wS	20	#4	7'-8"	102
wV	20	#5	11'-0"	229
Reinforcing Steel			Lb	3,863
Class "C" Concrete			CY	20.3

TYPE 5XB40 BEAMS

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	1¼"D	1'-8"	14
H	8	#6	33'-8"	405
L	18	#6	4'-0"	108
S	30	#5	11'-4"	355
U	4	#6	8'-0"	48
V	33	#5	11'-9"	404
wH1	14	#6	11'-5"	240
wH2	20	#6	9'-8"	290
wS	22	#4	7'-8"	113
wV	22	#5	12'-0"	275
Reinforcing Steel			Lb	4,005
Class "C" Concrete			CY	21.9

TABLES OF ESTIMATED QUANTITIES WITH 3:1 HEADER SLOPE (12)

TYPE 5XB20 BEAMS

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	1¼"D	1'-8"	14
H	6	#6	33'-8"	303
L	18	#6	4'-0"	108
S	30	#5	11'-4"	355
U	4	#6	8'-0"	48
V	33	#5	8'-5"	290
wH1	14	#6	11'-5"	241
wH2	16	#6	9'-8"	232
wS	22	#4	7'-8"	113
wV	22	#5	8'-8"	199
Reinforcing Steel			Lb	3,656
Class "C" Concrete			CY	18.7

TYPE 5XB28 BEAMS

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	1¼"D	1'-8"	14
H	8	#6	33'-8"	405
L	18	#6	4'-0"	108
S	30	#5	11'-4"	355
U	4	#6	8'-0"	48
V	33	#5	9'-9"	336
wH1	14	#6	13'-5"	282
wH2	20	#6	11'-8"	350
wS	26	#4	7'-8"	133
wV	26	#5	10'-0"	271
Reinforcing Steel			Lb	4,055
Class "C" Concrete			CY	21.3

TYPE 5XB34 BEAMS

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	1¼"D	1'-8"	14
H	8	#6	33'-8"	405
L	18	#6	4'-0"	108
S	30	#5	11'-4"	355
U	4	#6	8'-0"	48
V	33	#5	10'-9"	370
wH1	14	#6	14'-5"	303
wH2	20	#6	12'-8"	381
wS	28	#4	7'-8"	143
wV	28	#5	11'-0"	321
Reinforcing Steel			Lb	4,201
Class "C" Concrete			CY	23.0

TYPE 5XB40 BEAMS

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	1¼"D	1'-8"	14
H	8	#6	33'-8"	405
L	18	#6	4'-0"	108
S	30	#5	11'-4"	355
U	4	#6	8'-0"	48
V	33	#5	11'-9"	404
wH1	14	#6	16'-5"	345
wH2	20	#6	14'-8"	441
wS	32	#4	7'-8"	164
wV	32	#5	12'-0"	401
Reinforcing Steel			Lb	4,438
Class "C" Concrete			CY	25.5

(5) See Span details for "Y" value.

(7) Omit Dowels D at end of unit. Deduct 14 lbs from reinforcing steel total.

(9) Spacing based on beam type:
XB20 ~ 2 Equal Spaces
XB28 ~ 3 Equal Spaces
XB34 ~ 3 Equal Spaces
XB40 ~ 3 Equal Spaces

(12) Quantities shown are for one Abutment only (with Approach Slab). With no Approach Slab, add 1.3 CY Class "C" Concrete and 202 Lbs Reinforcing Steel for 4 additional H bars.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

ABUTMENTS

TYPE 5XB20 THRU 5XB40 PRESTR CONC X-BEAMS

32' ROADWAY

AXB-32

FILE: xbstde41.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
©TxDOT June 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		74

DATE: 5/7/2021 1:49:08 PM
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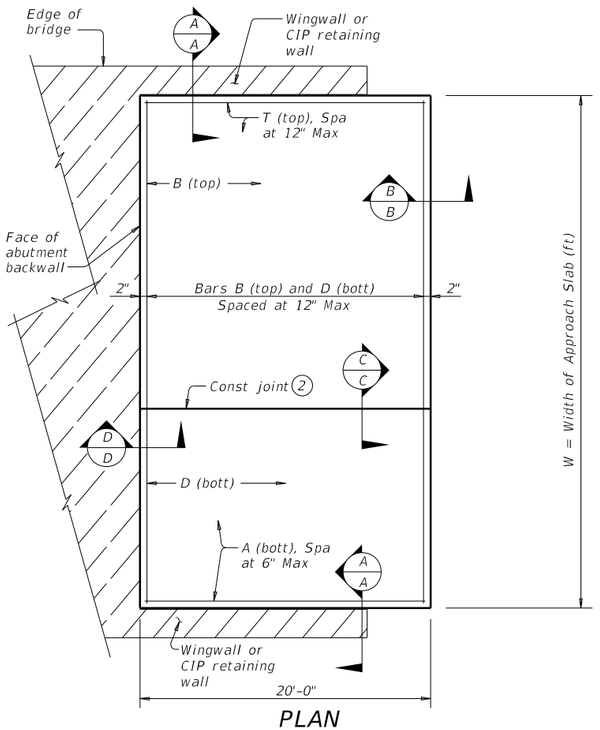
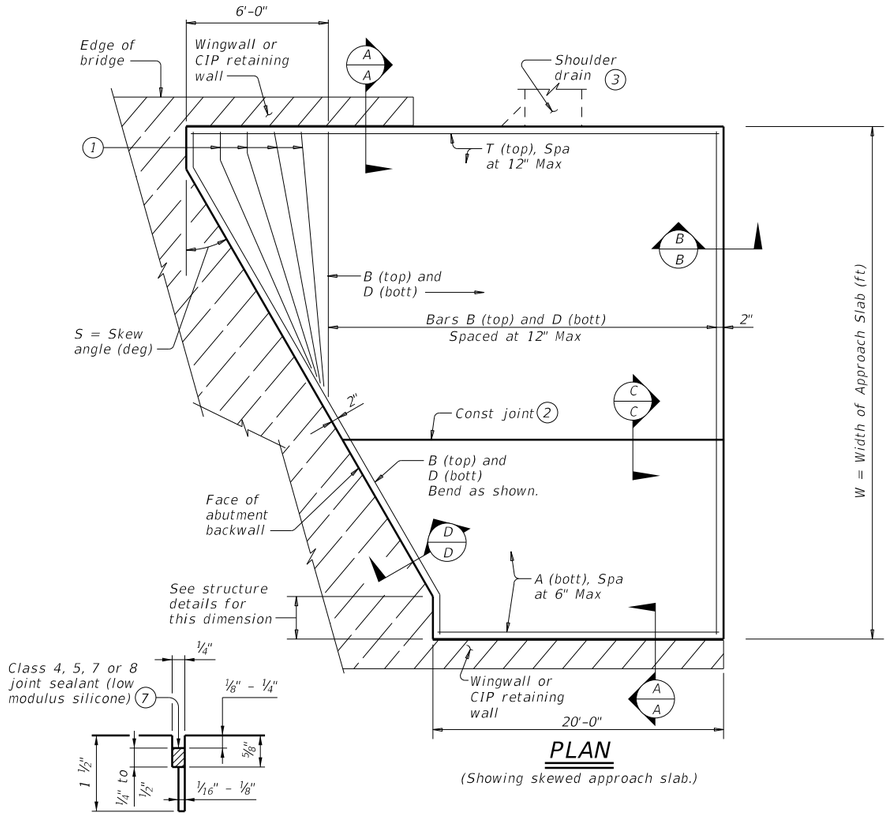


PLAN

(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.

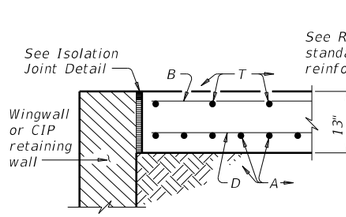
(5) Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.

(6) See details elsewhere in plans for required cross-slope.

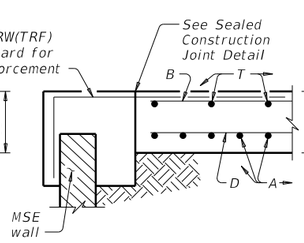
(7) Place in accordance with Item 438.

(8) Provide backer rod that is 25% larger than joint opening and compatible with the sealant.

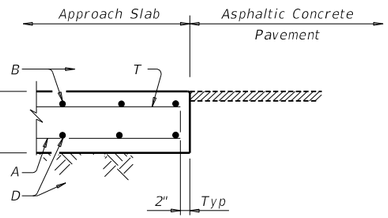
(9) If bridge rail is present at the wingwall or CIP retaining wall, place ½" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

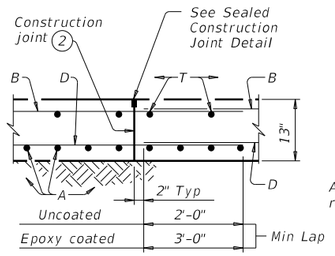


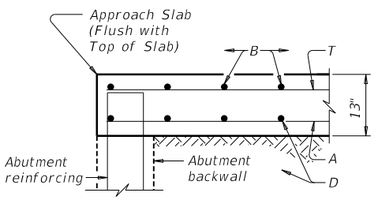
SHOWING WINGWALL OR CIP RETAINING WALL



SHOWING MSE WALL





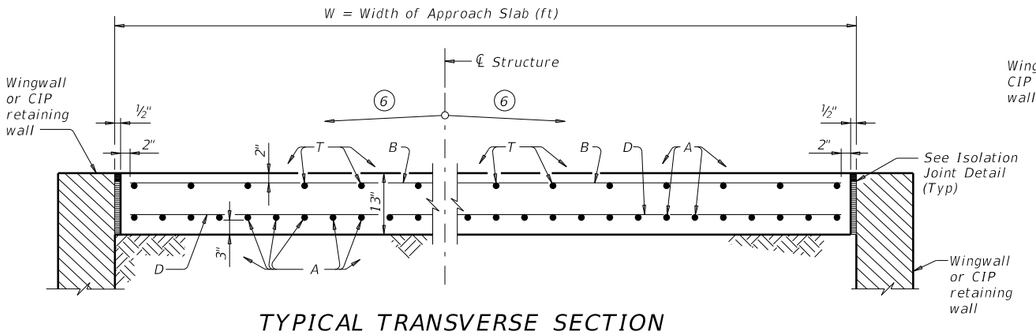


SECTION A-A

SECTION B-B

SECTION C-C (5)

SECTION D-D



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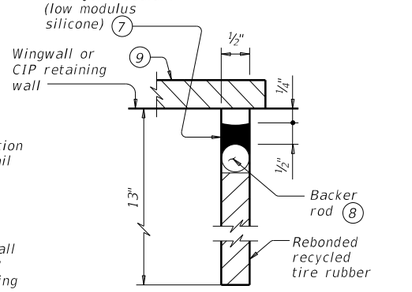
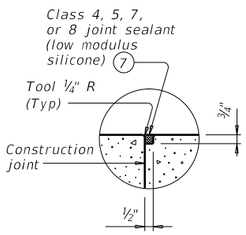


ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

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

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 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.

Texas Department of Transportation

Bridge Division Standard

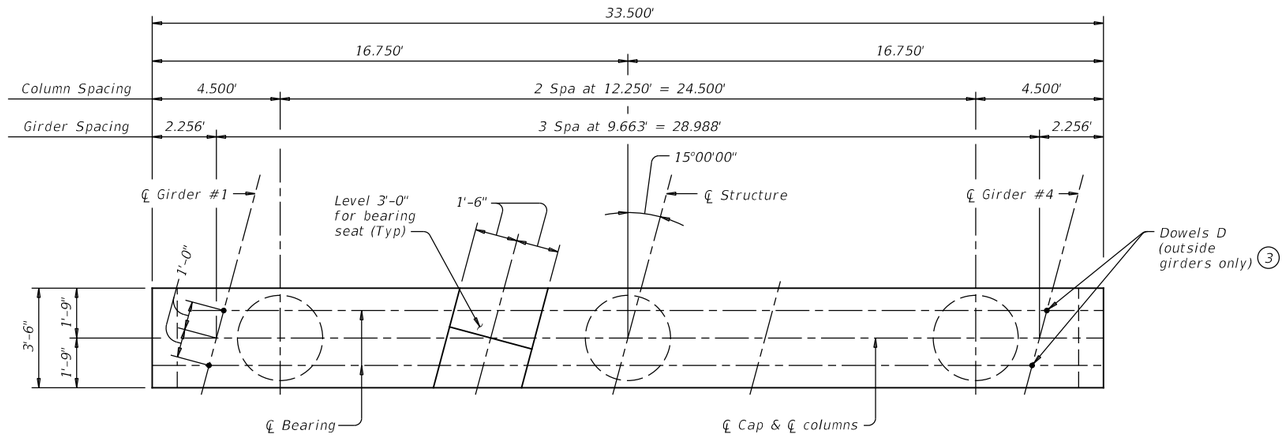
BRIDGE APPROACH SLAB

ASPHALTIC CONCRETE PAVEMENT

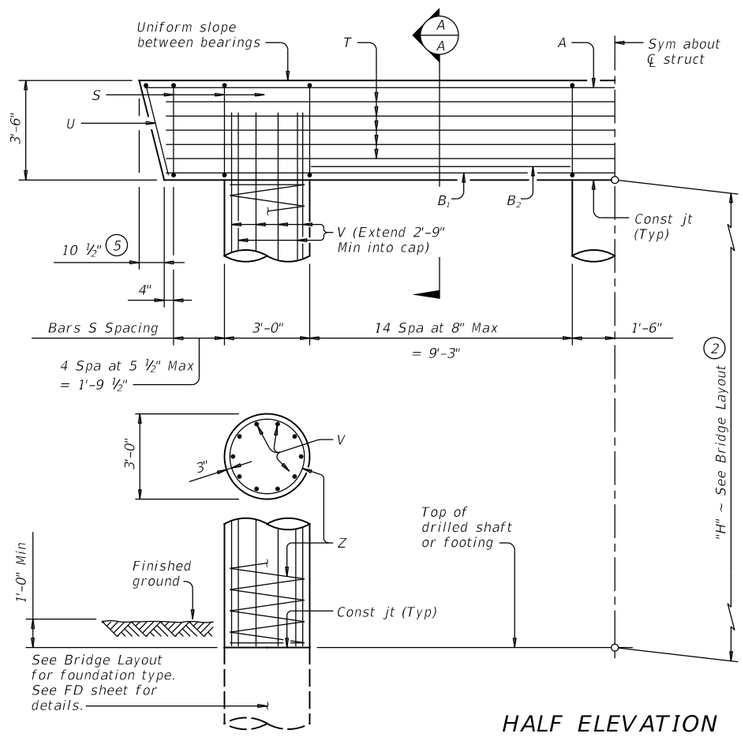
BAS-A

FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		75

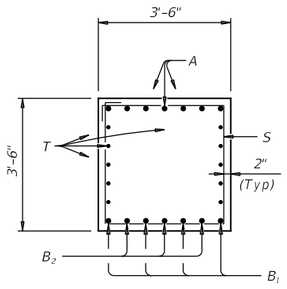
DATE:
FILE:



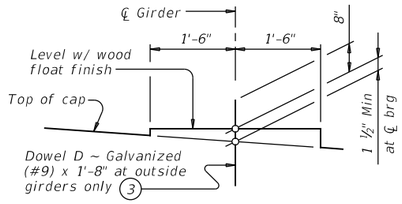
PLAN



HALF ELEVATION

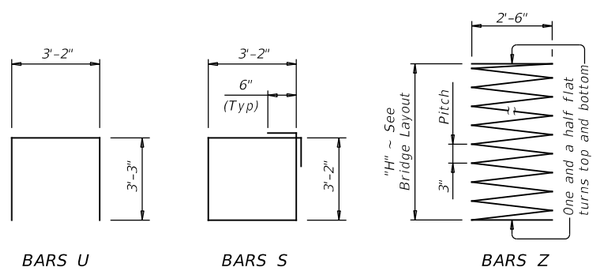


SECTION A-A



BEARING SEAT DETAIL

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



(1) Quantities shown are based on an "H" value of 36'. For each linear foot variation in "H" value, make the following adjustments:
Bars V length, 1'-0"
Bars Z length, 31'-5"
Reinforcing steel, 165 Lb
Class "C" conc (col), 0.78 CY

(2) This standard may not be used for "H" heights exceeding 36'. In areas of very soft soil or where scour is anticipated, allowable "H" heights must be evaluated by the Engineer prior to the use of this standard.

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

(4) Foundation Loads based on "H" = 36'.

(5) Measured parallel to top of cap cross-slope.

TABLE OF ESTIMATED QUANTITIES (1)

Bar	No.	Size	Length	Weight
A	7	#11	33'- 0"	1,227
B_1	4	#11	31'- 6"	670
B_2	6	#11	9'- 3"	295
D (3)	4	#9	1'- 8"	23
S	40	#5	13'- 8"	570
T	10	#5	31'- 6"	329
U	2	#5	9'- 8"	20
V	30	#9	38'- 9"	3,953
Z	3	#4	1,154'- 7"	2,314
Reinforcing Steel			Lb	9,401
Class "C" Concrete (Cap)			CY	15.0
Class "C" Concrete (Col)			CY	28.3

FOUNDATION LOADS (4)

Span Average	Drilled Shaft Loads	Pile Load (Tons/Pile)		
		3 Pile Ftg	4 Pile Ftg	5 Pile Ftg
Ft	Tons/Shaft			
40	113	41	31	26
45	122	44	34	28
50	130	47	36	29
55	139	50	38	31
60	147	52	40	33
65	155	55	42	34
70	164	58	44	36
75	172	61	46	38
80	180	63	48	39
85	189	66	50	41
90	197	69	52	43
95	205	72	54	44
100	213	74	56	46
105	221	77	58	47
110	230	80	61	49
115	238	83	63	51
120	246	85	65	52

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
See Bridge Layout for foundation type, size and length.
See Common Foundation Details (FD) standard sheet for all foundation details and notes.
See Shear Key (IGSK) standard sheet for all shear key details and notes, if applicable.
Bent selected must be based on the average span length rounded up to the next 5 ft increment.
Details are drawn showing right forward skew. See Bridge Layout for actual skew directions.
These bent details may be used with standard SIG-32-15 only.

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

MATERIAL NOTES:

Provide Class C concrete (f'c = 3,600 psi).
Provide Class C (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 reinforcing steel.
Galvanize dowel bars D.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

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

BIG-32-15

FILE: big42sts-17.dgn	DN: TAR	CK: SDB	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		76

DATE: 5/7/2021 1:49:09 PM
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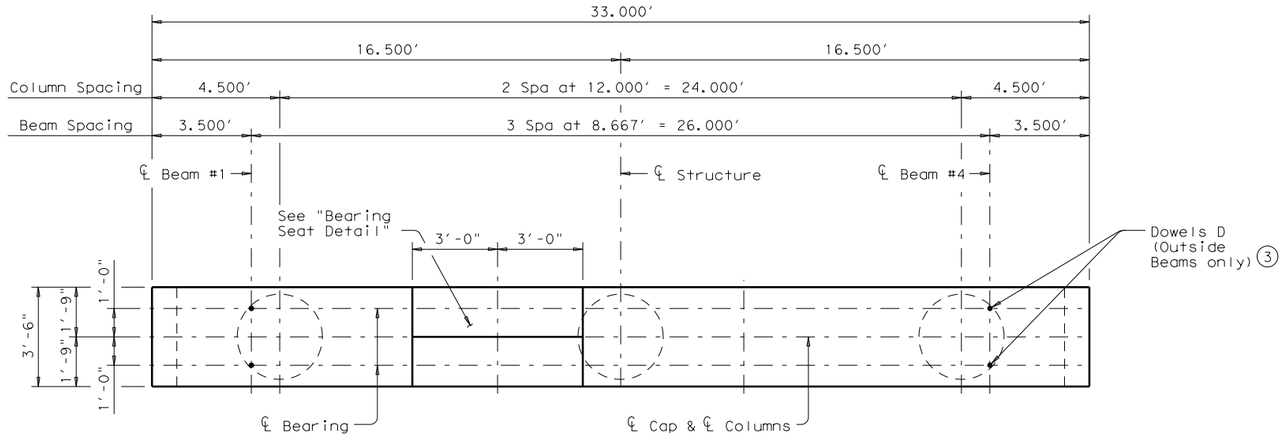
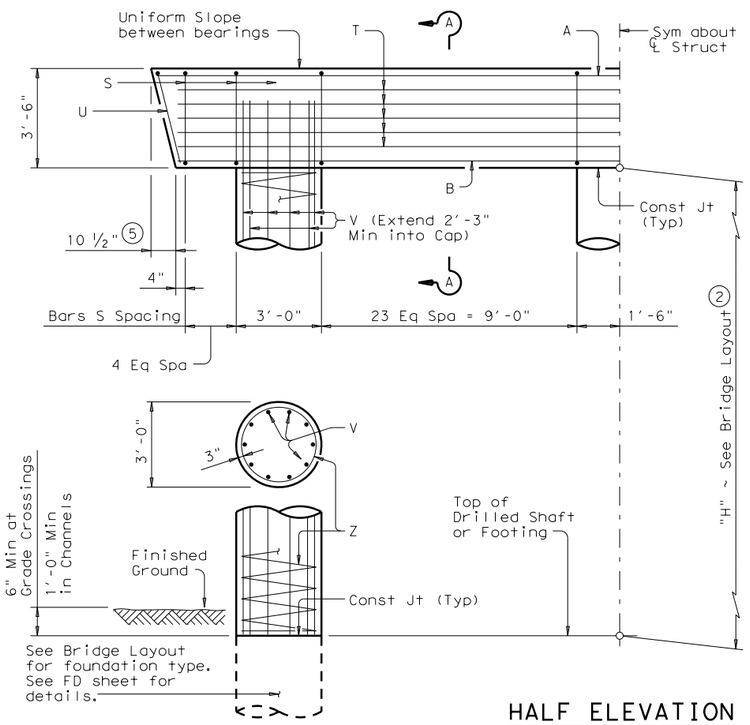
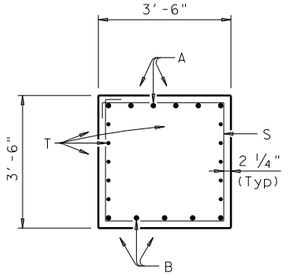


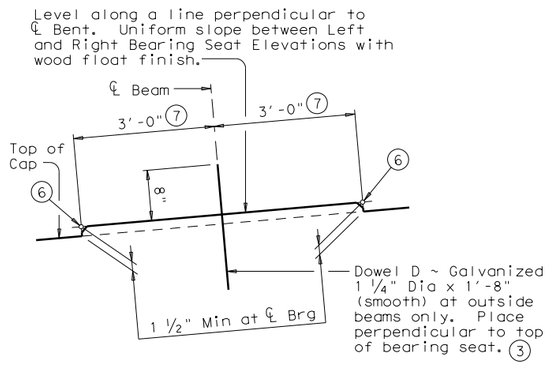
PLAN



HALF ELEVATION

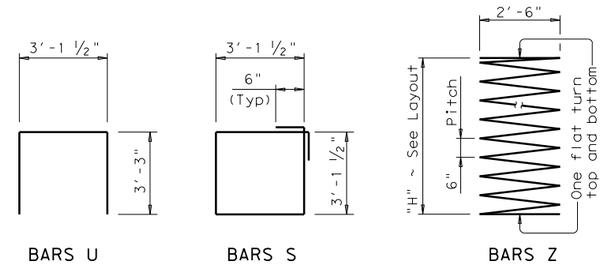


SECTION A-A



BEARING SEAT DETAIL

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



BARS U BARS S BARS Z

① Quantities shown are based on an "H" value of 36′. For each linear foot variation in "H" value, make the following adjustments:
Bars V length, 1′-0"
Bars Z length, 15.740′
Reinforcing Steel, 120 Lb
Class "C" Conc (Col), 0.785 CY

② This standard may not be used for "H" heights exceeding 36′. In areas of very soft soil or where scour is anticipated, allowable "H" heights must be evaluated by the Engineer prior to the use of this standard.

③ Omit Dowels D at end of units. Adjust reinforcing steel total accordingly.

④ Foundation Loads based on "H" = 36′.

⑤ Measured parallel to top of cap cross-slope.

⑥ Right and left elevations and locations are provided elsewhere.

⑦ Measured along ℄ of Bearing.

TABLE OF ESTIMATED QUANTITIES ①

Bar	No.	Size	Length	Weight
A	6	#11	32′- 6"	1,036
B	5	#11	31′- 0"	824
D ③	4	1 ¼"D	1′- 8"	28
S	58	#5	13′- 6"	817
T	10	#5	31′- 0"	323
U	2	#5	9′- 8"	20
V	30	#9	38′- 3"	3,902
Z	3	#3	583′- 0"	658
Reinforcing Steel			Lb	7,608
Class "C" Concrete (Cap)			CY	15.0
Class "C" Concrete (Col)			CY	28.3

FOUNDATION LOADS ④

Span Average	Drilled Shaft Loads	Pile Load (Tons/Pile)		
		3 Pile Ftg	4 Pile Ftg	5 Pile Ftg
Ft	Tons/Shaft			
40	121	44	33	27
45	130	47	36	29
50	140	50	38	31
55	149	53	40	33
60	159	56	43	35
65	168	59	45	37
70	177	62	47	39
75	186	65	50	41
80	195	68	52	42
85	205	71	54	44
90	214	74	57	46
95	223	77	59	48
100	232	81	61	50
105	241	84	63	51

GENERAL NOTES:
Designed according to AASHTO LRFD Specifications.
Concrete strength f′c = 3,600 psi.
All Cap reinforcing must be Grade 60.
Galvanize dowel bars D.
Column and Drilled Shaft reinforcing may be Grade 40.
See Bridge Layout for foundation type, size and length.
See Foundation Detail standard FD for all foundation details and notes.
Bent selected must be based on the average span length rounded up to the next 5 Ft increment.
These bent details may be used with Standard SXB-32 only.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

INTERIOR BENTS

TYPE 5XB20 THRU 5XB40 PRESTR CONC X-BEAMS

32' ROADWAY

BXB-32

FILE: xbstde44.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
©TxDOT June 2011 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		77

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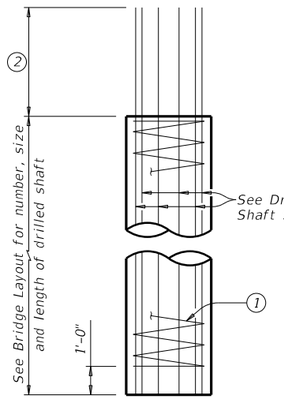
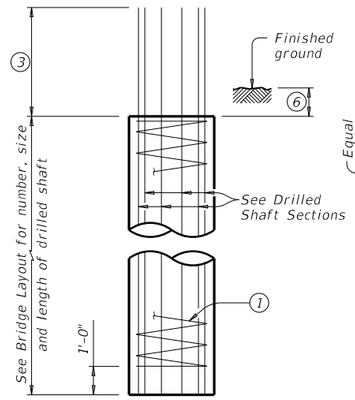
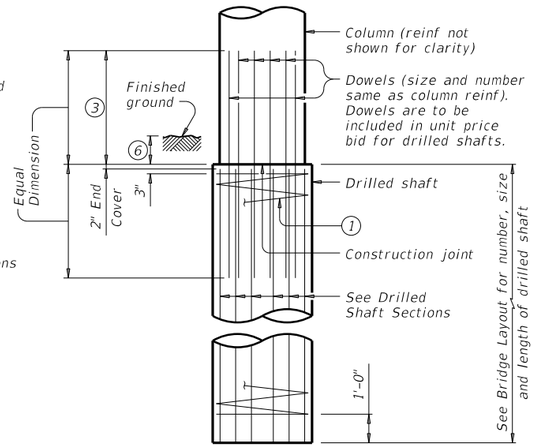


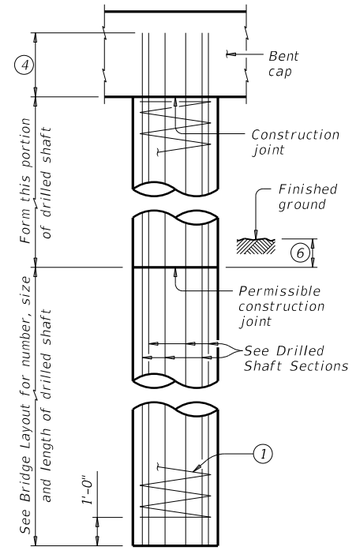
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



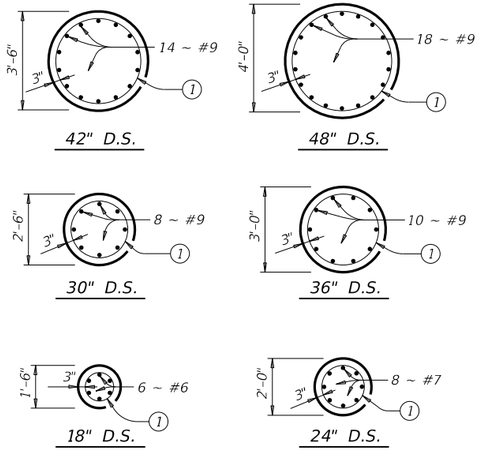
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

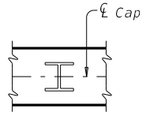


DRILLED SHAFT SECTIONS

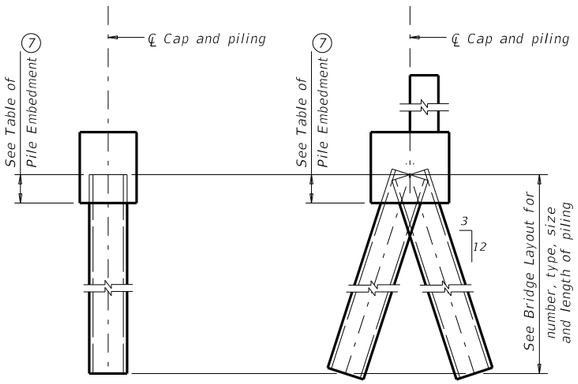
DRILLED SHAFT DETAILS

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

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

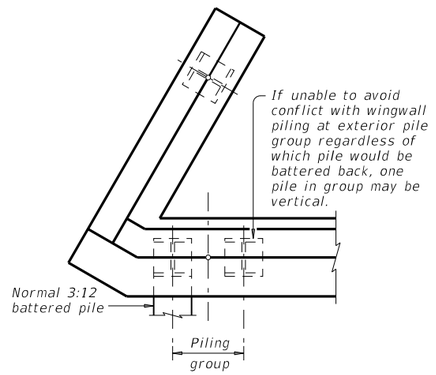


ORIENTATION OF STEEL H-PILING

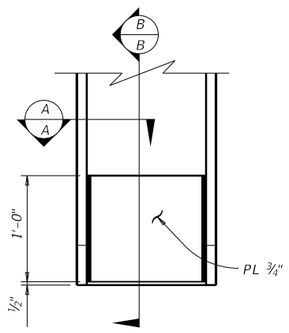


VERTICAL PILE BATTERED PILE

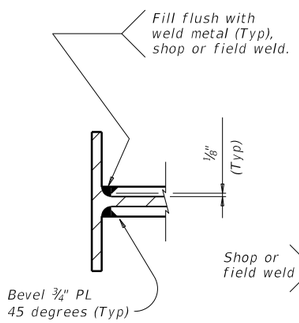
PILING DETAILS
(Concrete or steel H)



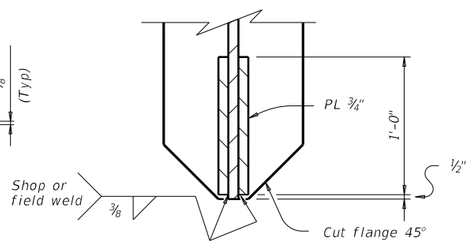
DETAIL "A"
(Showing plan view of a 30° skewed abutment)



ELEVATION



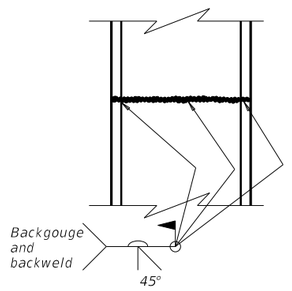
SECTION A-A



SECTION B-B

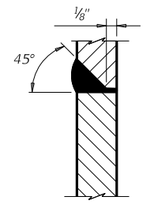
STEEL H-PILE TIP REINFORCEMENT

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



STEEL H-PILE SPLICE DETAIL

Use when required.



SECTION THRU FLANGE OR WEB

(1) #3 spiral at 6" pitch (one and a half flat turns top and bottom).

(2) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-0"
#9 Bars = 2'-3"

(3) Min lap with column reinf:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(4) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-3"
#9 Bars = 2'-9"

(5) Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

Texas Department of Transportation

Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS 01-20: Added #11 bars to the FD bars.	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		78

DATE: 5/7/2021 1:49:10 PM
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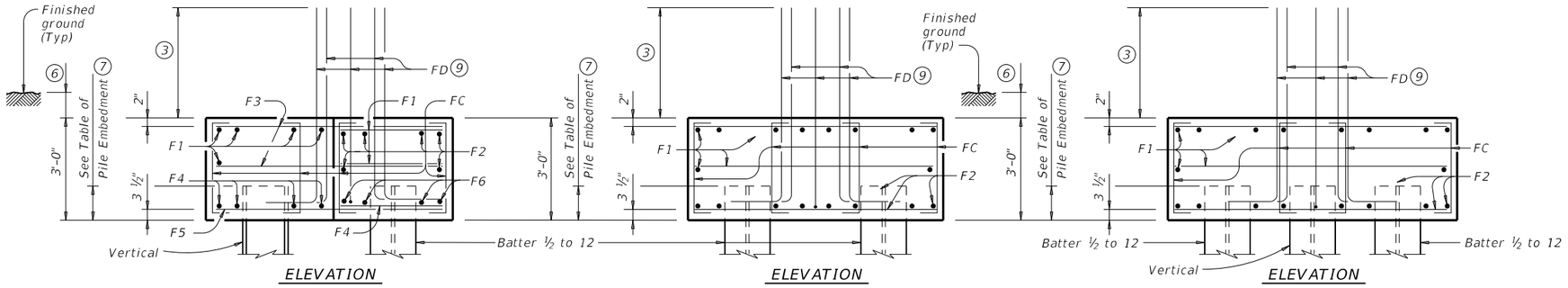
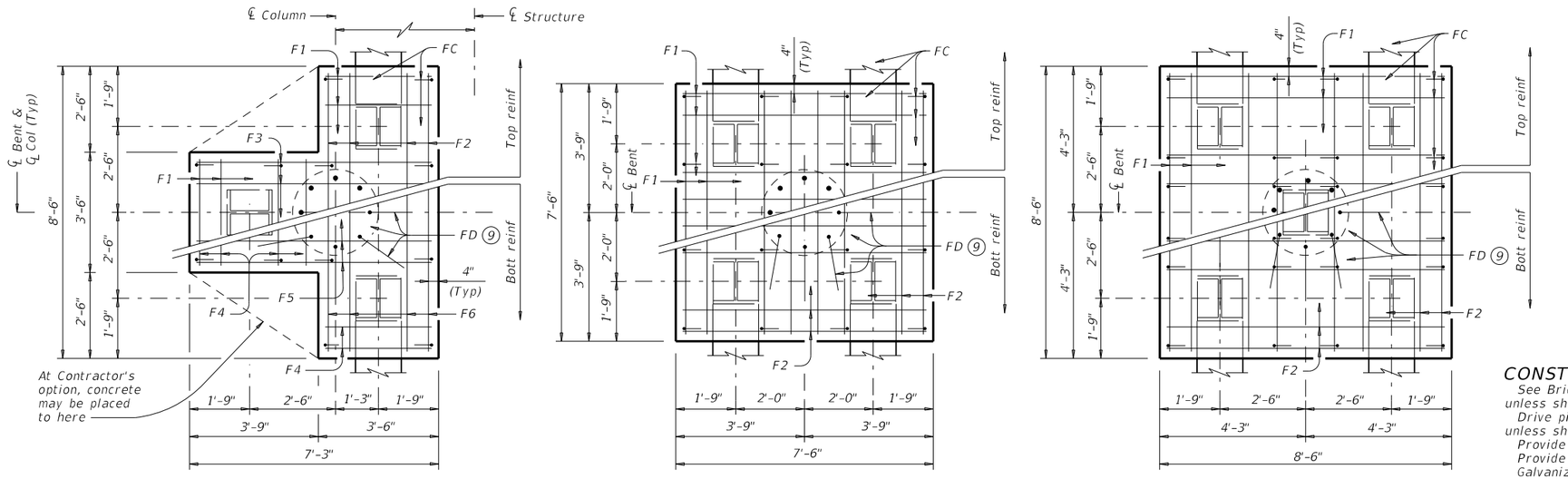




THREE PILE FOOTING (8)

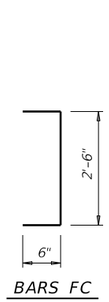
For 36" Dia and smaller columns.

FOUR PILE FOOTING (8)

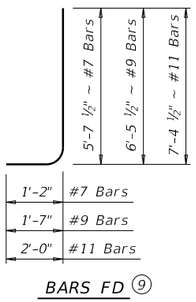
For 42" Dia and smaller columns.

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: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS 01-20: Added #11 bars to the FD bars.	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		79

DATE:
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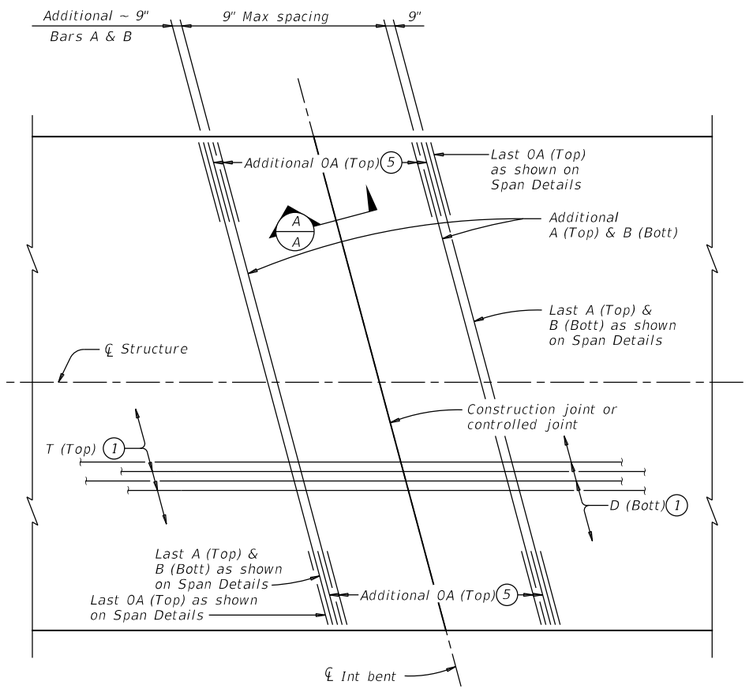
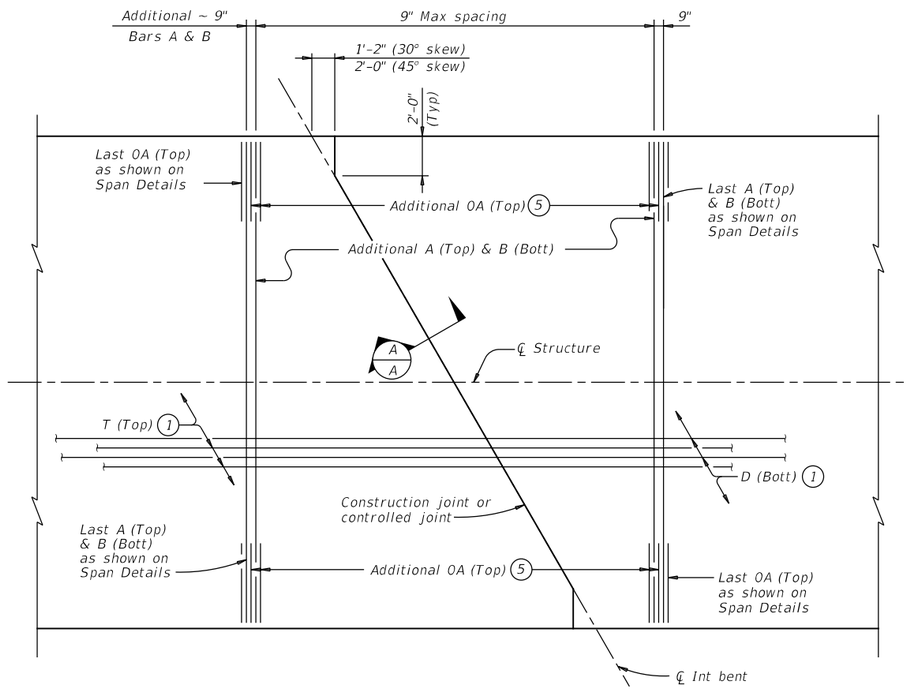


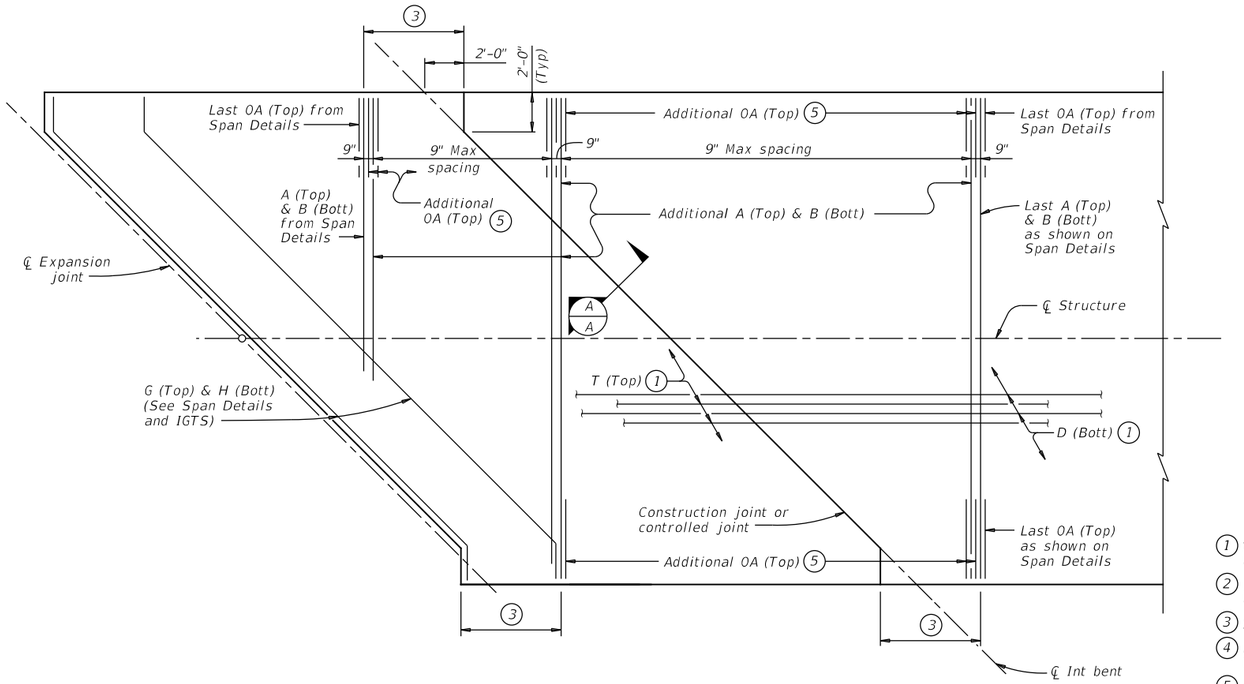
PLAN FOR 0° OR 15° SKEW

(Showing 15° skew)



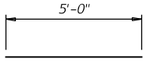
PLAN FOR 30° OR 45° SKEW

(Showing 30° skew)

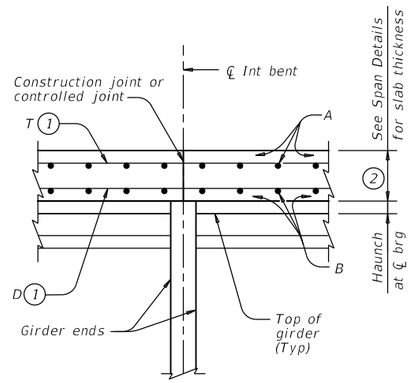


PLAN FOR 45° SKEW 4

(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-38, IGSD-40 and IGSD-44.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

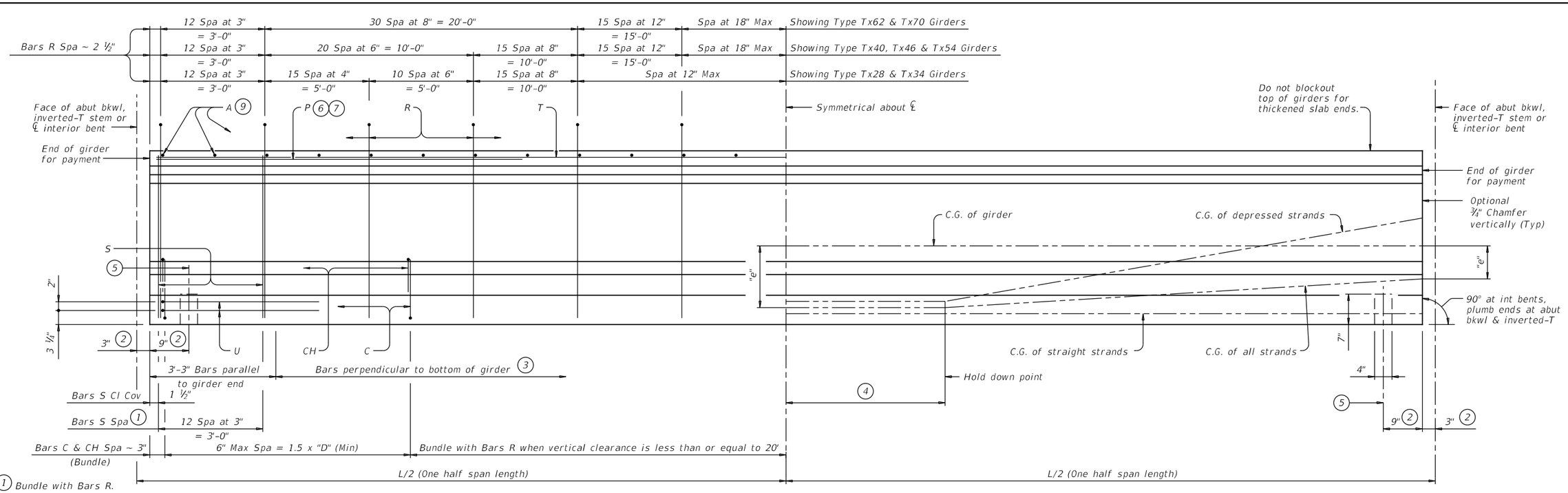
CONTINUOUS SLAB DETAILS

PRESTR CONC I-GIRDER SPANS

IGCS

FILE: igcs1sts-19.dgn	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
10-19: Added bubble note 6.	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		80

DATE:
FILE:



(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.

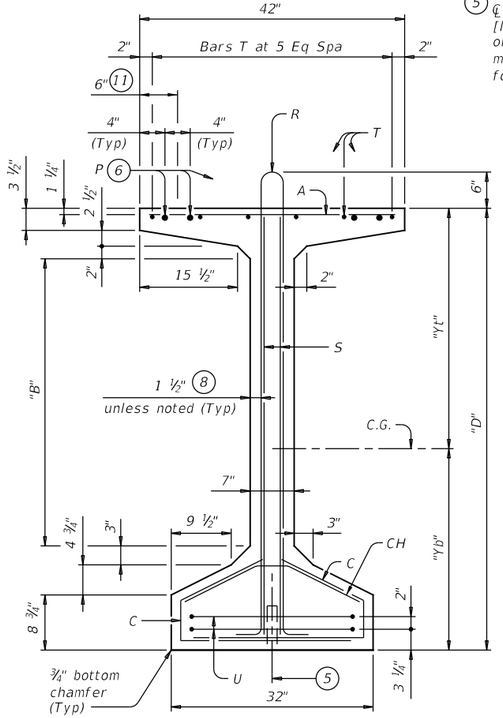
(7) Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

(8) 1 ⅜" Clear Cover to Bars S.

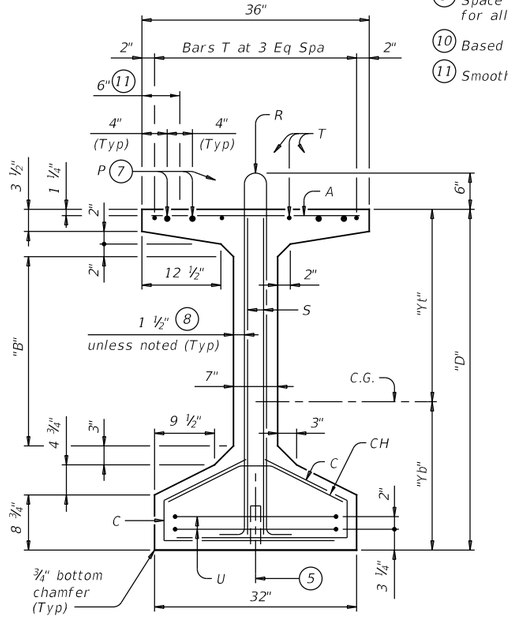
(9) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

(10) Based on 155 pcf total weight of concrete and reinforcing steel.

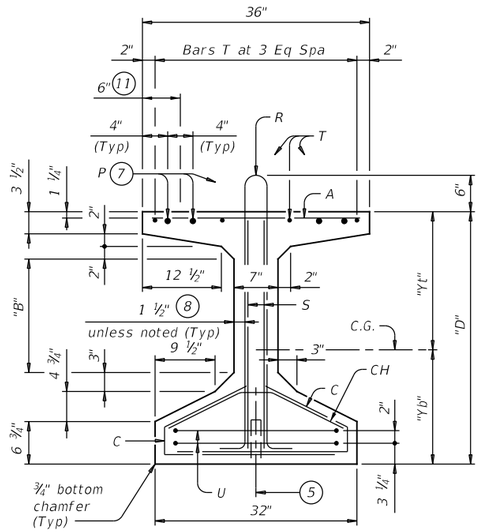
(11) Smooth trowel finish on the slab overhang side of exterior girder.



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.

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

HL93 LOADING

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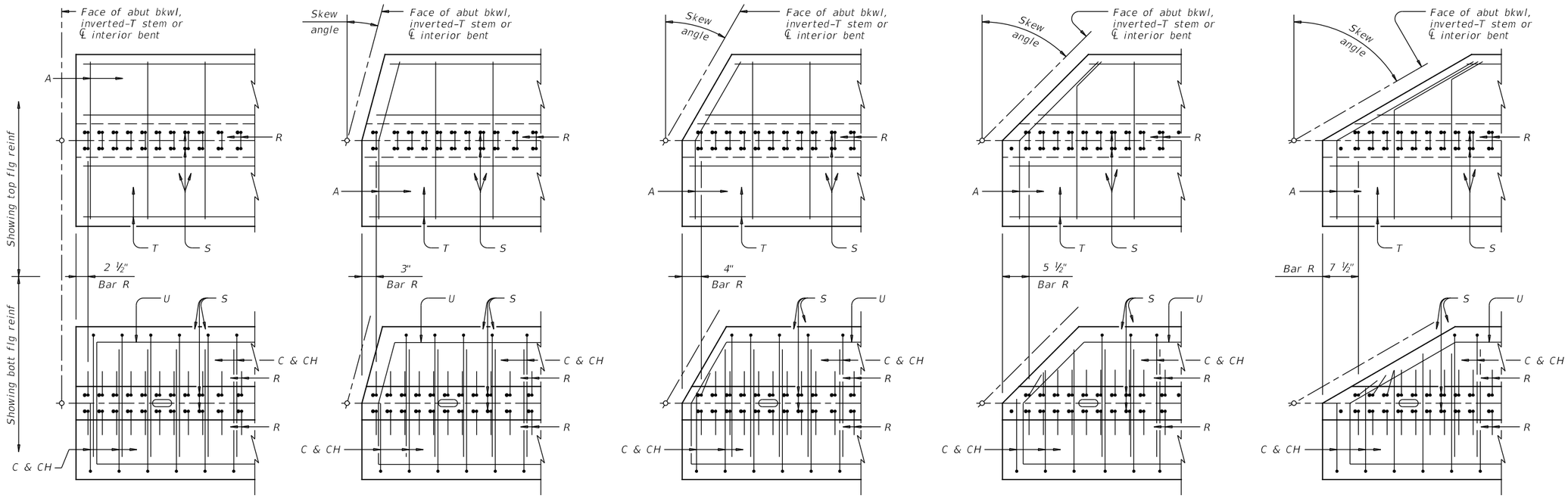
PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

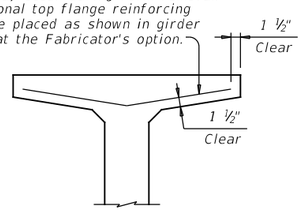
FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
10-19: Added Bars C and CH full length for VC<= 20'	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		81

DATE:
FILE:

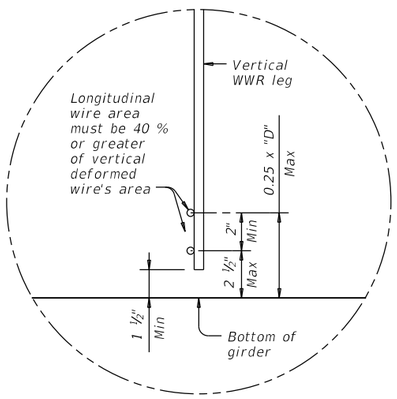


PLAN OF GIRDER ENDS (12)

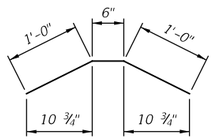
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



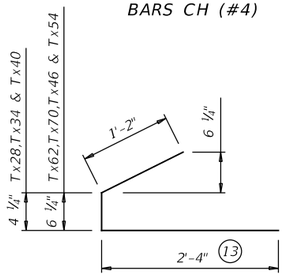
OPTIONAL TOP FLANGE REINFORCING DETAIL



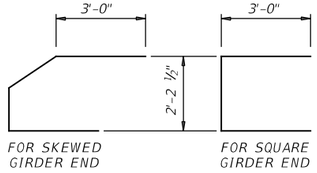
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



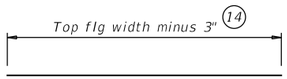
BARS CH (#4)



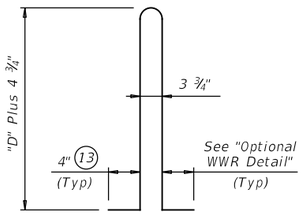
BARS C (#4)



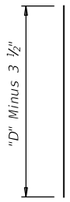
BARS U (#5)



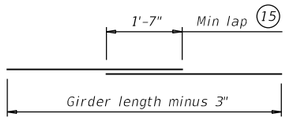
BARS A (#3)



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.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

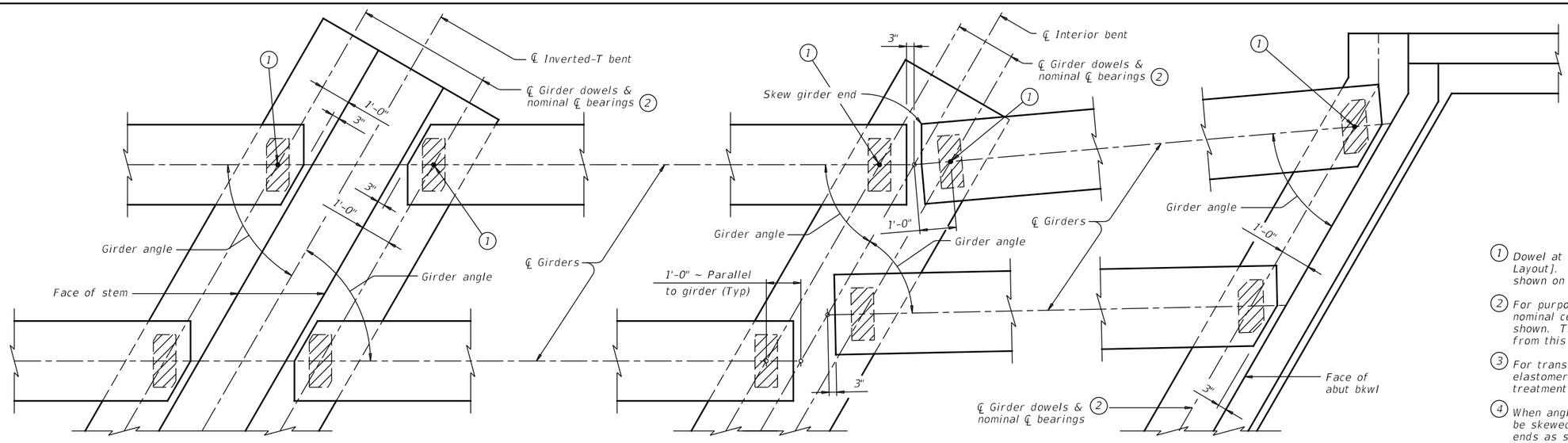
Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
10-19: Added Bars C and CH full length for VC<= 20'	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		82

DATE:
FILE:



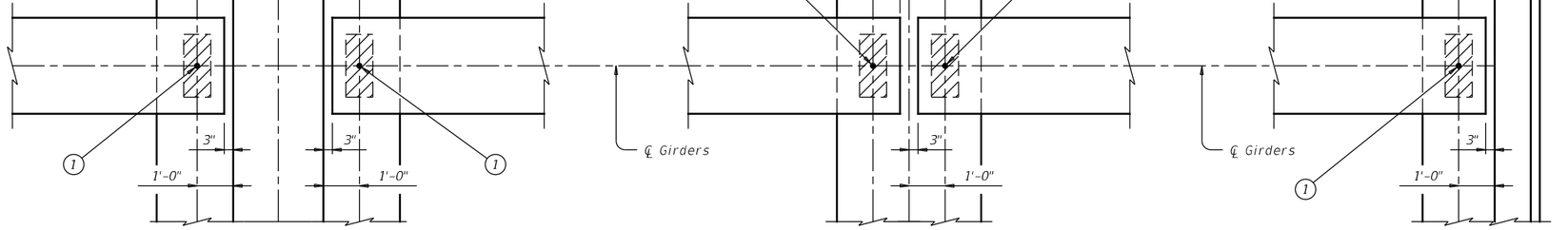
(1) Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(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.

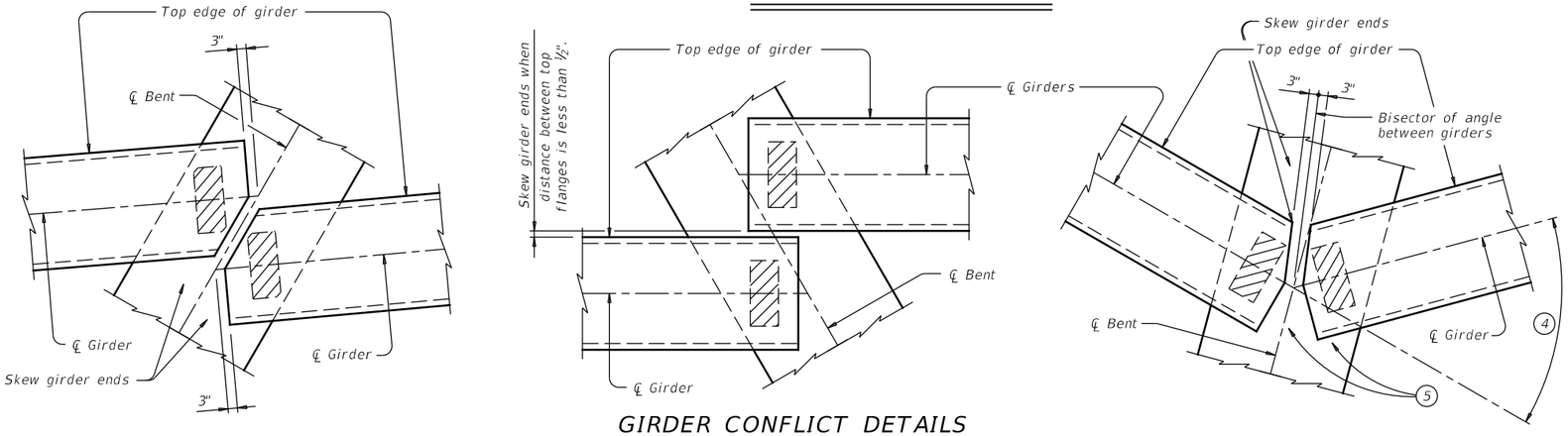
(3) For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.

(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.



GIRDER END DETAILS



GIRDER CONFLICT 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".

HL93 LOADING

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

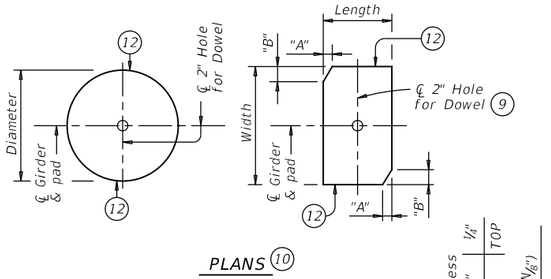
ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

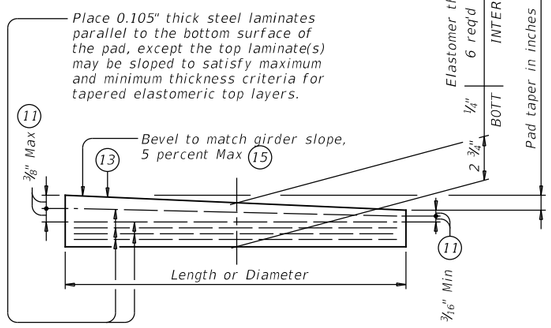
IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		83

DATE:
FILE:



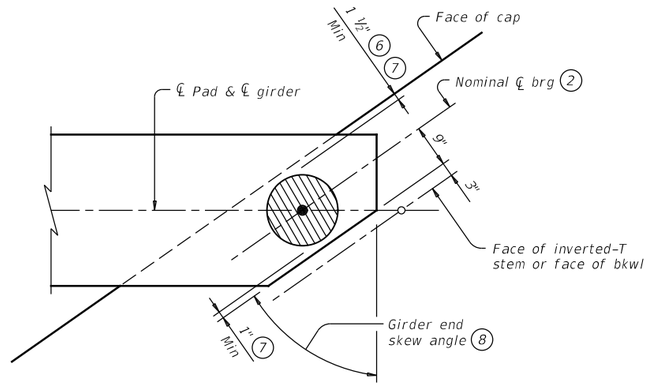
PLANS (10)



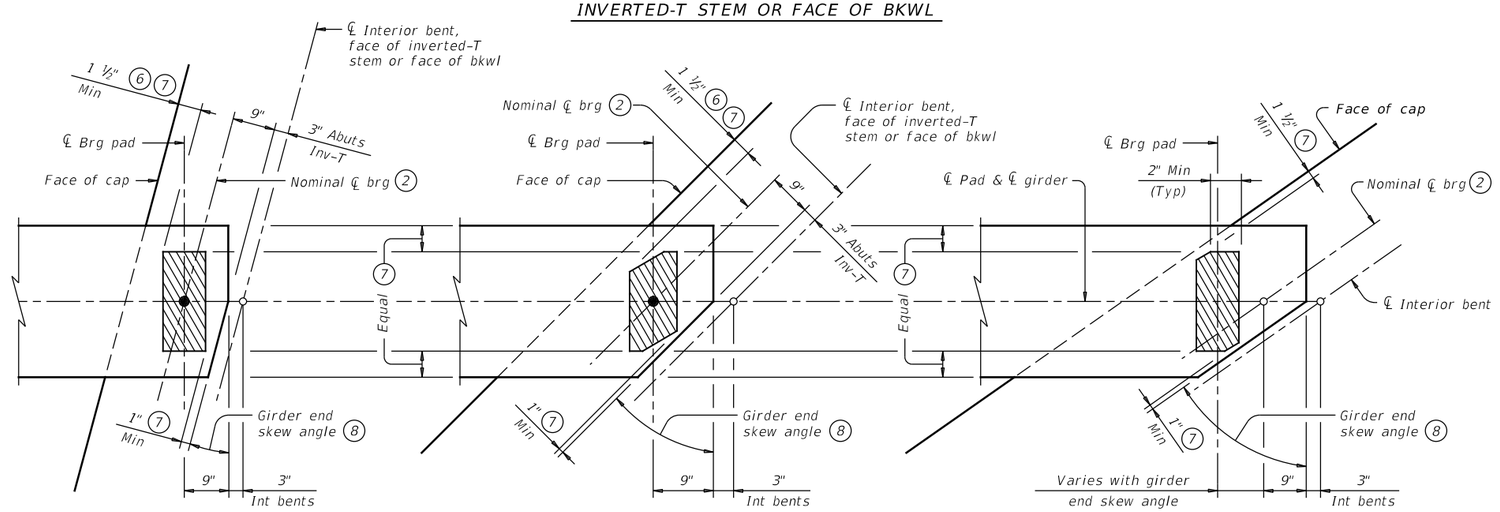
ELEVATION

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

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		84

DATE:
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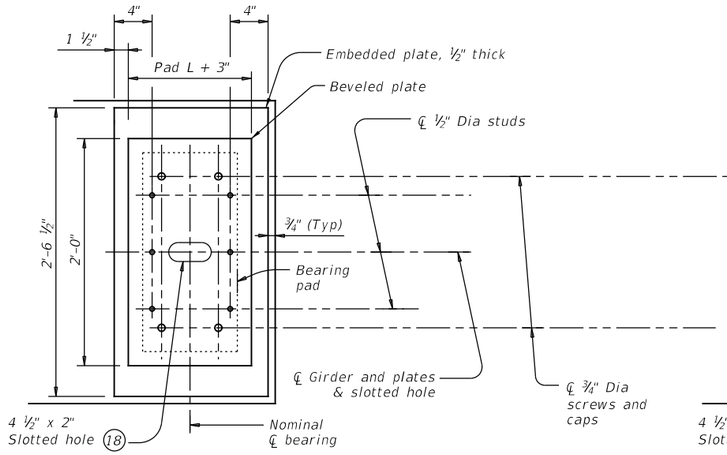
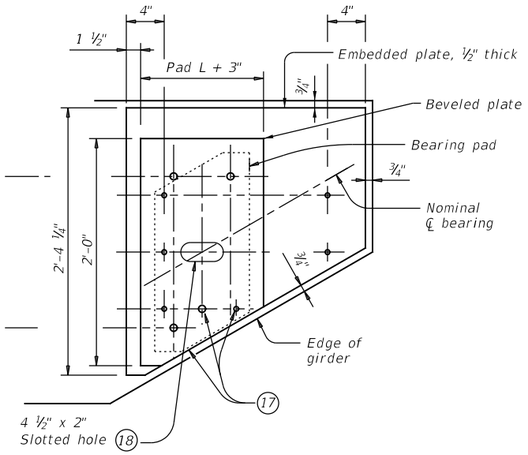
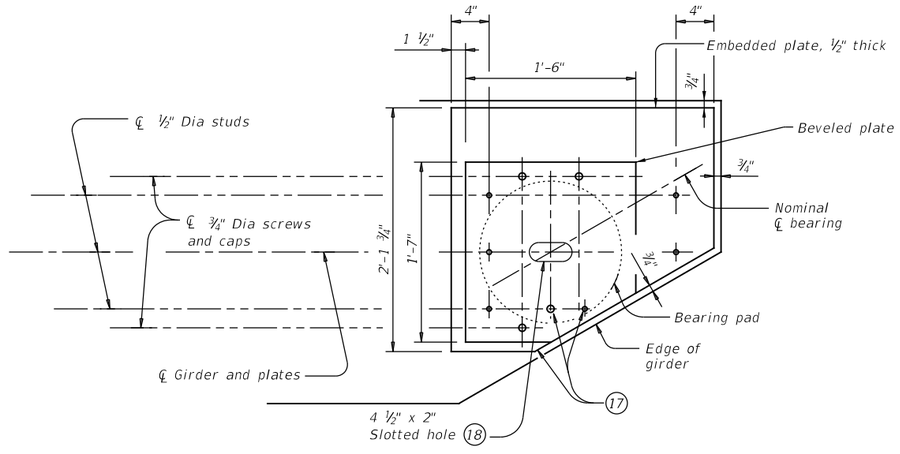


NORMAL GIRDER END
RECTANGULAR BEARING PAD

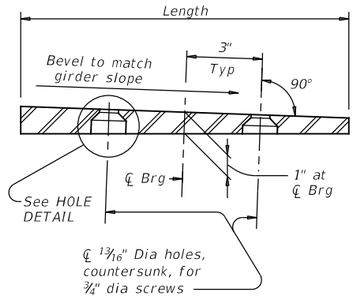


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

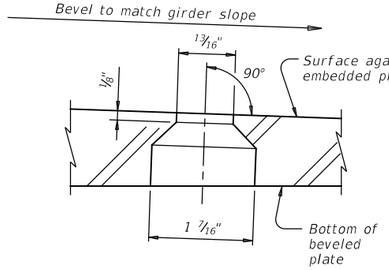


SKEWED GIRDER END
15" DIA BEARING PAD

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.

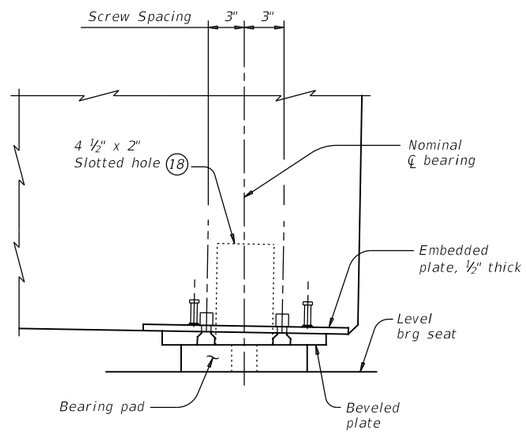
When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

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

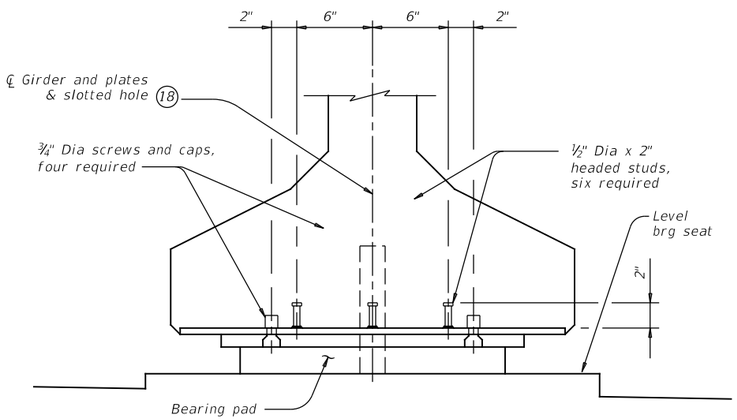
¾" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a ¾" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga 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

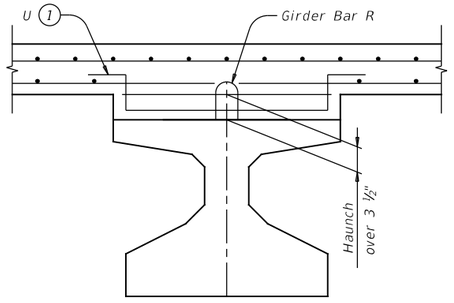
Texas Department of Transportation
Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

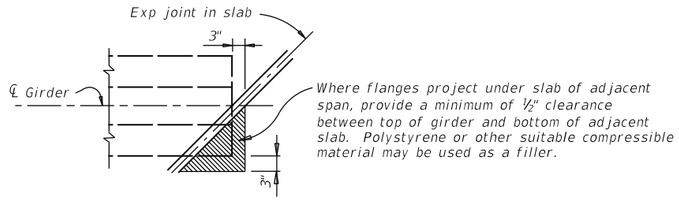
IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		85

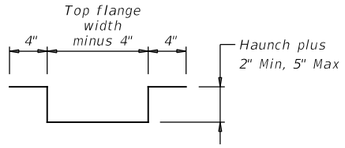
DATE:
FILE:



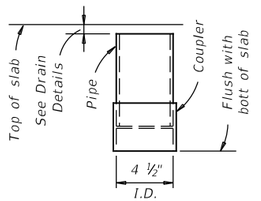
HAUNCH REINFORCING DETAIL



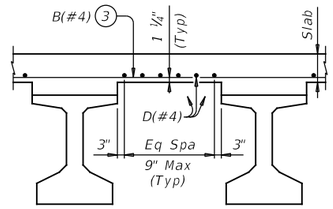
TREATMENT AT GIRDER END FOR SKEWED SPANS



BARS U (#4)

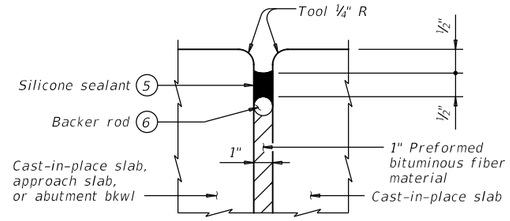


C-I-P DRAIN DETAIL (2)

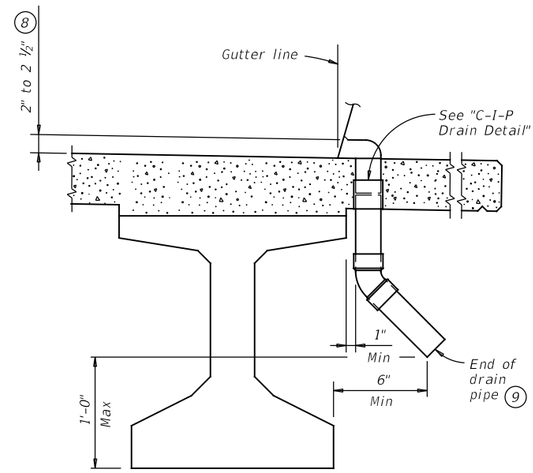


TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

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

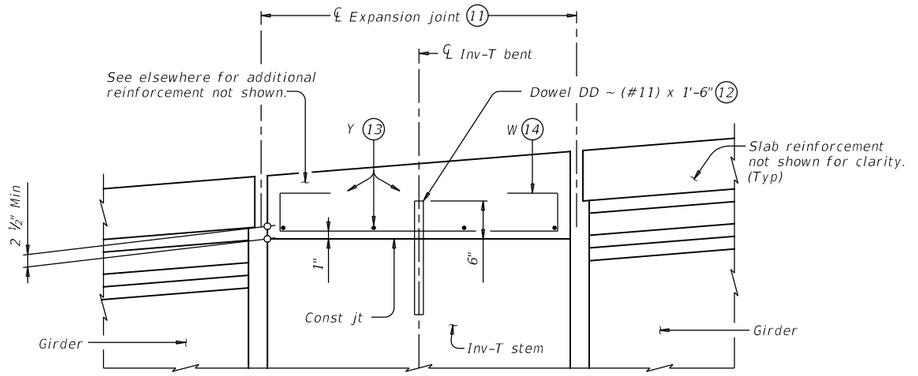
MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

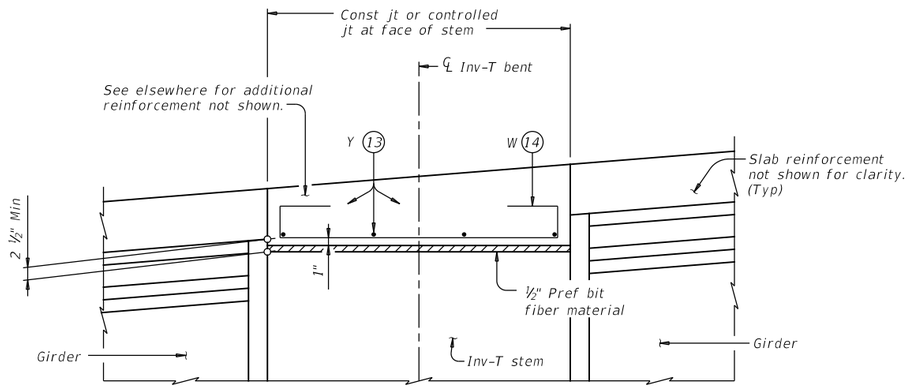
IGMS

FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS: 10-19: Modified Note 7. Type A now a pay item.	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		86

DATE:
FILE:

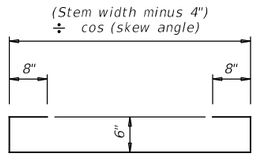


SHOWING EXPANSION JOINTS

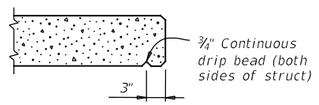


SHOWING CONST JTS OR CONTROLLED JTS

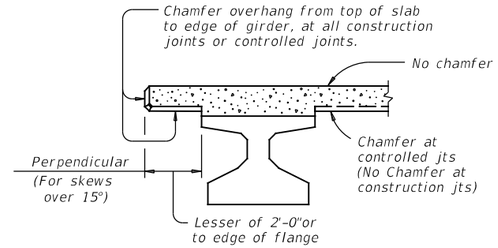
REINFORCEMENT OVER INV-T BENTS



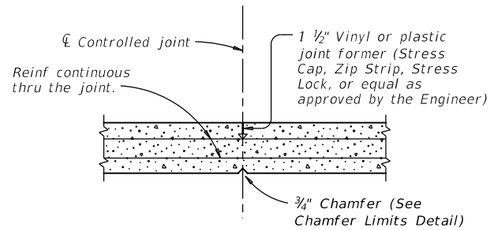
BARS W (#4)



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: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT			
©TxDOT August 2017	CONT	SECT	JOB		HIGHWAY		
REVISIONS	1191	03	033, ETC.		FM 1245, ETC.		
10-19: Modified Note 7, Type A now a pay item.	DIST	COUNTY			SHEET NO.		
	WACO	LIMESTONE			87		

DATE:
FILE:

STRUCTURE	DESIGNED GIRDERS								DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING		
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.	TO END	RELEASE STRGTH (1)	MINIMUM 28 DAY COMP STRGTH	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE	STRGTH	"e" ℄	"e" END												
						(in)	fpu (ksi)	(in)	(in)		(in)	f'ci (ksi)	f'c (ksi)	fct(ksi)	fcb(ksi)	(kip-ft)	Moment	Shear	Inv	Opr	Inv
Type Tx28 Girders 32' Roadway 8.5" Slab	40	ALL	Tx28		14	0.6	270	10.48	9.34	2	10.5	4.000	5.000	1.189	-1.700	1731	0.850	1.070	1.58	2.04	2.01
	45	ALL	Tx28		14	0.6	270	10.48	9.34	2	10.5	4.000	5.400	1.507	-2.077	1717	0.820	1.080	1.48	1.91	1.57
	50	ALL	Tx28		16	0.6	270	10.23	9.23	4	8.5	4.000	5.800	1.853	-2.508	2040	0.800	1.080	1.39	1.80	1.30
	55	ALL	Tx28		18	0.6	270	10.04	8.26	4	12.5	4.100	6.400	2.247	-2.980	2377	0.780	1.090	1.26	1.69	1.07
	60	ALL	Tx28		22	0.6	270	9.75	7.57	4	16.5	4.800	6.900	2.655	-3.462	2715	0.760	1.090	1.24	1.82	1.05
	65	ALL	Tx28		26	0.6	270	9.56	7.71	4	16.5	5.600	7.300	3.104	-3.978	3064	0.740	1.100	1.09	1.76	1.07
Type Tx34 Girders 32' Roadway 8.5" Slab	40	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	0.934	-1.303	1975	0.880	1.050	1.77	2.29	2.35
	45	ALL	Tx34		14	0.6	270	13.01	12.15	2	8.5	4.000	5.000	1.180	-1.588	2124	0.850	1.060	1.75	2.27	2.11
	50	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000	1.437	-1.907	2248	0.830	1.060	1.64	2.13	1.82
	55	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000	1.739	-2.263	2449	0.810	1.060	1.37	1.77	1.35
	60	ALL	Tx34		18	0.6	270	12.57	11.23	4	10.5	4.000	5.500	2.068	-2.640	2806	0.790	1.070	1.30	1.72	1.17
	65	ALL	Tx34		22	0.6	270	12.28	7.92	4	28.5	4.000	6.000	2.424	-3.039	3173	0.770	1.070	1.59	2.08	1.34
	70	ALL	Tx34		26	0.6	270	12.09	8.09	4	30.5	4.700	6.500	2.807	-3.458	3548	0.750	1.080	1.08	1.81	1.04
	75	ALL	Tx34		30	0.6	270	11.81	7.41	6	28.5	5.200	6.700	3.195	-3.894	3951	0.740	1.080	1.44	1.93	1.12
	80	ALL	Tx34		34	0.6	270	11.48	7.25	6	30.5	5.800	7.000	3.633	-4.373	4378	0.730	1.080	1.23	1.67	1.05
Type Tx40 Girders 32' Roadway 8.5" Slab	40	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	0.768	-1.053	2052	0.910	1.030	2.02	2.62	2.88
	45	ALL	Tx40		14	0.6	270	15.60	15.60			4.700	5.000	0.967	-1.282	2430	0.880	1.040	2.01	2.61	2.63
	50	ALL	Tx40		14	0.6	270	15.60	15.60			4.500	5.000	1.195	-1.554	2558	0.860	1.040	1.91	2.48	2.29
	55	ALL	Tx40		16	0.6	270	15.35	14.35	4	8.5	4.000	5.000	1.442	-1.834	2685	0.830	1.050	1.60	2.07	1.79
	60	ALL	Tx40		18	0.6	270	15.16	13.82	4	10.5	4.000	5.000	1.687	-2.118	2875	0.810	1.050	1.57	2.03	1.61
	65	ALL	Tx40		18	0.6	270	15.16	13.82	4	10.5	4.000	5.000	1.978	-2.447	3277	0.800	1.060	1.31	1.70	1.22
	70	ALL	Tx40		20	0.6	270	15.00	13.40	4	12.5	4.000	5.200	2.288	-2.783	3666	0.780	1.060	1.13	1.68	1.08
	75	ALL	Tx40		24	0.6	270	14.77	9.77	4	34.5	4.100	5.700	2.619	-3.135	4064	0.760	1.060	1.60	2.07	1.26
	80	ALL	Tx40		28	0.6	270	14.60	10.60	4	32.5	4.900	6.000	2.964	-3.509	4498	0.750	1.070	1.27	1.99	1.14
	85	ALL	Tx40		32	0.6	270	14.23	8.60	6	36.5	5.100	6.200	3.328	-3.900	4944	0.740	1.070	1.29	2.04	1.08
	90	ALL	Tx40		36	0.6	270	13.93	9.27	6	34.5	5.900	6.600	3.695	-4.294	5394	0.730	1.070	1.33	1.75	1.07
Type Tx46 Girders 32' Roadway 8.5" Slab	40	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.678	-0.844	2150	0.950	1.020	2.22	2.88	3.41
	45	ALL	Tx46		14	0.6	270	17.60	17.60			4.500	5.000	0.846	-1.024	2543	0.920	1.020	2.22	2.88	3.17
	50	ALL	Tx46		14	0.6	270	17.60	17.60			4.500	5.000	1.041	-1.235	3012	0.890	1.030	1.82	2.36	2.47
	55	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.000	5.000	1.257	-1.465	3277	0.870	1.030	1.77	2.30	2.22
	60	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.000	5.000	1.489	-1.701	3221	0.840	1.040	1.51	1.95	1.77
	65	ALL	Tx46		18	0.6	270	17.16	15.83	4	10.5	4.000	5.000	1.732	-1.957	3424	0.830	1.040	1.48	1.92	1.59
	70	ALL	Tx46		18	0.6	270	17.16	15.83	4	10.5	4.000	5.000	2.001	-2.227	3834	0.810	1.040	1.26	1.64	1.23
	75	ALL	Tx46		20	0.6	270	17.00	15.40	4	12.5	4.000	5.000	2.289	-2.510	4254	0.790	1.040	1.16	1.63	1.10
	80	ALL	Tx46		24	0.6	270	16.77	14.10	4	20.5	4.000	5.100	2.579	-2.804	4703	0.780	1.050	1.28	1.83	1.14
	85	ALL	Tx46		28	0.6	270	16.60	11.46	4	40.5	4.200	5.500	2.905	-3.125	5181	0.770	1.050	1.38	1.98	1.14
	90	ALL	Tx46		32	0.6	270	16.23	9.48	6	42.5	4.400	5.700	3.234	-3.438	5624	0.750	1.050	1.46	2.11	1.13
	95	ALL	Tx46		34	0.6	270	16.07	11.13	6	34.5	5.000	5.900	3.582	-3.777	6117	0.740	1.060	1.49	2.12	1.12
	100	ALL	Tx46		38	0.6	270	15.81	11.39	6	34.5	5.600	6.600	3.961	-4.139	6635	0.730	1.060	1.31	1.78	1.03

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 AASTHO 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.

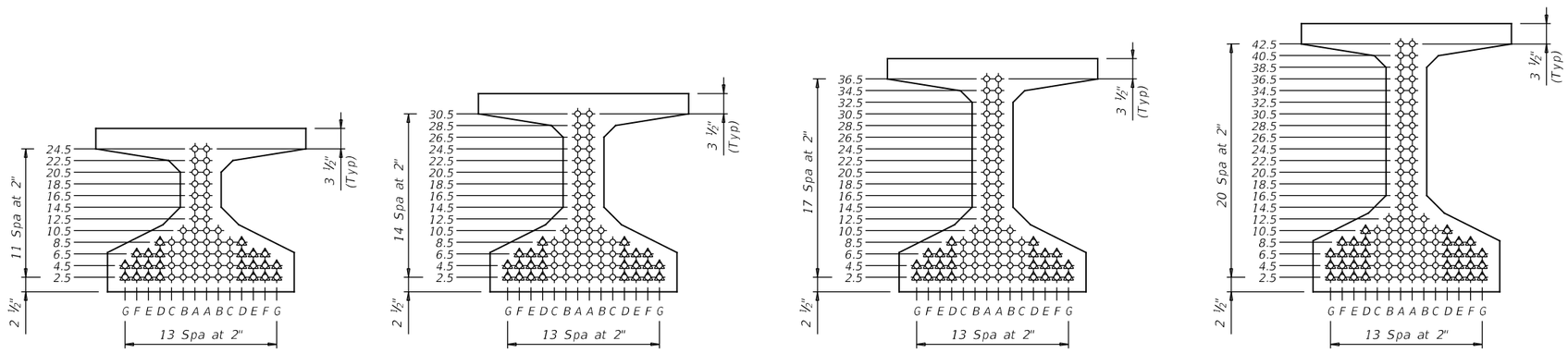
Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked △. Double wrap full-length debonded strands in outer most position of each row.

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.



HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

32' ROADWAY

IGSD-32

FILE: ig06stds-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Redesigned girders. 1-21: Added load rating.	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		88

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DATE:
FILE:

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING		
	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
Type Tx54 Girders 32' Roadway 8.5" Slab	40	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.561	-0.686	2216	0.980	1.010	2.55	3.30	4.09
	45	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.703	-0.835	2629	0.950	1.010	2.12	2.75	3.32
	50	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	0.858	-1.003	3108	0.920	1.020	2.10	2.73	3.05
	55	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.035	-1.189	3629	0.900	1.020	2.05	2.66	2.77
	60	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.224	-1.381	3931	0.870	1.020	1.76	2.28	2.27
	65	ALL	Tx54		18	0.6	270	20.56	19.23	4	10.5	4.000	5.000	1.430	-1.588	4159	0.850	1.020	1.75	2.26	2.09
	70	ALL	Tx54		18	0.6	270	20.56	19.23	4	10.5	4.000	5.000	1.653	-1.815	4103	0.840	1.030	1.49	1.93	1.68
	75	ALL	Tx54		20	0.6	270	20.41	18.81	4	12.5	4.000	5.000	1.877	-2.035	4399	0.820	1.030	1.50	1.94	1.56
	80	ALL	Tx54		20	0.6	270	20.41	18.81	4	12.5	4.000	5.000	2.129	-2.284	4880	0.810	1.030	1.29	1.67	1.23
	85	ALL	Tx54		22	0.6	270	20.28	18.46	4	14.5	4.000	5.000	2.392	-2.534	5339	0.790	1.040	1.30	1.68	1.12
	90	ALL	Tx54		26	0.6	270	20.08	16.39	4	28.5	4.000	5.000	2.665	-2.800	5839	0.780	1.040	1.22	1.67	1.00
	95	ALL	Tx54		28	0.6	270	20.01	14.29	4	44.5	4.000	5.000	2.951	-3.075	6353	0.770	1.040	1.38	1.86	1.03
	100	ALL	Tx54		32	0.6	270	19.63	12.51	6	44.5	4.300	5.200	3.262	-3.370	6892	0.760	1.040	1.42	1.99	1.03
	105	ALL	Tx54		36	0.6	270	19.34	12.01	6	50.5	4.700	5.400	3.574	-3.667	7434	0.750	1.040	1.48	2.10	1.05
	110	ALL	Tx54		40	0.6	270	19.11	12.51	6	50.5	5.300	6.100	3.899	-3.973	7988	0.740	1.050	1.53	2.19	1.08
	115	ALL	Tx54		44	0.6	270	18.83	11.55	8	48.5	5.600	6.400	4.252	-4.301	8569	0.730	1.050	1.29	1.74	1.03
	120	ALL	Tx54	*	48	0.6	270	18.42	10.09	10	50.5	5.800	7.700	4.619	-4.640	9165	0.720	1.050	1.28	1.69	1.01
Type Tx62 Girders 32' Roadway 8.5" Slab	60	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	0.961	-1.157	4309	0.900	1.010	1.98	2.56	2.74
	65	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.121	-1.331	4614	0.880	1.010	1.69	2.19	2.26
	70	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.292	-1.514	4894	0.860	1.020	1.71	2.21	2.12
	75	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.475	-1.705	4844	0.840	1.020	1.48	1.92	1.75
	80	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.000	5.000	1.659	-1.903	5116	0.830	1.020	1.49	1.93	1.64
	85	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.000	5.000	1.866	-2.120	5578	0.820	1.020	1.29	1.67	1.32
	90	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.500	5.500	2.080	-2.338	6072	0.800	1.030	1.31	1.70	1.23
	95	ALL	Tx62		24	0.6	270	24.94	22.94	4	16.5	4.000	5.000	2.310	-2.574	6621	0.790	1.030	1.31	1.70	1.12
	100	ALL	Tx62		26	0.6	270	24.85	22.39	4	20.5	4.000	5.000	2.531	-2.805	7159	0.780	1.030	1.27	1.70	1.03
	105	ALL	Tx62		30	0.6	270	24.58	14.18	6	58.5	4.800	5.800	2.771	-3.050	7723	0.770	1.030	1.64	2.16	1.31
	110	ALL	Tx62		34	0.6	270	24.25	15.42	6	56.5	4.200	5.000	3.020	-3.304	8301	0.760	1.030	1.60	2.10	1.21
	115	ALL	Tx62		36	0.6	270	24.11	17.44	6	46.5	4.700	5.600	3.291	-3.576	8909	0.750	1.030	1.53	2.04	1.13
	120	ALL	Tx62		40	0.6	270	23.88	16.68	6	54.5	5.100	6.000	3.545	-3.835	9493	0.740	1.040	1.63	2.12	1.47
	125	ALL	Tx62		44	0.6	270	23.60	14.87	8	56.5	5.300	6.100	3.836	-4.124	10128	0.730	1.040	1.51	2.04	1.35
	130	ALL	Tx62		48	0.6	270	23.28	15.28	8	56.5	5.800	6.700	4.144	-4.438	10849	0.730	1.040	1.44	1.80	1.11

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER
*	2.5(14),4.5(14),6.5(14),8.5(4),10.5(2)

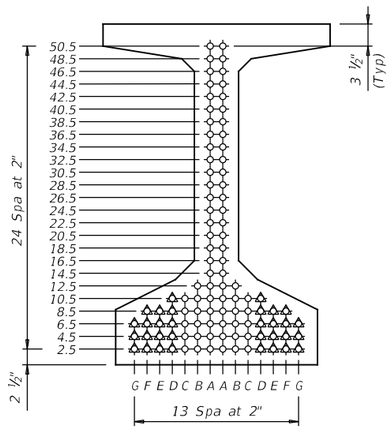
(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

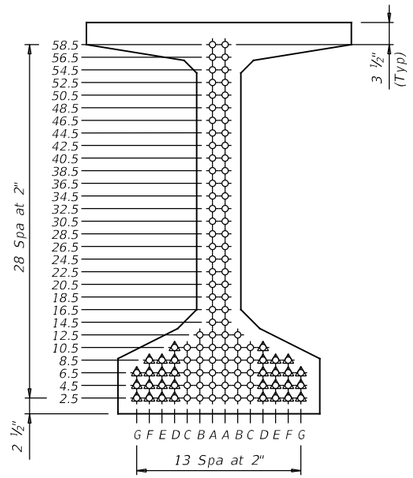
Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.



TYPE Tx54



TYPE Tx62

HL93 LOADING

Texas Department of Transportation

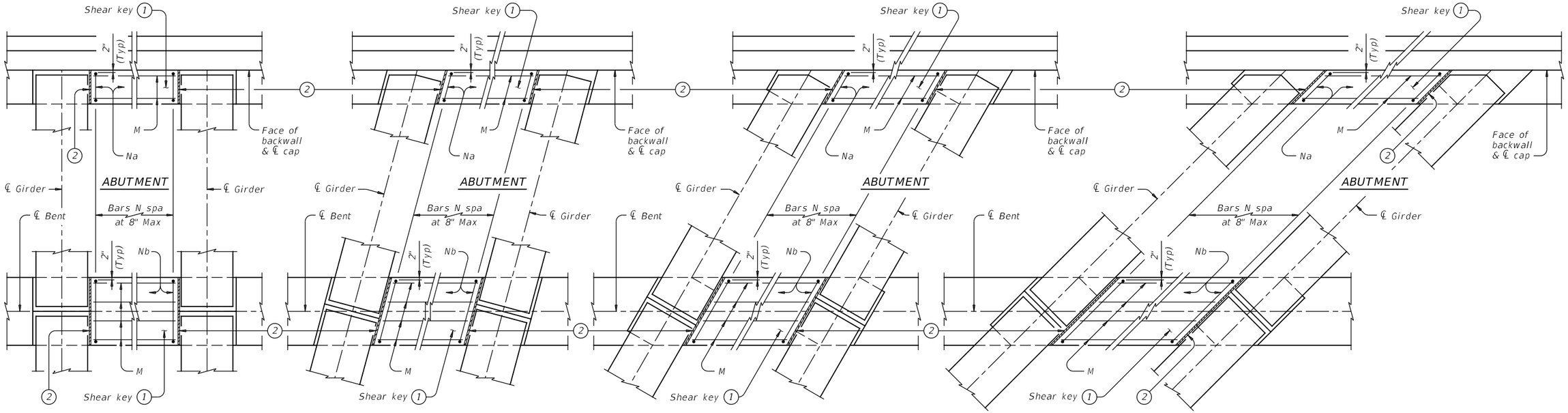
Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

32' ROADWAY

IGSD-32

FILE: ig06stds-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Redesigned girders. 1-21: Added load rating.	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		89



INTERIOR BENT

PARTIAL PLANS WITH NO SKEW

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

INTERIOR BENT

PARTIAL PLANS WITH 15° SKEW

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

INTERIOR BENT

PARTIAL PLANS WITH 30° SKEW

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

INTERIOR BENT

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.

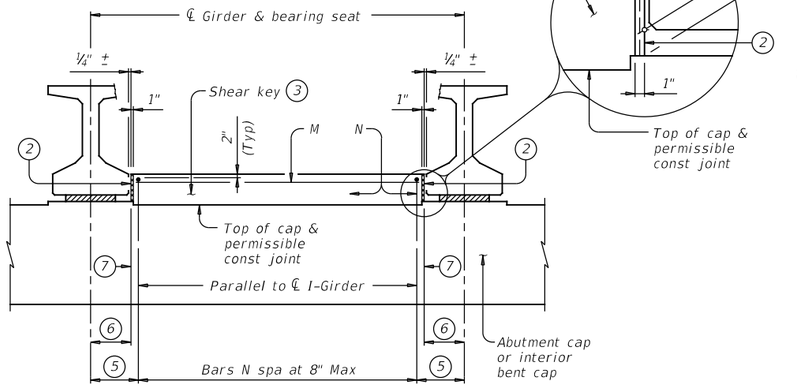
(5) With No Skew = 1'-8 ¼", measured along ℄ cap.
With Skew = 1'-8 ¼" ÷ Cos Skew, measured along ℄ cap.

(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.

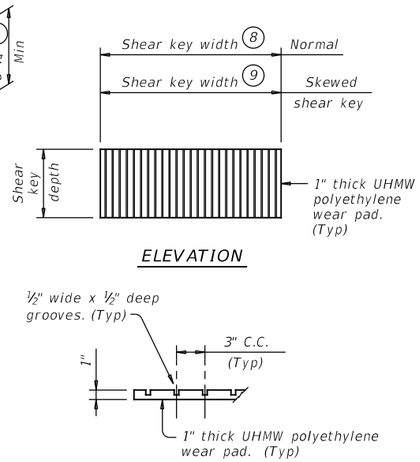
(8) Abutments = ½ Cap width.
Interior bents = Cap width.

(9) Abutments = ½ Cap width ÷ Cos Skew.
Interior bents = Cap width ÷ Cos Skew.



PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

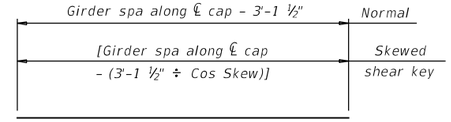
Showing shear key with girder Type Tx46. Other I-Girder types similar.



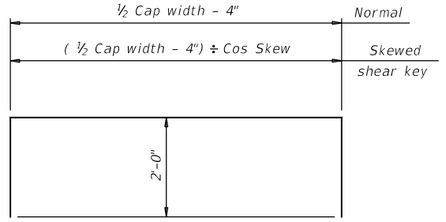
ELEVATION

PART SECTION

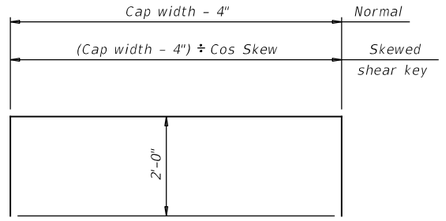
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For abutments)



BARS Nb (#5)
(For interior bents)

CONSTRUCTION NOTES:

Provide Class "C" concrete (f'_c = 3,600 psi). Provide Class "C" (HPC) if shown elsewhere on the plans.

Provide Grade 60 reinforcing steel.

Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.

Provide Ultra High Molecular Weight (UHMW) polyethylene wear pads in accordance with ASTM D6712.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

These details are limited to bridges skewed 45 degrees and less.

This standard is only applicable for I-Girders.

Modify details for bearing conditions, and girder spacing not shown on this standard. Details do not account for sole plate or pedestal bearing seat.

Include shear key concrete in abutment or bent concrete for payment.

UHMW polyethylene wear pads are subsidiary to Class "C" concrete.

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

Texas Department of Transportation

Bridge Division Standard

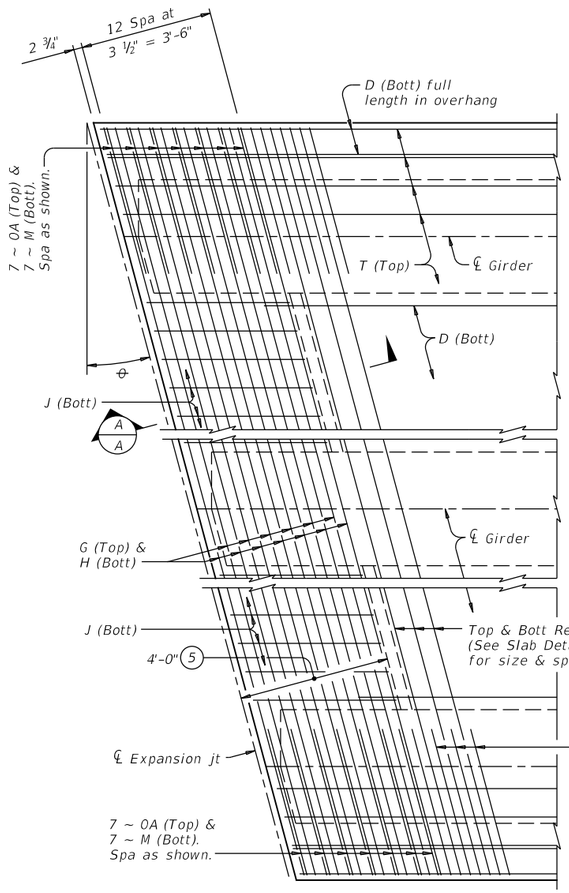
SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

IGSK

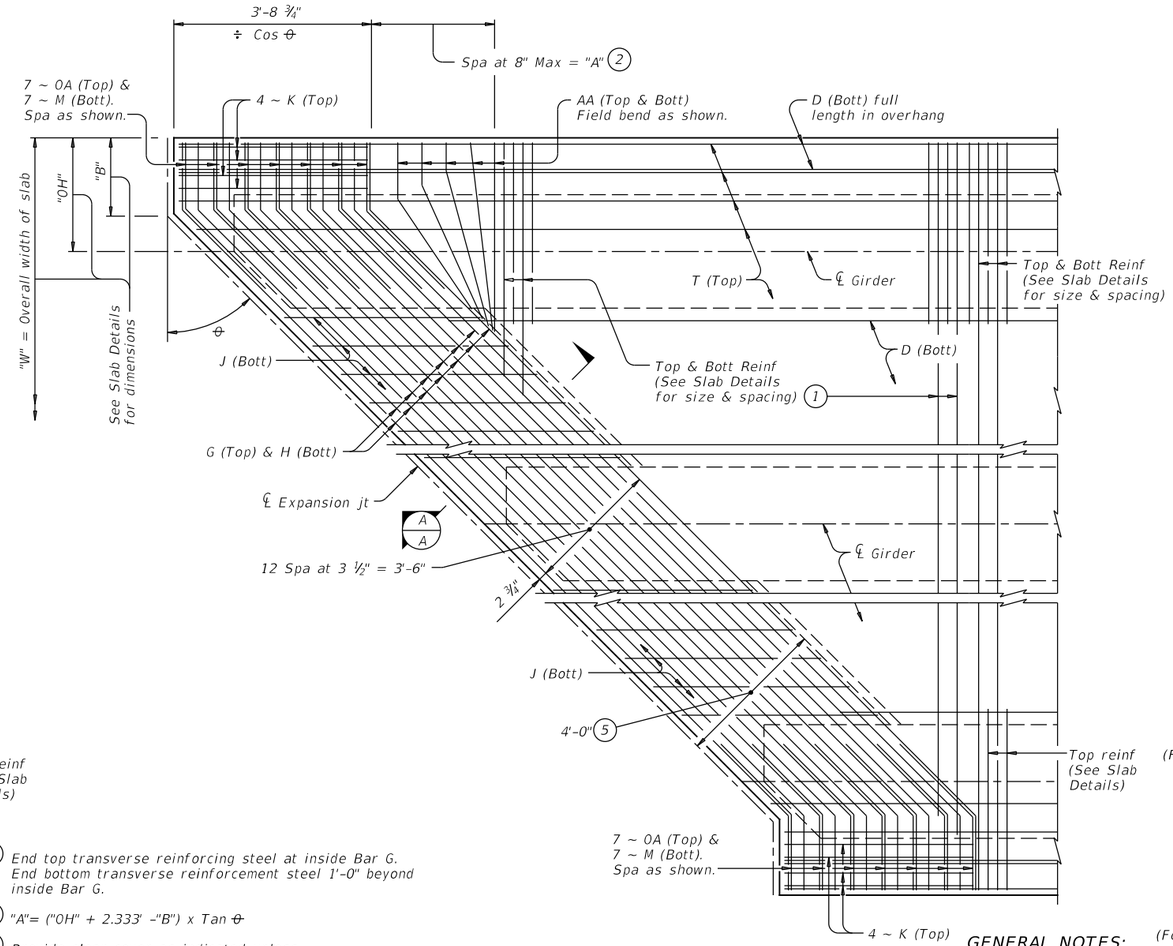
FILE: igskstds-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		90

DATE:
FILE:

DATE:
FILE:

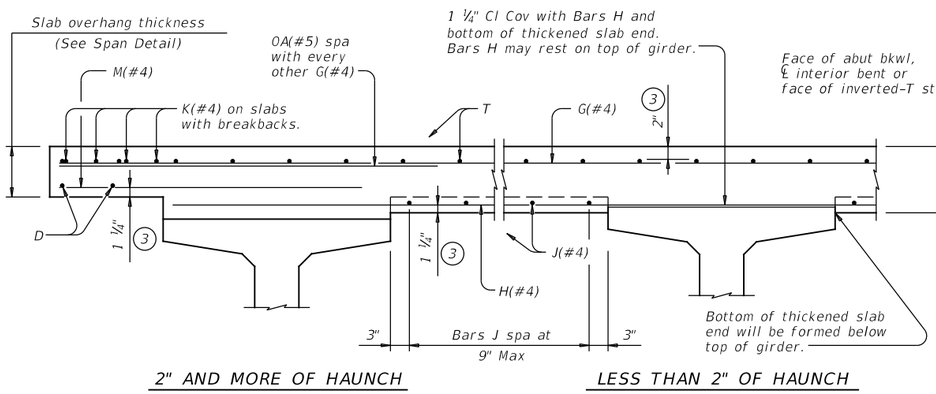


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR SLABS WITH BREAKBACK

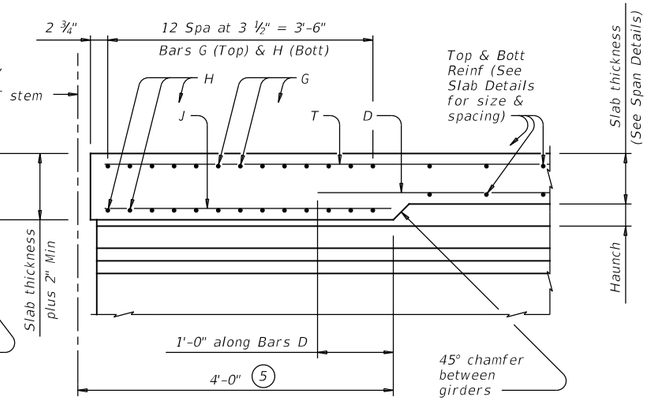
1. End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
2. "A"= ("OH" + 2.333' -"B") x Tan θ
3. Provide clear cover as indicated unless otherwise shown on Span Details.
4. Only required on slabs with breakbacks.
5. Thickened slab end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



2" AND MORE OF HAUNCH — LESS THAN 2" OF HAUNCH

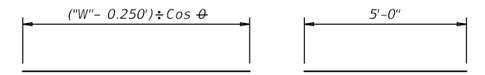
TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at ℄ Brg)

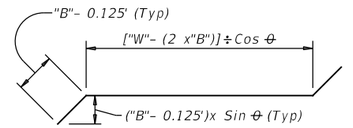


SECTION A-A

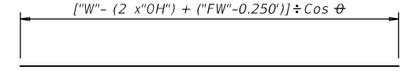
(Showing with 2" and more of haunch)



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

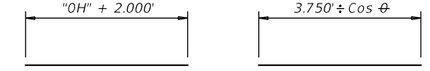


BARS G (#4) (For slabs with breakbacks)

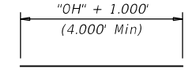


"FW" = girder's top flange width (ft)

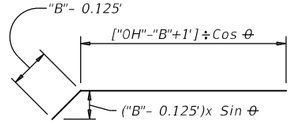
BARS H (#4)



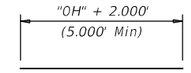
BARS AA (#5) (4) — BARS J (#4)



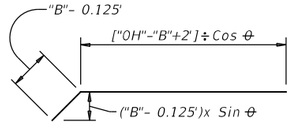
BARS M (#4) (For slabs without breakbacks)



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



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



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

GENERAL NOTES:

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

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

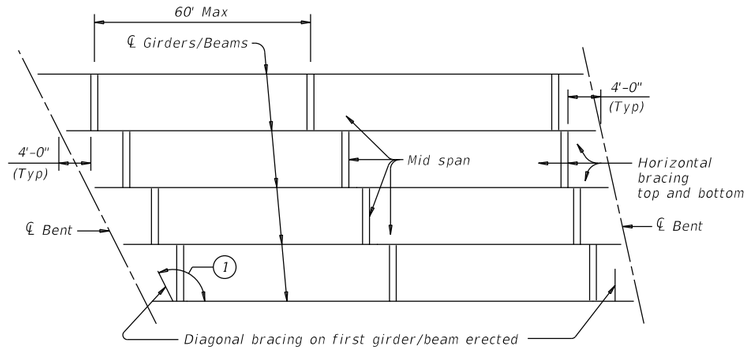
THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

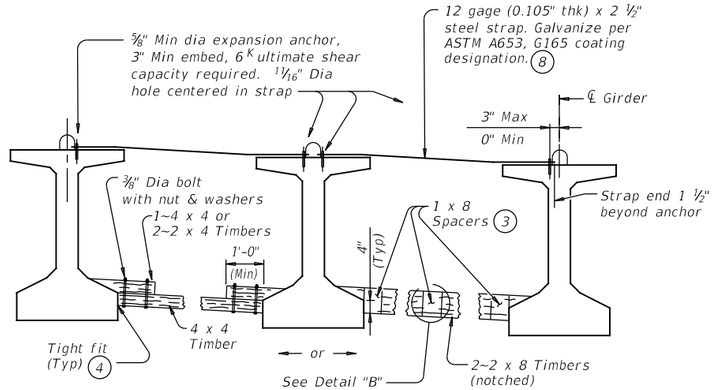
IGTS

FILE: igtssts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		91

DATE:
FILE:

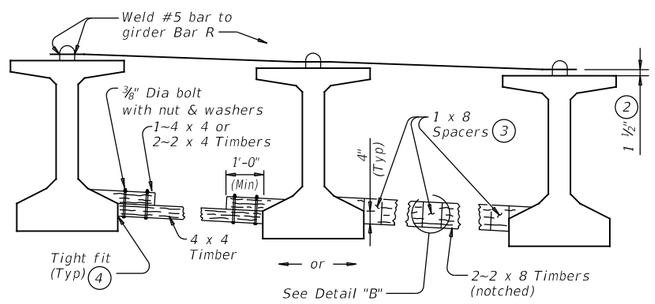


ERECTION BRACING



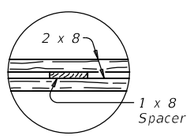
FOR ERECTION BRACING, OPTION 1

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



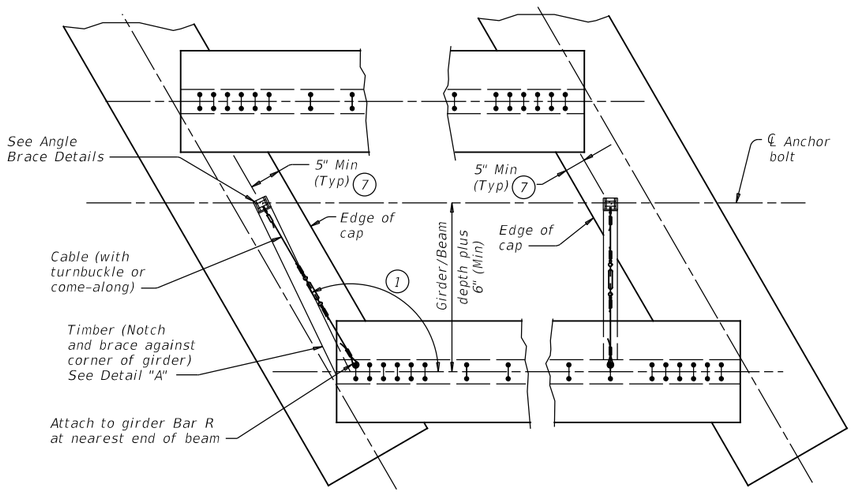
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS (5)

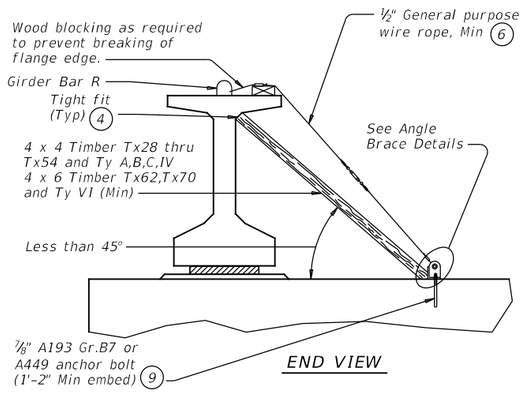


PLAN

DETAIL "B"



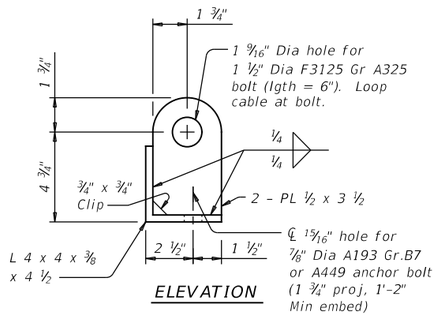
PLAN



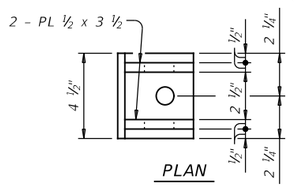
END VIEW

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.

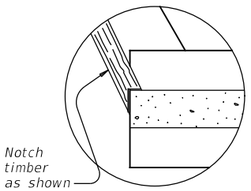
ERECTION BRACING:

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)

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	WACO	LIMESTONE		92

DATE:
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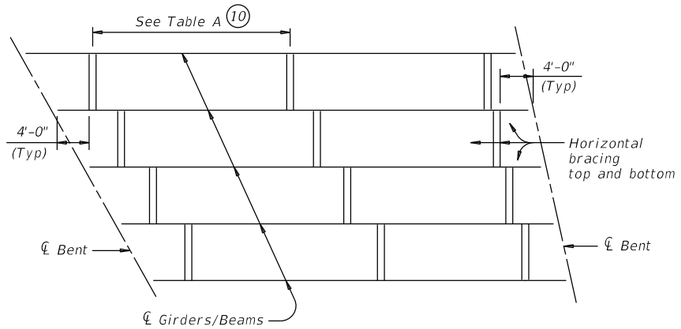


SLAB PLACEMENT BRACING

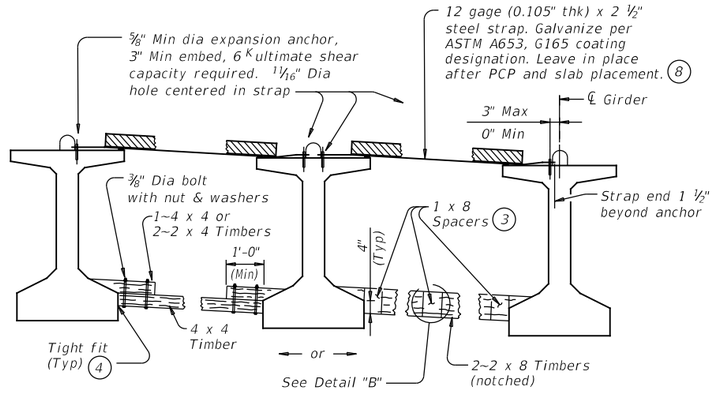
TABLE A

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

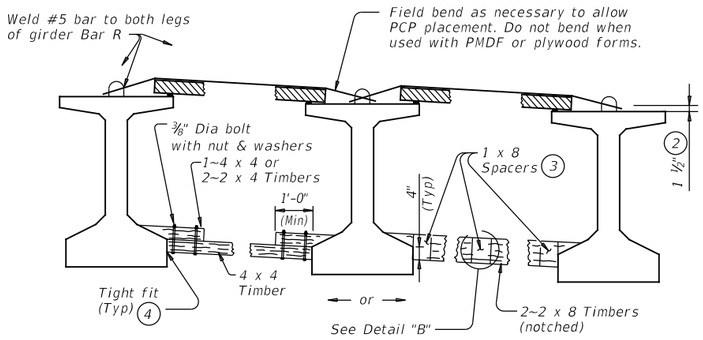
OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)

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

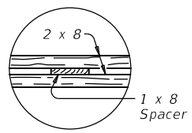
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS (5)



PLAN

DETAIL "B"

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (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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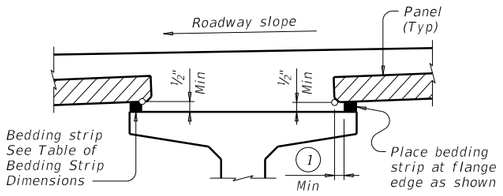
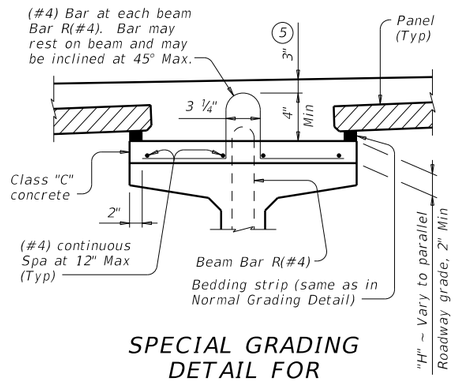


NORMAL GRADING DETAIL (3)

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-giders, 1 ½" Min for all other beam types.

(2) Allowed for I-girders, not allowed on other beam types.

(3) To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in 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.

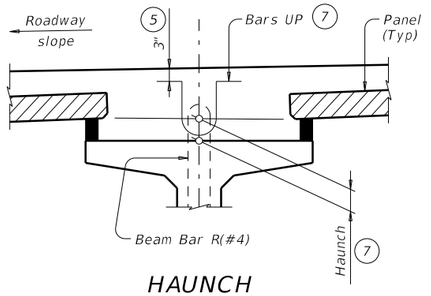
These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

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".

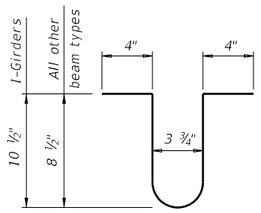
Cover dimensions are clear dimensions, unless noted otherwise.

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

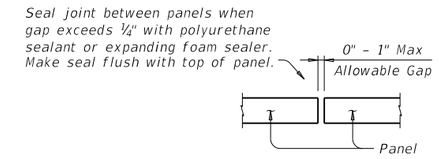


HAUNCH REINFORCING DETAIL

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

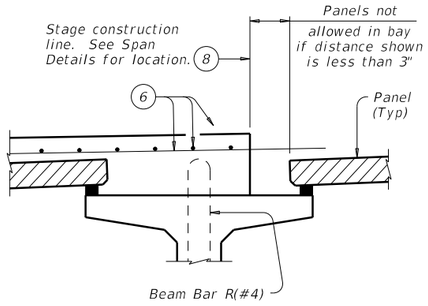


BARS UP (#4) (7)

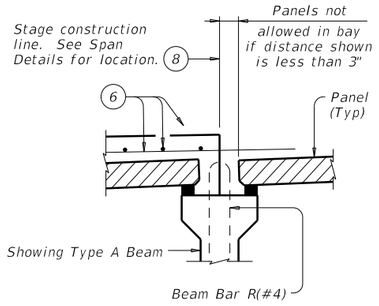


PANEL JOINTS

(Panel reinforcing not shown for clarity.
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



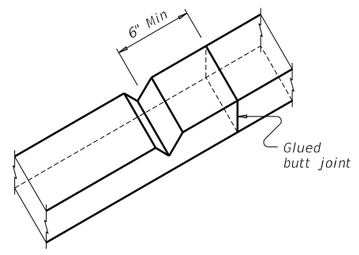
PRESTR CONC I-GIRDERS



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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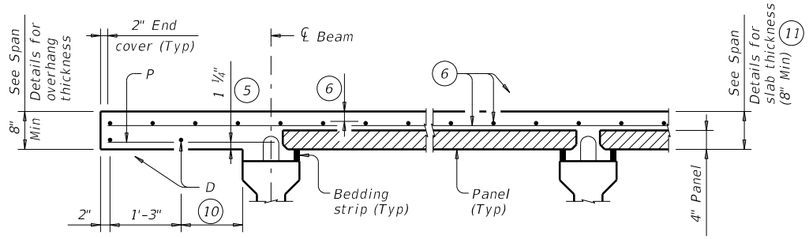

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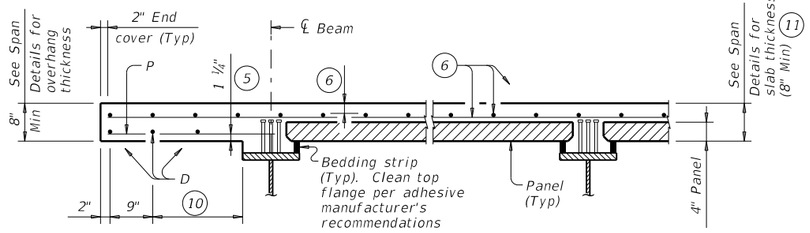
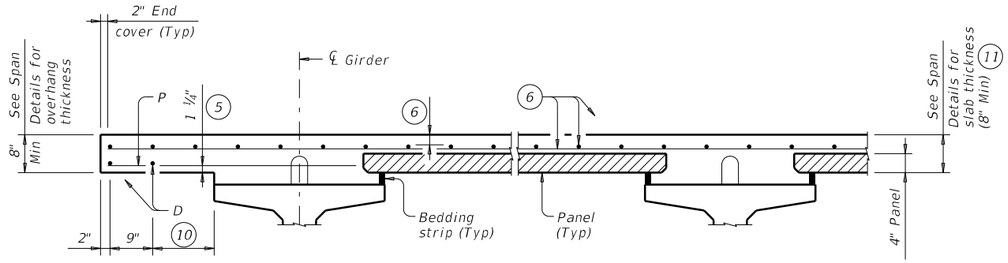
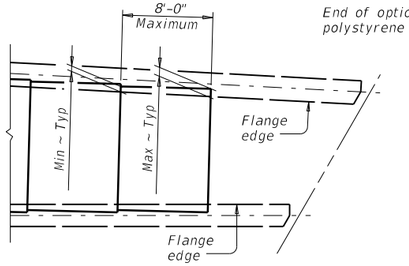


STEEL BEAMS

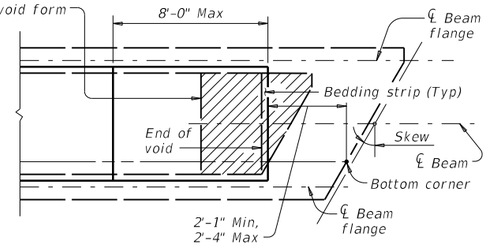


PRESTRESSED CONCRETE I-GIRDERS

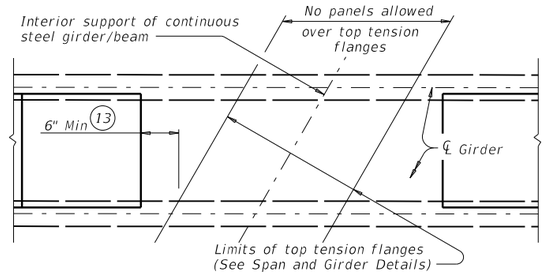


AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on bemm/girder type.



OVER CONC U-BEAMS



AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS

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.

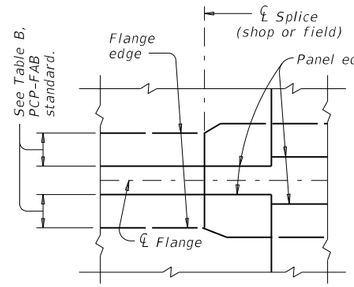
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8" o.c..

(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.

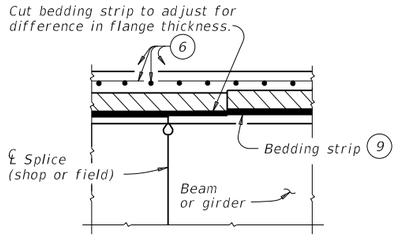
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



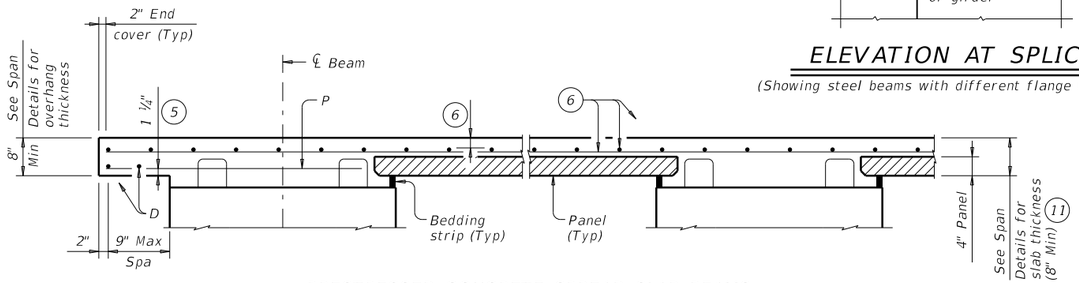
PLAN AT SPLICE

(Showing steel beams with flange width transition)



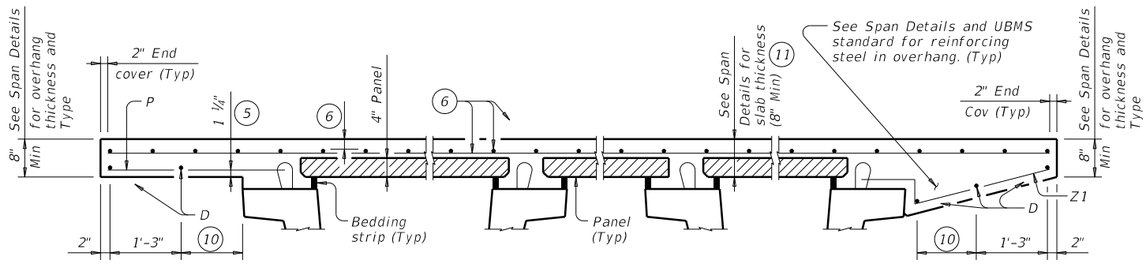
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

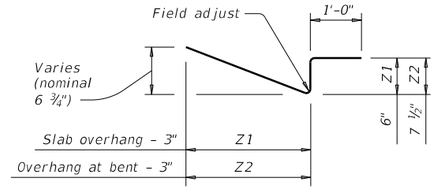
Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS



BARS Z (#4) (12)

HL93 LOADING SHEET 2 OF 4

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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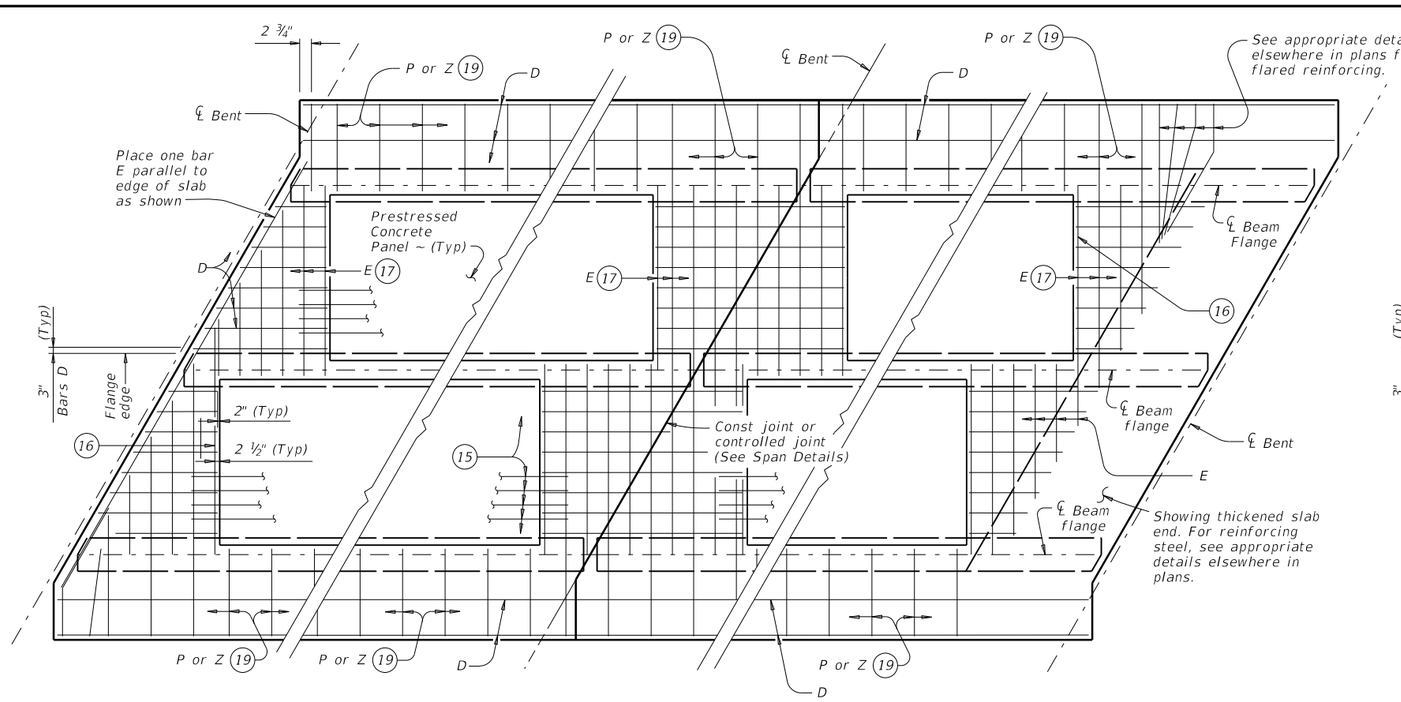
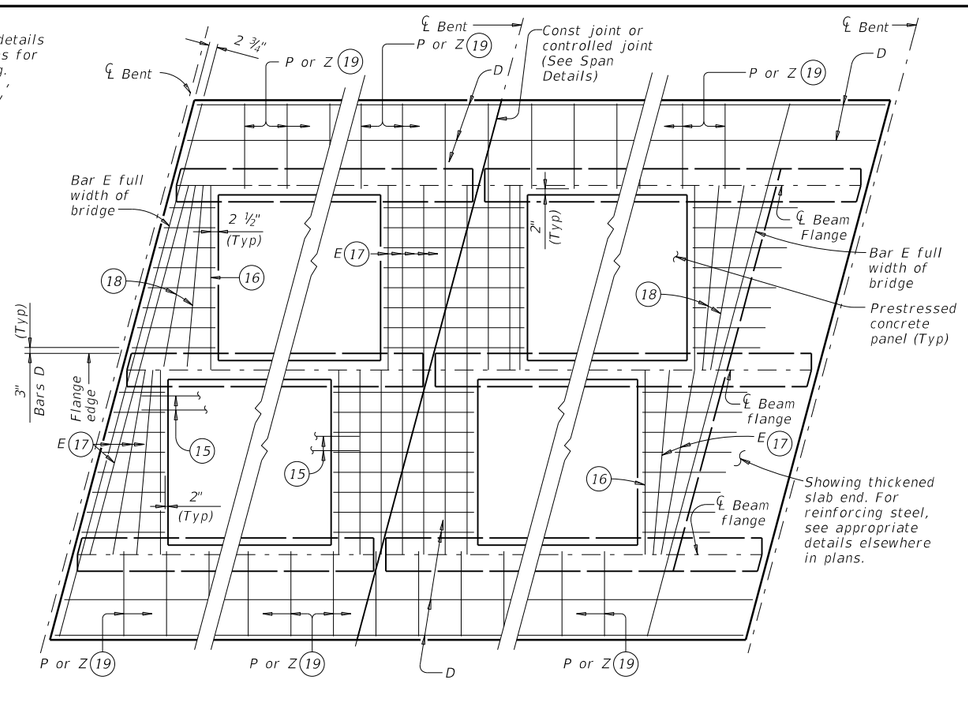


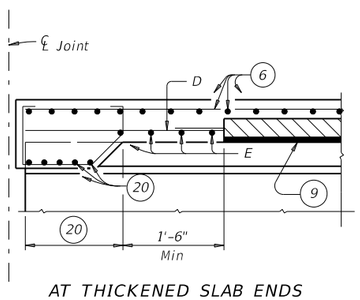
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

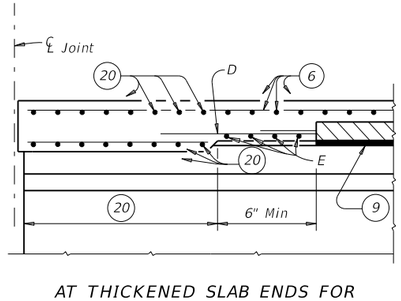


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

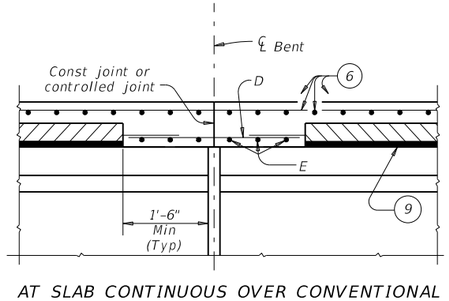
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



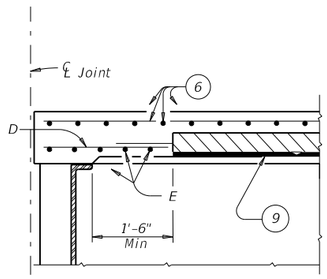
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



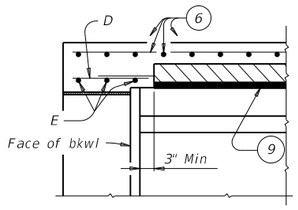
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



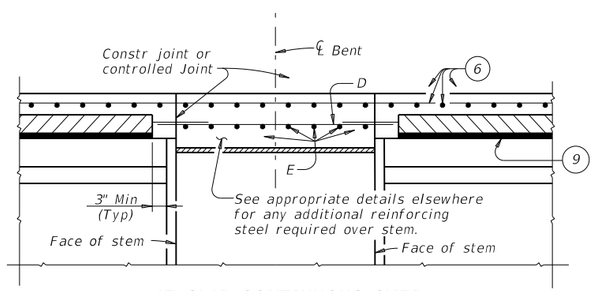
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(14) Max Spacing as listed unless otherwise shown.

(15) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(16) Maintain one Bar E(#4) parallel to panel ends (Typ).

(17) Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.

(18) Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.

(19) Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(20) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

FILE: pcpstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		96

DATE: 5/7/2021 1:49:13 PM
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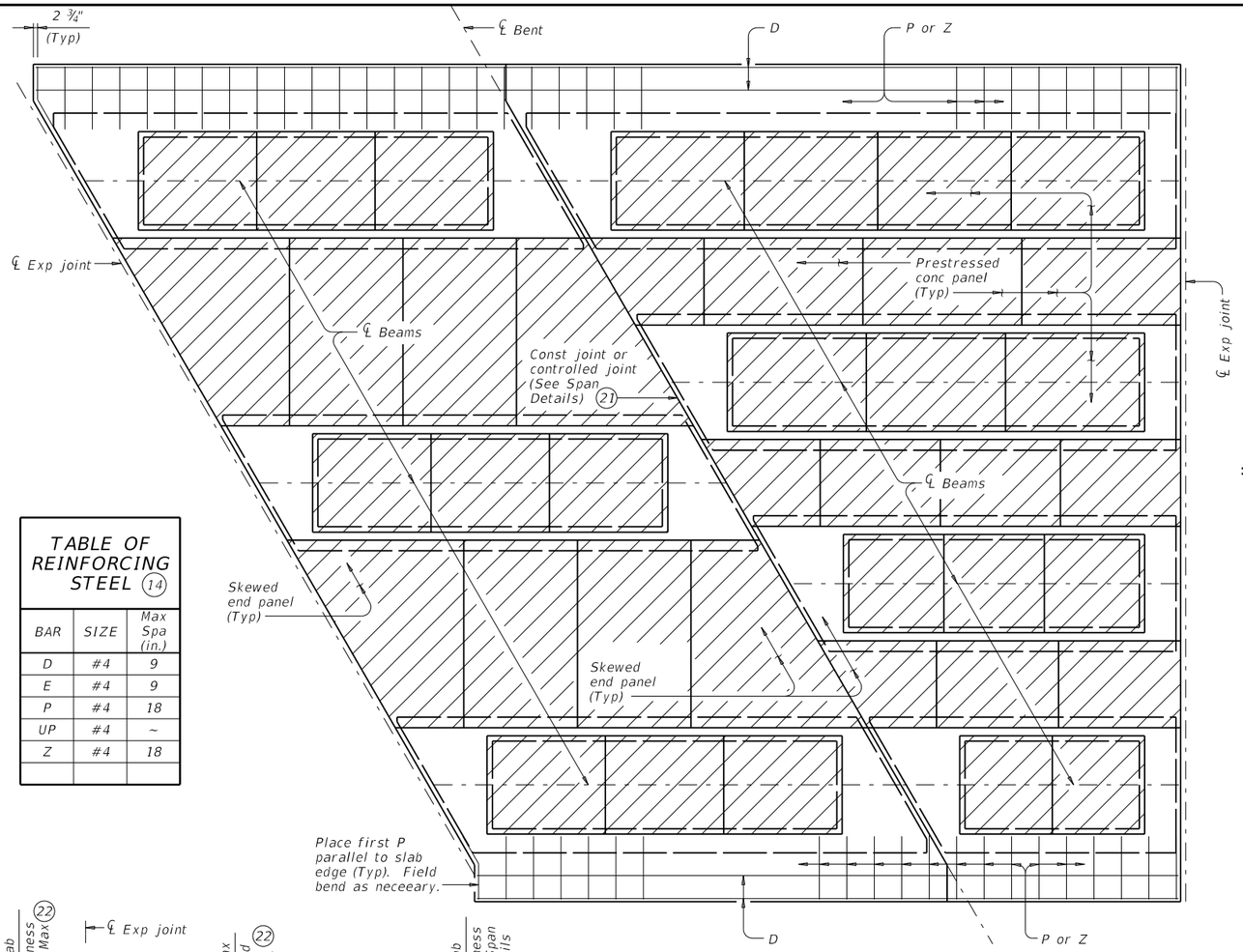
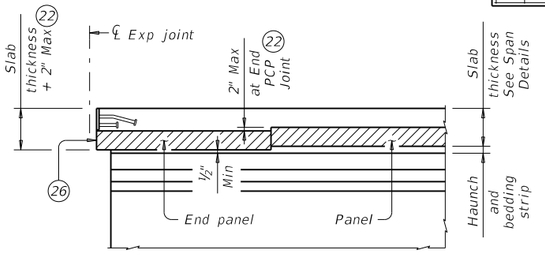


OPTION 2 ~ PLAN OF SLAB

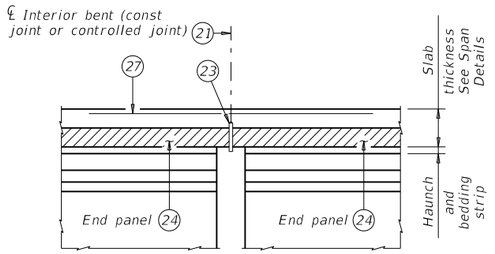
(Showing U-Beams; other beams similar)

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



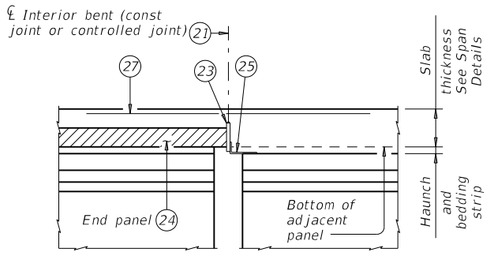
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-A, SEJ-S(0), AJ, and Type A expansion joints only.



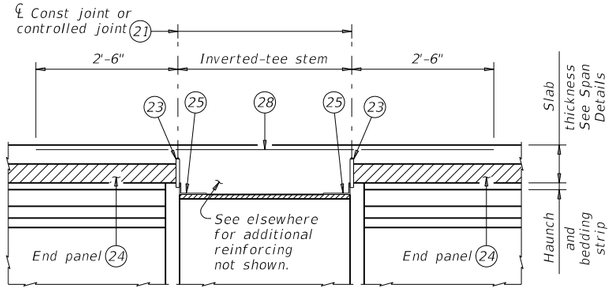
CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT

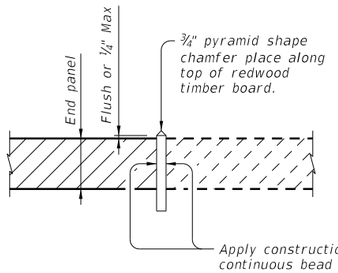
Panel against beam/girder end in adacent span.



INVERTED-T BENT

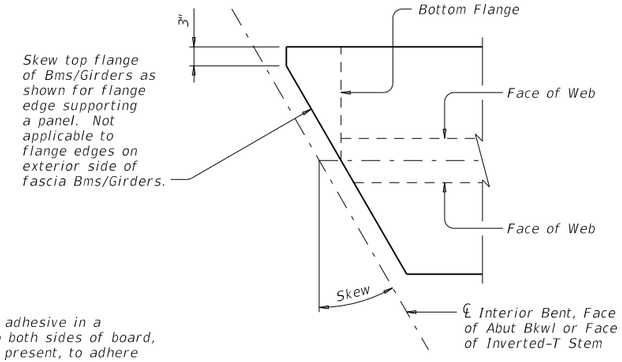
Panels against inverted-tee stem

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-Bm/I-Girder, U-Bms and Steel Bms 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-A and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and 0A from standard IGTS in the slab.

HL93 LOADING SHEET 4 OF 4

Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

FILE: pcpstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		97

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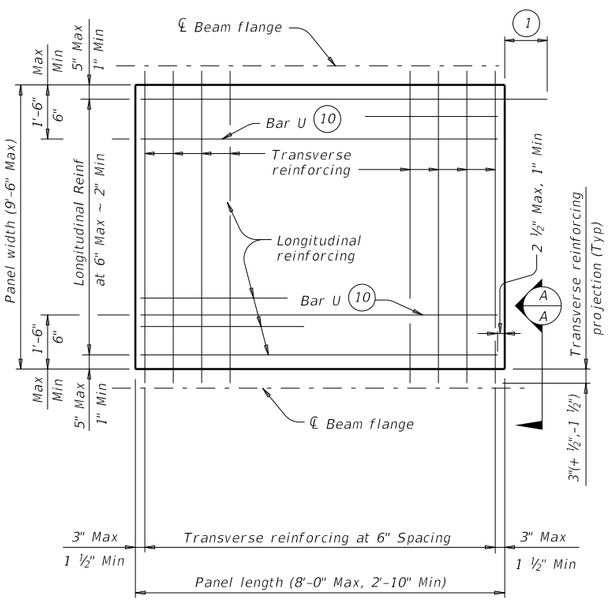
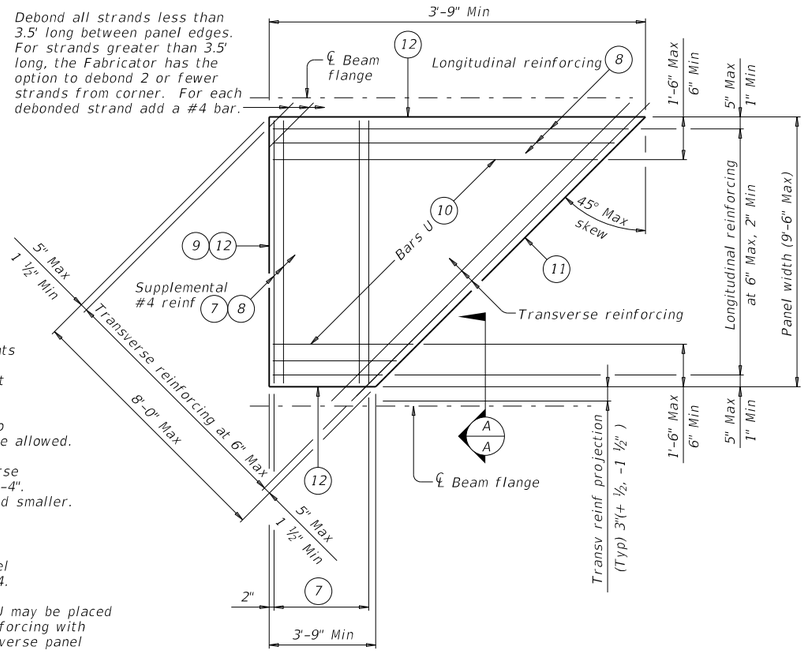


TYPICAL NON-SKEWED PANEL PLAN



TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

1. At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2",-0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
2. Four loops required per panel.
3. Four loops required per panel. ⅜" or ½" strands may be used.
4. Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
5. See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
6. One Splice allowed per panel. No more than two sheets of WWR are allowed.
7. Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
8. End Cover 2 ½" Max, 1" Min.
9. Recess strands on indicated panel edge in accordance with Item 424.
10. At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
11. Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
12. Timber form work permissible this edge.

TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3	4 ½
IV	6	4	7 ½
VI	6 ½	4 ½"	8 ½
U40 – 54	5 ½	5 ½	7
Tx28-70	6	5	7 ½
XB20 – 40	4	3	4 ½
XSB12 – 15	4	3	4 ½

TABLE B (4) (5)			
Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3	3 ¼
Over 15" to 18"	4	3	4 ¾
Over 18"	5	3 ½	6 ¼

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3,500 psi. Minimum 28 day strength f'c=5,000 psi.

Provide ¾" chamfer along bottom edge of panel on beam side.

Do not use epoxy-coated reinforcing steel bar or strand in panels.

Remove laitance from top panel surface.

Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.

For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).

Place transverse panel reinforcement at panel centroid and space at 6" Max.

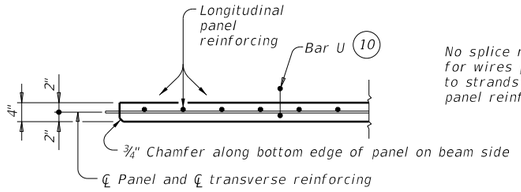
LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

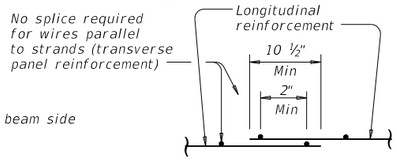
No combination of longitudinal reinforcement options in a panel is allowed.

Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

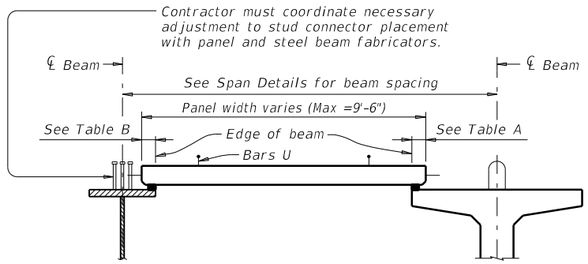


SECTION A-A

(Not showing supplemental #4 bars for skewed end panels.)



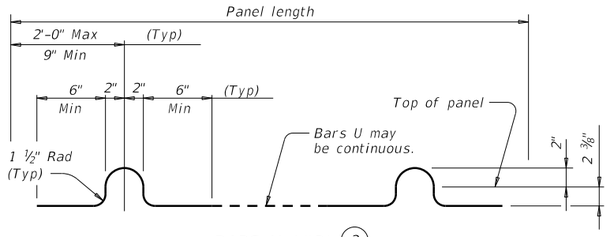
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



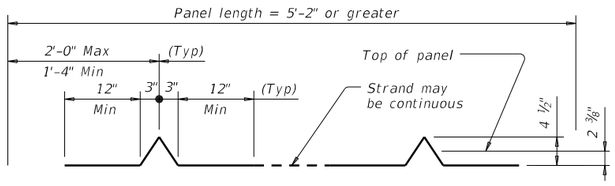
STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

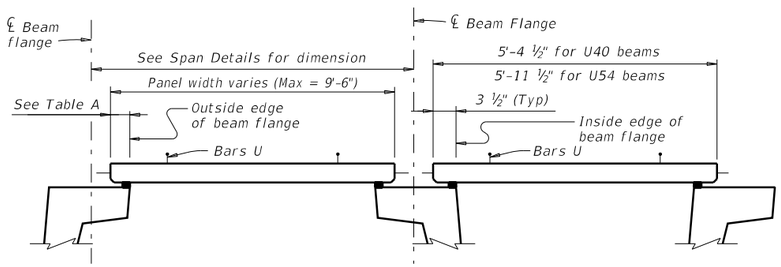
Typ unless noted otherwise



BARS U (#3) (2)



OPTIONAL STRAND FOR BARS U (3)



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

FILE: pcpstde2-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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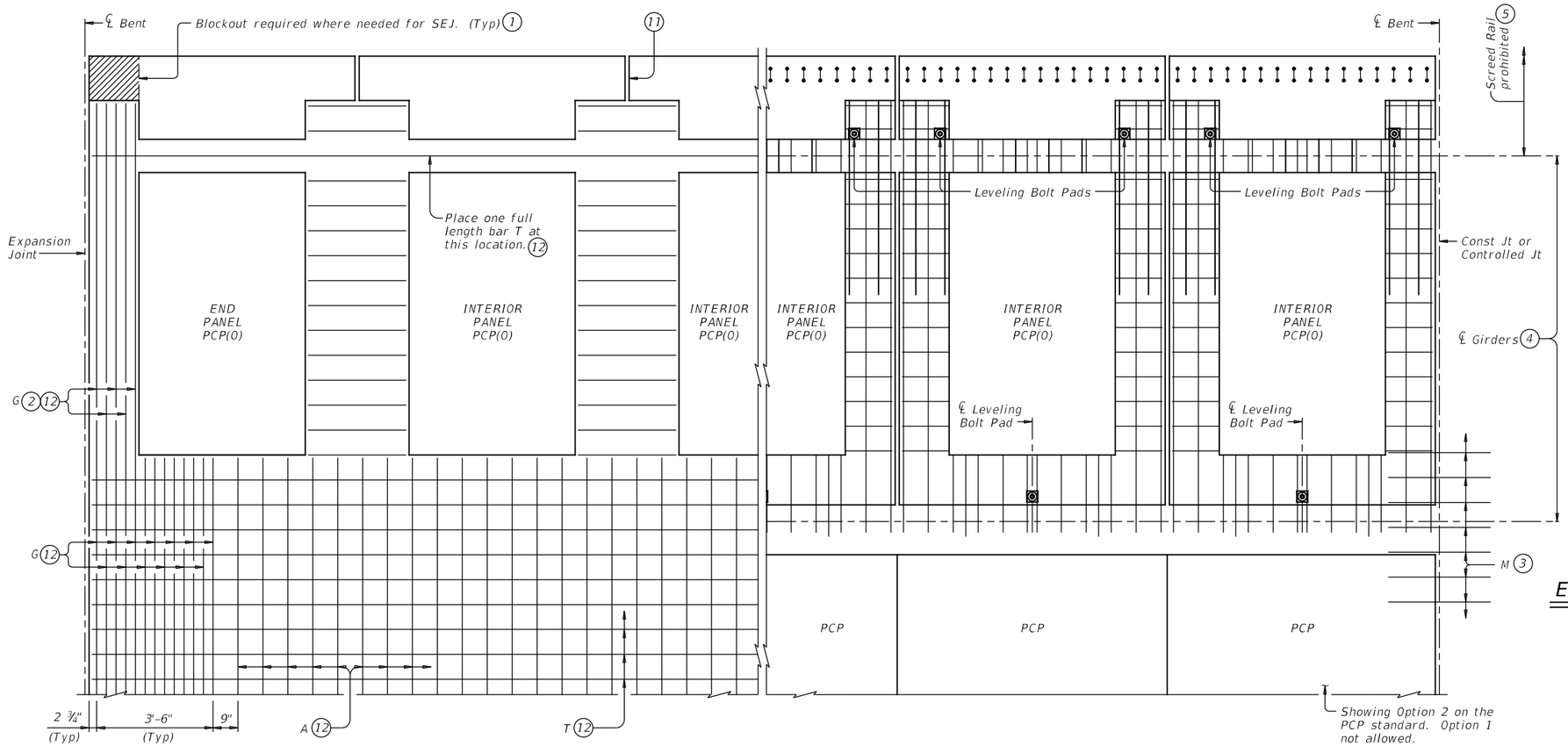
	WACO	LIMESTONE		98



SHOWING FIELD PLACEMENT OF TOP REINFORCING STEEL

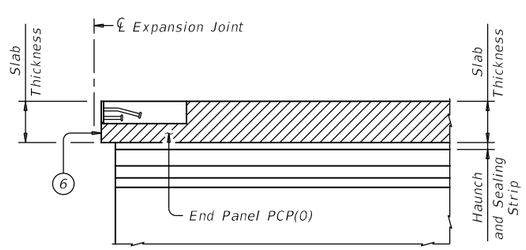
SHOWING PCP(0) EXPOSED REINFORCING STEEL

Field placed bars M shown for clarity.

PANEL LAYOUT

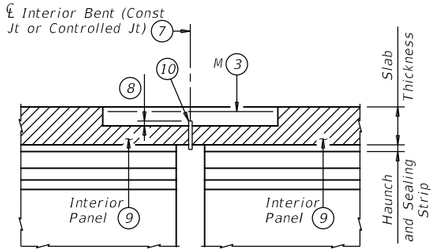
PCP(0) shown with gaps between panels for clarity.
The gap cannot be considered as a panel fabrication tolerance.

1. 1'-4" x 1'-6" x 4 ½" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.
2. When blockout is required, extend bars G into blockout.
3. Place additional bars M 2'-11" in length on top of bars A and between every bar T. Center bars M at center of bent. Located at bents with construction joints or controlled joints only. Bars M may replace additional (#4) bars 5'-0" in length as shown on PCP standard in Option 2 ~ Elevations At Beam Ends. Option 1 not allowed.
4. It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.
5. Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.
6. Place end panel PCP(0) within ½" of expansion joint opening. Do not encroach on required expansion joint opening.
7. Top Plastic Joint Former at Controlled Joints (Stress Cap, Zip Strip, Stress Lock, etc.) is not required with these Details.
8. 0" Min, ¾" Max, support as necessary.
9. Place panel within ½" of ¾" thick board.
10. ¾" thick wood/timber board, leave in place. Place straight, within ¼" of Centerline of Bent, across bridge width and end board at exterior flange edge of fascia girders. Do not extend into overhang.
11. Seal top of panel only, with a Class 4 sealant prior to rail construction. Typical between panels. Do not seal at Expansion Joints.
12. 1 ½" End Cover. (Typ)



EXPANSION JOINT

For SEJ-A, SEJ-S(0), AJ and Type A Expansion Joints only.

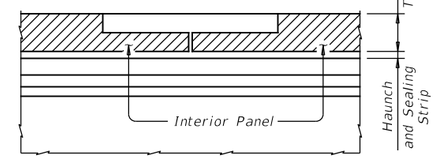


CONST JT OR CONTROLLED JT

Panel against Panel between Bms/Girders.

ELEVATIONS AT GIRDER ENDS WITH PCP(O)

Reinforcing steel not shown for clarity.



ELEVATION BETWEEN PCP(O)

The gap cannot be considered as a panel fabrication tolerance.
Reinforcing steel not shown for clarity.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS

PCP(O)

FILE: pcpostd1-17.dgn	DN: KLM	CK: DVL	DW: JTR	CK: KLM
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		98A

DATE:
FILE:

BAR TABLE		
BAR	SIZE	MAX SPA (IN)
A (12)(17)	#4	9"
G (12)(17)	#4	3½"
M	#4	9"
T (12)(17)	#4	9"

(4) It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.

(5) Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.

(12) 1 ½" End Cover on bars. (Typ)

(13) Space bars UP(#4) with girder bars R(#4) in all areas where measured haunch exceeds 3 ½" with Prestressed Concrete I-Girders. Epoxy coating for Bars UP is not required.

(14) 6" plus or minus.

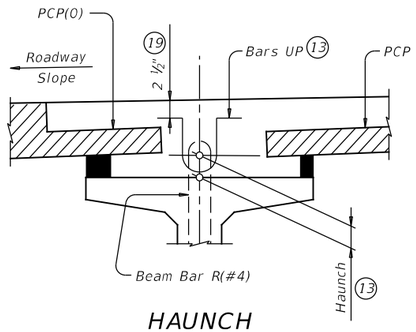
(15) Place sealing strip at flange edge as shown. Butt adjacent sealing strips longitudinally together with adhesive. Use pencil vibrators with concrete placement over girder and between sealing strips to avoid rupturing sealing strips. Cut sealing strips 2" higher than anticipated haunch thickness and compress to grade.

(16) (#3) Panel bars F must be field bent and welded to the R bars in girder. Two bars F per panel.

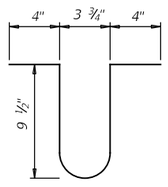
(17) Field placed bars that are allowed to be lapped. Reinforcing steel that protrudes from panels are not considered bars to be lapped. See "Material Notes" for applicable bar laps.

(18) ℄ Leveling Bolt Pad. 1" Dia Coil Rod or 1" Dia Coil Bolt shown, are furnished by the contractor. After grading each PCP(0) panel with the 1" Dia coil rods or coil bolts, secure each panel in its final resting position (plastic shims, welding, etc) and remove all 1" Dia coil rods or coil bolts for the cast-in-place concrete. Coil rods/bolts may be left in place at contractor's option. If coil rods/bolts are left in place, coil rods/bolts must have at least 2 ½" of cover to top of finish grade. Grading bolts are inadequate to carry all conceivable screed/construction loads. Panel support method must be calculated, location identified, and placed on shop drawings. Method chosen to support panels must be adequate for all construction loads. Panel support method must be placed/constructed after final grading and before screed rail placement.

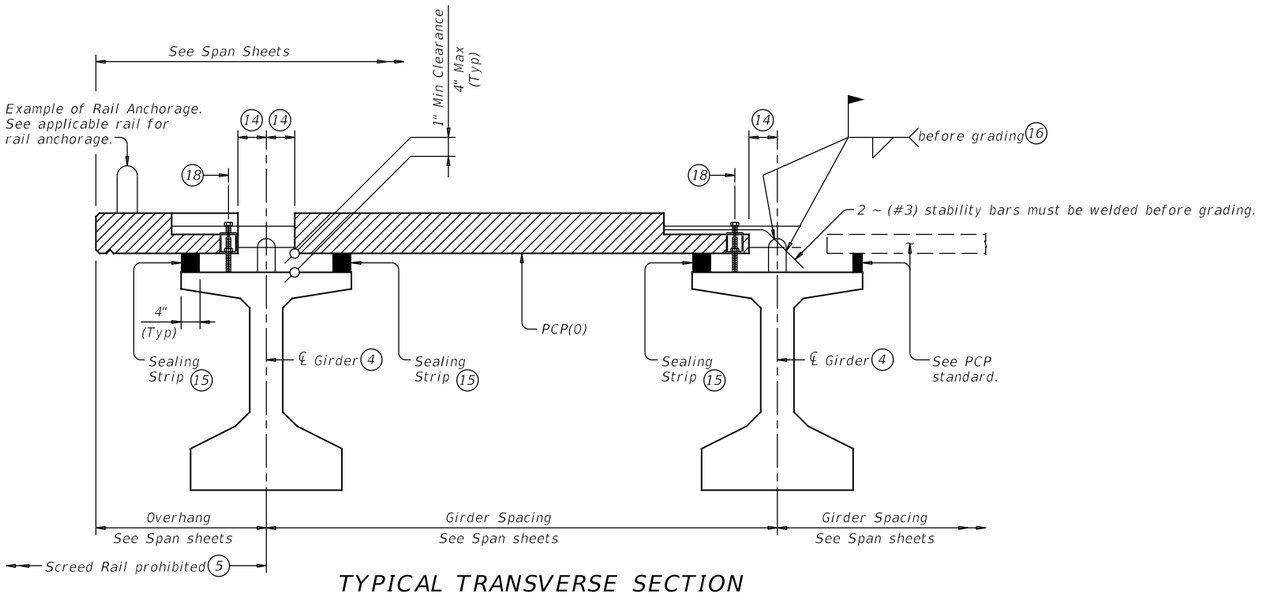
(19) Unless shown otherwise on Span Details.



HAUNCH REINFORCING DETAIL (4)



BARS UP (#4) (13)



TYPICAL TRANSVERSE SECTION

(Showing Girder Type Tx46)

CONSTRUCTION NOTES:

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended.

Ensure proper cleaning of construction debris and consolidation of concrete mortar under the edges of the panels. Place sealing strips at girder flange edges so that adequate space is provided for the mortar to flow a minimum of 8" transversely under the panels as the slab concrete is placed.

Panel placement with Option 1 on the PCP standard is not allowed.

It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.

To allow the proper amount of mortar to flow between girder and panel, maintain a minimum vertical opening of 1". Roadway cross-slope reduces the opening available for entry of the mortar. Sealing strips vary in thickness along girder are therefore required.

Seal the top panel with a Class 4 sealant as shown in the Panel Layout.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the reinforcing steel is shown on the Span Details to be epoxy coated, then epoxy coat bars A, G, M, & T.

Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

Provide sealing strips comprised of one layer low density polyurethane (1.0 Lbs density) foam sealing strips or equivalent. Oversize the height of sealing strips by 2". Bond sealing strips to the girder with 3M Scotch ® 4693 or equivalent adhesive compatible with sealing strips.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

These details can be used as an option to construct the deck overhang when noted on the Span details and in conjunction with the PCP(0)-FAB, PCP and applicable Standard sheets.

These details are only applicable for Prestr Conc I-Girders.

Any additional reinforcement or concrete required on these details is subsidiary to the bid Item "Reinforced Concrete Slab".

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

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation | Bridge Division

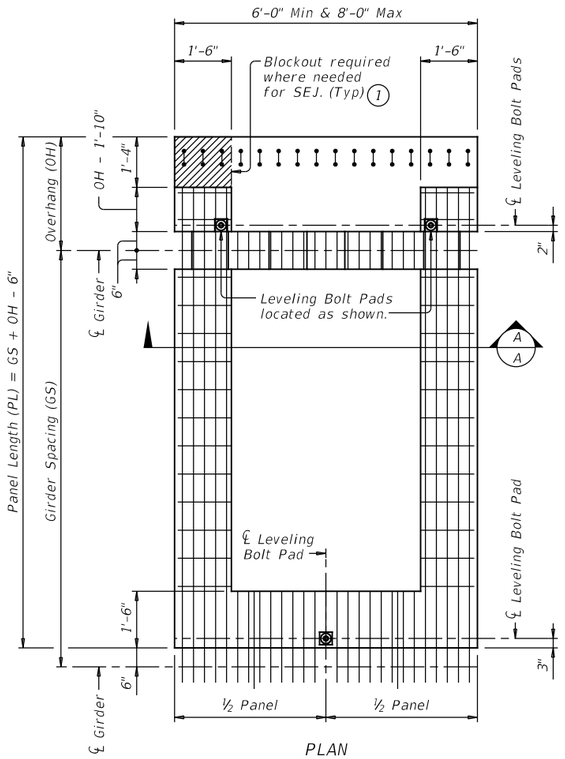
PRECAST CONCRETE PANELS FOR OVERHANGS

PCP(O)

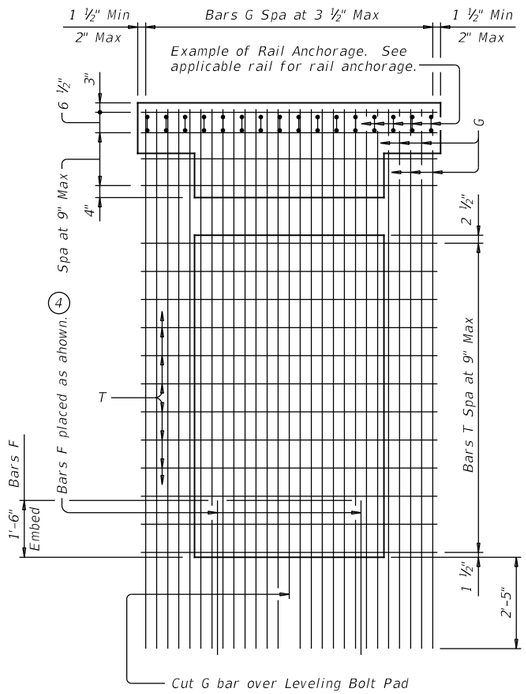
FILE: pcpostd1-17.dgn	DN: KLM	CK: DVL	DW: JTR	CK: KLM
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		98B

DATE:
FILE:

BAR TABLE	
BAR	SIZE
A (2)	#4
B (2)	#4
D (2)(3)	#4
F (3)	#3
G (2)	#4
H (2)	#4
K (2)(3)	#8
T (2)(3)	#4

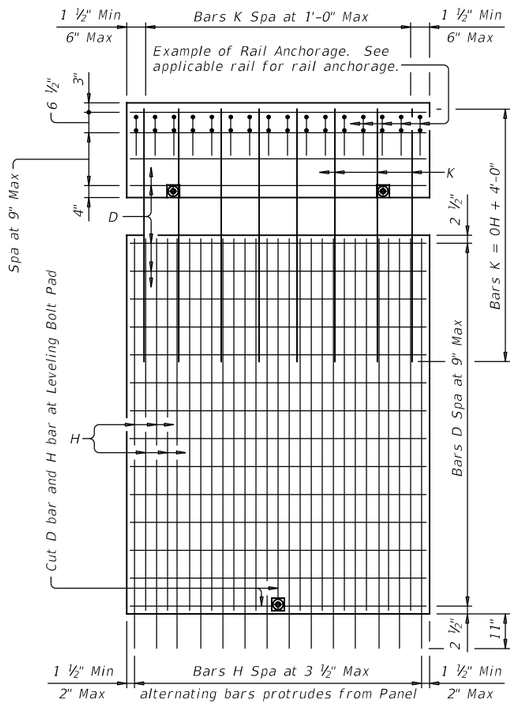


PLAN



TOP REINFORCING STEEL

END PANEL



BOTTOM REINFORCING STEEL

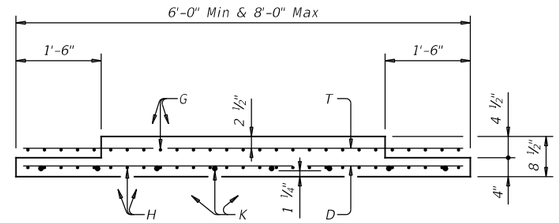
1 (1) 1'-4" x 1'-6" x 4 ½" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.

2 (2) 1 ½" End Cover on bars. (Typ)

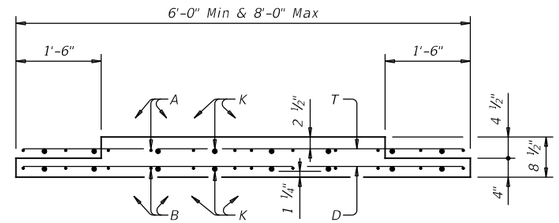
3 (3) Bars that are not allowed to have lap splices.

4 (4) Place F bars under bars T and against bars G.

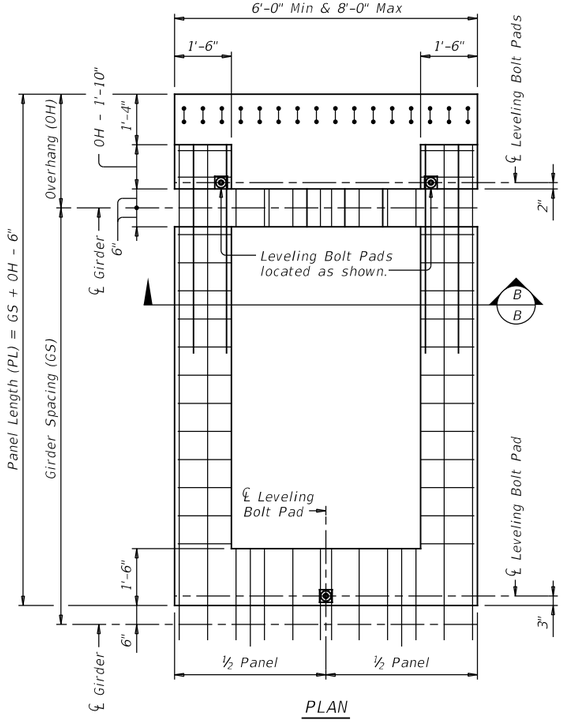
5 (5) Place F bars under bars T and between bars A.



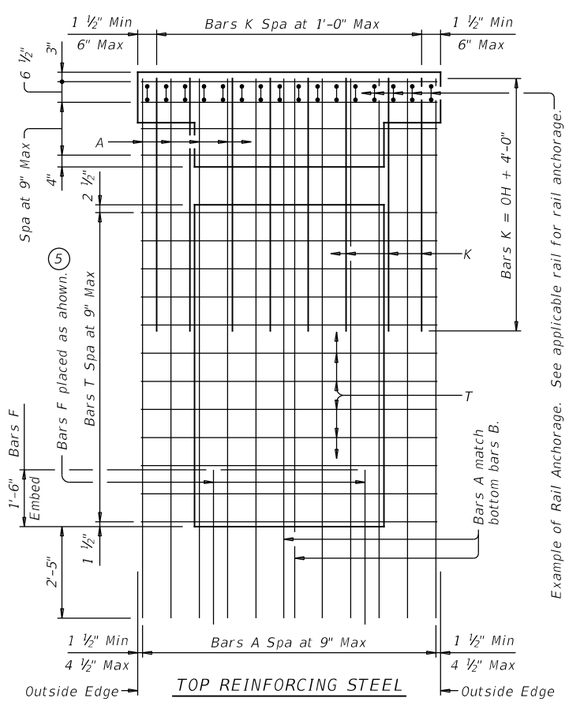
SECTION A-A



SECTION B-B

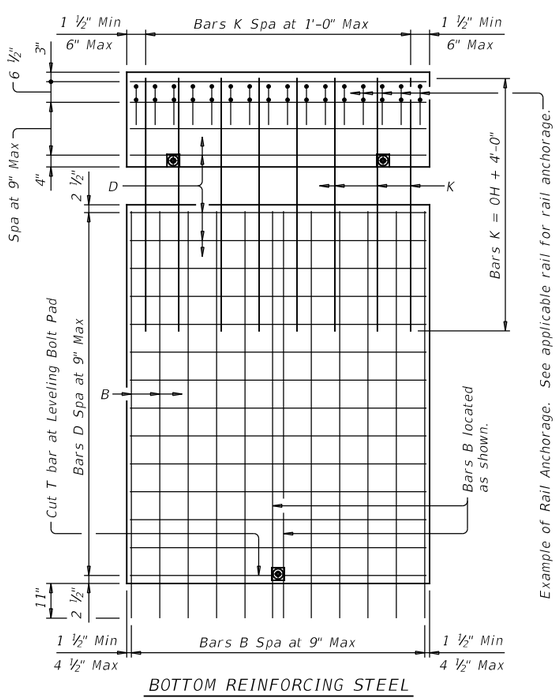


PLAN



TOP REINFORCING STEEL

INTERIOR PANEL



BOTTOM REINFORCING STEEL

HL93 LOADING

Texas Department of Transportation

Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

FILE: pcpostd2-17.dgn	DN: KLM	CK: DVL	DW: JTR	CK: KLM
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
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	WACO	LIMESTONE		98C

DATE:
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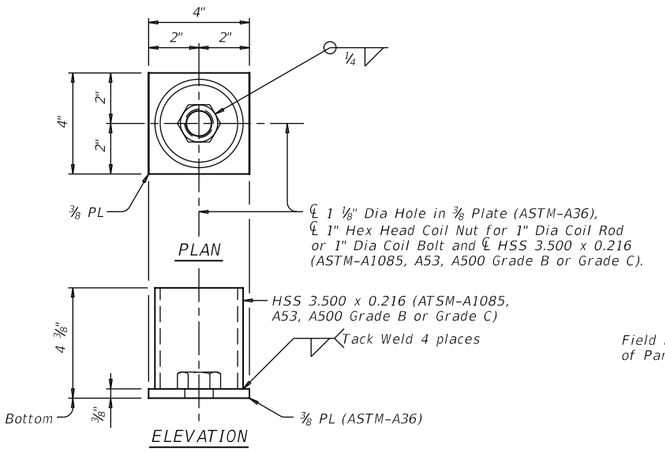
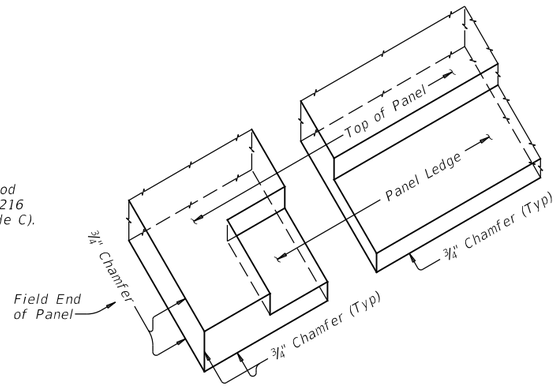


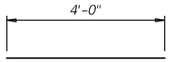
LEVELING BOLT PAD DETAILS

Galvanize if epoxy coated reinforcing steel is used in slab. Do not oil this assembly.

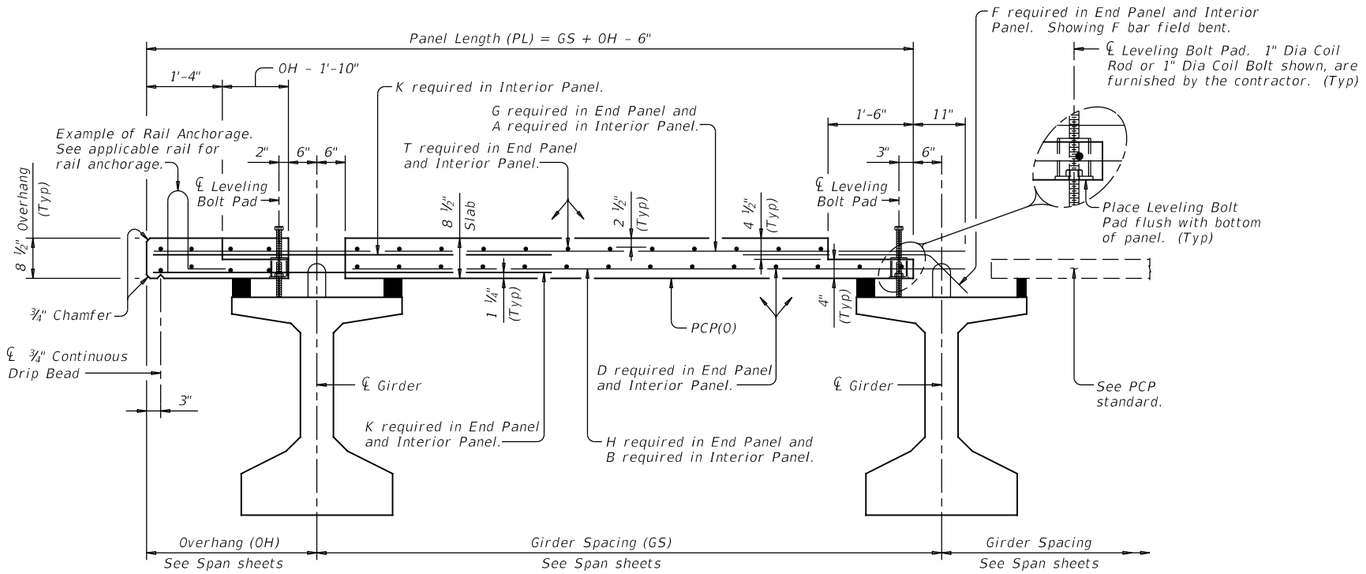


ISOMETRIC VIEW AT CORNER OF PANEL

Showing Typical Chamfers on Panel. Drip Bead and reinforcing steel not shown for clarity.



BARS F



TYPICAL TRANSVERSE SECTION

(Showing Girder Type Tx46)

CONSTRUCTION/FABRICATION NOTES:

Remove laitance from top panel surface.

Finish top surface area of panel with a broom finish. Finish top ledge of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Provide ¾" concrete chamfers as shown on these details.

Do not lap splice bars D, F, K & T. Bars A, B, G & H, may be spliced with only one lap splice allowed on each bar.

Panels must be fabricated by a fabricator meeting the requirements of DMS 7300 for Multi-Project Nonstressed Member Fabrication Plant.

MATERIAL NOTES:

Provide Class H concrete (f'c=4000 psi) in panels. Provide Class H (HPC) concrete for panels if required elsewhere in plans. Maximum large aggregate size is 1".

Provide material as shown on this standard for the Leveling Bolt Pad.

Provide Grade 60 conventional reinforcing steel.

Provide epoxy coated reinforcement for bars A, B, D, G, H, K & T if slab reinforcement is epoxy coated.

An equal area and spacing of deformed Welded Wire Reinforcement (WWR) ASTM-A1064 may be substituted for bars A, B, D, G, H & T, unless otherwise noted. Bars F and K can not be replaced with WWR.

Galvanize leveling bolt pad assembly if epoxy-coated reinforcing steel is used in slab.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

These details are only applicable for Prestr Conc I-Girders.

Any additional reinforcement, lifting devices or epoxy coated reinforcement required on these details are subsidiary to the bid Item "Reinforced Concrete Slab".

See railing details for rail anchorage in panel overhang.

A panel layout which identifies location of each panel must be developed by the fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

Submit stable lifting methods and devices to the Engineer for approval.

Shop drawings for the fabrication of panels will require the Engineer's approval.

Cover dimensions are clear dimensions, unless noted otherwise.

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

HL93 LOADING

Texas Department of Transportation

Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

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REVISIONS	1191	03	033, ETC.	FM 1245, ETC.
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	WACO	LIMESTONE		98D

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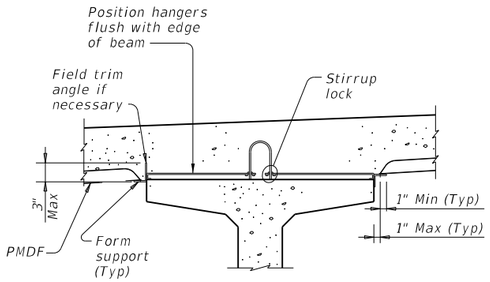
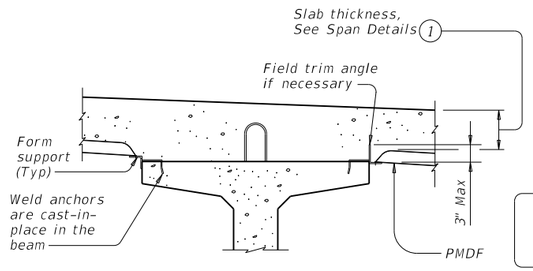
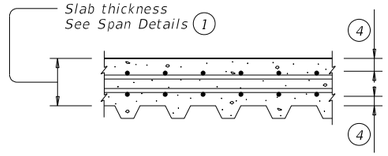


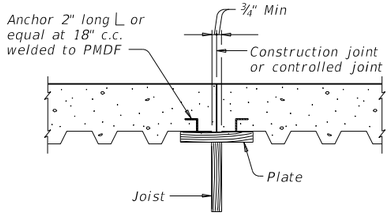
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



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

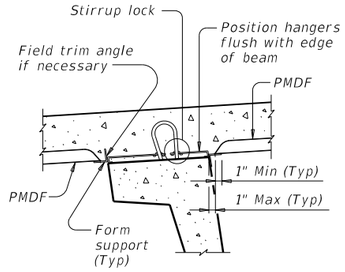


TYP LONGITUDINAL SLAB SECTION

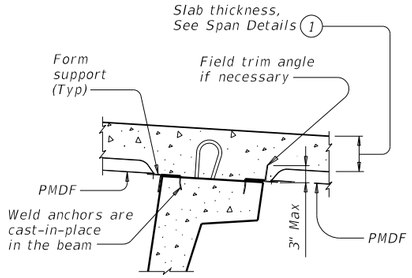


Note: In spans where PMD forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

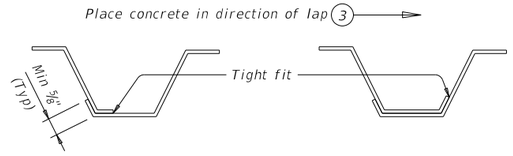
SECTION THRU CONSTRUCTION JOINT



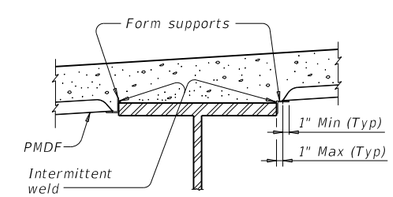
U-BEAMS WITH STIRRUP LOCKS



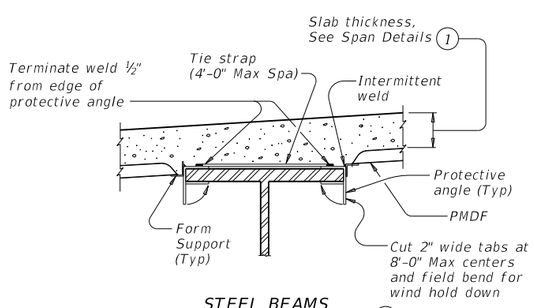
U-BEAMS WITH WELD ANCHORS



SIDE LAP DETAILS

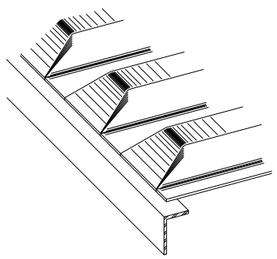


STEEL BEAMS AT COMPRESSION FLANGES



STEEL BEAMS AT TENSION FLANGES (2)

TYPICAL TRANSVERSE SECTIONS



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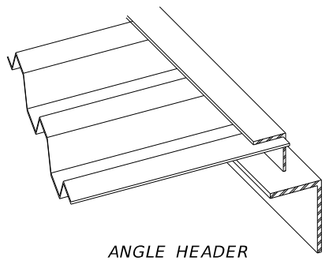

ANGLE HEADER

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

TYPES OF END CLOSURES

1. (1) Slab thickness minus 5/8" if corrugations match reinforcing bars.
2. (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. (3) The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.
4. (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'.

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

CONSTRUCTION NOTES:

Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		99

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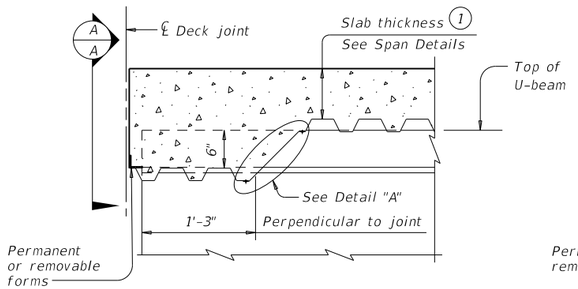
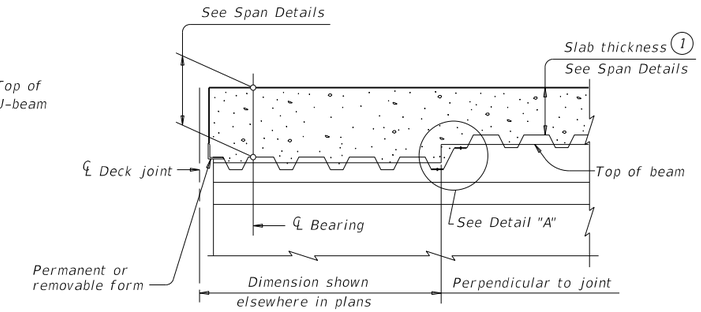
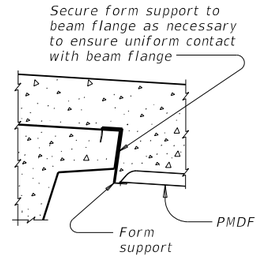


AT THICKENED SLAB END FOR U-BEAMS

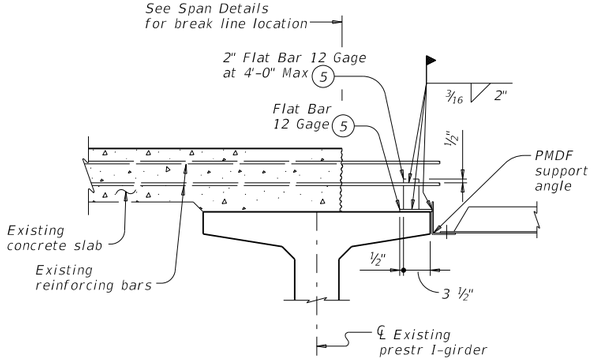


AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS

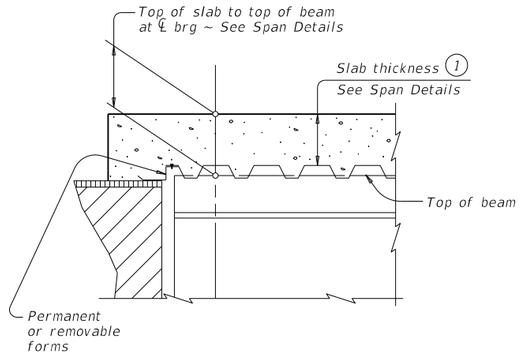
Showing I-beam block-out. No block-out for I-girders or steel beams.



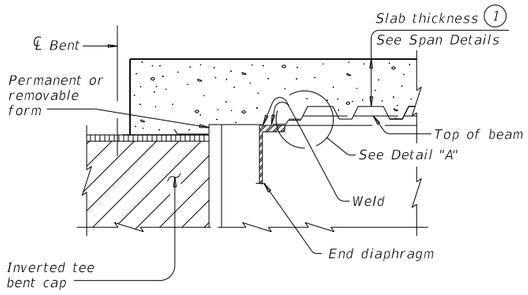
SECTION A-A



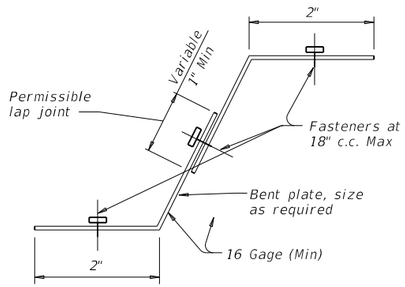
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



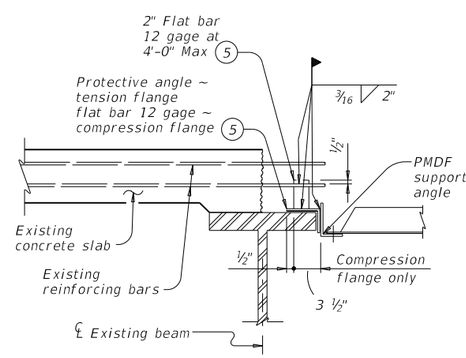
AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END



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

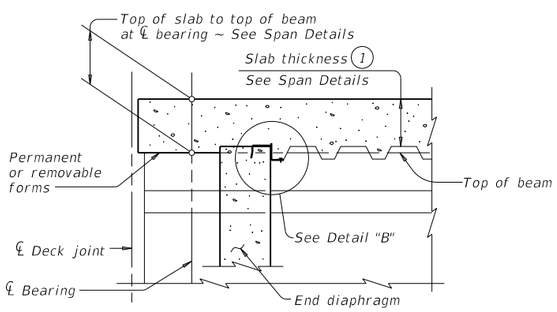


DETAIL "A"

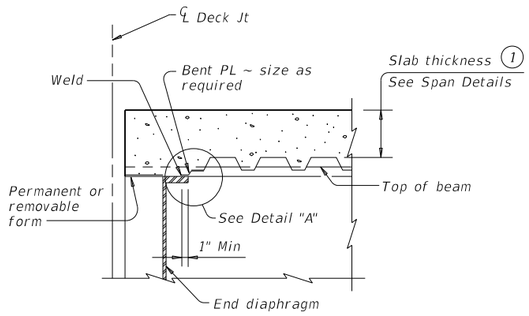


SHOWING STEEL BEAMS

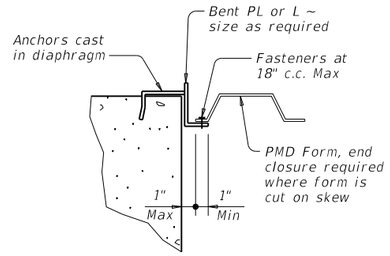
WIDENING DETAILS



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



AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END



DETAIL "B"

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars

(5) Minimum yield stress of 12 gage bars shall be 40 ksi

DETAILS AT ENDS OF BEAMS

SHEET 2 OF 2

Texas Department of Transportation

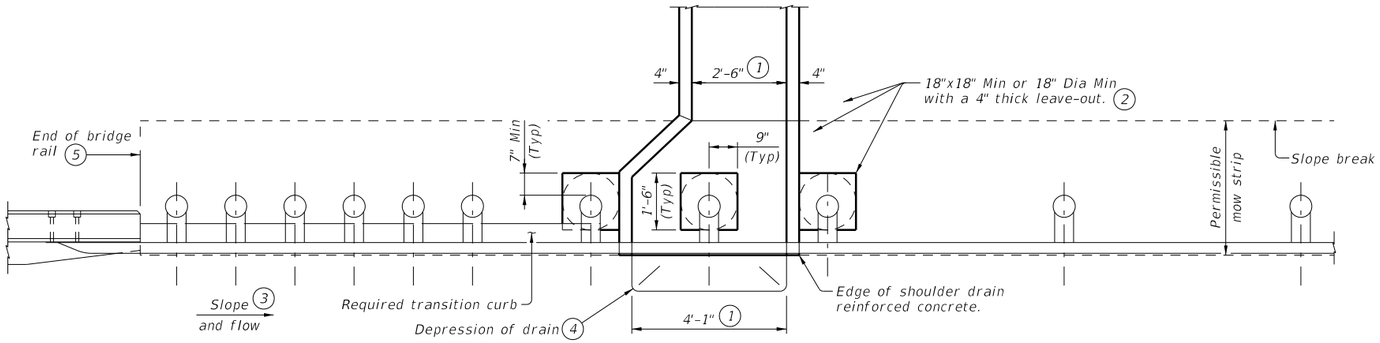
Bridge Division Standard

PERMANENT METAL DECK FORMS

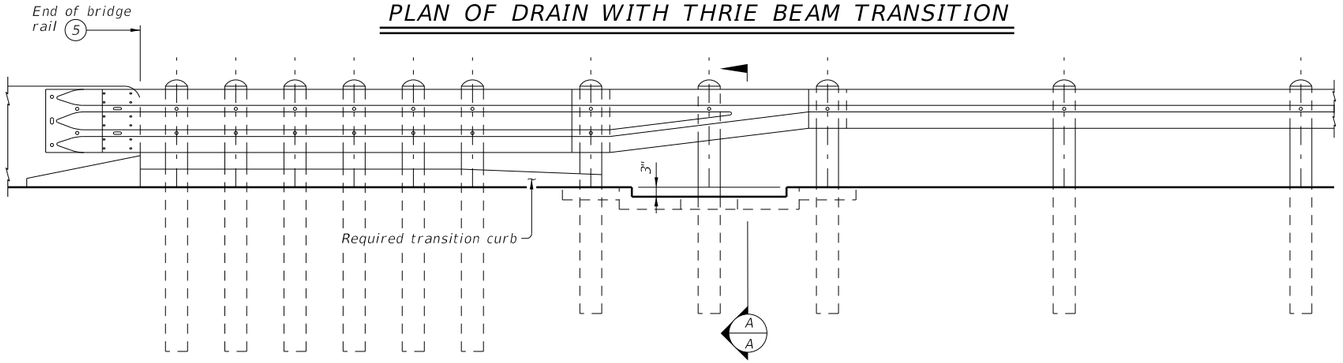
PMDF

FILE: pmdfste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		100

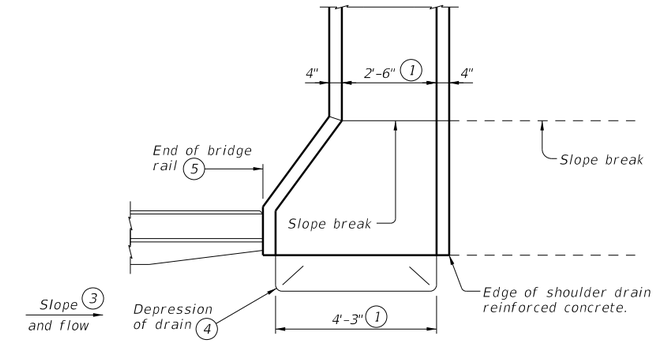
DATE: 5/7/2021 1:49:17 PM
FILE: i:\proj\R31067I.02 - TxDOT - 3299 Bridge WA 3 - Sub to IEA\05 Design (PS & E)\Plan Set\20. Project Specific Standards\7. Bridge\sdebr001-19 (1).dgn



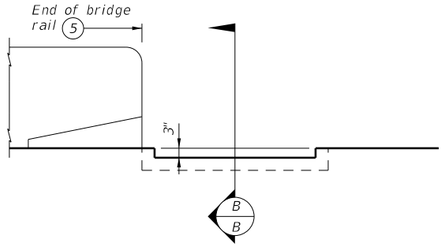
PLAN OF DRAIN WITH THRIE BEAM TRANSITION



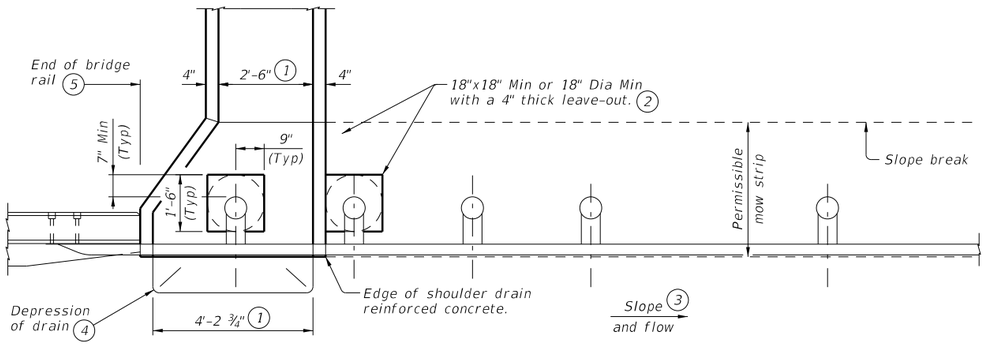
ROADWAY ELEVATION OF DRAIN WITH THRIE BEAM TRANSITION



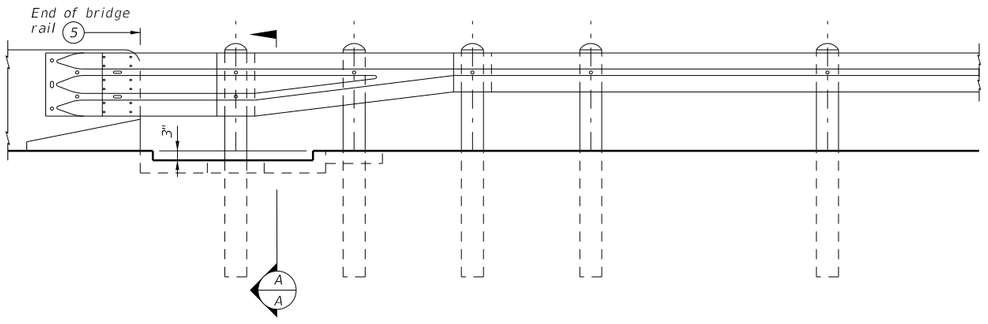
PLAN OF DRAIN WITHOUT MBGF TRANSITION



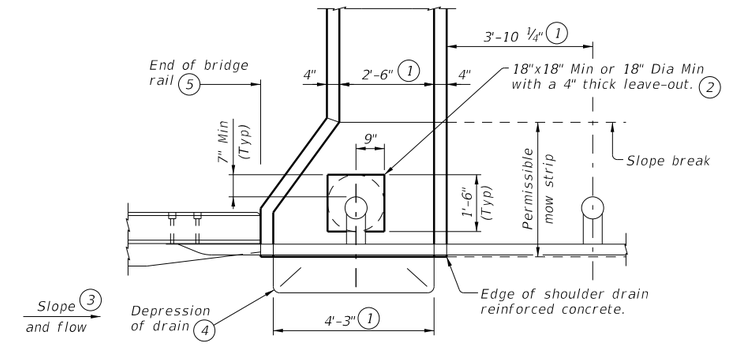
ROADWAY ELEVATION OF DRAIN WITHOUT MBGF TRANSITION



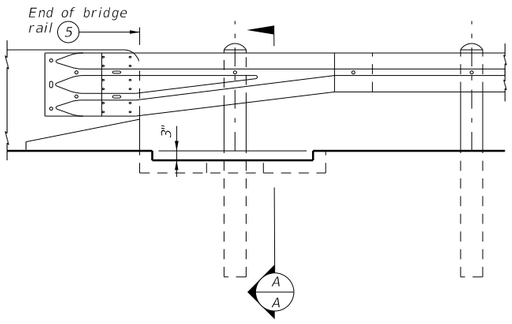
PLAN OF DRAIN WITH TL-2 (LOW SPEED) TRANSITION



ROADWAY ELEVATION OF DRAIN WITH TL-2 (LOW SPEED) TRANSITION



PLAN OF DRAIN WITH DOWNSTREAM ANCHOR TERMINAL



ROADWAY ELEVATION OF DRAIN WITH DOWNSTREAM ANCHOR TERMINAL

(1) Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer. Location of shoulder drain must consider limitation imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.

(2) Fill leave-outs with no more than a 2-sack grout mixture (1 part cement, 5 parts water, and 14 parts sand by volume) with a 28-day compressive strength of approximately 120 psi or less. Provide grout of 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 (20" Max leave-out).

(3) For other slope and flow directions drain configuration may be mirrored wider or tapered wider if shown elsewhere in the plans or directed by the Engineer.

(4) Form depression into concrete, asphalt pavement, or approach slab.

(5) See Bridge Layout for rail type.

Texas Department of Transportation

Bridge Division Standard

SHOULDER DRAIN AT END OF BRIDGE RAIL

SD-EBR

FILE: sdebr001-19.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		101

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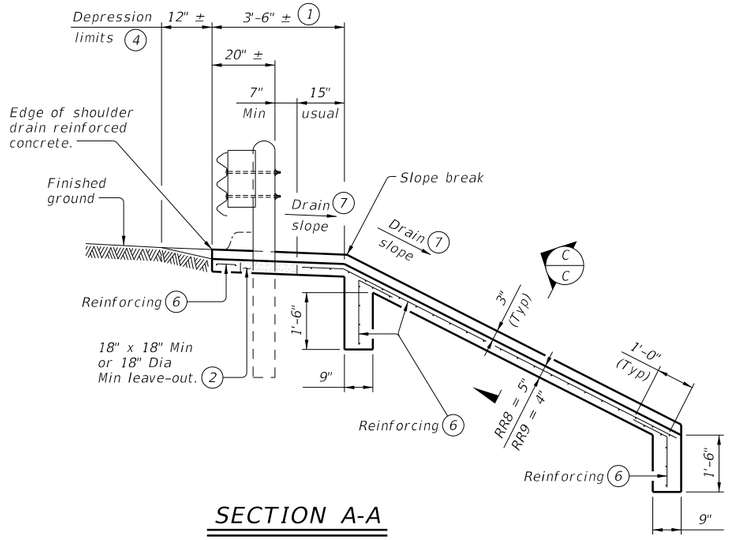
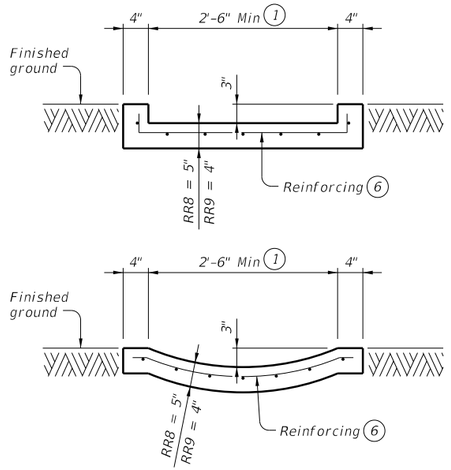
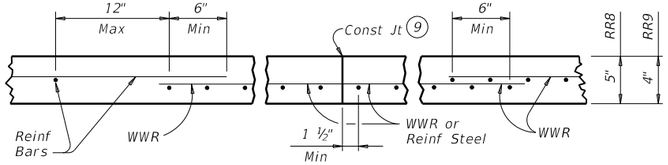


SECTION A-A



SECTION C-C

Sections shown without integrated riprap.



REINFORCEMENT DETAILS (6)

See General Notes for optional synthetic fiber reinforcement.

(1) Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer. Location of shoulder drain must consider limitation imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.

(2) Fill leave-outs with no more than a 2-sack grout mixture (1 part cement, 5 parts water, and 14 parts sand by volume) with a 28-day compressive strength of approximately 120 psi or less. Provide grout of 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 (20" Max leave-out).

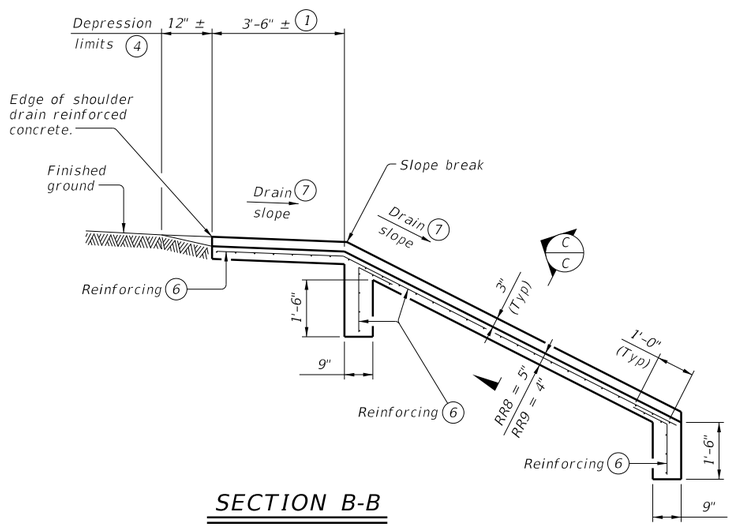
(4) Form depression into concrete, asphalt pavement, or approach slab.

(6) Provide (#3) reinforcing bar at 18" spacing c-c or welded wire reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars, unless shown otherwise.

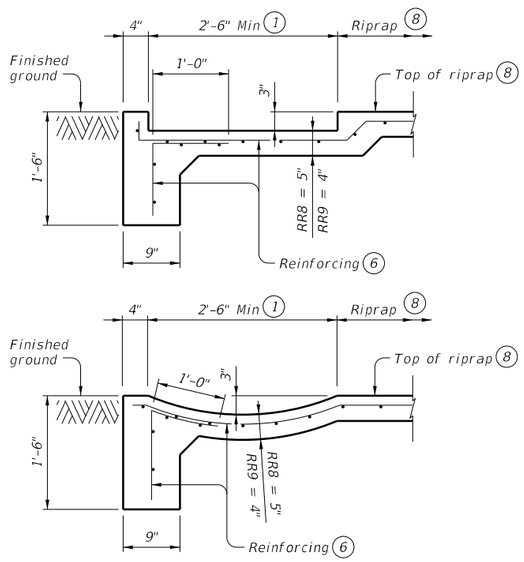
(7) See elsewhere in plans or as directed by the Engineer.

(8) See CRR standard for details and notes not shown.

(9) WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic fiber is utilized.



SECTION B-B



SECTION C-C

Sections shown with integrated riprap.

GENERAL NOTES:

Provide Class "B" concrete with a minimum compressive strength of 2,000 psi unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

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

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

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

See Metal Beam Guard Fence (Mow Strip) standard for details and notes not shown.

Payment for furnishing and placing 2-sack grout mixture will be subsidiary to shoulder drain.

Payment for shoulder drain will be as per Item 420, "Cl B Conc (Flume)". All details shown herein are subsidiary to shoulder drain.

See Layout for limits of shoulder drain.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

SHOULDER DRAIN AT END OF BRIDGE RAIL

SD-EBR

FILE: sdebr001-19.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		102

DATE: 5/7/2021 1:49:19 PM
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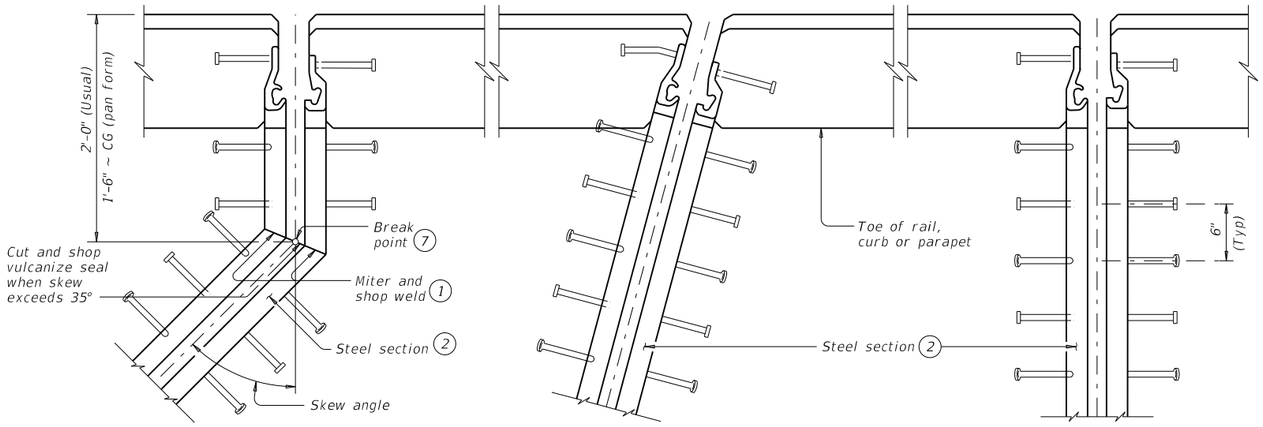
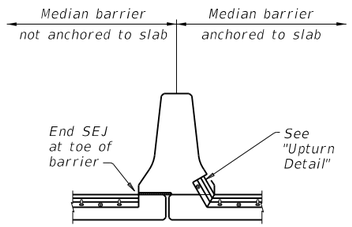
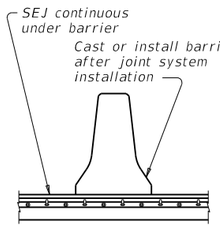


SHOWING SKEWS WITH SLAB BREAKBACKS | SHOWING SKEWS WITHOUT SLAB BREAKBACKS | SHOWING WITHOUT SKEWS AND SLAB BREAKBACKS

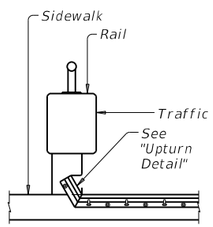
PLANS OF END CONDITIONS



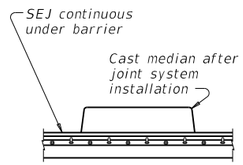
WITH OPEN DECK JOINT BELOW MEDIAN BARRIER



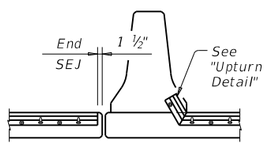
AT MEDIAN BARRIER



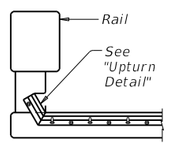
AT SIDEWALK BEHIND BRIDGE RAIL



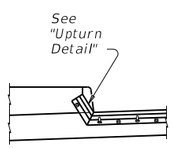
AT RAISED MEDIAN



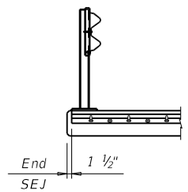
WITH OPEN DECK JOINT ADJACENT TO MEDIAN BARRIER



AT CONCRETE BRIDGE RAIL

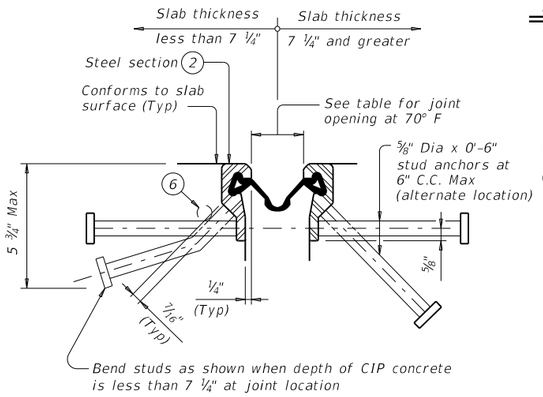


AT SIDEWALK

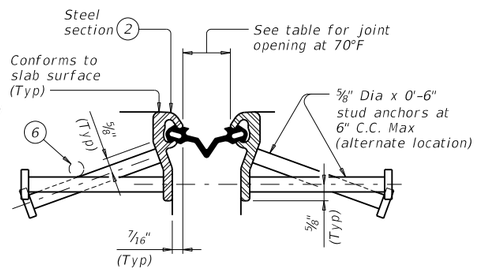


AT STEEL POST BRIDGE RAIL

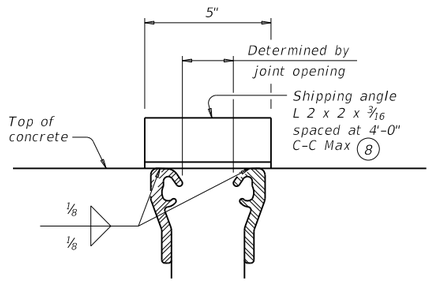
TYPICAL SECTIONS (5)



SECTION THRU WATSON BOWMAN ACME (SE-400 OR SE-500) JOINTS



SECTION THRU D.S. BROWN (A2R-400 OR A2R-XTRA) JOINTS



SHOWING D.S. BROWN (Ty SSCM2)
(All joints are similar.) (Studs are not shown for clarity.)

SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

TABLE OF SEALED EXPANSION JOINT INFORMATION

MANUFACTURER	STEEL SECTION (2)	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening (3)	Seal Type	Joint Opening (3)
D.S. Brown	Type SSCM2	A2R-400	1 ¾"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 ¾"	SE-500	2"

REDUCED LONGITUDINAL MOVEMENT RANGE

SKEW (deg)	JOINT SIZE	
	4"	5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

DESIGN NOTES:

Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations.

For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

(1) Remove all burrs which will be in contact with seal prior to making splice.

(2) Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.

(3) These openings are also the recommended minimum installation openings.

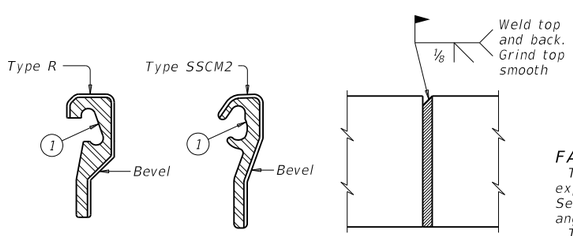
(4) Reduce for sidewalk or parapet heights less than 6".

(5) Other conditions affecting the joint profile should be noted elsewhere.

(6) Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.

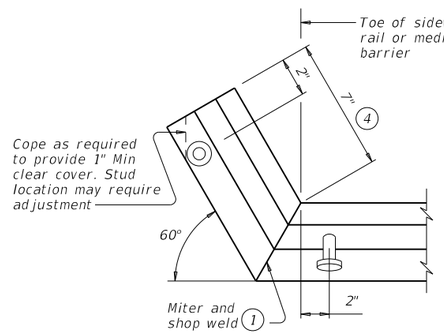
(7) See Span details for location of break point.

(8) Align shipping angle perpendicular to joint.



WELD LIMITS | WELD LIMITS | REAR VIEW

FIELD SPLICE DETAIL



UPTURN DETAIL

FABRICATION NOTES:

Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts.

The seal must be continuous and included in the price bid for sealed expansion joint.

Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1.

Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section with System II or IV primer in accordance with Item 446, "Feild Cleaning and Painting Steel", unless required to galvanize when shown in the plans. Provide galvanizing in accordance with Item 445, "Galvanizing". Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of sealed expansion joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint.

Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

GENERAL NOTES:

Provide sealed expansion joints in the size and at locations shown on the plans.

Minimum slab and overhang thickness required for the use of SEJ-M is 6 ½".

Texas Department of Transportation

Bridge Division Standard

SEALED EXPANSION JOINT TYPE M WITHOUT OVERLAY

SEJ-M

FILE: sejmste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		103

DATE:
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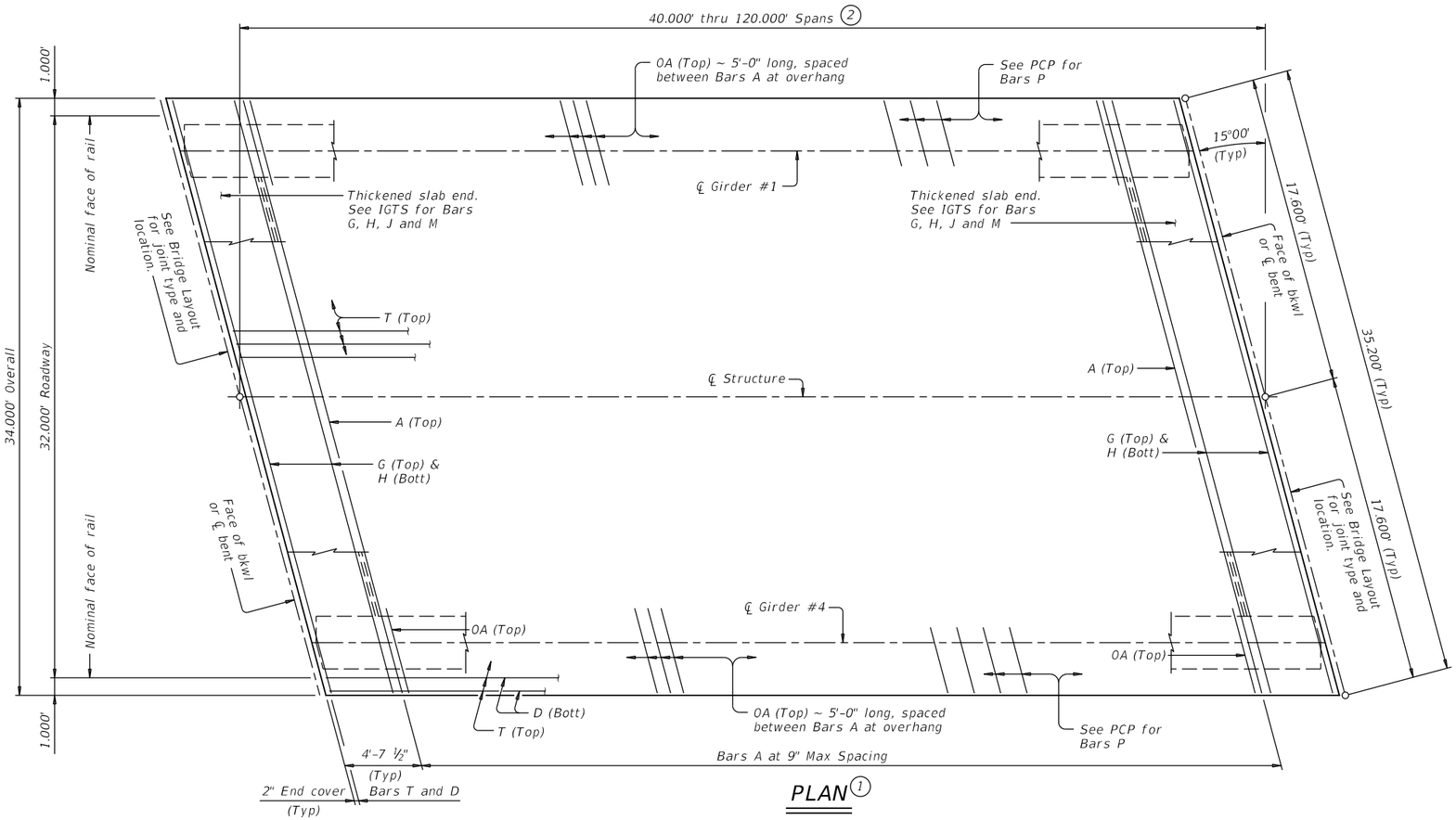


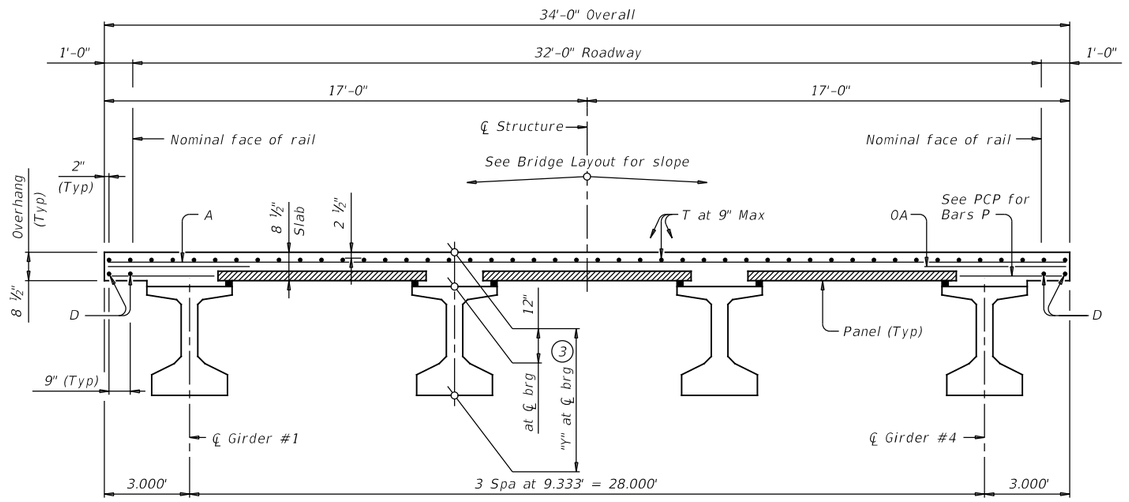
PLAN (1)

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

(1) If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see standard IGCS for adjustment to slab reinforcement and quantities.

(2) Span lengths for prestressed concrete I-Girder type:
Type Tx28 for spans lengths 40.000' thru 65.000'.
Type Tx34 for spans lengths 40.000' thru 80.000'.
Type Tx40 for spans lengths 40.000' thru 90.000'.
Type Tx46 for spans lengths 40.000' thru 100.000'.
Type Tx54 for spans lengths 40.000' thru 120.000'.

(3) "Y" value shown is based on theoretical girder camber, dead load deflection from an 8 ½" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve and/or if the precast overhang panel (PCP(0)) option is used.



TYPICAL TRANSVERSE SECTION

(Showing girder type Tx46)

TABLE OF SECTION DEPTHS	
GIRDER TYPE	"Y" AT ℄ BRG (3)
	Ft/In
Tx28	3'-4"
Tx34	3'-10"
Tx40	4'-4"
Tx46	4'-10"
Tx54	5'-6"

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

32' ROADWAY 15° SKEW

SIG-32-15

FILE: sig42sts-19.dgn	DN: JMH	CK: ASB	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS: 10-19: Increased "X" and "Y" Values	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		104

DATE:
FILE:

TABLE OF DEAD LOAD DEFLECTIONS

TYPE Tx28 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.011	0.015
45	0.017	0.024
50	0.026	0.037
55	0.040	0.056
60	0.057	0.080
65	0.079	0.111

TYPE Tx34 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.006	0.009
45	0.010	0.014
50	0.016	0.022
55	0.024	0.033
60	0.034	0.048
65	0.047	0.066
70	0.064	0.090
75	0.085	0.120
80	0.111	0.156

TYPE Tx40 GIRDERS

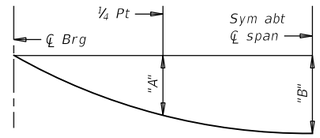
SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.004	0.006
45	0.006	0.009
50	0.011	0.015
55	0.016	0.022
60	0.022	0.031
65	0.031	0.043
70	0.042	0.059
75	0.056	0.078
80	0.073	0.102
85	0.093	0.131
90	0.118	0.165

TYPE Tx46 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.003	0.004
45	0.004	0.006
50	0.007	0.010
55	0.011	0.015
60	0.015	0.021
65	0.021	0.030
70	0.028	0.040
75	0.038	0.053
80	0.049	0.069
85	0.063	0.089
90	0.080	0.113
95	0.100	0.140
100	0.123	0.173

TYPE Tx54 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.002	0.003
45	0.003	0.004
50	0.005	0.007
55	0.007	0.010
60	0.010	0.014
65	0.014	0.020
70	0.019	0.027
75	0.025	0.035
80	0.033	0.046
85	0.042	0.059
90	0.053	0.074
95	0.066	0.093
100	0.081	0.114
105	0.100	0.140
110	0.120	0.169
115	0.144	0.202
120	0.172	0.241



DEAD LOAD DEFLECTION DIAGRAM

Calculated deflections shown are due to the concrete slab on interior girders only (Ec = 5000 ksi). Adjust values as required for exterior girders and if optional slab forming is used. These values may require field verification.

TABLE OF ESTIMATED QUANTITIES

SPAN LENGTH	REINF CONCRETE SLAB	Prestressed Concrete Girders			TOTAL (5) REINF STEEL
		ABUT TO (4) INT BT	INT BT TO (4) INT BT	ABUT TO (4) ABUT	
Ft	SF	LF	LF	LF	Lb
40	1,360	157.96	158.00	157.93	3,128
45	1,530	177.96	178.00	177.93	3,519
50	1,700	197.96	198.00	197.93	3,910
55	1,870	217.96	218.00	217.93	4,301
60	2,040	237.96	238.00	237.93	4,692
65	2,210	257.96	258.00	257.93	5,083
70	2,380	277.96	278.00	277.93	5,474
75	2,550	297.96	298.00	297.93	5,865
80	2,720	317.96	318.00	317.93	6,256
85	2,890	337.96	338.00	337.93	6,647
90	3,060	357.96	358.00	357.93	7,038
95	3,230	377.96	378.00	377.93	7,429
100	3,400	397.96	398.00	397.93	7,820
105	3,570	417.96	418.00	417.93	8,211
110	3,740	437.96	438.00	437.93	8,602
115	3,910	457.96	458.00	457.93	8,993
120	4,080	477.96	478.00	477.93	9,384

(4) Fabricator will adjust lengths for girder slopes as required.

(5) Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

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 PCP(O) and PCP(O)-FAB for precast overhang panel details if this option is used.

See IGMS standard for miscellaneous details.

See applicable rail details for rail anchorage in slab.

See PMDF standard for details and quantity adjustments if this option is used.

This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

This standard does not support the use of transition bents.

Cover dimensions are clear dimensions, unless noted otherwise.

MATERIAL NOTES:

Provide Class S concrete (f'c = 4,000 psi).

Provide Class S (HPC) concrete if shown elsewhere in the plans.

Provide Grade 60 reinforcing steel.

Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"

Epoxy coated ~ #4 = 2'-5"

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, OA, P or T unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

32' ROADWAY 15° SKEW

SIG-32-15

FILE: sig42sts-19.dgn	DN: JMH	CK: ASB	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Increased "X" and "Y" Values	1191	03	033, ETC.	FM 1245, ETC.
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		105

DATE: 5/7/2021 1:49:19 PM
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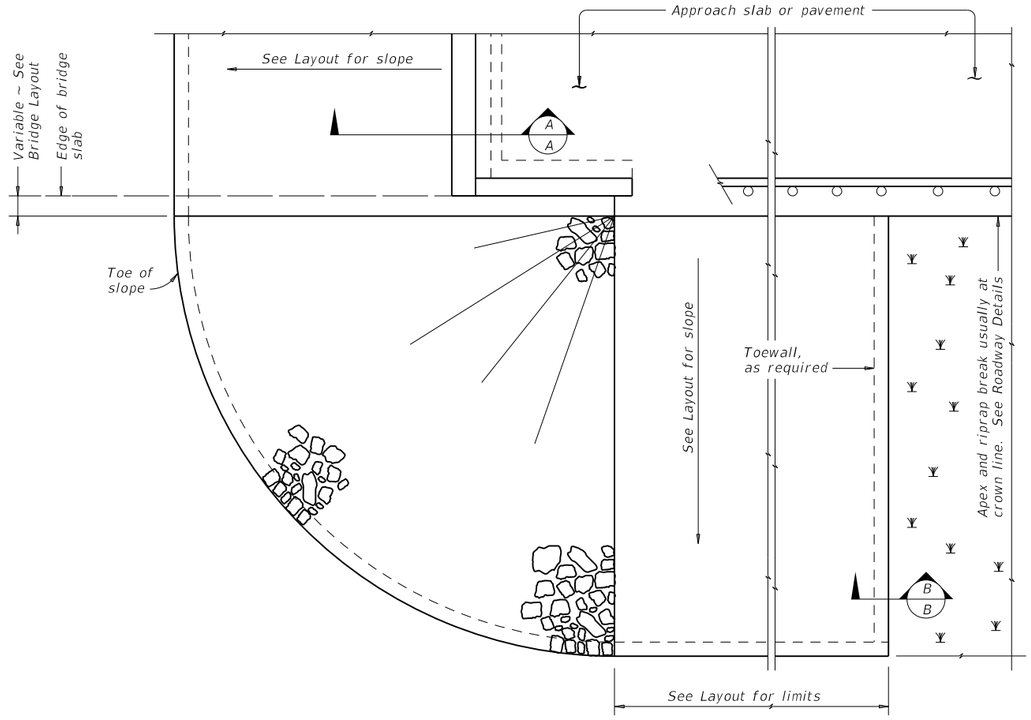
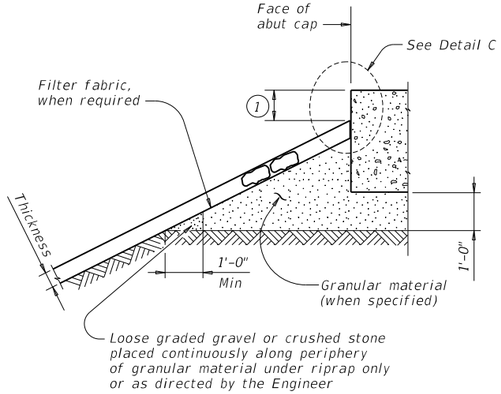
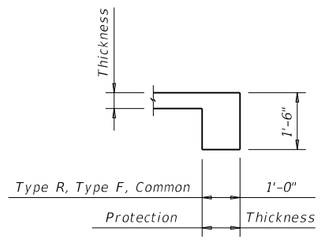


PLAN

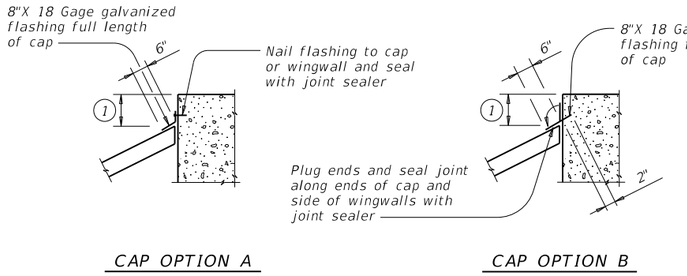


SECTION A-A AT CAP



SECTION B-B

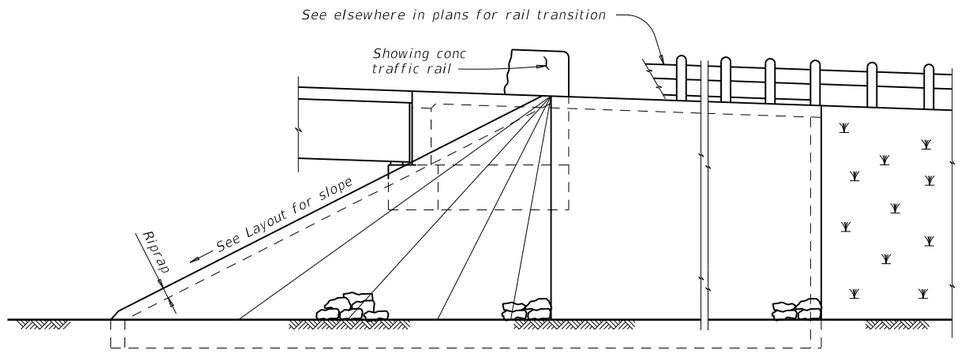
Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C



ELEVATION

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

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

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		106

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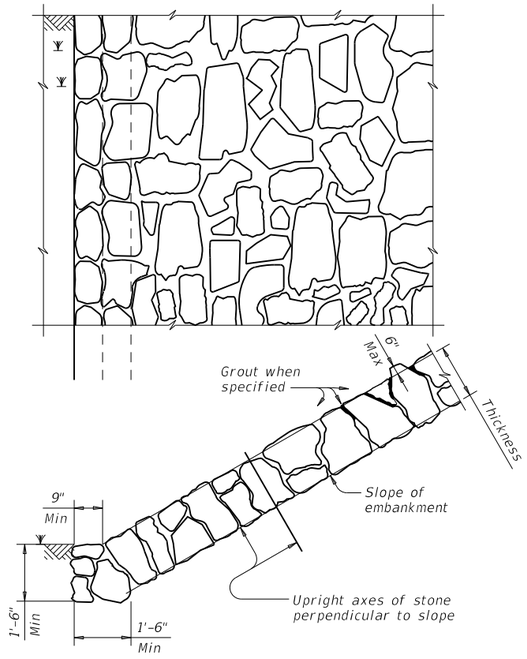


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

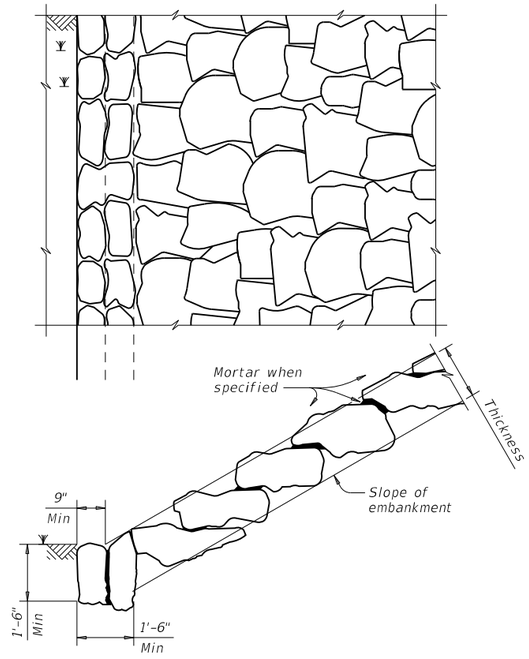


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

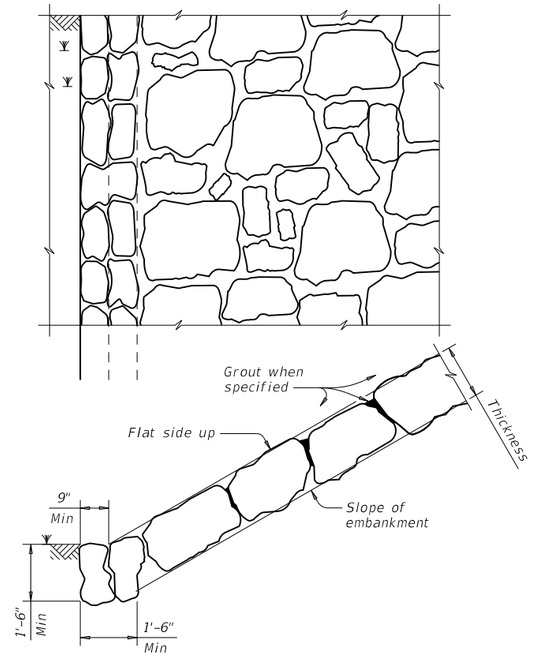


FIGURE 3 ~ TYPE F STONE RIPRAP

grouted

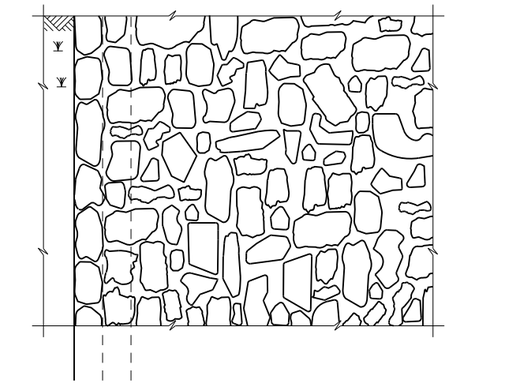


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

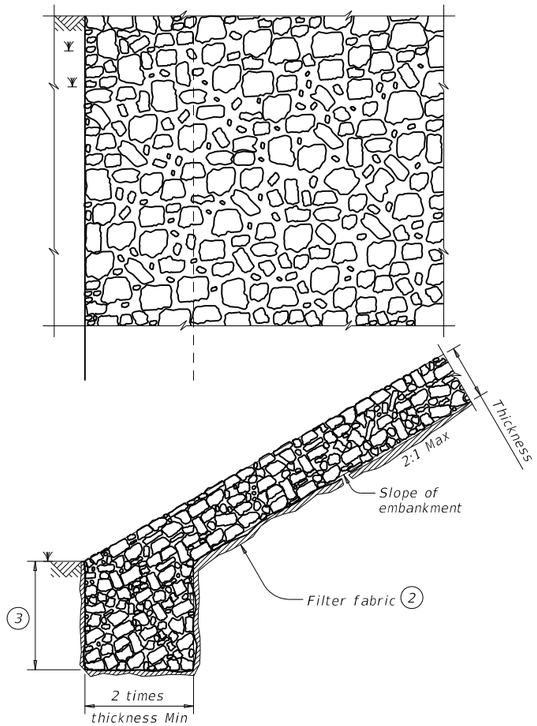


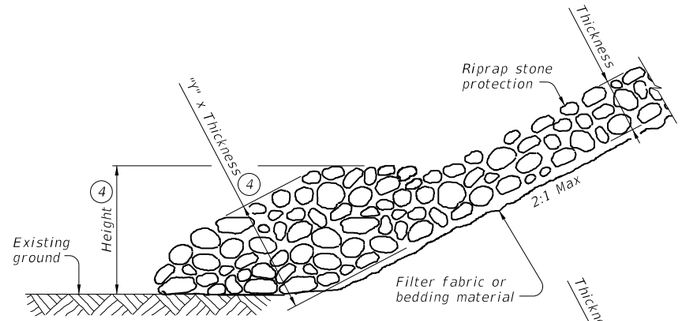
FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

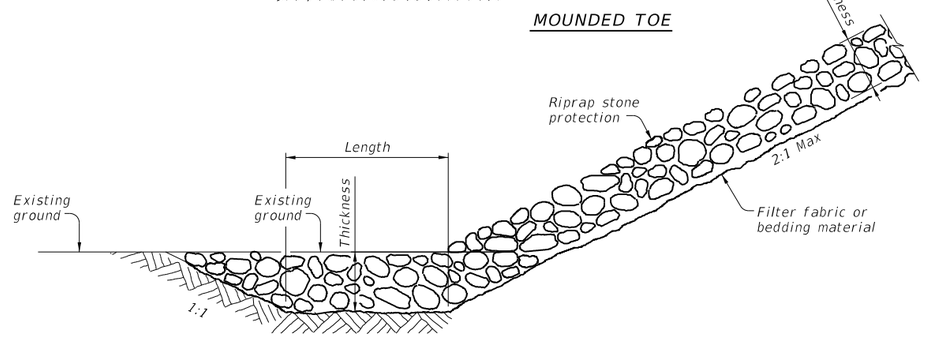
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(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)

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		107

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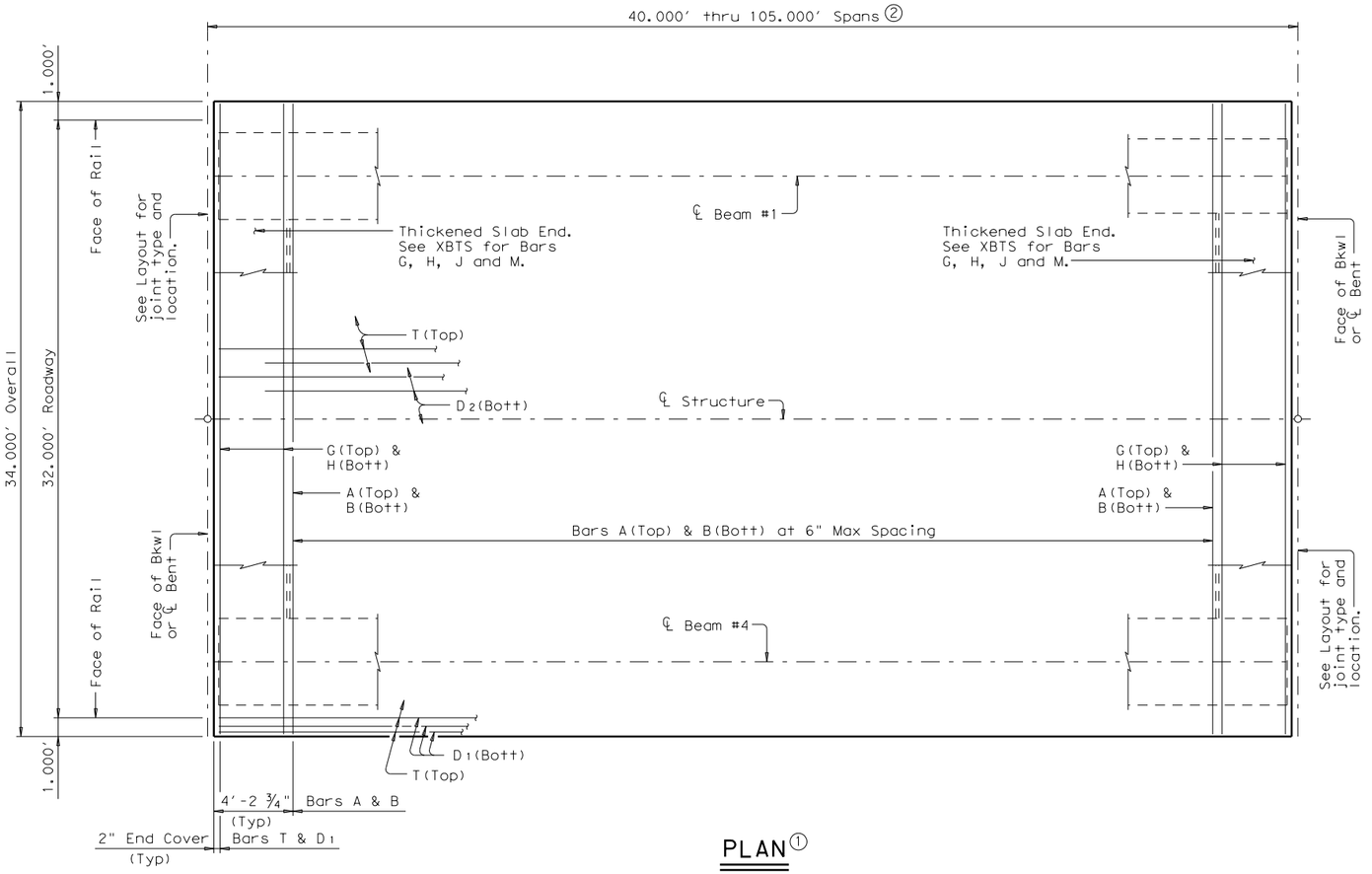
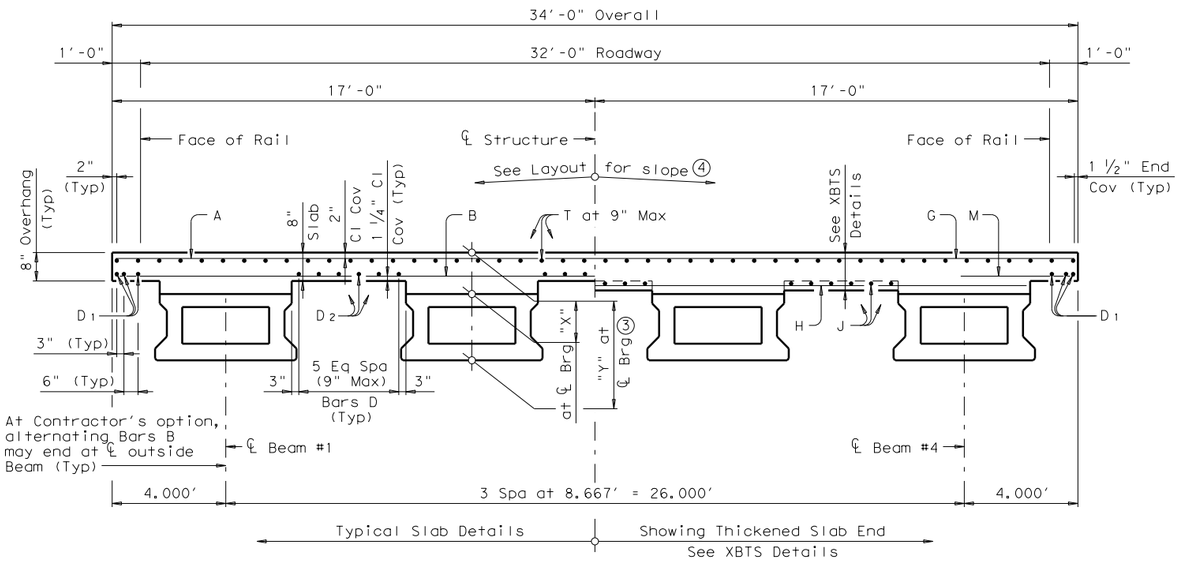


PLAN ①



TYPICAL TRANSVERSE SECTION

(Showing Beam Type 5XB28)

BAR TABLE	
BAR	SIZE
A	#5
B	#5
D	#5
G	#5
H	#5
J	#5
M	#5
T	#4

① If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see Standard XBCS for adjustment to slab reinforcement and quantities.

② Span Lengths for Prestressed Concrete X-Beam Type:
Type 5XB20 for Spans Lengths 40.000′ thru 65.000′.
Type 5XB28 for Spans Lengths 40.000′ thru 80.000′.
Type 5XB34 for Spans Lengths 40.000′ thru 95.000′.
Type 5XB40 for Spans Lengths 40.000′ thru 105.000′.

③ "Y" value shown is based on theoretical beam camber, dead load deflection from an 8" cast-in-place concrete slab and a constant roadway grade. The contractor will adjust this value as necessary for any roadway vertical curve.

④ This standard does not provide for changes in roadway cross-slopes within the structure.

TABLE OF SECTION DEPTHS								
Span Length	Beam Type 5XB20		Beam Type 5XB28		Beam Type 5XB34		Beam Type 5XB40	
	"X"	"Y"③	"X"	"Y"③	"X"	"Y"③	"X"	"Y"③
Ft	In	Ft/In	In	Ft/In	In	Ft/In	In	Ft/In
40	10"	2′-6"	10"	3′-2"	10"	3′-8"	10"	4′-2"
45	10"	2′-6"	10"	3′-2"	10"	3′-8"	10"	4′-2"
50	10"	2′-6"	10"	3′-2"	10"	3′-8"	10"	4′-2"
55	10"	2′-6"	10"	3′-2"	10"	3′-8"	10"	4′-2"
60	10 ½"	2′-6 ½"	10"	3′-2"	10"	3′-8"	10"	4′-2"
65	11"	2′-7"	10"	3′-2"	10"	3′-8"	10"	4′-2"
70	---	---	10"	3′-2"	10"	3′-8"	10"	4′-2"
75	---	---	10 ½"	3′-2 ½"	10"	3′-8"	10"	4′-2"
80	---	---	11"	3′-3"	10"	3′-8"	10"	4′-2"
85	---	---	---	---	10 ½"	3′-8 ½"	10"	4′-2"
90	---	---	---	---	10 ½"	3′-8 ½"	10"	4′-2"
95	---	---	---	---	11"	3′-9"	10"	4′-2"
100	---	---	---	---	---	---	10 ½"	4′-2 ½"
105	---	---	---	---	---	---	11"	4′-3"

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE X-BEAM SPANS (TYPE 5XB20 THRU 5XB40)

32′ ROADWAY

SXB-32

FILE: xbstde47.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
©TxDOT June 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		108

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FILE: I:\proj\R310671.02 - TxDOT - 3299 Bridge WA 3 - Sub to IEA\05 Design (PS & E)\Plan Set\20. Project Specific Standards\7. Bridge\xbstde47.dgn

TABLE OF DEAD LOAD DEFLECTIONS

TYPE 5XB20 BEAMS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.014	0.019
45	0.021	0.030
50	0.033	0.047
55	0.050	0.070
60	0.071	0.100
65	0.100	0.140

TYPE 5XB28 BEAMS

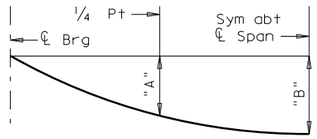
SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.005	0.007
45	0.009	0.012
50	0.014	0.019
55	0.020	0.028
60	0.029	0.041
65	0.040	0.056
70	0.055	0.077
75	0.073	0.102
80	0.095	0.133

TYPE 5XB34 BEAMS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.003	0.004
45	0.005	0.007
50	0.008	0.011
55	0.012	0.017
60	0.017	0.024
65	0.024	0.034
70	0.033	0.046
75	0.043	0.060
80	0.056	0.079
85	0.072	0.101
90	0.091	0.128
95	0.113	0.159

TYPE 5XB40 BEAMS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.002	0.003
45	0.004	0.005
50	0.005	0.007
55	0.008	0.011
60	0.011	0.016
65	0.016	0.022
70	0.021	0.030
75	0.029	0.040
80	0.037	0.052
85	0.047	0.066
90	0.060	0.084
95	0.074	0.104
100	0.091	0.128
105	0.112	0.157



DEAD LOAD DEFLECTION DIAGRAM

Calculated deflections shown are due to the concrete slab on interior beams only (Ec = 5,000 ksi). Adjust values as required for exterior beams and if optional slab forming is used. These values may require field verification.

TABLE OF ESTIMATED QUANTITIES

SPAN LENGTH	REINF CONCRETE SLAB	⑤ PRESTR CONCRETE X-BEAMS	CLASS "S" CONCRETE	⑥ TOTAL REINF STEEL
Ft	SF	LF	CY	Lb
40	1,360	158.00	38.5	8,840
45	1,530	178.00	43.2	9,945
50	1,700	198.00	47.9	11,050
55	1,870	218.00	52.7	12,155
60	2,040	238.00	57.2	13,260
65	2,210	258.00	61.9	14,365
70	2,380	278.00	66.7	15,470
75	2,550	298.00	70.7	16,575
80	2,720	318.00	75.2	17,680
85	2,890	338.00	79.1	18,785
90	3,060	358.00	82.9	19,890
95	3,230	378.00	86.0	20,995
100	3,400	398.00	92.1	22,100
105	3,570	418.00	98.7	23,205

⑤ Fabricator will adjust lengths for beam slopes as required.

⑥ Reinforcing steel weight is calculated using an approximate factor of 6.5 Lbs/SF.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and Standard XBCS.

See XBTS Standard for Thickened Slab End Details and quantity adjustments.

See PCP or PMDF Standards for details and quantity adjustments if either of these options are used.

See XBMS Standard for miscellaneous details.

All reinforcing must be Grade 60.

Concrete strength f'c = 4,000 psi.

Bar laps, where required, will be as follows:

Uncoated ~ #4 = 1'-5"
~ #5 = 1'-9"
Epoxy Coated ~ #4 = 2'-1"
~ #5 = 2'-7"

See railing details for rail anchorage in slab.

This standard does not support the use of Transition Bents.

HL93 LOADING *SHEET 2 OF 2*

Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE X-BEAM SPANS (TYPE 5XB20 THRU 5XB40)

32' ROADWAY

SXB-32

FILE: xbstde47.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
©TxDOT June 2011	CONT	SECT	JOB	HIGHWAY
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	WACO	LIMESTONE		109

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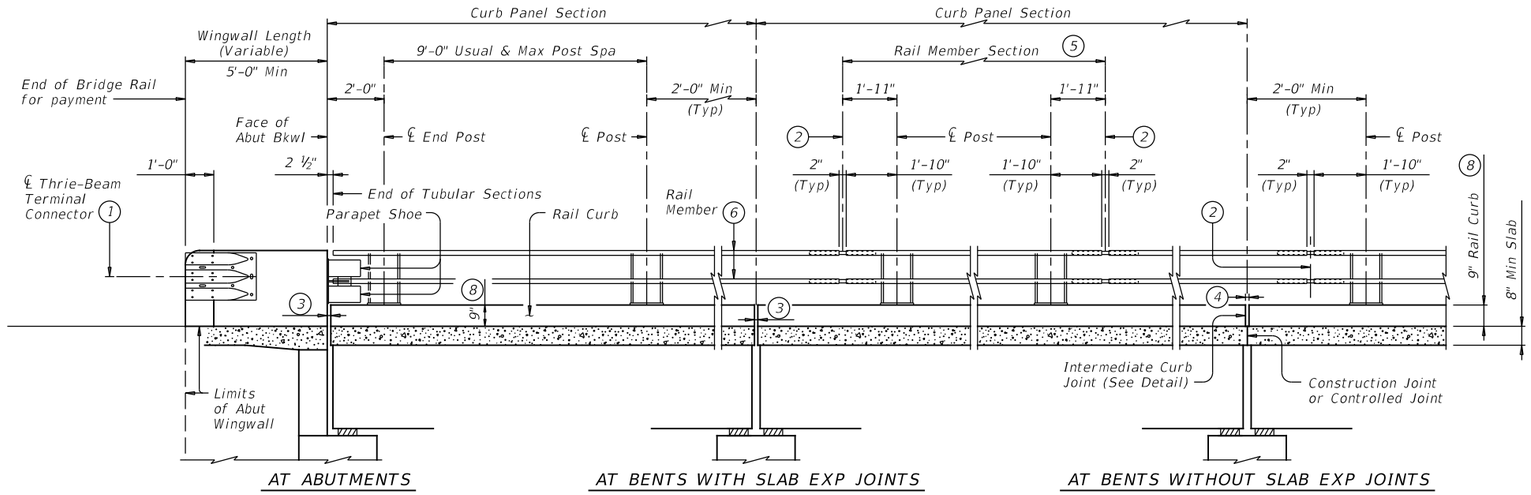
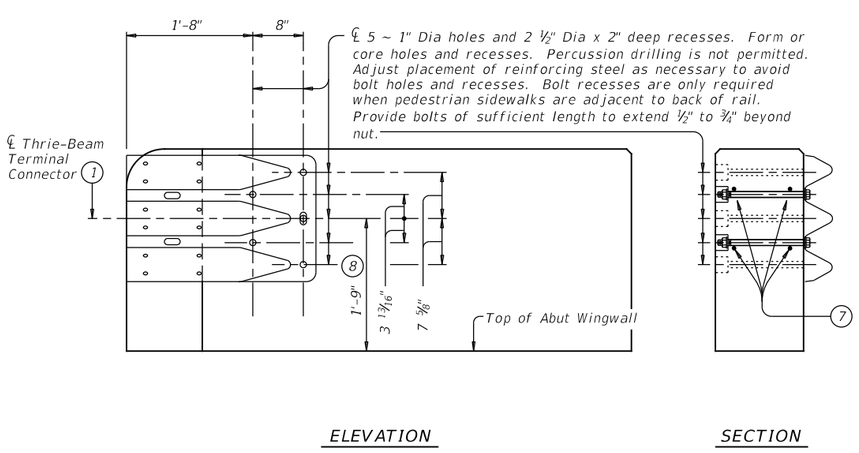
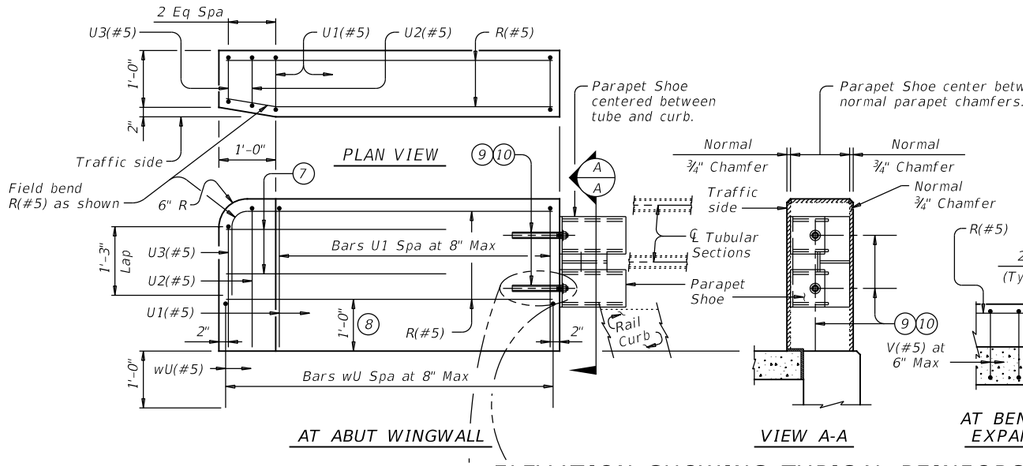


ROADWAY ELEVATION OF RAIL

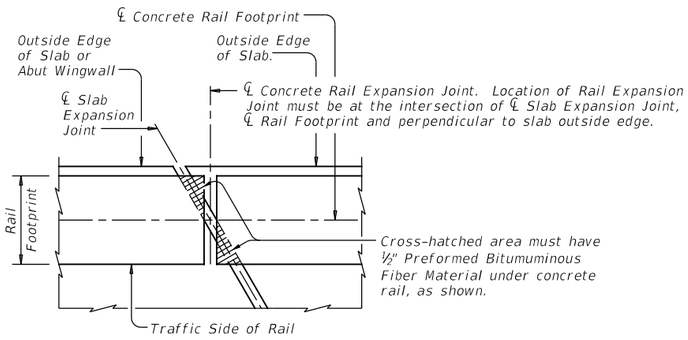
1. Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
2. ℄ Expansion Joint or Splice Joint as required.
3. Same as slab joint opening. (5" Max Expansion Joint).
4. ¼" Min, ¾" Max.
5. Rail member sections must have at least two posts but not more than four.
6. HSS 6 x 2 x ¼ (ASTM A1085 or A500 Gr B).
7. Place 4 additional Bars R(#5) 3'-8" in length inside Bars U(#5) and centered 2'-0" from end of rail when Terminal Connections are required. Field bend as needed.
8. Increase 2" for structures with overlay.
9. Anchor bolts must be ⅞" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with heavy hex nuts and one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into parapet wall with a Type III, Class C, D, E, or F anchor adhesive. Adhesive anchor embedment depth is 8". Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".
10. Install Parapet Shoe after rail has been placed. To ease installation, temporarily brace parapet shoe until the anchorage system achieves manufacturer's recommended curing time. Anchorage system must be assembled with one hardened steel washer (ASTM F436) and one heavy hex nut (ASTM A563) each. Remove temporary bracing after anchorage systems has been firmly tightened.



TERMINAL CONNECTION DETAILS

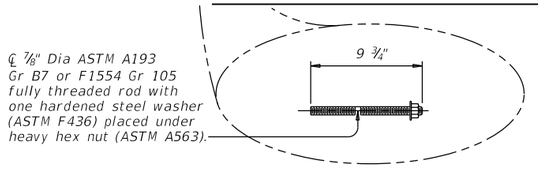


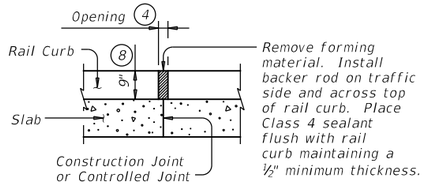
ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.





INTERMEDIATE CURB JOINT DETAIL

Provide at all interior bents without slab expansion joints.

SHEET 1 OF 4

Texas Department of Transportation

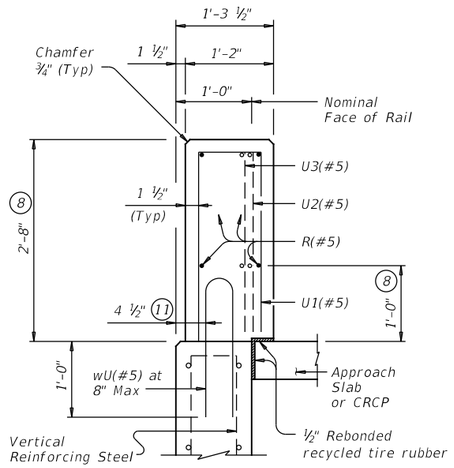
Bridge Division Standard

TRAFFIC RAIL

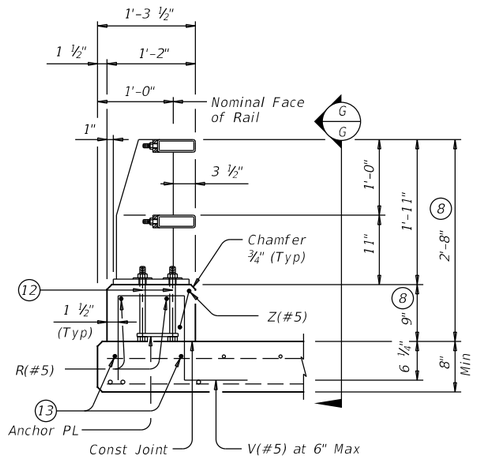
TYPE T1W

FILE:	r1std002-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT	September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS		1191	03	033, ETC.	FM 1245, ETC.
		DIST	COUNTY		SHEET NO.
		WACO	LIMESTONE		110

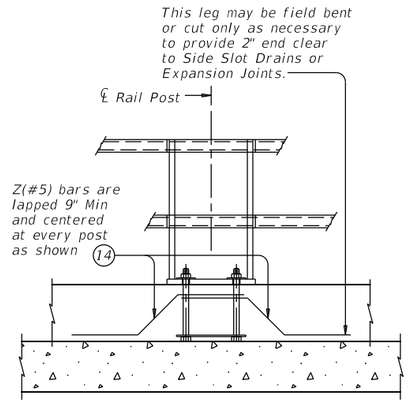
DATE:
FILE:



ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

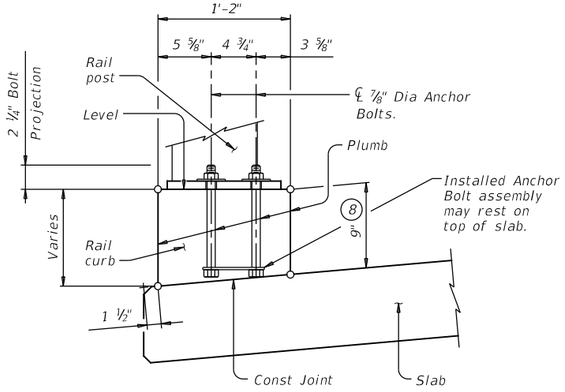


ON BRIDGE SLAB



VIEW G-G

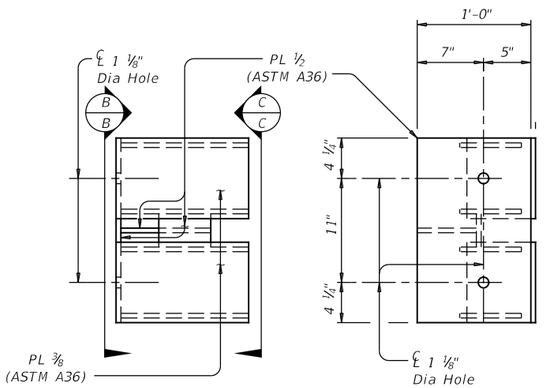
Bars V and R omitted for clarity.



RAIL CURB FORMING DETAIL

Reinforcing steel and rail curb chamfers not shown for clarity.

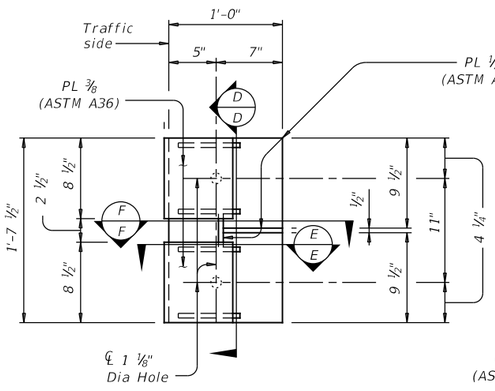
SECTIONS THRU RAIL



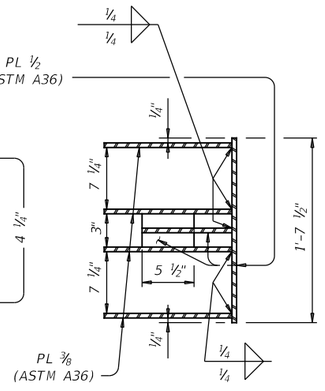
PARAPET SHOE

(Parapet Shoe weight = 92 lb each, for contractor's information only).

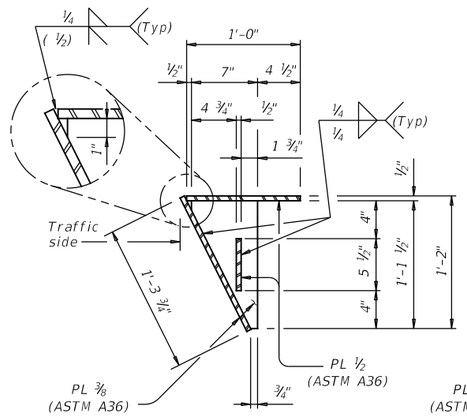
VIEW B-B



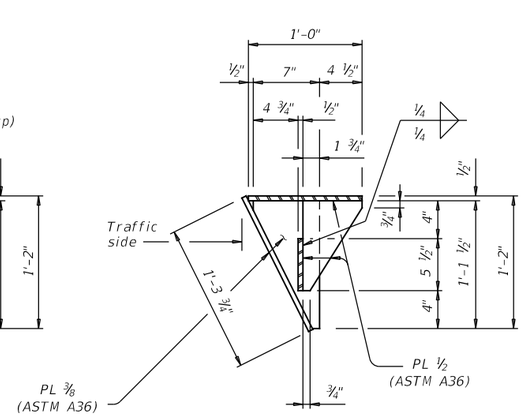
VIEW C-C



SECTION D-D



SECTION E-E



SECTION F-F

(8) Increase 2" for structures with overlay.

(11) 5 ¼" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.

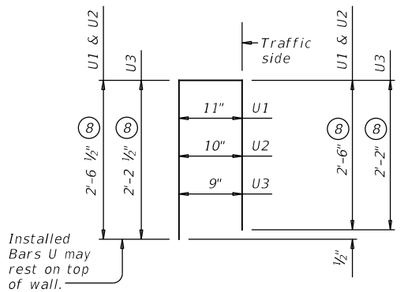
(12) ℄ ⅞" Dia Anchor Bolts. See "Anchor Bolt Assembly Details".

(13) Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

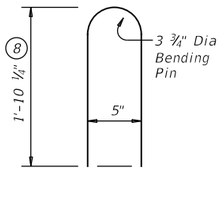
(14) Adjust Bars Z(#5) as necessary to avoid Bars V(#5).

(15) Length shown for 6 ¼" Min bar embedment with no overlay. Adjust as required.

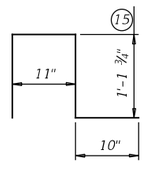
(16) Increase 2 ¾" for structures with overlay.



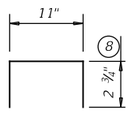
BARS U(#5)



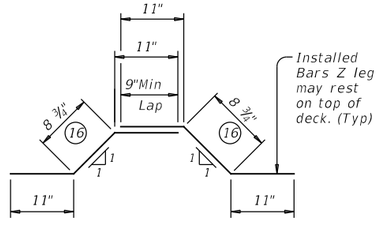
BARS wU(#5)



BARS V(#5)



BARS VS(#5)



BARS Z(#5)

SHEET 2 OF 4

Texas Department of Transportation

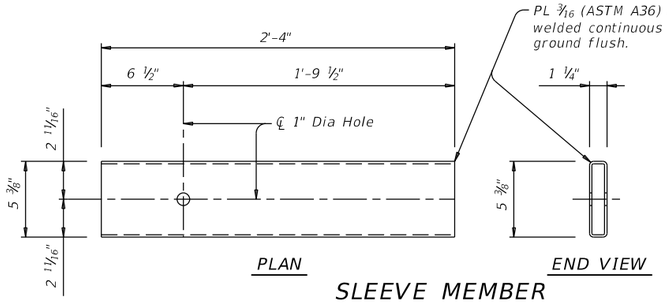
Bridge Division Standard

TRAFFIC RAIL

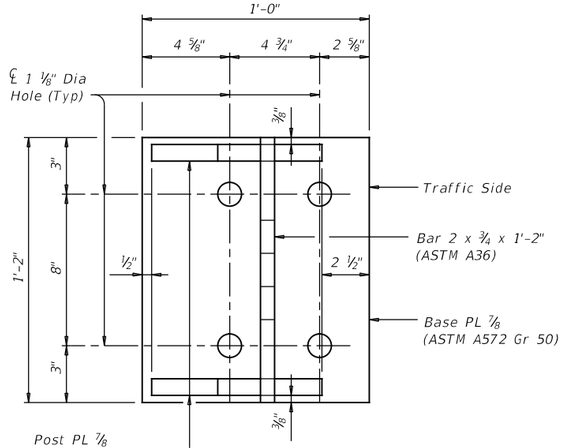
TYPE T1W

FILE:	rlstd002-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT	September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS		1191	03	033, ETC.	FM1245, ETC.
		DIST	COUNTY		SHEET NO.
		WACO	LIMESTONE		111

DATE:
FILE:

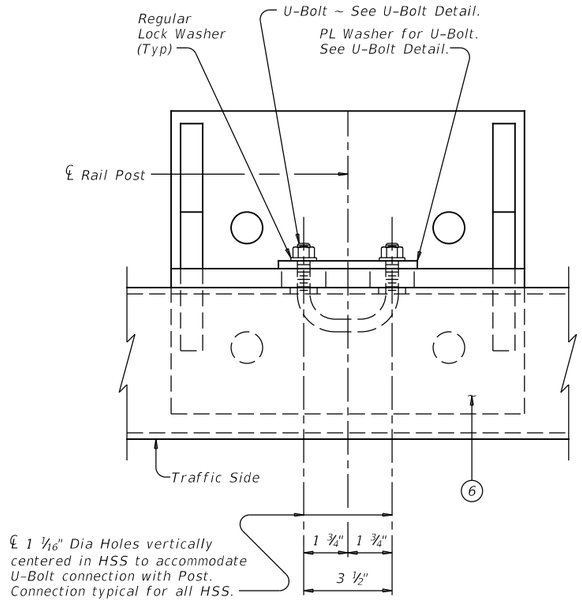


SLEEVE MEMBER



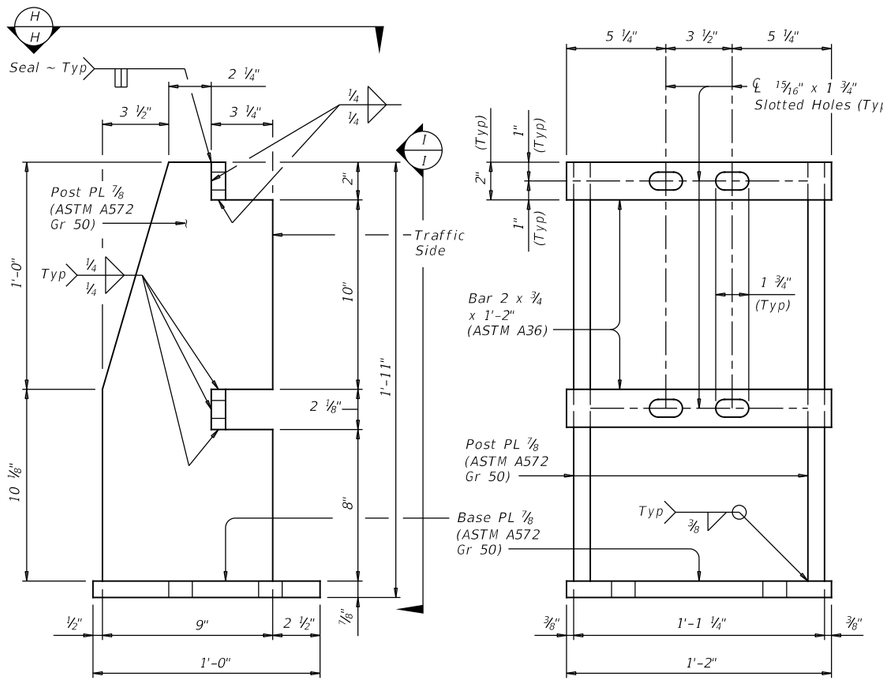
VIEW H-H

(Showing Hole location in Base PL)



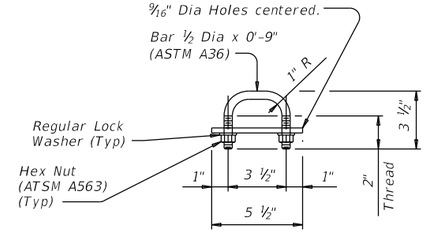
TOP VIEW OF RAIL POST

(Showing connection for rail post and HSS.)



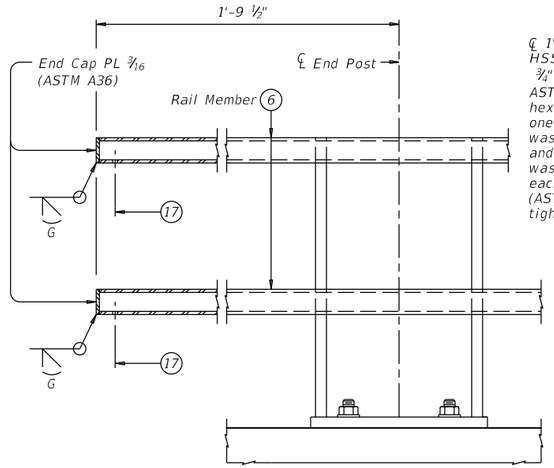
POST DETAIL

VIEW I-I

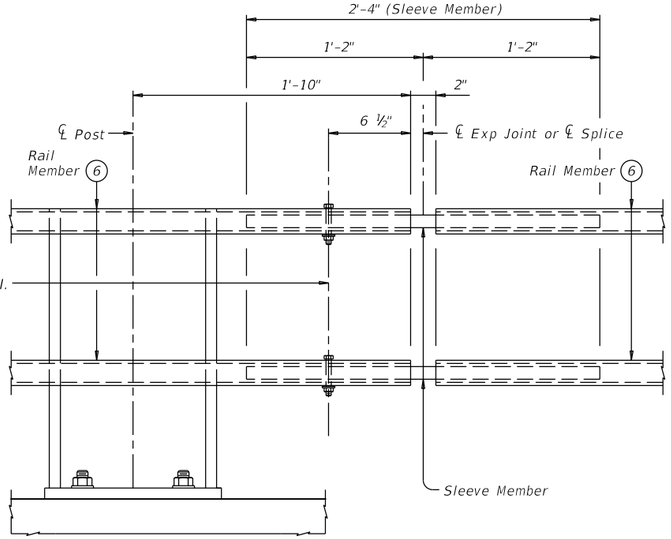


U-BOLT DETAIL

(Showing U-Bolt for rail post and HSS.)



END CAPS ON HSS AT END POST



℄ 1" Dia holes in HSS centered for ¾" Dia x 3 ½" ASTM F3125 Gr A325 hex head bolts with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut (ASTM A563). Wrench tight, do not crush rail.

EXPANSION JOINT OR SPLICE

(6) HSS 6 x 2 x ¼ (ASTM A1085 or A500 Gr B).

(17) ℄ ⅜" Dia Drain Hole in bottom of HSS.

SHEET 3 OF 4

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T1W

FILE:	r1std002-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT	September 2019	CONT	SECT	JOB	HIGHWAY
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		DIST	COUNTY		SHEET NO.
		WACO	LIMESTONE		112

DATE:
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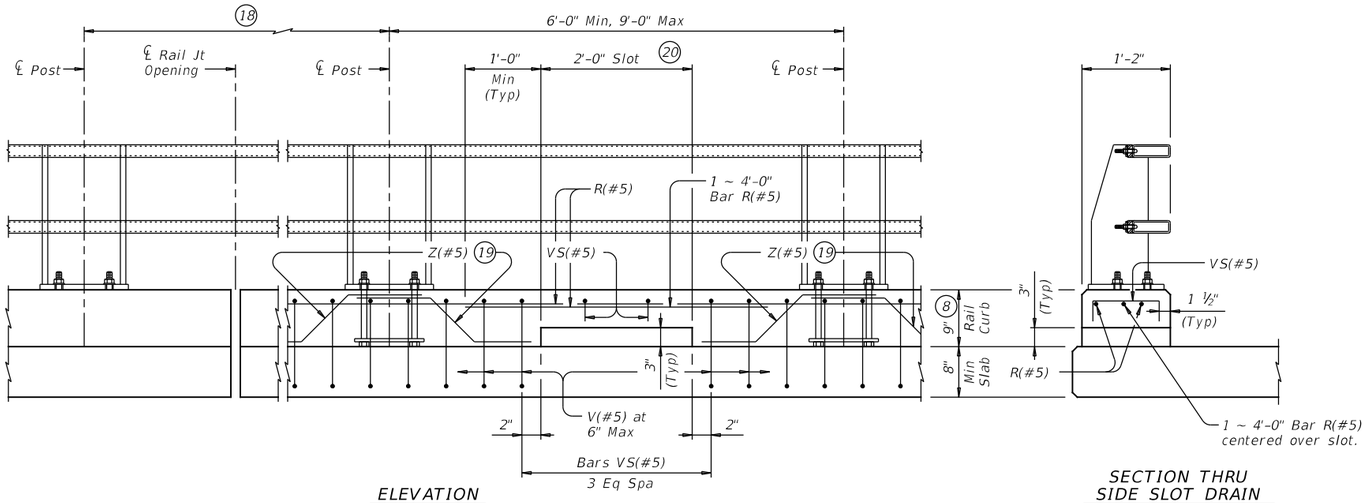
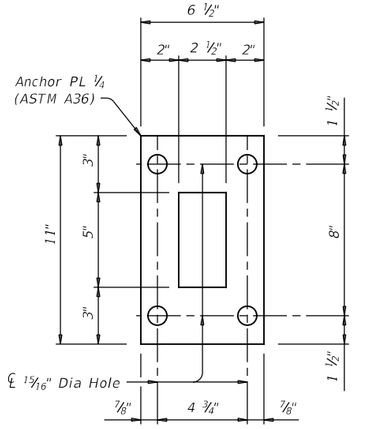


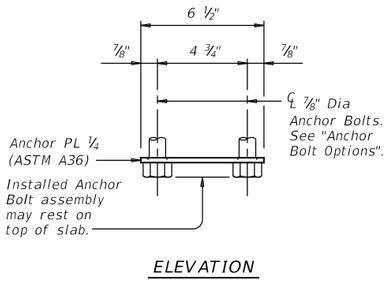
ELEVATION

SECTION THRU SIDE SLOT DRAIN

OPTIONAL SIDE SLOT DRAIN DETAILS 21

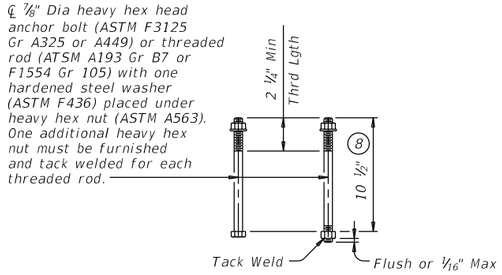


PLAN OF ANCHOR PLATE



ELEVATION

ANCHOR BOLT ASSEMBLY DETAILS



ANCHOR BOLT OPTIONS

(Showing Anchor Bolts for Base Plate)

(8) Increase 2" for structures with Overlay.

(18) Side slot drains are not allowed in areas where there is a joint in the concrete curb between rail posts.

(19) Bars Z(#5). See "Section Thru Rail" and "View G-G" for Bar Z placement and spacing.

(20) Center side slot drain between posts within the limits shown.

(21) Side slot drains may be used where shown elsewhere on the plans or as directed by the Engineer. Do not place drains over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway and a sidewalk, side slot drains are not permitted.

CONSTRUCTION NOTES:

The face of tubular sections and rail curb must be plumb unless otherwise approved. Steel posts must be square to the top of curb. Use Type VIII epoxy mortar under post base plates if gaps larger than 1/16" exist.

Bend tubes to required radius for curved rails. Shop drawings for approval are required for curved rails.

One shop splice per rail member section is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

Round or chamfer exposed edges of rail members and rail posts to approximately 1/16" by grinding.

Chamfer all exposed concrete corners.

MATERIAL NOTES:

Provide ASTM A1085 or A500 Gr B for all HSS.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over gavanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel". Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.

Anchor bolts for base plate must be ⅞" Dia ASTM F3125 Gr A325 or A449 bolts (or ASTM A193 Gr B7 or F1554 Gr 105 threaded rods with one tack welded heavy hex nut each) with one hardened steel washer (ASTM F436) placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements.

Provide ¾" Dia x 3 ½" hex head bolts (ASTM F3125 Gr A325) for expansion or splice joints in HSS with one regular washer and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements.

Provide ½" Dia round bar U-bolts (ASTM A36) with plate washer (ASTM A36) and regular lock washers placed under hex nuts that conform to ASTM A563 requirements. See "U-Bolt Detail".

Provide Class "S" concrete. When Class "S" concrete for slab is HPC, include a minimum of 3 gallons of calcium nitrite inorganic corrosion inhibitor per cubic yard of Class "S" concrete.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #5 = 2'-0"
Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:

This rail has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

This railing cannot be used on bridges with expansion joints providing more than 5" movement or on cast-in-place retaining walls, unless otherwise noted.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Submit erection drawings showing panel lengths, rail post spacing, and anchor bolt setting, to the Engineer for approval.

Average weight of railing with no overlay: 173 plf total
131 plf (Conc)
42 plf (Steel).

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

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T1W

FILE:	r1std002-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
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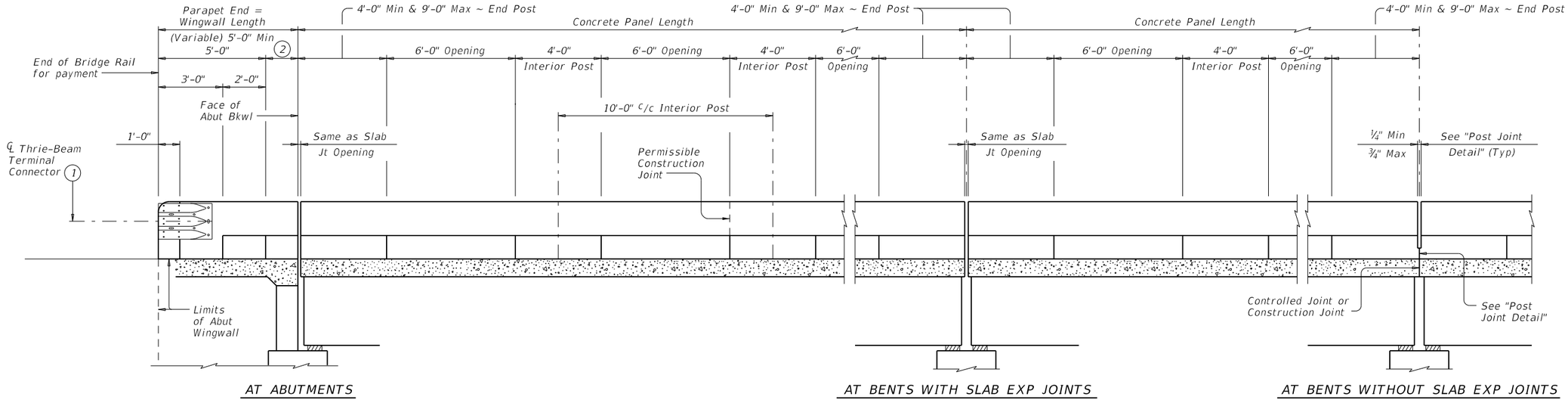
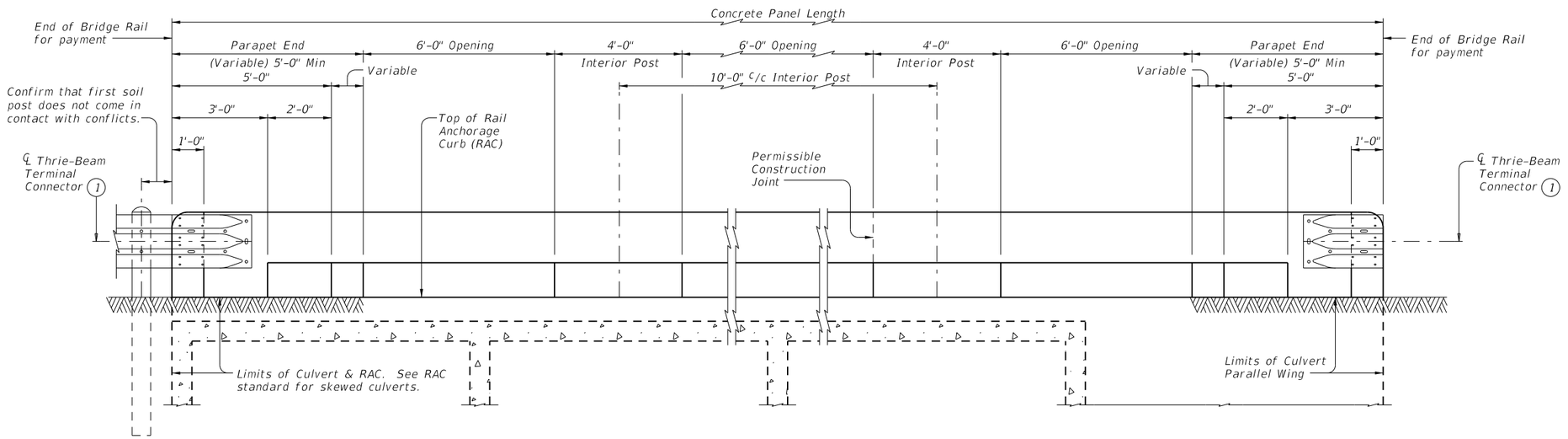
		DIST	COUNTY		SHEET NO.
		WACO	LIMESTONE		113



ROADWAY ELEVATION OF RAIL ON BRIDGE



ROADWAY ELEVATION OF RAIL ON BOX CULVERTS

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

(1) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.

(2) Wingwall Length minus 5'-0" (Varies)

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SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T223

FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
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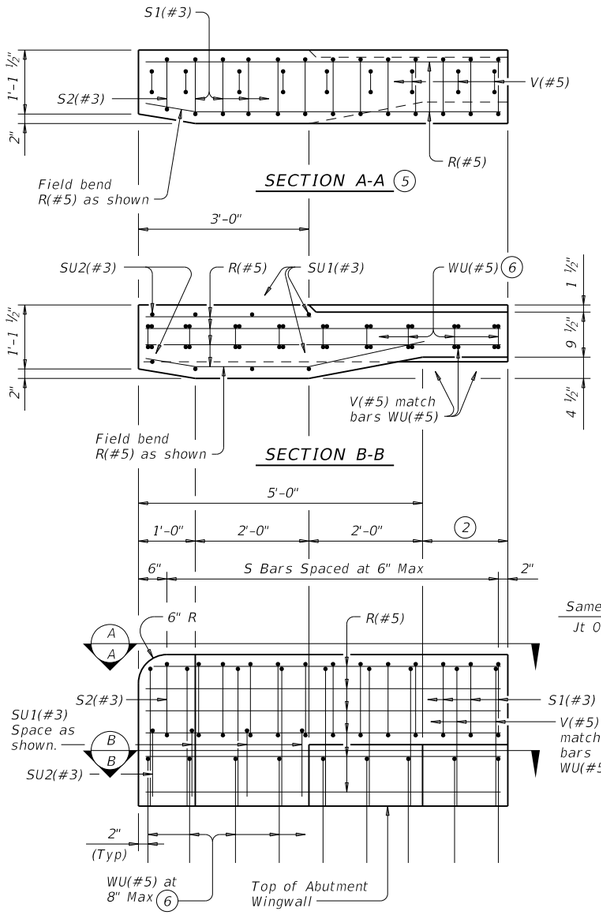
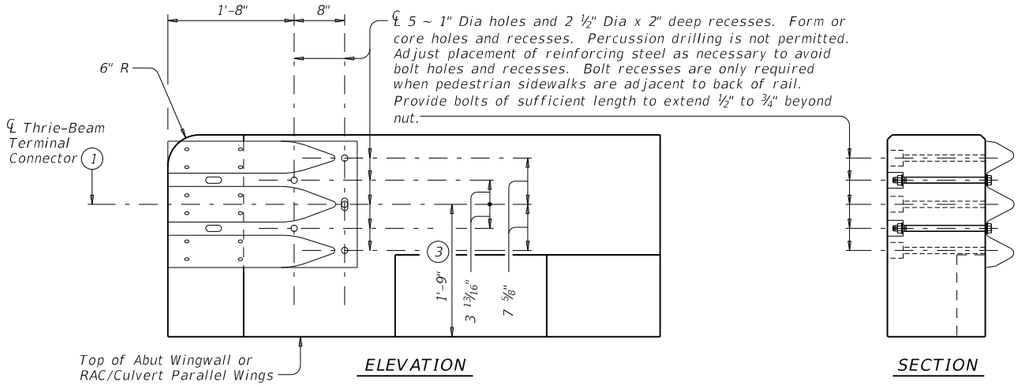
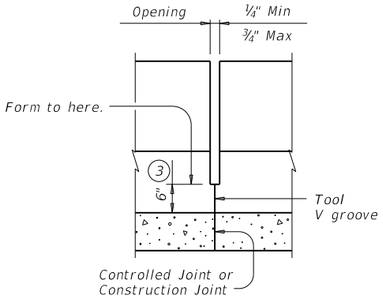


PARAPET END AT ABUT WINGWALL (6)

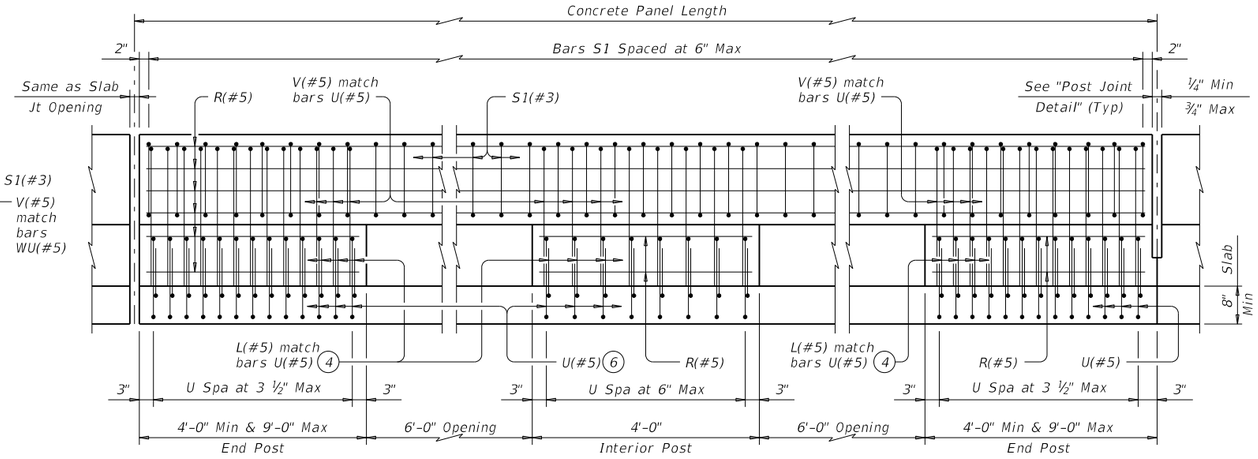


TERMINAL CONNECTION DETAILS



POST JOINT DETAIL

Provide at all interior bents without slab expansion joints.



AT SLAB EXPANSION JOINTS

AT 4' INTERIOR POST

AT BENTS WITHOUT SLAB EXPANSION JOINTS

ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab. Rail on box culvert similar.

(1) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.

(2) Wingwall Length minus 5'-0" (Varies)

(3) Increase 2" for structures with overlay.

(4) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(5) Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.

(6) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on achorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

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SHEET 2 OF 3

Texas Department of Transportation

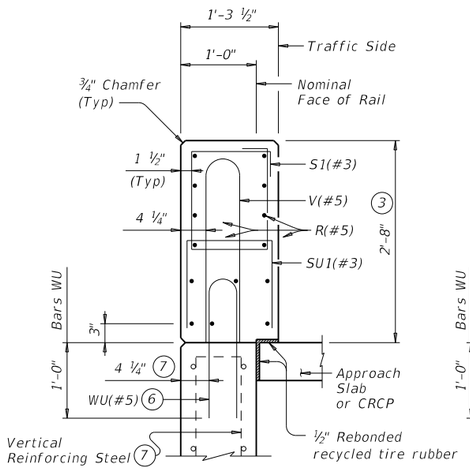
Bridge Division Standard

TRAFFIC RAIL

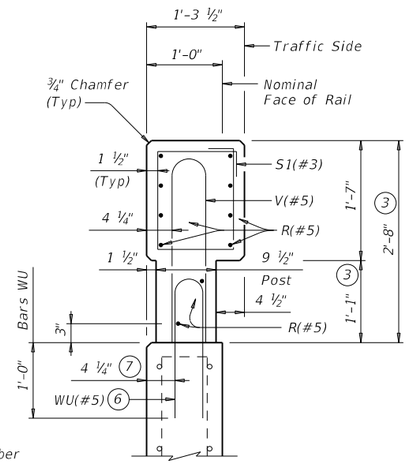
TYPE T223

FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		115

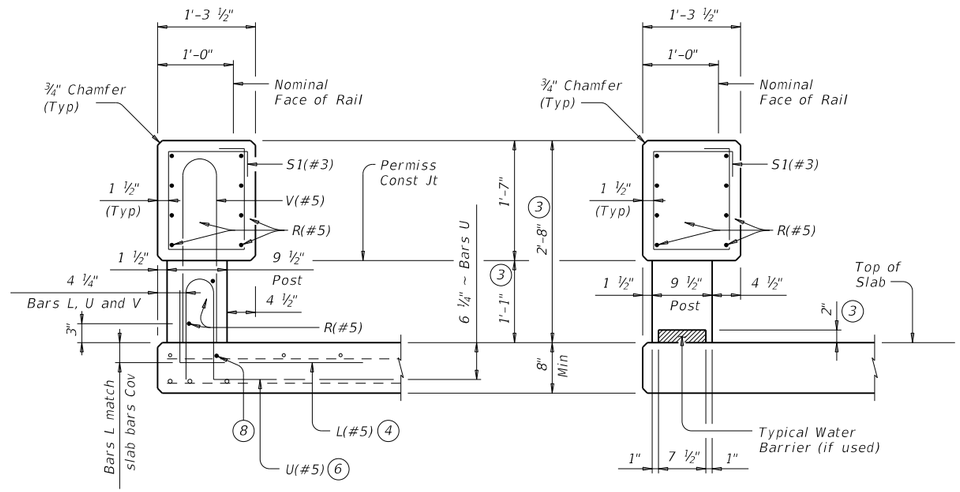
DATE: 5/7/2021 1:49:22 PM
FILE: I:\proj\N3106711.02 - TxDOT - 3299 Bridge WA 3 - Sub to IEA\05 Design (PS & E)\Plan Set\20. Project Specific Standards\7. Bridge\rlstd005-19.dgn



SECTION C-C
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

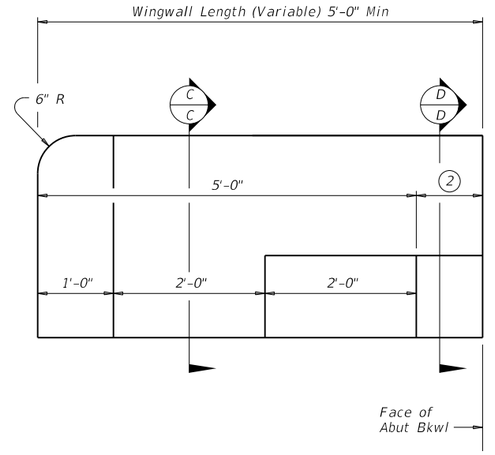


AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB

SECTIONS THRU RAIL

Sections on box culverts similar.



ELEVATION AT ABUTMENT WINGWALL

Box culvert parallel wings or rail anchorage curb similar.

(2) *Wingwall Length minus 5'-0" (Varies)*

(3) *Increase 2" for structures with overlay.*

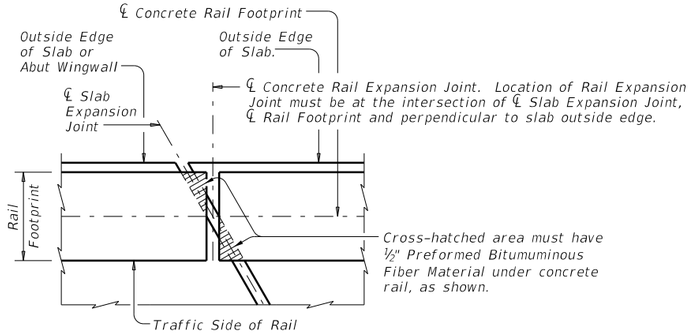
(4) *Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.*

(6) *Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.*

(7) *When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.*

(8) *Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.*

(9) *At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 ¼" above the roadway surface without overlay.*



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

CONSTRUCTION NOTES:

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.

Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.

Chamfer all exposed corners.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #5 = 2'-0"

Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:

This rail has been evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

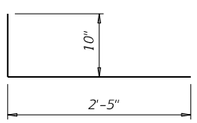
Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

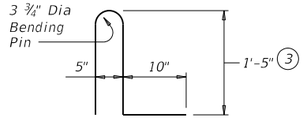
Shop drawings are not required for this rail.

Average weight of railing with no overlay is 358 plf.

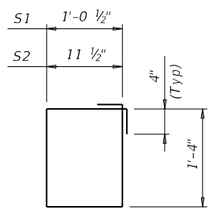
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



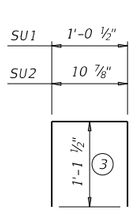
BARS L (#5)



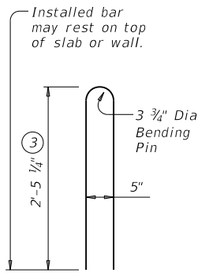
BARS U (#5) (9)



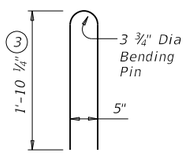
BARS S (#3)



BARS SU (#3)



BARS V (#5) (9)



BARS WU (#5)

SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T223

FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
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REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		116

DATE: 5/7/2021 1:49:23 PM
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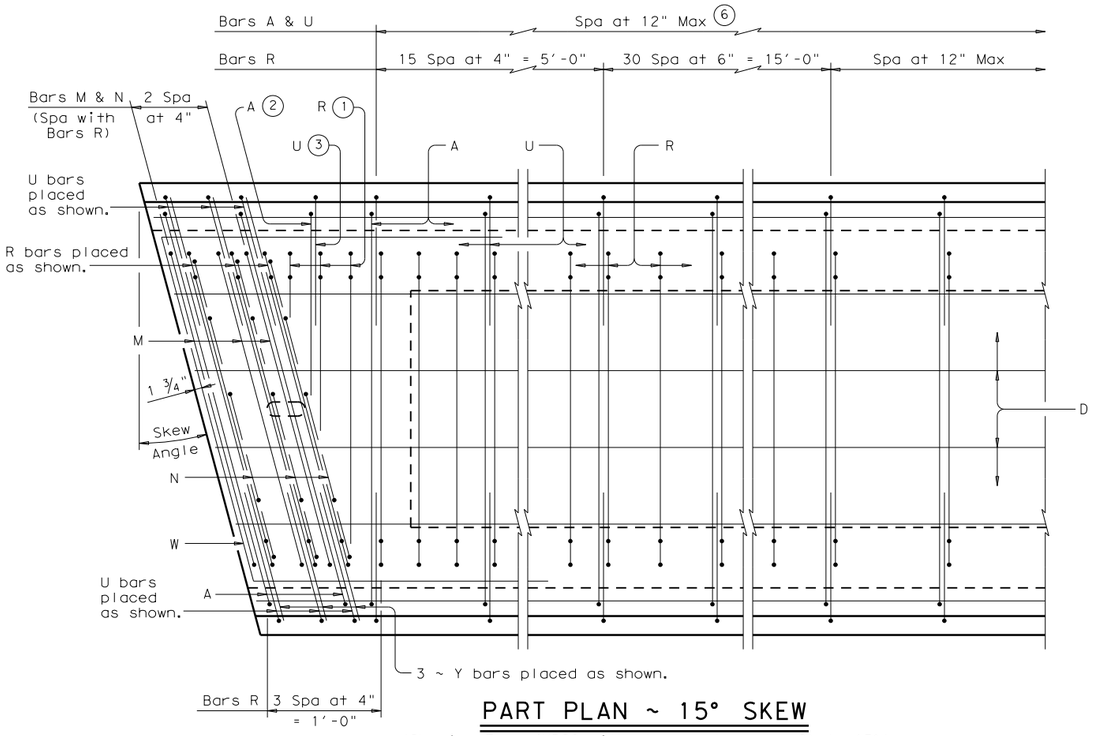
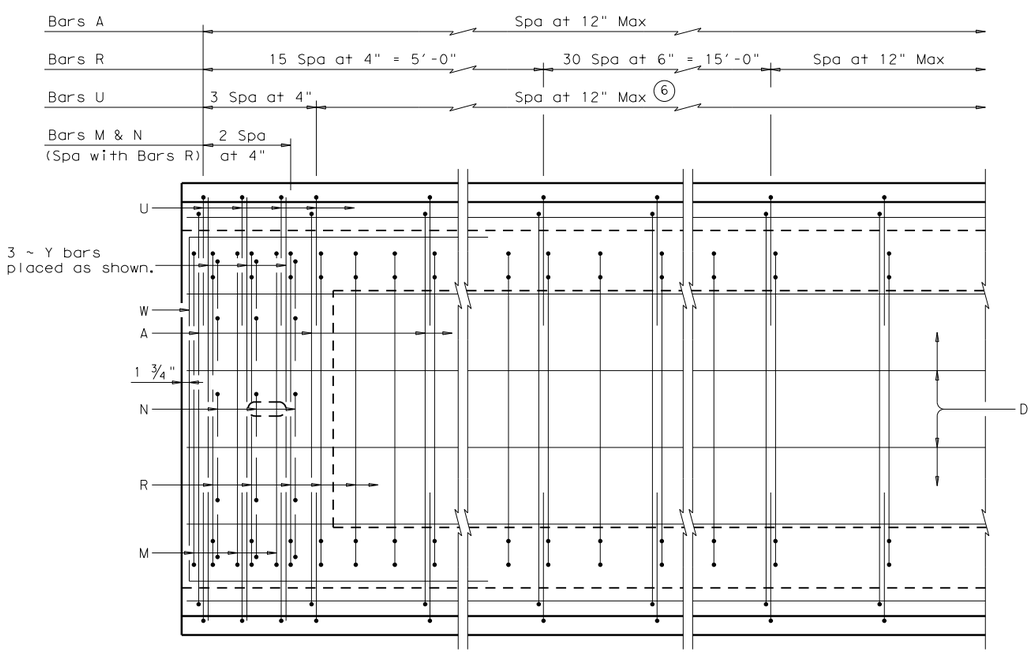


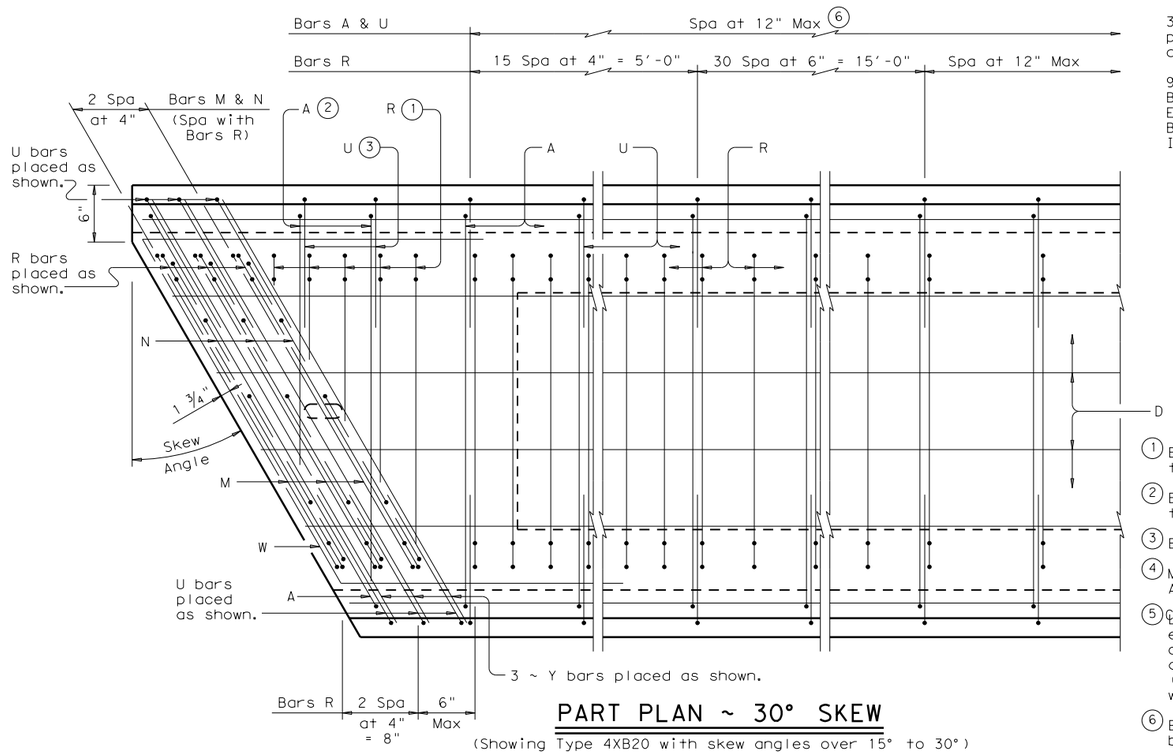
PART PLAN ~ 15° SKEW

(Showing Type 4XB20 with skew angles over 0° to 15°)



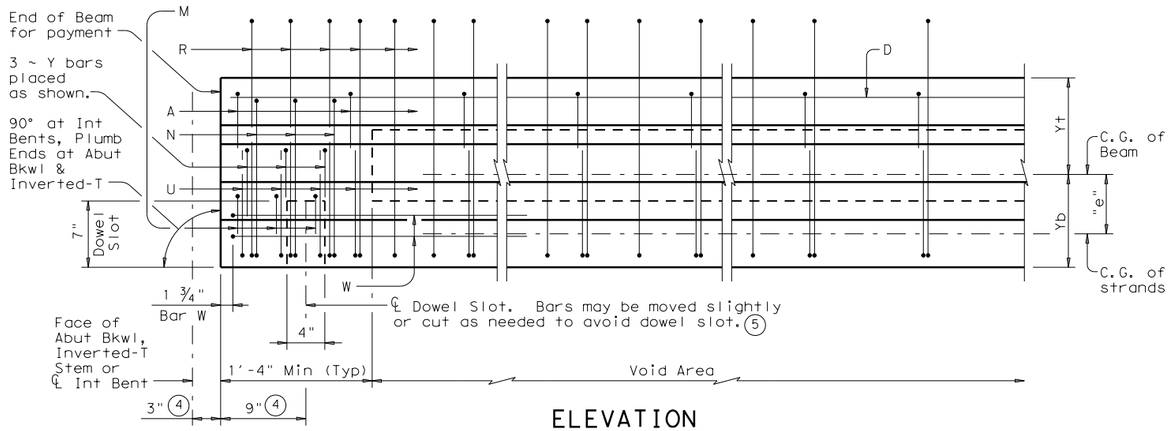
PART PLAN

(Showing Type 4XB20)



PART PLAN ~ 30° SKEW

(Showing Type 4XB20 with skew angles over 15° to 30°)



ELEVATION

1. (1) Bars R spaced at 4" Max. Cut Bars R as necessary to provide 2" clear between adjacent bars as shown.
2. (2) Bars A spaced with Bars U. Cut Bars A as necessary to provide 2" clear between adjacent bars as shown.
3. (3) Bars U spaced at 8" Max as shown.
4. (4) Measured perpendicular to ℄ Interior Bents, Abutment Bkwl or Inverted-T Stem.
5. (5) ℄ 4" x 1 1/2" Vertical Slotted Hole at doweled beam end [labeled (D) on Bridge Layout]. Required for outside beam only or as shown on substructure details. Anchorage holes may be tapered (4 3/4" x 1 5/8") at base. If holes are formed with sheet metal, forms may be left in place.
6. (6) End Bars U the greater of 5' from beam ends or 3' beyond the last debonded strands.

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE X-BEAM DETAILS (TYPE XB20)

XB20

FILE: xbstds01.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
©TxDOT June 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		117

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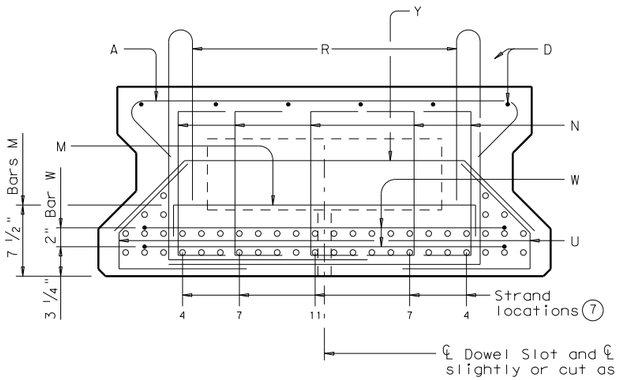
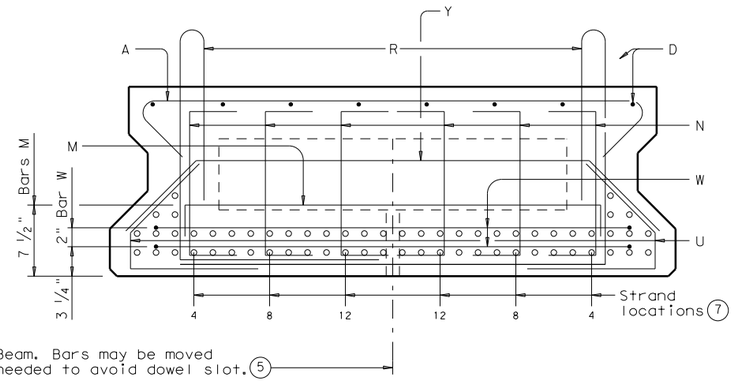
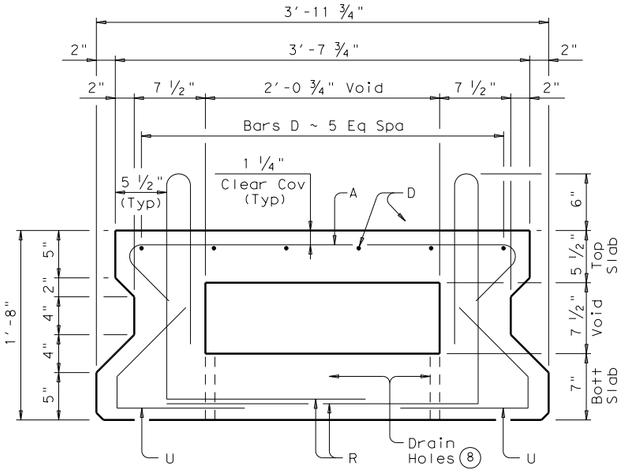


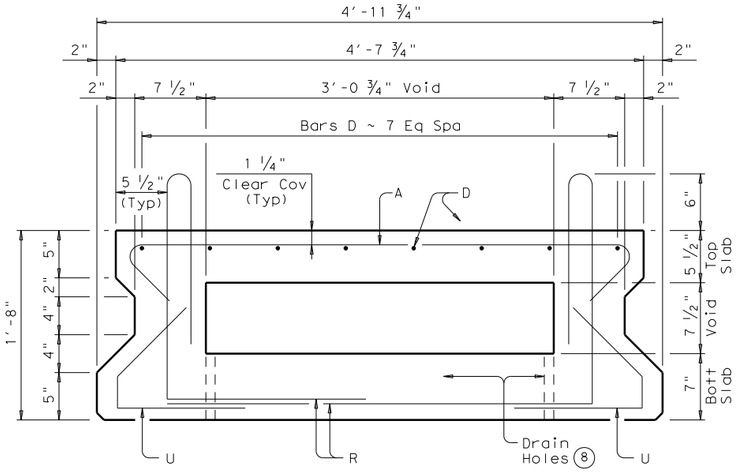


℄ Dowel Slot and ℄ Beam. Bars may be moved slightly or cut as needed to avoid dowel slot. (5)

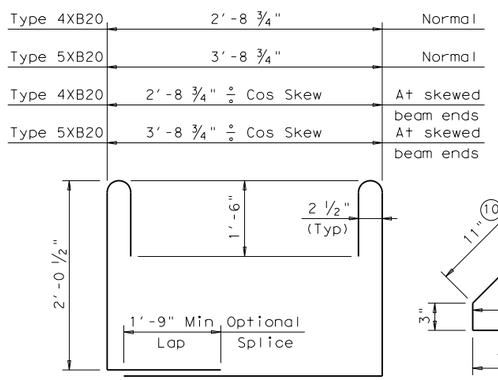
END BLOCK SECTION ~ TYPE 4XB20



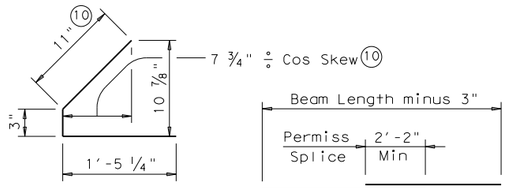
END BLOCK SECTION ~ TYPE 5XB20



TYPICAL SECTION ~ TYPE 4XB20



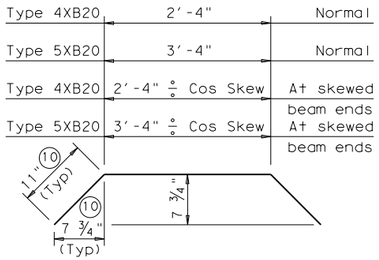
BARS R (#4) (11)



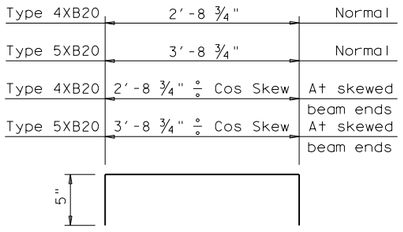
BARS U (#4) (11)

BARS D (#5) (11)
(Place splices in middle third of span)

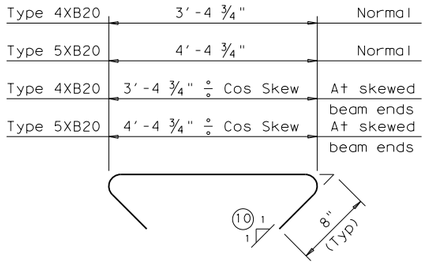
TYPICAL SECTION ~ TYPE 5XB20



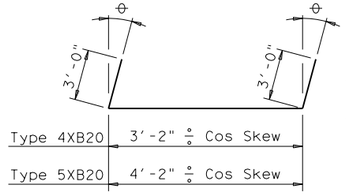
BARS Y (#5)



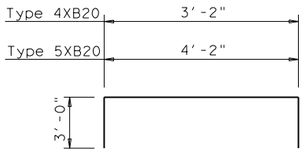
BARS M (#5)



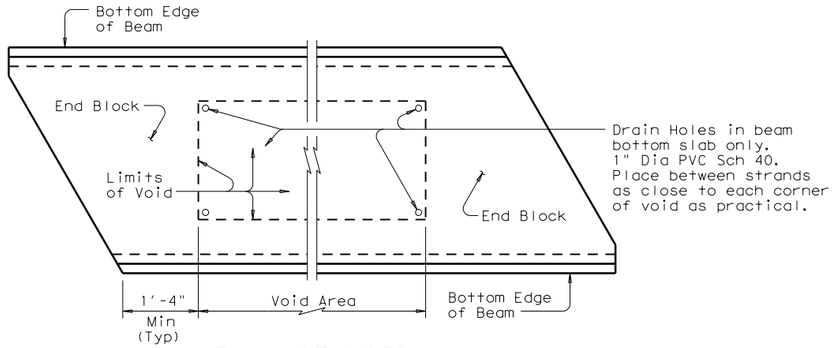
BARS A (#4) (11)



BARS W (#5)
(For skewed beam ends)



BARS W (#5)
(For square beam ends)



PLAN OF VOID

(Showing 30° skew)

(5) ℄ 4" x 1 ½" Vertical Slotted Hole at doweled beam end [labeled (D) on Bridge Layout]. Required for outside beam only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

(7) See standard XBND or appropriate Prestressed Concrete X-Beam Standard Designs sheet for locations of pretensioning strands.

(8) Drain Holes 1" Dia PVC Sch 40 Pipe as shown between strands in all beam void corners. See "Plan of Void".

(9) Based on 150 pcf weight density of concrete. Weight of end blocks is not included.

(10) Dimension will vary slightly with skew. Adjust as necessary.

(11) At the Fabricator's option, alternate designs utilizing deformed welded wire reinforcement (WWR) conforming to ASTM A1064 of equivalent cross sectional area to replace all or some of Bars A, D, R and U will be permitted. Smooth Welded Wire Reinforcement is not permitted.

BEAM PROPERTIES

		Type 4XB20	Type 5XB20
Area	in^2	689	839
Y top	in	10.47	10.47
Y bott	in	9.53	9.53
I	in^4	29,124	36,621
Weight (9)	lb/ft	718	874

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

Use Class H concrete. Use Class H (HPC) if required elsewhere in plans. All reinforcing steel must be Grade 60.

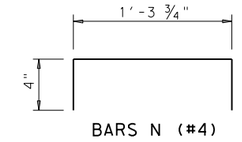
Two-stage monolithic casting is required. The concrete in the first stage cast (bottom beam flange) must remain plastic until the second stage cast (webs and top beam flange) is placed. Vibrate as required to ensure consolidation between the two casts.

1 ¼" clear cover to reinforcement is required unless noted otherwise.

These details are applicable for skews up to 30 degrees only.

Chamfer bottom beam corners ¾" or round to a ¾" radius.

Punch through all drain holes, removing any blockage, before beams are shipped.



BARS N (#4)

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Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE X-BEAM DETAILS (TYPE XB20)

XB20

FILE: xbstds01.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
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	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		118

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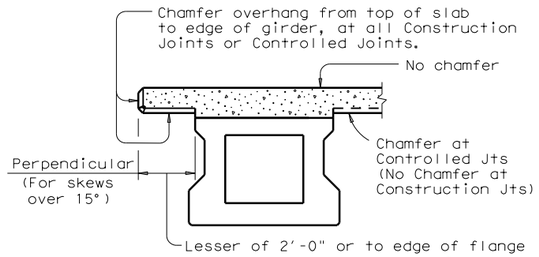
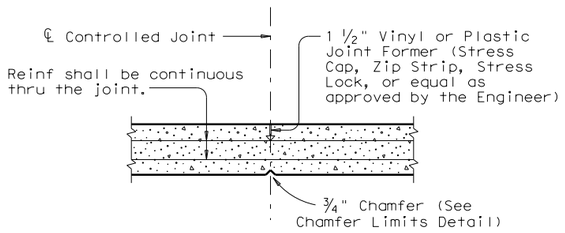
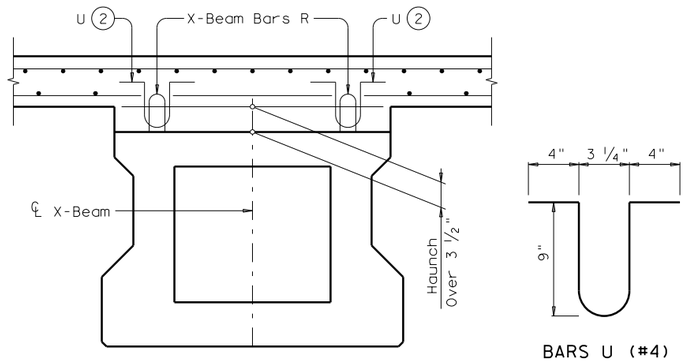


CHAMFER LIMITS DETAIL (1)



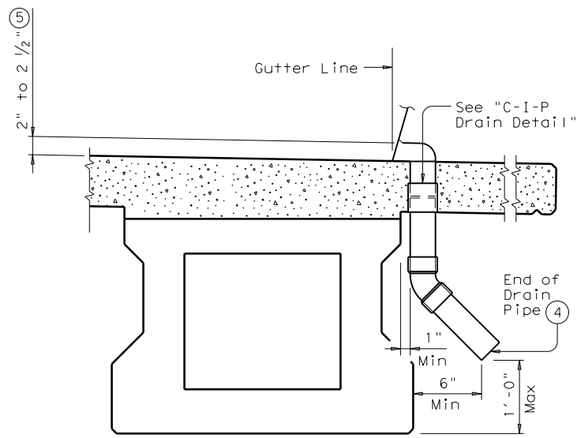
CONTROLLED JOINT DETAIL

(Saw-cutting will not be allowed)

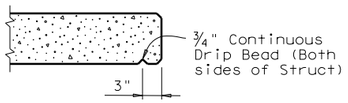


BARS U (#4)

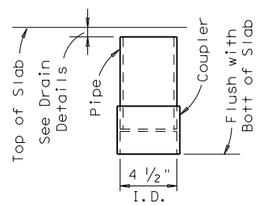
HAUNCH REINFORCING DETAIL



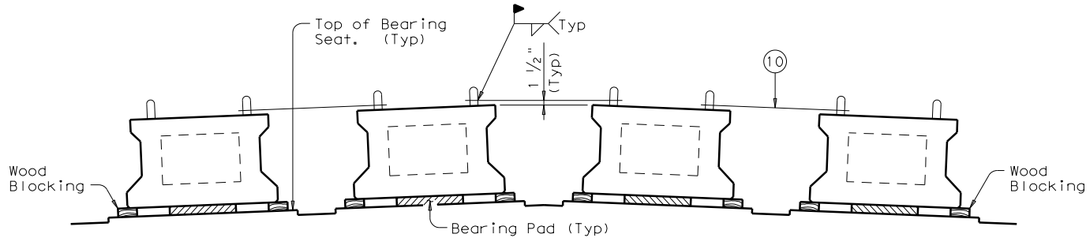
DRAIN DETAIL (6)



DRIP BEAD DETAIL



C-I-P DRAIN DETAIL (3)



MINIMUM BEAM BLOCKING & BRACING DETAIL

Provide blocking at both sides of all beam ends supported by one bearing pad. Leave blocking in place for at least 4 days after slab is cast and afterwards remove at the Contractor's convenience.

(1) See Span details for type of joint and joint locations.

(2) Space Bars U with Beam Bars R in all areas where measured haunch exceeds 3 ½".

(3) Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.

(4) No water shall be discharged onto beams.

(5) Drain Entrance formed in Rail or Sidewalk.

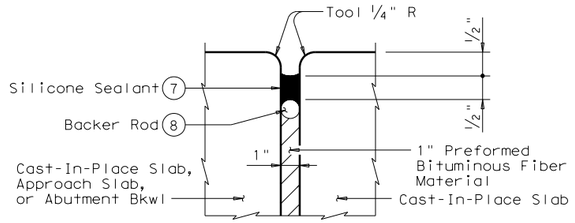
(6) All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location shall be as directed by the Engineer. No drains shall be permitted over roadways or railways, or within 10'-0" of Bent Caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside beam face. Variations of the above designs, as required for the type of rail used and its location on the structure, shall be installed with the approval and direction of the Engineer.

(7) Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.

(8) 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(9) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints. Type A joints will not be paid for directly, but shall be considered subsidiary to Item 422, "Concrete Superstructures".

(10) Weld a (#5) bar at each beam end as shown immediately after erection and prior to PCP placement. These bars are in addition to slab reinforcement.



TYPE A JOINT DETAIL (9)

GENERAL NOTES:

Designed in accordance with AASHTO LRFD Specifications.

All items (reinforcing steel, drains, joint formers, etc.) shown on this sheet shall be considered subsidiary to other bid items.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems and/or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS WITH MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE X-BEAMS

XBBR-MS

FILE: xbstds05.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
©TxDOT June 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		119

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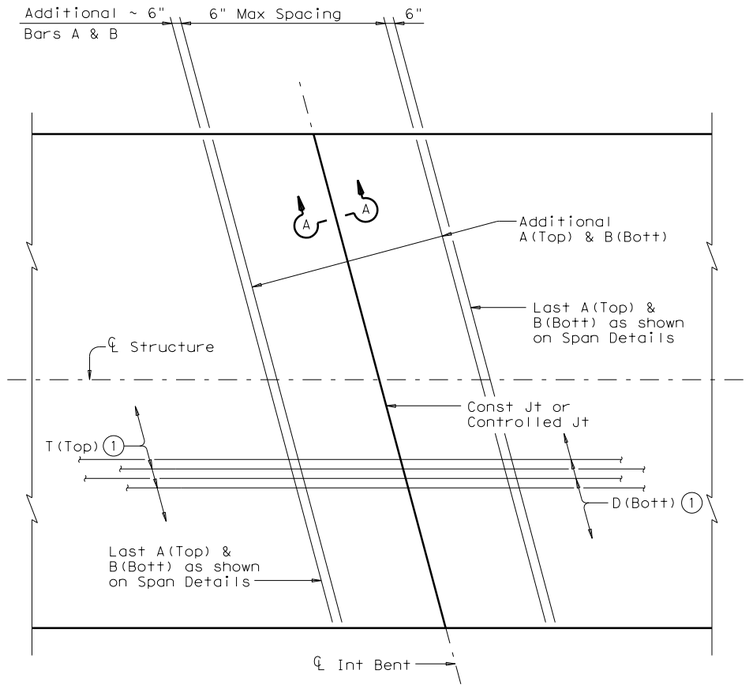
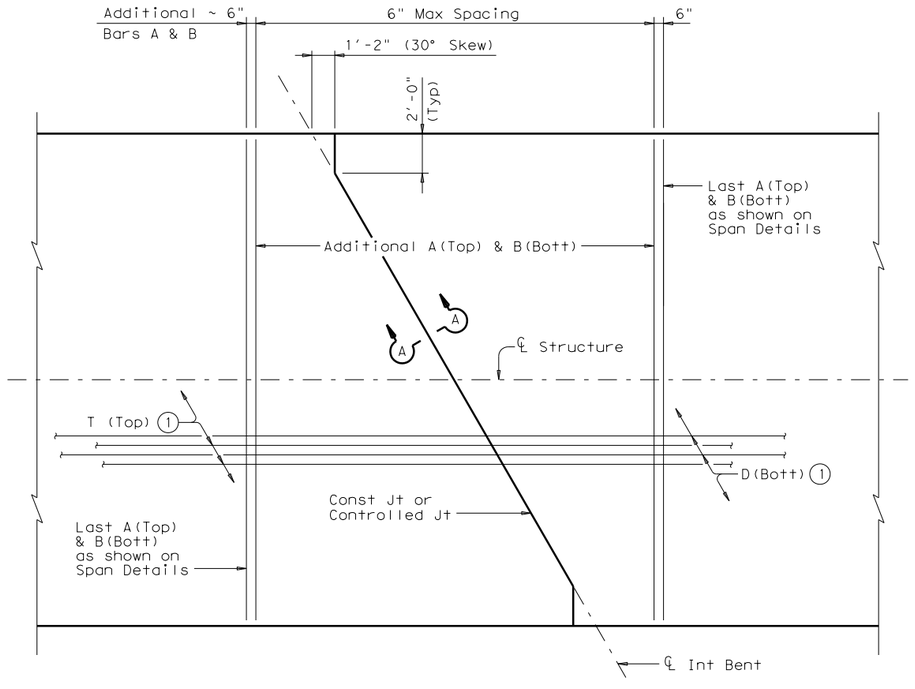


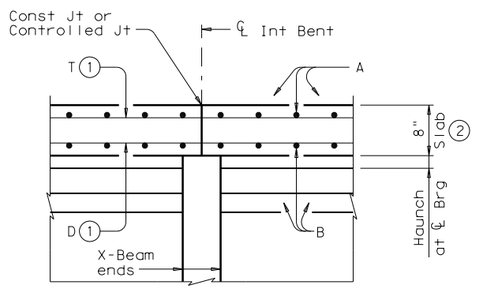
PLAN FOR SKEW ANGLES 0° TO 15°

(Showing 15° skew)



PLAN FOR SKEW ANGLES OVER 15° TO 30°

(Showing 30° skew)



SECTION A-A

1. Top and bottom mats must be continuous through joint.
2. Maintain a constant 8" thick slab over the bent.

TABLE OF ALLOWABLE UNIT LENGTH

Max Rdwy Grade, Percent	Unit Length Factor
0.00	4.6
1.00	4.4
2.00	4.2
3.00	4.0
4.00	3.7
5.00	3.5

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	#5
B	#5
D	#5
T	#4

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

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

Where multi-span units are indicated on the Bridge Layout, the Thickened Slab End details and reinforcement shown on Standard XBTS (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 Standard PCP (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.

All reinforcing must be Grade 60.

Concrete strength f'c = 4,000 psi.

Bar laps, where required, will be as follows:

Uncoated ~ #4 = 1'-5"
~ #5 = 1'-9"
Epoxy Coated ~ #4 = 2'-1"
~ #5 = 2'-7"

The details shown on this sheet are applicable for use only with the Prestressed Concrete X-Beam Standard Designs shown on standards XBSD-32, XBSD-38, XBSD-40 and XBSD-44.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

CONTINUOUS SLAB DETAILS
PRESTR CONC X-BEAM SPANS

XBCS

FILE: xbstde06.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
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REVISIONS	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		120

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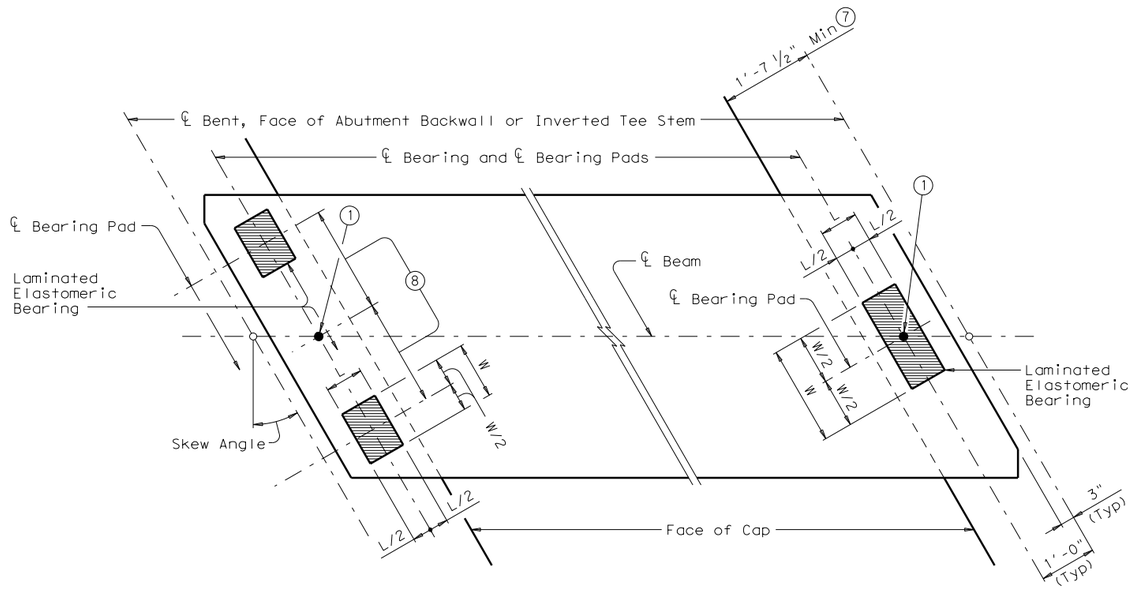
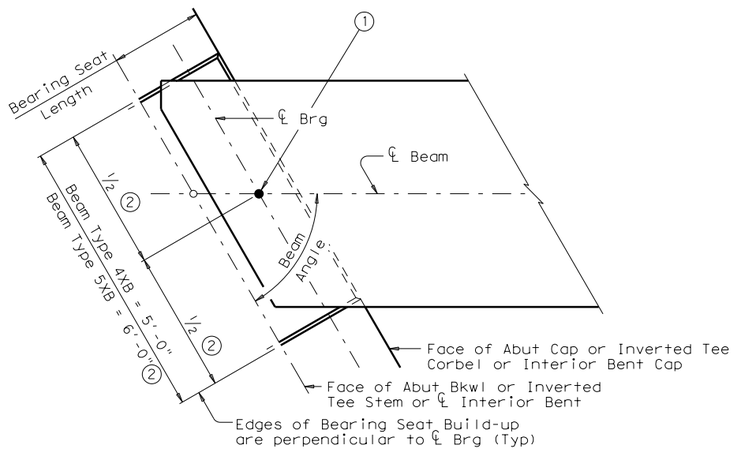


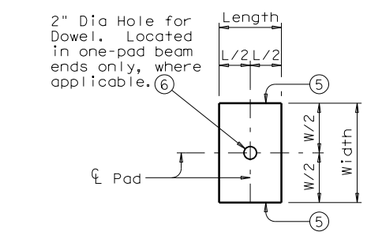
ELASTOMERIC BEARING PLACEMENT DIAGRAMS

Place one bearing at forward station beam end.
Place two bearings at back station beam end.

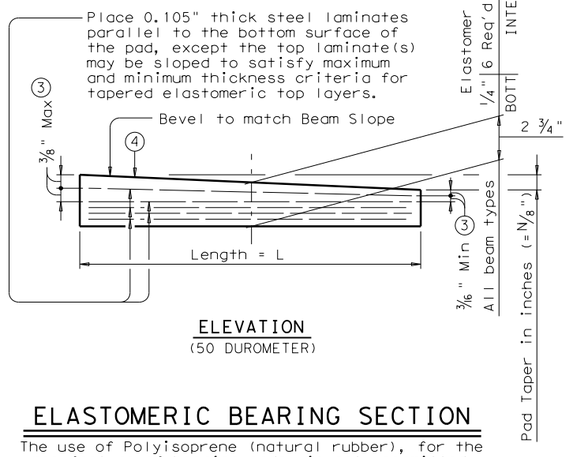


BEARING SEAT DIMENSIONS

Used when shown on Abutment and/or Bent details.



PLAN



ELEVATION
(50 DUROMETER)

ELASTOMERIC BEARING SECTION

The use of Polyisoprene (natural rubber), for the manufacture of bearing pads, is not permitted.

ELASTOMETRIC BEARING DIMENSIONS TABLE

BEARING TYPE (4)	BEAM TYPE	ONE BEARING		TWO BEARINGS	
		L	W	L	W
XB20-"N"	4XB20	8"	21"	8"	10"
	5XB20	8"	21"	8"	10"
XB28-"N"	4XB28	8"	21"	8"	10"
	5XB28	8"	21"	8"	10"
XB34-"N"	4XB34	8"	21"	8"	12"
	5XB34	8"	21"	8"	12"
XB40-"N"	4XB40	8"	21"	8"	12"
	5XB40	8"	21"	8"	12"

(1) Dowel at doweled beam end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(2) Measured along ℄ of Bearing.

(3) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(4) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. Include the value of "N" (amount of taper in ⅛" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for ⅛" taper)
N=2, (for ¼" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan beam slope by more than $\left(\frac{0.0625"}{\text{Length}}\right)$ IN/IN.

(5) Locate Permanent Mark here.

(6) Provide 2" Dia Hole only at locations required. See substructure details for location.

(7) Minimum dimension required for the bearings shown on this standard.

(8) 4XB beams = 1'-2" along ℄ Bearing (Typ).
5XB beams = 1'-8" along ℄ Bearing (Typ).

GENERAL NOTES:

Set beams on elastomeric bearings of the dimensions shown. Center bearings as near nominal ℄ bearing as possible within limits shown.

Constant thickness bearings may be used for moderate beam slopes up to 0.008 ft/ft.

For skewed supports, Bearings beveled for beam slope may not provide uniform contact. However, predicted contact is considered within allowable tolerances.

Shop drawings for approval are required.

A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. Provide copy of the bearing layout to the Engineer.

Cost of furnishing and installing elastomeric bearings is to be included in unit price bid for "Prestressed Concrete X-Beams".

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

These details are applicable for skews up to 30 degrees only.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING DETAILS

PRESTR CONC X-BEAMS

XBEB

FILE: xbstde07.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
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	WACO	LIMESTONE		121

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DESIGNED BEAMS (STRAIGHT STRANDS)

STRUCTURE	SPAN LENGTH (ft)	BEAM NO.	BEAM TYPE	PRESTRESSING STRANDS: NON-STD STRAND PATTERN	PRESTRESSING STRANDS: TOTAL NO.	PRESTRESSING STRANDS: SIZE (in)	PRESTRESSING STRANDS: STRGTH fpu (ksi)	PRESTRESSING STRANDS: "e" ℄ (in)	PRESTRESSING STRANDS: "e" END (in)	PRESTRESSING STRANDS: TOT NO. DEB	DEBONDED STRAND PATTERN PER ROW: DIST FROM BOTTOM (in)	NO.OF STRANDS: TOTAL	NO.OF STRANDS: DE-BONDED	NUMBER OF STRANDS DEBONDED TO (ft from end): 3	6	9	12	15	CONCRETE: RELEASE STRGTH ① f'ci (ksi)	CONCRETE: MINIMUM 28 DAY COMP STRGTH f'c (ksi)
TYPE 5XB20 X-BEAMS 32' Roadway 8" Slab	40	ALL	5XB20		12	0.6	270	7.03	7.03	0	2.50	12	0	0	0	0	0	0	4.000	5.000
	45	ALL	5XB20		14	0.6	270	7.03	7.03	0	2.50	14	0	0	0	0	0	0	4.000	5.000
	50	ALL	5XB20		20	0.6	270	7.03	7.03	0	2.50	20	0	0	0	0	0	0	4.000	5.000
	55	ALL	5XB20		24	0.6	270	7.03	7.03	4	2.50	24	4	2	2	0	0	0	4.000	5.000
	60	ALL	5XB20		30	0.6	270	6.90	6.87	6	2.50	28	6	2	2	2	0	0	4.400	5.000
	65	ALL	5XB20		36	0.6	270	6.59	6.46	8	2.50	28	8	2	2	2	2	0	4.900	5.200
TYPE 5XB28 X-BEAMS 32' Roadway 8" Slab	40	ALL	5XB28		12	0.6	270	10.63	10.63	0	2.50	12	0	0	0	0	0	0	4.000	5.000
	45	ALL	5XB28		12	0.6	270	10.63	10.63	0	2.50	12	0	0	0	0	0	0	4.000	5.000
	50	ALL	5XB28		12	0.6	270	10.63	10.63	0	2.50	12	0	0	0	0	0	0	4.000	5.000
	55	ALL	5XB28		14	0.6	270	10.63	10.63	0	2.50	14	0	0	0	0	0	0	4.000	5.000
	60	ALL	5XB28		18	0.6	270	10.63	10.63	0	2.50	18	0	0	0	0	0	0	4.000	5.000
	65	ALL	5XB28		22	0.6	270	10.63	10.63	0	2.50	22	0	0	0	0	0	0	4.000	5.000
	70	ALL	5XB28		26	0.6	270	10.63	10.63	2	2.50	26	2	2	0	0	0	0	4.000	5.000
	75	ALL	5XB28		32	0.6	270	10.38	10.32	6	2.50	28	6	0	2	2	2	0	4.000	5.000
	80	ALL	5XB28		36	0.6	270	10.19	10.10	6	2.50	28	6	2	2	0	2	0	4.600	5.000
TYPE 5XB34 X-BEAMS 32' Roadway 8" Slab	40	ALL	5XB34		10	0.6	270	13.11	13.11	0	2.50	10	0	0	0	0	0	0	4.000	5.000
	45	ALL	5XB34		12	0.6	270	13.11	13.11	0	2.50	12	0	0	0	0	0	0	4.000	5.000
	50	ALL	5XB34		14	0.6	270	13.11	13.11	0	2.50	14	0	0	0	0	0	0	4.000	5.000
	55	ALL	5XB34		14	0.6	270	13.11	13.11	0	2.50	14	0	0	0	0	0	0	4.000	5.000
	60	ALL	5XB34		16	0.6	270	13.11	13.11	0	2.50	16	0	0	0	0	0	0	4.000	5.000
	65	ALL	5XB34		18	0.6	270	13.11	13.11	0	2.50	18	0	0	0	0	0	0	4.000	5.000
	70	ALL	5XB34		22	0.6	270	13.11	13.11	0	2.50	22	0	0	0	0	0	0	4.000	5.000
	75	ALL	5XB34		24	0.6	270	13.11	13.11	0	2.50	24	0	0	0	0	0	0	4.000	5.000
	80	ALL	5XB34		28	0.6	270	13.11	13.11	4	2.50	28	4	2	2	0	0	0	4.000	5.000
	85	ALL	5XB34		34	0.6	270	12.75	12.65	8	2.50	28	8	4	2	2	0	0	4.000	5.000
	90	ALL	5XB34		40	0.6	270	12.51	12.31	10	2.50	28	10	2	2	2	2	2	4.200	5.000
	95	ALL	5XB34		44	0.6	270	12.38	12.17	10	2.50	28	10	2	2	2	2	2	4.600	5.200
TYPE 5XB40 X-BEAMS 32' Roadway 8" Slab	40	ALL	5XB40		10	0.6	270	15.70	15.70	0	2.50	10	0	0	0	0	0	0	4.000	5.000
	45	ALL	5XB40		12	0.6	270	15.70	15.70	0	2.50	12	0	0	0	0	0	0	4.000	5.000
	50	ALL	5XB40		14	0.6	270	15.70	15.70	0	2.50	14	0	0	0	0	0	0	4.000	5.000
	55	ALL	5XB40		14	0.6	270	15.70	15.70	0	2.50	14	0	0	0	0	0	0	4.000	5.000
	60	ALL	5XB40		14	0.6	270	15.70	15.70	0	2.50	14	0	0	0	0	0	0	4.000	5.000
	65	ALL	5XB40		16	0.6	270	15.70	15.70	0	2.50	16	0	0	0	0	0	0	4.000	5.000
	70	ALL	5XB40		18	0.6	270	15.70	15.70	0	2.50	18	0	0	0	0	0	0	4.000	5.000
	75	ALL	5XB40		20	0.6	270	15.70	15.70	0	2.50	20	0	0	0	0	0	0	4.000	5.000
	80	ALL	5XB40		24	0.6	270	15.70	15.70	2	2.50	24	2	2	0	0	0	0	4.000	5.000
	85	ALL	5XB40		28	0.6	270	15.70	15.70	4	2.50	28	4	2	2	0	0	0	4.000	5.000
	90	ALL	5XB40		32	0.6	270	15.45	15.40	6	2.50	28	6	2	4	0	0	0	4.000	5.000
	95	ALL	5XB40		36	0.6	270	15.26	15.09	10	2.50	28	10	4	6	0	0	0	4.000	5.000
	100	ALL	5XB40		42	0.6	270	15.04	14.77	12	2.50	28	12	2	4	2	2	2	4.000	5.000
	105	ALL	5XB40		48	0.6	270	14.87	14.58	16	2.50	28	14	2	6	2	0	4	4.500	5.100
											4.50	20	2	2	0	0	0	0		

OPTIONAL DESIGN

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) (ft-kips)	LIVE LOAD DISTRIBUTION FACTOR ② Moment	LIVE LOAD DISTRIBUTION FACTOR ② Shear
1.231	-1.621	1255	0.688	0.903
1.557	-1.997	1498	0.667	0.897
1.926	-2.432	1787	0.649	0.891
2.333	-2.901	2090	0.633	0.887
2.777	-3.406	2407	0.619	0.883
3.259	-3.946	2739	0.606	0.879
0.800	-1.023	1748	0.719	0.948
1.006	-1.255	1793	0.697	0.942
1.240	-1.523	1870	0.678	0.937
1.497	-1.812	2187	0.661	0.933
1.777	-2.124	2521	0.647	0.929
2.079	-2.454	2867	0.633	0.926
2.404	-2.807	3231	0.621	0.923
2.753	-3.182	3614	0.611	0.921
3.124	-3.578	4011	0.601	0.919
0.657	-0.777	1818	0.736	0.976
0.824	-0.953	2172	0.714	0.971
1.014	-1.158	2487	0.695	0.966
1.222	-1.378	2432	0.678	0.962
1.449	-1.614	2632	0.663	0.958
1.693	-1.866	2997	0.649	0.956
1.955	-2.134	3381	0.637	0.953
2.236	-2.419	3781	0.626	0.951
2.535	-2.718	4197	0.615	0.949
2.853	-3.036	4634	0.606	0.947
3.188	-3.369	5086	0.597	0.946
3.542	-3.719	5558	0.589	0.945
0.560	-0.629	1886	0.752	1.001
0.701	-0.772	2255	0.729	0.996
0.861	-0.938	2694	0.709	0.991
1.037	-1.117	3007	0.692	0.988
1.227	-1.308	2947	0.676	0.984
1.433	-1.513	3137	0.662	0.982
1.654	-1.731	3521	0.650	0.980
1.890	-1.962	3939	0.638	0.978
2.142	-2.207	4378	0.628	0.976
2.408	-2.464	4834	0.618	0.975
2.690	-2.735	5310	0.609	0.974
2.988	-3.020	5806	0.601	0.973
3.300	-3.318	6319	0.593	0.972
3.628	-3.630	6854	0.586	0.971

DESIGN NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.

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

Beam designs are applicable for 8" concrete slabs without overlay and 0 through 30 degree skews.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

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

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

Locate strands for the designed beam as low as possible on the 2" grid system unless a non-standard stand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc. Place strands within a row as follows:

1) Locate a strand in each "1" position.
2) Place strand symmetrically about vertical centerline of box.
3) Space strands as equally as possible across the entire width.

Strand debonding must comply with Item 424.4.2.2.4.

Do not debond strands in position "1". Distribute debonded strands equally about the vertical centerline. Decrease debonded lengths working inward, with debonding staggered in each row.

Full-length debonded strands are only permitted in positions marked △.

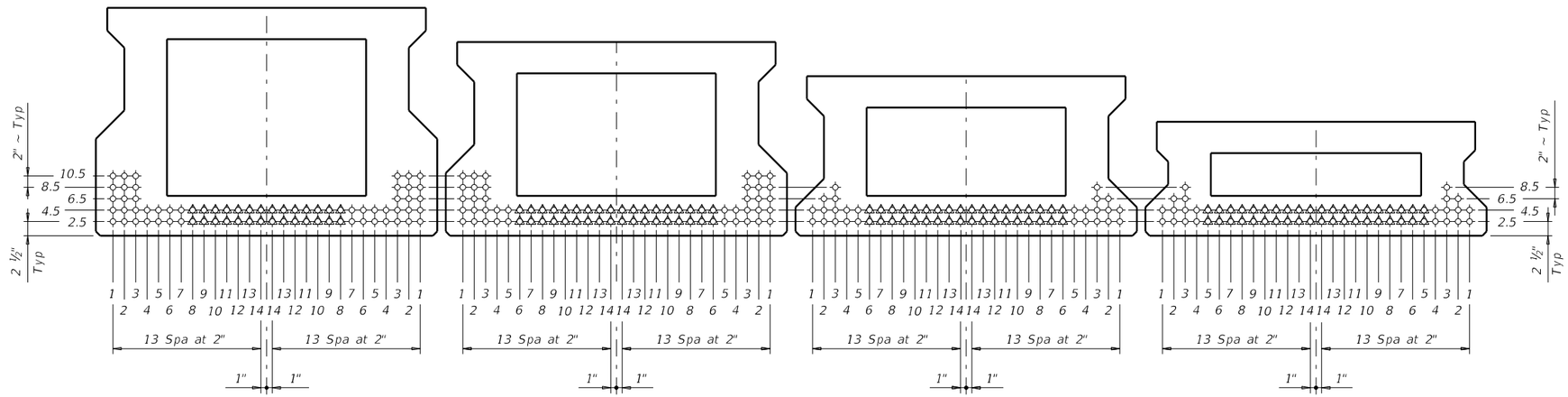
① Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

② Portion of full HL93.



TxDOT 5XB40 BEAMS | TxDOT 5XB34 BEAMS | TxDOT 5XB28 BEAMS | TxDOT 5XB20 BEAMS

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE X-BEAM STANDARD DESIGNS

32' ROADWAY

XBSD-32

FILE: xbstds40.dgn	DN: SRW	CK: BMP	DW: SFS	CK: SDB
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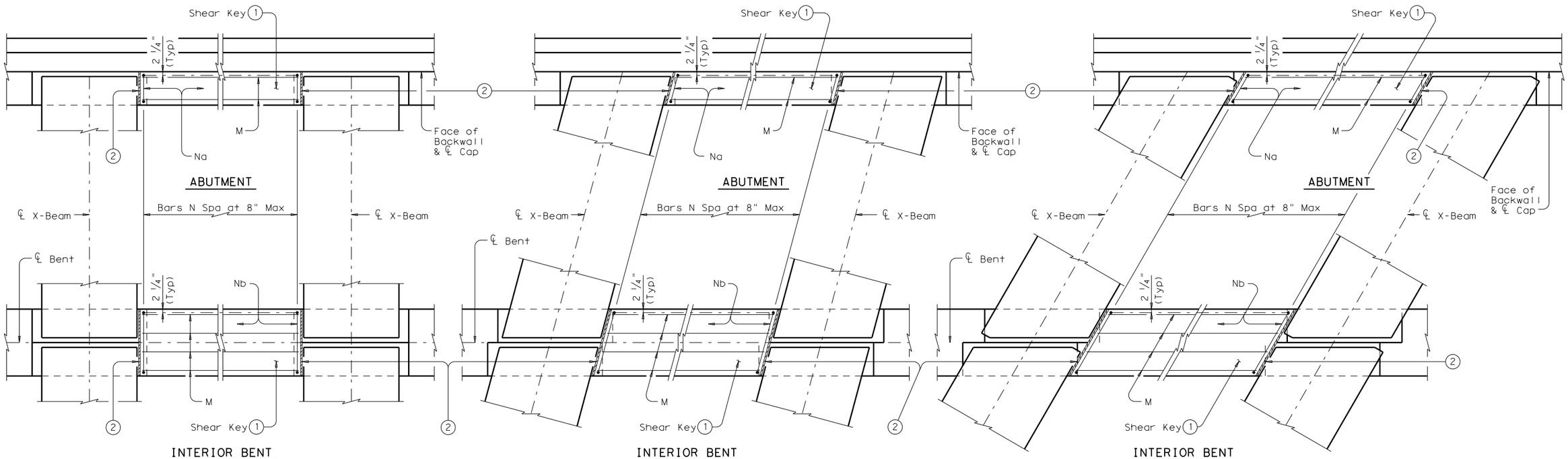
REVISIONS	1191	03	033,ETC.	FM 1245,ETC
01-16: Notes, 0.6" strand designs.	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		122

DATE: 5/7/2021 1:49:26 PM
FILE: I:\proj\R310671.02 - TxDOT - 3299 Bridge WA 3 - Sub to IEA\05 Design (PS & E)\Plan Set\20. Project Specific Standards\7. Bridge\xbstds92.dgn



PARTIAL PLANS WITH NO SKEW

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

PARTIAL PLANS WITH 15° SKEW

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

PARTIAL PLANS WITH 30° SKEW

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

(1) Place shear keys on the upstream side of structure between outside beam and next adjacent beam, unless shown otherwise on plans.

(2) UHMW Polyethylene Wear Pad. (Typ)

(3) Leave a 1/4" gap plus or minus between beam and face of wear pad. Cast wear pad with shear key, smooth side facing beam. Care must be taken to keep concrete from flowing under beam. 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.

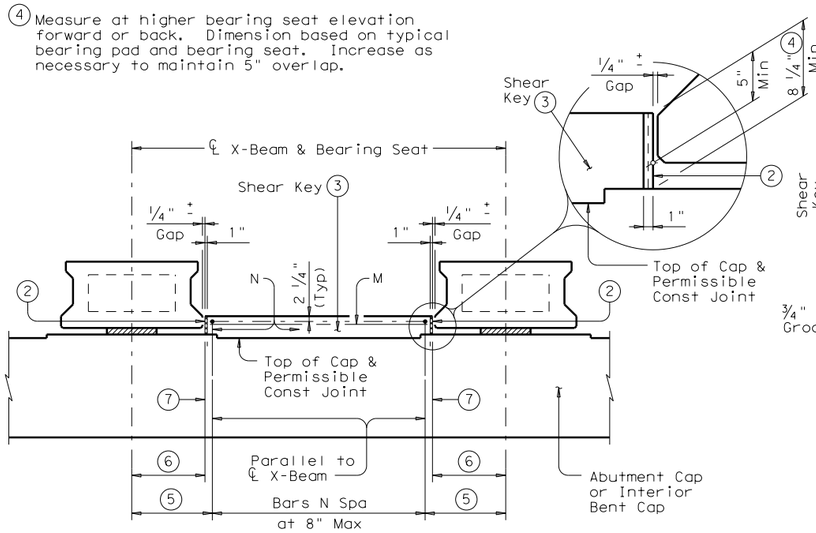
(5) With No Skew = 2'-10", measured along ℄ Cap.
With Skew = 2'-10" ÷ Cos Skew, measured along ℄ Cap.

(6) With No Skew = 2'-6 1/4", measured anlong ℄ Cap.
With Skew = 2'-6 1/4" ÷ Cos Skew, measured anlong ℄ Cap.

(7) Face of UHMW Polyethylene Wear Pad. Smooth side of polyethylene wear pad facing beam.

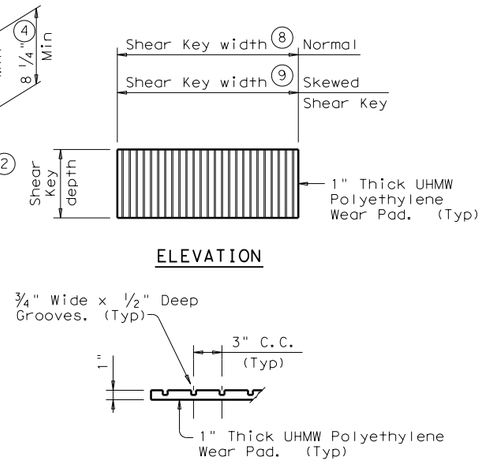
(8) Abutments = 1/2 Cap width.
Interior Bents = Cap width.

(9) Abutments = 1/2 Cap width ÷ Cos Skew.
Interior Bents = Cap width ÷ Cos Skew.

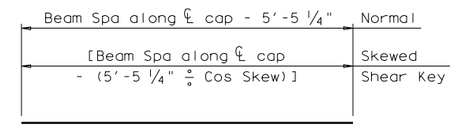


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

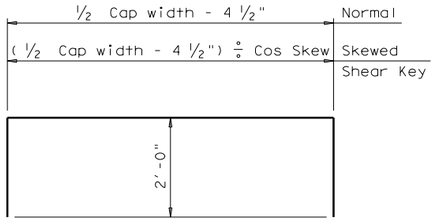
Showing shear key with beam Type 5XB28.
Other XB beam types similar.



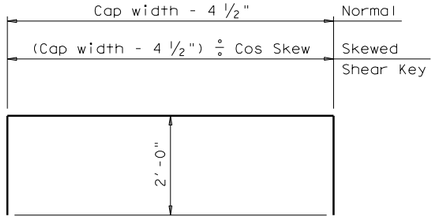
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For Abutments)



BARS Nb (#5)
(For Interior Bents)

CONSTRUCTION NOTES:

Use Class "C" concrete. Use Class "C" (HPC) if shown elsewhere on the plans.
Provide concrete with strength f'c = 3,600 psi.
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 Polyethylene wear pads in accordance with ASTM D6712.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.
Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These details are limited to bridges skewed 30 degrees and less.
This standard is only applicable for 5XB X-Beams.
Modify details for bearing conditions, beam type, and beam spacing not shown on this standard. Details do not account for pedestal bearing seat.
Include shear key concrete in Abutment or Bent concrete for payment.
UHMW polyethylene wear pads are subsidiary to Class "C" concrete.

Texas Department of Transportation

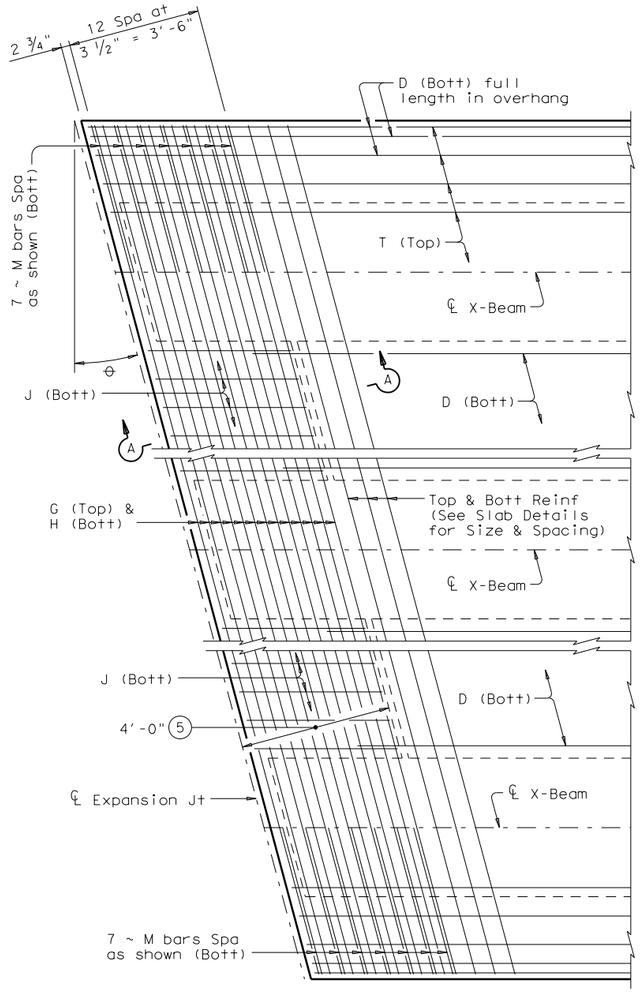
Bridge Division Standard

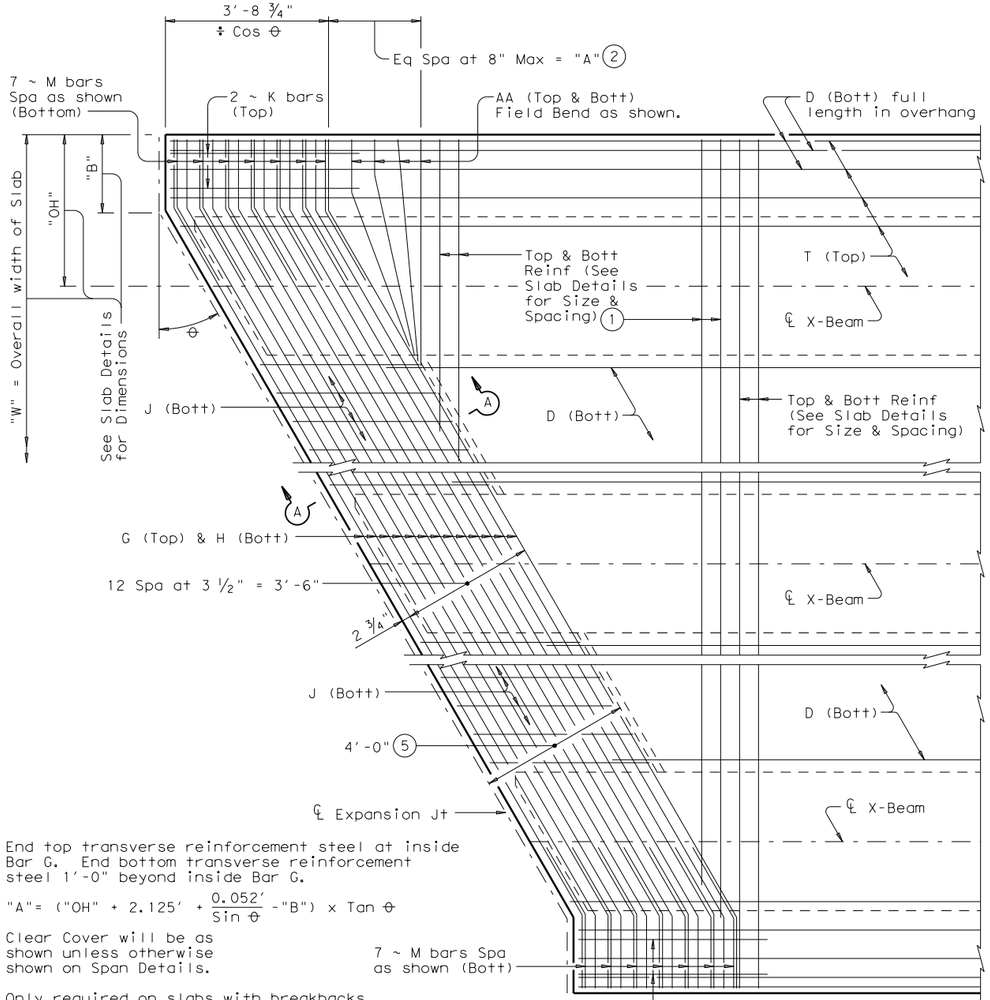
SHEAR KEY DETAILS
PRESTR CONCRETE X-BEAMS

XBSK

FILE: xbstds92.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT April 2013 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1191	03	033,ETC.	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		123

DATE: 5/7/2021 1:49:27 PM
FILE: i:\proj\N3106711.02 - TxDOT - 3299 Bridge WA 3 - Sub to IEA\05 Design (PS & E)\Plan Set\20. Project Specific Standards\7. Bridge\xbstde09.dgn





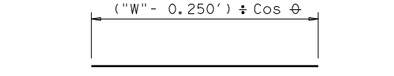
(1) End top transverse reinforcement steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.

(2) "A"= ("OH" + 2.125' + $\frac{0.052'}{\text{Sin }\theta}$ -"B") x Tan θ

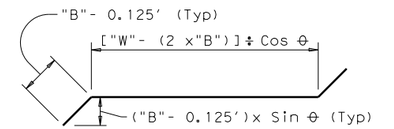
(3) Clear Cover will be as shown unless otherwise shown on Span Details.

(4) Only required on slabs with breakbacks.

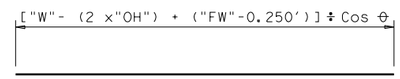
(5) Thickened Slab End dimensioned perpendicular to Face of Bkwl, Centerline Interior Bent or Face of Inverted-T Stem.



BARS G (#5)
(For Slabs Without Breakbacks)

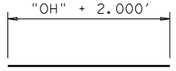


BARS G (#5)
(For Slabs With Breakbacks)

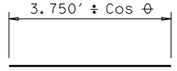


"FW" = Beam top Flange width (ft)

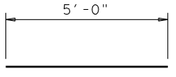
BARS H (#5)



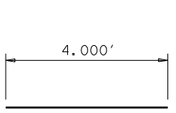
BARS AA (#5) (4)



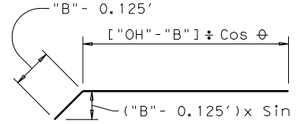
BARS J (#5)



BARS K (#5) (4)



BARS M (#5)
(For Slabs Without Breakbacks)



BARS M (#5)
(For Slabs With Breakbacks)

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

These details are restricted to Prestressed Concrete X-Beam Spans.

These details are to be used in conjunction with the Span Details and Standard PCP (if prestressed concrete panels are used).

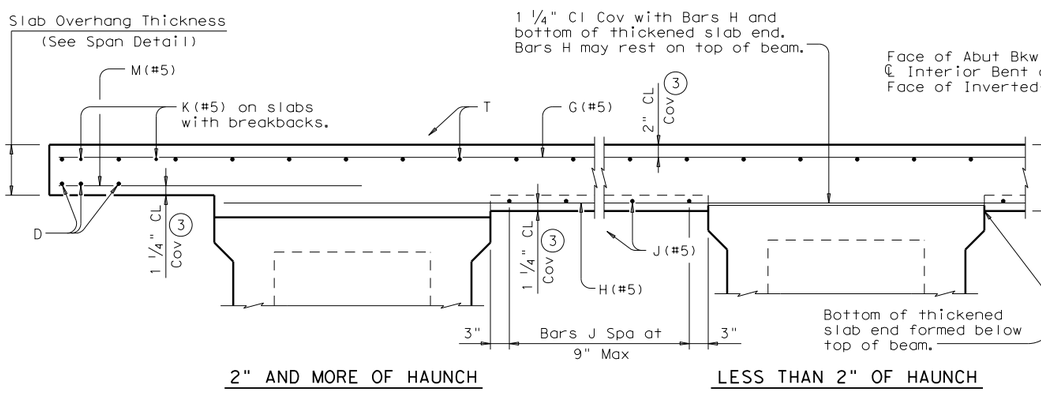
All reinforcing bars must be Grade 60 steel.

If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J and M must be epoxy coated.

Bar laps, where required, will be as follows:

Uncoated ~ #4	= 1'-5"
~ #5	= 1'-9"
Epoxy Coated ~ #4	= 2'-1"
~ #5	= 2'-7"

PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



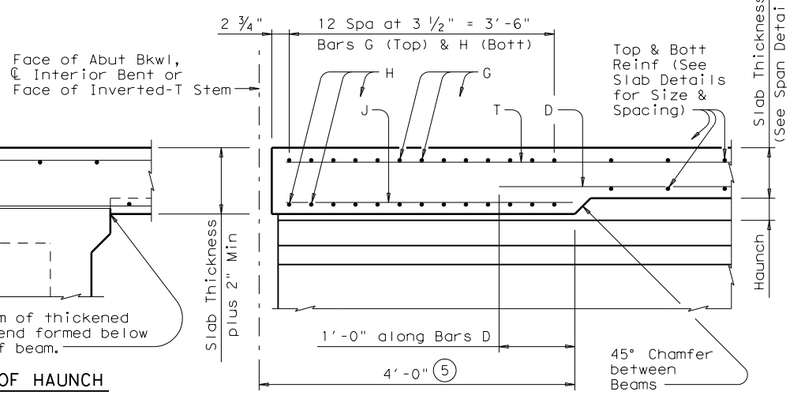
2" AND MORE OF HAUNCH

LESS THAN 2" OF HAUNCH

TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc X-Beams at ℄ Brg)

PARTIAL PLAN FOR SLABS WITH BREAKBACK



SECTION A-A

(Showing with 2" and more of Haunch)

HL93 LOADING

Texas Department of Transportation

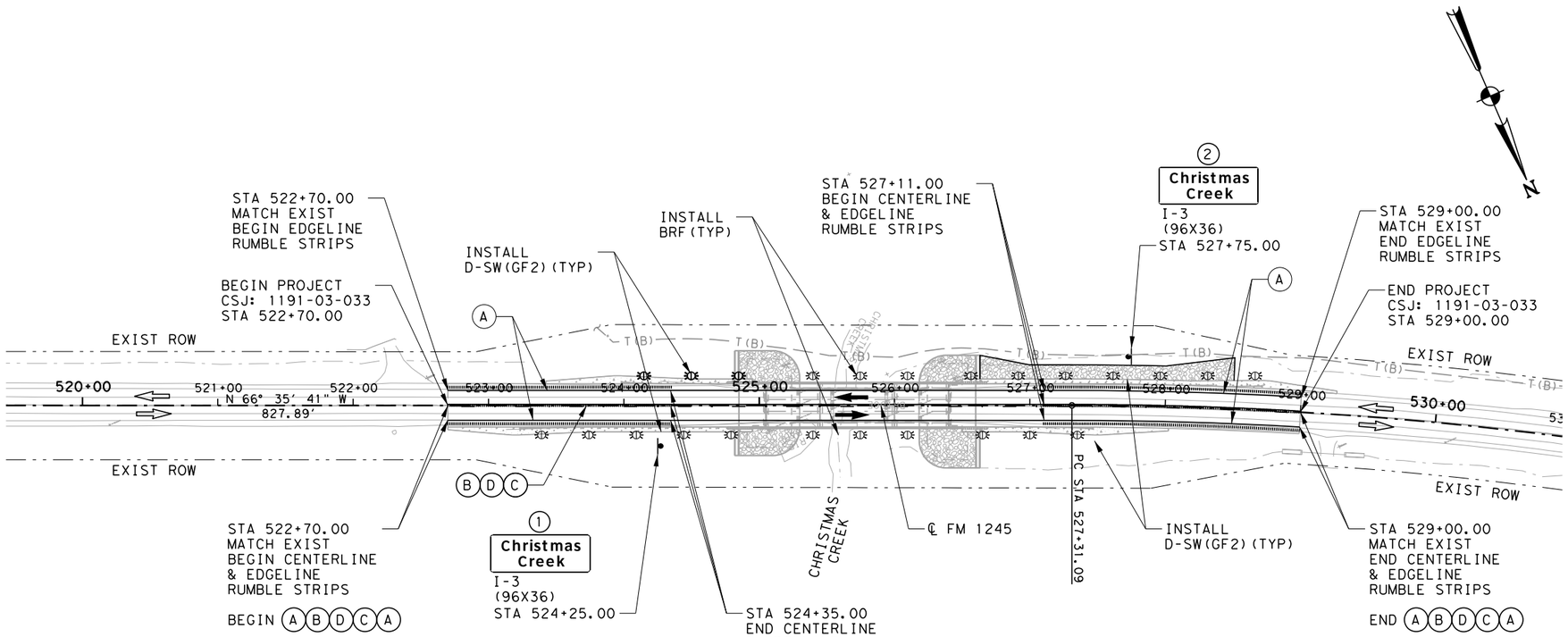
Bridge Division Standard

THICKENED SLAB END DETAILS
PRESTRESSED CONCRETE X-BEAM SPANS

XBTS

FILE: xbstde09.dgn	DN: JMH	CK: AM	DW: JTR	CK: JMH
©TxDOT June 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033, ETC.	FM 1245, ETC
	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		124

HORIZONTAL SCALE IN FEET
0 50 100



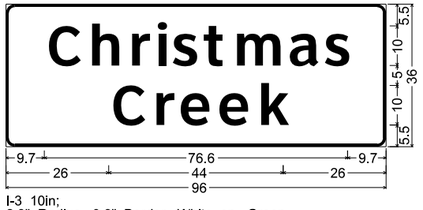
LEGEND:

- (A) RE PM W/SET REQ TY I (W) 4" (SLD) (100 MIL)
- (B) RE PM W/SET REQ TY I (Y) 4" (SLD) (100 MIL)
- (C) RE PM W/SET REQ TY I (Y) 4" (BRK) (100 MIL)
- (D) RAIS PV MRK TY II A-A
- (#) SMALL SIGN IDENTIFIER
- PROP SMALL SIGN ASSY
- PROP DELINEATOR ASSY
- DIRECTION OF TRAFFIC FLOW

NOTES:

1. ALL EXIST SIGNS TO BE REMOVED AND REPLACED UNLESS NOTED.
2. INSTALL DELINEATORS AND OBJECT MARKERS PER TXDOT D&OM STANDARDS EXCEPT AS NOTED.
3. REFER TO TXDOT PM(2)-12 STANDARD FOR REFLECTORIZED RAISED PAVEMENT MARKER SPACING AND D & OM(5)-20 FOR DELINEATOR AND OBJECT MARKER SPACING.

(1) (2)



I-3 10in;
2.3" Radius, 0.8" Border, White on, Green;
"Christmas", ClearviewHwy-5-W-R; "Creek", ClearviewHwy-5-W-R;

W. RICHARD RENTON JR.
84792
STATE OF TEXAS
REGISTERED
PROFESSIONAL ENGINEER

5/12/2021

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1245

SIGNING AND PAVEMENT MARKINGS PLAN

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		125
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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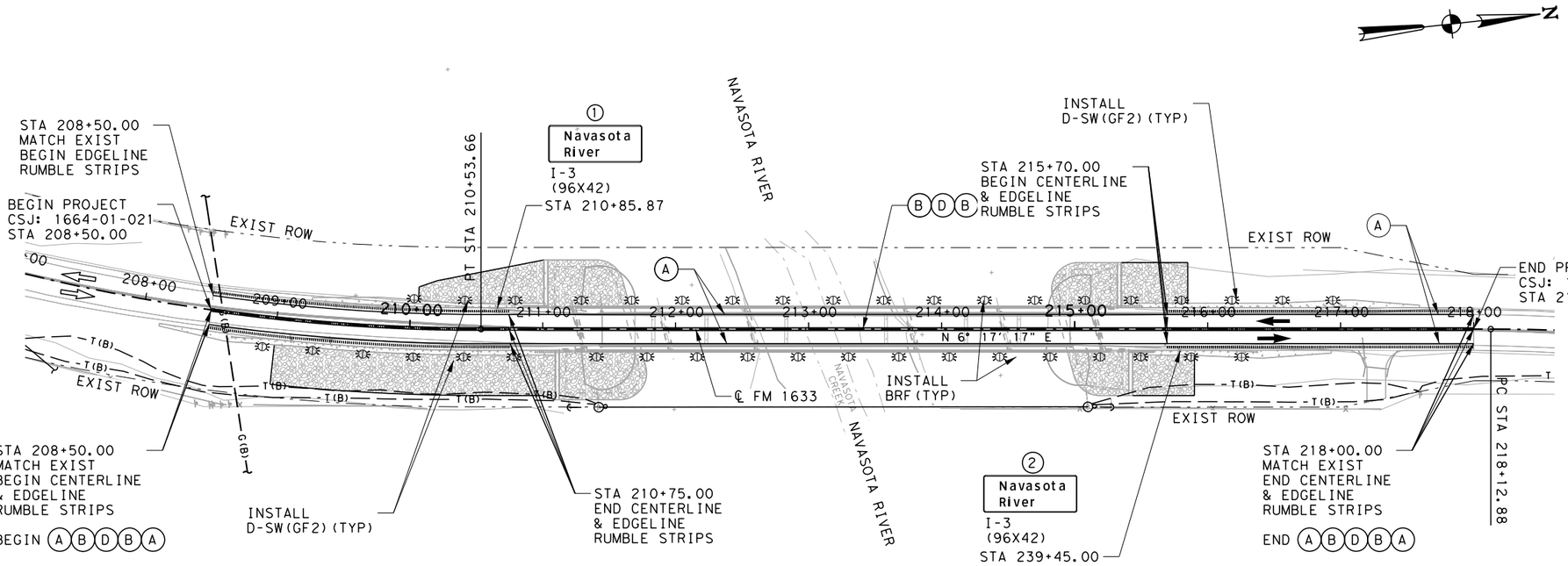
MODEL:Design

HORIZONTAL SCALE IN FEET
0 50 100



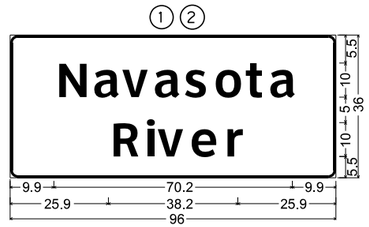
LEGEND:

- (A) RE PM W/SET REQ TY I (W) 4" (SLD) (100 MIL)
- (B) RE PM W/SET REQ TY I (Y) 4" (SLD) (100 MIL)
- (C) RE PM W/SET REQ TY I (Y) 4" (BRK) (100 MIL)
- (D) RAIS PV MRK TY II A-A
- (#) SMALL SIGN IDENTIFIER
- PROP SMALL SIGN ASSY
- PROP DELINEATOR ASSY
- DIRECTION OF TRAFFIC FLOW

NOTES:

1. ALL EXIST SIGNS TO BE REMOVED AND REPLACED UNLESS NOTED.
2. INSTALL DELINEATORS AND OBJECT MARKERS PER TXDOT D&OM STANDARDS EXCEPT AS NOTED.
3. REFER TO TXDOT PM(2)-12 STANDARD FOR REFLECTORIZED RAISED PAVEMENT MARKER SPACING AND D & OM(5)-20 FOR DELINEATOR AND OBJECT MARKER SPACING.

(1)(2)



I-3 10in;
2.3" Radius, 0.8" Border, White on, Green;
"Navasota", ClearviewHwy-5-W-R; "River", ClearviewHwy-5-W-R;

STATE OF TEXAS
W. RICHARD RENTON JR.
84792
REGISTERED PROFESSIONAL ENGINEER

5/12/2021

NO.	REVISION	DATE

Texas Department of Transportation

IEA
18383 PRESTON ROAD
SUITE 500
DALLAS, TEXAS 75252
(214) 884-4253
FIRM REGISTRATION No. F-10161

FM 1633

SIGNING AND PAVEMENT MARKINGS PLAN

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		126
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC.

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5/12/2021 10:56:44 AM USER: rdelossan
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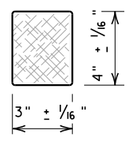
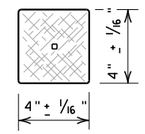
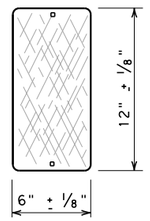
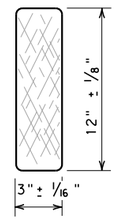
MODEL: Design

DATE: 5/7/2021 3:06:35 PM
FILE: \\pusscshrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.01 Traffic\dom1-20.dgn

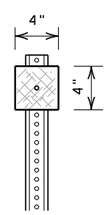
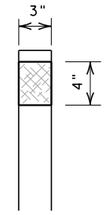
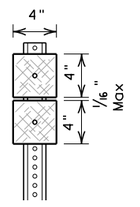
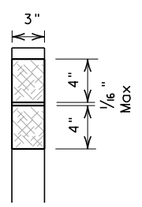
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	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

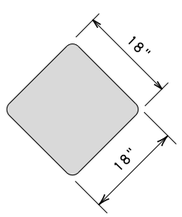
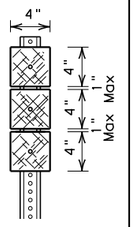
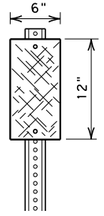
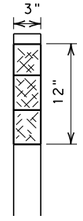
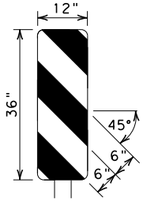
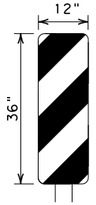
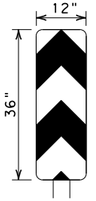
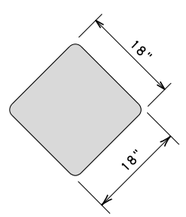
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

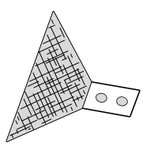
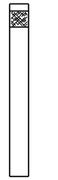
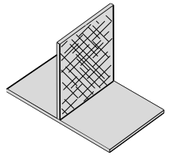
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

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

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			

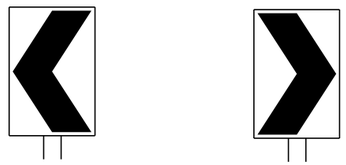
1. Barrier reflectors shall meet the requirements of DMS 8600.
2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.

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"	

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

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC	FM 1245,ETC
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	WAC	LIMESTONE		127

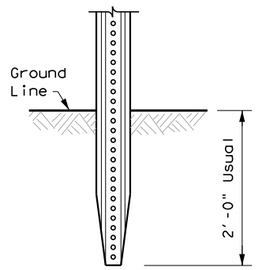
20A

DATE: 5/7/2021 3:06:37 PM
FILE: \\pusxcshrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04dom2-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

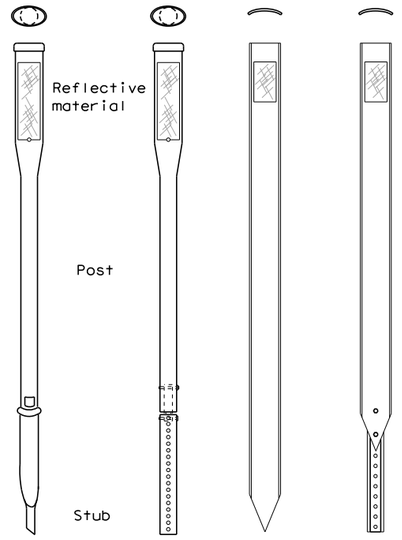


NOTES

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.

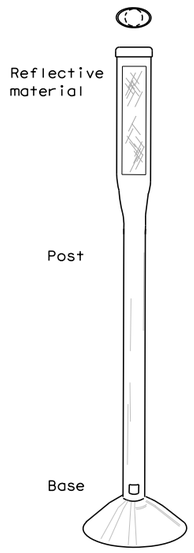
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



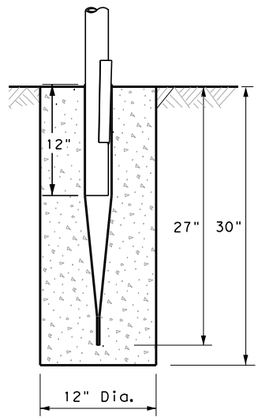
SURFACE MOUNT

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.

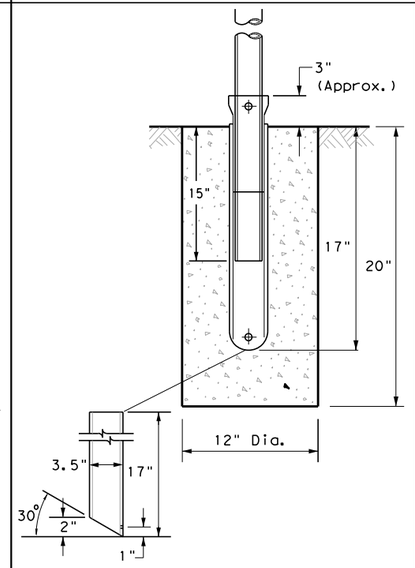
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

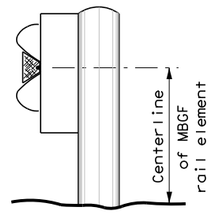
NOTE

1. Install per manufacturer's recommendations.

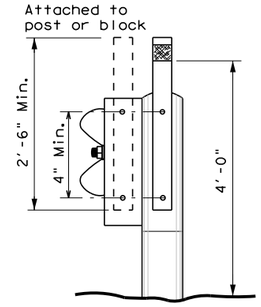
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

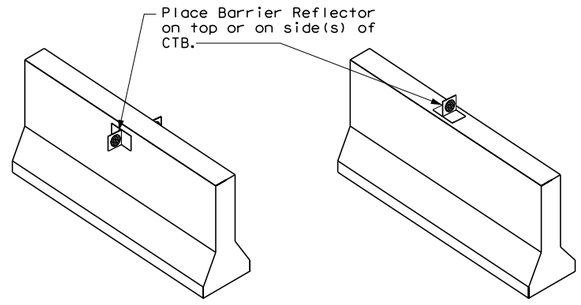
GF1



GF2



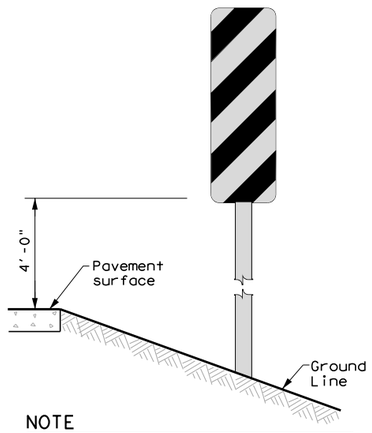
CONCRETE TRAFFIC BARRIER (CTB)



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.

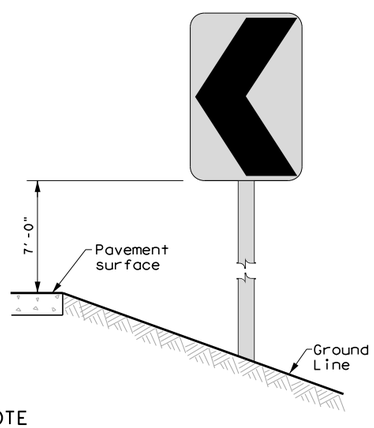
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

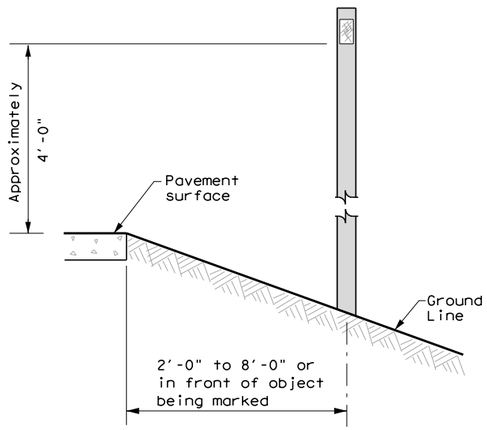
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
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10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	WAC	LIMESTONE		128

20B

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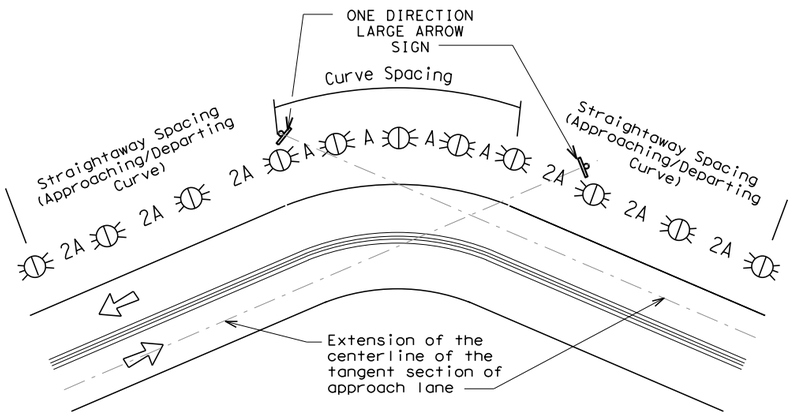
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

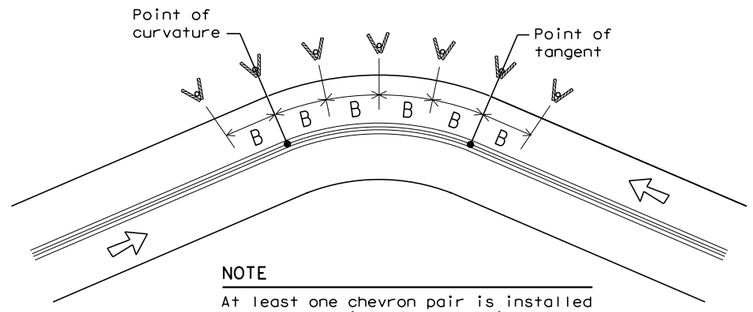
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

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
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3-15 8-15 8-15 7-20	DIST	COUNTY		SHEET NO.
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20C

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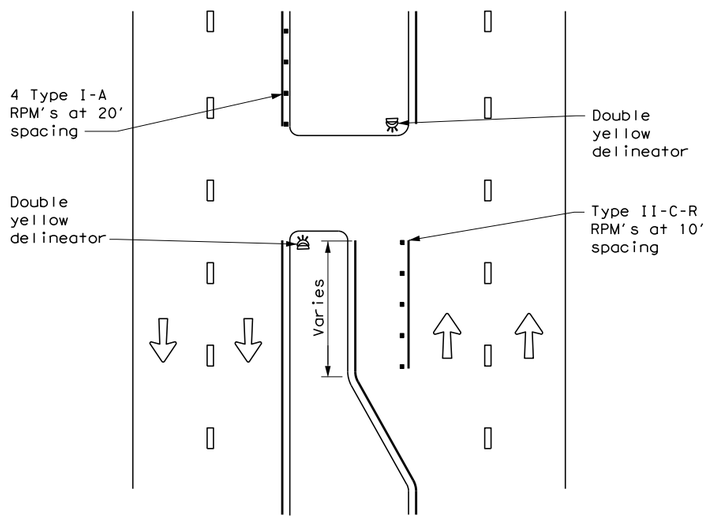
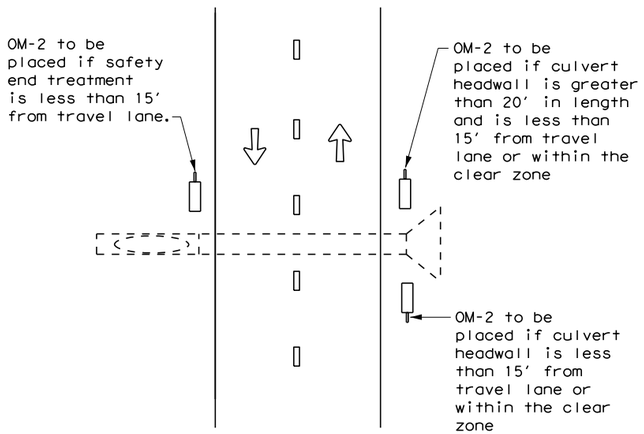
CROSSOVERS



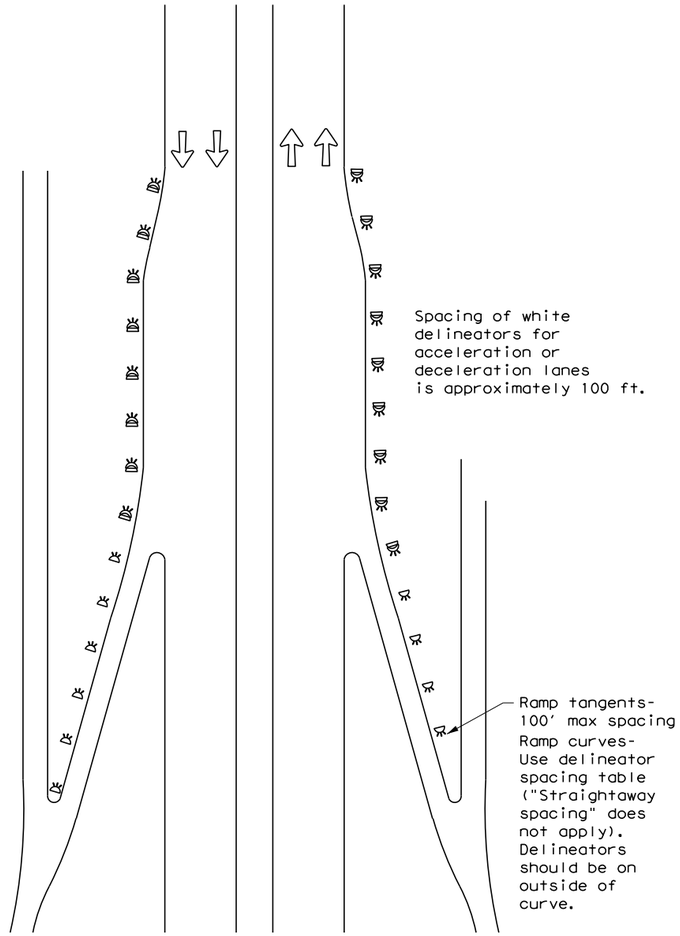
DETAIL 1

FOR CULVERTS WITHOUT MBGF



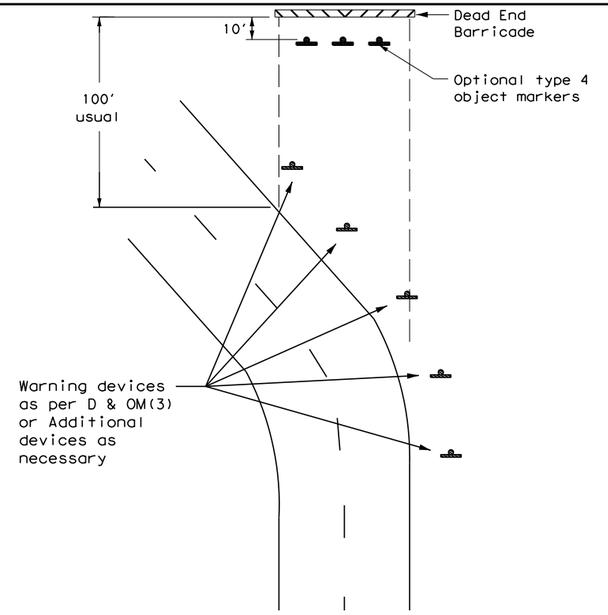
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



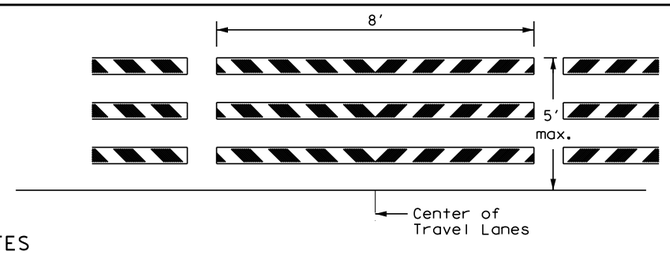
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

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

DETAIL 5

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
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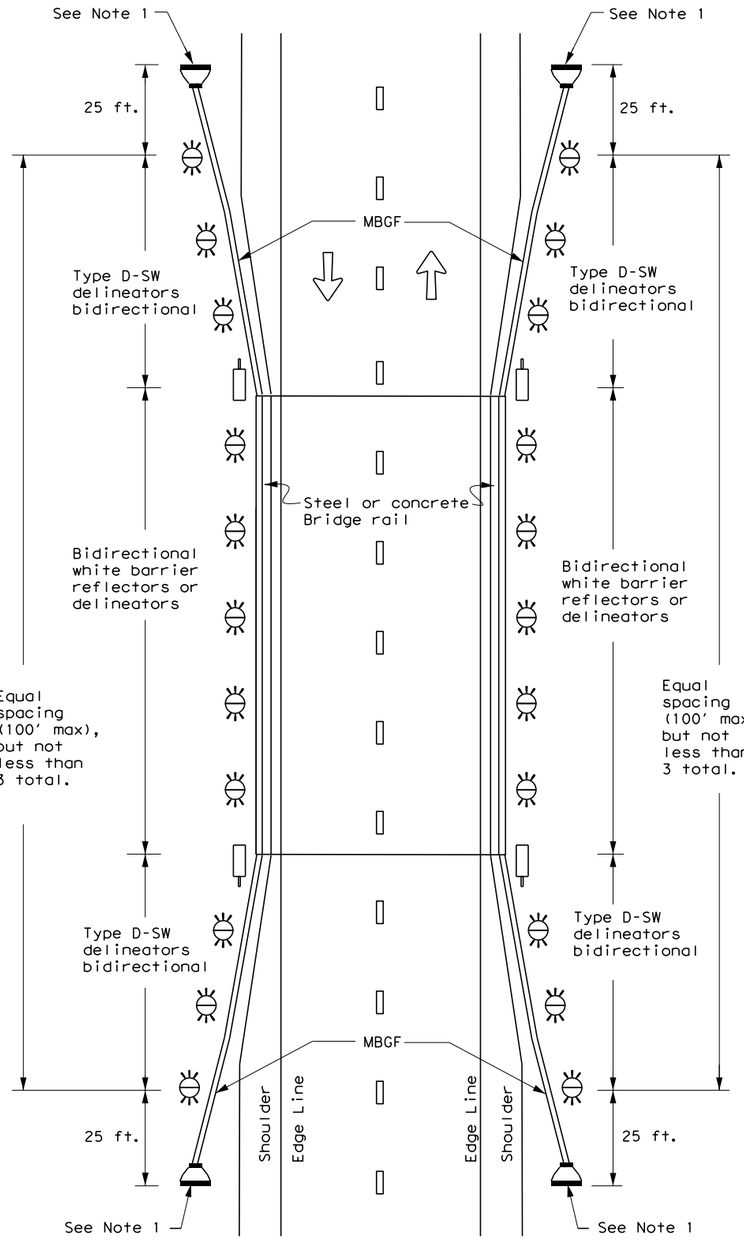
3-15	DIST	COUNTY		SHEET NO.
7-20	WAC	LIMESTONE		130

20D

DATE: 5/7/2021 3:06:49 PM
FILE: \\pusscshrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04dom5-20.dgn

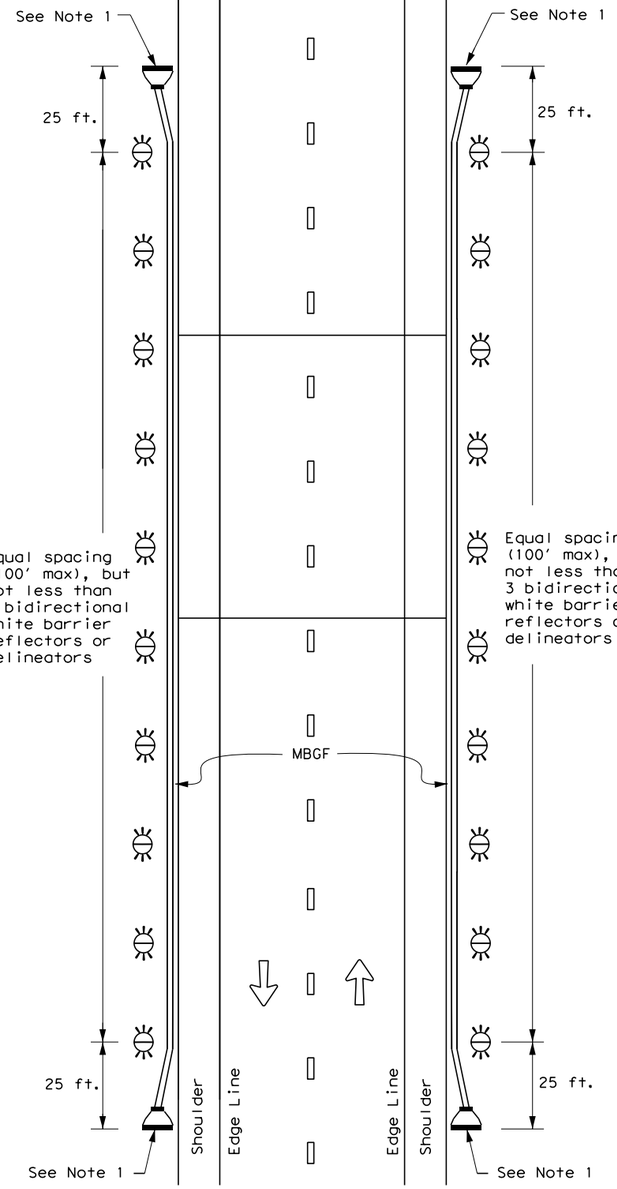
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

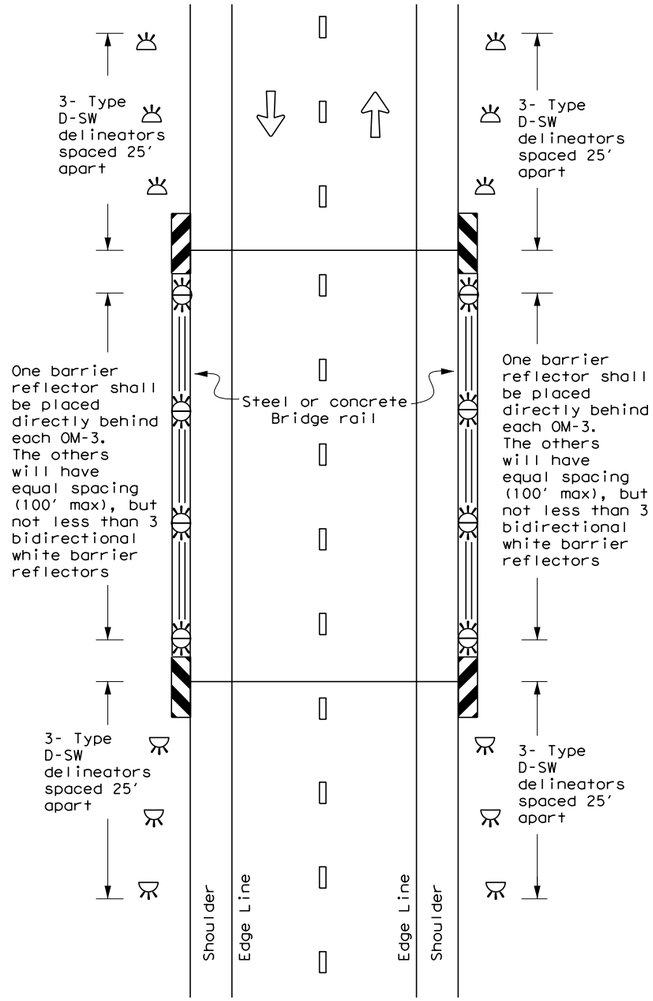
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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
REVISIONS	1191	03	033, ETC	FM 1245, ETC
7-20	DIST	COUNTY		SHEET NO.
	WAC	LIMESTONE		131

20E

DATE: 5/7/2021 3:06:51 PM
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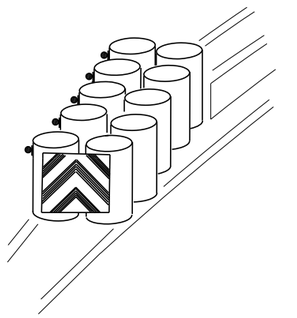
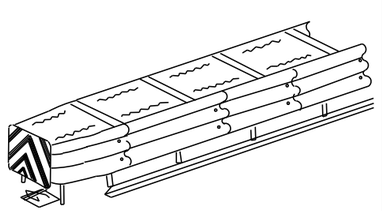
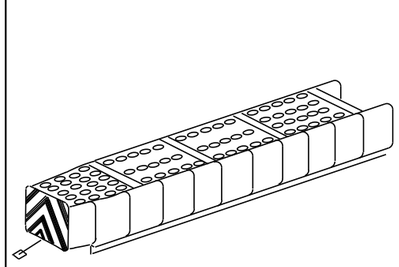
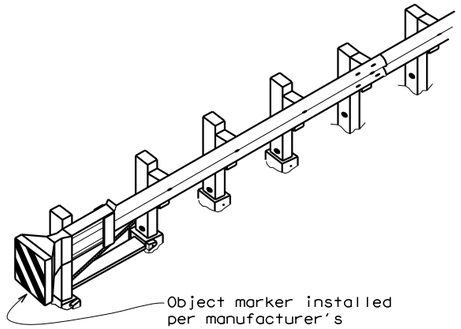
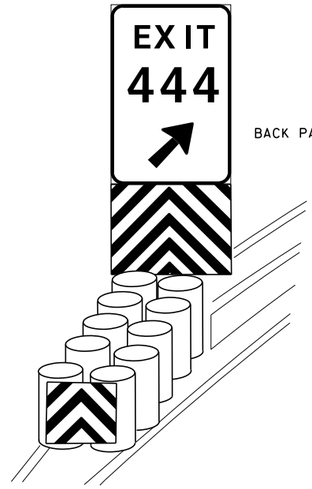
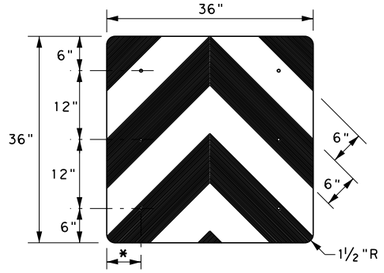


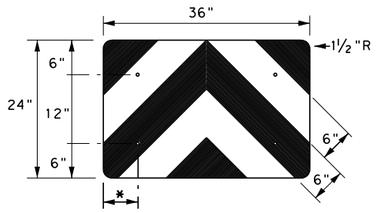




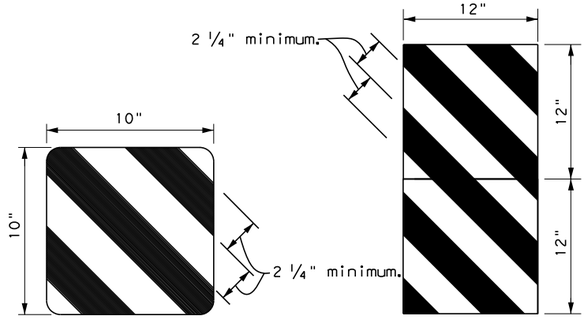




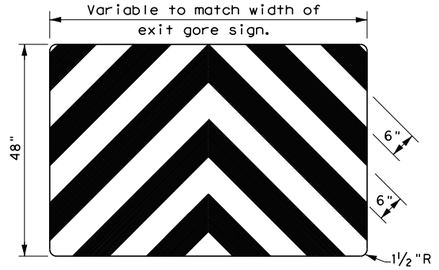


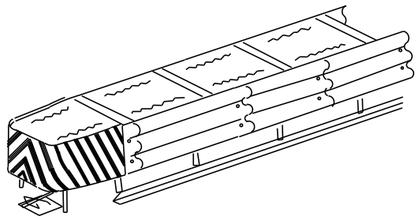


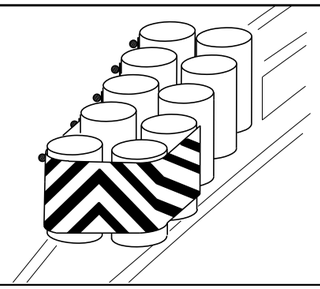
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

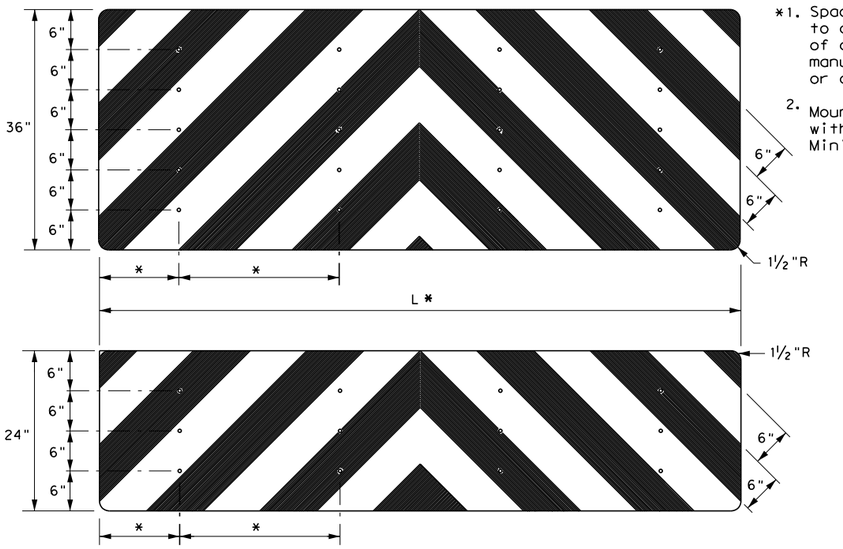


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC	FM 1245,ETC
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	WAC	LIMESTONE		132
4-98 7-20				

20G

DATE: 5/7/2021 3:06:54 PM
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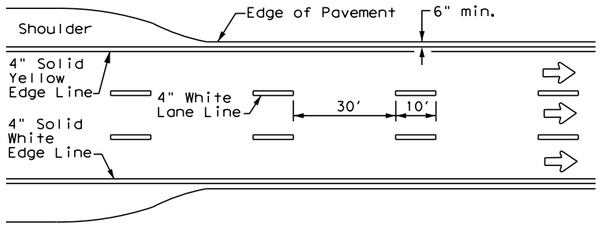
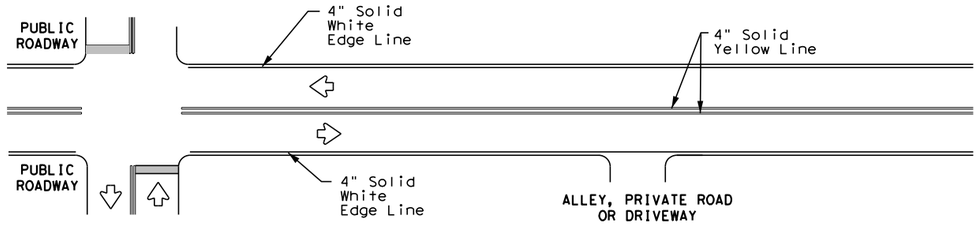
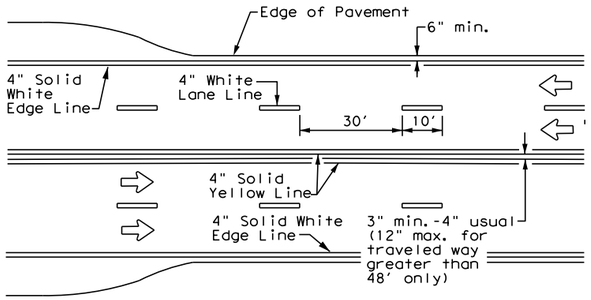


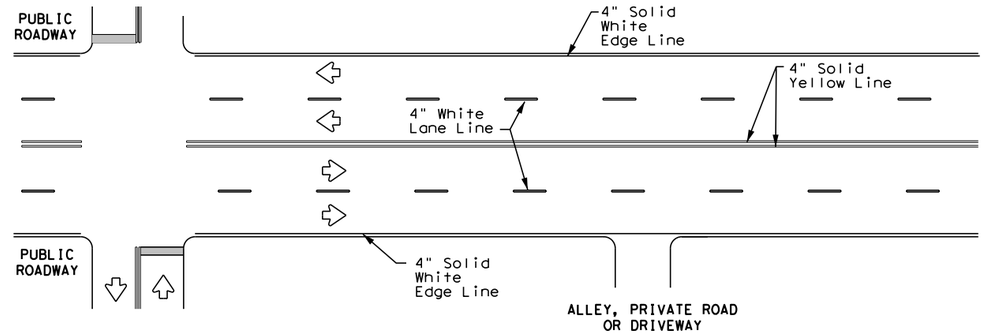
EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



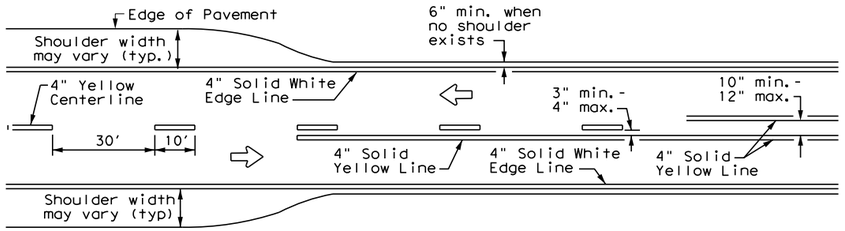
TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



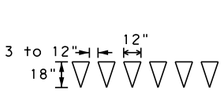
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



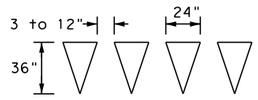
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

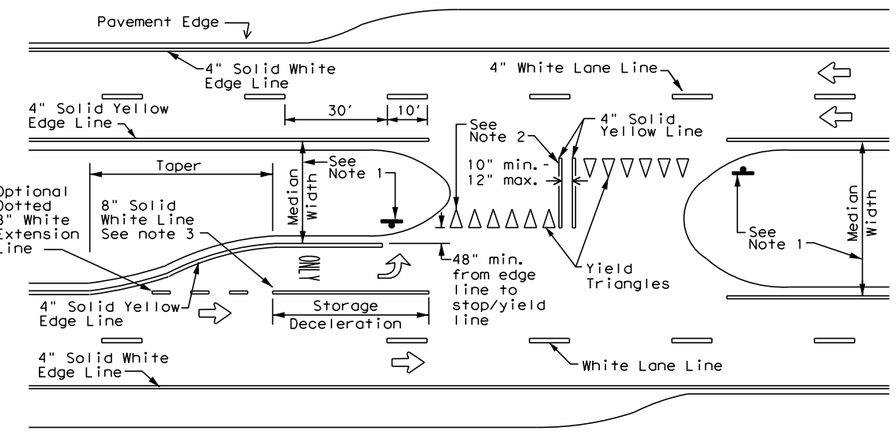


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

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 are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles 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.

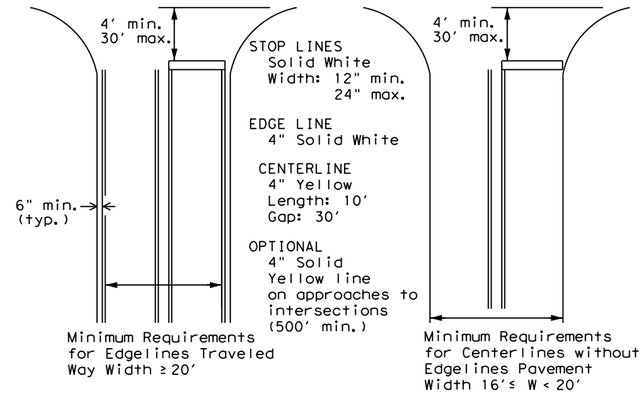
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

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 inside of edgeline to the inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE
Based on Traveled Way and Pavement Widths
for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

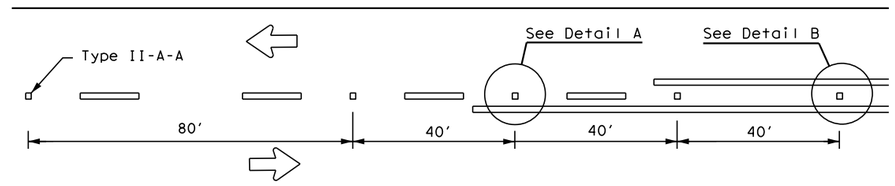
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

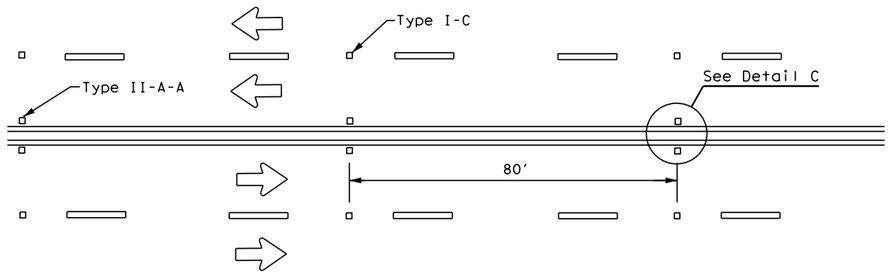
FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	1191	03	033,ETC	FM 1245,ETC
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	WAC	LIMESTONE		133

22A

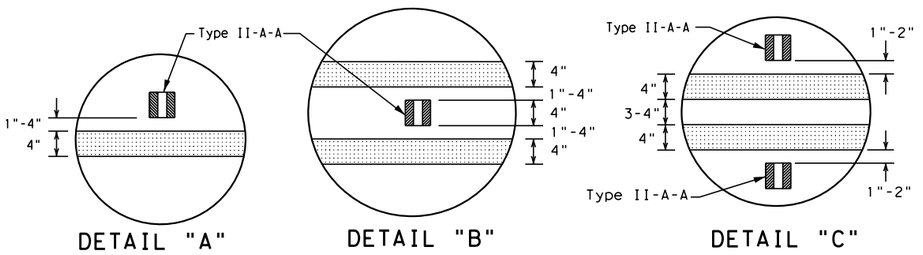
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



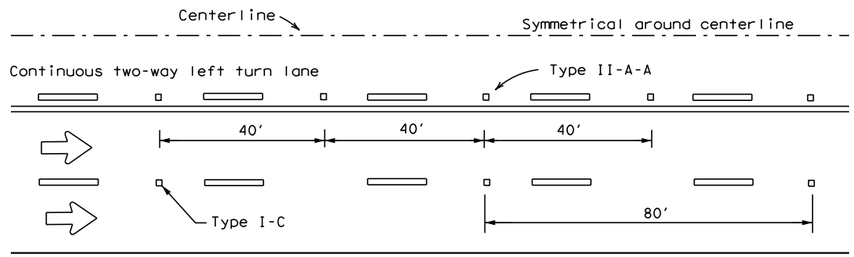
CENTERLINE FOR ALL TWO LANE ROADWAYS



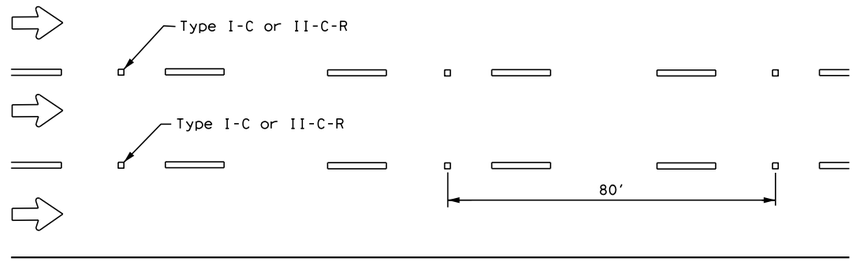
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" DETAIL "B" DETAIL "C"



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

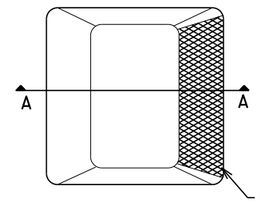


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

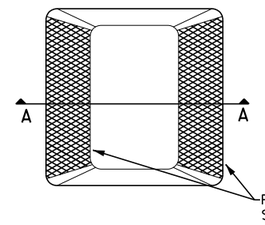
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

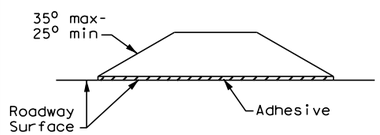
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

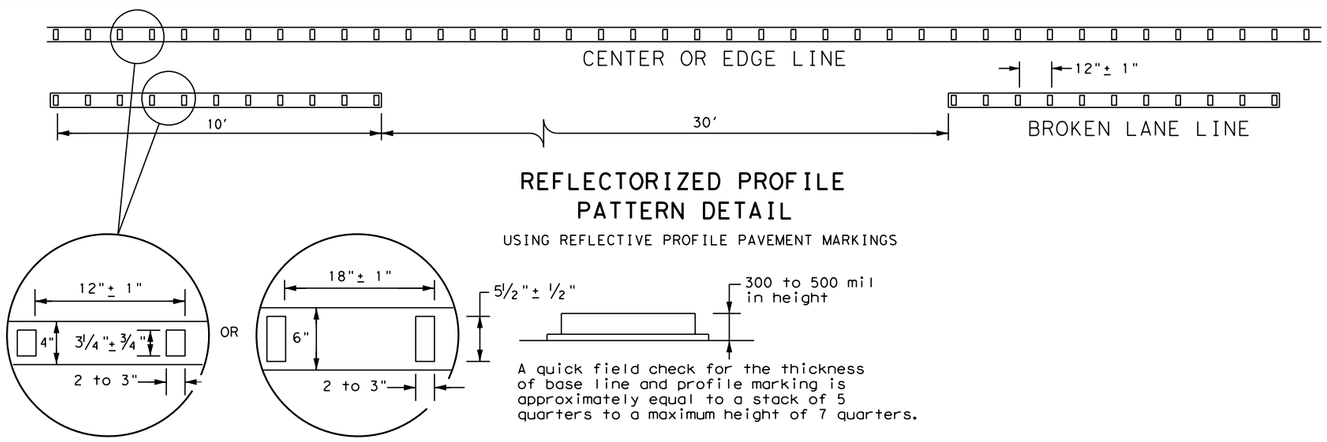


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

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.

NOTE

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 in 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.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
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5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	WAC	LIMESTONE		134

22B

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DATE: 5/7/2021 3:06:58 PM
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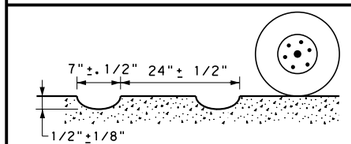
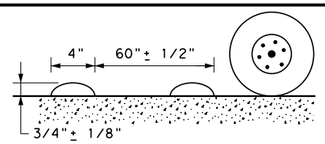
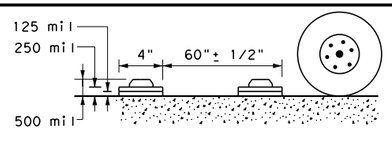
CENTERLINE RUMBLE STRIPS



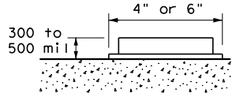
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

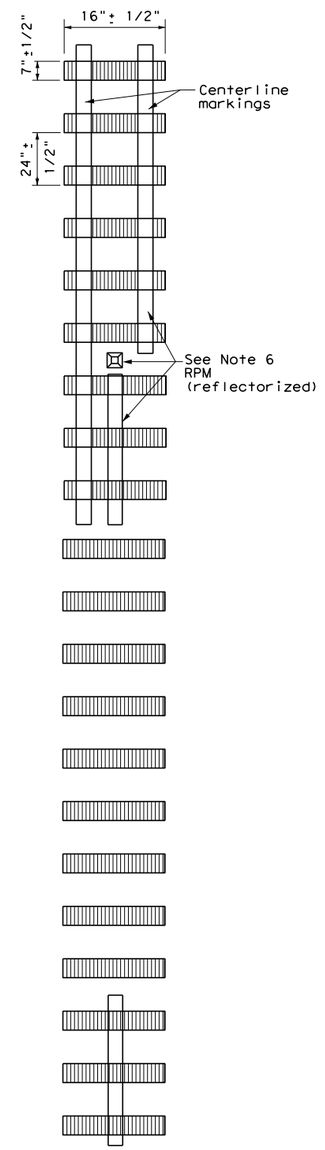


PREFORMED THERMOPLASTIC STRIPS



PROFILE MARKINGS

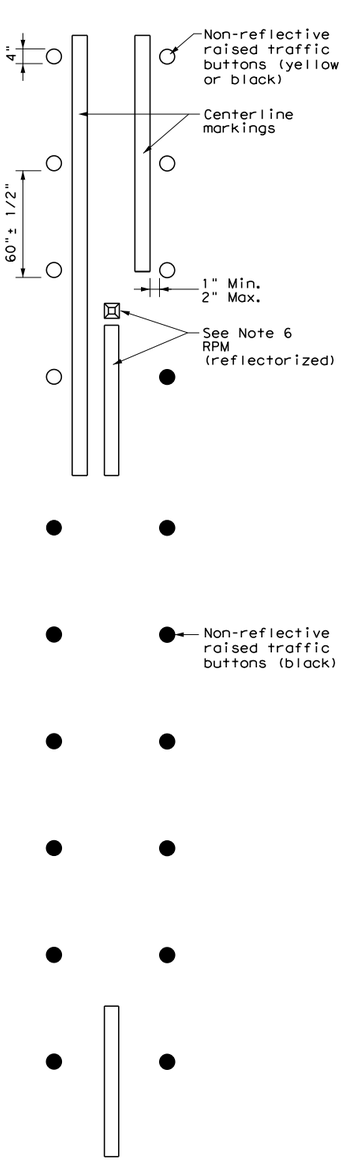
PROFILE VIEW



TWO LANE TWO-WAY ROADWAYS

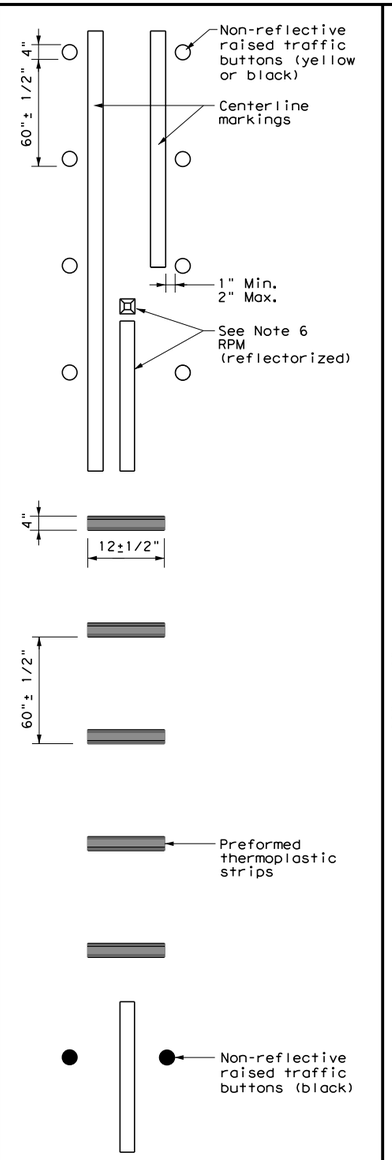
PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS



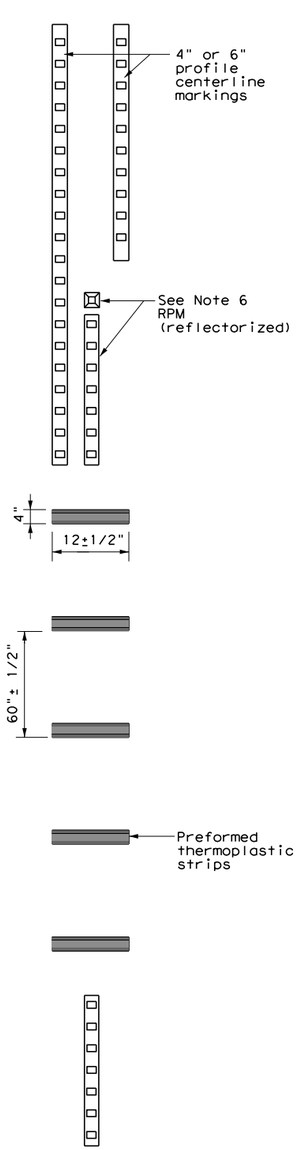
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

12. See standard sheet RS(4).

Texas Department of Transportation®

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WAC	LIMESTONE		135

DATE: 5/7/2021 3:07:01 PM
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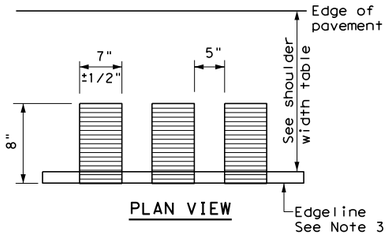
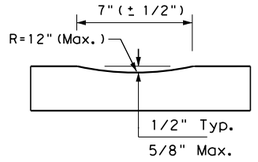
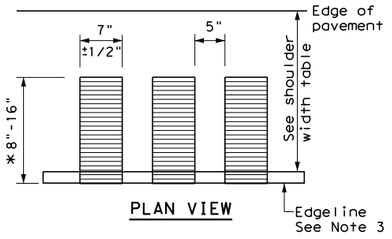
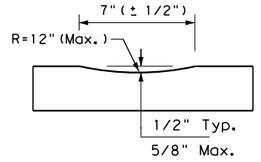




PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)

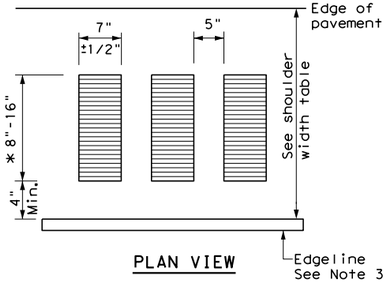




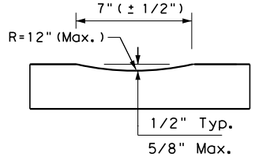
* This distance may vary based on width of shoulder

PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)

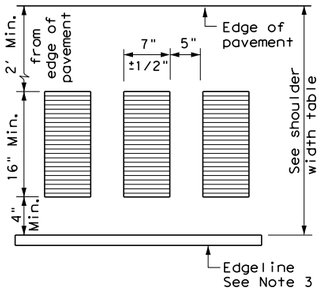


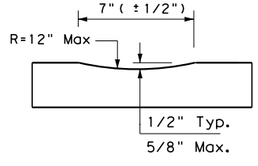
* This distance may vary based on width of shoulder



PROFILE VIEW
OPTION 3

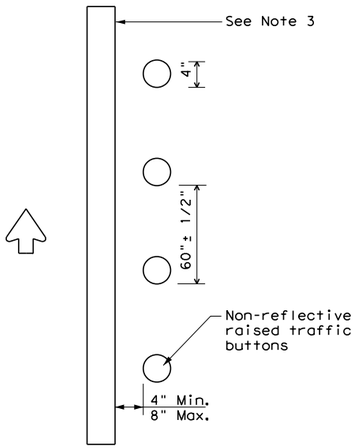
CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)





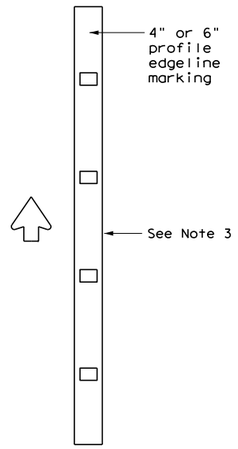
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

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) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

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 edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
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. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS
RS(4)-13

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC	FM 1245,ETC
	DIST	COUNTY		SHEET NO.
	WAC	LIMESTONE		136

DATE: 5/7/2021 3:07:03 PM
FILE: \\pusscshrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.11 Standards\1633 & 1245\Traffic\smdgen.dgn

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

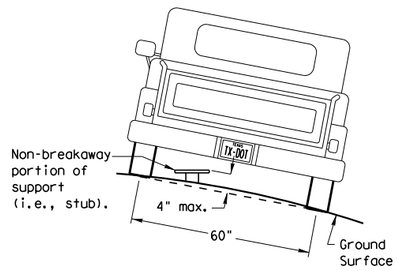
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

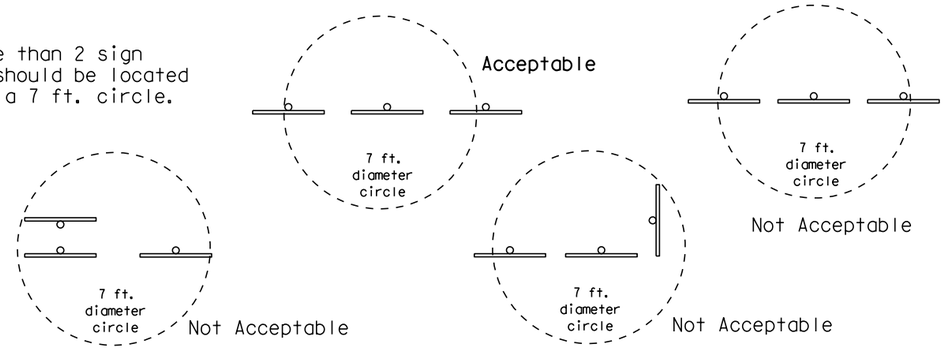
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



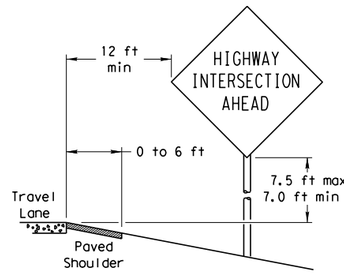
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



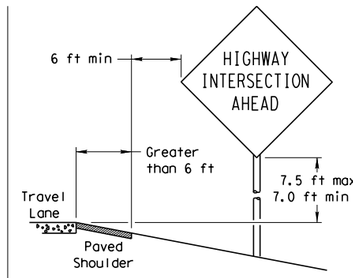
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

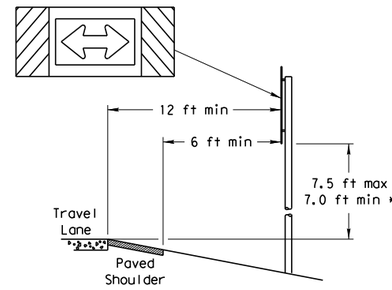
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



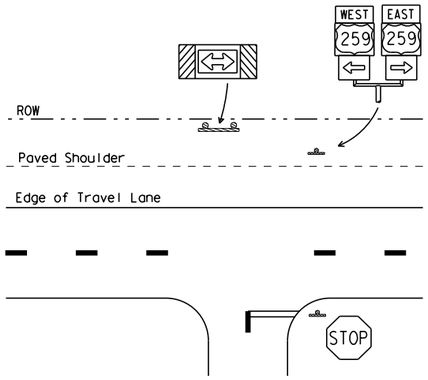
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

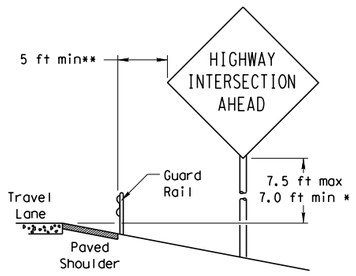
T-INTERSECTION



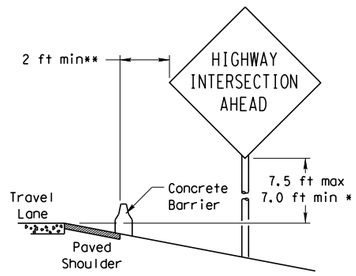
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

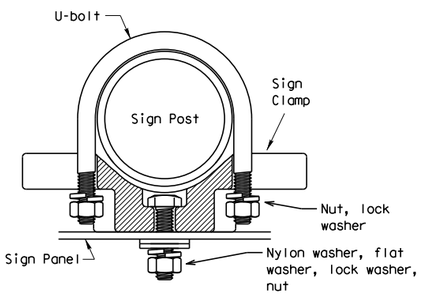
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

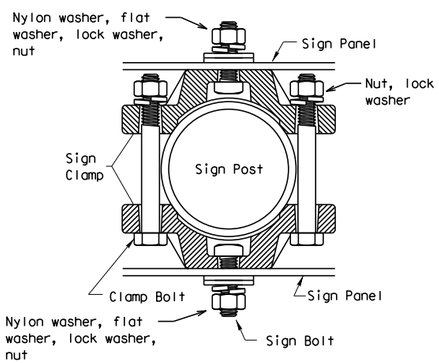


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

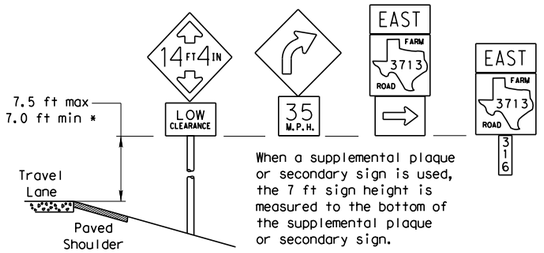
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



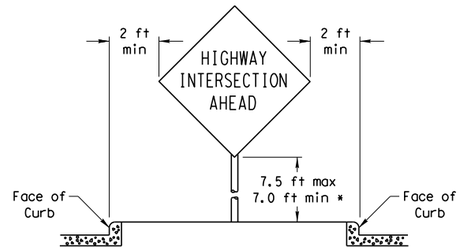
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



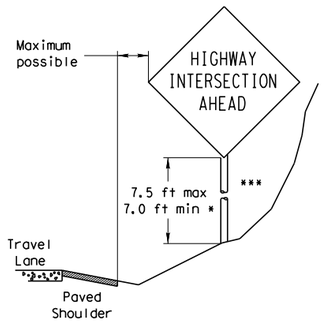
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

9-08 REVISIONS

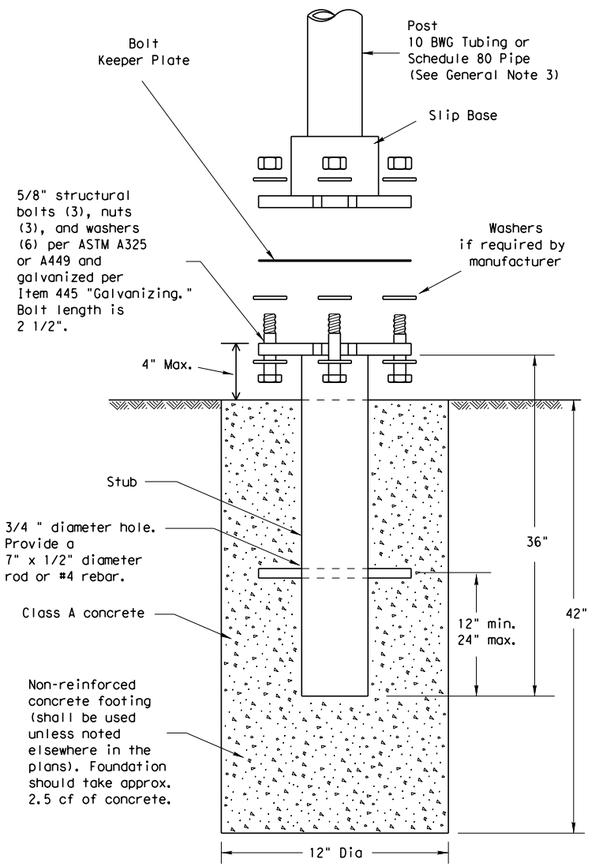
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
1191	03	033,ETC	FM 1245,ETC

DIST	COUNTY	SHEET NO.
WAC	LIMESTONE	137

DATE: 5/7/2021 3:07:05 PM
FILE: \\pussosshrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.11 Standards\1633 & 1245\Traffic\smds1.dgn

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

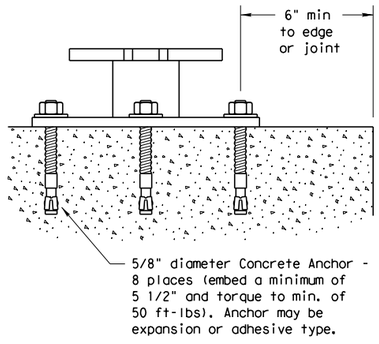
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
1191	03	033,ETC	FM 1245,ETC

DIST	COUNTY	SHEET NO.
WAC	LIMESTONE	138

DATE: 5/7/2021 3:07:07 PM
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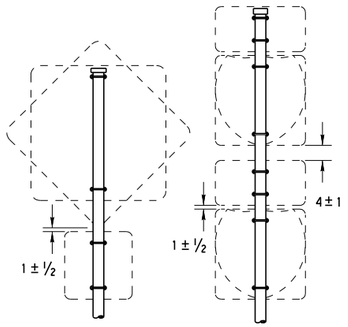
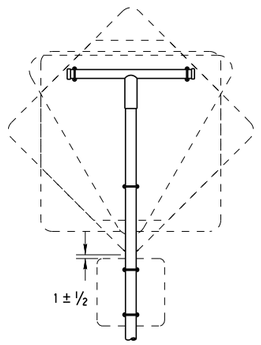
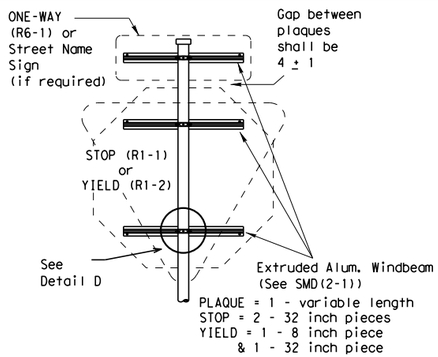


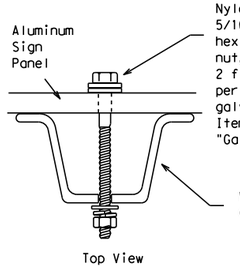
SM RD SGN ASSM TY XXXXX(1)XX(P)



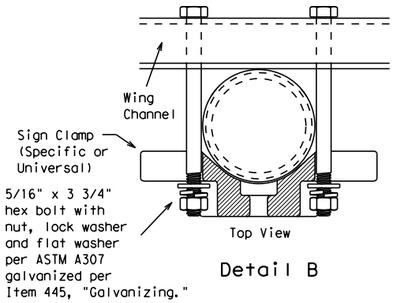
SM RD SGN ASSM TY XXXXX(1)XX(T)



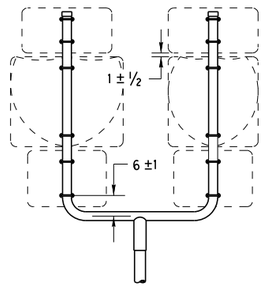
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



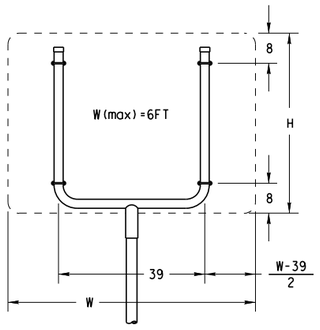
Detail A



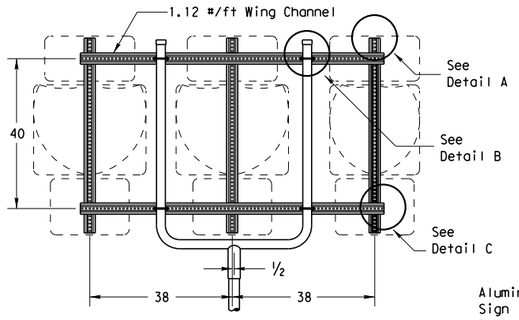
Detail B



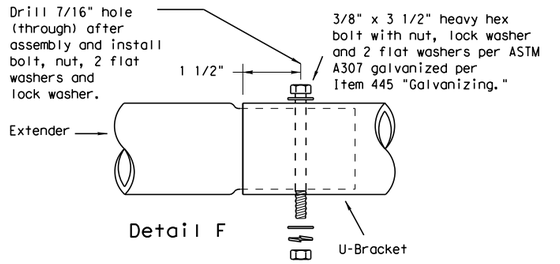
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

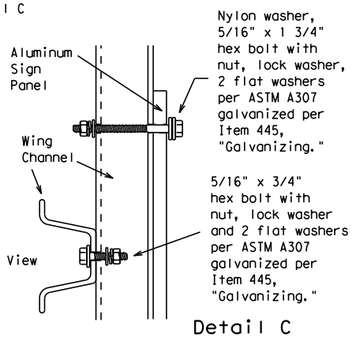


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

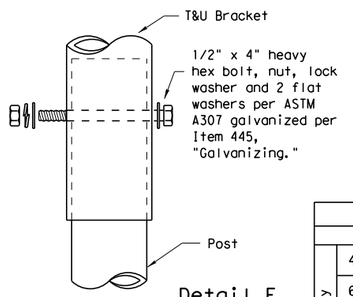


Detail F

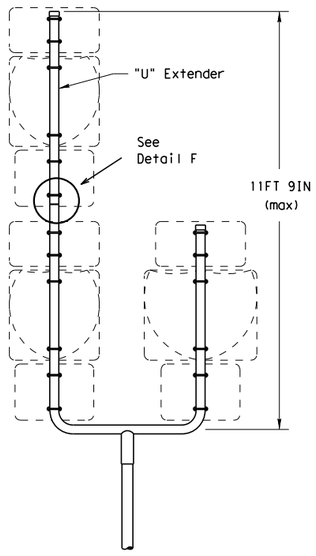
Splices shall only be allowed behind the sign substrate.



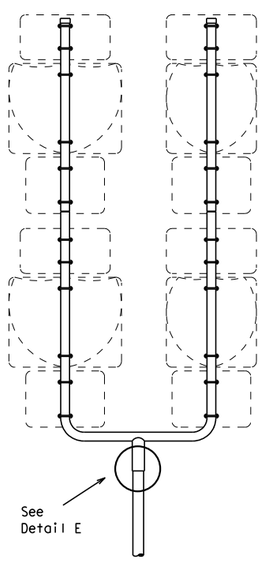
Detail C



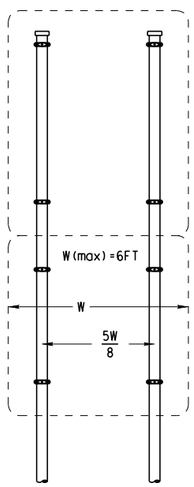
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

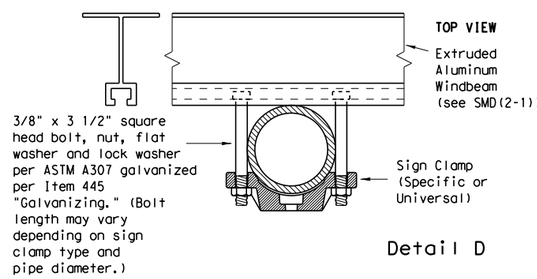


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

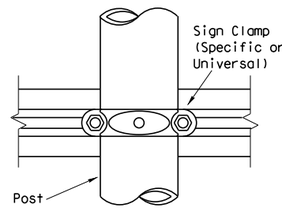


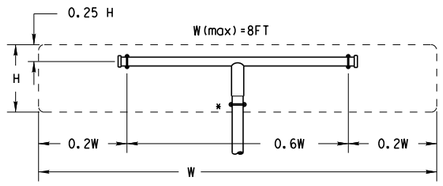
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

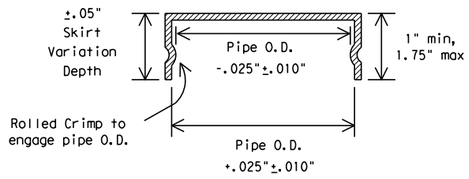




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
1191	03	033,ETC	FM 1245,ETC

DIST	COUNTY	SHEET NO.
WAC	LIMESTONE	139

DATE: 5/7/2021 3:07:10 PM
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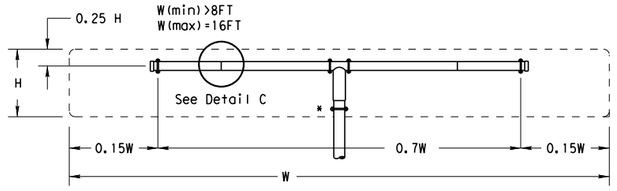
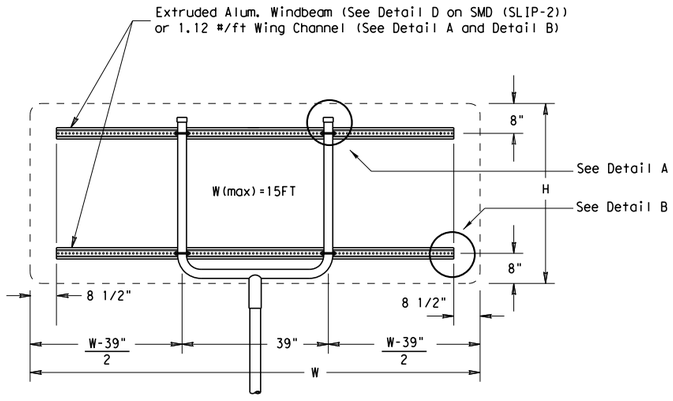
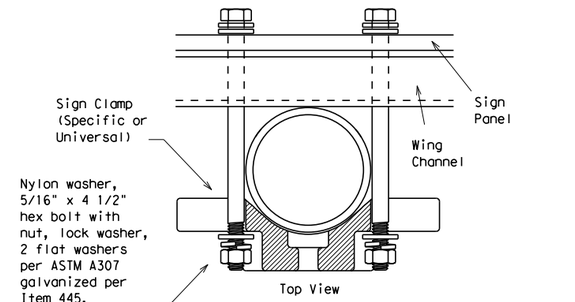


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)

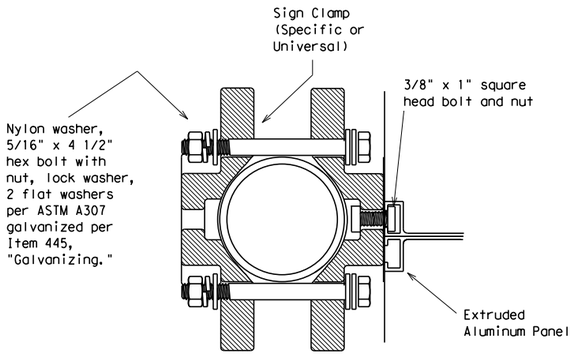


SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

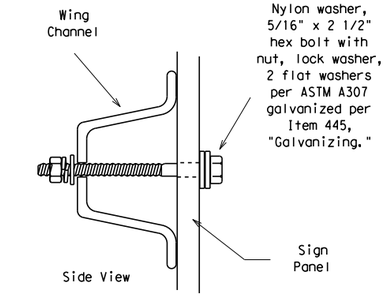


Top View

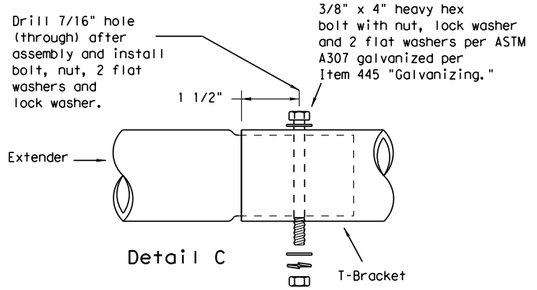
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

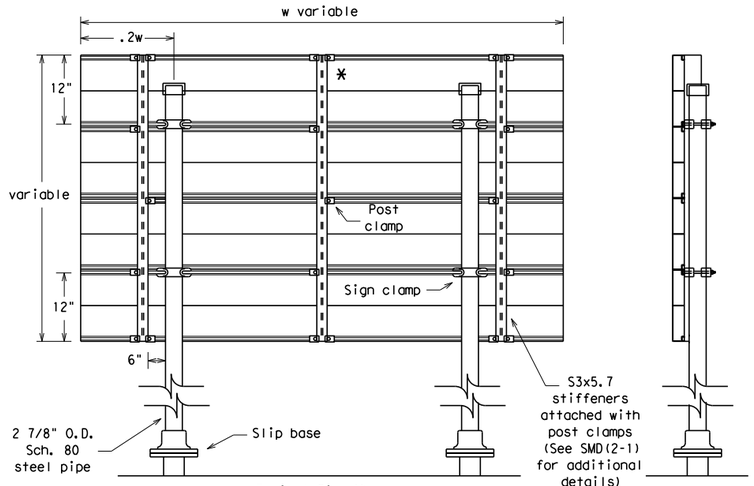


Detail B



Detail C

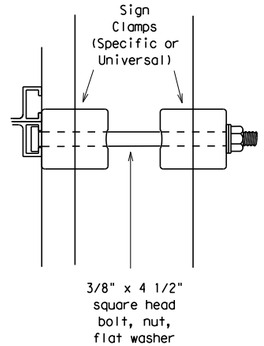
Splices shall only be allowed behind the sign substrate.



Typical Sign Mount

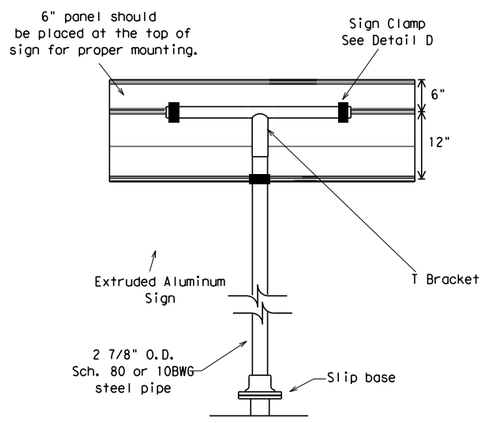
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

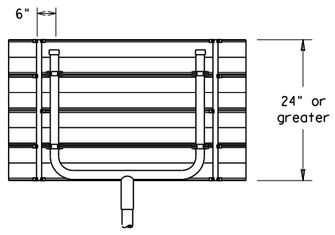


Detail E

See Detail E
for clamp installation



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
1191	03	033,ETC	FM 1245,ETC

DIST	COUNTY	SHEET NO.
WAC	LIMESTONE	140

DATE: 5/7/2021 3:07:12 PM
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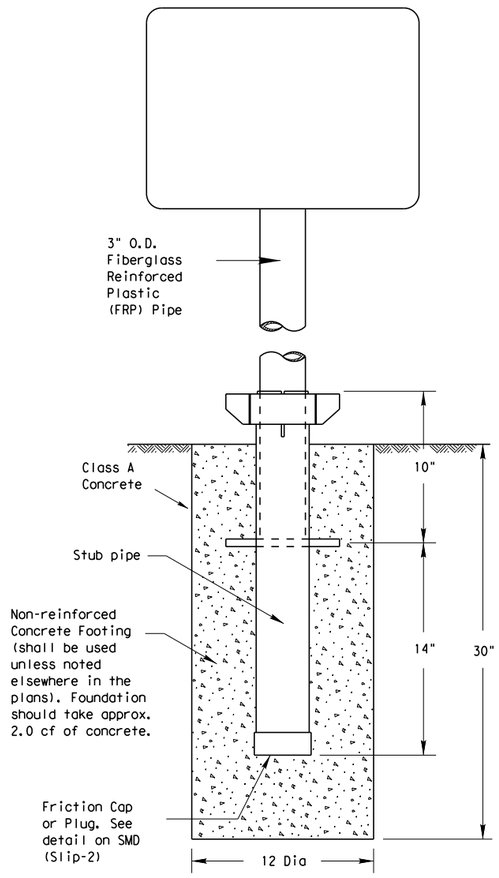
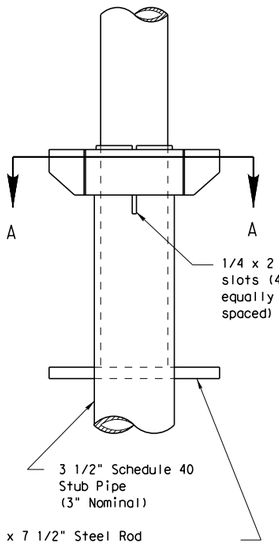
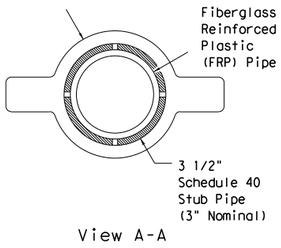
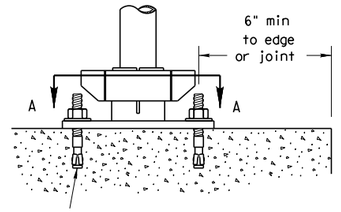
Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post





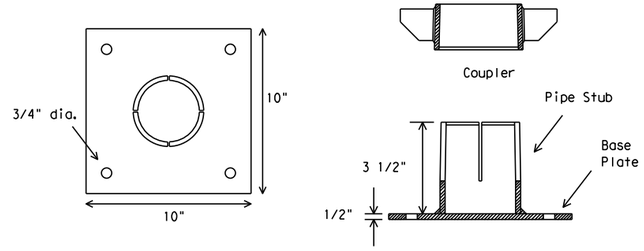


SM RD SGN ASSM TY FRP(X)UA(P)



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. 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.

BOLT-DOWN DETAILS



SM RD SGN ASSM TY FRP(X)UB(P)

GENERAL NOTES:

1. FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet.
2. All nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing."
3. See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: http://www.txdot.gov/publications/traffic.htm

FRP POST REQUIREMENTS

1. Materials shall conform to the requirements of Departmental Material Specification DMS-4410 and will be furnished in a yellow or gray color as specified elsewhere in the plans.
2. Thickness of FRP sign support is 0.125" + 0.031", - 0.0".
3. FRP sign supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing:
   Texas Department of Transportation
   Traffic Operations Division
   125 East 11th Street
   Austin, Texas 78701-2483

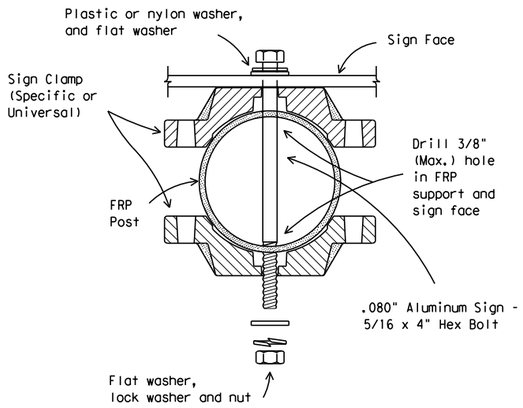
UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
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. Insert base post in foundation hole to depths shown and fill hole with concrete. Cut base post from bottom and ensure a minimum of 18" embedment if installed in solid rock.
4. Level and plumb the base post with coupler using a torpedo level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer. Bottom of base post slots shall be above the concrete footing.
5. Attach sign to FRP post.
6. Insert sign post into base post. Lower until the post comes to rest on the steel rod.
7. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
8. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

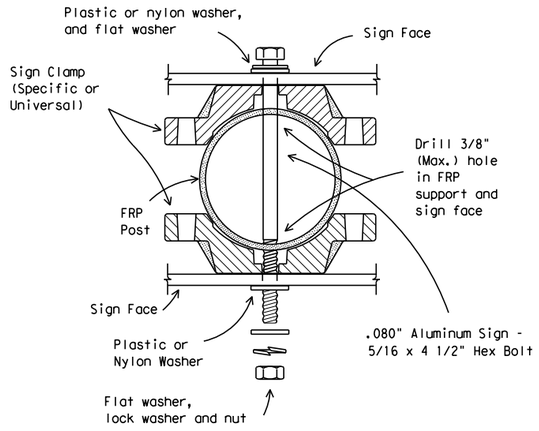
BOLT DOWN SIGN SUPPORT

1. Position base plate with coupler on existing concrete.
2. Drill holes into concrete and insert the 5/8" diameter bolts with wedge anchors, and tighten nuts.
3. Attach sign to FRP post.
4. Insert bottom of sign post into pipe stub.
5. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
6. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

Typical Sign Mounting Detail for FRP Support with Single Sign



Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs



Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS UNIVERSAL ANCHOR SYSTEM WITH FRP POST

SMD(FRP)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

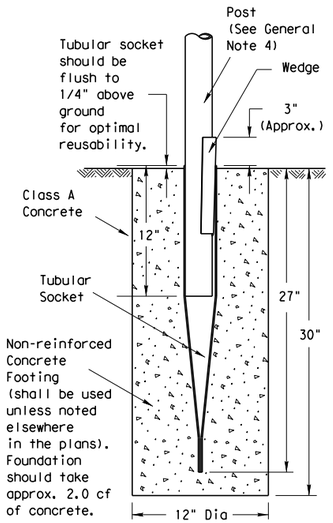
CONT	SECT	JOB	HIGHWAY
1191	03	033,ETC	FM 1245,ETC

DIST	COUNTY	SHEET NO.
WAC	LIMESTONE	141

9-08 REVISIONS

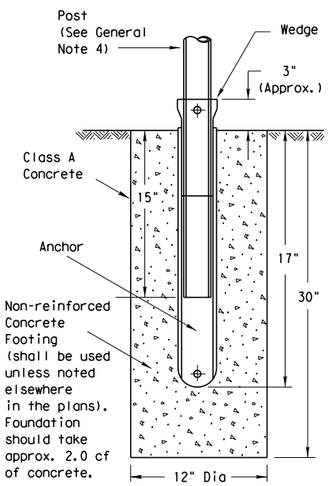
DATE: 5/7/2021 3:07:14 PM
FILE: \\pusscshrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.11 Standards\1633 & 1245\Traffic\smdtwt.dgn

Wedge Anchor Steel System



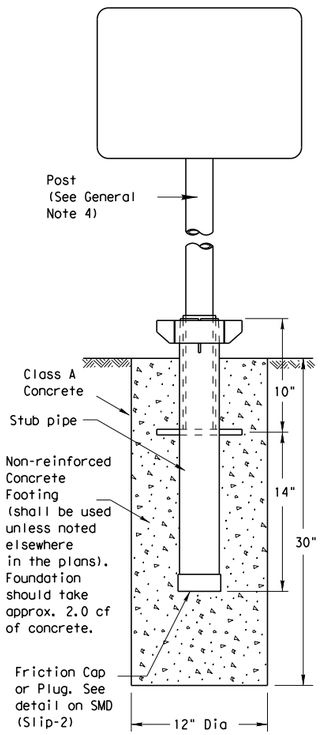
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

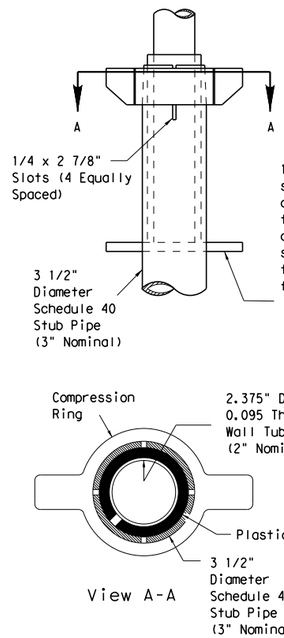


SMD RD SGN ASSM TY TWT(X)WP(X)

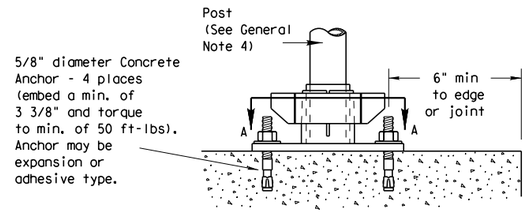
Universal Anchor System with Thin-Walled Tubing Post



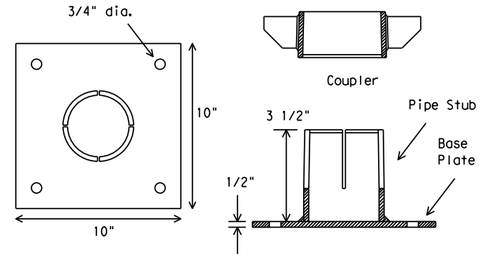
SM RD SGN ASSM TY TWT(X)UA(P)



Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

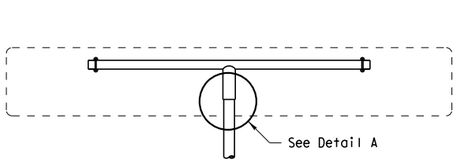


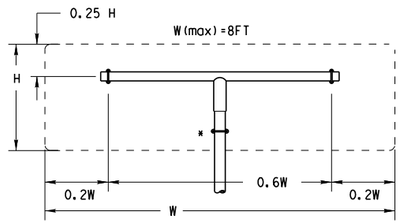
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. 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.



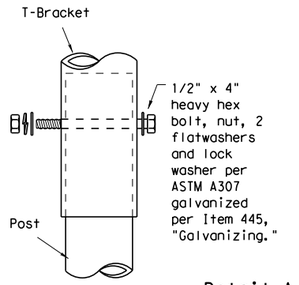
SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   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
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
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. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

9-08 REVISIONS

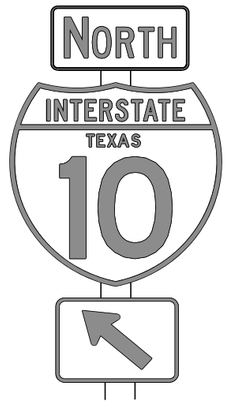
CONT	SECT	JOB	HIGHWAY
1191	03	033,ETC	FM 1245,ETC
DIST	COUNTY		SHEET NO.
WAC	LIMESTONE		142

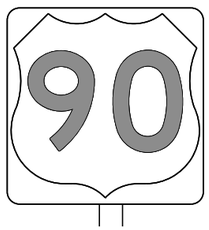
26E

DATE: 5/7/2021 3:07:17 PM
FILE: \\pussesnrfil01\J-Jobs\2138B TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04tsr3-13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING





TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

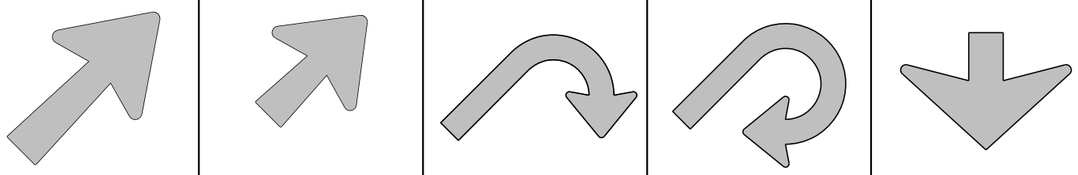
FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC	FM 1245,ETC
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	WAC	LIMESTONE		143

3

DATE: 5/7/2021 3:07:19 PM
FILE: \\pussc5hrfil01\J-Jobs\21388 TxDOT WAC 3 Bridges\06.00 Design\06.04 Sheets\06.04.01.tsr5-13.dgn

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

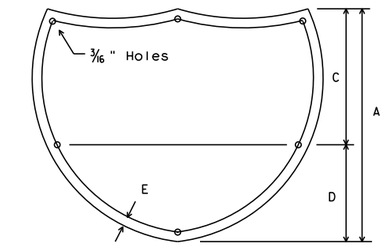
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

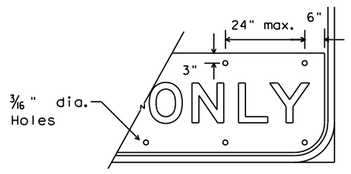
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

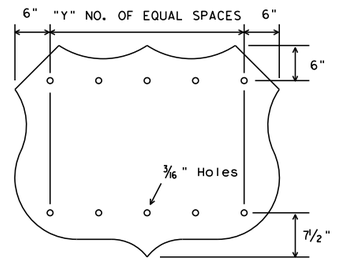


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

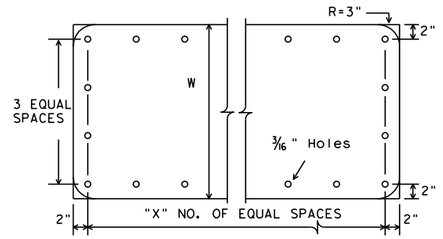


EXIT ONLY PANEL



U.S. ROUTE MARKERS

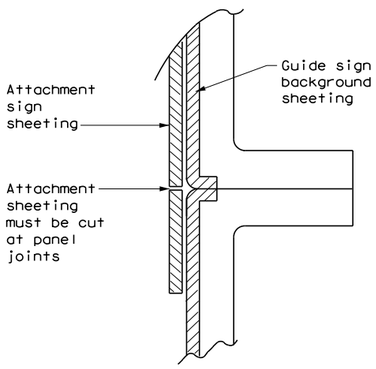
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

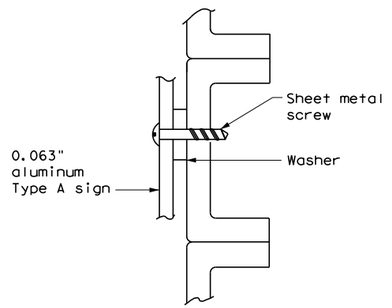
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



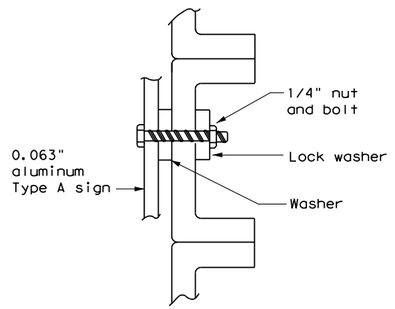
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



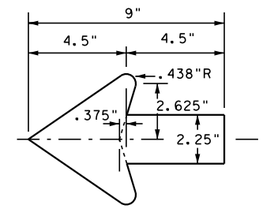
NUT/BOLT ATTACHMENT

NOTE:

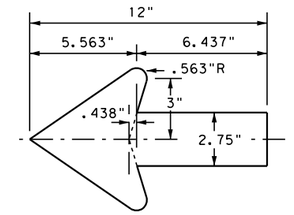
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1191	03	033,ETC	FM 1245,ETC
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	WAC	LIMESTONE		144

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

DATE:
FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☒ Required Action

Action No.

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

2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.

3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.

4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. Christmas Creek
2.
3.
4.
5.
6.
7.
8.

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

Action No.

1. SEE STATEMENT ABOVE

2.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. SEE STATEMENT ABOVE

2.

3.

4.

☐ No Action Required ☒ Required Action

Action No.

1. Comply with Migratory Bird Treaty Act (MBTA)

2. Plains Spotted Skunk: Contractors will be advised of potential occurence in the project area, and to avoid harming the species if encountered, and to avoed unnecessary impacts to dens

3. Alligator Snapping Turtle: Contractor will be advised of potential occurrence in the project area, and to avoid harming the species if encountered.

4.

5. SEE STATEMENT BELOW

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☒ Yes ☐ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☒ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1. Lead Based Paint: The removal, containment, and disposal process of hazardous materails would comply with applicable federal,state and local laws.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

Texas Department of Transportation

Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

FM 1245 EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP		CK: AR
© TxDOT: February 2015	CONT	SECT	JOB		HIGHWAY
REVISIONS	1191	03	033, etc.		FM 1245, etc.
12-12-2011 (DS)	DIST	COUNTY			SHEET NO.
05-07-14 ADDED NOTE SECTION IV.	WAC	Limestone			145
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.					

SITE DESCRIPTION

PROJECT LIMITS:

CSJ 1191-03-033: On FM 1245 @ Christmas Creek
Limestone County.

LOCATION MAPS:

Refer to title sheet for project location map.

PROJECT DESCRIPTION:

CSJ 1191-03-033:

Construction of Bridge Replacement
Consisting of Repl Br & Apprs

MAJOR SOIL DISTURBING ACTIVITIES:

The major soil disturbing activities for this project will consist of excavation, embankment, grading and construction of proposed bridge and roadway.

TOTAL PROJECT AREA:	1.53 AC
TOTAL AREA TO BE DISTURBED:	0.93 AC

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

CSJ 1191-03-033:
The predominant soil type is Kaufman Clay (Kd).
Vegetative cover is in good condition with 90-95% coverage.

NAME OF RECEIVING WATERS:

CSJ 1191-03-033:
Christmas Creek flows in a northeasterly direction from FM 1245 and ties into Navasota River and ultimately drains into Lake Mexia, Segment 1210 of the Navasota River watershed.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

- [X] TEMPORARY SEEDING
- [X] PERMANENT PLANTING, SODDING, OR SEEDING
- [ ] MULCHING
- [ ] SOIL RETENTION BLANKET
- [X] NATURAL BARRIERS OR BUFFER ZONES
- [X] PRESERVATION OF NATURAL RESOURCES

OTHER: TXR 150000, Part III, Section G, 2 Stabilization of disturbed areas must, at a minimum, be initiated immediately whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. Temporary stabilization must be completed no more than 14 calendar days after initiation of soil stabilization measures, and final stabilization must be achieved prior to termination of permit coverage.

STRUCTURAL PRACTICES:

- [T] SILT FENCES
- [ ] HAY BALES
- [T] SANDBAG OR ROCK BERMS
- [ ] DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- [ ] DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- [ ] DIVERSION DIKE AND SWALE COMBINATIONS
- [ ] PIPE SLOPE DRAINS
- [ ] PAVED FLUMES
- [T] ROCK BEDDING AT CONSTRUCTION EXIT
- [T] TIMBER MATTING AT CONSTRUCTION EXIT
- [ ] CHANNEL LINERS
- [ ] SEDIMENT TRAPS
- [ ] SEDIMENT BASINS
- [ ] STORM INLET SEDIMENT TRAP
- [ ] STONE OUTLET STRUCTURES
- [ ] CURBS AND GUTTERS
- [ ] STORM SEWERS
- [ ] VELOCITY CONTROL DEVICES

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

The order of activities will be as follows:

1. Preserve existing vegetative cover as much as possible.
2. Install temporary sediment control fencing, rock berms and other items as shown on plans prior to any soil disturbing activities.
3. Remove existing bridge, construct proposed bridge and roadway and perform any necessary excavation, embankment and grading.
4. Place temporary/permanent seeding as shown in the plans and as directed.

STORM WATER MANAGEMENT:

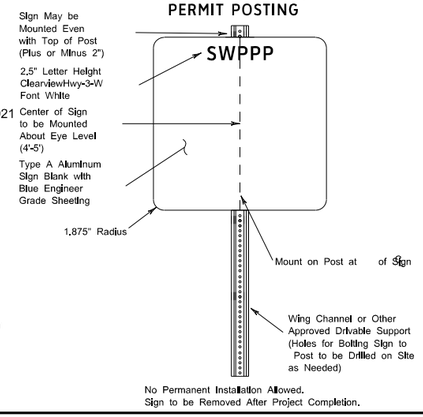
An integral part of the SWPPP for this project includes the EPIC Sheet, Item 506, Waco District Waters of the US Notes, Waco District Typical Applications for Best Management Practices, Form 2118 TxDOT inspection forms, Contractor daily inspection forms, miscellaneous general notes on environmental requirements, TxDOT EC Standards, 2014 Standard Specifications, TxDOT roadway design drawings, SWPPP design and working BMP drawings, Site Manager Data Base, EMS Stage Gate Inspections and the Waco District environmental folders. The requirements of the TxDOT EMS will be fully implemented including training requirements for Contractors and TxDOT staff.

STATE OF TEXAS
CHRISTIAN L. MOORMAN
93828
LICENSED PROFESSIONAL ENGINEER

5/11/2021

Texas Department of Transportation
Waco District Office
Advanced Project Development
100 South Loop Drive
Waco Texas, 76704-2858

STORM WATER POLLUTION PREVENTION PLAN PERMIT POSTING



OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE: All erosion and sediment best management practices (BMPs) will be maintained in good working order per the environmental notes, details and standards included as part of the project plans and contract documents. BMP repairs will be made at the earliest possible date, but no later than seven calendar days after the inspection report has been completed and immediately after the ground has dried sufficiently to allow equipment access. BMPs damaged by the Contractor will be repaired or replaced immediately. The installation and repair of BMPs at creeks and outfalls will be given priority.

INSPECTION: TxDOT Form 2118 inspections to support TXR150000 and 404 permits will be conducted on a seven day interval on the same day of the week, until permits are terminated. The Contractor will provide daily BMP inspection reports on work days. Stage Gate Inspections and other BMP inspections will be conducted by the District and Area Office Staff based on requirements of the TxDOT Environmental Management System (EMS).

WASTE MATERIALS: Any waste materials generated during construction will be disposed of in accordance with existing federal, state, and local laws.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

At a minimum, any products in the following categories are considered to be hazardous: Fuels, Lubricating products, Asphalt products, or Concrete curing compounds and any additives. In the event of a spill which may be hazardous, clean-up will be done in accordance with federal, state, and local regulations. The Contractor will maintain a list of all chemicals and wastes required for the project; including chemicals used by sub-contractors, and will implement written spill prevention and clean-up plans.

SANITARY WASTE:
Sanitary waste from portable units will be collected by a licensed sanitary waste management contractor.

OFF SITE VEHICLE TRACKING:

- [ ] HAUL ROADS DAMPENED FOR DUST CONTROL
- [X] LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- [X] EXCESS DIRT ON ROAD REMOVED DAILY
- [ ] STABILIZED CONSTRUCTION ENTRANCE

REMARKS:
Disposal areas, stockpiles, and haul roads will be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas will not be located in any wetland, waterbody or streambed. Construction staging area and vehicle maintenance area will be constructed by the contractor in a manner to minimize the runoff pollutants.

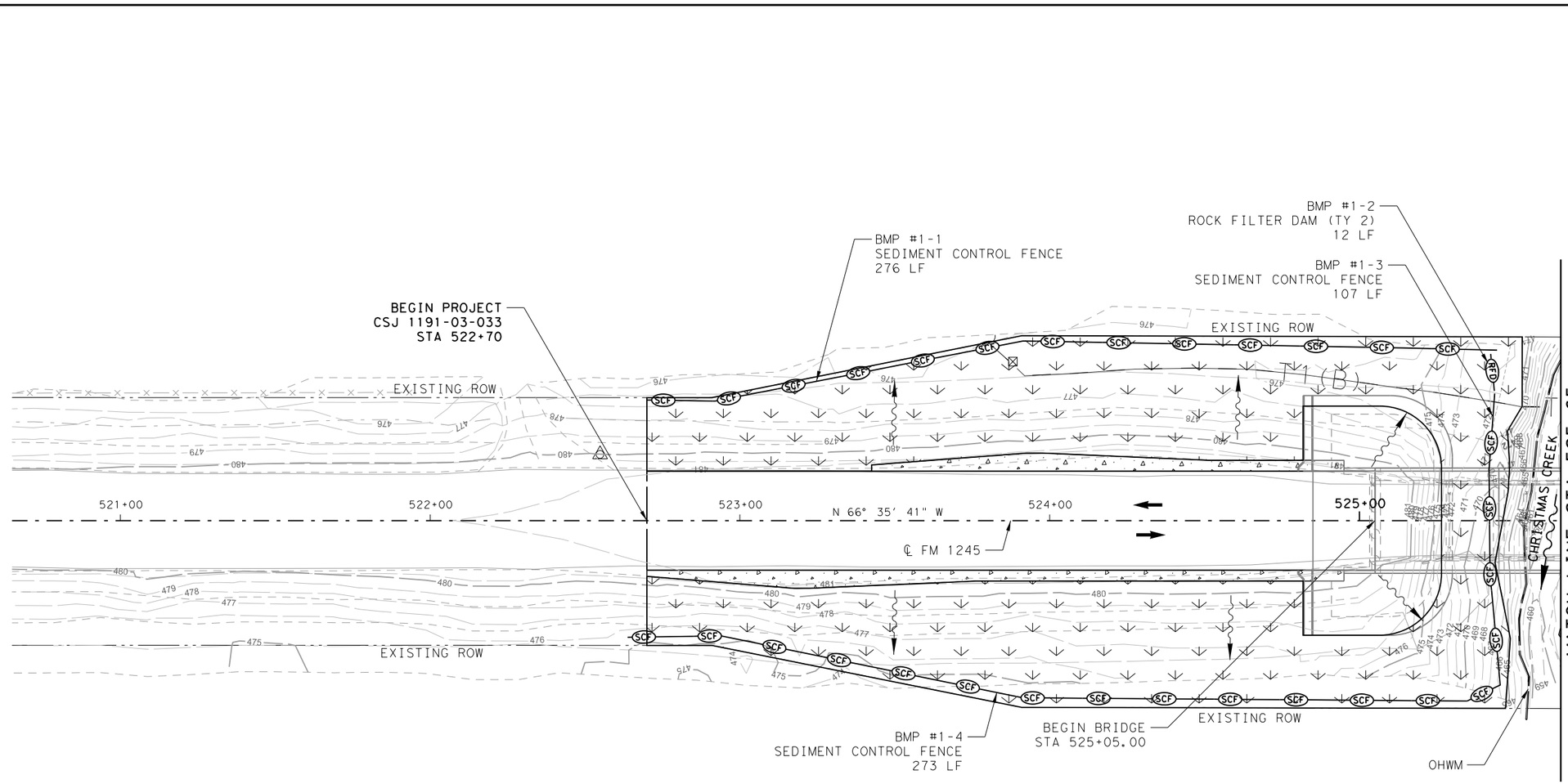
Furnish one SW3P permit posting sign and sign support as detailed on the SW3P Sheet. Install this sign in a location selected by the Engineer. The sign and support should be removed upon completion of the project and is the property of the Contractor. The purchase of the sign and support, installation, relocation(s) if determined necessary by the Engineer and removal at project end will be subsidiary to Item 506.

Sedimentation Basins - Since the area disturbed is less than 10 acres, a sedimentation basin is not required.

WACO DISTRICT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FM 1245

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			146
STATE	DIST.	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT.	SECT.	JOB	HIGHWAY NO.
1191	03	033,ETC.	FM1245,ETC.



0 20 40
HORIZONTAL SCALE IN FEET

N

LEGEND

- RFD — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- SOIL RETENTION BLANKET
- BROADCAST SEEDING (PERM)
- TRAFFIC FLOW ARROW
- WATER FLOW ARROW

NOTE:

1. SW3P ITEMS SHOULD BE ADJUSTED TO ACCOMMODATE ACTUAL FIELD CONDITIONS OR AS DIRECTED BY THE ENGINEER.

BMP #	DATE INSTALLED	DATE REMOVED
1-1		
1-2		
1-3		
1-4		

BMP	QUANTITY	DATE INSTALLED
SEEDING	2136 SY	

STATE OF TEXAS
CHRISTIAN L. MOORMAN
93828
LICENSED
PROFESSIONAL ENGINEER
5/7/2021

NO.	REVISION	DATE

Texas Department of Transportation

HUITT-ZOLLARS
HUITT-ZOLLARS, INC. ENGINEERING / SURVEYING
1717 McKINNEY AVENUE, SUITE 1400 DALLAS, TEXAS 75202-1236
Firm No. F-761

FM 1245

SW3P LAYOUT

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	147
STATE	DISTRICT	COUNTY
TEXAS	WACO	LIMESTONE
CONT	SECT	JOB / HIGHWAY NO
1191	03	033, ETC. / FM 1245, ETC

PLOT SCALE: 1:40
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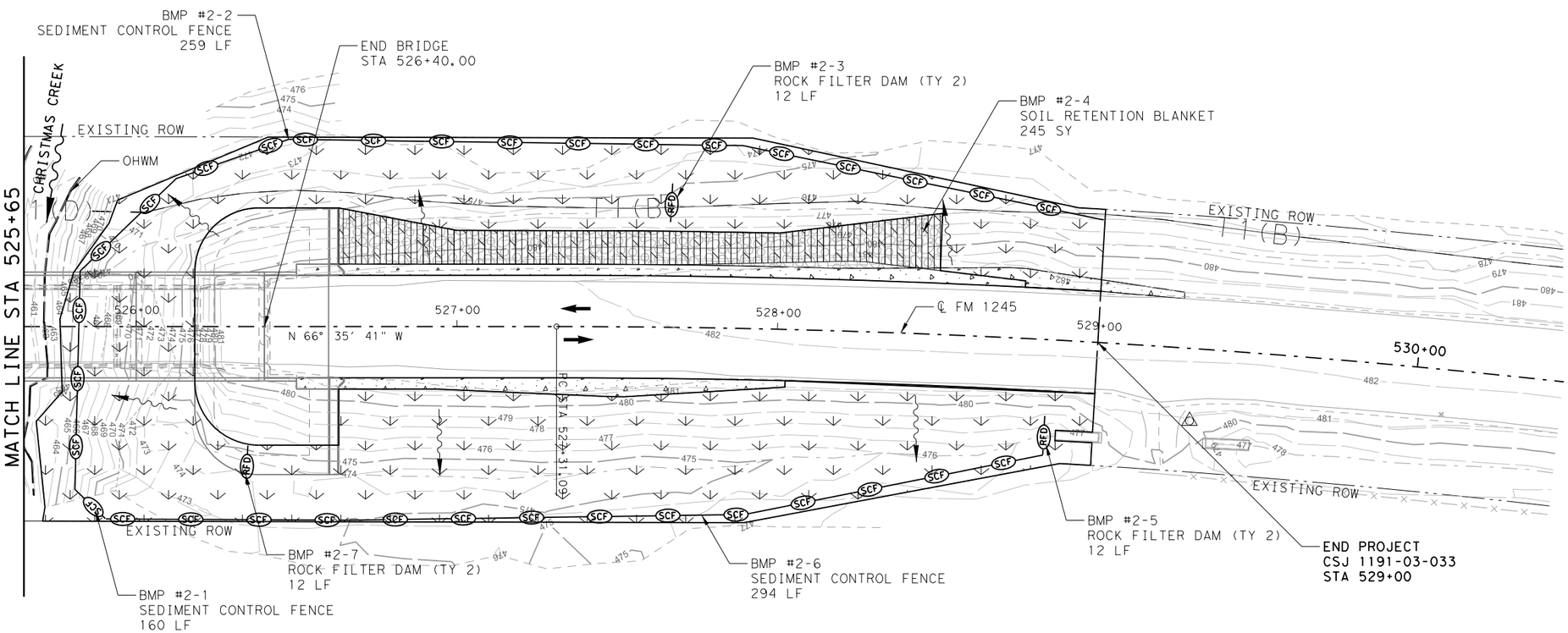

0 20 40
HORIZONTAL SCALE IN FEET

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- SCF — SEDIMENT CONTROL FENCE
- SOIL RETENTION BLANKET
- BROADCAST SEEDING (PERM)
- TRAFFIC FLOW ARROW
- WATER FLOW ARROW

NOTE:

1. SW3P ITEMS SHOULD BE ADJUSTED TO ACCOMMODATE ACTUAL FIELD CONDITIONS OR AS DIRECTED BY THE ENGINEER.

BMP #	DATE INSTALLED	DATE REMOVED
2-1		
2-2		
2-3		
2-4		
2-5		
2-6		
2-7		

BMP	QUANTITY	DATE INSTALLED
SEEDING	2352 SY	

STATE OF TEXAS
CHRISTIAN L. MOORMAN
93828
LICENSED PROFESSIONAL ENGINEER
5/7/2021

NO.	REVISION	DATE

Texas Department of Transportation

HUITT-ZOLLARS
HUITT-ZOLLARS, INC. ENGINEERING / SURVEYING
1717 McKINNEY AVENUE, SUITE 1400 DALLAS, TEXAS 75202-1236
Firm No. F-761

FM 1245

SW3P LAYOUT

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		148
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC

PLOT SCALE: 1:40
5/7/2021 9:55:04 AM cmoorman MODEL:$$MODEL$$
I:\proj\R310671.02 - TxDOT - 3299 Bridge WA 3 - Sub to IEA\05 Design (PS & E)\Plan Set\9. Environmental\S31067102-SWP_1245_02.dgn

I:\proj\R310671.02 - TxDOT - 3299 Bridge WA 3 - Sub to IEA\05 Design (PS & E)\Plan Set\9. Environmental\S31067102-SWP_1245_02.dgn

DATE:
FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. Navasota River
2.
3.
4.
5.
6.
7.
8.

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
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☐ No Action Required ☒ Required Action

Action No.

1. SEE STATEMENT ABOVE
2.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. SEE STATEMENT ABOVE
2.
3.
4.

☐ No Action Required ☒ Required Action

Action No.

1. Comply with Migratory Bird Treaty Act (MBTA)
2. Plains Spotted Skunk: Contractors will be advised of potential occurence in the project area, and to avoid harming the species if encountered, and to avoed unnecessary impacts to dens
3. Alligator Snapping Turtle: Contractor will be advised of potential occurrence in the project area, and to avoid harming the species if encountered.
4.
5. SEE STATEMENT BELOW

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

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NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

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Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☒ Yes ☐ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☒ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1. Lead Based Paint: The removal, containment, and disposal process of hazardous materails would comply with applicable federal,state and local laws.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.
2.
3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

FM 1633 EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP		CK: AR
©TxDOT: February 2015	CONT	SECT	JOB		HIGHWAY
REVISIONS	1191	03	033, ETC.		FM 1245, ETC.
12-12-2011 (DS)	DIST	COUNTY			SHEET NO.
05-07-14 ADDED NOTE SECTION IV.	WAC	Limestone			149
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.					

SITE DESCRIPTION

PROJECT LIMITS:

CSJ 1664-01-021: On FM 1633 @ Navasota River in Limestone County.

LOCATION MAPS:

Refer to title sheet for project location map.

PROJECT DESCRIPTION:

CSJ 1664-01-021:

Construction of Bridge Replacement
Consisting of Replacing Bridge and Approaches.

MAJOR SOIL DISTURBING ACTIVITIES:

The major soil disturbing activities for this project will consist of excavation, embankment, grading and construction of proposed bridge and roadway.

TOTAL PROJECT AREA:	2.19 AC
TOTAL AREA TO BE DISTURBED:	1.15 AC

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

CSJ 1664-01-021:
The predominate soil type is Whitesboro loam (Wf), frequently flooded.
Vegetative cover is in good condition with 90-95% coverage.

NAME OF RECEIVING WATERS:

CSJ 1664-01-021:
Navasota River drains into Fort Parker Lake, which ultimately drains into Lake Limestone, Segment 1252 of the Navasota River watershed.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

- [X] TEMPORARY SEEDING
- [X] PERMANENT PLANTING, SODDING, OR SEEDING
- [ ] MULCHING
- [X] SOIL RETENTION BLANKET
- [X] NATURAL BARRIERS OR BUFFER ZONES
- [X] PRESERVATION OF NATURAL RESOURCES

OTHER: TXR 150000, Part III, Section G, 2 Stabilization of disturbed areas must, at a minimum, be initiated immediately whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. Temporary stabilization must be completed no more than 14 calendar days after initiation of soil stabilization measures, and final stabilization must be achieved prior to termination of permit coverage.

STRUCTURAL PRACTICES:

- [T] SILT FENCES
- [ ] HAY BALES
- [T] SANDBAG OR ROCK BERMS
- [ ] DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- [ ] DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- [ ] DIVERSION DIKE AND SWALE COMBINATIONS
- [ ] PIPE SLOPE DRAINS
- [ ] PAVED FLUMES
- [T] ROCK BEDDING AT CONSTRUCTION EXIT
- [T] TIMBER MATTING AT CONSTRUCTION EXIT
- [ ] CHANNEL LINERS
- [ ] SEDIMENT TRAPS
- [ ] SEDIMENT BASINS
- [ ] STORM INLET SEDIMENT TRAP
- [ ] STONE OUTLET STRUCTURES
- [ ] CURBS AND GUTTERS
- [ ] STORM SEWERS
- [ ] VELOCITY CONTROL DEVICES

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

The order of activities will be as follows:

1. Preserve existing vegetative cover as much as possible.
2. Install temporary sediment control fencing, rock berms and other items as shown on plans prior to any soil disturbing activities.
3. Remove existing bridge, construct proposed bridge and roadway and perform any necessary excavation, embankment and grading.
4. Place soil retention blankets and temporary/permanent seeding as shown in the plans and as directed.

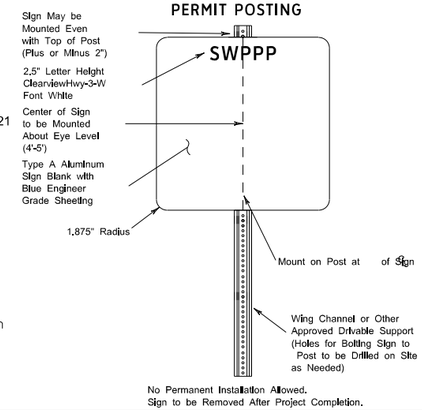
STORM WATER MANAGEMENT:

An integral part of the SWPPP for this project includes the EPIC Sheet, Item 506, Waco District Waters of the US Notes, Waco District Typical Applications for Best Management Practices, Form 2118 TxDOT inspection forms, Contractor daily inspection forms, miscellaneous general notes on environmental requirements, TxDOT EC Standards, 2014 Standard Specifications, TxDOT roadway design drawings, SWPPP design and working BMP drawings, Site Manager Data Base, EMS Stage Gate Inspections and the Waco District environmental folders. The requirements of the TxDOT EMS will be fully implemented including training requirements for Contractors and TxDOT staff.

STATE OF TEXAS
CHRISTIAN L. MOORMAN
93828
LICENSED PROFESSIONAL ENGINEER
5/11/2021

Texas Department of Transportation
Waco District Office
Advanced Project Development
100 South Loop Drive
Waco Texas, 76704-2858

STORM WATER POLLUTION PREVENTION PLAN PERMIT POSTING



OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE: All erosion and sediment best management practices (BMPs) will be maintained in good working order per the environmental notes, details and standards included as part of the project plans and contract documents. BMP repairs will be made at the earliest possible date, but no later than seven calendar days after the inspection report has been completed and immediately after the ground has dried sufficiently to allow equipment access. BMPs damaged by the Contractor will be repaired or replaced immediately. The installation and repair of BMPs at creeks and outfalls will be given priority.

INSPECTION: TxDOT Form 2118 inspections to support TXR150000 and 404 permits will be conducted on a seven day interval on the same day of the week, until permits are terminated. The Contractor will provide daily BMP inspection reports on work days. Stage Gate Inspections and other BMP inspections will be conducted by the District and Area Office Staff based on requirements of the TxDOT Environmental Management System (EMS).

WASTE MATERIALS:
Any waste materials generated during construction will be disposed of in accordance with existing federal, state, and local laws.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

At a minimum, any products in the following categories are considered to be hazardous: Fuels, Lubricating products, Asphalt products, or Concrete curing compounds and any additives. In the event of a spill which may be hazardous, clean-up will be done in accordance with federal, state, and local regulations. The Contractor will maintain a list of all chemicals and wastes required for the project; including chemicals used by sub-contractors, and will implement written spill prevention and clean-up plans.

SANITARY WASTE:
Sanitary waste from portable units will be collected by a licensed sanitary waste management contractor.

OFF SITE VEHICLE TRACKING:

- [ ] HAUL ROADS DAMPENED FOR DUST CONTROL
- [X] LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- [X] EXCESS DIRT ON ROAD REMOVED DAILY
- [ ] STABILIZED CONSTRUCTION ENTRANCE

REMARKS:
Disposal areas, stockpiles, and haul roads will be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas will not be located in any wetland, waterbody or streambed. Construction staging area and vehicle maintenance area will be constructed by the contractor in a manner to minimize the runoff pollutants.

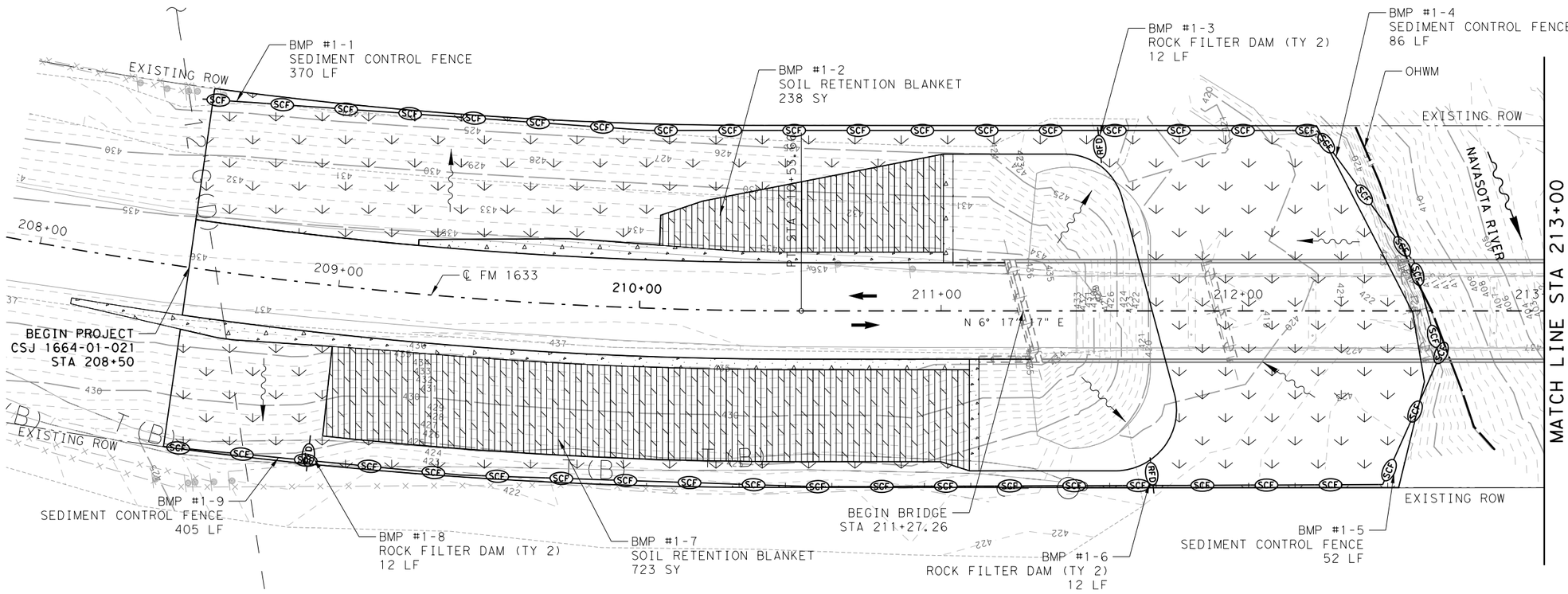
Furnish one SW3P permit posting sign and sign support as detailed on the SW3P Sheet. Install this sign in a location selected by the Engineer. The sign and support should be removed upon completion of the project and is the property of the Contractor. The purchase of the sign and support, installation, relocation(s) if determined necessary by the Engineer and removal at project end will be subsidiary to Item 506.

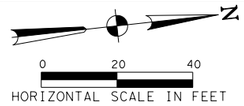
Sedimentation Basins - Since the area disturbed is less than 10 acres, a sedimentation basin is not required.

WACO DISTRICT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FM 1633

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			150
STATE	DIST.	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT.	SECT.	JOB	HIGHWAY NO.
1191	03	033,ETC.	FM1245,ETC.





LEGEND

- RFD — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- SOIL RETENTION BLANKET
- BROADCAST SEEDING (PERM)
- TRAFFIC FLOW ARROW
- WATER FLOW ARROW

NOTE:

1. SW3P ITEMS SHOULD BE ADJUSTED TO ACCOMMODATE ACTUAL FIELD CONDITIONS OR AS DIRECTED BY THE ENGINEER.

BMP #	DATE INSTALLED	DATE REMOVED
1-1		
1-2		
1-3		
1-4		
1-5		
1-6		
1-7		
1-8		
1-9		

BMP	QUANTITY	DATE INSTALLED
SEEDING	2516 SY	

NO.	REVISION	DATE

Texas Department of Transportation

HUITT-ZOLLARS

HUITT-ZOLLARS, INC. ENGINEERING / SURVEYING
1717 McKINNEY AVENUE, SUITE 1400 DALLAS, TEXAS 75202-1236
Firm No. F-761

FM 1633

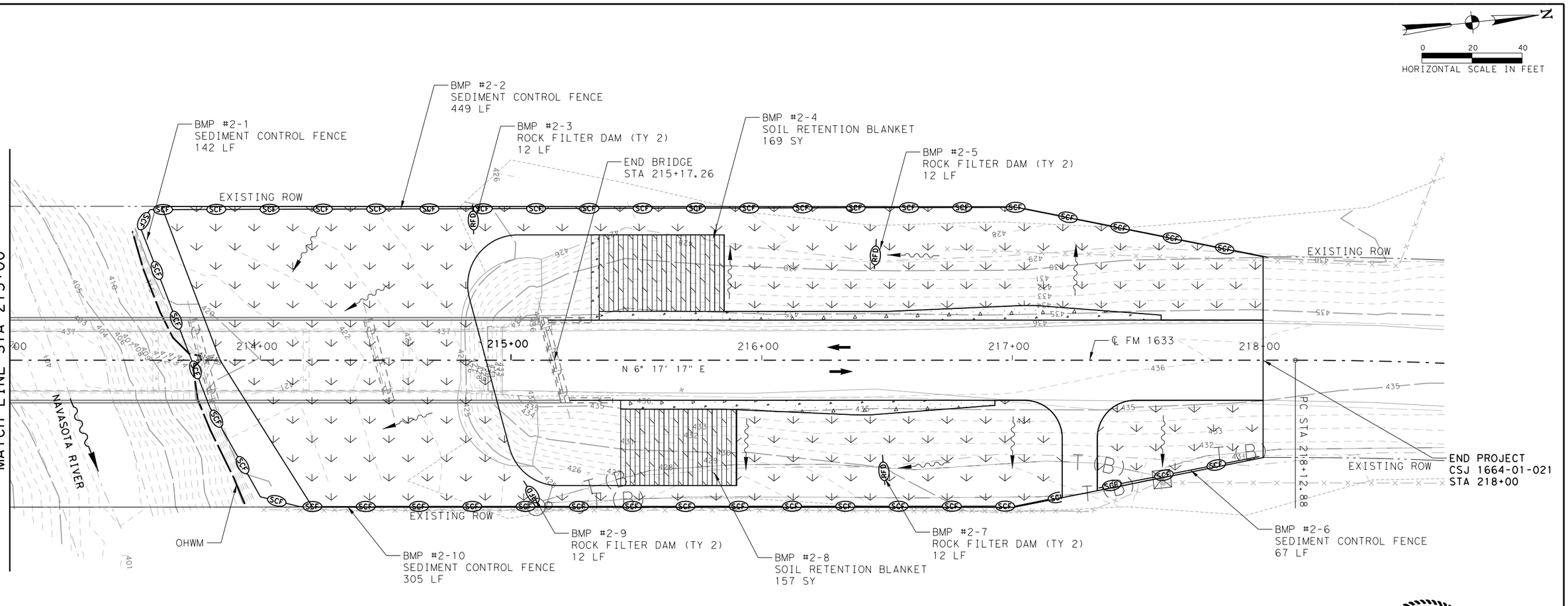
SW3P LAYOUT

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
06	SEE TITLE SHEET		151
STATE	DISTRICT	COUNTY	
TEXAS	WACO	LIMESTONE	
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC

PLOT SCALE: 1:40
5/7/2021 9:55:08 AM cmoorman MODEL:$$MODEL$$
I:\proj\R310671.02 - TxDOT - 3299 Bridge WA 3 - Sub to IEA\05 Design (PS & E)\Plan Set\9. Environmental\S31067102-SWP_1633_01.dgn

I:\proj\R310671.02 - TxDOT - 3299 Bridge WA 3 - Sub to IEA\05 Design (PS & E)\Plan Set\9. Environmental\S31067102-SWP_1633_01.dgn



BMP #	DATE INSTALLED	DATE REMOVED
2-1		
2-2		
2-3		
2-4		
2-5		
2-6		
2-7		
2-8		
2-9		
2-10		

BMP	QUANTITY	DATE INSTALLED
SEEDING	3061 SY	

LEGEND

- (RFD) ROCK FILTER DAM (TY 2)
- (SCF) SEDIMENT CONTROL FENCE
- SOIL RETENTION BLANKET
- BROADCAST SEEDING (PERM)
- TRAFFIC FLOW ARROW
- WATER FLOW ARROW

NOTE:

1. SW3P ITEMS SHOULD BE ADJUSTED TO ACCOMMODATE ACTUAL FIELD CONDITIONS OR AS DIRECTED BY THE ENGINEER.

STATE OF TEXAS
CHRISTIAN L. MOORMAN
93828
LICENSED
PROFESSIONAL ENGINEER
5/7/2021

NO.	REVISION	DATE

Texas Department of Transportation

HUITT-ZOLLARS

HUITT-ZOLLARS, INC. ENGINEERING / SURVEYING
1717 McKINNEY AVENUE, SUITE 1400 DALLAS, TEXAS 75202-1236
Firm No. F-761

FM 1633

SW3P LAYOUT

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
06	SEE TITLE SHEET	152
STATE	DISTRICT	COUNTY
TEXAS	WACO	LIMESTONE
CONT	SECT	JOB	HIGHWAY NO
1191	03	033, ETC.	FM 1245, ETC

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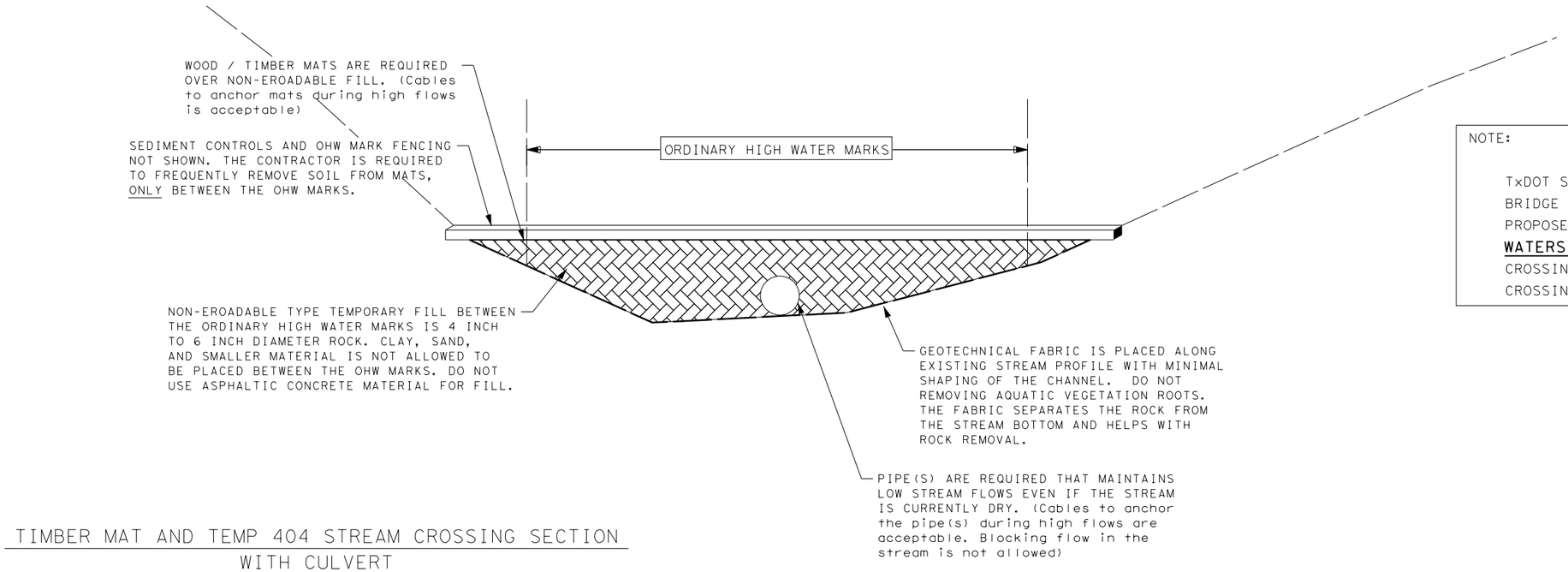
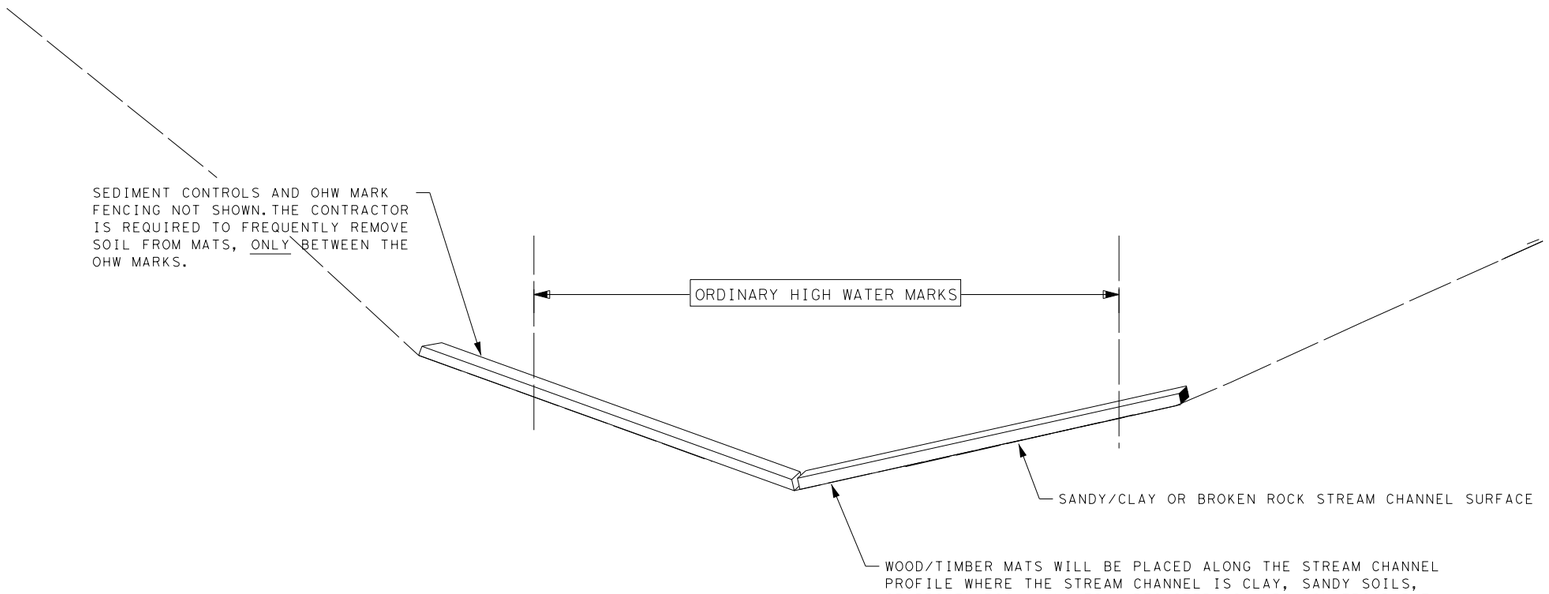


TIMBER MAT AND TEMP 404 STREAM CROSSING SECTION
WITH CULVERT

NO SOIL SHOULD BE PUSHED OR MOVED FROM ABOVE THE OHW MARKS TO BELOW THE OHW MARKS.

NOTE:

TxDOT SHOULD EVALUATE ACCROSS FROM BOTH SIDES OF THE BRIDGE / CULVERT AND ALSO EVALUATE THE CONTRACTOR'S PROPOSED DEMOLITION AND CONSTRUCTION TECHNIQUES PER WATERS OF THE US NOTE #3 AND ALLOW A TEMPORARY CROSSING ONLY WHEN NECESSARY. TEMPORARY STREAM CROSSINGS SHOULD BE REMOVED AS SOON AS POSSIBLE.



TIMBER MAT AND TEMP 404 STREAM CROSSING SECTION
WITHOUT CULVERT

NO SOIL SHOULD BE PUSHED OR MOVED FROM ABOVE THE OHW MARKS TO BELOW THE OHW MARKS.

NOTE:

TYPICAL USE IS FOR STREAM BANKS THAT ARE VERY FLAT AND STREAM CONDITIONS THAT ARE DRY OR VERY LOW FLOW. A SINGLE RAIN EVENT MAY CAUSE THE CONTRACTOR TO CHANGE TO THE CULVERT TEMPORARY CROSSING. REMOVE STREAM CROSSINGS AS SOON AS POSSIBLE.

TIMBER MATS WILL BE ADEQUATELY SIZED FOR THE INTENDED EQUIPMENT AND WILL NOT BREAK UPON LOADING.

Texas Department of Transportation

TEMPORARY STREAM CROSSING DETAIL

WACO DISTRICT STANDARD

NOT TO SCALE

FED. ROAD DIV. No.	FEDERAL AID PROJECT		SHEET NO.
6	SEE TITLE SHEET		153
STATE	DISTRICT		COUNTY
TEXAS	WACO		LIMESTONE
CONTROL	SECTION	JOB	HIGHWAY NO.
1191	03	033,ETC.	FM1245,ETC.

REVISED 03/09/2015

4' minimum steel or wood posts spaced at 6' to 8'.
Softwood posts shall be 3" minimum in diameter or nominal 2" x 4".
Hardwood posts shall have a minimum cross section of 1.5" x 1.5"

Connect the ends of the successive reinforcement sheets or rolls a minimum of 6 times with hog rings.

Fasten fabric to the top strand of the wire using hog rings or cord at a maximum spacing of 15".

Attach the wire mesh and fabric on end posts using 4 evenly spaced staples for wooden posts (or 4 T-Clips or sewn vertical pockets for steel posts).

Galvanized welded wire mesh (W.W.M.) (12.5 GA. SWG Min.) with a maximum opening size of 2"x 4"or Woven Mesh (W.M.)(See woven mesh option detail)

Woven filter fabric

FLOW

2"

90°

Place 4" to 6" of fabric against the trench side and approximently 2" across the trench bottom in the upstream direction.

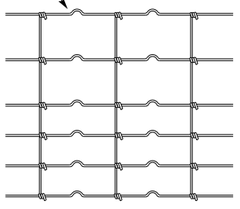
Minimum trench size shall be 6" square. Backfill and hand tamp.

A

TEMPORARY SEDIMENT CONTROL FENCE

SCF

Top of Fence



Filter fabric 3' min. width.

Backfill & hand tamp.

FLOW

2"

90°

Embed posts 18" min. or Anchor if in rock.

6"

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.

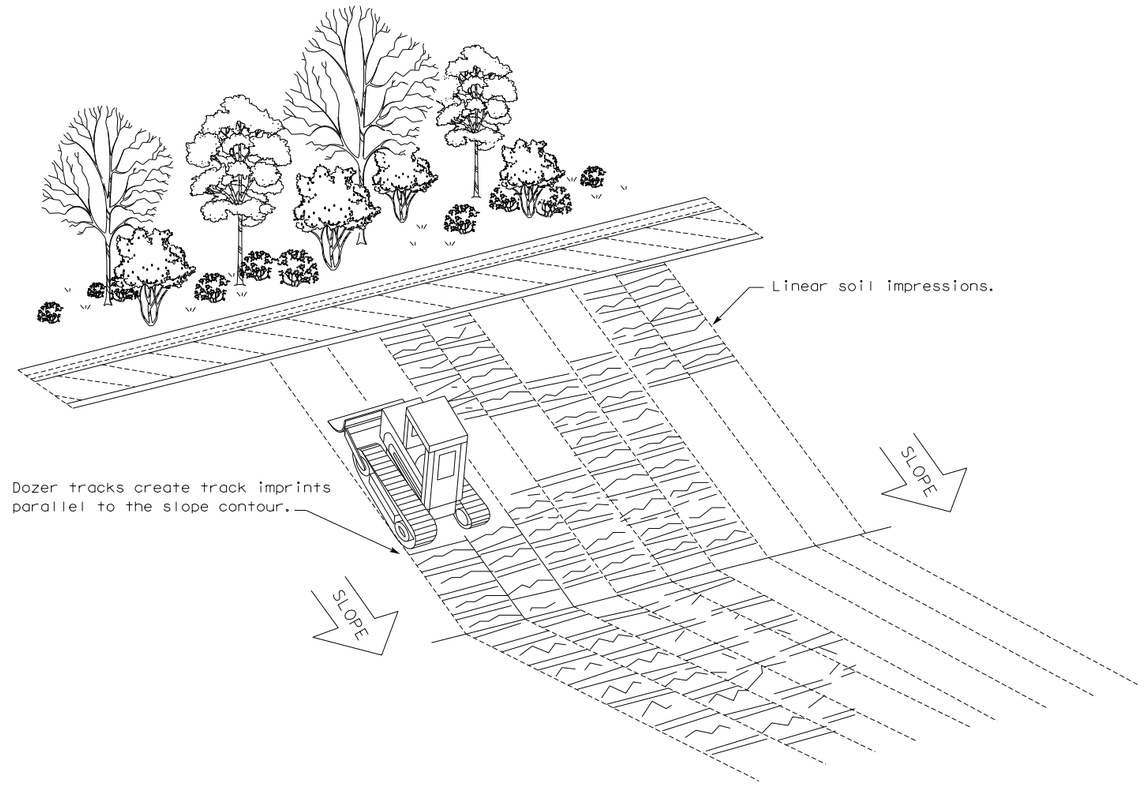
LEGEND

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

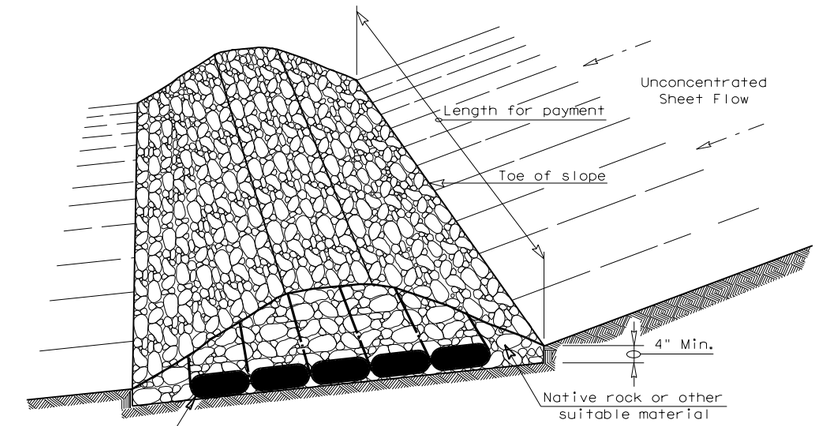
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

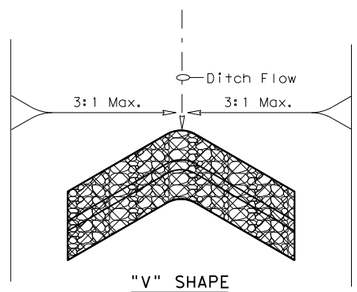
FILE: ec116	DN: TxDOT		CK: KM		DW: VP		DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	1191	03	033,ETC.		FM 1245,ETC		
	DIST	COUNTY			SHEET NO.		
	WACO	LIMESTONE			154		

DATE: 5/7/2021
FILE: i:\proj\R310671.02 - TxDOT - 3299 Bridge WA 3 - Sub to IEA\05 Design (PS & E)\Plan Set\20. Project Specific Standards\9. Environmental\ec216.dgn

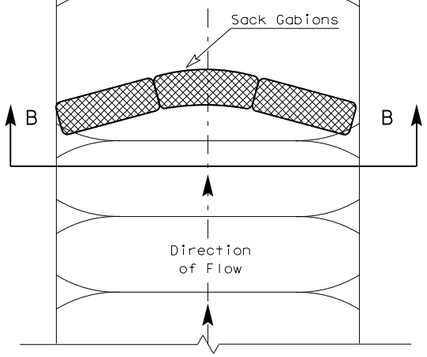


FILTER DAM AT TOE OF SLOPE

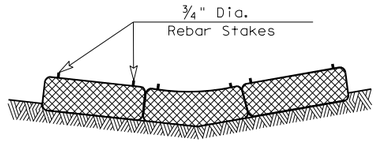
RFD1



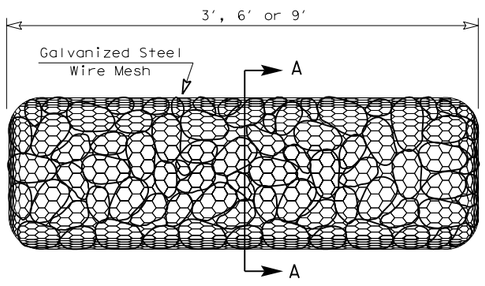
"V" SHAPE
PLAN VIEW



PLAN VIEW

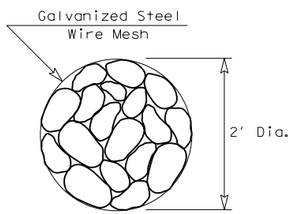


SECTION B-B

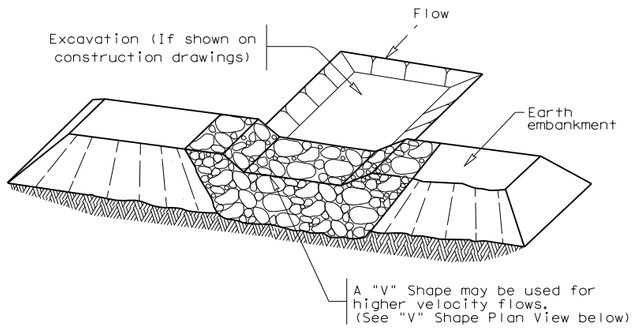


TYPE 4 (SACK GABIONS)

RFD4

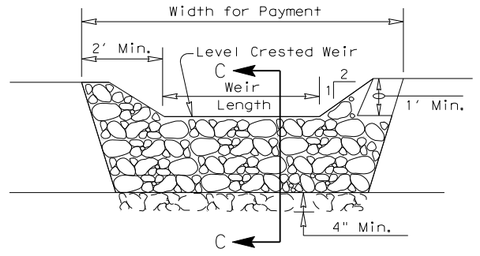


SECTION A-A

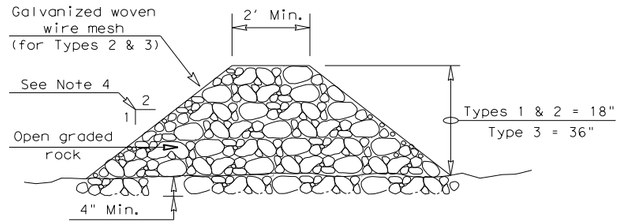


FILTER DAM AT SEDIMENT TRAP

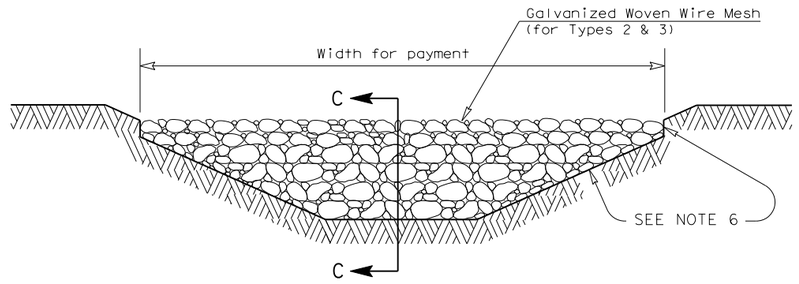
RFD1 OR RFD2



PROFILE



SECTION C-C



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.

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.

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	1191	03	033,ETC.	FM 1245,ETC		
	DIST	COUNTY		SHEET NO.		
	WACO	LIMESTONE		155		

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

1. Prior to TxDOT allowing the Contractor to start construction, the Contractor will provide the required storm water and 404 permit documentation and support activities, including but not limited to the following:

   - Provide a list of all chemicals, construction and waste products that will be generated, stored or brought upon TxDOT ROW. The list includes expected construction debris, sanitary wastes, construction chemicals and petroleum products used or generated by the Contractor and sub-contractors. Along with the list, the Contractor will supply a spill prevention plan and clean up procedures that will include each of these chemical products or generated waste.

   - Provide in the construction schedule the necessary line items that will comply with the schedule and planning requirements of the storm water permit.

   - Post the TxDOT storm water permit and any Contractor permits, per permit requirements.

   - Provide copies of storm water permits for Contractor PSL(s). As new PSL(s) may be obtained for the project, provide copies of new or amended permits to TxDOT. The Contractor will not disturb soil without the proper permits.

   - Provide scale drawings of off ROW PSL's within one mile of the project, for field offices, borrow sources, plant sites or other uses.

   - Provide permit information on any Contractor batch plants or concrete crushing plants to be located at a Contractor PSL(s) within one mile of the project limits or boundaries. Copies of the air and water permits are to be provided to TxDOT before materials will be used on the project. No asphalt or concrete batch plants or concrete crushing plants will be located on TxDOT ROW.

   - Provide a letter indicating a Contractor Responsible Person for environmental compliance (CRP) for the project, and maintain a CRP throughout the project duration.

   - Provide all environmental documentation including certification of compliance and EMS training documents/certificates prior to starting work. The Contractor is to provide daily BMP inspection reports that document all field BMPs needing repair or replacement. The Contractor is to clearly document specific BMPs needing repair and location each work day. The Contractor is encouraged to be proactive in fixing BMPs without TxDOT direction.

   - Provide documentation required for Waters of the US, Note #3 and submittals for Item 496 bridge removal. Bridge removal methods submitted will follow all Waters of the US note requirements. The Contractor is not to start construction within the Ordinary High Water Marks of any stream until receiving approval for stream channel construction methods from TxDOT.

   - Provide a written procedure for managing all chemicals and construction items placed in vertical containment structures. Also, provide methods to be used for the treatment, disposal, collection or release of storm water.

   - Provide an estimated date by letter, for the submittal of marked up bridge drawings, indicating cut locations for any structural steel requiring cutting or torching of steel, coated with lead containing paints.

2. Place and maintain trash cans and portable sanitary facilities at locations where there is active construction. Worker generated trash and construction debris will be kept from being transported by storm water and will be collected daily from the ground and routinely hauled from the work area.

3. Contractor will provide TxDOT copies of all correspondence with MS4s, TCEQ, EPA, DSHS and Corps of Engineers regarding activities on this project.

4. Contractor to conduct storm water inspections and develop SWPPP documents to support Contractor permits obtained for the project including PSL(s).

5. Contractor will maintain written documentation of locations of all portable sanitary facilities. The Contractor is required to document the location and disposition of all spills and cleanups from portable sanitary facilities.

6. Contractor will not store chemicals on TxDOT ROW, unless chemicals are stored following all environmental and safety regulations. Fuels for construction equipment will not be stored on TxDOT ROW.

7. The Contractor will store fuels and bulk chemicals on Contractor PSL(s) using a secondary containment method, such as double lined tanks and/or free standing containment reservoirs made of plastic or steel designed to hold bulk chemicals or drums.

8. The Contractor will not remove sediment controls without the prior approval of TxDOT, except for a sediment control that may back up water and cause safety or traffic problems.

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

9. Any sediment controls removed by the Contractor must be re-installed before the next rainfall event or by the end of day, as approved in advance.

10. Vegetative buffer strips may be used in place of temporary sediment controls such as silt fences and rock filter dams. The amount of disturbed soil area will be limited to 1/3 of an acre or less for a minimum of 50 feet of grassed ditch and 2/3 of an acre of disturbed soil for a minimum of 100 feet of grassed ditch.

11. Construction equipment found to be leaking oil, fuel or coolant will be immediately stopped, the leaking fluid collected and the equipment fixed. Equipment continuing to leak will be removed from the project at no cost to TxDOT. Leaking fluids from equipment will be collected and removed from the project or PSL.

12. Earth berms or mounds typically used to stockpile topsoil and used in place of boundary silt fence will be seeded upon being constructed. Long term use of earth berms or mounds will not be continued without establishing grass on the control.

13. The Contractor will inform TxDOT of new areas where soil will be disturbed to facilitate planning for new sediment controls. Areas of vegetated soil will not be disturbed by the Contractor, unless adequate sediment controls can be installed before the next rainfall event. The Contractor will assist TxDOT in keeping an accurate set of working SWPPP drawings that show the locations of all temporary sediment and erosion controls.

14. The Contractor will maintain an adequate amount of temporary sediment controls on hand at the field office or project staging area for critical SWPPP maintenance, including silt fence (minimum of 200 feet) and rock / fabric for rock filter dams (minimum for 100 feet of Type III dams).

    The requirement for BMP rock quantities on hand is waived for small projects for on and off system bridge installations. The Contractor having a BMP Subcontractor does not eliminate the requirement for the Contractor to have the required silt fence and rock on hand, typically stored at the Contractor PSL.

15. Failure of a sub-contractor to complete storm water work on time will require the Contractor to start storm water sediment control work immediately and complete the work with high priority, or be subject to stop work on the entire project.

16. Earth materials on roads as a result of soil tracking will not be allowed to be transported off ROW in storm water. Soil or rock material found on roadways deposited from Contractor equipment will be removed daily.

17. Unless approved, completed concrete curb inlets will not be blocked by sediment controls. The contractor will frequently sweep the completed or partially completed roadway to keep sediment out of drainage pipes.

18. The Contractor will be responsible for proper dust control and will route construction traffic in a manner that minimizes dust generation.

19. Water for dust control will contain no pollutants, but may be non-potable from upland stock ponds. No quantity of water to be used for construction purposes may be taken from a 404 stream, prior to the proper authorizations or permits being obtained by the Contractor.

20. Contractor is to direct workers and sub-contractors to use portable sanitary facilities provided by the Contractor and not to trespass off ROW.

21. Contractor will provide written verification to TxDOT that earth borrow pits and disposal sources meet environmental and regulatory requirements, prior to use. Excavations will meet all OSHA requirements and the current safety guidelines established for TxDOT Quarries and Pits.

22. Boundary silt fences that are terminated down slope, with one end being at the lowest elevation, will be installed with an L - hook to contain sediment. Boundary silt fences that are installed on flat ground will have L-hooks on both ends.

23. Rock filter dams across ditches will be constructed where the rock filter dam ends are embedded within the ditch side slopes and ditch bottom. The top center elevation of the rock filter dam will be at least 6 inches lower than the elevations on the rock filter dam ends.

24. Silt fence will be constructed in a U or V pattern across ditch lines and up the ditch side slope to keep storm water from flowing around the ends of the silt fence. Small silt fences that do not adequately span the ditch and allows storm water around the end(s) will not be used. Where there is adequate space, large U pattern silt fences are preferred to facilitate sediment collection and sediment removal with equipment.

25. Sediment controls (RFDs or silt fences) will be located along road ditches as marked on the SWPPP drawings. Modifications to the sediment control spacing will be adjusted during the project based on sediment control effectiveness. The installation and maintenance of sediment controls at or near outfalls, where storm water leaves TxDOT ROW, takes persistent over ditch line sediment controls.

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BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

26. Storm water draining sheet flow over disturbed soil sloped towards the ROW property line, will be intercepted by a boundary silt fence typically installed with L-shaped ends.

27. For ditch grading and shoulder up work, the Contractor is limited during good weather to remove up to one mile (limited to five acres of disturbed soil) of ditch line sediment controls; on one side of the roadway. Outfall controls cannot be removed during this activity. Ditch line controls must be replaced upon completion of work and before the next rain event.

28. Sediment controls damaged by the Contractor, as defined by permit, must be fixed or replaced immediately upon discovery.

29. Notches in silt fences are not typically allowed. Specific silt fences that back up water onto lanes of traffic may be notched if approved.

30. For silt fence maintenance, the Contractor will leave approximately 4 inches of deposited sediment up stream of silt fences and not over excavate around silt fences or rock filter dams.

31. The Contractor will inform TxDOT of new construction areas and where soil is planned to be disturbed. Sediment controls will be installed at outfalls prior to the Contractor beginning soil disturbing activities up slope from the outfall.

32. Water from concrete saw cutting, concrete grinding and concrete coring activities; or fine materials from concrete chipping and salvage will not be allowed to enter storm drains or enter streams.

33. Storm water containing suspended sediment and turbidity needing to be removed from excavations or low areas will be pumped or gravity drained through vegetated buffer strips (50 foot minimum) or placed in ditches with temporary sediment controls, prior to the water being discharged into a stream.

34. Uncontaminated water from natural groundwater seepage, springs, foundations and drains that does not contain suspended sediment or any pollutants may be discharged without storm water controls.

35. Lime or cement if spilled in ditches or outside the defined limits of application is considered a pollutant and will be excavated and removed the same day, to avoid contaminating streams.

36. If located along the project ROW, RAP stockpiles will be located where there is a minimum 100 feet of vegetative buffer strip before storm water will reach a stream. RAP will not be used as a construction material within the Ordinary High Water Marks of a stream channel of a 404 designated stream.

37. If allowed on the project, concrete truck wash out areas will have adequate volume to allow 12 inch freeboard for rain and will be lined with 6 mils of plastic. No concrete will be stored higher than the 12 inch freeboard. Cleaning of truck chutes and equipment does not constitute concrete truck wash out and this activity may be completed at the concrete placement location. Wash out areas will not be located closer than 50 ft from down slope inlets or stream channels.

38. For outfalls near stock ponds closer than 50 foot from disturbed soil at the ROW line, redundant sediment controls will be provided, typically a combination of rock filter dam and a silt fence constructed in line of the flow.

39. Earth stockpiles will utilize silt fence sediment controls, positioned on the low end of the stockpile drainage area with L-hooks or silt fence installed around the entire stockpile.

40. Sediment controls including rock filter dams and silt fences will not be installed across any 404 streams. Sediment controls at 404 streams will be positioned to limit sediment entering the stream from the banks and around structures/culverts, and will allow free flow of storm water to pass through the ROW without being dammed by any sediment controls. Remove loose materials from stream channels prior to each rain event.

41. Sediment controls for non-404 streams may be constructed across the drainage channel in unlimited locations. It is appropriate to use sediment control details typically used for 404 streams for non-404 streams when flow velocities are high. Remove loose material from stream channels prior to each rain event.

42. Incomplete drainage pipe installation across the roadway does not remove the requirement for having sediment controls around the ends of the pipe. To stay within permit requirements, sediment controls should be installed over and around the terminated end and along each side of the banks as soon as construction on the pipe has been completed. Remove loose material from stream channels prior to each rain event.

43. Safety end / headwall construction temporarily will require the removal of part of the sediment control placed over and around the pipe end. Retain in place as much functioning sediment control as possible. Replace the silt fence over and around the top of the pipe, immediately upon concrete placement and form removal. Do not remove culvert sediment controls that cannot be replaced before the next rain event. Sediment control at the ends of culverts must be in place and available for any rain event until the disturbed soil areas are re-vegetated.

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BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

44. Between the Ordinary High Water Marks of a 404 stream channel, the Contractor will disturb only the minimum amount of stream channel that is necessary to complete the work.

45. Rock riprap for erosion control does not replace the requirements to maintain sediment control until vegetation is re-established. Replace sediment controls immediately after installing erosion rock.

46. At the direction of TxDOT, sediment deposited into existing and new culverts will be removed subsidiary to Item 506. Sediment to be removed is either pre-existing material before construction starts or sediment generated as a part of this project.

47. Provide treated 2X4 cross bracing for rectangular inlet silt fence, subsidiary to Item 506.

48. Loose or granular earth materials will not be used to repair silt fence undercuts. Silt fence undercut repairs will be conducted with well compacted soils or the silt fence will be reset in a nearby location.

49. Silt fence steel T posts of approximately 1.25 pounds per foot are allowed at a spacing of 8 feet or less. Silt fence steel T posts between approximately 1.25 pounds per foot and 0.85 pounds per foot are allowed for T post spacing of 5 feet or less.

50. Silt fence to be used to slow the flow of storm water down slopes will be positioned approximately horizontal (on the contour) with L hooks on the ends and limited to approximately 200 feet in length. Multiple sections and levels of silt fence may be required in addition to temporary / permanent erosion control flumes.

51. Soil retention blankets will be installed rolled down the slope with the small dimension side embedded at the top of slope, unless recommended otherwise by the manufacturer. Excess grass, rocks, trash, debris or clods will be removed before seeding and installing soil retention blankets. All installations will be by the manufacturer recommendations. Contractor equipment, including tractor mowers will be kept off areas with soil retention blankets until the grass is established.

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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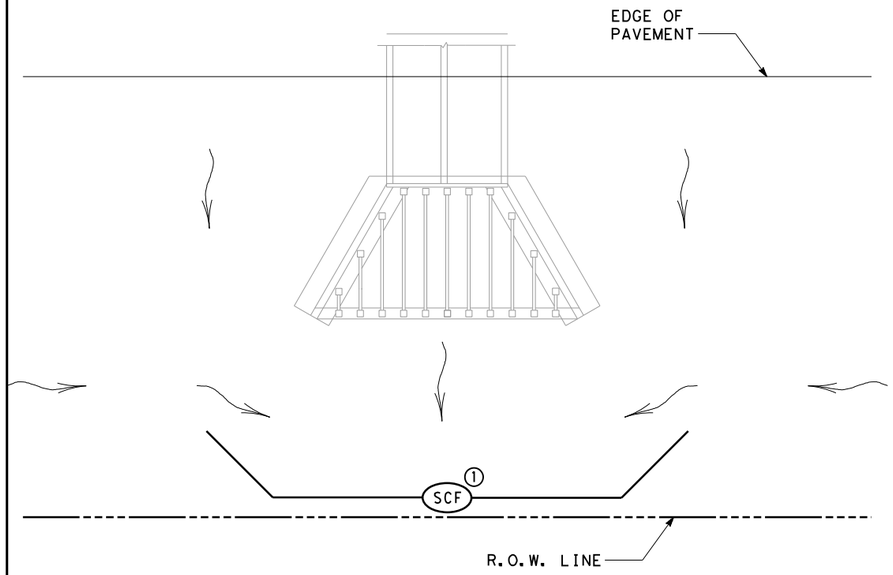
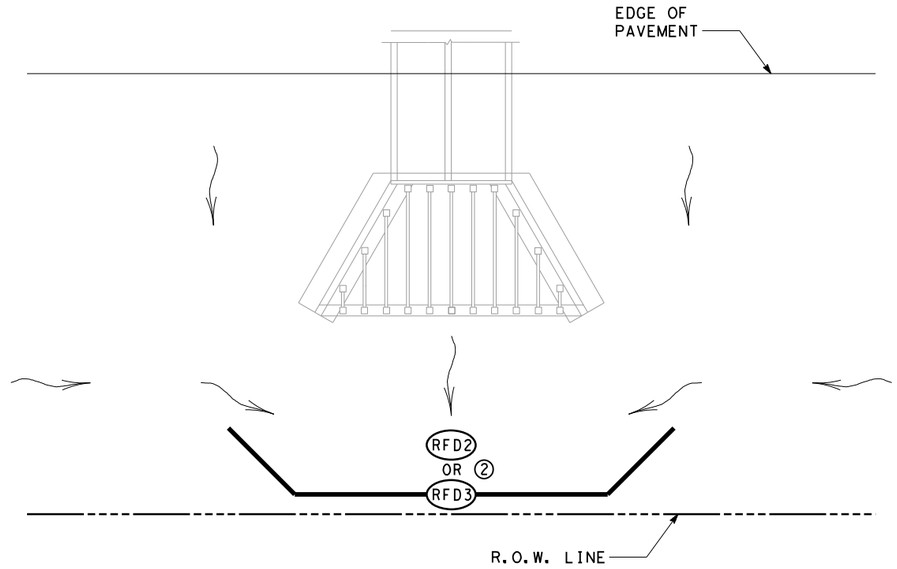


BEST MANAGEMENT PRACTICE (BMP) #1

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #2

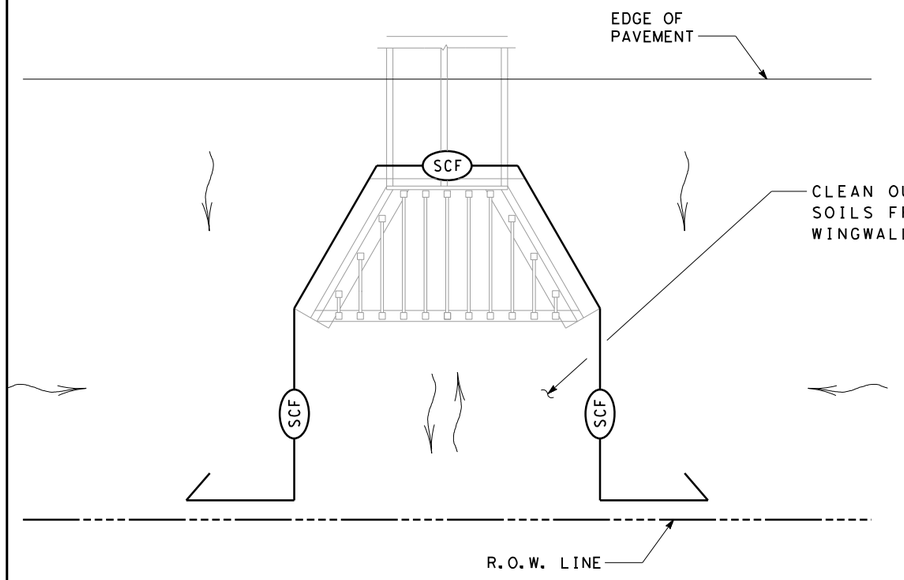
FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

NOTES:

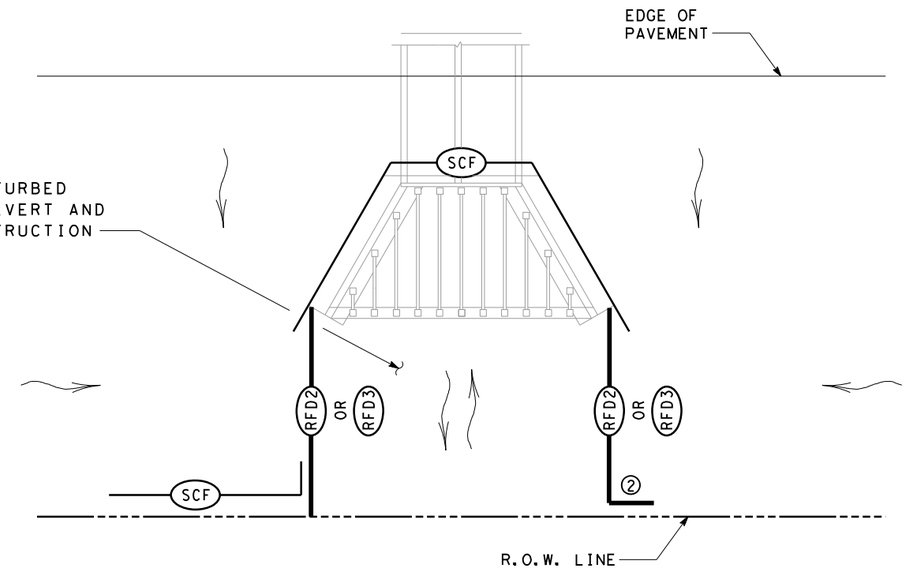
① EXTEND SILT FENCE SO STORM WATER DOES NOT GO AROUND THE ENDS. USE L-HOOKS ON ENDS AS REQUIRED.

② EXTEND ROCK FILTER DAM SO STORM WATER DOES NOT GO AROUND THE ENDS.



BEST MANAGEMENT PRACTICE (BMP) #3

FOR 404 OR NON-404 STREAMS ~ SEDIMENT CONTROL AT EXIT OR ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #4

FOR 404 OR NON-404 STREAMS ~ SEDIMENT CONTROL AT EXIT OR ENTRANCE OF CULVERT

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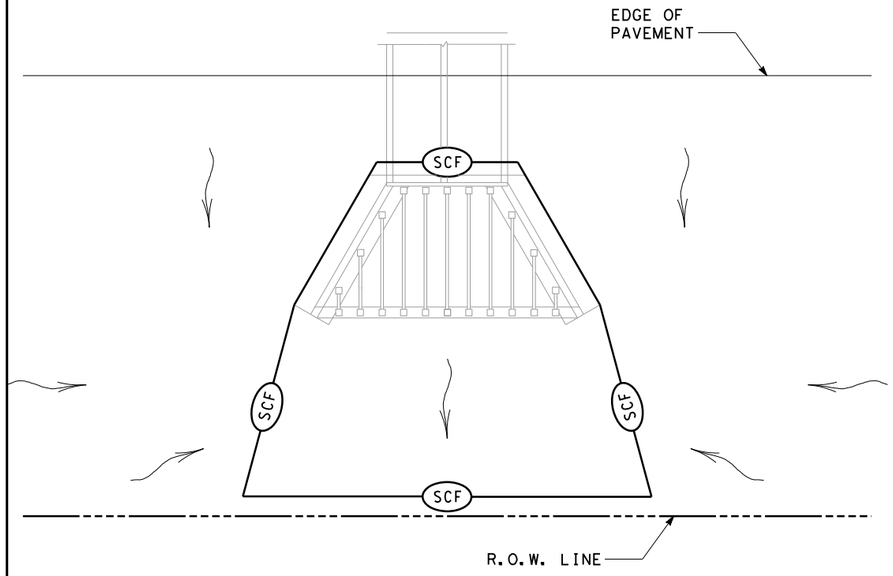
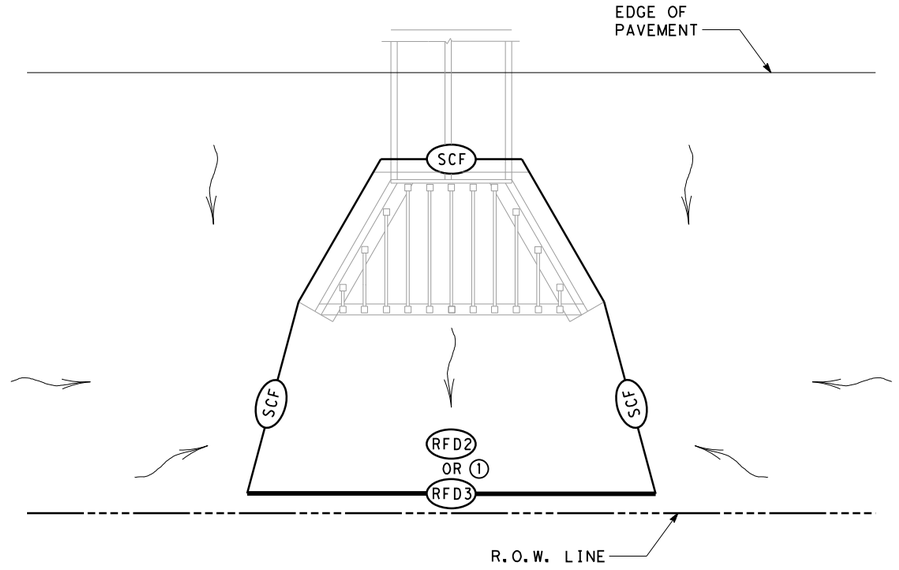


BEST MANAGEMENT PRACTICE (BMP) #5

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #6

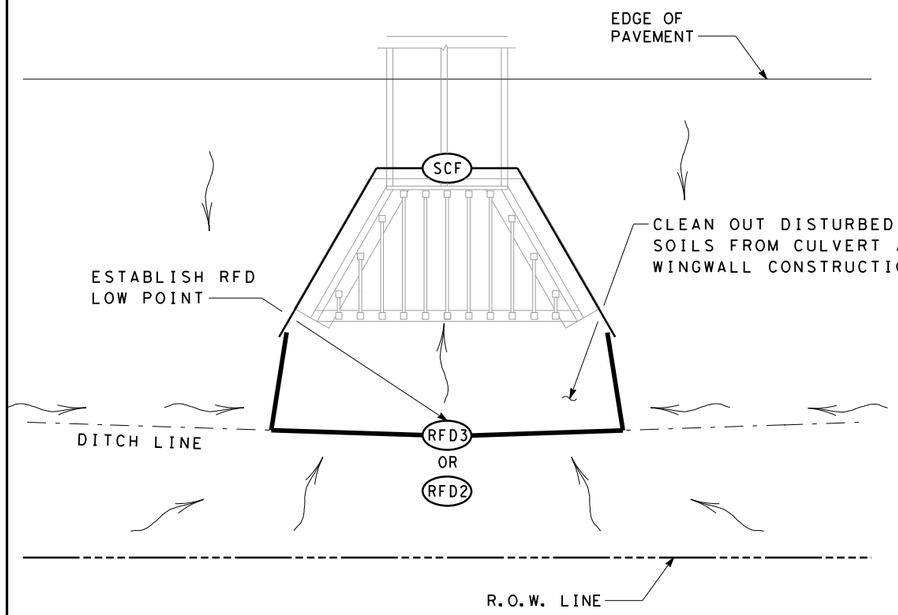
FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

NOTES:

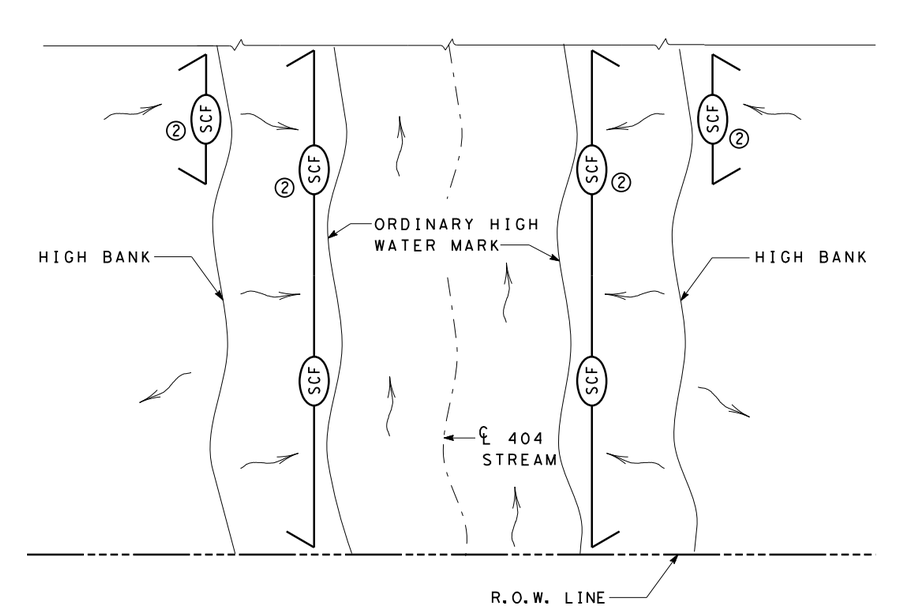
① PROVIDE OVERLAP OF SILT FENCE WITH ROCK FILTER DAM.

② USE SILT FENCE L-HOOKS ON ENDS TO BLOCK STORM WATER SEDIMENT



BEST MANAGEMENT PRACTICE (BMP) #7

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #8

FOR 404 STREAMS ~ SEDIMENT CONTROL DURING PROJECT CLEARING AND GRUBBING

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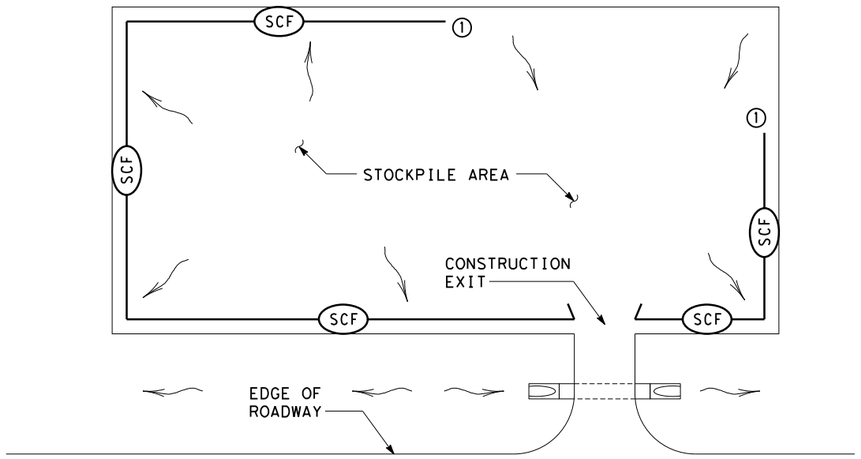
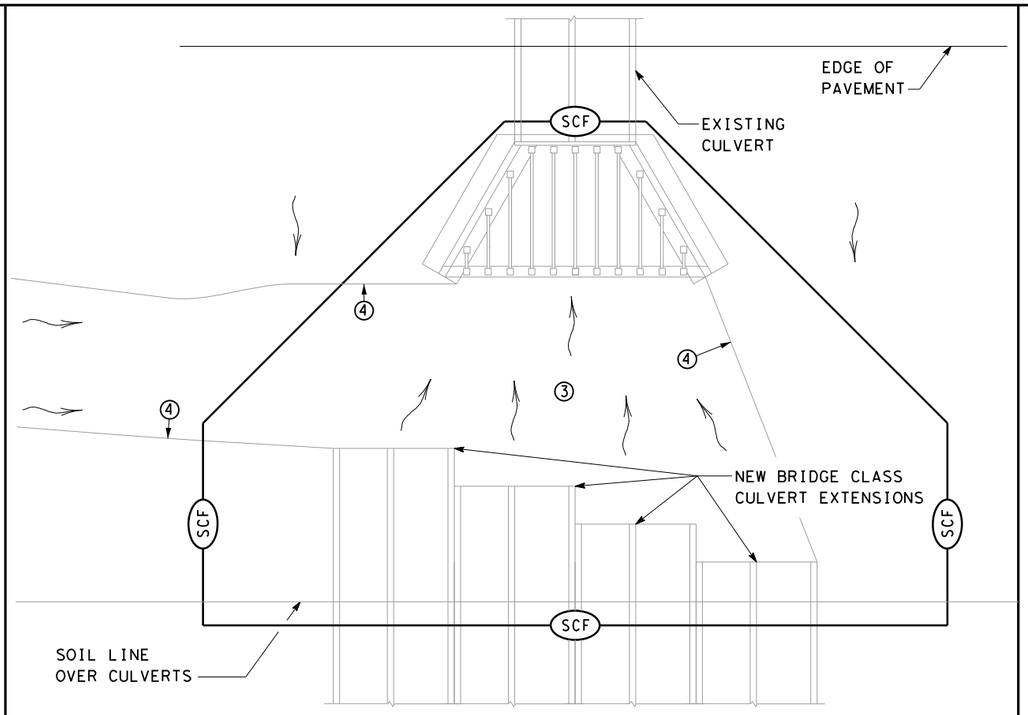


BEST MANAGEMENT PRACTICE (BMP) #9

STOCKPILE SEDIMENT CONTROL



BEST MANAGEMENT PRACTICE (BMP) #10

FOR 404 OR NON-404 STREAMS ONLY ~
SEDIMENT CONTROL AT PHASED CONSTRUCTION OF BRIDGE CLASS CULVERTS

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

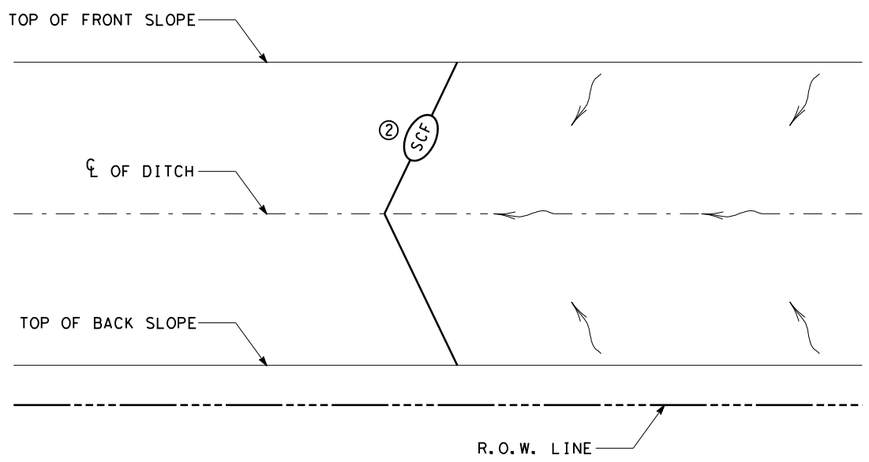
NOTES:

① START SEDIMENT CONTROL AT LOCATION SO ALL STORM WATER WITH SEDIMENT IS COLLECTED

② ROCK FILTER DAMS OR EARTH/GRASSED EMBANKMENTS CAN BE SUBSTITUTED AS DIRECTED.

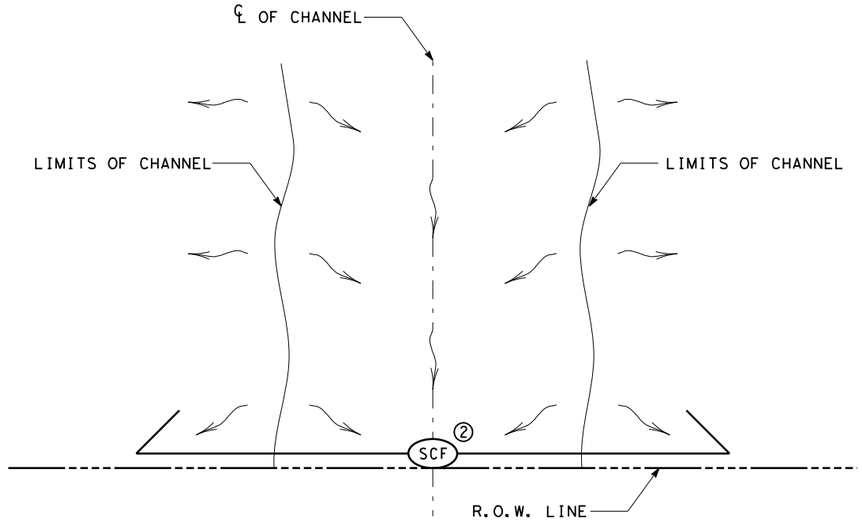
③ PROVIDE A SMOOTH TRANSITION FROM THE INVERT ELEVATIONS BETWEEN CULVERTS. REMOVE LOOSE SOIL FROM EXCAVATED AREA BETWEEN CULVERTS.

④ PROVIDE AND INSTALL PNEUMATICALLY PLACED CONCRETE ON THE DITCH BOTTOM AND SIDE SLOPES BETWEEN TEMPORARY TERMINATIONS BETWEEN OLD AND NEW CULVERTS. PNEUMATICALLY PLACED CONCRETE WILL BE PLACED TO THE HEIGHT OF THE LARGEST CULVERT ON THE DITCH SIDE SLOPES; AND TO A LIMIT 10 FEET OUTSIDE THE LOCATION OF BMPS ALONG THE DITCH BOTTOM. CEMENT STABILIZED SAND MAY BE SUBSTITUTED FOR PNEUMATICALLY PLACED CONCRETE, IN AREAS WHERE INSTALLATION WORKS AND AT THE OPTION OF TXDOT.



BEST MANAGEMENT PRACTICE (BMP) #11

BOUNDRY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED UP SLOPE



BEST MANAGEMENT PRACTICE (BMP) #12

BOUNDRY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED DOWN SLOPE

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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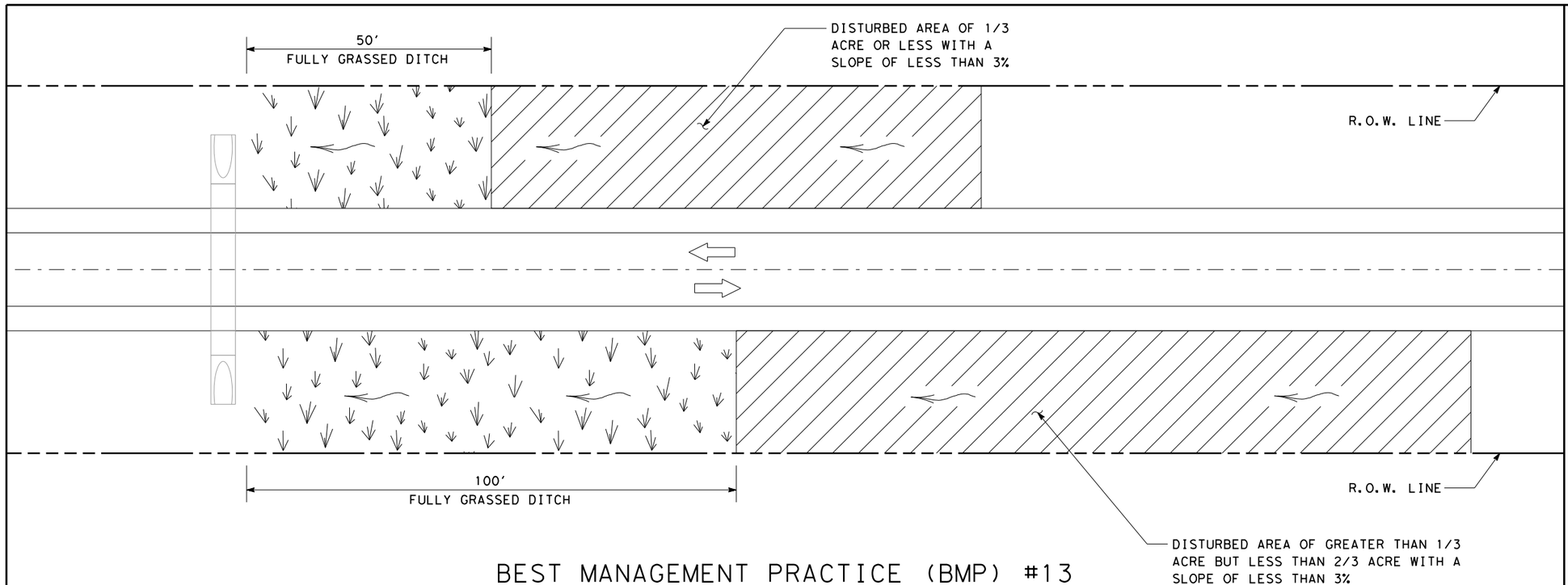
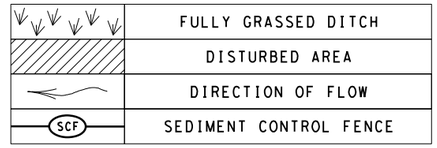


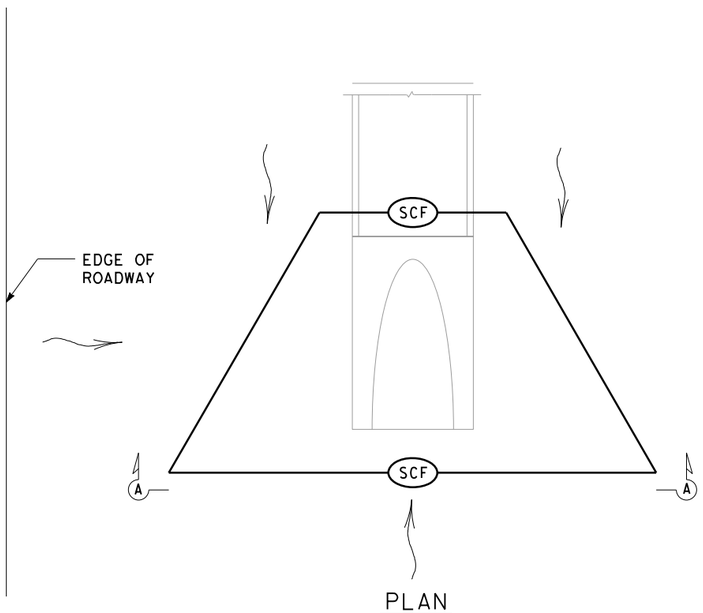
BEST MANAGEMENT PRACTICE (BMP) #13

USE OF VEGETATIVE BUFFERS IN PLACE OF TEMPORARY SEDIMENT CONTROLS SUCH AS SILT FENCE AND ROCK FILTER DAMS

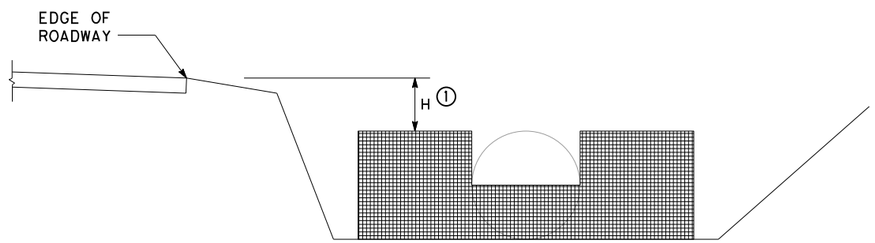


① FOR H DIMENSIONS LESS THAN 1.5' SILT FENCE MAY NEED TO BE NOTCHED AS SHOWN IN VIEW A-A. ADD EXTRA POSTS AT NOTCH.

② BMP #14 MAY BE USED AT CROSS DRAINAGE STRUCTURES AS DIRECTED.



PLAN



VIEW A-A

BEST MANAGEMENT PRACTICE (BMP) #14

NON-404 STREAMS AND DITCHES ONLY ~ SEDIMENT CONTROL AT PARALLEL DRAINAGE STRUCTURE ENTRANCE ②

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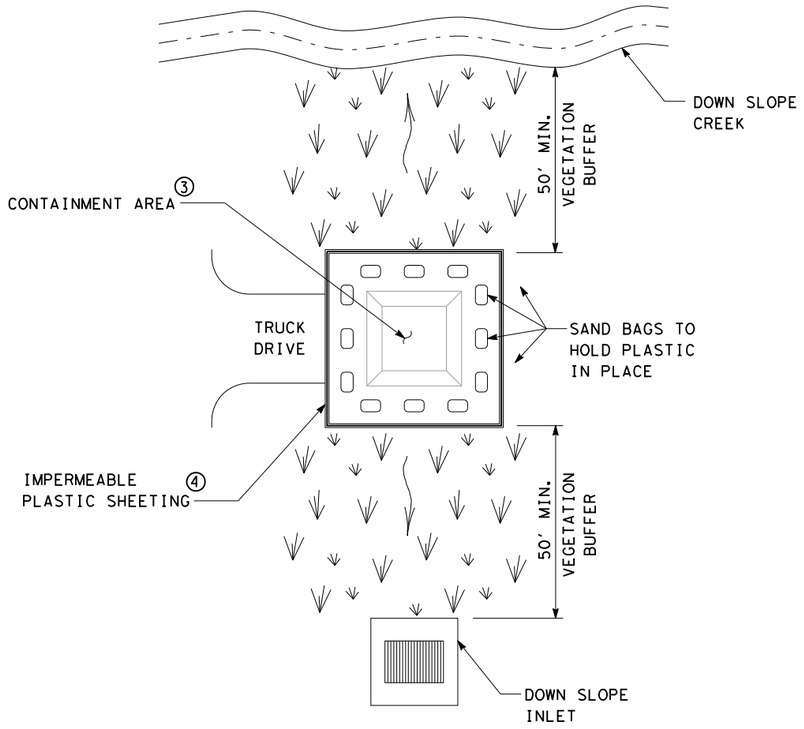
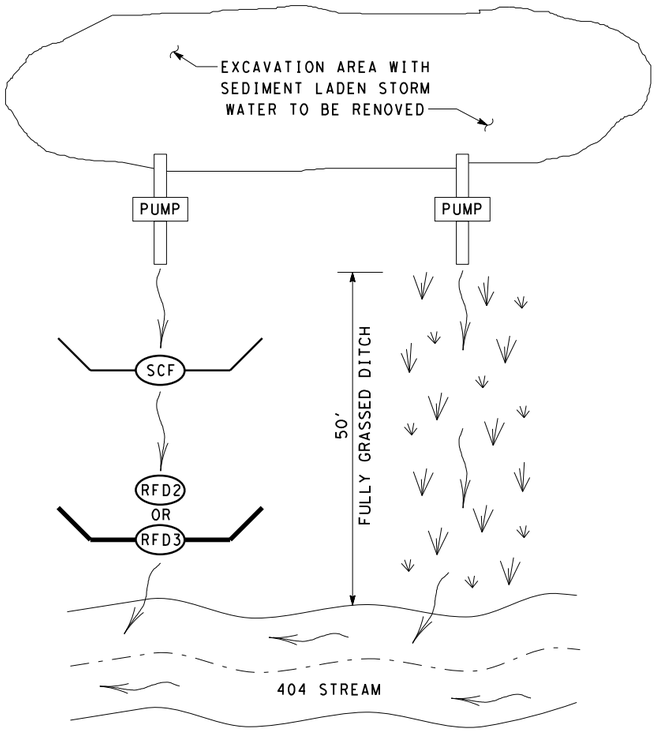


BEST MANAGEMENT PRACTICE (BMP) #15

CONCRETE TRUCK WASHOUT AREA



BEST MANAGEMENT PRACTICE (BMP) #16

PUMPED STORM WATER SEDIMENT CONTROLS ①

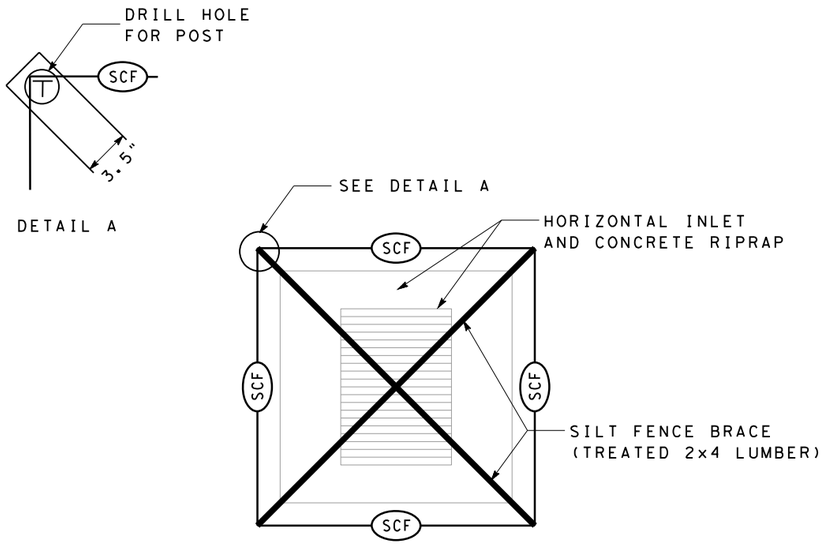
	FULLY GRASSED DITCH
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)

① PUMPED STROM WATER FROM AN EXCAVATION AREA SHOULD BE DISCHARGED IN A 50' VEGETATIVE BARRIER OR THROUGH TWO TEMPORARY SEDIMENT CONTROLS BEFORE ENTERING A 404 STREAM.

② FOR LANDOWNER STOCKPONDS WITHIN 50' OF THE RIGHT OF WAY LINE, PROVIDE REDUNDANT SEDIMENT CONTROLS AT THE CONVEYANCE OF THE POND. MINIMUM OF TWO SEDIMENT CONTROLS.

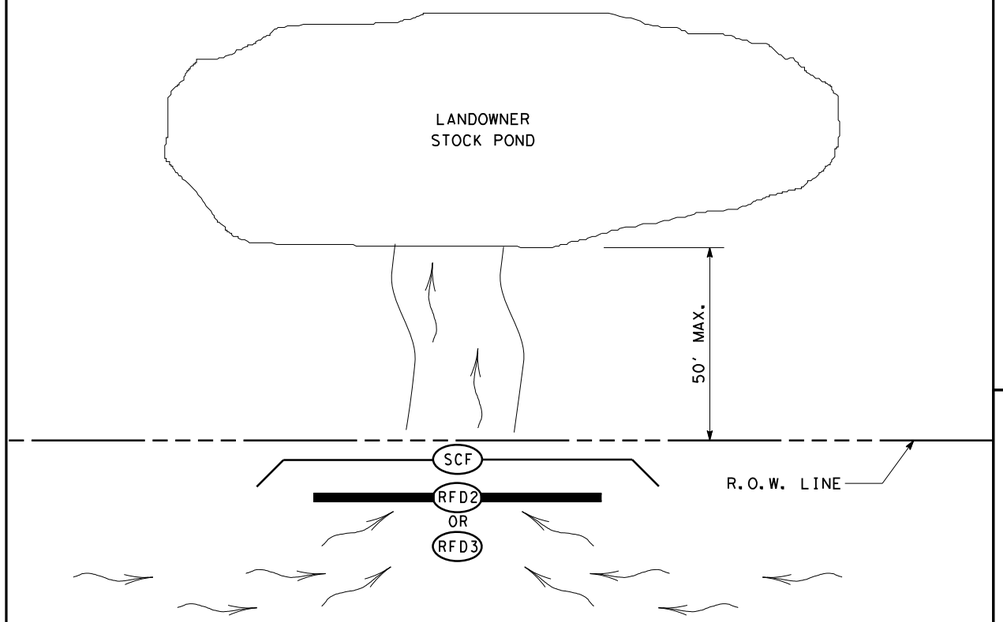
③ WHEN CONTAINMENT AREA REACHES 1' FREEBOARD, DISCONTINUE WASHOUT PLACEMENT AND REMOVE MATERIAL UPON SOLIDIFICATION.

④ EACH TIME SOLIDIFIED MATERIAL IS REMOVED REPLACE PLASTIC SHEETING.



BEST MANAGEMENT PRACTICE (BMP) #17

HORIZONTAL INLET SEDIMENT CONTROL



BEST MANAGEMENT PRACTICE (BMP) #18

LANDOWNER STOCKPOND SEDIMENT CONTROL ②

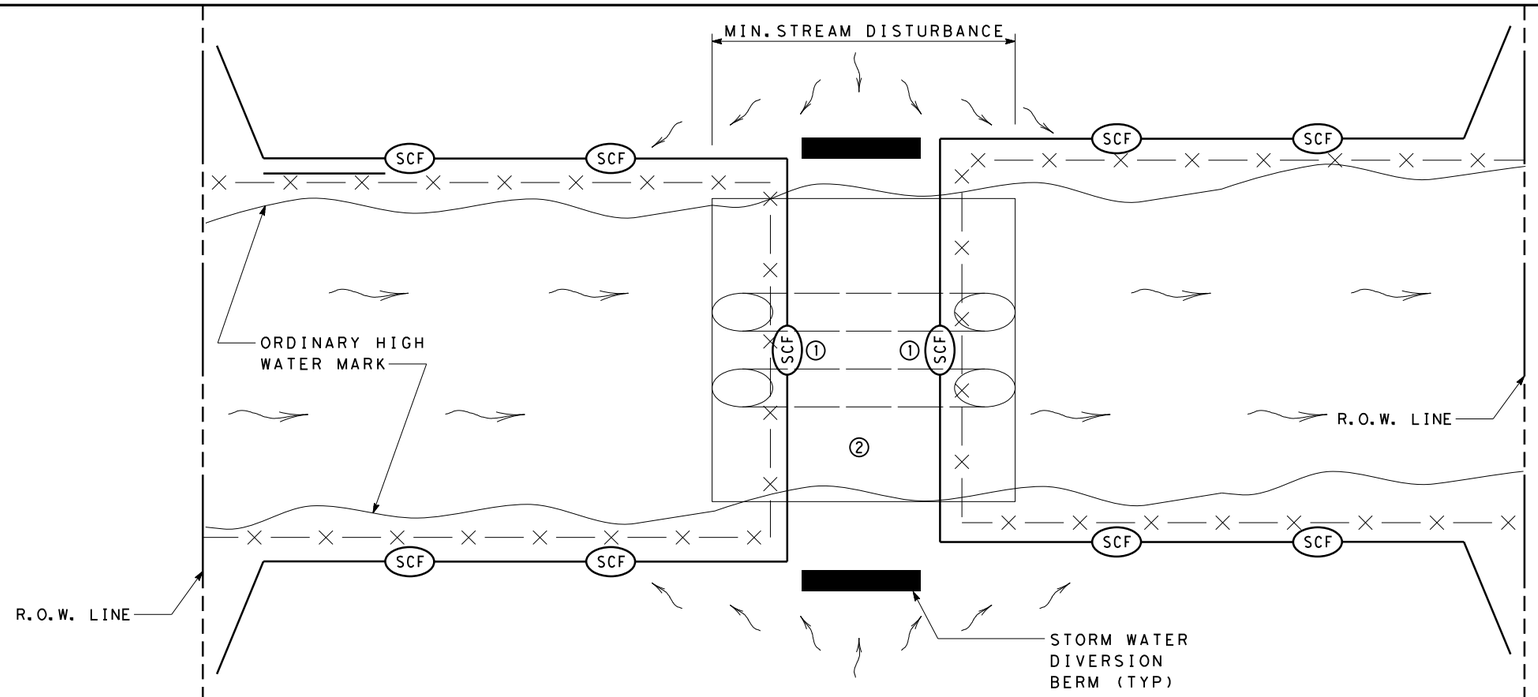
SCALE = NTS SHEET 9 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

FILE: BMPLAYOUTS.dgn	DN: TXDOT		CK: TXDOT	DW: TXDOT		CK: TXDOT	
©TxDOT 2009	CONT	SECT	JOB		HIGHWAY		
REVISIONS	1191	03	033,ETC.		FM 1245,ETC		
DEC 2013 FEB 2015	DIST	COUNTY				SHEET NO.	
	WACO	LIMESTONE				164	



BEST MANAGEMENT PRACTICE (BMP) #19

TYPICAL 404 STREAM CROSSING (SEDIMENT CONTROL AT CROSSING)

	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD	ROCK FILTER DAM
	SECURITY FENCING

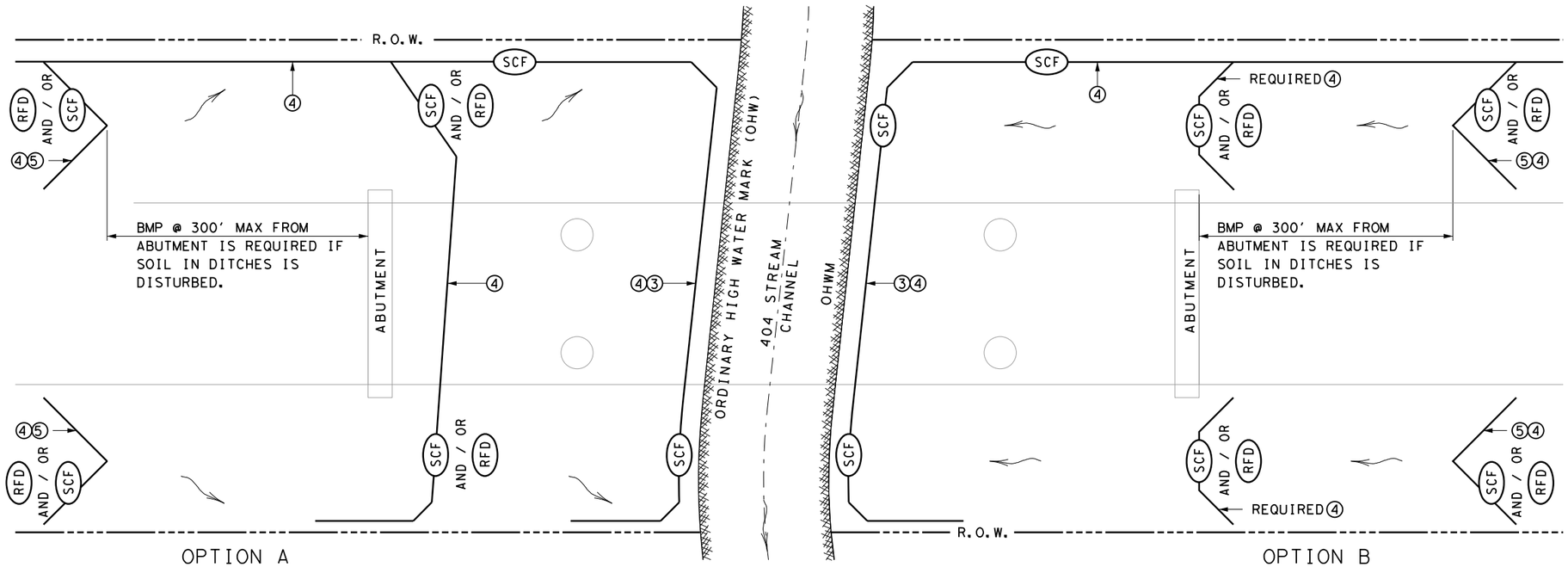
① HAY BALES MAY BE SUBSTITUTED FOR SILT FENCE OVER THE STREAM CROSSING.

② CROSSING WILL BE AS PER REQUIREMENTS OF THE WATERS OF THE US GENERAL NOTES.

③ INSTALL SILT FENCE SLIGHTLY UP FROM OHW MARK FROM R.O.W. TO R.O.W.

④ USE SILT FENCE L-HOOKS ON LEVEL OR DOWN SLOPING ENDS TO BLOCK STORM WATER SEDIMENT

⑤ INSTALL LARGE V OR U SHAPED BMP'S FROM ABUTMENT AS SHOWN. IF THERE IS STEEP DITCH CONDITIONS DECREASE SPACING AND CONSIDER RFD'S. ADD ADDITIONAL BMP'S IF GRADE IS STEEP OR IF FLOW IS HIGH.



BEST MANAGEMENT PRACTICE (BMP) #20

FOR 404 STREAMS ~ BMP'S AT BRIDGES

SCALE = NTS SHEET 10 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

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	DIST	COUNTY		SHEET NO.
	WACO	LIMESTONE		165