SEE SHEET 2 FOR INDEX OF SHEETS

SL 494
FUNCTION CLASSIFICATION:
MINOR ARTERIAL

DESIGN SPEED
MAINLANES .....50 MPH
DESIGN ADT
MAINLANES 2022 ....1,401 2042 2,593

FED RD DIV NO	PROJECT NUMBER		HIGHWAY NUMBER
6	BR 2022(511)		SL 494
STATE	DISTRICT	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONTROL	SECTION	JOB	SHEET NO.
0177	14	039	1

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

PROJECT NO. : BR 2022(511)

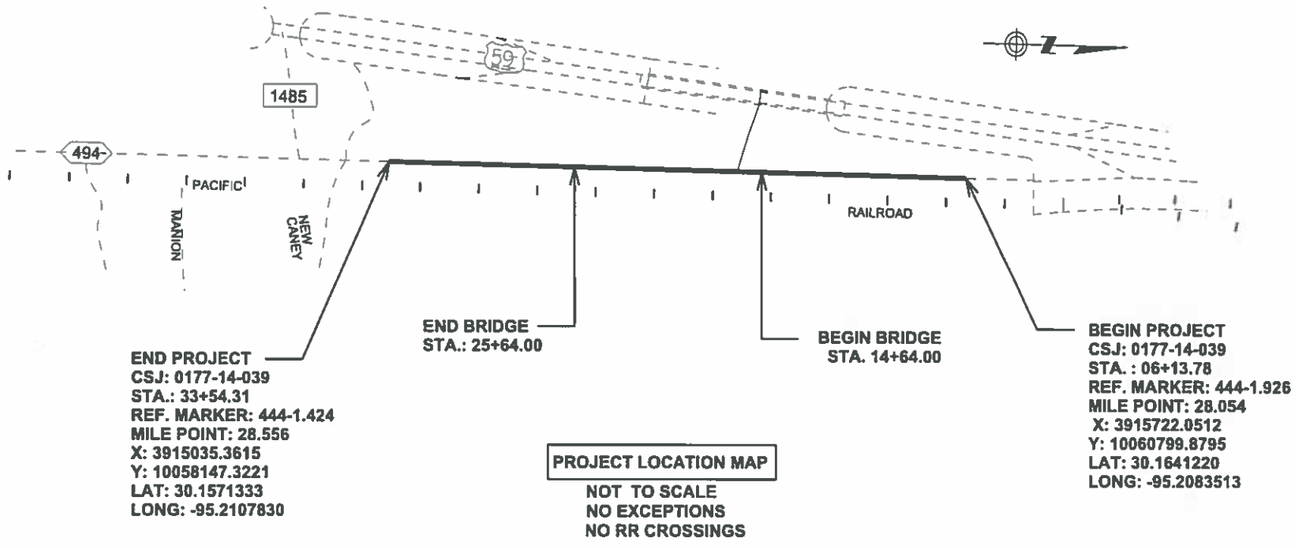
CSJ: 0177-14-039

HIGHWAY: SL 494

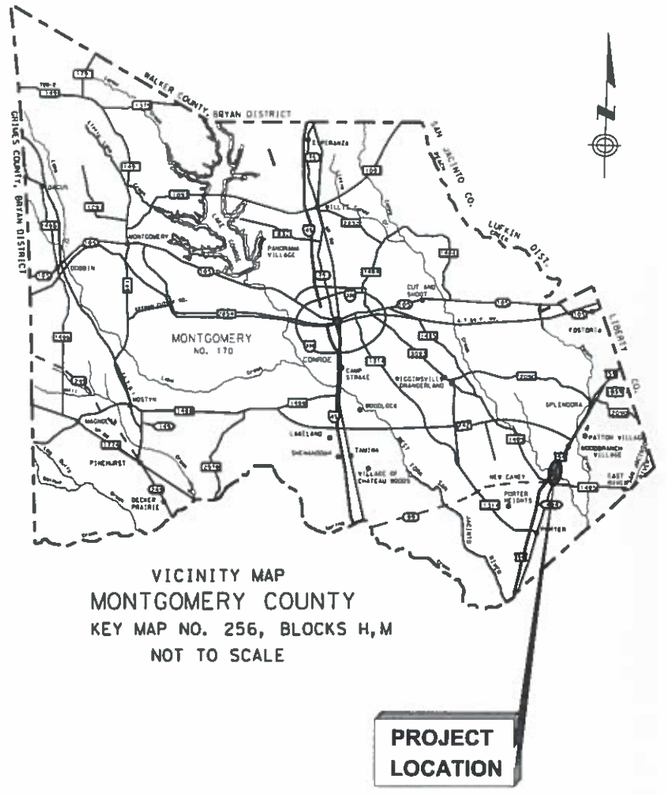
FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT

CONSISTING OF EMBANKMENT, EXCAVATION LIME TREATED SUBGRADE, CEMENT TREATED SUBGRADE, ASPHALT STABILIZED BASE, ASPHALT PAVEMENT, RETAINING WALLS, DRILL SHAFTSCOLUMNS, BENT CAPS, BRIDGE DECK, RAILING SIGNING, PAVEMENT MARKINGS LAYMAN'S DESC.: REPLACE BRDIGES AND APPROACHES

CSJ	COUNTY	LIMITS	ROADWAY		BRIDGES		TOTAL	
			FT	MI	FT	MI	FT	MI
0177-14-039	MONTGOMERY	AT CANEY CREEK	1640.53	0.31	1100.00	0.21	2740.53	0.52



PROJECT LOCATION MAP
NOT TO SCALE
NO EXCEPTIONS
NO RR CROSSINGS



VICINITY MAP
MONTGOMERY COUNTY
KEY MAP NO. 256, BLOCKS H, M
NOT TO SCALE

PROJECT LOCATION

COUNTY MONTGOMERY PROJ. NO. BR 2022(511)
HWY. NO. SL 494 LETTING DATE 05/22
CONTRACTOR NAME
CONTRACT BEGIN DATE
WORK COMPLETED DATE
DATE OF ACCEPTANCE

NOTES:

1. ALL HORIZONTAL COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (1993 ADJUSTMENT). CENTRAL ZONE TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT) MONUMENTS ROD: TXCN, TXHE AND TXRS WEWE HELD FIXED USING THEIR PUBLISHED HORIZONTAL VALUES. THE COORDINATE POSITION FOR ALL POINTS IS BASED ON GPS SURVERYS MEETING THE STANDARDS OF ACCURACY SET FORTHIN THE FEDERAL GEODETIC CONTROL COMMITTEE PUBLICATION ENTITLED GEOMETRIC GEODETIC ACCURACY STANDARDS AND SPECIFICATIONS FOR USING GPS RELATIVE POSITIONING TECHNIQUES REPRINTED WITH CORRECTIONS AUGUST 1, 1989

2. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED SCALE FACTOR OF 1.00007202

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

Texas Department of Transportation

SUBMITTED FOR LETTING: 2/25/22

Alexander M Bergman P.E.
AREA ENGINEER

APPROVED FOR LETTING: 3/4/2022

DocuSigned by:
James Koch , P.E.
8A3C5A1652A6C...
FOR DISTRICT ENGINEER

CK:
DW:
CK:
DN:

GENERAL

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	2	INDEX OF SHEETS
	3	SL 494 EXISTING TYPICAL SECTION
	4-6	SL 494 PROPOSED TYPICAL SECTION
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	8, 8A-8B	ESTIMATE AND QUANTITY SHEET
	9	ROADWAY QUANTITY SUMMARY
	10	DRIVEWAY QUANTITY SUMMARY
	11	PAVEMENT MARKING QUANTITY SUMMARY
	12	SW3P QUANTITY SUMMARY
	13	SUMMARY OF SMALL SIGNS

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STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter P.E.

04.08.22

SL 494
INDEX SHEET

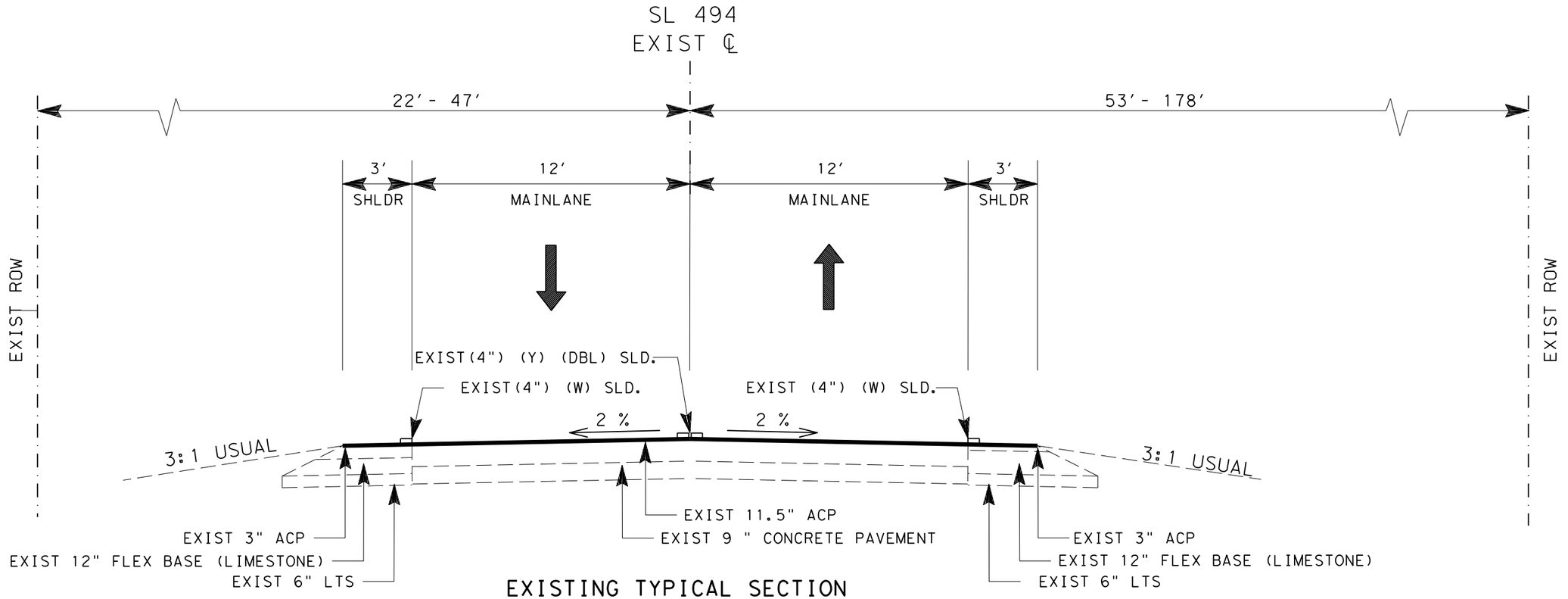
THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE (*) HAVE BEEN SELECTED BY ME, OR UNDER RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS POJECT.

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		2

DATE: $DATE$ $TIME$
FILE: $FILE$



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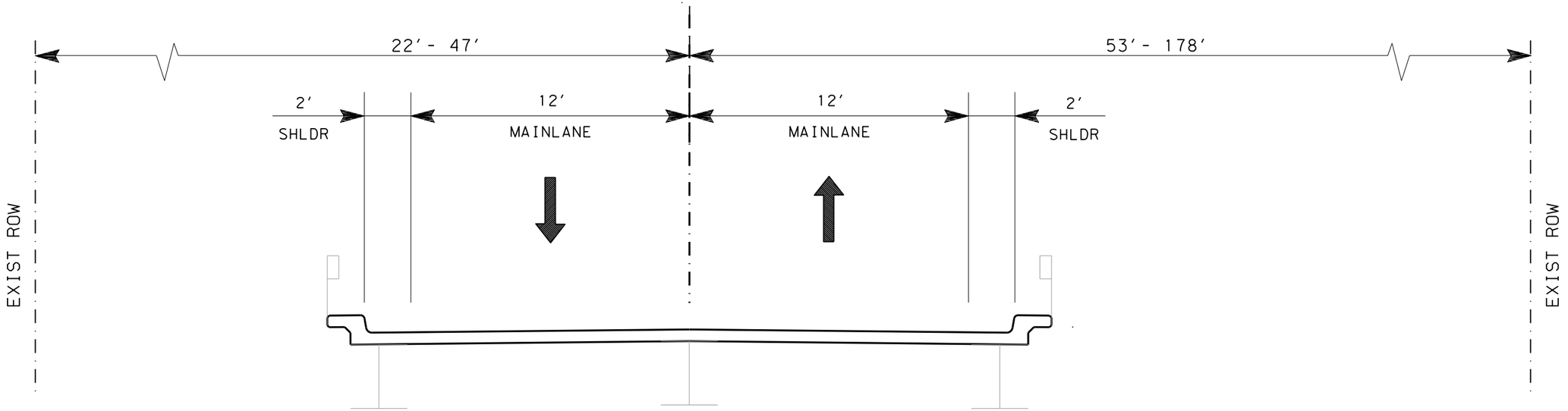
STA. 25+60.00 TO 33+54.31



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DATE: 02/02/2022 10:59 AM
FILE:

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.

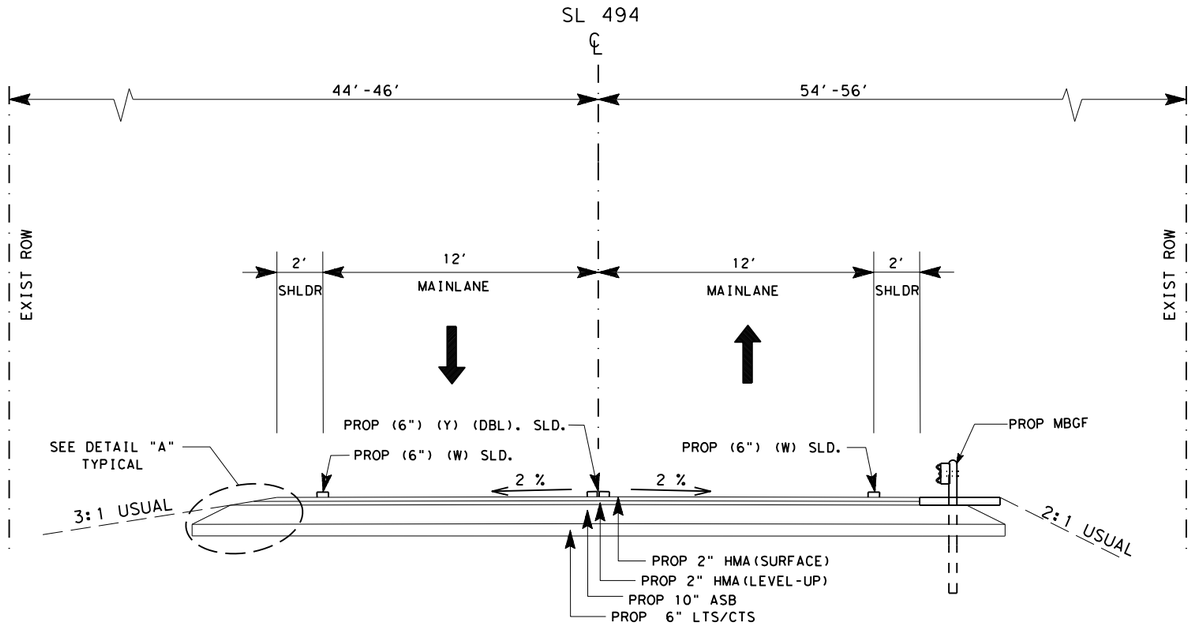
02.24.22

SL 494 EXISTING TYPICAL SECTION

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		3



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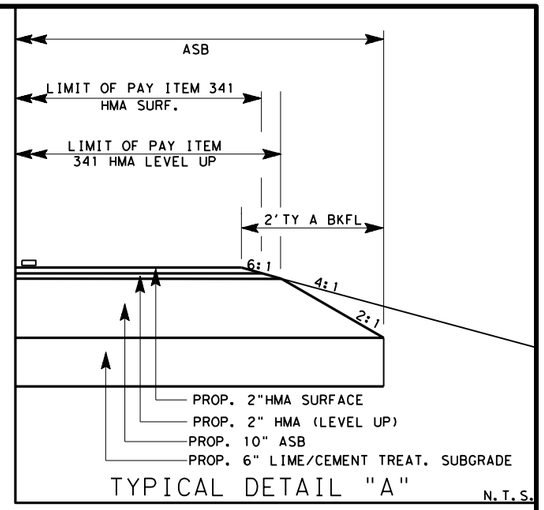

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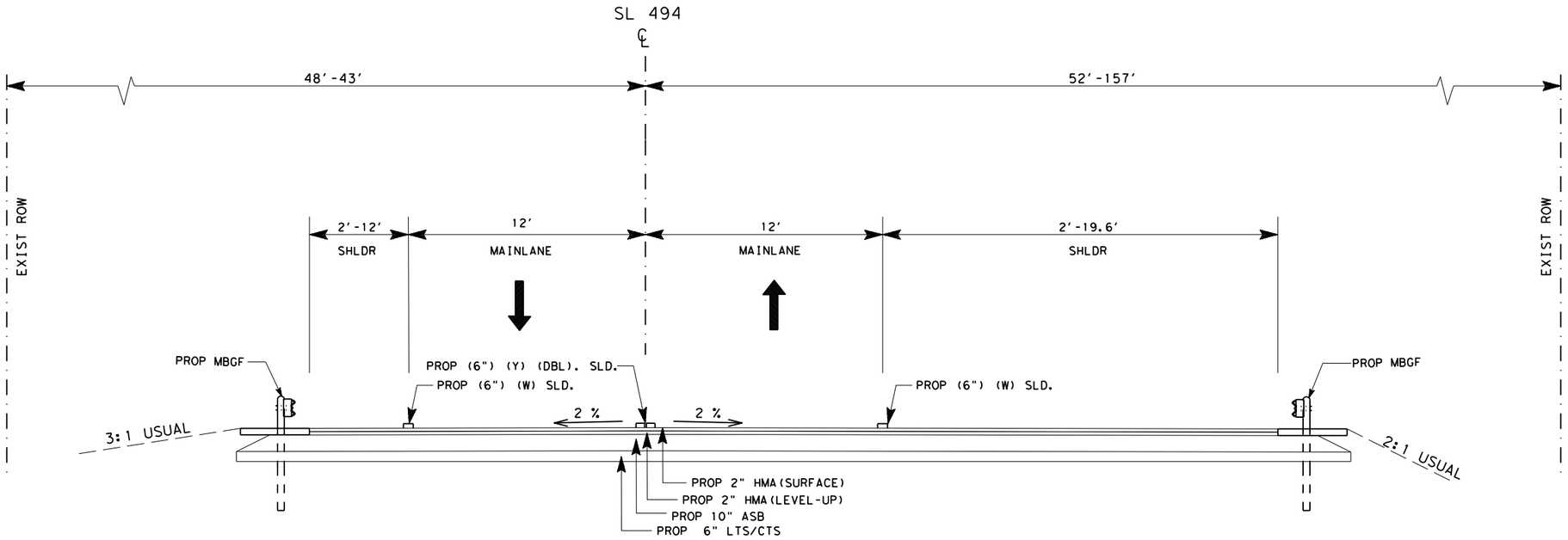

PROPOSED TYPICAL SECTION

STA. 12+37.00 TO 14+35.00
STA. 25+91.00 TO 27+59.00

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter P.E.

02.24.22

SL 494
PROPOSED TYPICAL SECTION

SHEET 1 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		4

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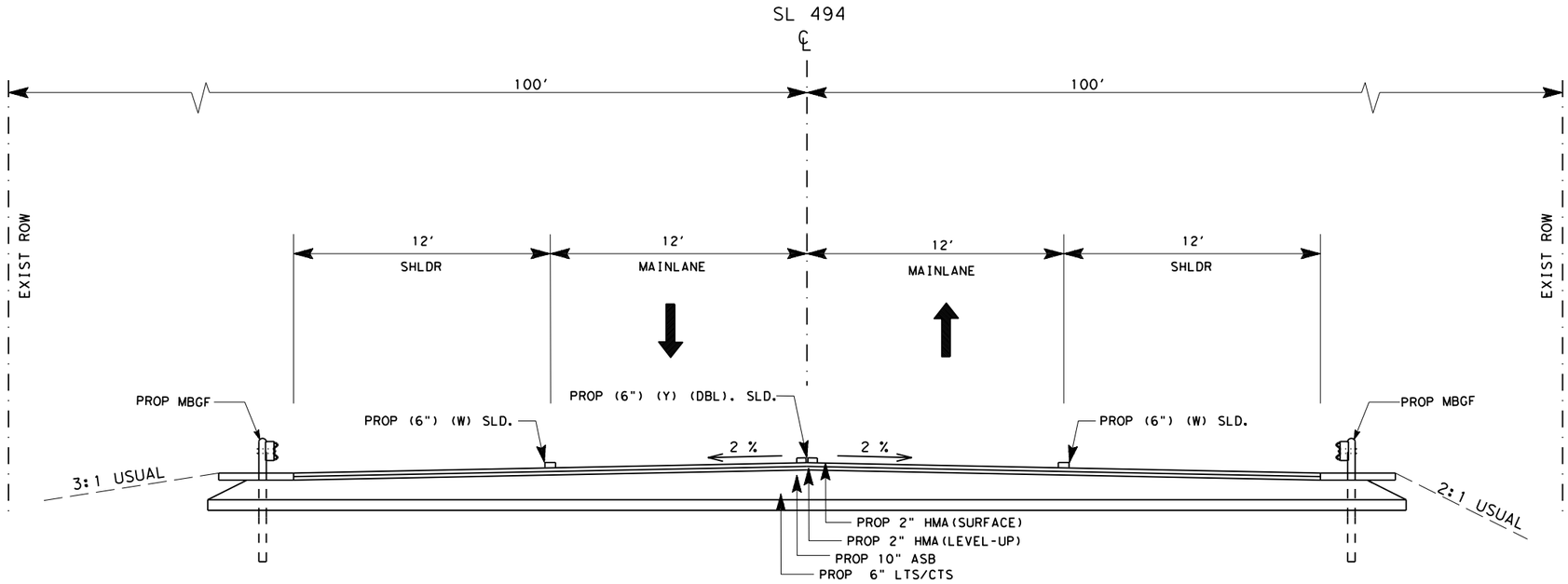

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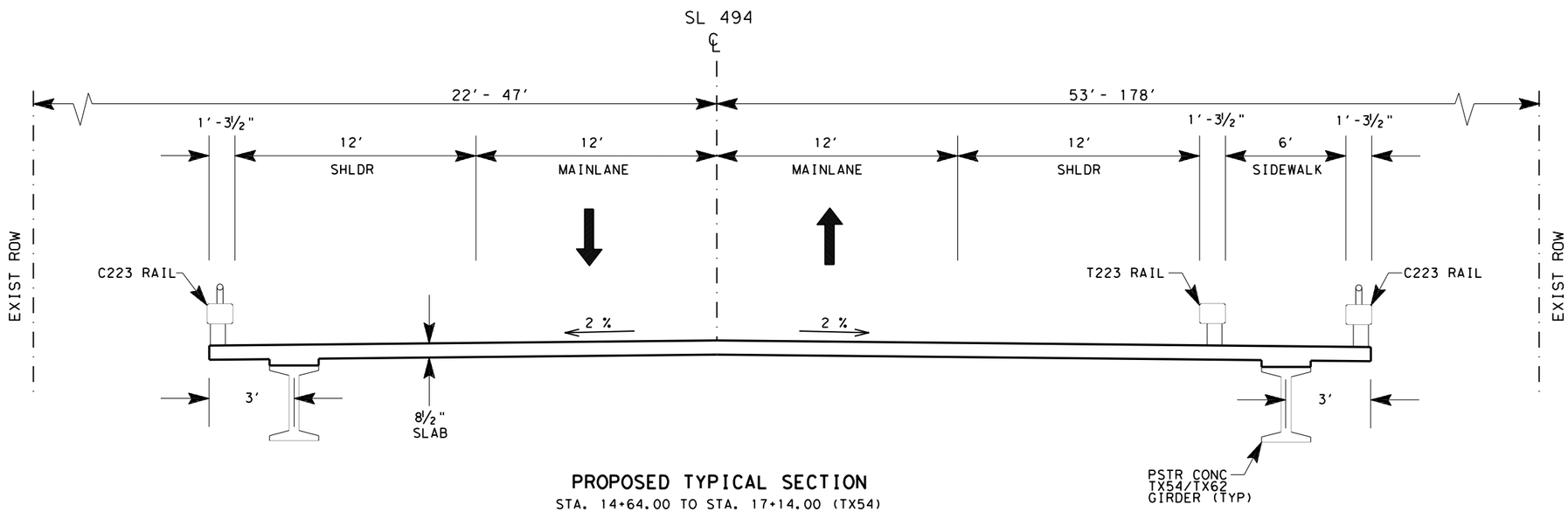

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STA. 18+54.00 TO STA. 25+64.00 (TX54)

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
02.24.22

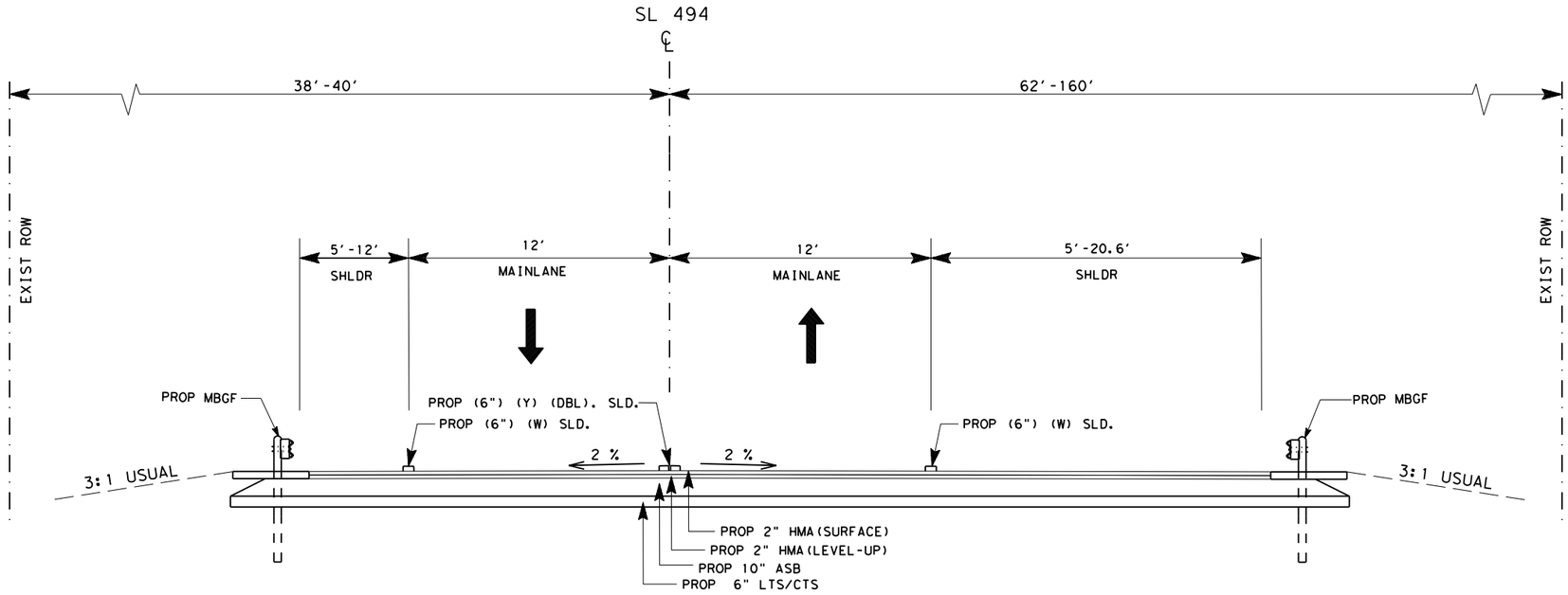
SL 494
PROPOSED TYPICAL SECTION

SHEET 2 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		5

DATE: 02/02/2022 11:03 AM
FILE:



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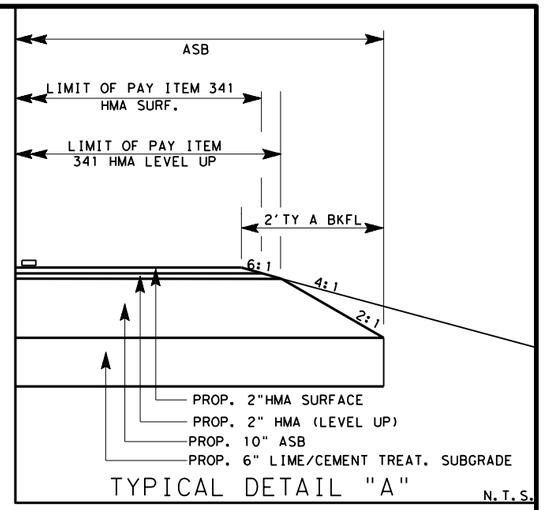
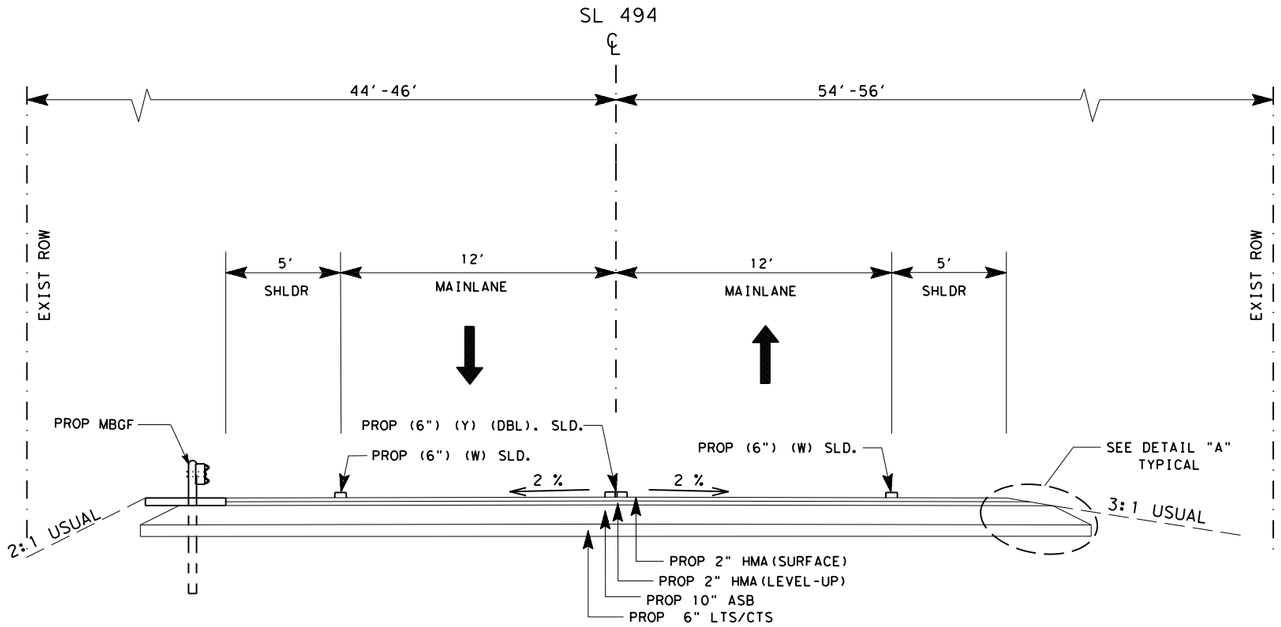


NOTE: RIDE QUALITY SCHEDULE 1



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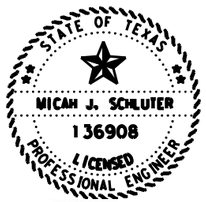


Micah J. Schluter, P.E.

02.24.22

SL 494
PROPOSED TYPICAL SECTION

SHEET 3 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		6

DATE: 02/02/2022 11:03 AM
FILE:

General Notes:

General:

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

Abraham M. Guzman, P.E. Abe.Guzman@txdot.gov
Matthew M. Connelly, P.E. Matthew.Connelly@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals. 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%20Responses/

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, and CCSJ/Project Name.

Unless otherwise shown on the plans, RAP generated by this project will become the property of the Contractor for use in the current construction project or in future projects.

If fixed features require, the governing slopes shown may vary between the limits shown and to the extent determined by the Engineer.

Superelevate the curves to match the existing surface.

Notify the Engineer immediately if discrepancies are discovered in the horizontal control or the benchmark data.

References to manufacturer's trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved, except for roadway illumination, electrical, and traffic signal items.

The cost for materials, labor, and incidentals to provide for traffic across the roadway and for ingress and egress to private property in accordance with Section 7.2.4 of the standard specifications is subsidiary to the various bid items. Restore access roadways to their original condition upon completing construction.

Grade street intersections and median openings for surface drainage.

If a foundation is to be placed where a riprap surface or an asphalt concrete surface presently exists, use caution in breaking out the existing surface for placement. Break out no greater area than is required to place the foundation. After placing the foundation, wrap the periphery with 0.5 in. pre-molded mastic expansion joint. Then replace the remaining portion of the broken out surface with Class A or Class C concrete or cold mix asphalt concrete to the exact slope, pattern,

and thickness of the existing riprap or asphalt. Payment for breaking out the existing surface, wrapping the foundation, and replacing the surface is subsidiary to the various bid items.

The lengths of the posts for ground mounted signs and the tower legs for the overhead sign supports are approximate. Verify the lengths before ordering these materials to meet the existing field conditions and to conform to the minimum sign mounting heights shown in the plans.

Furnish aluminum Type A signs instead of plywood signs for signs shown on the Summary of Small Signs sheet.

Stencil the National Bridge Inventory (NBI) number on each existing bridge shown on these plans. The NBI number is shown above the title block for each bridge layout.

Clearly mark or highlight on the shop drawings, the items being furnished for this project. Submit required shop drawings in accordance with the shop drawing distribution list shown in the note for Item 5 for review and distribution.

Make requests for additional soil information for this project at the Area Engineer's office.

Procure permits and licenses, which are to be issued by the City, County, or Municipal Utility District.

General: Site Management

Mow the grass and weeds within the project limits a maximum of 3 times a year as directed. This work is subsidiary to the various bid items.

Mark stations every 100 ft. and maintain the markings for the project duration. Remove the station markings at the completion of the project. This work is subsidiary to the various bid items.

Do not mix or store materials, or store or repair equipment, on top of concrete pavement or bridge decks unless authorized by the Engineer. Permission will be granted to store materials on surfaces if no damage or discoloration will result.

Assume ownership of debris and dispose of at an approved location. Do not dispose of debris on private property unless approved in writing by the District Engineer.

Control the dust caused by construction operations. For sweeping the base material in preparation for laying asphalt and for sweeping the finished concrete pavement, use one of the following types of sweepers or approved equal:

Tricycle Type	**Truck Type - 4 Wheel**
Wayne Series 900	M-B Cruiser II
Elgin White Wing	Wayne Model 945
Elgin Pelican	Mobile TE-3
	Mobile TE-4
	Murphy 4042

General: Traffic Control and Construction

Schedule construction operations such that preparing individual items of work follows in close sequence to constructing storm drains in order to provide as little inconvenience as practical to the businesses and residents along the project.

Schedule work so that the base placement operations follow the subgrade work as closely as practical to reduce the hazard to the traveling public and to prevent undue delay caused by wet weather.

This project requires extensive grading operations in an environmentally sensitive area.

If relocating mailboxes, place them with the post firmly in the ground at nearby locations. Upon completing the project, the Engineer will locate the final mailbox placement. Perform this work in accordance with the requirements of the Item, "Mailbox Assemblies," except for measurement and payment. This work is subsidiary to the various bid items.

If fences cross construction easements shown on the plans and work is required beyond the fences, remove and replace the fences as directed. This work and the materials are subsidiary to the various bid items.

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

General: Utilities

Consider the locations of underground utilities depicted in the plans as approximate and employ responsible care to avoid damaging utility facilities. Depending upon scope and magnitude of planned construction activities, advanced field confirmation by the utility owner or operator may be prudent. Where possible, protect and preserve permanent signs, markers, and designations of underground facilities.

If the Contractor damages or causes damage (breaks, leaks, nicks, dents, gouges, etc.) to the utility, contact the utility facility owner or operator immediately.

At least 72 hours before starting work, make arrangements for locating existing Department-owned above ground and underground fiber optic, communications, power, illumination, and traffic signal cabling and conduit. Do this by calling the Department's Houston District Traffic Signal Operations Office at 713-802-5662 to schedule marking of underground lines on the ground. Use caution if working in these areas to avoid damaging or interfering with existing facilities.

Notify the Engineer at least 48 hours before constructing junction boxes at storm drain and utility intersections.

Install or remove poles and luminaires located near overhead or underground electrical lines using established industry and utility safety practices. Consult the appropriate utility company before beginning such work.

If overhead or underground power lines need to be de-energized, contact the electrical service provider to perform this work. Costs associated with de-energizing the power lines or other protective measures required are at no expense to the Department.

If working near power lines, comply with the appropriate sections of Texas State Law and Federal Regulations relating to the type of work involved.

Perform electrical work in conformance with the National Electrical Code (NEC) and Department's standard sheets.

Item 5: Control of Work

Before contract letting, cross-section data for this project will be available to the prospective bidders in PDF format on the Department's Houston District website located at:

https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/Houston%20District/Construction%20Projects/

The cross-section data provided above is for non-construction purposes only and it is the responsibility of the prospective bidder to validate the data with the appropriate plans, specifications, and estimates for the projects.

Submit shop drawings electronically for the fabrication of items as documented in Table 1 below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link, ftp://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf. References to 11 in. x 17 in. sheets in individual specifications for structural items imply electronic CAD sheets.

Table 1

2014 Construction Specification Required Shop/Working Drawing Submittals - TxDOT Generated Plans

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/ Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&.2	Construction Load Analyses	Y	Y	Y	B	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	A	WD
403	Temporary Special Shoring	Y	N	Y	C	WD
420	Formwork/Falsework	Y	N	Y	A	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	C	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	B	SD
425	Prestr Concr Sheet Piling	Y	Y	N	B	SD
425	Prestr Concr Beams	Y	Y	N	B	SD
425	Prestr Concr Bent	Y	Y	N	B	SD
426	Post Tension Details	Y	Y	N	B	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	B	SD
441	Bridge Protective Assembly	Y	Y	N	B	SD
441	Misc Steel (various steel assemblies)	Y	Y	N	B	SD

441	Steel Pedestals (bridge raising)	Y	Y	N	B	SD
441	Steel Bearings	Y	Y	N	B	SD
441	Steel Bent	Y	Y	N	B	SD
441	Steel Diaphragms	Y	Y	N	B	SD
441	Steel Finger Joint	Y	Y	N	B	SD
441	Steel Plate Girder	Y	Y	N	B	SD
441	Steel Tub-Girders	Y	Y	N	B	SD
441	Erection Plans, including Falsework	Y	N	Y	A	WD
449	Sign Structure Anchor Bolts	Y	Y	N	T	SD
450	Railing	Y	Y	N	A	SD
462	Concrete Box Culvert	Y	Y	N	C	SD
462	Concrete Box Culvert (Alternate Designs Only,calcs reqd.)	Y	Y	Y	B	SD
464	Reinforced Concrete Pipe (Jack and Bore only; ONLY when requested)	Y	Y	Y	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets	Y	Y	N	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets (Alternate Designs Only, calcs req'd.)	Y	Y	Y	B	SD
466	Pre-cast Headwalls and Wingwalls	Y	Y	N	A	SD
467	Pre-cast Safety End Treatments	Y	Y	N	A	SD
495	Raising Existing Structure (calcs reqd.)	Y	Y	Y	B	SD
610	Roadway Illumination Supports (Non-Standard only, calcs reqd.)	Y	Y	Y	BRG	SD
613	High Mast Illumination Poles (Non-standard only, calcs reqd.)	Y	Y	Y	BRG	SD
627	Treated Timber Poles	Y	Y	N	T	SD
644	Special Non-Standard Supports (Bridge Mounts, Barrier Mounts, Etc.)	Y	Y	Y	T	SD
647	Large Roadside Sign Supports	Y	Y	Y	T	SD
650	Cantilever Sign Structure Supports - Alternate Design Calcs.	Y	Y	Y	T	SD
650	Sign Structures	Y	Y	N	T	SD
680	Installation of Highway Traffic Signals	Y	Y	N	T	SD
682	Vehicle and Pedestrian Signal Heads	Y	Y	N	T	SD
684	Traffic Signal Cables	Y	Y	N	T	SD
685	Roadside Flashing Beacon Assemblies	Y	Y	N	T	SD
686	Traffic Signal Pole Assemblies (Steel) (Non-Standard only)	Y	Y	Y	T	SD
687	Pedestal Pole Assemblies	Y	Y	N	T	SD
688	Detectors	Y	Y	N	A	SD
784	Repairing Steel Bridge Members	Y	Y	Y	B	WD
SS	Prestr Concr Crown Span	Y	Y	N	B	SD
SS	Sound Barrier Walls	Y	Y	Y	A	SD
SS	Camera Poles	Y	Y	Y	TMS	SD
SS	Pedestrian Bridge (Calcs req'd.)	Y	Y	Y	B	SD
SS	Screw-In Type Anchor Foundations	Y	Y	N	T	SD
SS	Fiber Optic/Communication Cable	Y	Y	N	TMS	SD
SS	Spread Spectrum Radios for Signals	Y	Y	N	T	SD
SS	VIVDS System for Signals	Y	Y	N	T	SD

SS	CTMS Equipment	Y	Y	N	TMS	SD

Notes:

1. Document flow for Working Drawings differs from Shop Drawings in that Working Drawings must be submitted to the Engineer rather than the Engineer of Record and they are for the information of the Engineer only; an approval stamp and distribution to all project offices is not required.

Key to Reviewing Party

A - Area Office

Area Office	Email Address
Montgomery Area Office	HOU-MONTAShpDrwgs@txdot.gov

B - Houston Bridge Engineer

Bridge Design (Houston TxDOT)	HOU-BrgShpDrwgs@txdot.gov

BRG - Austin Bridge Division

Bridge Design (Austin TxDOT)	BRG_ShopPlanReview@txdot.gov

C - Construction Office

Construction	HOU-ConstrShpDrwgs@txdot.gov
Laboratory	HOU-LabShpDrwgs@txdot.gov

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

Item 7: Legal Relations and Responsibilities

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

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

Document and coordinate with the USACE, if required, before hauling any excavation from or hauling any embankment to a USACE permit area by either 1 or 2 below:

1. **Restricted Use of Materials for the Previously Evaluated Permit Areas.** Document both the Project Specific Locations (PSL) and their authorization. Maintain copies for review by the Department or any regulatory agency. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project:
   a. Suitable excavation of required material in the areas shown on the plans and cross sections as specified in the Item, "Excavation" is used for permanent or temporary fill (under the Item, "Embankment") within a USACE permit area.
   b. Suitable embankment (under the Item, "Embankment") from within the USACE permit area is used as fill within a USACE evaluated area.
   c. Unsuitable excavation or excess excavation, "Waste" (under the Item, "Excavation"), that is disposed of at a location approved within a USACE evaluated area.

2. **Contractor Materials from Areas Other than Previously Evaluated Areas.** Provide the Department with a copy of USACE coordination or approvals before initiating any activities for an area within the project limits that has not been evaluated by the USACE or for any off right of way locations used for the following, but not limited to, haul roads, equipment staging areas, borrow and disposal sites:
   a. The Item, "Embankment" used for temporary or permanent fill within a USACE permit area.
   b. Unsuitable excavation or excess excavation, "Waste" (under the Item, "Excavation"), that is disposed of outside a USACE evaluated area

Before bidding on this project, obtain a copy of the complete U.S. Army Corps of Engineers Individual Permit Number SWG-2020-00631 at the Area Engineer's office. Review the permit before bidding on the project and become aware of its conditions.

Place erosion control measures around the perimeter of impacted wetlands as shown in the above mentioned U.S. Army Corps of Engineers Nationwide permits. During staging and construction operations, equipment is not allowed in the Waters of the United States.

Do not place temporary fill in areas determined to be wetlands. This prohibition includes constructing staging areas, temporary fills or other actions that would result in placing fill in wetlands within the right of way, which are not addressed in the plans. The Engineer will coordinate with the Houston District Environmental Section to determine if wetlands are present on this project before placing temporary fill. If wetlands exist, obtain the appropriate permits from the U.S. Army Corps of Engineers.

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, GALVESTON DISTRICT
2000 FORT POINT RD
GALVESTON, TEXAS 77550

September 21, 2021

Evaluation Branch

SUBJECT: Permit No. SWG-2021-00631; Nationwide Permit Verification; Texas Department of Transportation Control # 0177-14-039

Ms. Sue Theiss
Texas Department of Transportation
Houston District
P.O. Box 1386
Houston, TX 77251-1386

Dear Ms. Theiss,

This is in reference to your request, dated August 30, 2021, to temporarily discharge a total of 311 cubic yards of fill material into 0.38 acre of Wetland 1, palustrine emergent (PEM) wetland, and 0.01-acre of Wetland 2, palustrine forested wetland, during the placement of a temporary construction access road. The project also involves the permanent discharge of a total of 21 cubic yards of fill material into 0.01 acre of Wetland 1, PEM wetland, and 63 linear feet (0.01-acre) of Stream 1, an unnamed tributary of Caney Creek, during the replacement of State Loop (SL) 494 bridge involving placement of bridge columns and floodplain mitigation grading. The replacement bridge will be 1,100-feet-long by 58-feet-wide with drilled bridge columns. The project site is located in within wetlands and an unnamed tributary of Caney Creek along State Loop 494 starting at Payne Road/Roberts Road and ending at Via Principale Parkway, in New Caney, in Montgomery County, Texas.

This request is verified by Nationwide Permit (NWP) 14 pursuant to Section 404 of the Clean Water Act. This NWP verification is valid provided the activity is compliant with the enclosed plans, in 11 sheets. In addition, the activity must be in compliance with the NWP General/Regional Conditions, and the Section 401 Water Quality Certification, which can be found at: http://www.swg.usace.army.mil/Business-With-Us/Regulatory/Permits/Nationwide-General-Permits/. A hard copy can be provided to you upon request.

NWP 14. Linear Transportation Projects: Authorizes activities required for crossings of waters of the United States associated with the construction, expansion, modification, or improvement of linear transportation projects. Temporary structures must be removed, to the maximum extent practicable, after their use has been discontinued, Temporary fills must be removed in their entirety and the affected areas returned to preconstruction elevations. The affected areas must be revegetated, as appropriate.

The NWP verification is valid until the NWP is modified, reissued, or revoked. The subject NWPs authorized in 2021 are scheduled to be modified, reissued, or revoked prior to March 15, 2026. It is incumbent upon you to remain informed of changes to the NWPs. We will issue a public notice when the NWPs are reissued. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant NWP is modified or revoked, you will have 12 months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this NWP.

The following special conditions have been added to your authorization:

1. The permittee shall not initiate activities in the permit area associated with this permit, which have not previously been evaluated by the Corps as part of the permit review for this project, until such work has been submitted to and approved by the Corps. Such activities include, but are not limited to, haul roads, equipment staging areas, and borrow and disposal sites. The permit area includes all waters of the United States affected by activities associated with the project, as well as any additional area(s) of non-waters of the United States in the immediate vicinity of, directly associated with, and/or affected by, activities in waters of the United States. Special restrictions may be required for such work. The permittee shall develop procedures to ensure that contractors are aware of this condition and encourage contractors to coordinate their selection of these sites with the permittee as soon as possible to avoid construction delays. The permittee, or its designated agent/contractor, may coordinate with the Corps on compliance with this special condition.

2. The permittee shall conduct a meeting with the construction contractor or contractors detailing the terms and conditions of this permit prior to commencing construction activities of the project. The permittee shall notify the Galveston District of the pre- construction meeting at least two weeks in advance of the scheduled meeting. Within two weeks following the meeting, the permittee will also provide written confirmation to the Corps that the meeting was held.

The impacts to waters of the United States (U.S.) associated with this NWP verification are based on a Preliminary Jurisdictional Determination (PJD) for your subject site. If you wish, you may request an Approved Jurisdictional Determination (AJD) (which may be appealed), by submitting a written request to us within 30 days from the date of this letter. Please note that if you request an AJD and then decide to appeal it, the appeal will not be accepted if any work has started in waters of the U.S. or that would alter the hydrology of waters of the U.S.

The jurisdictional determination included herein has been conducted to identify the jurisdictional status of aquatic resources for purposes of the Clean Water Act for the particular site identified in this request. This jurisdictional determination may not be valid for the Wetland Conservation Provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should discuss the applicability of a certified wetland determination with the local USDA service center, prior to starting work.

If you have any question regarding this verification, please contact Elizabeth Shelton at the letterhead address or by telephone at 409-766-3937. Please notify the Chief of the Compliance Branch in the Galveston District Regulatory Division in writing at the letterhead address, upon completion of the authorized project.

FOR THE DISTRICT COMMANDER:

Janet Thomas Botello

Janet Thomas Botello
Chief, Evaluation
Branch

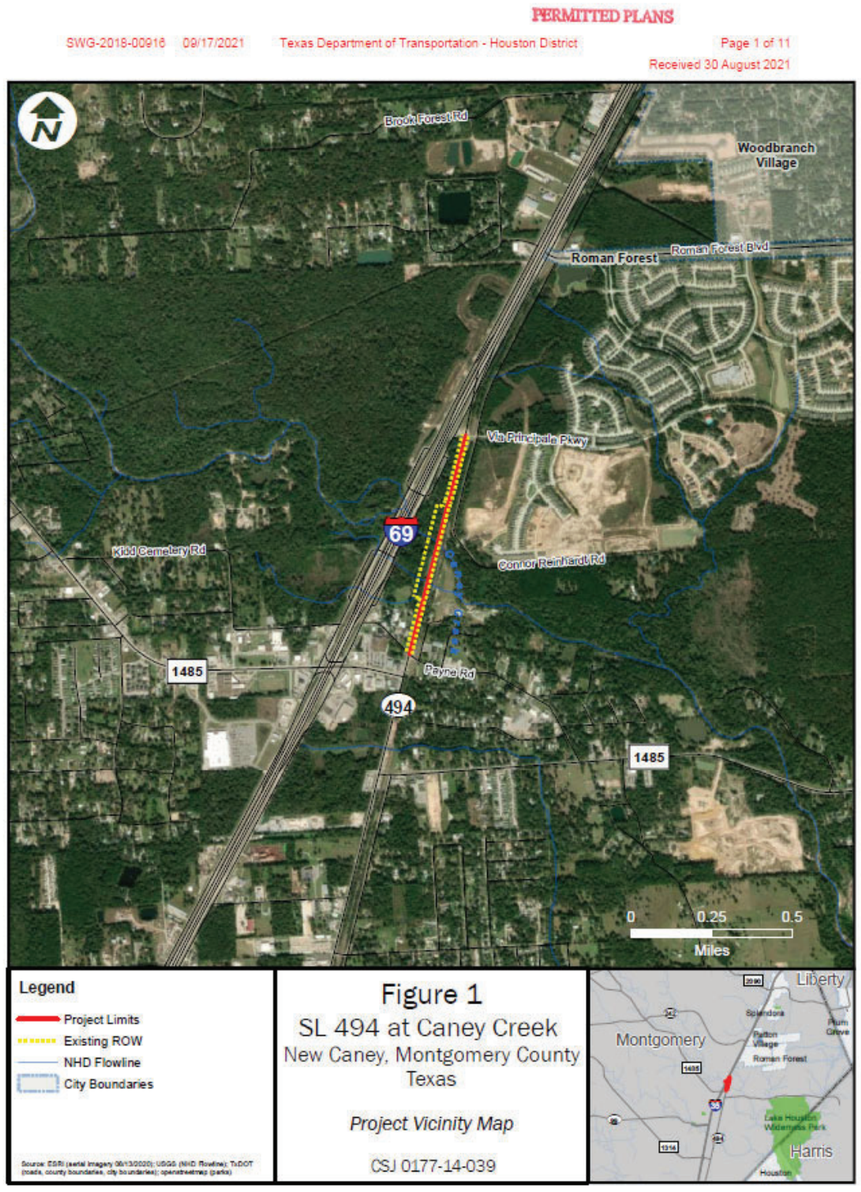
cc w/Encl.
Mr. Andrew Leske
Texas Department of
Transportation Houston District
P.O. Box 1386
Houston, TX 77251-1386

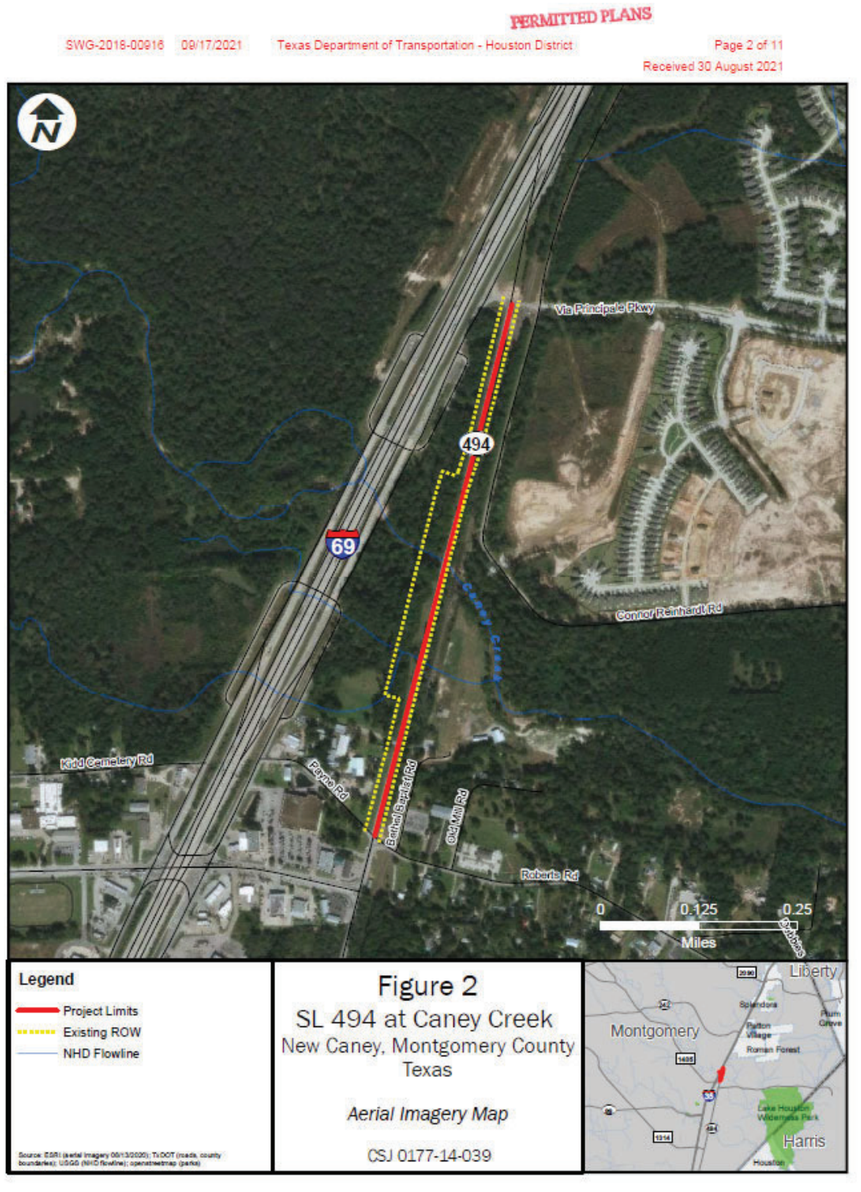
Eighth Coast Guard District, New Orleans, LA

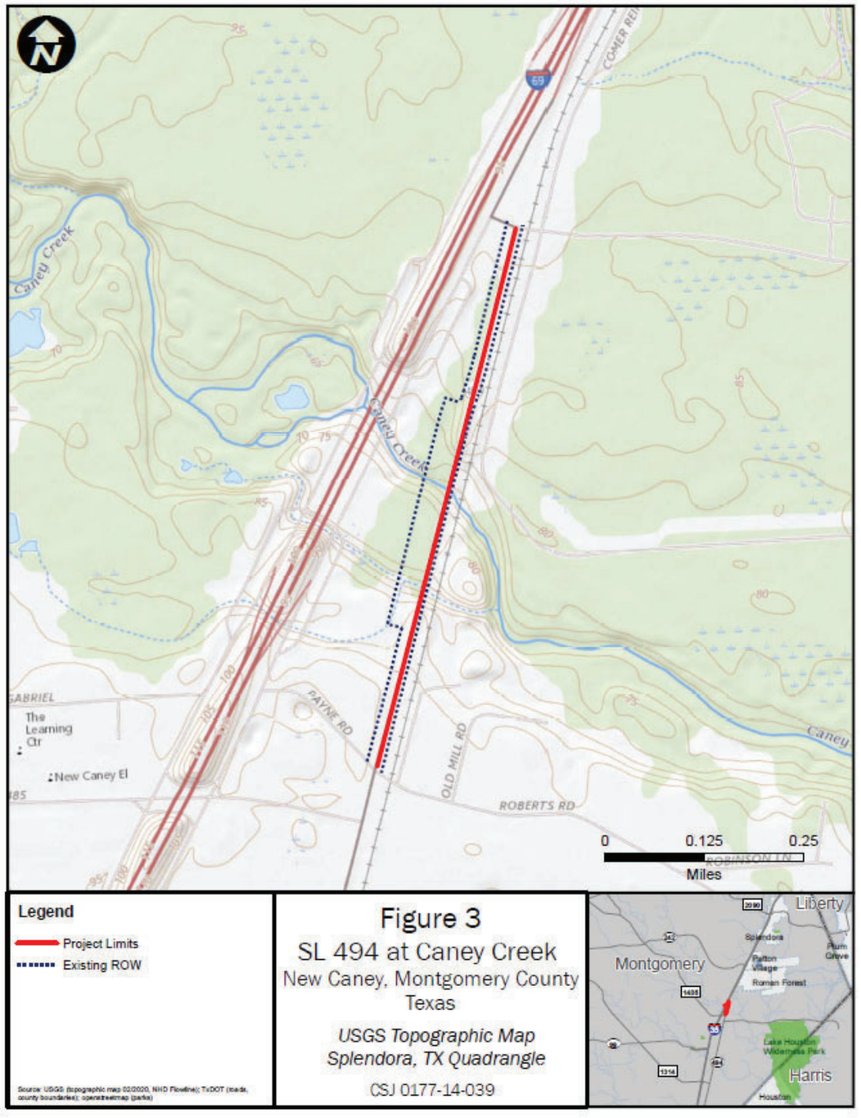
National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Coast & Geodetic Survey, Silver Spring, MD

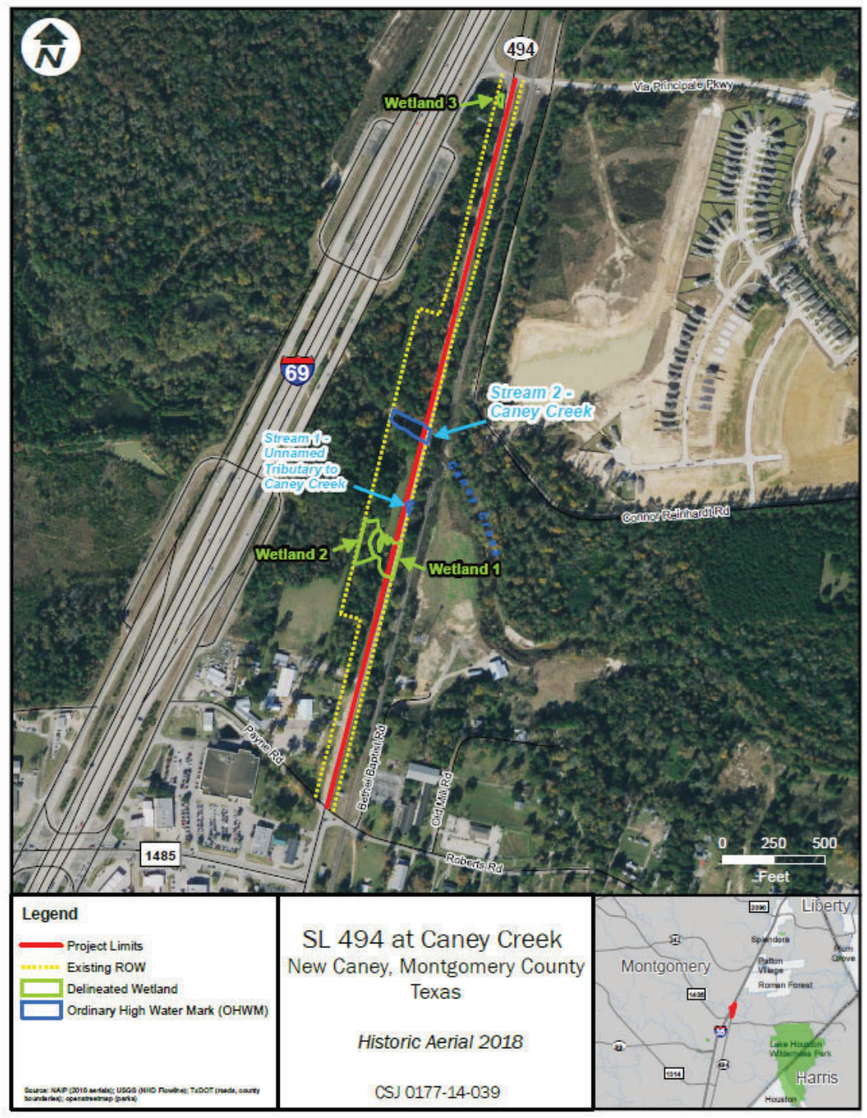
Texas Commission on Environmental

Quality Texas General Land Office


PERMITTED PLANS
SWG-2018-00916 09/17/2021 Texas Department of Transportation - Houston District Page 1 of 11
Received 30 August 2021
Brook Forest Rd
Woodbranch Village
Roman Forest
Roman Forest Blvd
Via Principale Pkwy
Connor Reinhardt Rd
Kidd Cemetery Rd
Payne Rd
69
494
1485
1485
0 0.25 0.5
Miles
Legend
Project Limits
Existing ROW
NHD Flowline
City Boundaries
Figure 1
SL 494 at Caney Creek
New Caney, Montgomery County
Texas
Project Vicinity Map
CSJ 0177-14-039
Liberty
Montgomery
Harris


PERMITTED PLANS
SWG-2018-00916 09/17/2021 Texas Department of Transportation - Houston District Page 2 of 11
Received 30 August 2021
Via Principale Pkwy
494
69
Connor Reinhardt Rd
Kidd Cemetery Rd
Payne Rd
Bethel Baptist Rd
Old Mill Rd
Roberts Rd
0 0.125 0.25
Miles
Legend
Project Limits
Existing ROW
NHD Flowline
Figure 2
SL 494 at Caney Creek
New Caney, Montgomery County
Texas
Aerial Imagery Map
CSJ 0177-14-039
Liberty
Montgomery
Harris



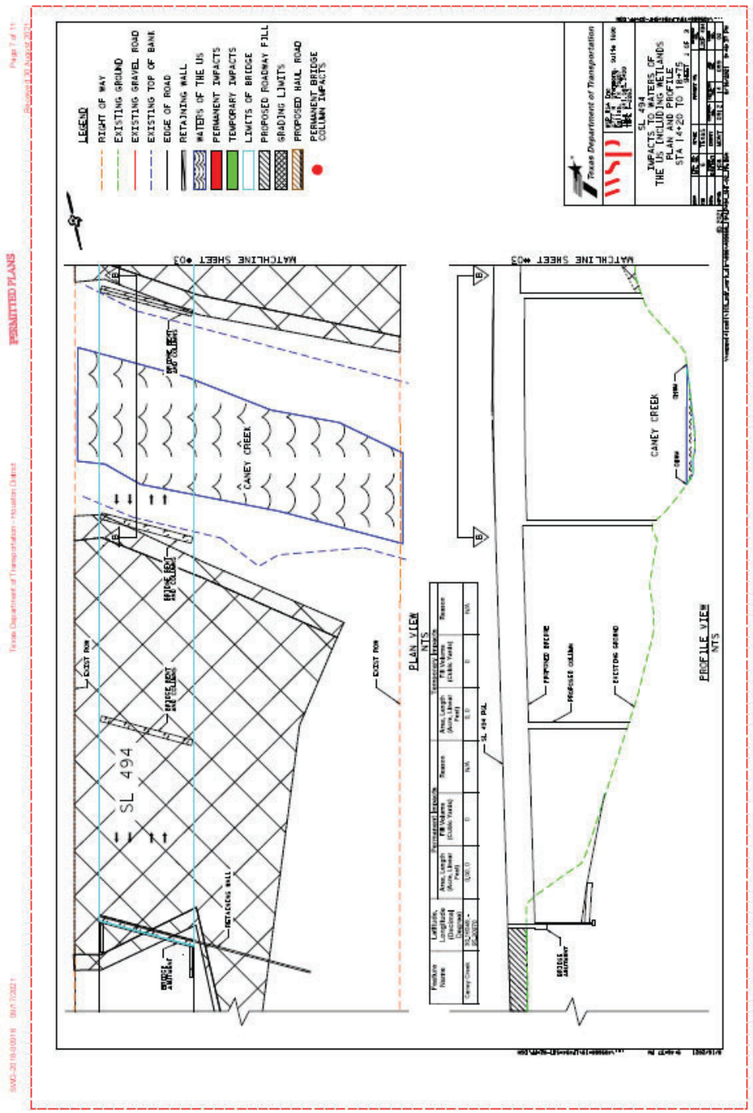


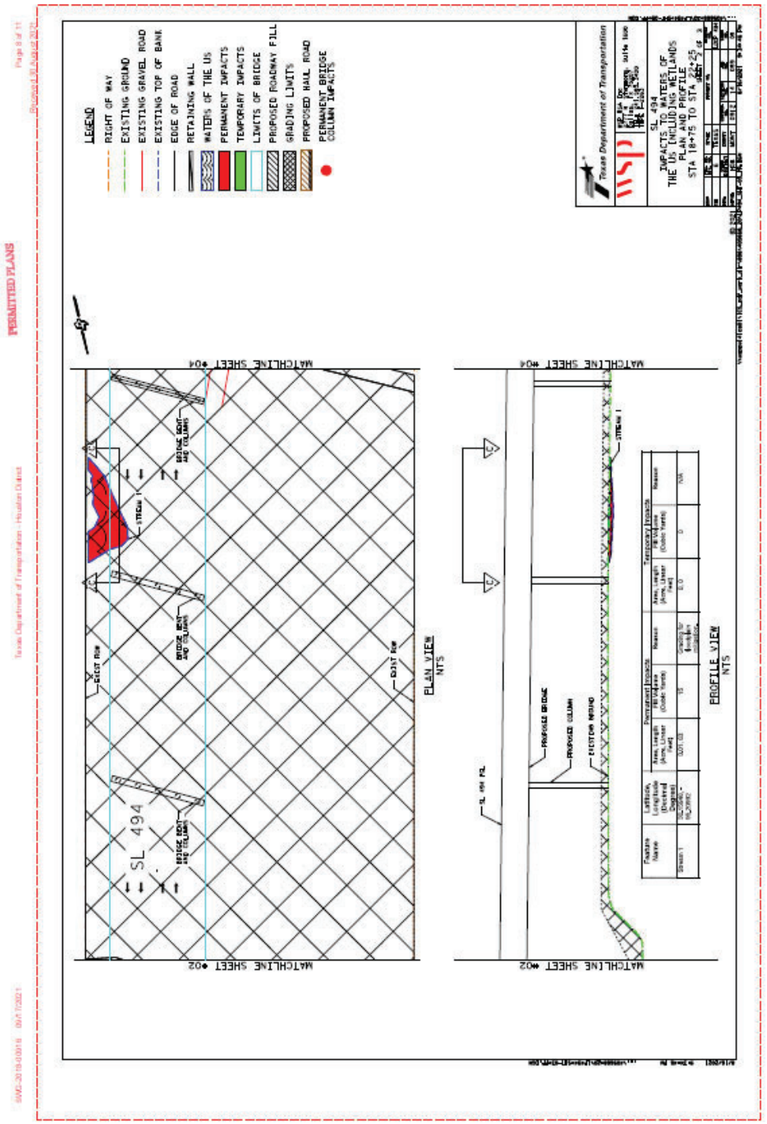
Section 404/10 Impacts Table

State Loop 494 at Caney Creek from Payne Road/Roberts Road to Via Principale Parkway

0177-14-039

Waterbody or wetland characteristics					Total Section 404 Impacts for WATERBODY OR WETLAND					
					Temporary			Permanent		
Waterbody or wetland number	Name	Type	Latitude, Longitude	Acres within project area (all waterbodies and wetlands)	Temporary waterbody or wetland impacts (acres)	Linear feet/acres within project area (streams only)	Temporary stream impacts (linear feet/acres)	Cubic yards (CY) of fill material to be temporarily discharged	Permanent waterbody or wetland impacts (acres)	Permanent stream impacts (linear feet/acres)	Cubic yards (CY) of fill material to be permanently discharged
Wetland 1	Unnamed wetland	Palustrine emergent	30.15876, -95.21029	0.46	0.38	N/A	N/A	309	<0.01	N/A	6
Wetland 2	Unnamed wetland	Palustrine forested	30.15901, -95.21062	0.30	<0.01	N/A	N/A	2	0.00	N/A	0
Stream 1	Unnamed tributary of Caney Creek	Ephemeral stream	30.15946, -95.20992	0.01	0.00	63	0	0	0.01	63	15
Stream 2	Caney Creek	Perennial stream	30.16049, -95.20970	0.30	0.00	206	0	0	0.00	0	0
Wetland 3	Unnamed wetland	Palustrine emergent	30.16487, -95.20821	0.02	0.00	N/A	0	0	0.00	0.00	0


LEGEND
RIGHT OF WAY
EXISTING GROUND
EXISTING GRAVEL ROAD
EXISTING TOP OF BANK
EDGE OF ROAD
RETAINING WALL
WATERS OF THE US
PERMANENT IMPACTS
TEMPORARY IMPACTS
LIMITS OF BRIDGE
PROPOSED ROADWAY FILL
GRADING LIMITS
PROPOSED HAUL ROAD
PERMANENT BRIDGE COLUMN IMPACTS
SL 494
IMPACTS TO WATERS OF THE US INCLUDING WETLANDS PLAN AND PROFILE STA 14+20 TO 18+25
MATCHLINE SHEET •03
CANEY CREEK
PLAN VIEW
NTS
PROFILE VIEW
NTS
PERMITTED PLANS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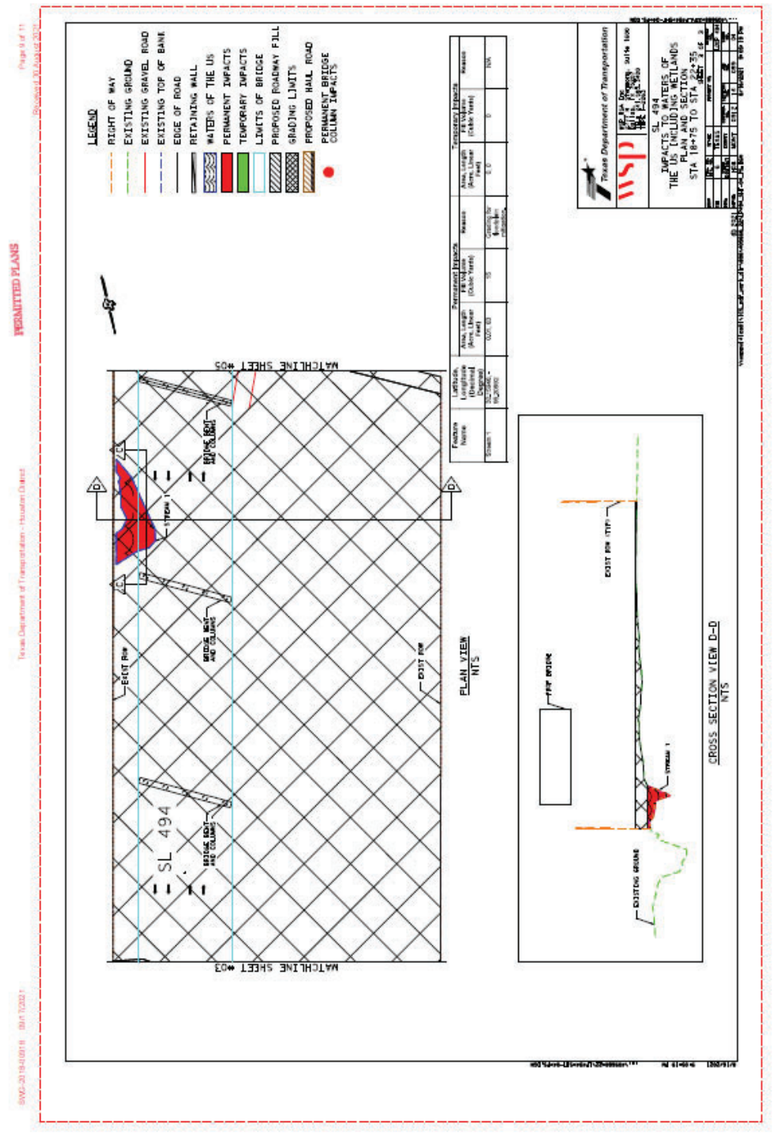
RETAINING WALL
WATERS OF THE US
PERMANENT IMPACTS
TEMPORARY IMPACTS
LIMITS OF BRIDGE
PROPOSED ROADWAY FILL
GRADING LIMITS
PROPOSED HAUL ROAD
PERMANENT BRIDGE COLUMN IMPACTS
SL 494
IMPACTS TO WATERS OF THE US INCLUDING WETLANDS PLAN AND PROFILE STA 18+75 TO STA 22+75
MATCHLINE SHEET •04
MATCHLINE SHEET •02
PLAN VIEW
NTS
PROFILE VIEW
NTS
PERMITTED PLANS


LEGEND
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EXISTING TOP OF BANK
EDGE OF ROAD
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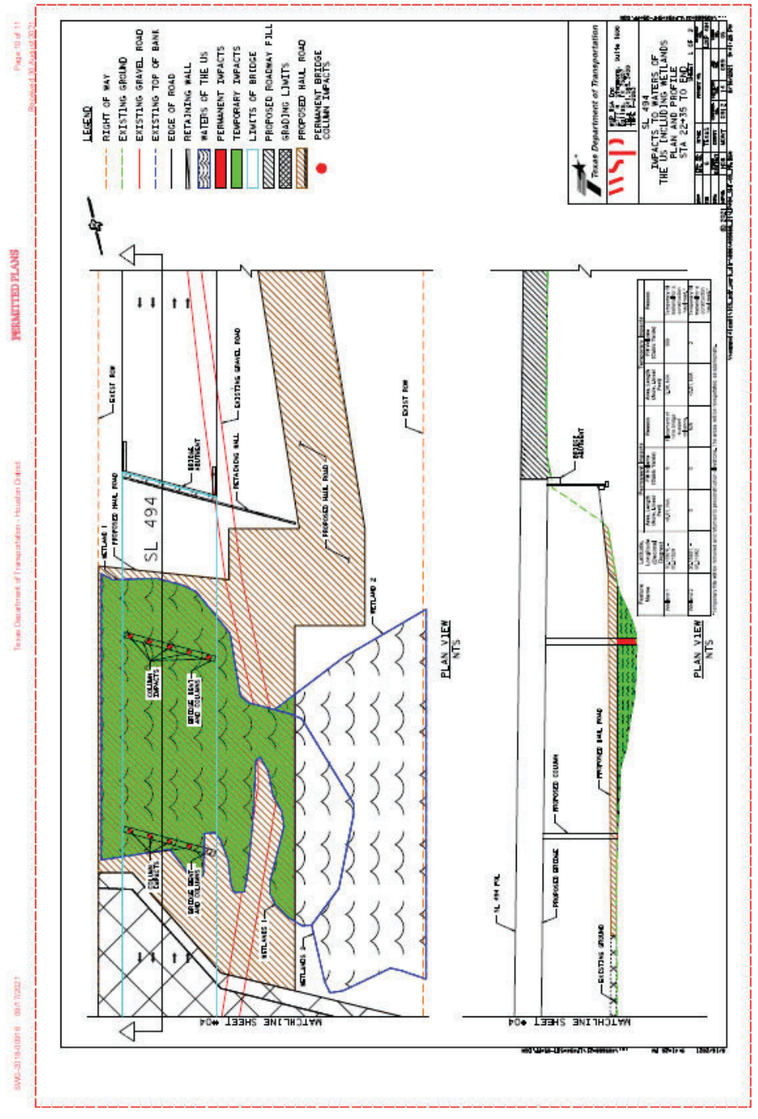
PERMANENT IMPACTS
TEMPORARY IMPACTS
LIMITS OF BRIDGE
PROPOSED ROADWAY FILL
GRADING LIMITS
PROPOSED RAIL ROAD
PERMANENT BRIDGE COLUMN IMPACTS
PERMITTED PLANS
Texas Department of Transportation
IMPACTS TO WATERS OF THE US (INCLUDING WETLANDS
PLAN AND PROFILE
STA 1+75 TO STA 22+35
SL 494
MATCHLINE SHEET #05
MATCHLINE SHEET #03
EXIST ROW
PROP ROW
BRIDGE ABUT AND COLUMNS
PLAN VIEW
NTS
CROSS SECTION VIEW D-D
NTS
EXISTING GROUND


LEGEND
RIGHT OF WAY
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EXISTING GRAVEL ROAD
EXISTING TOP OF BANK
EDGE OF ROAD
RETAINING WALL
WATERS OF THE US
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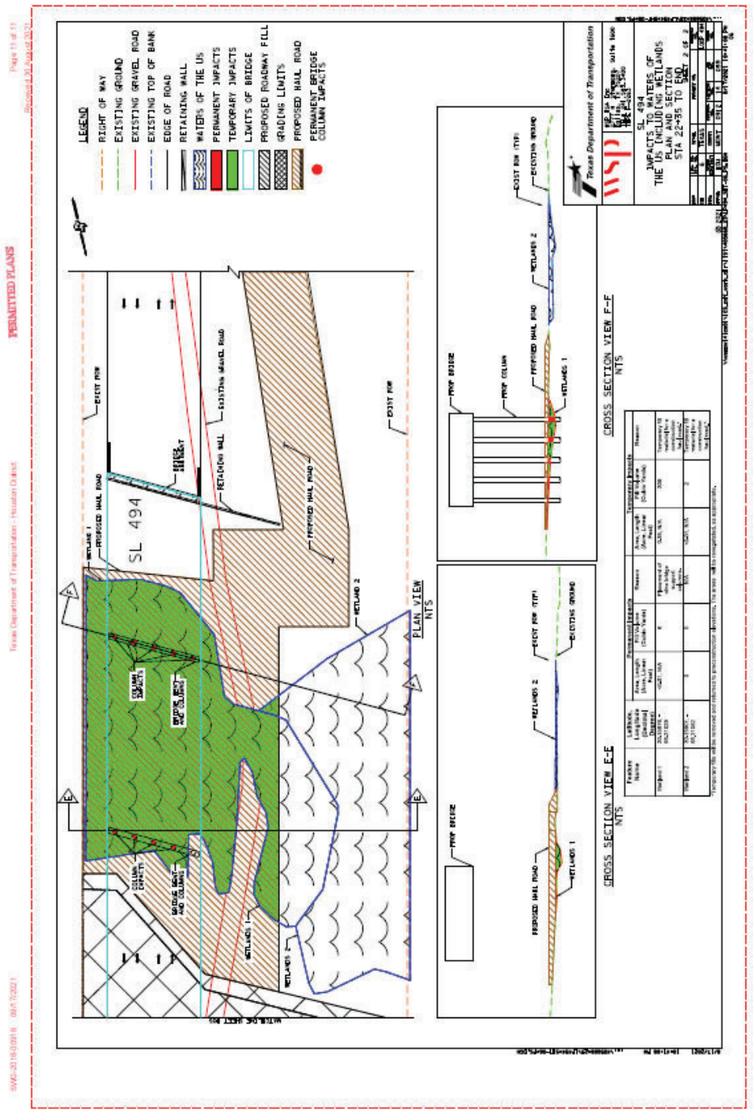
LIMITS OF BRIDGE
PROPOSED ROADWAY FILL
GRADING LIMITS
PROPOSED RAIL ROAD
PERMANENT BRIDGE COLUMN IMPACTS
PERMITTED PLANS
Texas Department of Transportation
IMPACTS TO WATERS OF THE US (INCLUDING WETLANDS
PLAN AND PROFILE
STA 22+35 TO STA
SL 494
MATCHLINE SHEET #04
EXIST ROW
PROP ROW
BRIDGE ABUT AND COLUMNS
PLAN VIEW
NTS
EXISTING GROUND



Avoid encroaching into the wetland areas delineated in the plans. Place erosion control measures around the wetlands as shown on the plans. No construction work or construction

equipment is permitted within this delineated area. If applicable for bridge construction, construct drilled shafts outside of this delineated area. Secure approval for the locations of field offices, material storage sites, material disposal sites, plants, borrow pits, etc. in writing before use to ensure that the proposed location is not within Jurisdictional Waters of the United States (wetlands).

Do not store any material in Waters of the United States inside the right of way without written approval.

Before construction operations begin, provide a drawing of the location of proposed temporary access roads, haul roads, or temporary fill used during construction operations to ensure that they are not within Jurisdictional Waters of the United States.

If the Contractor elects to use an area not permitted and determined to be within Jurisdictional Waters of the United States during the prosecution of the work, the Contractor will hold the Department harmless for delays caused by procuring the necessary permits from the United States Army Corps of Engineers.

Maintain the roadway slope stability. Maintaining slope stability is subsidiary to the various bid items.

If the work is on or in the vicinity of an at-grade railroad crossing, involves incidental work on railroad right of way, or involves construction of a railroad grade separation structure, notify the railroad company's Division Engineer and the Department's Project Engineer at least 30 days before performing any work on the railroad right of way and make arrangements for railroad flaggers unless otherwise shown in the contract. Obtain the required Railroad Right of Entry Permit from the railroad company. Payment of applicable permit fees is the responsibility of the Contractor. Acquiring the Railroad Right of Entry Permit is a lengthy process, allow sufficient time for this.

The State shall require the State's Contractor to name the Union Pacific Railroad on the general insurance policy.

The nesting / breeding season for migratory birds is February 15 through September 30.

Conduct any tree removal outside of the migratory bird nesting season. If this is not possible due to scheduling, then exercise caution to remove only those trees with no active nests. Do not destroy nests on structures or in trees within the project limits during the nesting / breeding season.

Take measures to prevent the building of nests on any structures or trees within the project limits throughout the duration of the construction if work / removal will be performed during the nesting / breeding season. This can be accomplished by application of bird repellent gel, netting by hand every 3 to 4 days, or any other non-threatening method approved by the Houston District Environmental Section. Obtain this approval well in advance of the planned use.

Contact the Houston District Environmental Section at 713-802-5244. The cost of this work is subsidiary to the various bid items.

No significant traffic generator events have been identified.

Item 8: Prosecution and Progress

The Department will not adjust the number of days for the project and milestones, if any, due to differences in opinion regarding any assumptions made in the preparation of the schedule or for errors, omissions, or discrepancies found in the time determination schedule.

The road-user cost liquidated damages are $570.00 per day. After the project is substantially complete, the liquidated damages become those based on contract administration costs.

Working days will be computed and charged based on a *standard* workweek in accordance with Section 8.3.3.2.2.

The maximum number of days the time charges on this contract may be suspended due to contractor mobilization, and material fabrication/accumulation or processing delays is 90 days. The Engineer and the Contractor may mutually agree, in writing, to decrease this maximum number of days.

Item 100: Preparing Right of Way

Clean existing ditches under fill sections of undesirable materials including grass, muck, and trash. Perform this work in accordance with the Construction section of the Item, "Preparing Right of Way." This work is subsidiary to this bid Item.

The Item, "Preparing Right of Way" will be measured for payment only in those designated areas shown on the plans. Preparing right of way necessary to perform construction that is outside designated areas is subsidiary to this bid Item.

Remove abandoned utilities that are in conflict with the new utilities, at no expense to the Department.

Reestablish and maintain right of way stakes after completing the right of way preparation activities and until the new utilities are in place.

Remove and assume ownership of the existing ground mounted signs within the limits of roadway construction unless otherwise noted or directed. This work is subsidiary to the Item, "Preparing Right of Way."

Item 104: Removing Concrete

Removing concrete curb is paid as a separate bid item if the existing pavement on which it rests is not removed at the same time.

Item 105: Removing Treated and Untreated Base and Asphalt Pavement

Removing curb on cement-treated and untreated base or on cement treatment being removed at the same time is subsidiary to this bid Item.

Item 104: Removing Concrete
Item 105: Removing Treated and Untreated Base and Asphalt Pavement
Item 305: Salvaging, Hauling, and Stockpiling Reclaimable Asphalt Pavement

Case 2 - ACP over cement or lime treatment

Removing the Asphalt Concrete Pavement (ACP) material is paid under the Item, "Salvaging, Hauling, and Stockpiling Reclaimable Asphalt Pavement."

Removing the cement or lime treatment is paid under the Item, "Removing Treated and Untreated Base and Asphalt Pavement."

Remove the ACP separately from the cement or lime treatment. Make the removed depth as uniform as possible during each removal pass if the pavement depth being removed is composed of different asphalt layers. Unless otherwise approved, stockpile the RAP of differing types of quality separately by its intended use such as for the asphalt treatment, cement treatment, lime treatment, or asphalt concrete pavement. Break, crush, or mill the stockpiled materials so that 100 percent pass the 2-in. sieve.

Case 3 - ACP over concrete pavement

The removal of the Asphalt Concrete Pavement (ACP) material is paid under the Item, "Salvaging, Hauling, and Stockpiling Reclaimable Asphalt Pavement."

Removing the concrete pavement material is paid under the Item, "Removing Concrete."

Item 110: Excavation

If manipulating the excavated material requires moving the same material more than once to accomplish the desired results, the excavation is measured and paid for only once regardless of the manipulation required.

Transition the ditch grades and channel bottom widths at structure locations. Use only approved channel excavation in the embankment.

Item 132: Embankment

If salvaged base is used for the embankment material, break it into small pieces to achieve the required density and to facilitate placing in the embankment. Obtain approval of the material before placing in the embankment.

Furnish Type C material with a maximum Liquid Limit (LL) of 65, a minimum Plasticity Index (PI) of 5, and composed of suitable earth material such as loam, clay, or other materials that form a suitable embankment.

The embankment material used on the project which has a Liquid Limit exceeding 45 will be tested for Liquid Limits at the rate of one test per 20,000 cu. yd. or per total quantity less than 20,000 cu. yd., unless otherwise directed. Only use material that passes the above tests.

Item 162: Sodding for Erosion Control
Item 166: Fertilizer
Item 168: Vegetative Watering

Refer to the "Fertilizer, Seed, Sod, Straw, Compost, and Water" plan sheet for material specifications, application rates, and for watering requirements.

Item 204: Sprinkling

Perform subsidiary sprinkling as required under various other items in accordance with the Item, "Sprinkling."

Sprinkling for dust control is subsidiary to the various bid items.

Item 210: Rolling

Use a medium pneumatic roller meeting the requirements of Item 210 as directed. This work is subsidiary to the various bid items. On every asphalt shot, use a minimum of 3 pneumatic rollers or as directed. Use approved rolling patterns. Successive asphalt shots will not be allowed until acceptable rolling has been accomplished on the preceding asphalt shot.

Item 260: Lime Treatment (Road-Mixed)

For slurry placing, before discharging through the distributors, sufficiently agitate or mix the lime and water to place the lime in suspension and to obtain a uniform mixture.

The Engineer will observe the lime treatment that the Contractor elects to open to construction traffic immediately after compaction. If the construction traffic damages the subgrade, route the traffic off the damaged section in accordance with the standard specification. If the construction traffic does not damage the subgrade, cure the subgrade until other courses of material cover it. Apply these courses within 14 days with a maximum curing period of 7 days.

Place the hydrated and the commercial lime as a water suspension or slurry according to the slurry placing method shown in Section 260.4.3.2, "Slurry Placement."

Use the type of lime at particular locations as directed.

Place the quicklime dry or as a slurry.

For the dry quicklime, a spreader box is not required if the lime material is evenly distributed.

In limited areas, the Contractor may construct the lime slurry subgrade under a sequence of work in which the application, mixing, and compaction are completed in the same working day, if approved by the Engineer.

Provide documentation from certified public scales showing gross, tare, and net weights. Provide producer's delivery tickets also showing gross, tare, and net weights. Completely empty the lime trailers at the project site. The Engineer may direct the Contractor to reweigh any shipment of lime on certified scales. The cost of this operation is subsidiary to the Item, "Lime Treatment (Road-Mixed)."

The percentage of lime shown on the plans is estimated on the basis of engineering tests. If soil tests made during construction indicate properties different than those originally anticipated, the Engineer may vary the percentage of the lime to provide soil characteristics similar to those of the preliminary tests.

Mix the lime with the new base material in an approved pug mill type stationary mixer.

Item 292: Asphalt Treatment (Plant-Mixed)
Item 3076: Dense-Graded Hot Mix Asphalt

Unless otherwise shown on the plans, RAP generated by this project will become the property of the Contractor for use in the current construction project or in future projects.

Item 292: Asphalt Treatment (Plant-Mixed)

If using the iron ore topsoil as the primary aggregate, meaning 80 percent or more by weight of the total mixture, the requirements for the water susceptibility test are waived.

Mixtures containing the iron ore topsoil are exempted from test methods TEX-217-F (Part I, separation of deleterious material and Part II, decantation test for coarse aggregate) and TEX-203-F (Sand Equivalent Test).

Assume responsibility for proportioning the materials entering the asphalt mixture, regardless of the type of plant used.

Furnish the mix designs for approval.

Compact the courses to a minimum density of 95 percent of the maximum density as determined using test method TEX-126-E.

Item 305: Salvaging, Hauling, and Stockpiling Reclaimable Asphalt Pavement

Unless otherwise shown on the plans, RAP generated by this project will become the property of the Contractor for use in the current construction project or in future projects.

Items 360, 420, and 421: All Concrete Items

For the Department's concrete cylinder split samples, transport the test cylinders to the Houston District Laboratory located at 7600 Washington Avenue in Houston, or to the appropriate Area Laboratory, when applicable. Transporting the test cylinders is subsidiary to the various bid items.

The approach pavement is paid for under the Item, "Concrete Pavement."

Item 400: Excavation and Backfill for Structures

Plugging existing pipe culverts is subsidiary to the various bid items.

If Recycled Cement Treatment (Type D) is included in the plans, the following additional requirements apply:

1. Use only approved sand, crushed concrete, or salvaged base free from deleterious matter, as aggregate for cement-stabilized backfill.

2. Provide crushed concrete or salvaged base backfill material in accordance with the Item, "Cement Treatment (Plant-Mixed)(Type D)" (base or crushed concrete), except the recycled Type D material must not contain Reclaimed Asphalt Pavement (RAP).

3. For backfill material below the spring line of pipes, use cement-stabilized sand rather than Recycled Type D backfill material.

4. For the cement-stabilized sand backfill, use a minimum of 7 percent of hydraulic cement based on the dry weight of backfill material. The cement content for the crushed concrete and salvaged base is specified in the Item, "Cement Treatment (Plant-Mixed) (Type D)."

5. Place and compact the stabilized backfill material using a gradation that provides a dense mass without segregating and is impervious to passing of water.

Item 416: Drilled Shaft Foundations

Include the cost for furnishing and installing anchor bolts mounted in the drilled shafts in the unit bid price for the various diameter drilled shafts.

The Department may test using ultrasonic methods the anchor bolts for overhead sign supports, light standards, and traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 420: Concrete Substructures

Unless otherwise noted, use Class C concrete with an ordinary surface finish for signal, lighting, or sign structure foundations.

Item 421: Hydraulic Cement Concrete

Entrained air is required in all slip formed concrete (bridge rail, concrete traffic barrier, pavement, etc.), but is not required for other structural concrete. Adjust the dosage of air entraining agent for low air content as directed or allowed by the Engineer. If entrained air is provided where not required, do not exceed the manufacturer's recommended dosage.

Item 423: Retaining Walls

Place concrete riprap mow strips for retaining walls as shown on the plans and in accordance with the Item, "Riprap." Use Class B concrete reinforced with No. 4 bars spaced at 18 in. centers each direction and placed 2 in. below the surface. This work is paid for under the Item, "Riprap."

Provide and maintain positive drainage away from the earth wall system, including the leveling pad, for the contract duration.

Approved Mechanically Stabilized Earth (MSE) Wall Systems are listed at the website below or from the Department's home page>Business>Bridge>Retaining Walls>Approved MSE Panel Systems:

http://www.txdot.gov/business/resources/approved-systems/mse-wall.html

Item 427: Surface Finishes for Concrete

Provide a Surface Area I finish for structures. Use concrete paint for the surface finish.

Item 432: Riprap

If stone riprap is shown on the plans, use common stone riprap in accordance with Section 432.2.3.3, placed dry in accordance with Section 432.3.2.3. Do not grout. Crushed concrete may also be used.

Item 442: Metal for Structures

Prestressed concrete panels will not be allowed on steel structures.

Item 464: Reinforced Concrete Pipe

Concrete collars are subsidiary to the various bid items except for those specified on the plans for stage construction, which are paid for under the Item, "Concrete Substructures" as "Cl C Conc (Collar)."

Rubber gaskets are required for concrete pipe joints except for connections of safety end treatments, driveway culverts, and joints between the existing pipes and extensions.

Open, install, and backfill each section, or a portion of a section, in the same day at locations requiring pipe culverts under existing roadways.

Place the pipe drains across existing roadways half at a time to allow passage of traffic. No trenches may remain open overnight.

Known locations of existing stub-outs are shown on the plans, but these stub-outs may be in a different position or condition. Delays, inconveniences, or additional work required will not be a basis for additional compensation.

Provide leave-outs or holes in the proposed storm drain structures and pipes for drainage during interim construction. This work is subsidiary to the various bid items.

The flowline elevations of side road structures are based on the proposed ditches. Field-verify these elevations and adjust them as necessary to meet the field conditions. Before placing these structures, prepare and submit for approval, the data (revised elevation, alignment, length, etc.) for the adjusted structures.

If groundwater is encountered while installing the storm drain system, install a suitable dewatering system to facilitate construction of the storm drains. The costs for materials and

labor required to install and maintain this system are subsidiary to the Item, "Reinforced Concrete Pipe."

Items 496: Removing Structures

Assume ownership and remove from the project site, items salvaged from the existing bridge decks and steel beams. The approximate weight of the steel beams is *7* tons, *56* tons and *11* tons.

Do not permit debris resulting from the structure removal or construction activities to enter a natural or manmade waterway such as drainage channels, rivers, streams, bays, etc. Remove debris which falls into such waterways. This work is subsidiary to the Item, "Removing Structures."

Item 502: Barricades, Signs, and Traffic Handling

Use a traffic control plan for handling traffic through the various phases of construction. Follow the phasing sequence unless otherwise agreed upon by the Area Engineer and the Project Manager. Ensure this plan conforms to the latest "Texas Manual on Uniform Traffic Control Devices" and the latest Barricade and Construction (BC) Standard Sheets.

Submit changes to the traffic control plan to the Area Engineer. Provide a layout showing the construction phasing, signs, striping, and signalizations for changes to the original traffic control plan.

Furnish and maintain the barricades and warning signs, including the necessary temporary and portable traffic control devices, during the various phases of construction. Place and construct these barricades and warning signs in accordance with the latest "Texas Manual on Uniform Traffic Control Devices" for typical construction layouts.

Cover work zone signs when work related to the signs is not in progress, or when any hazard related to the signs no longer exists.

Keep the delineation devices, signs, and pavement markings clean. This work is subsidiary to the Item, "Barricades, Signs, and Traffic Handling."

If a section is not complete before the end of the workday, pull back the base material to the existing pavement edge on a 6H: 1V slope. Edge drop-offs during the hours of darkness are not permitted.

Before detouring traffic onto the mainlane shoulders, remove dirt, debris, vegetation, and other deleterious material from the surface of the shoulders. Appropriately sign the detour in an approved manner. This work is subsidiary to the various bid items.

Cover or remove the permanent signs and construction signs that are incorrect or that do not apply to the current situation for a particular phase.

Do not mount signs on drums or barricades, except those listed in the latest Barricades and Construction standard sheets.

Use traffic cones for daytime work only. Replace the cones with plastic drums during nighttime hours.

Place positive barriers to protect drop-off conditions greater than 2 ft. within the clear zone that remain overnight.

Law enforcement assistance will be required for this project and is expected to be required for major traffic control changes and lane closures. Coordinate with local law enforcement and arrange for law enforcement as directed or agreed by the Engineer. Before payment will be made, complete the "Daily Report on Law Enforcement Force Account Work" (Form 318), provided by the Department and submit daily invoices that agree with this form for any day during the month in which approved services were provided.

Provide full-time, off-duty, uniformed, certified peace officers, as part of traffic control operations. The peace officers must be able to show proof of certification by the Texas Commission on Law Enforcement Officers Standards. The cost of the officers is paid for on a force account basis.

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

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

The Storm Water Pollution Prevention Plan (SWP3) consists of temporary erosion control measures needed and provided for under this Item. The disturbed area is less than one acre and use of erosion control measures is not anticipated. If physical conditions encountered at the job site require necessary controls, BMP installation, maintenance, and removal will be paid as extra work on a force account basis per Articles 4.4 and 9.7. Since the disturbed area is less than 5 acres, a "Notice of Intent" (NOI) is not required.

Use appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction staging area. Remove and dispose of materials in compliance with State and Federal laws.

Before starting construction, review with the Engineer the SWP3 used for temporary erosion control as outlined on the plans. Before construction, place the temporary erosion and sedimentation control features as shown on the SWP3.

Schedule the seeding or sodding work as soon as possible. The project schedule provides for a vegetation management plan.

After completing earthwork operations, restore and reseed the disturbed areas in accordance with the Department's specifications for permanent or temporary erosion control.

Implement temporary and permanent erosion control measures to comply with the National Pollution Discharge Elimination System (NPDES) general permit under the Clean Water Act.

Before starting grading operations and during the project duration, place the temporary or permanent erosion control measures to prevent sediment from leaving the right of way.

Item 540: Metal Beam Guard Fence

Painting the timber posts is not required.

Use timber posts for galvanized steel metal beam guard fence, except for anchorage at turned down ends.

Furnish and install wood blocks between the rail elements and the timber posts as detailed on the plans. These block-outs are subsidiary to this bid Item.

The quantity of the metal beam guard fence is subject to change.

Provide a mow strip as shown on the plans, at metal beam guard fence locations, including any guardrail end treatments.

Galvanize the rail elements supplied for this project by using a Type II Zinc Coating.

At locations requiring attachment of Metal Beam Guard Fence (MBGF) to concrete railing or concrete traffic barrier, repair and fill any existing holes in the railing or barrier that are not in the correct location for attaching the new MBGF. Perform this work in accordance with the Item, "Concrete Structure Repair." Existing anchor bolt holes that cannot be utilized must be filled with an epoxy grout before drilling new holes. Then core-drill new holes in the correct locations and repair any resulting spalls at no expense to the Department. This work is considered subsidiary to the MBGF transition section (Item 540).

Item 542: Removing Metal Beam Guard Fence

Remove and assume ownership of unsalvageable metal beam guard fence rail elements and posts. Transport and store any functional, salvageable rail elements, including steel posts, which are not reused in this project, to the Department's stockpile located at 901 N FM 3083 Rd E.

Replace removed wood posts which are unusable because of damage by the Contractor, at no expense to the Department.

Item 545: Crash Cushion Attenuators

After completing the project, return remaining unused crash cushion attenuators units to the Area Office Maintenance yard or as directed, at no cost to the Department.

A MASH compliant crash cushion attenuator is required for every temporary and permanent installation.

Item 585: Ride Quality for Pavement Surfaces

To eliminate the need for corrective action due to excessive deviations in the final surface layers, exercise caution to ensure satisfactory profile results in the intermediate paving layers (mixture).

Milling will not be allowed as a corrective action for excessive deviations in the final surface layer of hot-mix asphalt.

For Continuously Reinforced Concrete Pavement (CRCP) mainlanes and direct connectors, use Surface Test Type B and Pay Adjustment Schedule 2. For ramps use Surface Test Type A.

For asphalt mainlanes and direct connectors, use Surface Test Type B and Pay Adjustment Schedule 1. For ramps use Surface Test Type A.

Item 636: Signs

For design details not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Item 644: Small Roadside Sign Assemblies

Sign locations shown on the plans are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

Use the Texas Universal Triangular Slip Base with the concrete foundation for small ground mounted signs, unless otherwise shown in the plans.

Remove existing street name signs from existing stop signs and re-install them above the new stop signs. Removing and re-installing existing street name signs is subsidiary to the Item, "Small Roadside Sign Assemblies."

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Use Type E Super High Specific Intensity (Fluorescent Prismatic) yellow green reflective sheeting background to fabricate school signs (S1-1, S3-1, S4-3, S5-1, W16-2, SW16-9p, and SW16-7pL(R)).

Assume ownership of the removed existing signs.

Locations of the relocated signs are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

Replace existing signs that become damaged during relocation at no expense to the Department.

Item 666: Reflectorized Pavement Markings
Item 6038: Multipolymer Pavement Markings (MPM)

Use Type III glass beads for thermoplastic and multipolymer pavement markings.

Use a 0.100 in. (100 mil) thickness for thermoplastic pavement markings, measured to the top of the thermoplastic, not including the exposed glass beads.

Use a 0.022 in. (22 mil) thickness for multipolymer pavement markings, measured to the top of the multipolymer, not including the exposed glass beads.

For roadways with asphalt surfaces to be striped with work zone or permanent thermoplastic markings, the Contractor has the option to apply paint and beads markings for a maximum 30-day period until placing the thermoplastic markings, or until starting the succeeding phase of work on the striped area. Maintain the paint and beads markings, at no expense to the Department, until placing the thermoplastic markings or starting the succeeding phase of work on the striped area. The work zone markings, whether paint and beads or thermoplastic, are paid under the Item, "Work Zone Pavement Markings" and the markings are paid for only once for the given phase of construction.

If using paint and bead markings as described above, purchase the traffic paint from the open market.

If the Type II markings become dirty and require cleaning by washing, brushing, compressed air, or other approved methods before applying the Type I thermoplastic markings, this additional cleaning is subsidiary to the Item, "Reflectorized Pavement Markings."

Establish the alignment and layout for work zone striping and permanent striping.

Stripe all roadways before opening them to traffic.

Place pavement markings under these items in accordance with details shown on the plans, the latest "Texas Manual on Uniform Traffic Control Devices," or as directed.

When design details are not shown on the plans, provide pavement markings for arrows, words, and symbols conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Item 672: Raised Pavement Markers

If other operations are complete on the project and if the curing time period is not yet elapsed, the contract time will be suspended until the curing is done.

Before placing the raised pavement markers on concrete pavement, blast clean the surface using an abrasive-blasting medium. This work is subsidiary to the Item, "Raised Pavement Markers."

Provide epoxy adhesive that is machine-mixed or nozzle-mixed and dispensed. Equip the machine or nozzle with a mechanism to ensure positive mix measurement control.

Item 678: Pavement Surface Preparation for Markings

Do not blast clean asphalt concrete pavement. Clean asphalt concrete pavement as required under the applicable specifications or as directed.

On new concrete pavement or on existing concrete pavement when placing a new stripe on a new location, remove the curing compounds and contamination from the pavement surface by flail milling or as directed. In addition, air-blast the surface with compressed air just before placing the new stripe.

On existing concrete pavement when placing a new stripe on an existing location, after removing the existing stripe under the Item, "Eliminating Existing Pavement Markings and Markers," air-blast the surface with compressed air just before placing the new stripe.

Do not clean concrete pavement by grinding.

Item 3076: Dense-Graded Hot Mix Asphalt

Taper the asphalt concrete pavement at the beginning and ending points.

Use a maximum 6H:1V slope for the asphalt concrete pavement edge.

Where the 6H:1V ACP edge taper extends over onto the unsurfaced shoulders, blade off the loose existing shoulder material to provide a solid base for the outside taper edge. After placing the ACP overlay, blade this material back against the edge taper. This work is subsidiary to the various bid items.

The stockpile will be the point of sampling of coarse aggregate for test method TEX-217-F (Part II, decantation).

Place the asphalt concrete pavement in courses as shown on the typical sections.

Do not use petroleum-based solvents in the beds of hot mix asphalt delivery vehicles.

Dilution of tack coat is not allowed.

Do not use Surface Aggregate Classification (SAC) C for this project.

For determining the Asphalt Content, only ignition ovens will be allowed.

The tack coat rate shown on the "Basis of Estimate" is an average rate for calculating tack coat quantities. Vary the rate based on the pavement conditions and other factors such as manufacturer's recommendations and weather.

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

A shadow vehicle with Truck Mounted Attenuators (TMAs) or Trailer Attenuators (TAs) is required as shown on the appropriate Traffic Control Plan (TCP) sheets. TMAs/TAs must meet the requirements of the Compliant Work Zone Traffic Control Device List.

Level 3 Compliant TMAs/TAs are required for this project.

A total of one (1) shadow vehicle with a TMA/TA is required for the work with the exception of Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

A total of three (3) shadow vehicles with a TMA/TA are required for Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

Basis of Estimate

Item	Description	Limit and Rate	Unit
260	Lime Treatment (Road-Mixed) For materials used as subgrade * • Lime (HYD, COM, or QK) (SLRY) or QK(DRY)	 6 % by weight based on 100 Lb. / Cu. Ft. subgrade	SY TON
275	Cement Treatment (Road-Mixed) For materials used as subgrade * • Cement	 6 % by weight based on 100 Lb. / Cu. Ft. subgrade	SY TON
292	Asphalt Treatment (Plant-Mixed) • Asphalt • Aggregate	110 Lb. / Sq. Yd.-In. 5 % by weight 95 % by weight	TON
3076	Dense-Graded Hot Mix Asphalt • Asphalt • Aggregate Tack Coat • Applied on new HMA • Applied on Existing HMA • Applied on Milled HMA	110 Lb. / Sq. Yd.-In. 6 % by weight 94 % by weight 0.06 Gal. / Sq. Yd. 0.09 Gal. / Sq. Yd. 0.11 Gal. / Sq. Yd.	TON

* If used in existing roadway base, rate will be determined on a case by case basis.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0177-14-039 **DISTRICT** Houston **COUNTY** Montgomery
HIGHWAY SL 494

			CONTROL SECTION JOB		**0177-14-039**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00133936**		
			COUNTY		**Montgomery**		
			HIGHWAY		**SL 494**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	28.000		28.000	
	104-6001	REMOVING CONC (PAV)	SY	4,363.000		4,363.000	
	104-6009	REMOVING CONC (RIPRAP)	SY	286.000		286.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)	LF	482.000		482.000	
	105-6024	REMOVING STAB BASE AND ASPH PAV (21")	SY	1,309.000		1,309.000	
	105-6062	REMOVING STAB BASE AND ASPH PAV(4"-16")	SY	4,598.000		4,598.000	
	110-6001	EXCAVATION (ROADWAY)	CY	8,934.000		8,934.000	
	110-6002	EXCAVATION (CHANNEL)	CY	6,000.000		6,000.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	7,173.000		7,173.000	
	132-6035	EMBANK(FINAL)(DC)(TY E)(CSBE)	CY	8,683.000		8,683.000	
	162-6002	BLOCK SODDING	SY	8,552.000		8,552.000	
	166-6001	FERTILIZER	AC	1.770		1.770	
	168-6001	VEGETATIVE WATERING	MG	212.000		212.000	
	260-6008	LIME TRT(MIX EXST MATL & NEW BASE)(6")	SY	3,694.000		3,694.000	
	260-6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	TON	50.500		50.500	
	275-6001	CEMENT	TON	50.500		50.500	
	275-6002	CEMENT TREAT (EXIST MATL) (6")	SY	3,694.000		3,694.000	
	292-6003	ASPHALT STAB BASE (GR 2)(PG 70)	TON	3,898.000		3,898.000	
	305-6008	SALV, HAUL & STKPL RCL APH PV (0"TO 4")	SY	235.000		235.000	
	305-6016	SALV, HAUL & STKPL RCL APH PV (3")	SY	5,672.000		5,672.000	
	400-6005	CEM STABIL BKFL	CY	42.000		42.000	
	416-6001	DRILL SHAFT (18 IN)	LF	152.000		152.000	
	416-6003	DRILL SHAFT (30 IN)	LF	704.000		704.000	
	416-6005	DRILL SHAFT (42 IN)	LF	1,934.000		1,934.000	
	416-6006	DRILL SHAFT (48 IN)	LF	930.000		930.000	
	420-6013	CL C CONC (ABUT)	CY	93.000		93.000	
	420-6029	CL C CONC (CAP)	CY	225.100		225.100	
	420-6037	CL C CONC (COLUMN)	CY	198.460		198.460	
	422-6001	REINF CONC SLAB	SF	63,660.000		63,660.000	
	422-6015	APPROACH SLAB	CY	2,426.000		2,426.000	
	423-6001	RETAINING WALL (MSE)	SF	1,653.000		1,653.000	
	425-6039	PRESTR CONC GIRDER (TX54)	LF	8,607.000		8,607.000	
	425-6040	PRESTR CONC GIRDER (TX62)	LF	1,255.000		1,255.000	
	432-6008	RIPRAP (CONC)(CL B)(RR8&RR9)	CY	253.000		253.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	44.000		44.000	
	450-6006	RAIL (TY T223)	LF	1,156.000		1,156.000	
	450-6032	RAIL (TY C223)	LF	2,276.000		2,276.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0177-14-039 **DISTRICT** Houston **COUNTY** Montgomery
HIGHWAY SL 494

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0177-14-039**			
		PROJECT ID		**A00133936**			
		COUNTY		**Montgomery**			
		HIGHWAY		**SL 494**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	454-6018	SEALED EXPANSION JOINT (4 IN) (SEJ - M)	LF	235.000		235.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	88.000		88.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	4.000		4.000	
	496-6012	REMOV STR (BRIDGE 1000 FT OR GREATER)	EA	1.000		1.000	
	496-6025	REMOV STR (APPROACH SLAB)	EA	2.000		2.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	15.000		15.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	300.000		300.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	300.000		300.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	310.000		310.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	310.000		310.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	5,313.000		5,313.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	5,313.000		5,313.000	
	530-6005	DRIVEWAYS (ACP)	SY	235.000		235.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	950.000		950.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	300.000		300.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4.000		4.000	
	545-6007	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)	EA	2.000		2.000	
	636-6001	ALUMINUM SIGNS (TY A)	SF	46.000		46.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	2.000		2.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	3.000		3.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	5.000		5.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	2,863.000		2,863.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	1,531.000		1,531.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	576.000		576.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	42.000		42.000	
	3076-6081	D-GR HMA TY-D PG70-22 (EXEMPT)	TON	689.000		689.000	
	3076-6082	D-GR HMA TY-D PG70-22(LEVEL-UP)(EXEMPT)	TON	728.000		728.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	422.000		422.000	
	6038-6004	MULTIPOLYMER PAV MRK (W)(6")(SLD)	LF	2,310.000		2,310.000	
	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	1,155.000		1,155.000	
	6185-6002	TMA (STATIONARY)	DAY	10.000		10.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	8.000		8.000	
	18	ENVIRONMENTAL: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0177-14-039 **DISTRICT** Houston **COUNTY** Montgomery
HIGHWAY SL 494

		CONTROL SECTION JOB		**0177-14-039**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00133936**			
		COUNTY		**Montgomery**			
		HIGHWAY		**SL 494**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

ROADWAY QUANTITY SUMMARY

CSJ 0177-14-039	100 6002 PREPARING ROW STA	110 6001 EXCAVATION (ROADWAY) CY	110 6002 EXCAVATION (CHANNEL) CY	132 6006 EMBANKMENT (FINAL) (DENS CONT) (TY C) CY	132 6035 EMBANK (FINAL) (DC) (TY E) (CSBE) CY	260 6008 LIME TRT (MIX EXST MATL & NEW BASE) (6") SY	260 6012 LIME (HYD, COM OR QK) (SLRY) OR QK (DRY) TON	275 6001 CEMENT TON	275 6002 CEMENT TREAT (EXIST MATL) (6") SY
SHEET 1 OF 3	11	6663	3000	2526	5466	1938	26.5	26.5	1938
SHEET 2 OF 3	12	2271	3000	4647	3217	964	13	13	964
SHEET 3 OF 3	5					792	11	11	792
PROJECT TOTALS	**28**	**8934**	**6000**	**7173**	**8683**	**3694**	**50.5**	**50.5**	**3694**

CSJ 0177-14-039	292 6003 ASPHALT STAB BASE (GR 2) (PG 70) TON	400 6005 CEM STABIL BKFL CY	422 6015 APPROACH SLAB CY	* 423 6001 RETAINING WALL (MSE) SF	432 6008 RIPRAP (CONC) (CL B) (RR8&RR9) CY	432 6045 RIPRAP (MOW STRIP) (4 IN) CY	464 6005 RC PIPE (CL III) (24 IN) LF	467 6395 SET (TY II) (24 IN) (RCP) (6:1) (P) EA
SHEET 1 OF 3	2048		1213	769	168	18		
SHEET 2 OF 3	1025		1213	883		26		
SHEET 3 OF 3	825	42					88	4
PROJECT TOTALS	**3898**	**42**	**2426**	**1653**	**168**	**44**	**88**	**4**

* Quantity for section NW of bridge

CSJ 0177-14-039	540 6001 MTL W-BEAM GD FEN (TIM POST) LF	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM) EA	544 6001 GUARDRAIL END TREATMENT (INSTALL) EA	545 6007 CRASH CUSH ATTEN (INSTL) (L) (N) (TL3) EA	3076 6081 D-GR HMA TY-D PG70-22 EXEMPT TON	3076 6082 D-GR HMA TY-D PG70-22 (LEVEL-UP) EXEMPT TON	6001 6001 PORTABLE CHANGEABLE MESSAGE SIGN DAY	6185 6001 TMA (STATIONARY) EA	6185 6003 TMA (MOBILE OPERATION) HR
SHEET 1 OF 3	625	2	2	1	363	383			
SHEET 2 OF 3	325	2	2	1	186	194			
SHEET 3 OF 3					140	151	422	10	8
PROJECT TOTALS	**950**	**4**	**4**	**2**	**689**	**728**	**422**	**10**	**8**

DEMOLITION QUANTITY SUMMARY

CSJ 0177-14-039	104 6001 REMOVING CONC (PAV) SY	104 6009 REMOVING CONC (RIPRAP) SY	104 6054 REMOVING CONCRETE (MOW STRIP) LF	105 6024 REMOVING STAB BASE AND ASPH PAV (21") SY	105 6062 REMOVING STAB BASE AND ASPH PAV (4"-16") SY	305 6016 SALV, HAUL & STKPL RCL APH PV (3") SY	496 6012 REMOV STR (BRIDGE 1000 FT OR GREATER) EA	496 6025 REMOV STR (APPROACH SLAB) EA	542 6001 REMOVE METAL BEAM GUARD FENCE LF	544 6003 GUARDRAIL END TREATMENT (REMOVE) EA
SHEET 1 OF 3	2274	130	240	706	2274	2980		1	150	2
SHEET 2 OF 3	1140	156	242	320	1140	1460	1	1	150	2
SHEET 3 OF 3	949			283	949	1232				
PROJECT TOTALS	**4363**	**286**	**482**	**1309**	**4363**	**5672**	**1**	**2**	**300**	**4**

SL 494
ROADWAY QUANTITY SUMMARY

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		9

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DN:

DRIVEWAY QUANTITY SUMMARY

LOCATION	DRIVWAY NUMBER	APPROX INTERSECTION STA.	SURF TYPE	LT RADIUS	RT RADIUS	WIDTH	LENGTH	105 6062 REMOVING STAB BASE AND ASPH PAV(4"-16")	305 6008 SALV, HAUL & STKPL RCL APH PV (0"TO 4")	530 6005 DRIVEWAYS (ACP)
				FT	FT	FT	FT	SY	SY	SY
CSJ 0177-14-039										
SHEET 3 OF 3	1	30+34	ASPHALT	20	20	18	51	128	128	128
SHEET 3 OF 3	2	32+62	ASPHALT	20	20	18	49	107	107	107
PROJECT TOTALS				40	40	36	100	235	235	235

DATE: 05/26/2021 02:25 PM
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SL 494
DRIVEWAY
QUANTITY
SUMMARY

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		10

PAVEMENT MARKING QUANTITY SUMMARY

CSJ 0177-14-039	666 6309	666 6318	666 6321	672 6009	6038 6004	6038 6018
	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	RE PM W/RET REQ TY I (Y)6"(BRK) (100MIL)	RE PM W/RET REQ TY I (Y)6"(SLD) (100MIL)	REFL PAV MRKR TY II-A-A	MULTIPOLYMER PAV MRK (W)(6")(SLD)	MULTIPOLYMER PAV MRK (Y)(6")(BRK)
	LF	LF	LF	EA	LF	LF
SHEET 1 OF 3	1643	822		15	728	364
SHEET 2 OF 3	866	409	276	19	1582	791
SHEET 3 OF 3	354	300	300	8		
PROJECT TOTALS	**2863**	**1531**	**576**	**42**	**2310**	**1155**

SL 494
PAVEMENT MARKING QUANTITY SUMMARY

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		11

DATE: 02/24/2022 09:13 AM
FILE: pw:\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\0177140394 - Design\Plan Set\1. General\Summaries\SL 494 Pavement Marking Quantity Summary.dgn

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SW3P QUANTITY SUMMARY

CSJ 0177-14-039	162 6002 BLOCK SODDING SY	166 6001 FERTILIZER AC	168 6001 VEGETATIVE WATERING MG	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2) LF	506 6011 ROCK FILTER DAMS (REMOVE) LF	506 6020 CONSTRUCTION EXITS (INSTALL) (TY 1) SY	506 6024 CONSTRUCTION EXITS (REMOVE) SY	506 6038 TEMP SEDMT CONT FENCE (INSTALL) LF	506 6039 TEMP SEDMT CONT FENCE (REMOVE) LF
SHEET 1 OF 3	1146	0.24	29	150	150	148	148	2100	2100
SHEET 2 OF 3	6383	1.32	158	150	150	162	162	2468	2468
SHEET 3 OF 3	1023	0.21	25					745	745
PROJECT TOTALS	**8552**	**1.77**	**212**	**300**	**300**	**310**	**310**	**5313**	**5313**

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SL 494
SW3P
QUANTITY
SUMMARY

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		12

SUMMARY OF SMALL SIGNS

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS (IN)	PLYWOOD SIGNS	ALUMINUM SIGNS TYPE A	636	644 - INS SM RD SN SUP & AM			
								TYPE OF MOUNT			
							6001 ALUMINUM SIGNS (TY A) SF	6001 IN SM RD SN SUP&AM TY10BWG(1) SA(P)	6004 IN SM RD SN SUP&AM TY10BWG(1) SA(T)	6034 IN SM RD SN SUP&AM TYSBO(1) SA(U-TEXT)	6076 REMOVE SM RD SN SUP &AM (EA)
SL 494 REMOVAL											
1	1	W8-14aT	BRIDGE MAY ICE IN COLD WEATHER	48" x 48"							X
	2	I-3	CANEY CREEK	18" x 30"							X
2	3	I-3	CANEY CREEK	18" x 30"							X
	4	W10-4R	GRADE CROSSING & INTERSECTION ADVANCE	36" x 36"							X
3	5	M2-1	JCT	21" x 15"							X
		M1-6F	FARM ROAD FM 1485	36" x 36"							
SL 494 PROPOSED											
1	1	W8-14aT	BRIDGE MAY ICE IN COLD WEATHER	48" x 48"		X	16		X		
	2	I-3	CANEY CREEK	18" x 30"		X	3.8	X			
2	3	I-3	CANEY CREEK	18" x 30"		X	3.8	X			
	4	W10-4R	GRADE CROSSING & INTERSECTION ADVANCE	48" x 48"		X	16		X		
3	5	M2-1	JCT	21" x 15"		X	2.4		X		
		M1-6F	FARM ROAD FM 1485	24" x 24"		X	4				
TOTAL						6	46	2	3		5

*SEE SIGN DETAILS SHEET

ALUMINUM SIGN BLANKS(TY A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

GENERAL NOTES:

ALL SIGNS SHALL BE ERECTED ACCORDING TO THE LOCATION SHOWN ON THE LAYOUT SHEETS EXCEPT THAT THE ENGINEER MAY SHIFT A SIGN IN ORDER TO SECURE A MORE DESIRABLE LOCATION. THE CONTRACTOR WILL STAKE ALL SIGN LOCATIONS, AND NO CHANGES IN THOSE LOCATIONS SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.

SHEET 1 OF 1

SUMMARY OF SMALL SIGNS

STATE DISTRICT	FEDERAL REGION	CONTROL	SECTION	JOB	HIGHWAY
HOU	6	0177	14	039	SL 494
COUNTY		PROJECT NO.			SHEET
MONTGOMERY					13

STD-N29

CK:
DW:
CK:
DN:

TRAFFIC CONTROL PLAN NOTES AND PRINCIPAL OBJECTIVES

1. MAINTAIN SIGNED DETOUR AROUND PROJECT BRIDGE.
2. ENSURE ACCESS TO ADJACENT PROPERTY.
3. THE CONTRACTOR MAY COMBINE OR ALTER PHASING TO IMPROVE OPERATIONS BASE ON FIELD CONDITIONS AND UPON ENGINEER'S APPROVAL.

PHASE 1- DEMOLISH BRIDGE
PHASE 2- REMOVE EXISTING ASPHALT PAVEMENT
PHASE 3 - PERFORM EARTHWORK
PHASE 4 - CONSTRUCT DRILL SHAFTS, COLUMNS AND BENT CAPS. PLACE GIRDERS AND CONSTRUCT BRIDGE DECK AND RAILING.
PHASE 5 - CONSTRUCT ASPHALT PAVEMENT
PHASE 6 - CONSTRUCT DRIVEWAYS AND PLACE PAVEMENT MARKINGS AND SIGNS

DATE: 04/26/2019 07:21 PM
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STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

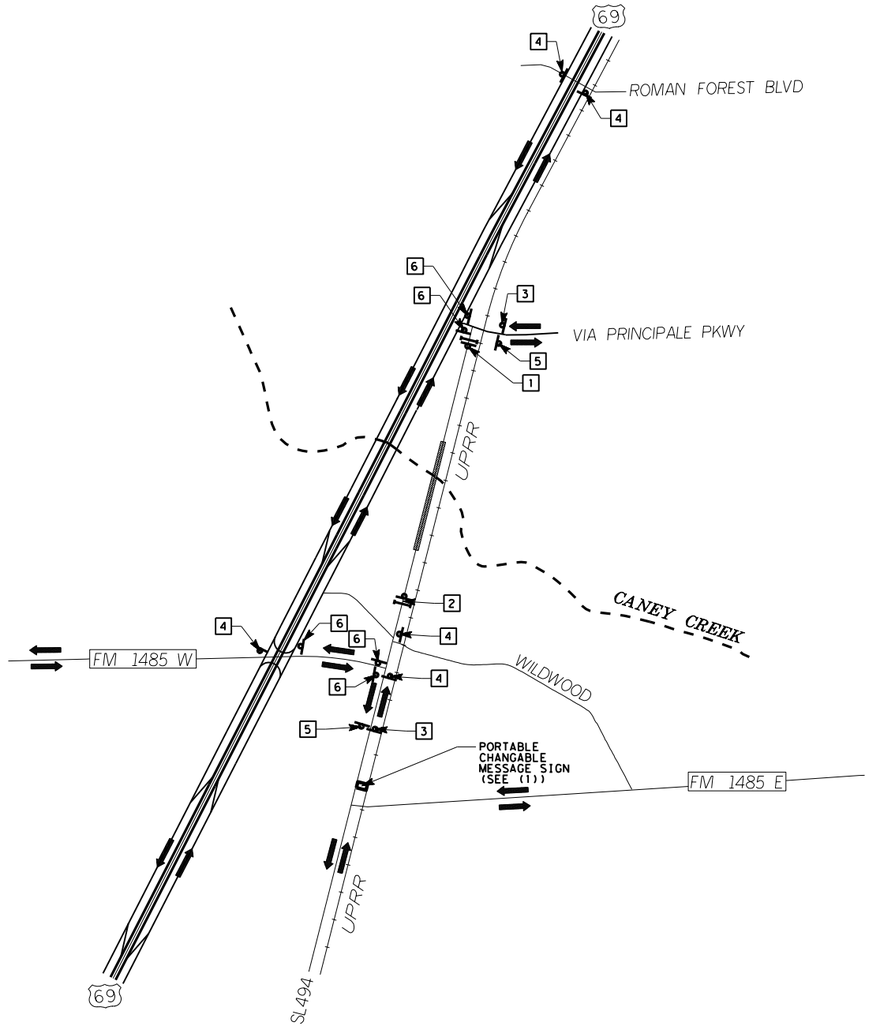
Micah J. Schluter, P.E.
04.08.22

SL 494
CONSTRUCTION SEQUENCE

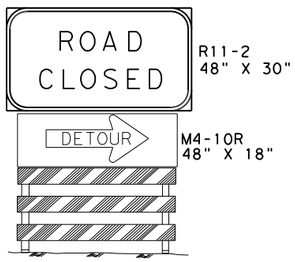
SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		13A



LEGEND



R11-2
48" X 30"

M4-10R
48" X 18"

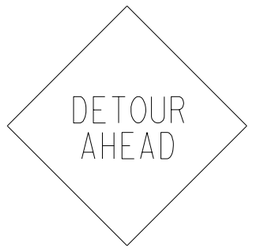
W/ TY. III
BARRICADES (X2)

1

R11-2
48" X 30"

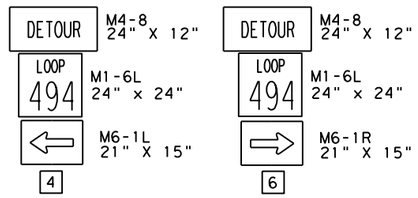
W/ TY. III
BARRICADES (X2)

2



CW20-2D
48" X 48"

3



M4-8
24" X 12"

M1-6L
24" x 24"

M6-1L
21" X 15"

4

M4-8
24" X 12"

M1-6L
24" x 24"

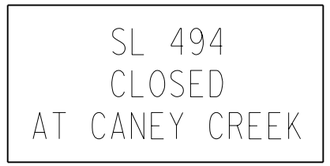
M6-1R
21" X 15"

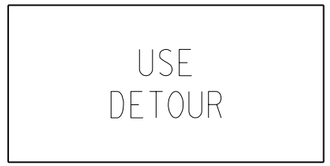
6

M4-8a
24" X 18"

5

(1) MESSAGE TO BE CONVEYED BY PCMS





OPEN TO TRAFFIC

TYPE 3 BARRICADE

TRAFFIC SIGN

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.

04.08.22

SL 494
DETOUR MAP

N.T.S.

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		13B

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

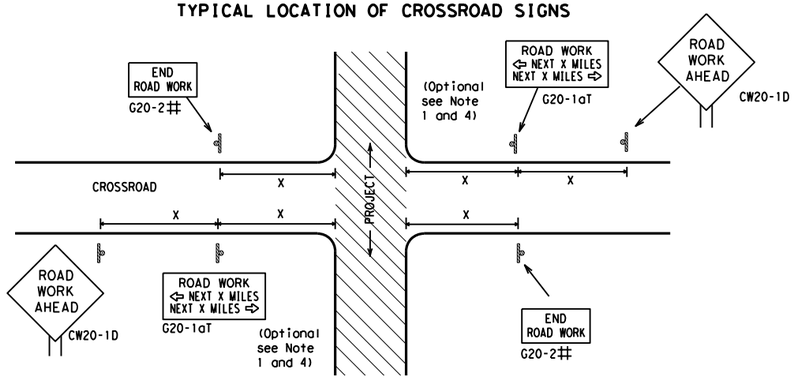
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	HOU	MONTGOMERY		14
5-10 5-21				

DATE:
FILE:

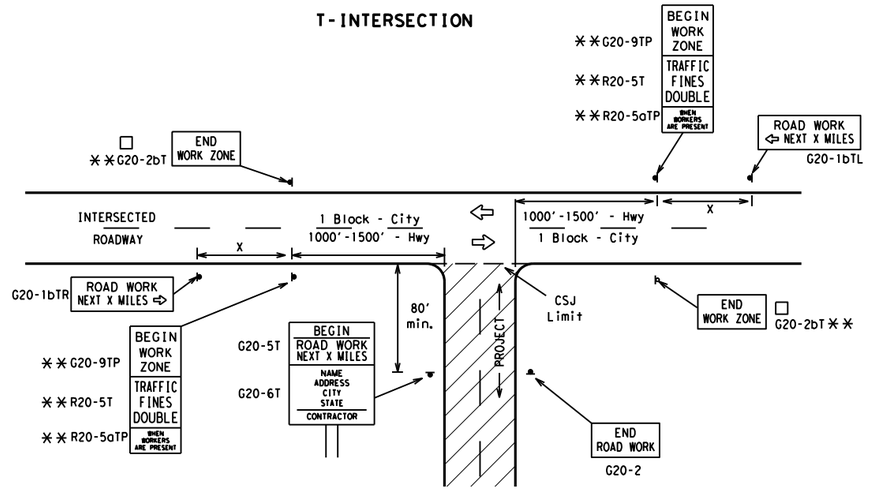
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

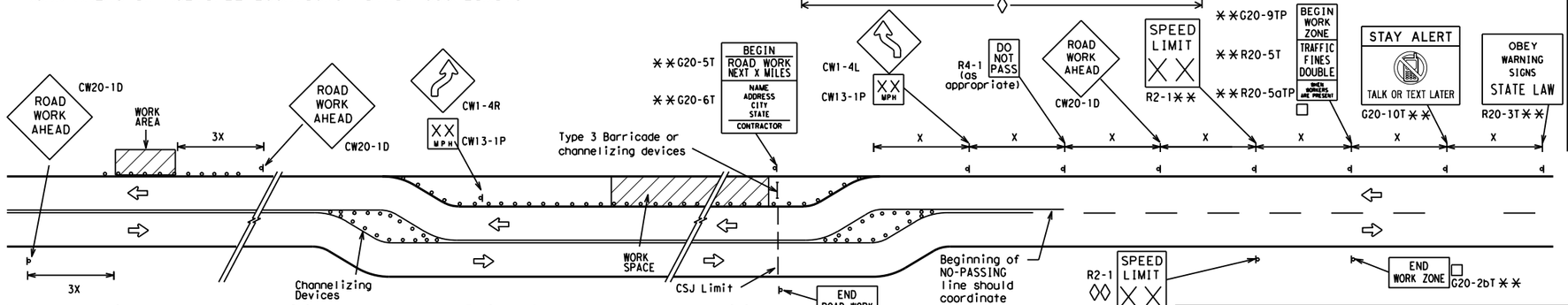
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

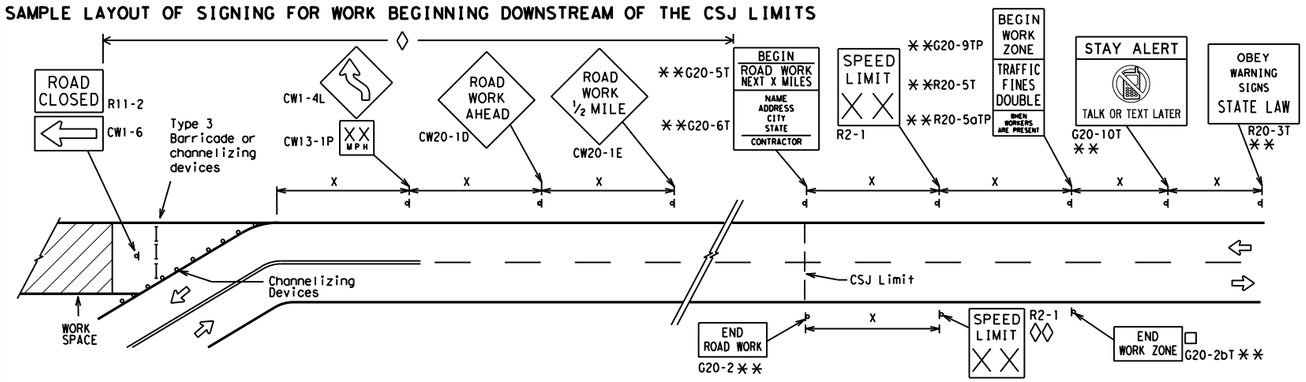
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

NOTES

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

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

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

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

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

LEGEND

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

SHEET 2 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
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7-13 5-21	HOU	MONTGOMERY		15

DATE:
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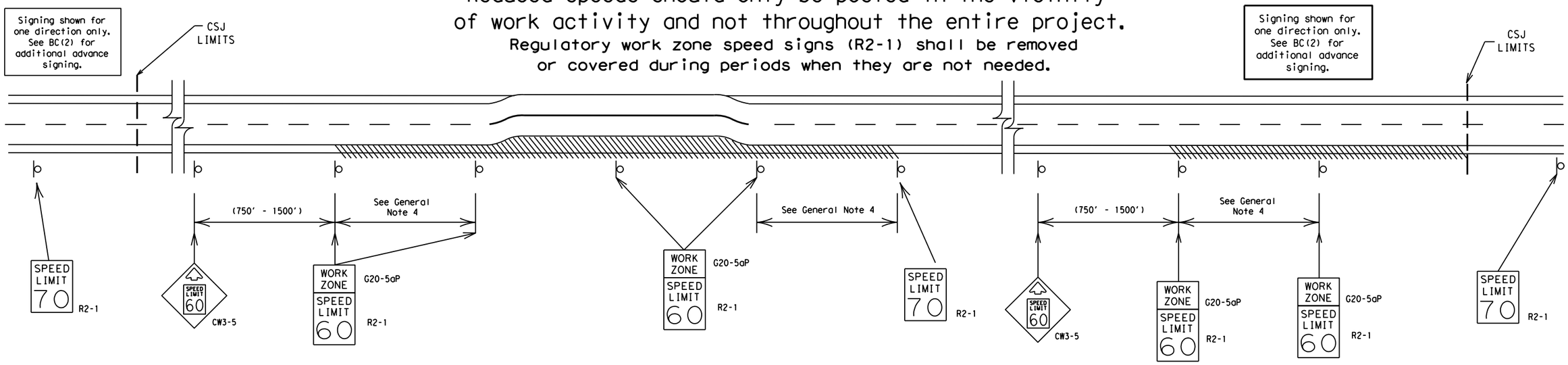
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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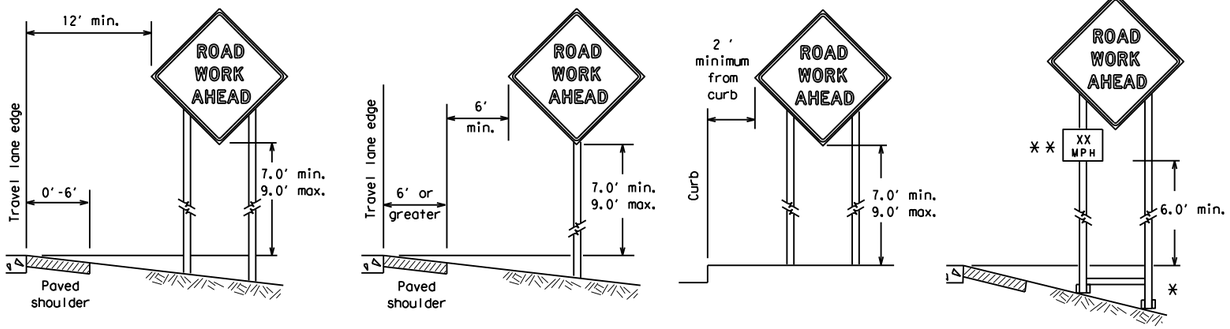
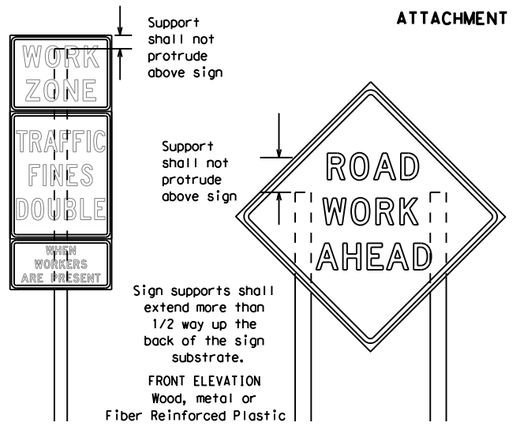
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

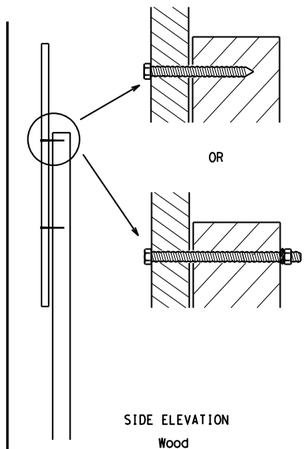


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





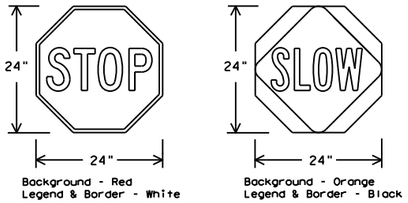
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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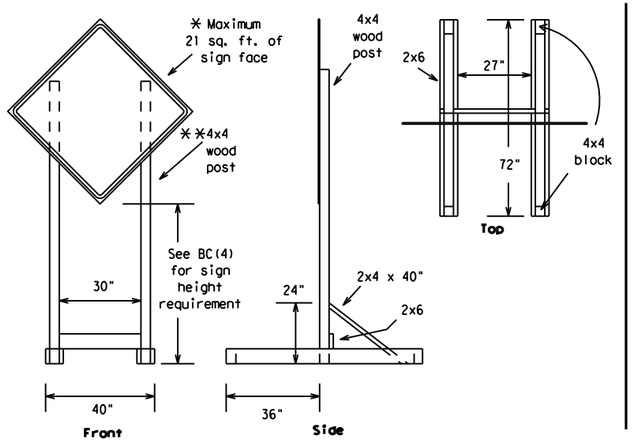
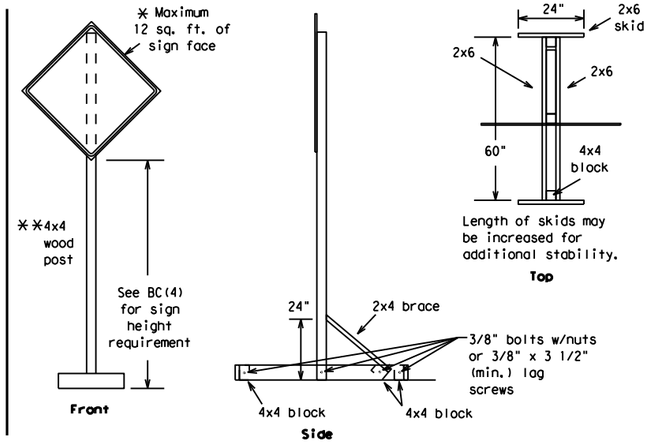
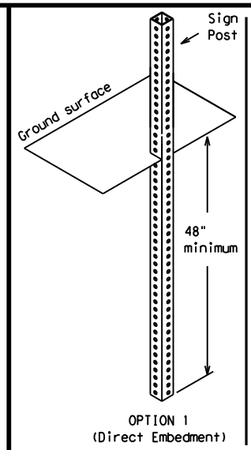
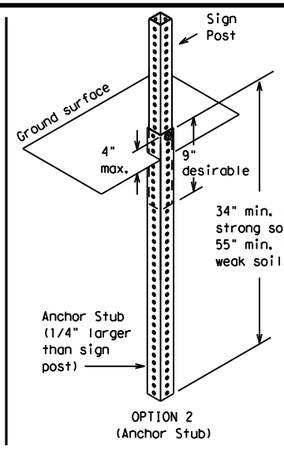


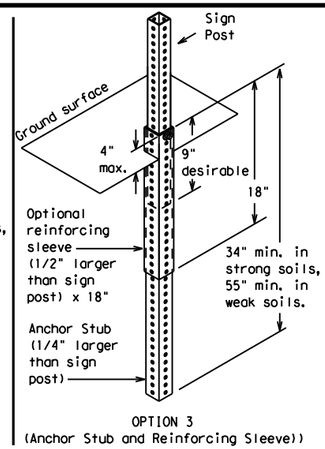


SKID MOUNTED WOOD SIGN SUPPORTS

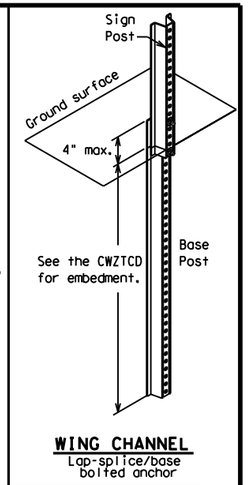
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







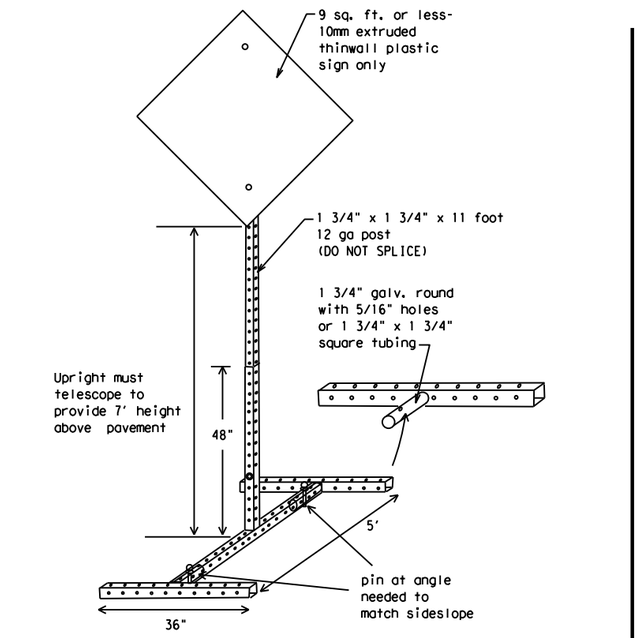
PERFORATED SQUARE METAL TUBING

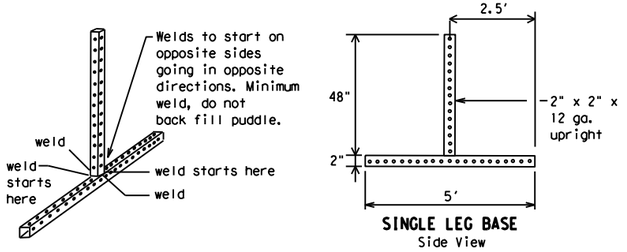


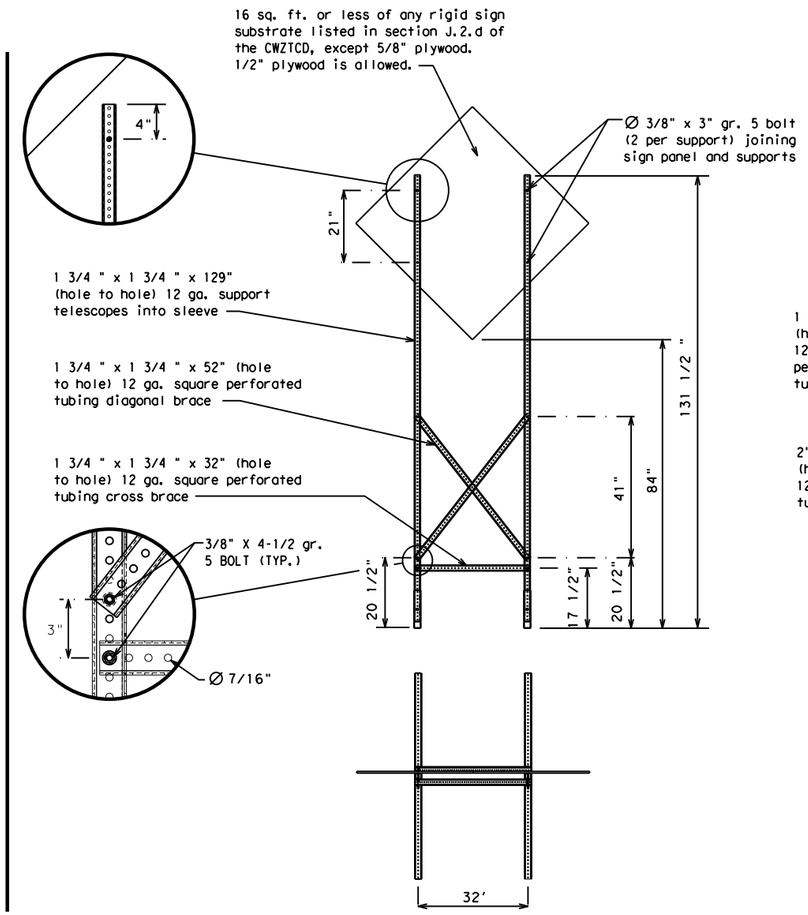
WING CHANNEL
Lap-splice/base bolted anchor

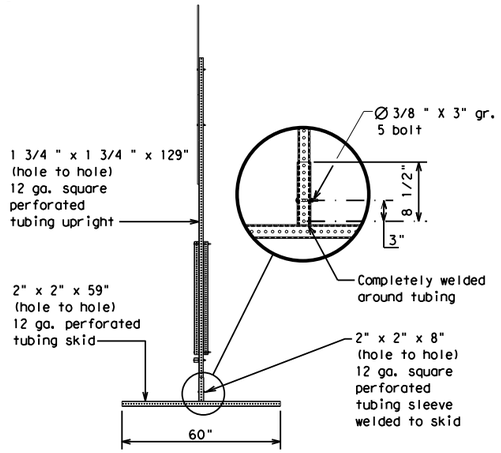
GROUND MOUNTED SIGN SUPPORTS

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









SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

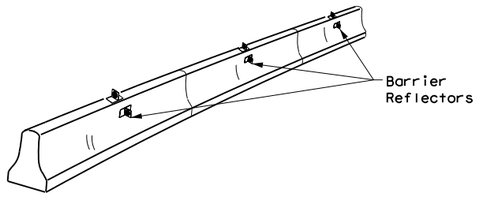
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		19

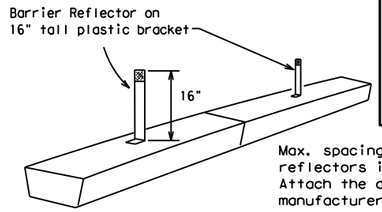
DATE:
FILE:

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



CONCRETE TRAFFIC BARRIER (CTB)

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

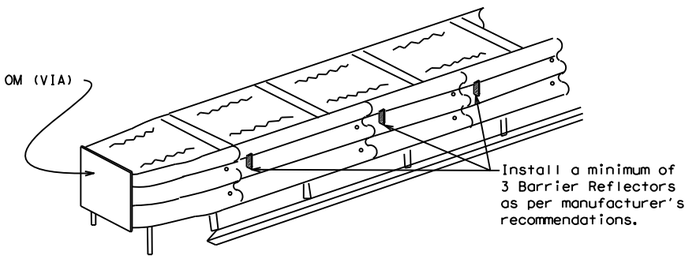


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

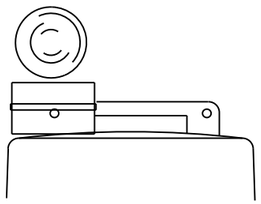


DELINEATION OF END TREATMENTS

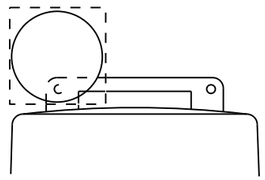
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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

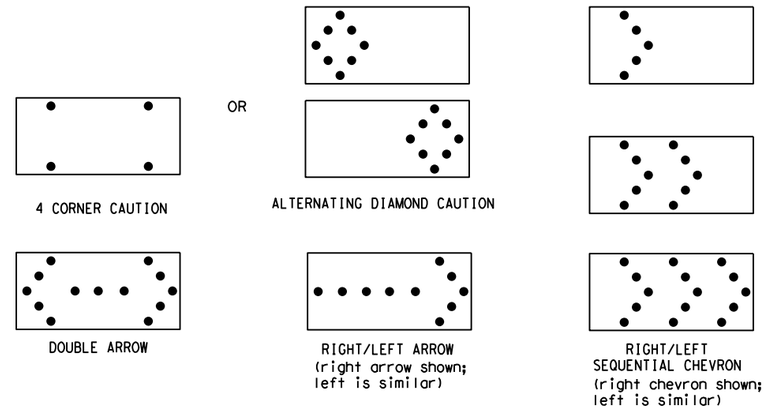
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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 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 Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		20

101

DATE:
FILE:

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

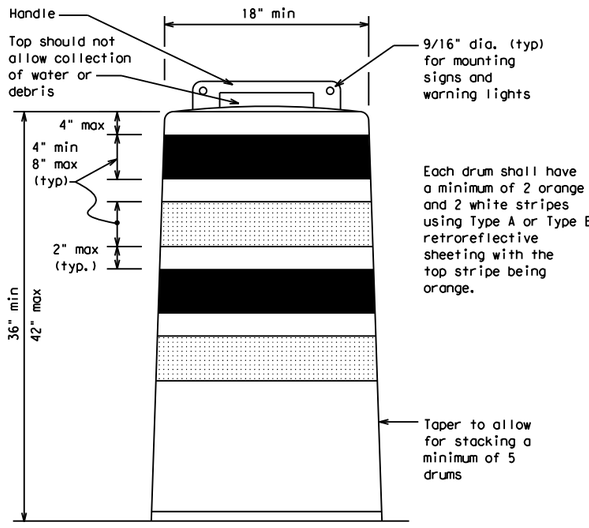
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

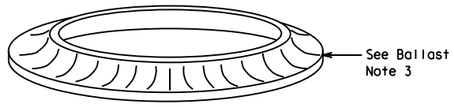
RETROREFLECTIVE SHEETING

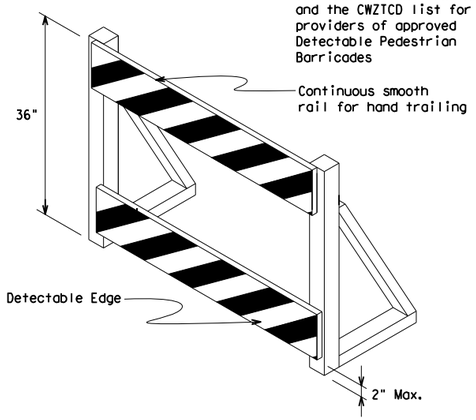
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

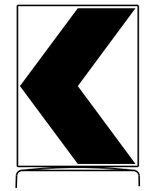




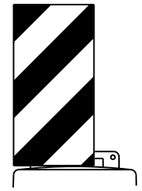


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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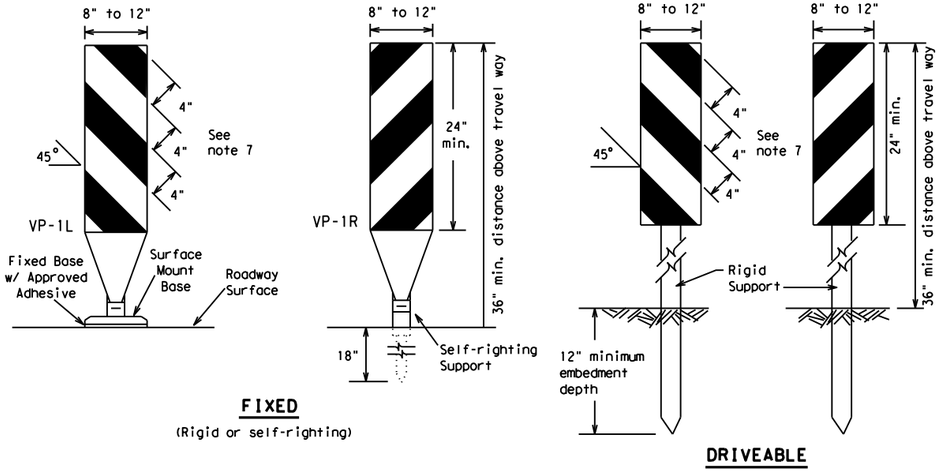
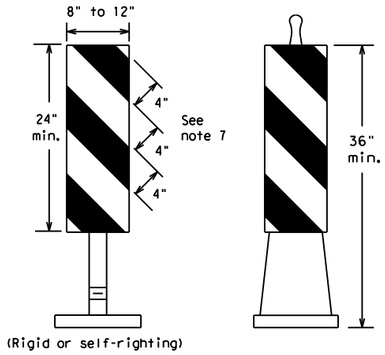


FIXED
(Rigid or self-righting)

DRIVEABLE

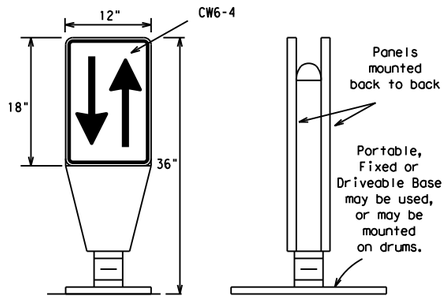


(Rigid or self-righting)

PORTABLE

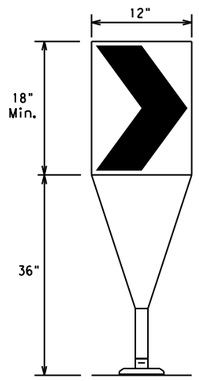
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

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)



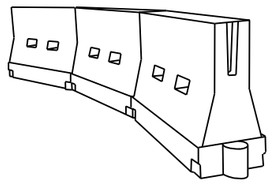
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

Posted Speed	Formula	Minimum Desirable Taper Lengths ** 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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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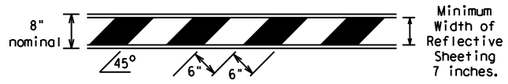
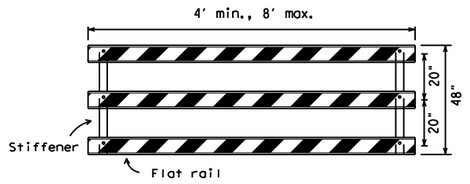
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



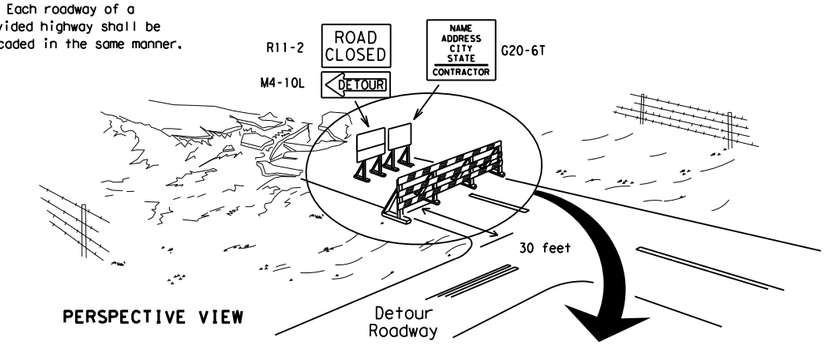
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

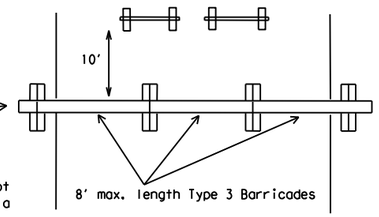
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

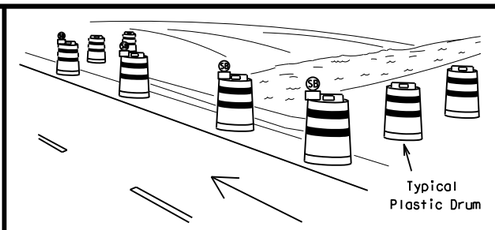
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

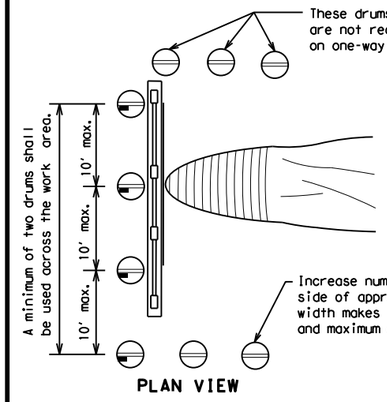
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

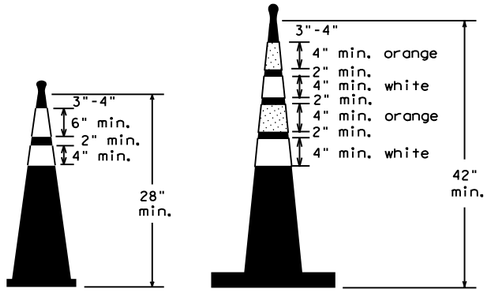
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

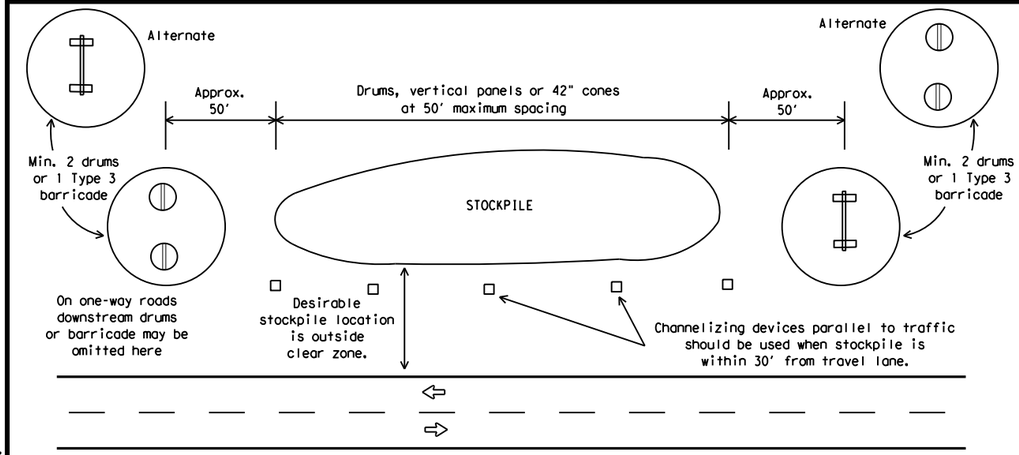
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

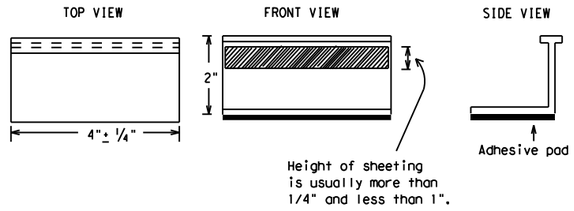
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

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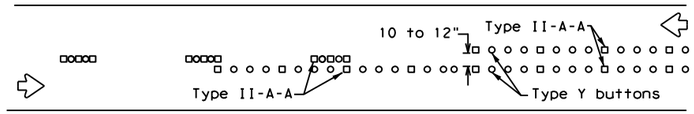
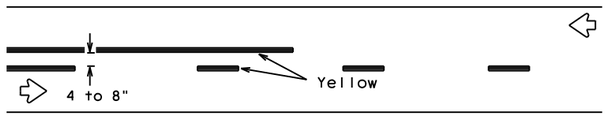
PAVEMENT MARKING PATTERNS

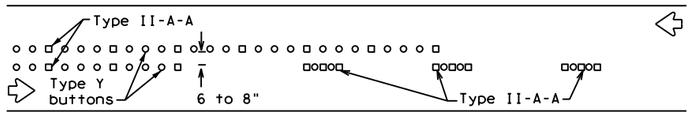
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



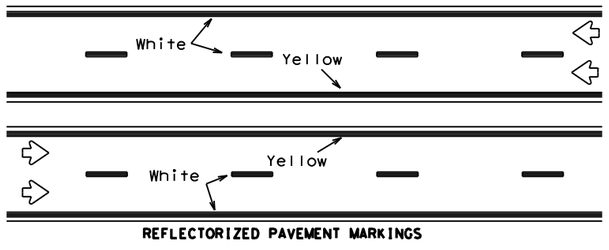
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



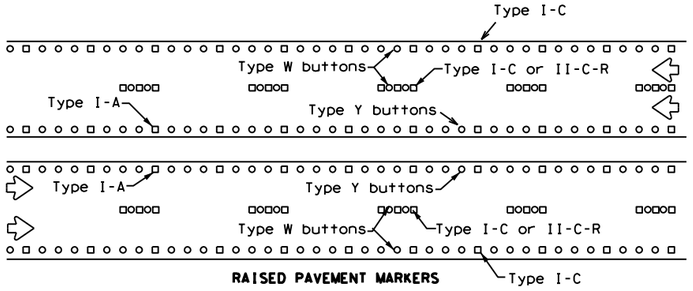
RAISED PAVEMENT MARKERS - PATTERN B

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

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



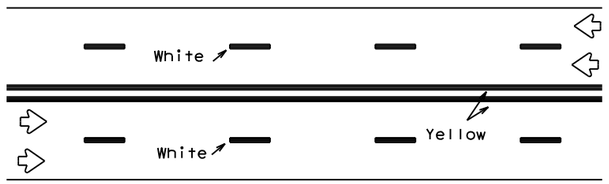
REFLECTORIZED PAVEMENT MARKINGS



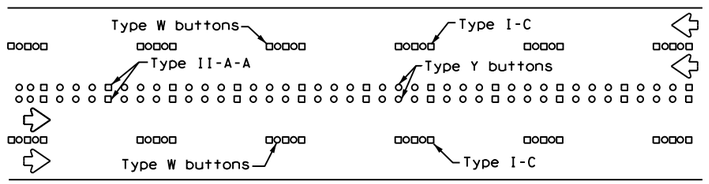
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



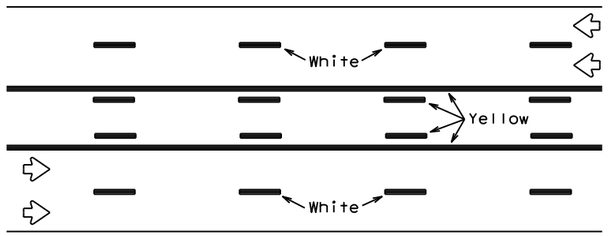
REFLECTORIZED PAVEMENT MARKINGS



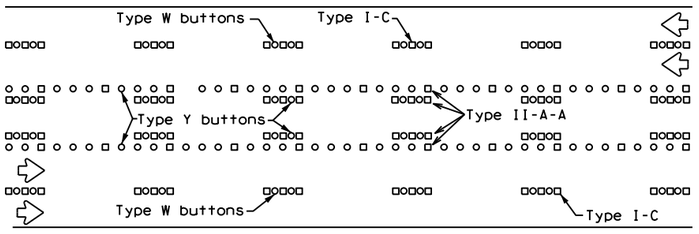
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

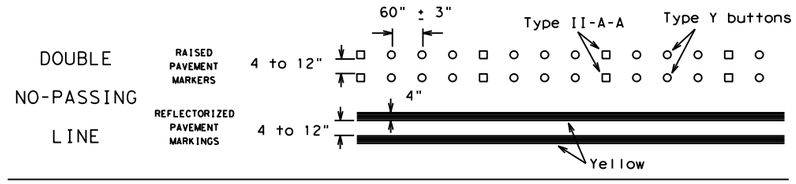
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

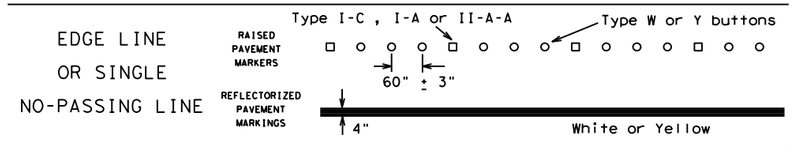
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

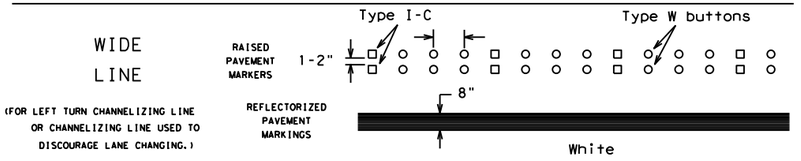


EDGE LINE OR SINGLE NO-PASSING LINE



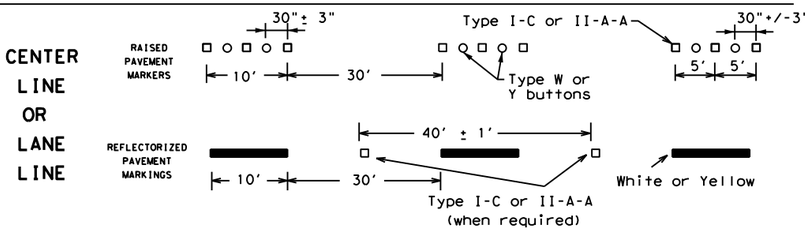
WIDE LINE

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

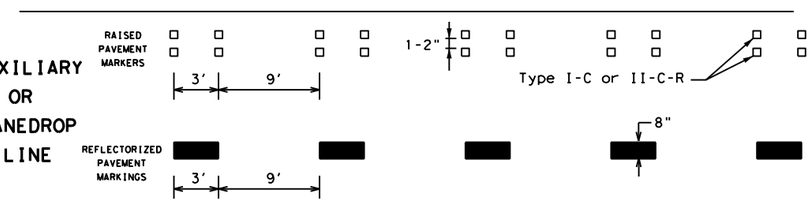


BROKEN LINES

CENTER LINE OR LANE LINE

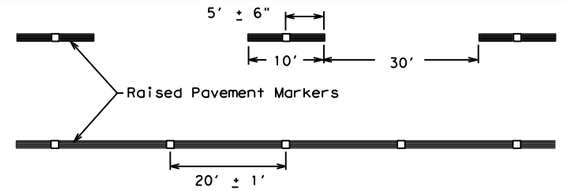


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

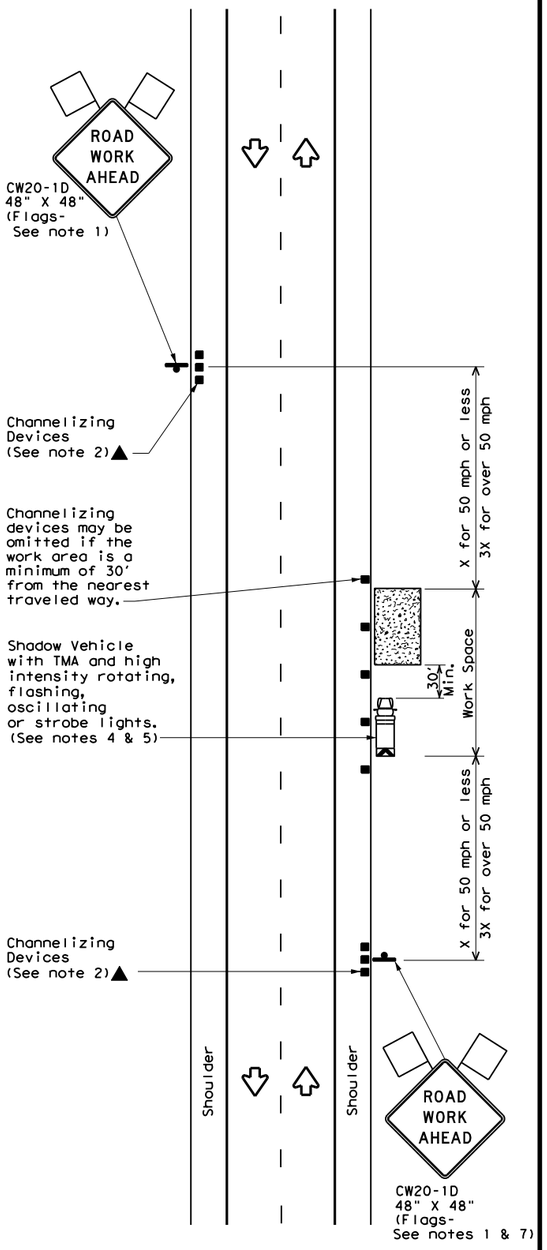
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

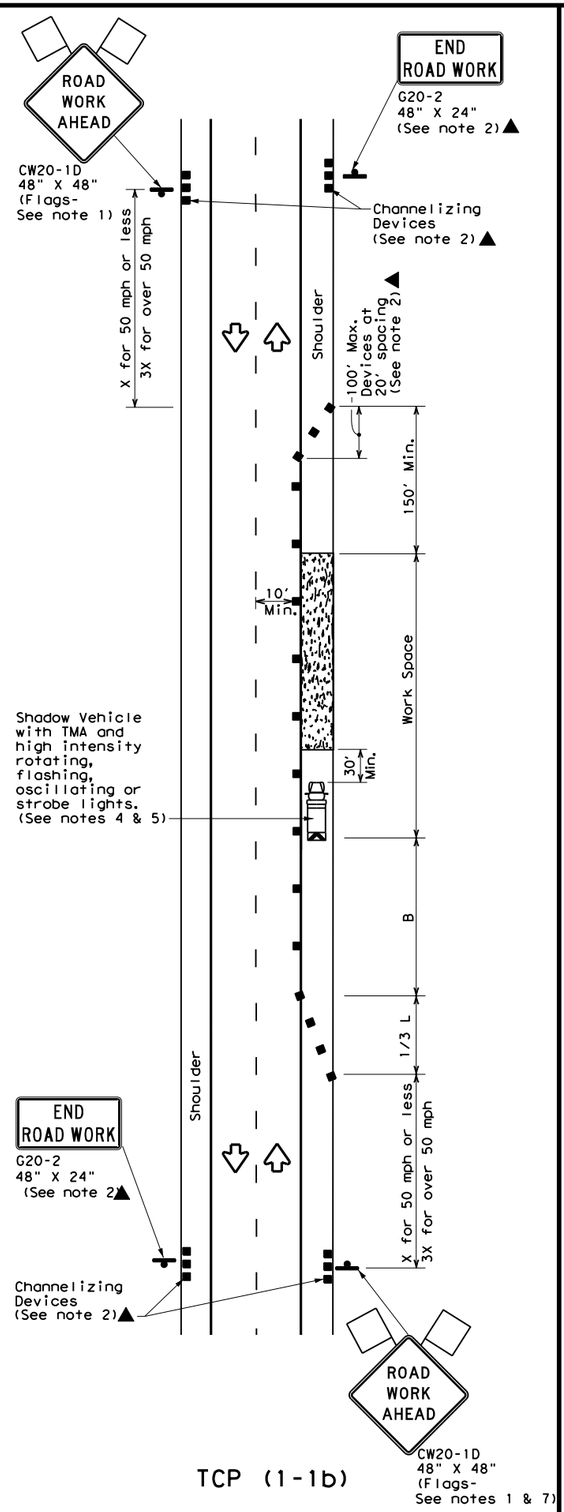
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		25

DATE:
FILE:



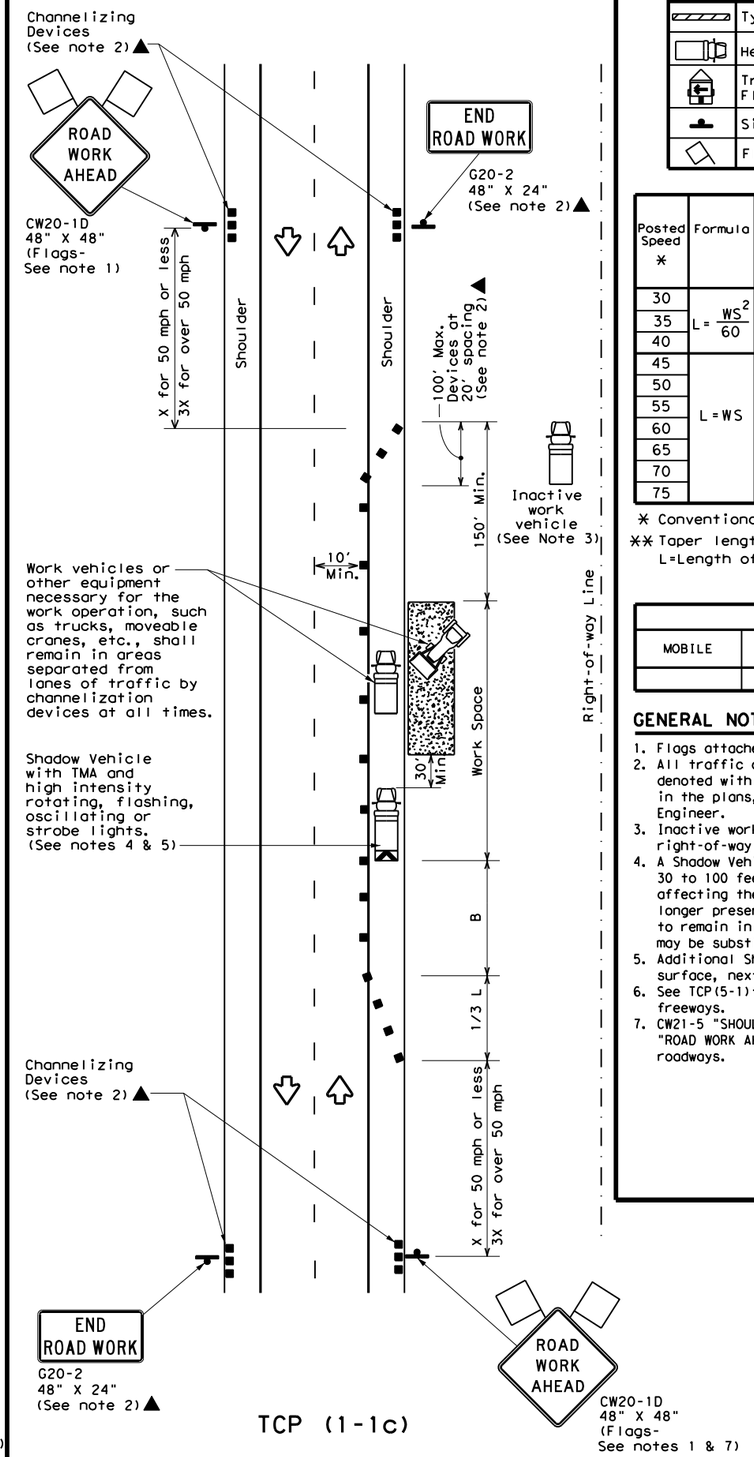
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

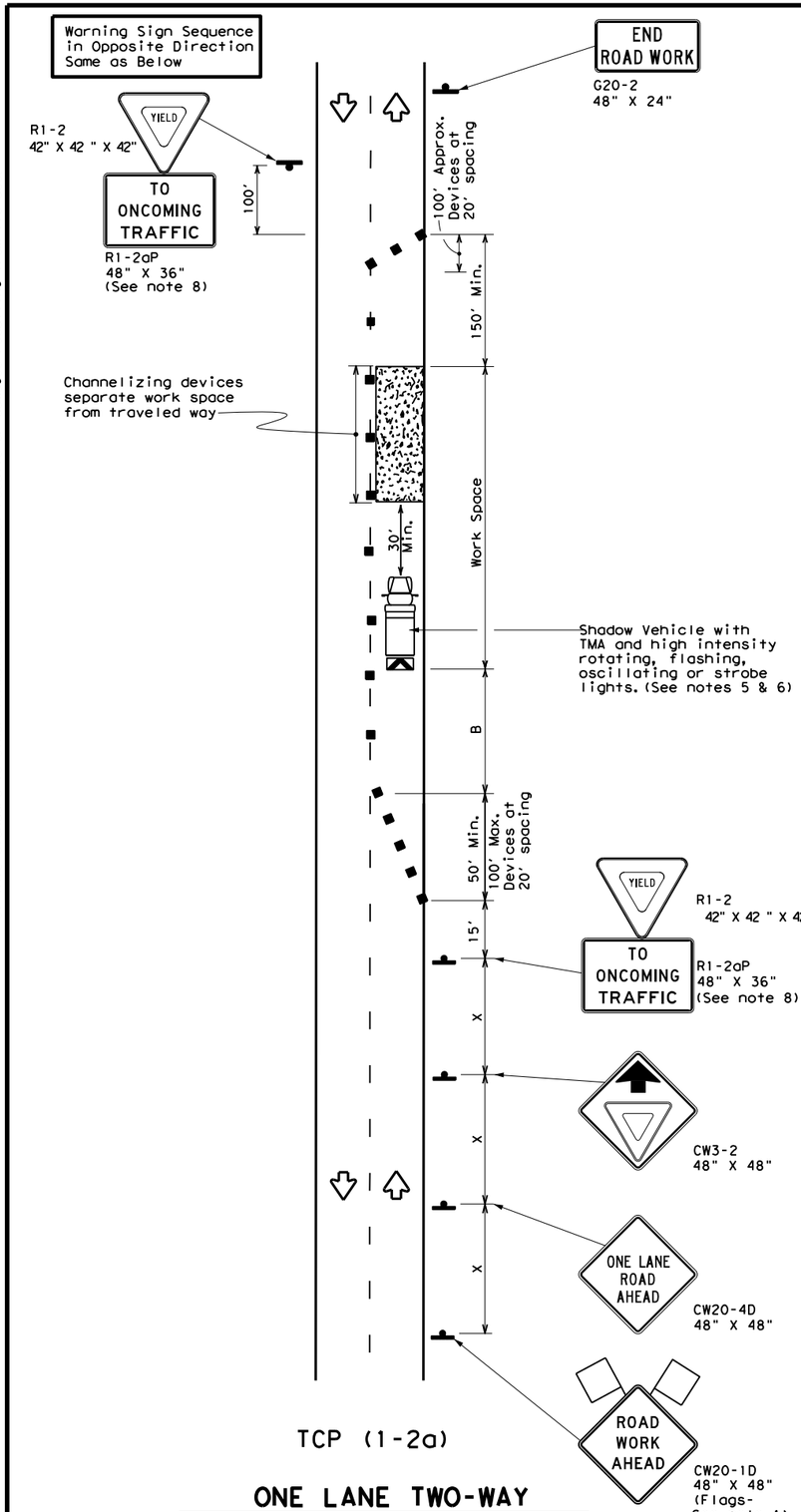
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98	0177	14	039	SL 494
8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	HOU	MONTGOMERY		26

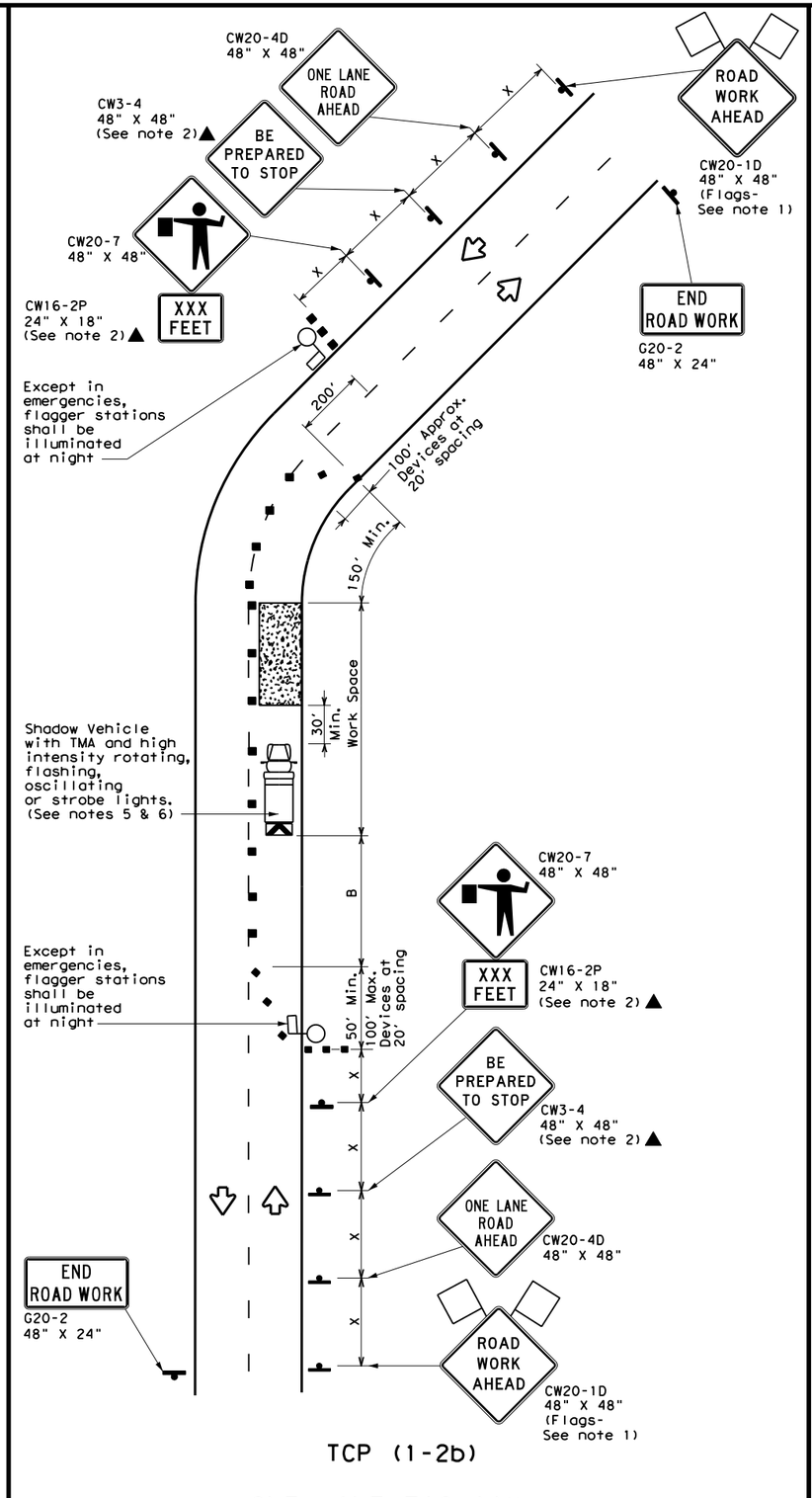
DATE:
FILE:



TCP (1-2a)

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

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

TCP (1-2b)

9. Flaggers should use two-way radios or other methods of communication to control traffic.
10. Length of work space should be based on the ability of flaggers to communicate.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
12. Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
13. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation

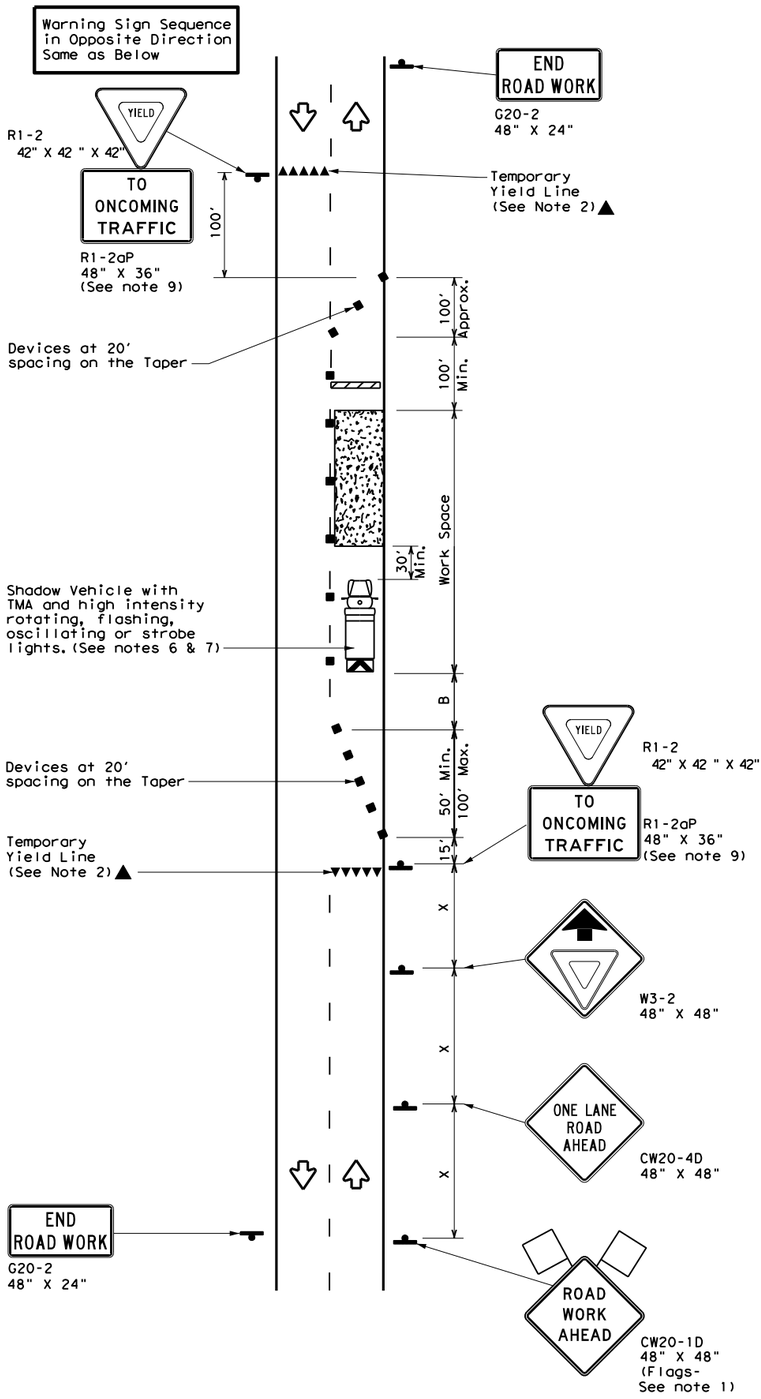
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

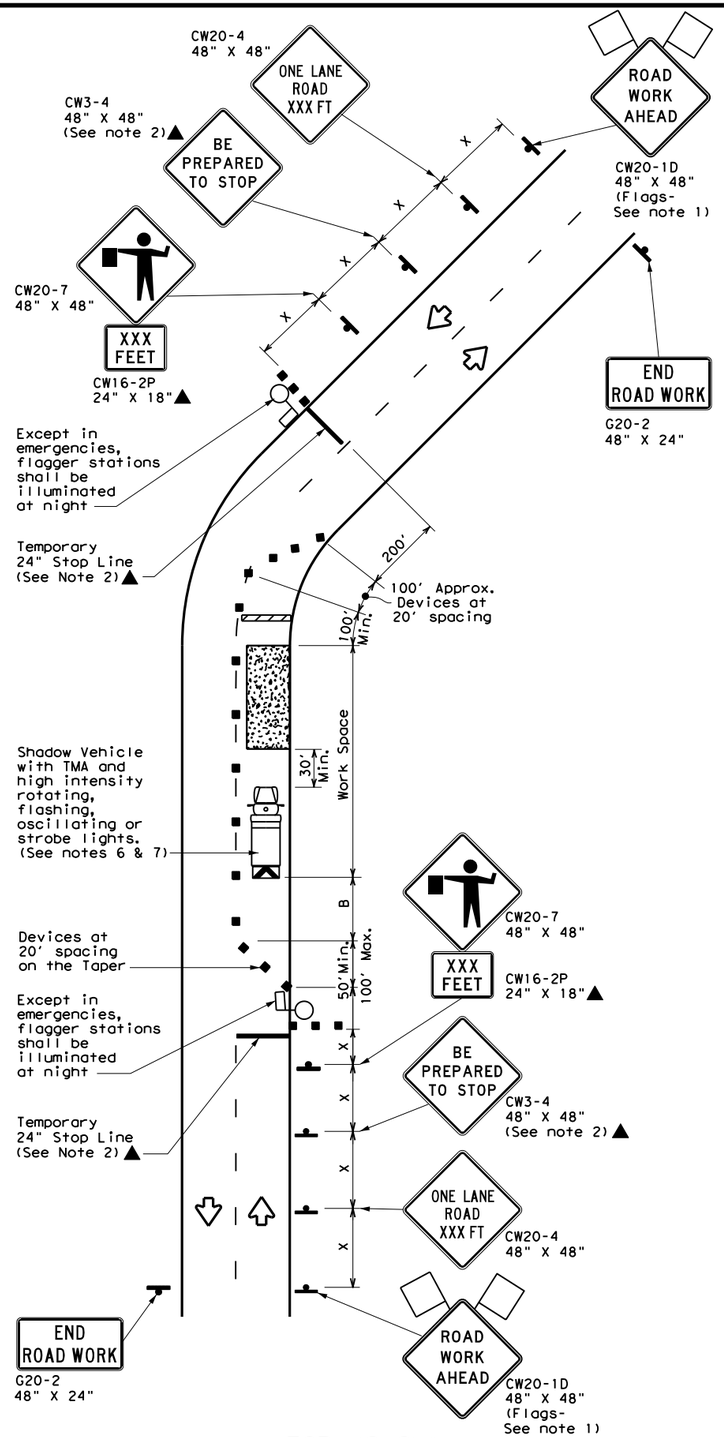
TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
4-90 4-98	DIST	COUNTY		SHEET NO.
2-94 2-12	HOU	MONTGOMERY		27
1-97 2-18				

DATE:
FILE:



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



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

LEGEND

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0177	14	039	SL 494
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	HOU	MONTGOMERY		28

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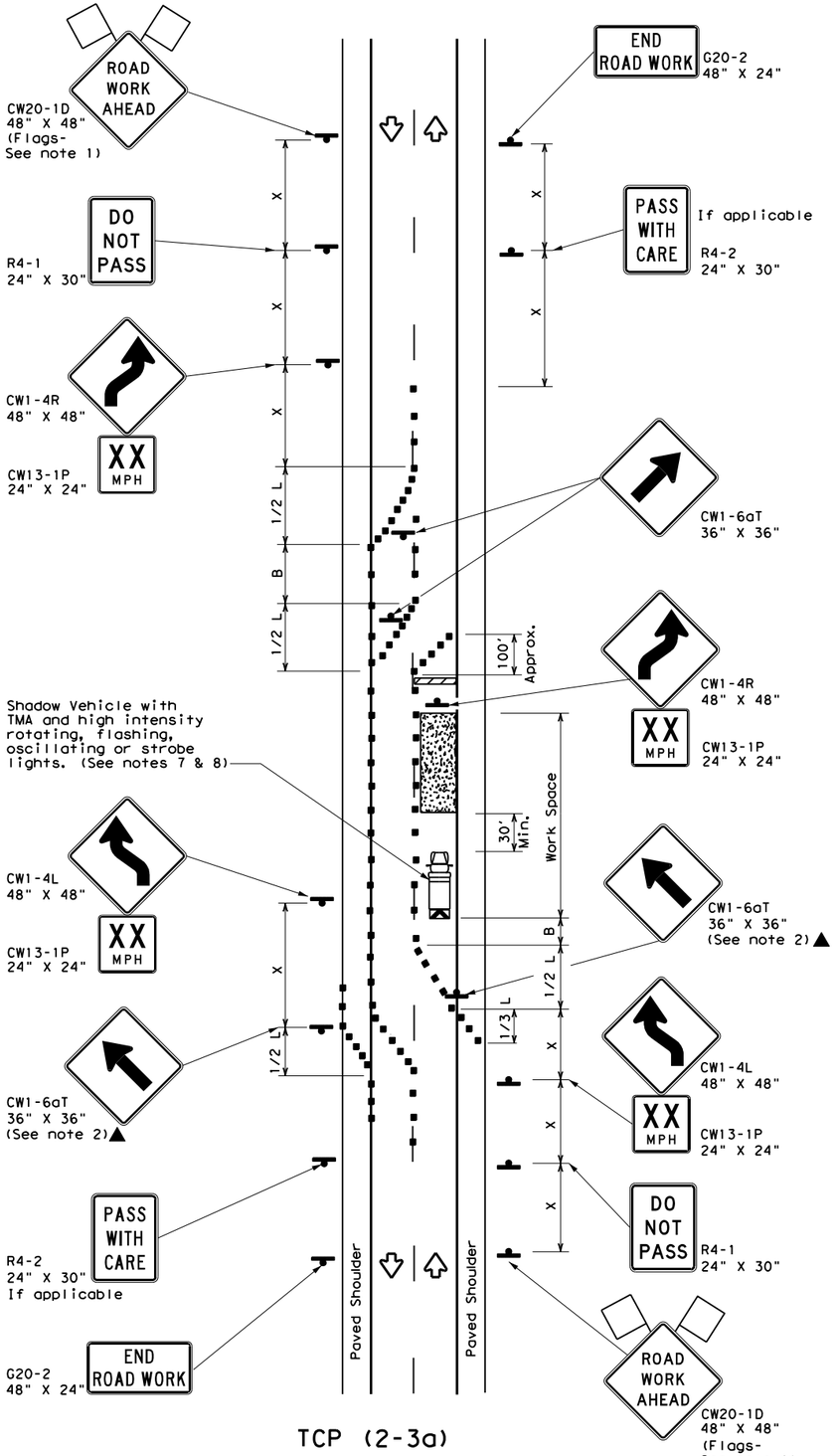
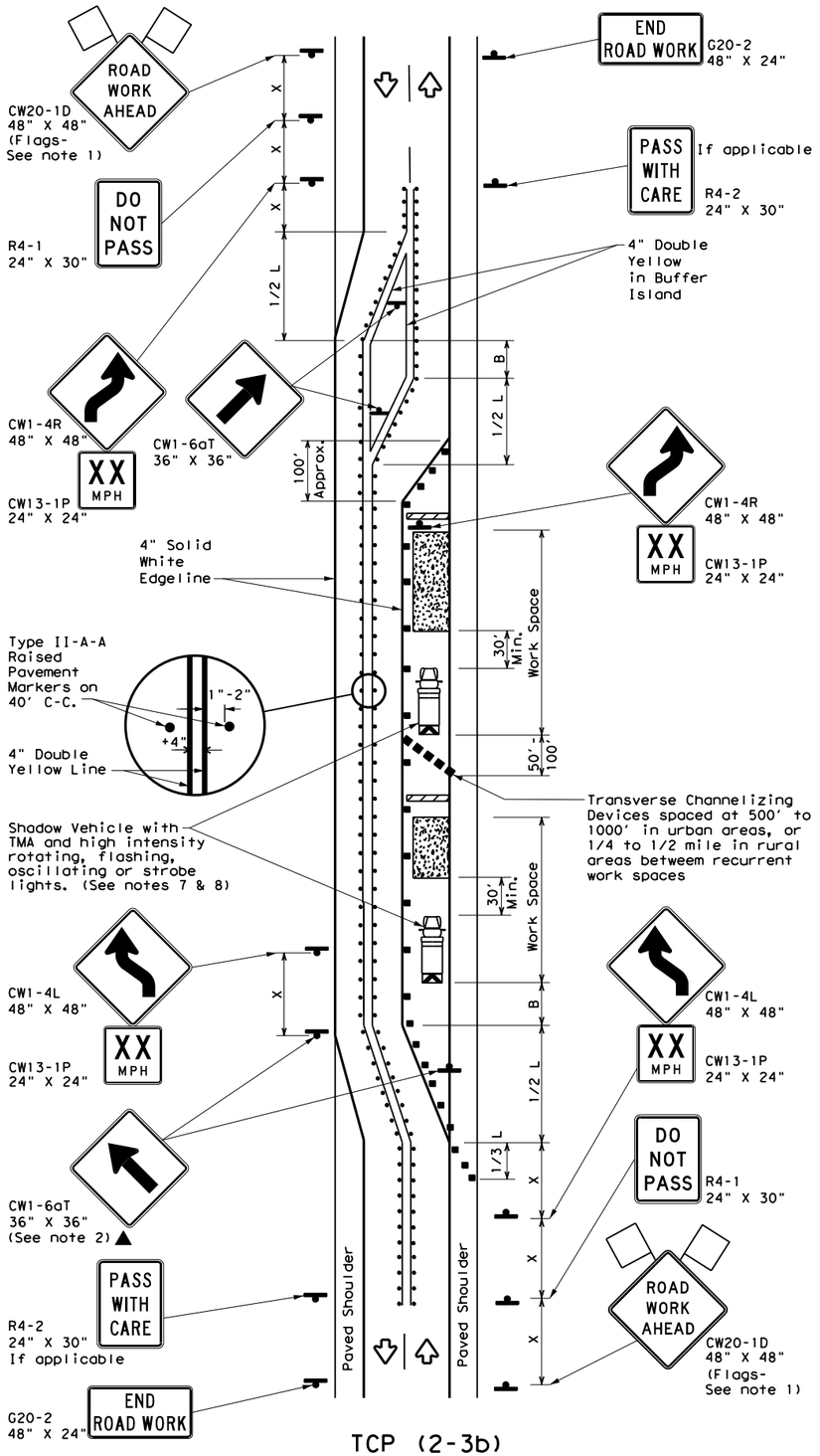
DATE:
FILE:



TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



TCP (2-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND			
	Type 3 Barricade	■ ■	Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	• • • •	Raised Pavement Markers Ty II-AA
	Sign		Traffic Flow
	Flag		Flagger

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted.
8. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-3a)

9. Conflicting pavement markings shall be removed for long-term projects. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter device spacing is intended for the area of the conflicting markings, not the entire work zone.

Texas Department of Transportation

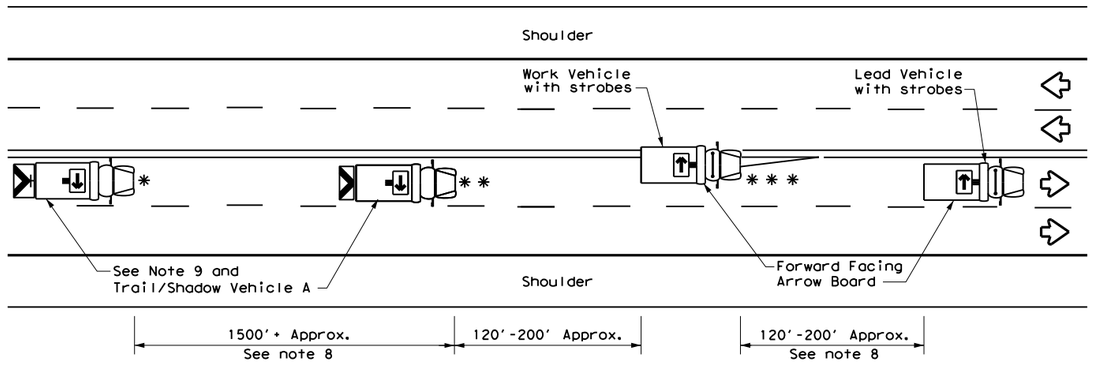
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

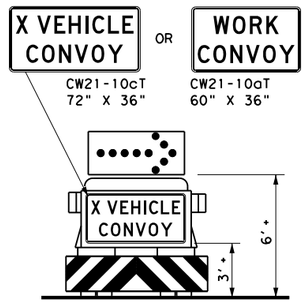
FILE: tcp(2-3)-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	HOU	MONTGOMERY		29
4-98 2-18				

DATE:
FILE:



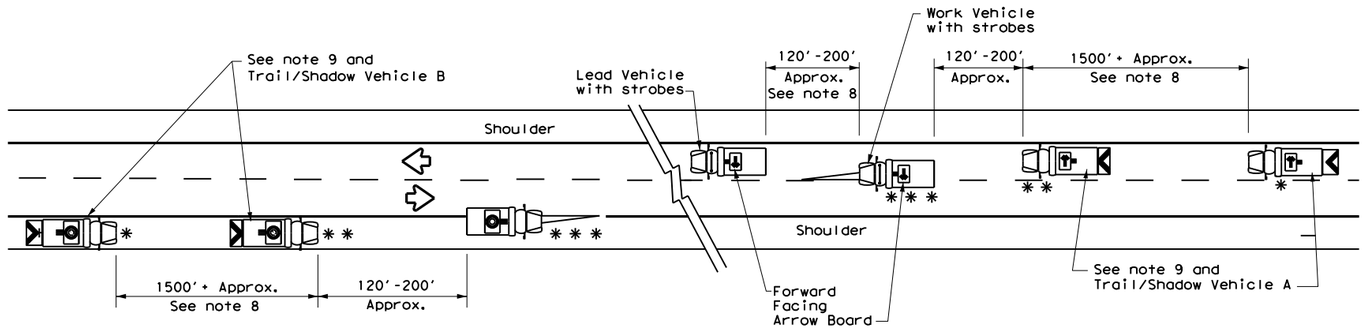
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

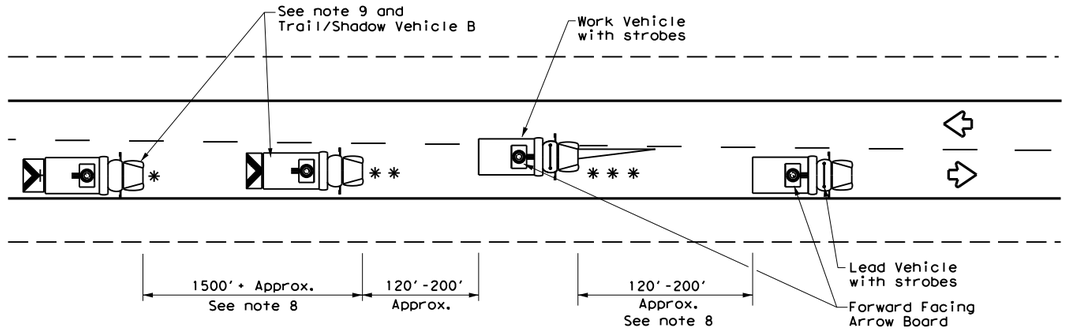


WORK ON SHOULDER

WORK ON TRAVEL LANE

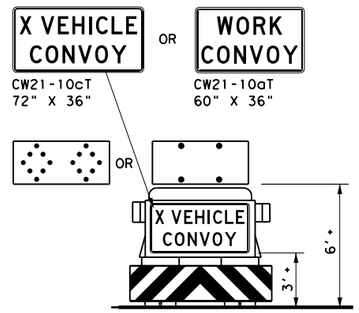
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

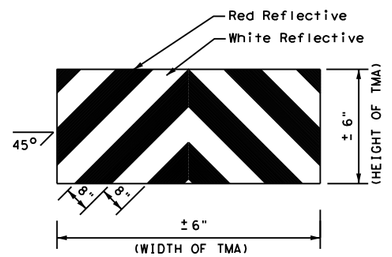
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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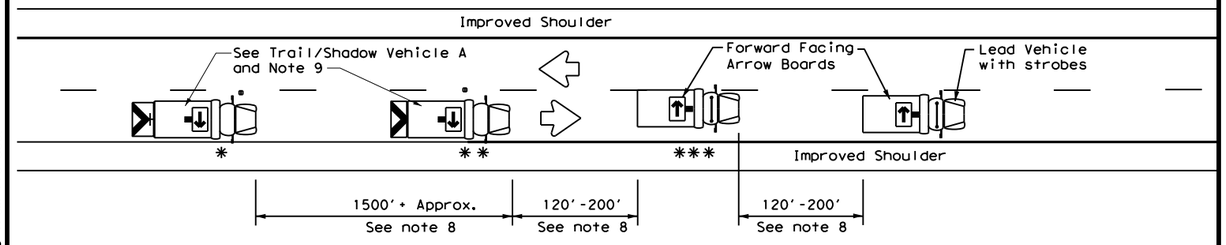
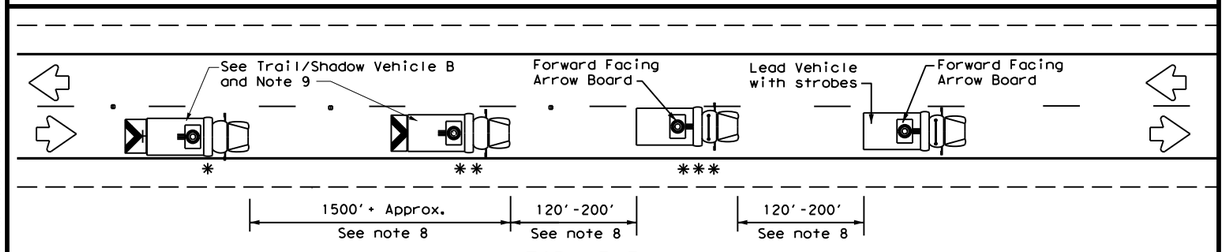
2-94 4-98 8-95 7-13 1-97	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		30



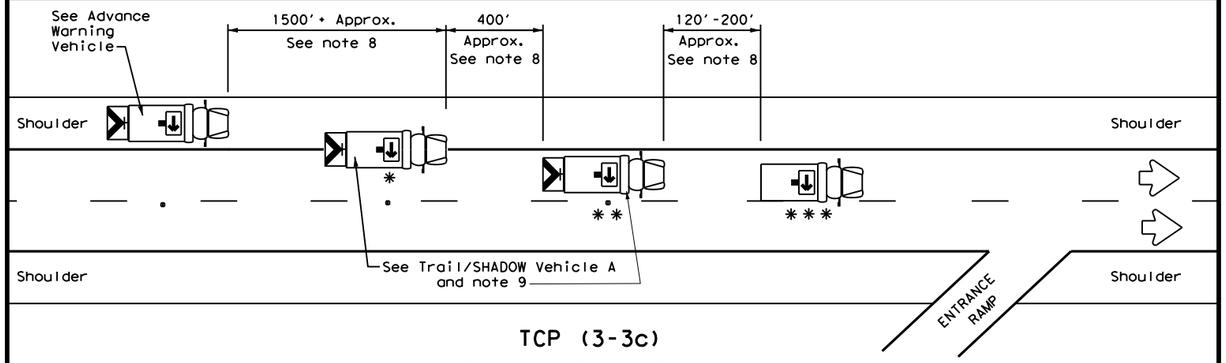
TCP (3-3a)

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



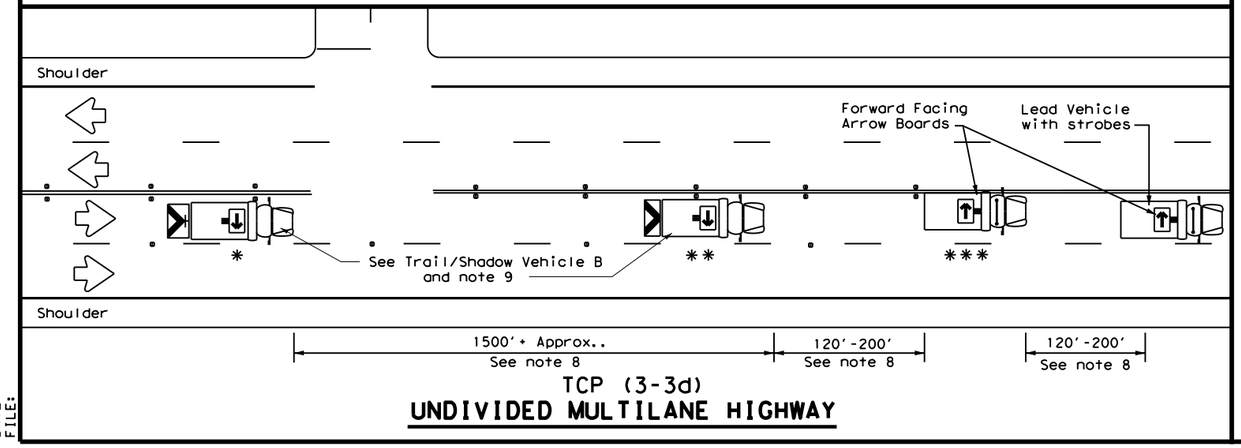
TCP (3-3b)

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



TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY

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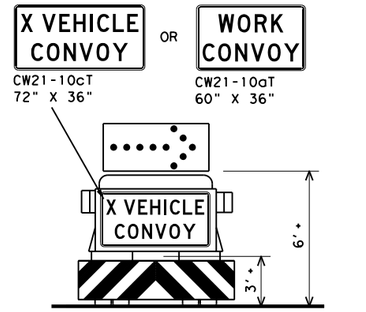
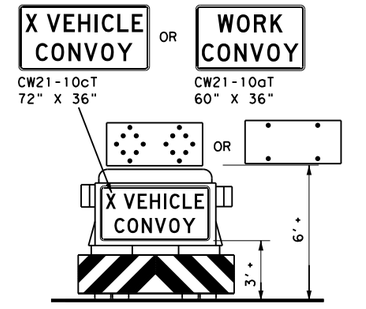
FILE:



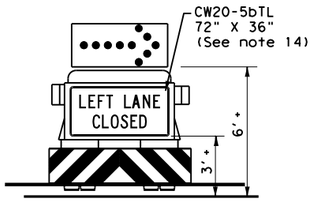
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

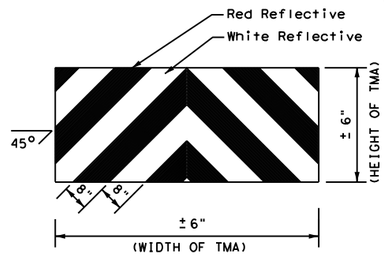


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

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

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	HOU	MONTGOMERY		31
1-97 7-14				

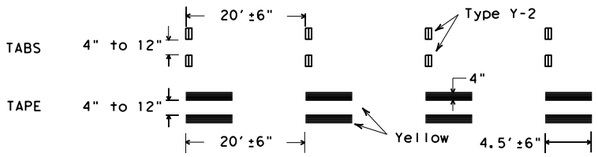
177

DATE:
FILE:

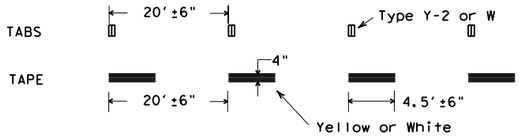
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

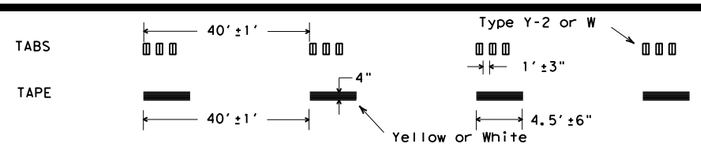


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



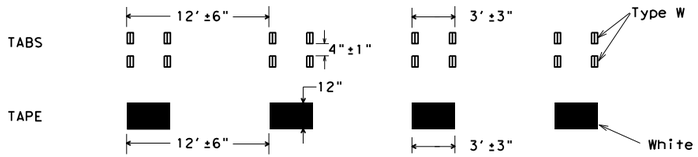
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

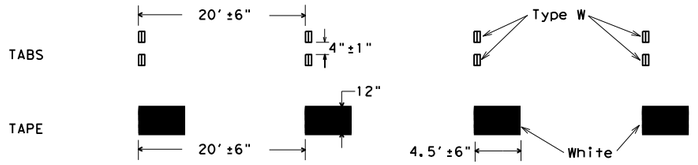


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



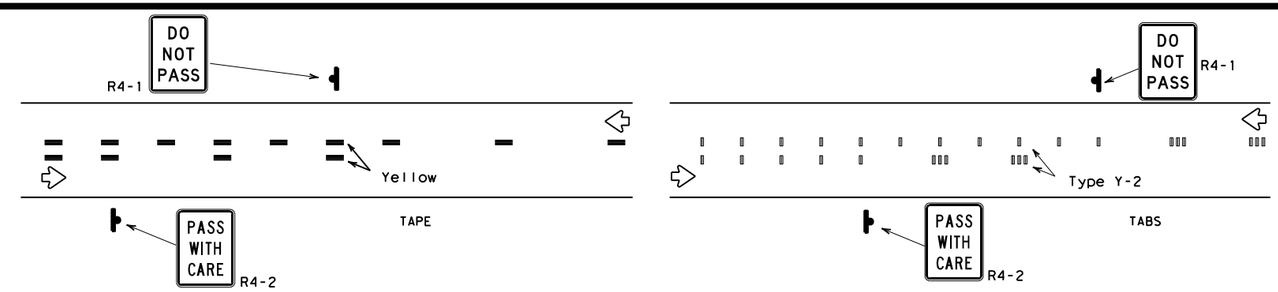
NOTES:

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

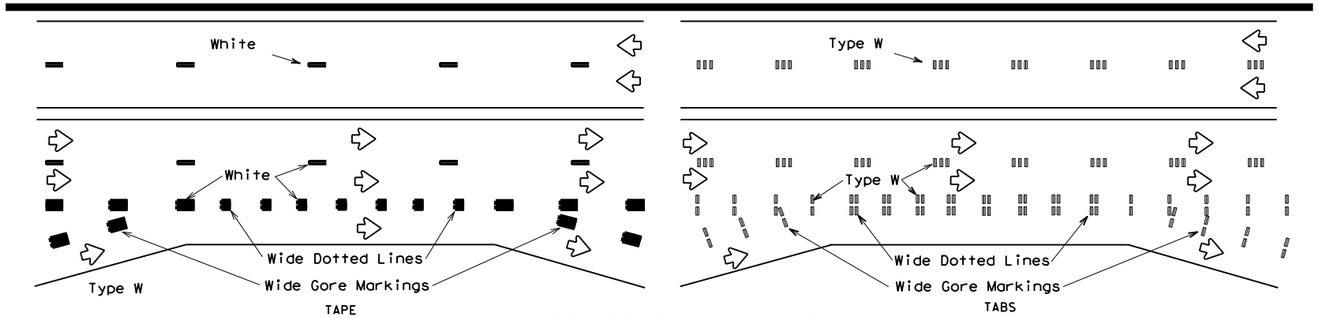
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

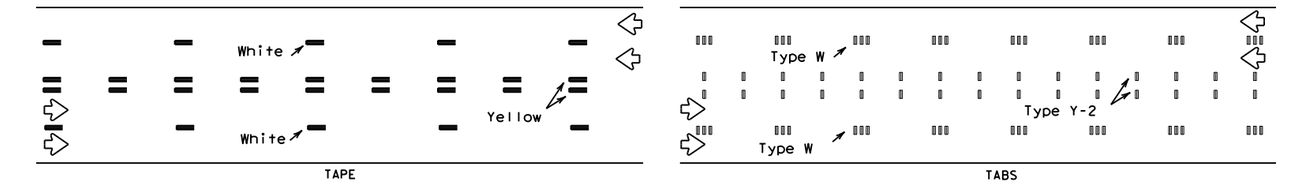
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



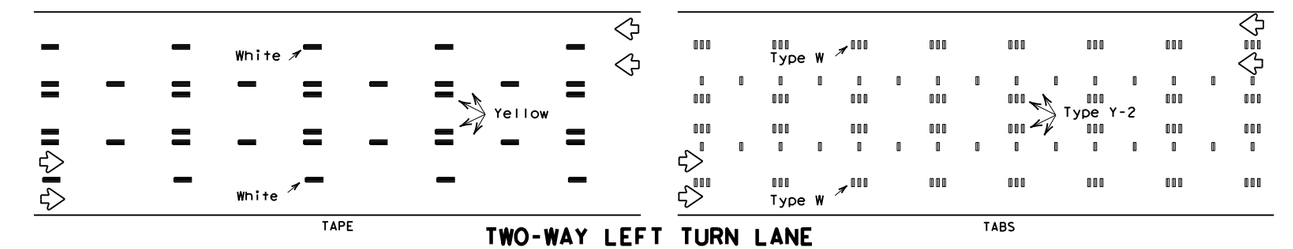
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



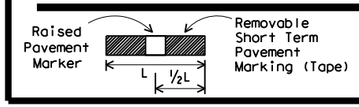
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
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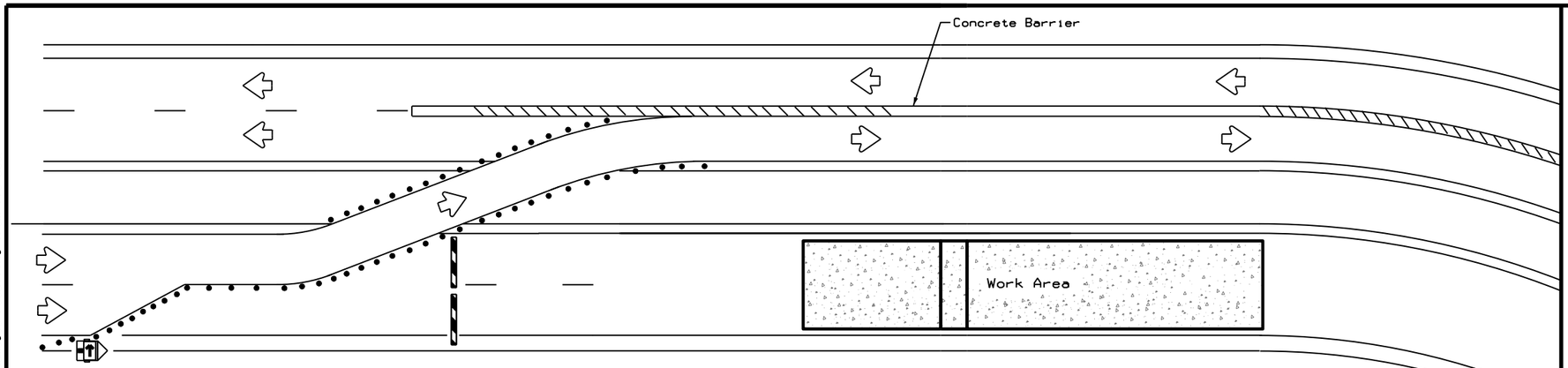
1-97		DIST	COUNTY		SHEET NO.
3-03		HOU	MONTGOMERY		32
7-13					



NOTES:

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

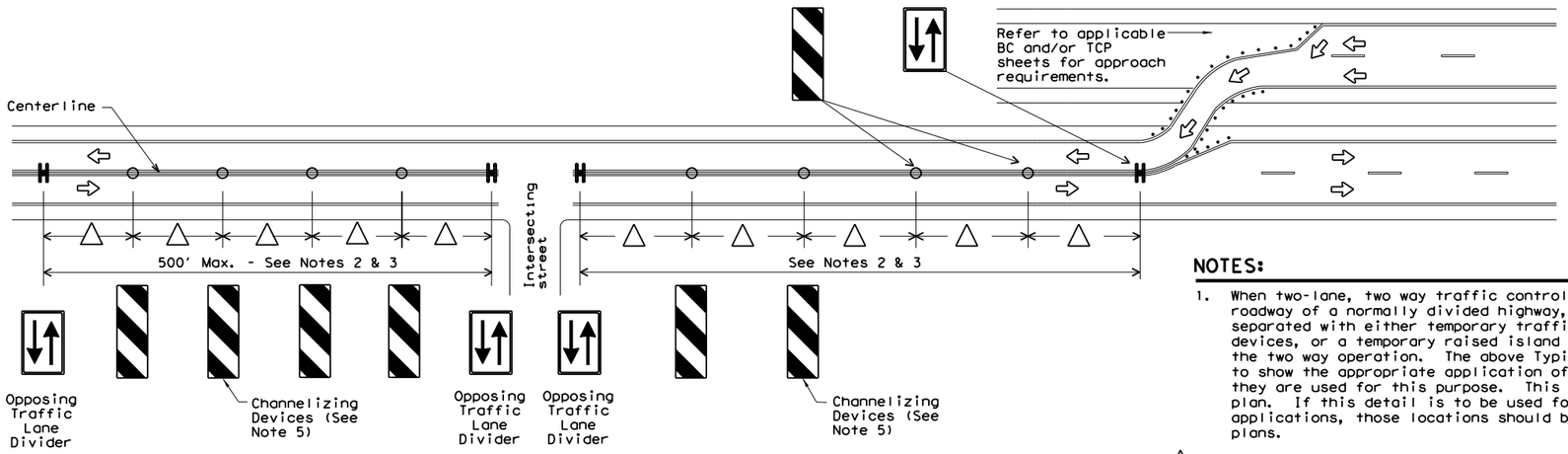
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

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

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

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

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



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

NOTES:

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

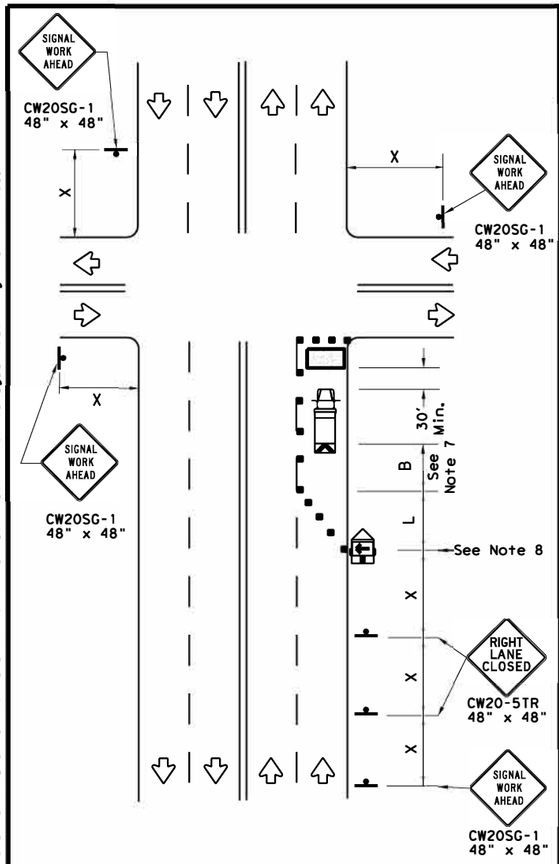
TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		33

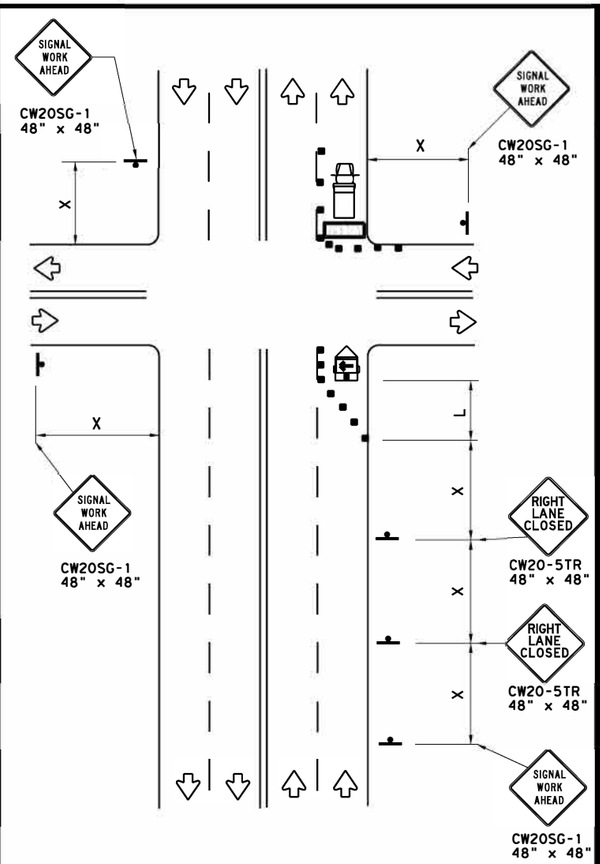
DATE:
FILE:

DATE:
FILE:



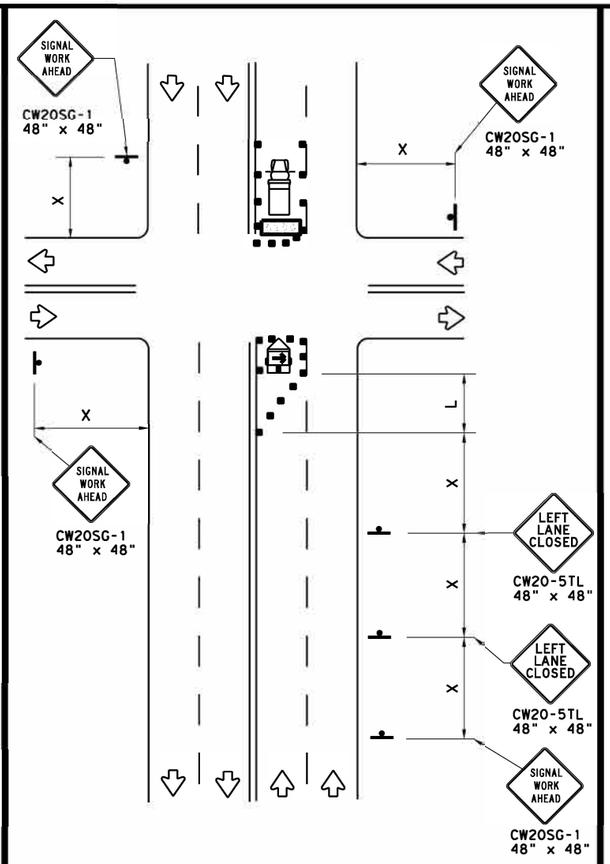
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



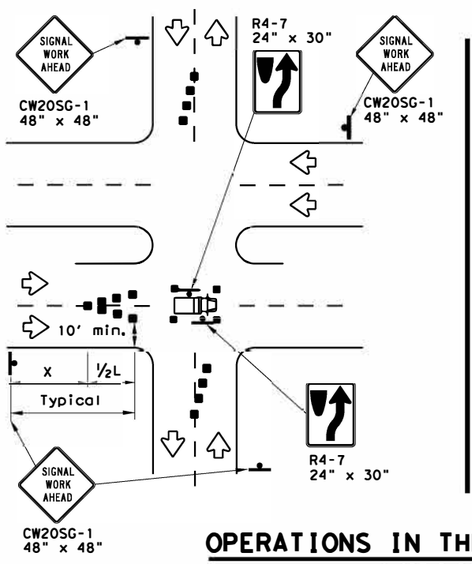
FAR SIDE RIGHT LANE CLOSURE

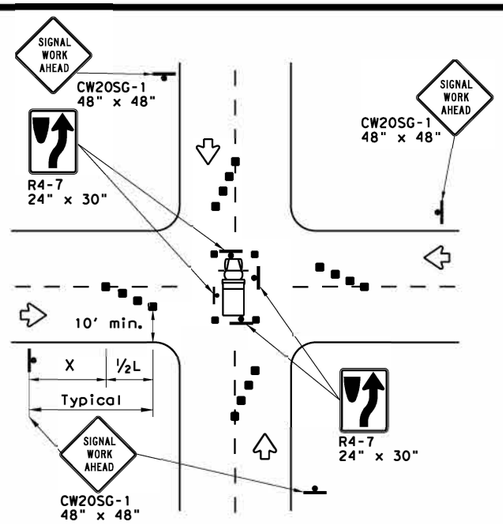
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY





OPERATIONS IN THE INTERSECTION

SHORT DURATION

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

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

* Conventional Roads Only

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

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.

GENERAL NOTES

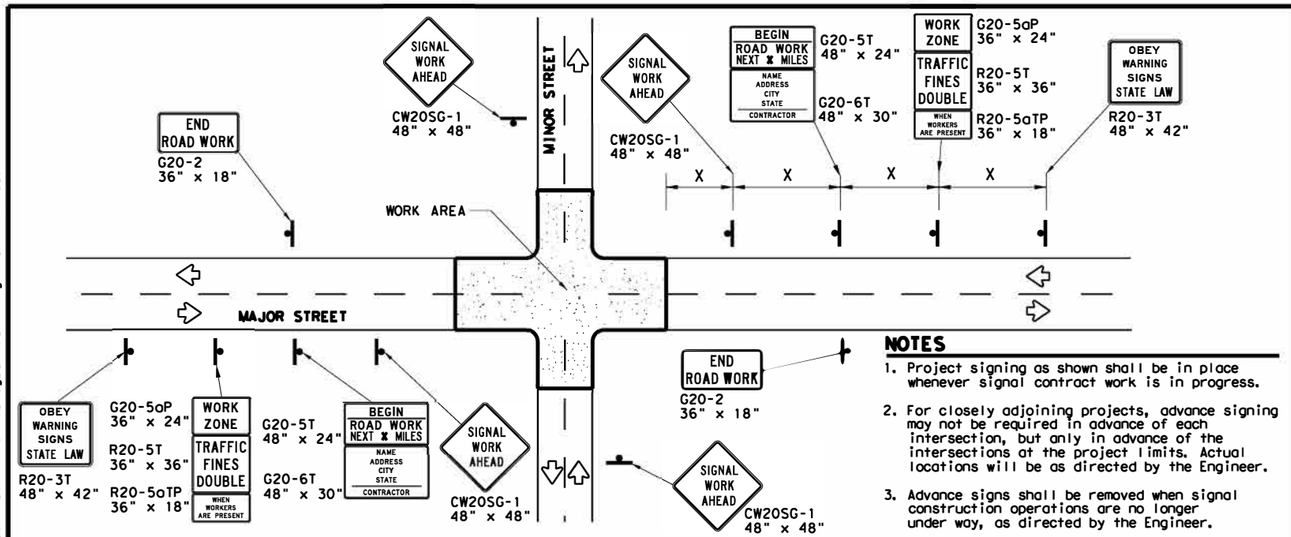
1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	HOU	MONTGOMERY		34



TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. 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".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night without damaging the sign sheeting. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

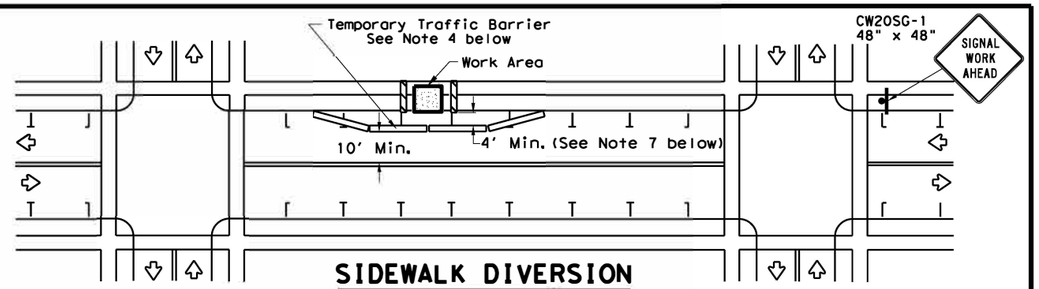
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support 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 fastners. 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.

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

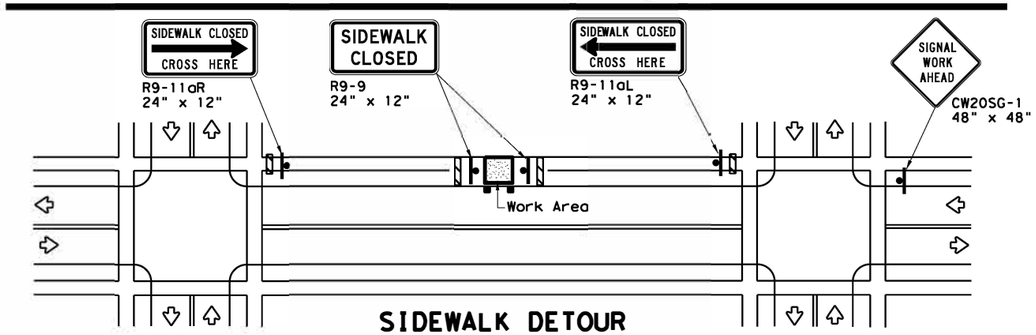
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

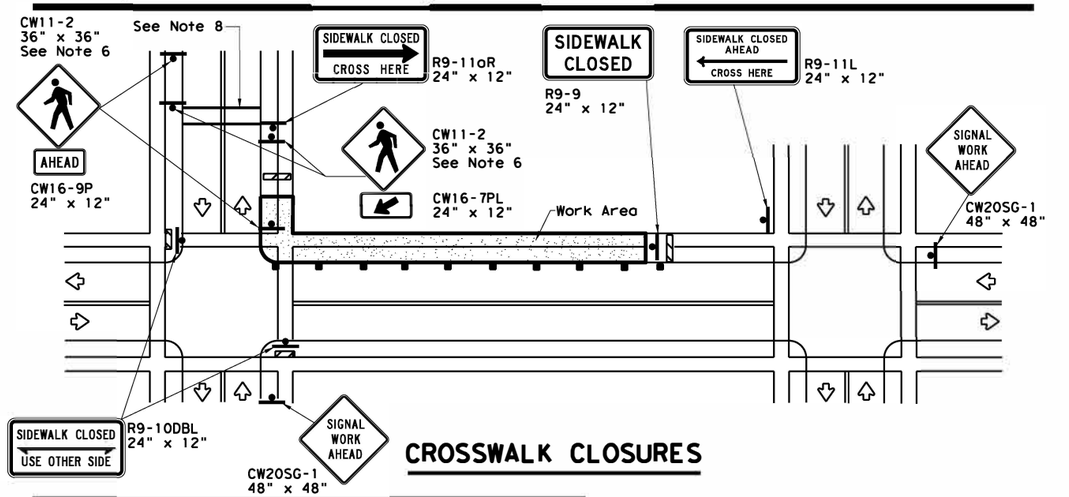
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	HOU	MONTGOMERY		35

DATE:
FILE:

Curve LP494PROPALI_1

P.I. Station	8+15.28	N	10,060,604.4759	E	3,915,672.8446	
Delta =	2° 42′ 57.74"	(RT)				
Degree =	0° 40′ 26.64"					
Tangent =	201.5040					
Length =	402.9326					
Radius =	8,500.0000					
External =	2.3881					
Long Chord =	402.8949					
Mid. Ord. =	2.3875					
P.C. Station	6+13.78	N	10,060,799.8795	E	3,915,722.0512	
P.T. Station	10+16.71	N	10,060,411.6234	E	3,915,614.4339	
C.C.		N	10,062,875.5515	E	3,907,479.3826	
Back = S	14° 08′ 03.72" W					
Ahead = S	16° 51′ 01.46" W					
Chord Bear = S	15° 29′ 32.59" W					

Curve Data

Curve LP494PROPALI_2

P.I. Station	12+19.92	N	10,060,217.1395	E	3,915,555.5290	
Delta =	2° 44′ 20.43"	(LT)				
Degree =	0° 40′ 26.64"					
Tangent =	203.2088					
Length =	406.3401					
Radius =	8,500.0000					
External =	2.4287					
Long Chord =	406.3015					
Mid. Ord. =	2.4280					
P.C. Station	10+16.71	N	10,060,411.6234	E	3,915,614.4339	
P.T. Station	14+23.05	N	10,060,020.0628	E	3,915,505.9850	
C.C.		N	10,057,947.6954	E	3,923,749.4851	
Back = S	16° 51′ 01.46" W					
Ahead = S	14° 06′ 41.03" W					
Chord Bear = S	15° 28′ 51.24" W					

Course from PT LP494PROPALI_2 to PC LP494PROPALI_5 S 14° 06′ 41.03" W Dist 1,205.4156

Curve Data

Curve LP494PROPALI_5

P.I. Station	27+36.29	N	10,058,746.4515	E	3,915,185.8067	
Delta =	1° 27′ 12.76"	(LT)				
Degree =	0° 40′ 26.64"					
Tangent =	107.8247					
Length =	215.6377					
Radius =	8,500.0000					
External =	0.6839					
Long Chord =	215.6320					
Mid. Ord. =	0.6838					
P.C. Station	26+28.47	N	10,058,851.0224	E	3,915,212.0952	
P.T. Station	28+44.11	N	10,058,641.2474	E	3,915,162.1792	
C.C.		N	10,056,778.6550	E	3,923,455.5952	
Back = S	14° 06′ 41.03" W					
Ahead = S	12° 39′ 28.27" W					
Chord Bear = S	13° 23′ 04.65" W					

Curve Data

Curve LP494PROPALI_6

P.I. Station	30+99.28	N	10,058,392.2714	E	3,915,106.2625	
Delta =	3° 26′ 20.80"	(RT)				
Degree =	0° 40′ 26.64"					
Tangent =	255.1778					
Length =	510.2025					
Radius =	8,500.0000					
External =	3.8295					
Long Chord =	510.1259					
Mid. Ord. =	3.8278					
P.C. Station	28+44.11	N	10,058,641.2474	E	3,915,162.1792	
P.T. Station	33+54.31	N	10,058,147.0981	E	3,915,035.5109	
C.C.		N	10,060,503.8398	E	3,906,868.7632	
Back = S	12° 39′ 28.27" W					
Ahead = S	16° 05′ 49.07" W					
Chord Bear = S	14° 22′ 38.67" W					

==========

Ending chain LP494PROPALI description

==========

		STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPI	1	6+13.78	88.4213				
VPC		11+25.00	91.5421	0.6105	K = 353.8		
VPI	2	12+00.00	92.0000		150.0000	75.0000	75.0000
VPT		12+75.00	92.7759	1.0345			
VPC		17+05.00	97.2241	1.0345	K = 105.1	SSD = 830.8	
VPI	3	17+80.00	98.0000		150.0000	75.0000	75.0000
High Point		18+13.70	97.7864				
VPT		18+55.00	97.7052	-0.3931			
VPC		31+55.00	92.5948	-0.3931	K = 142.0		
Low Point		32+10.80	92.4851				
VPI	4	32+30.00	92.3000		150.0000	75.0000	75.0000
VPT		33+05.00	92.7977	0.6636			
VPI	5	33+54.31	93.1249	0.6636			

==========

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter P.E.

03.01.22

SL 494
HORIZONTAL & VERTICAL ALIGNMENT DATA

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		36

DATE: 02/03/2022 11:33 AM
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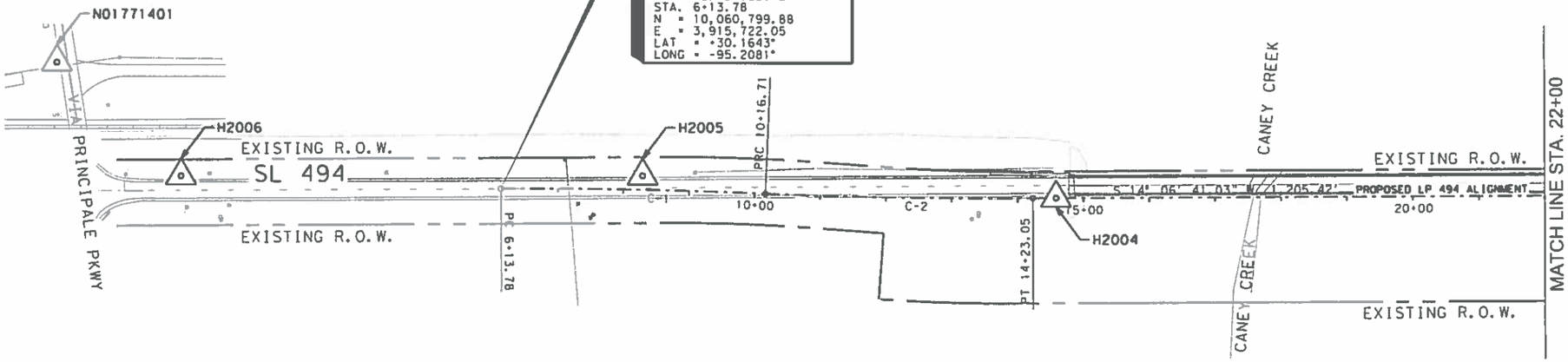


SCALE 1" = 100' (22" X 34")
SCALE 1" = 200' (11" X 17")
0 100 200
GRAPHIC SCALE IN FEET

C-1	
PI STATION	= 8+15.28
DELTA	= 2° 42' 57.74" (RT)
DEGREE OF CURVE	= 0° 40' 26.64"
TANGENT	= 201.50
LENGTH	= 402.93
RADIUS	= 8,500.00
PC STATION	= 6+13.78
PT STATION	= 10+16.71

C-2	
PI STATION	= 8+15.28
DELTA	= 2° 42' 57.74" (RT)
DEGREE OF CURVE	= 0° 40' 26.64"
TANGENT	= 201.50
LENGTH	= 402.93
RADIUS	= 8,500.00
PC STATION	= 6+13.78
PT STATION	= 10+16.71

From	To	Direction	Distance
N01771401	H2006	S 56° 45' 06" W	255.82
H2006	H2005	S 14° 27' 01" W	702.69
H2005	H2004	S 17° 30' 20" W	629.60
H2004	H2003	S 14° 12' 33" W	1,114.88

Point	North	East	Elevation	Station	Offset	Description
H2004	10,059,985.67	3,915,497.66	90.74'	14+58.44	-0.31'	SET 5/8" IR W/RED CAP "CONTROL POINT"
H2005	10,060,586.12	3,915,687.04	88.26'	8+29.11	-20.98'	SET 5/8" IR W/RED CAP "CONTROL POINT"
H2006	10,061,266.57	3,915,862.39	89.95'	OFF CHAIN	OFF CHAIN	SET 5/8" IR W/RED CAP "CONTROL POINT"
N01771401	10,061,406.83	3,916,076.33	91.12'	OFF CHAIN	OFF CHAIN	SET 5/8" IR W/ALUMINUM TXDOT DISC "N01771401"

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE (4203) NAD 83 AS DETERMINED BY GPS OBSERVATIONS USING THE TXDOT VRS NETWORK. ALL COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A TXDOT COMBINED ADJUSTMENT FACTOR OF 1.000030.

2. ALL PROJECT ELEVATIONS ARE BASED ON NAVD88 (GEOID12A) AS DETERMINED BY GPS OBSERVATIONS OF CONTROL POINT H2003 USING THE TXDOT VRS NETORK, ELEVATIONS OF ALL OTHER CONTROL POINTS WERE DETERMINED BY CONVENTIONAL THIRD ORDER LEVEL LOOPS.

3. RIGHT-OF-WAY IS APPROXIMATE AND BASED ON TXDOT RIGHT-OF-WAY MAPS PROVIDED. NO RECORD DEED SEARCH WAS PERFORMED.

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

5. ALL MEASURMENTS ARE U.S. SURVEY FEET.

STATE OF TEXAS
REGISTERED
BRANDON M. ABSHER
6654
PROFESSIONAL
LAND SURVEYOR

SIGNED: Brandon Absher
BRANDON M. ABSHER
REGISTERED PROFESSIONAL
LAND SURVEYOR TEXAS No. 6654

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E. 02/24/2022

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

CivilCorp
ENGINEERS • SURVEYORS
4611 E. AIRLINE ROAD, SUITE 300, VICTORIA, TEXAS 77904
TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #100576-00

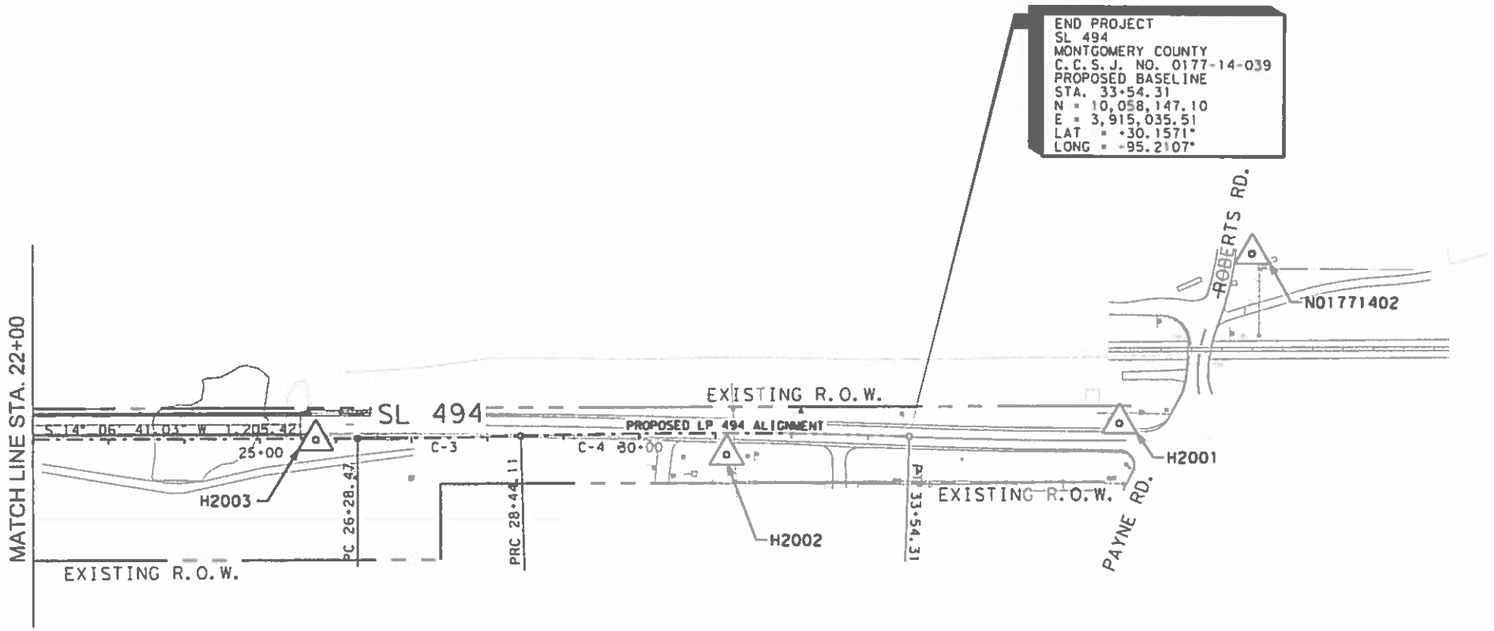
Michael Baker INTERNATIONAL
2002 W. Grand Parkway N.
Suite 325
Katy, TX 77449
TBPE Registration No. 2677

LOOP 494
STATION 6+13.78
TO
STATION 33+54.31

CONTROL INDEX SHEET

SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			37
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494



SCALE: 1" = 100' (22" X 34")
SCALE: 1" = 200' (11" X 17")

0 100 200
GRAPHIC SCALE IN FEET

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE (4203) NAD 83 AS DETERMINED BY GPS OBSERVATIONS USING THE TXDOT VRS NETWORK. ALL COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A TXDOT COMBINED ADJUSTMENT FACTOR OF 1.000030.

2. ALL PROJECT ELEVATIONS ARE BASED ON NAVD88 (GEOID12A) AS DETERMINED BY GPS OBSERVATIONS OF CONTROL POINT H2003 USING THE TXDOT VRS NETORK, ELEVATIONS OF ALL OTHER CONTROL POINTS WERE DETERMINED BY CONVENTIONAL THIRD ORDER LEVEL LOOPS.

3. RIGHT-OF-WAY IS APPROXIMATE AND BASED ON TXDOT RIGHT-OF-WAY MAPS PROVIDED. NO RECORD DEED SEARCH WAS PERFORMED.

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

5. ALL MEASURMENTS ARE U.S. SURVEY FEET.

STATE OF TEXAS
REGISTERED
BRANDON M. ABSHER
6654
PROFESSIONAL
LAND SURVEYOR

SIGNED: Brandon Absher
BRANDON M. ABSHER
REGISTERED PROFESSIONAL
LAND SURVEYOR TEXAS No. 6654

C-3		C-4	
PI STATION	= 27+36.29	PI STATION	= 30+99.28
DELTA	= 1° 27' 12.76" (LT)	DELTA	= 3° 26' 20.80" (RT)
DEGREE OF CURVE	= 0° 40' 26.64"	DEGREE OF CURVE	= 0° 40' 26.64"
TANGENT	= 107.82	TANGENT	= 255.18
LENGTH	= 215.64	LENGTH	= 510.20
RADIUS	= 8,500.00	RADIUS	= 8,500.00
PC STATION	= 26+28.47	PC STATION	= 28+44.11
PT STATION	= 28+44.11	PT STATION	= 33+54.31

From	To	Direction	Distance
H2004	H2003	S 14° 12' 33" W	1,114.88
H2003	H2002	S 16° 21' 07" W	541.71
H2002	H2001	S 09° 44' 21" W	518.85
H2001	N01771402	S 37° 43' 51" E	282.90

Point	North	East	Elevation	Station	Offset	Description
H2001	10,057,873.73	3,914,983.72	92.80'	OFF CHAIN	OFF CHAIN	SET 5/8" IR W/RED CAP "CONTROL POINT"
H2002	10,058,385.11	3,915,071.49	90.37'	31+14.83	28.06'	SET 5/8" IR W/RED CAP "CONTROL POINT"
H2003*	10,058,904.90	3,915,224.00	89.45'	25+73.31	1.59'	SET 5/8" IR W/RED CAP "CONTROL POINT"
H2008	10,057,649.99	3,915,156.84	93.71'	OFF CHAIN	OFF CHAIN	SET 5/8" IR W/ALUMINUM TXDOT DISC "N01771402"

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E 02/24/2022

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

CivilCorp
ENGINEERS • SURVEYORS
4611 E. AIRLINE ROAD, SUITE 300, VICTORIA, TEXAS 77904
TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #100576-00

Michael Baker INTERNATIONAL
2002 W. Grand Parkway N.
Suite 325
Katy, TX 77449
TBPE Registration No. 2677

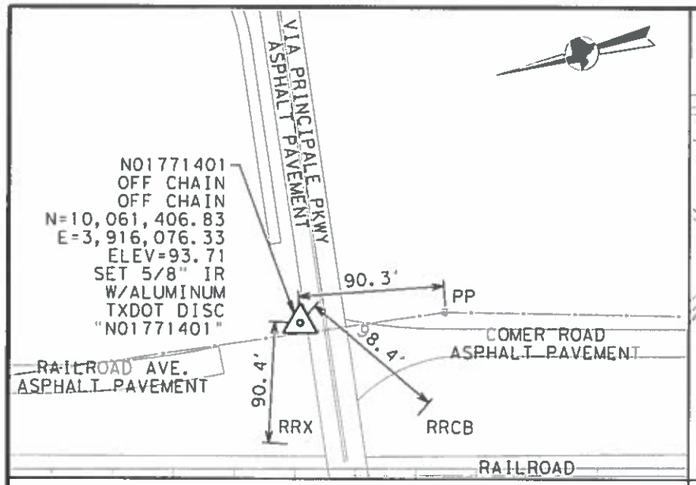
LOOP 494
STATION 6+13.78
TO
STATION 33+54.31

CONTROL INDEX SHEET

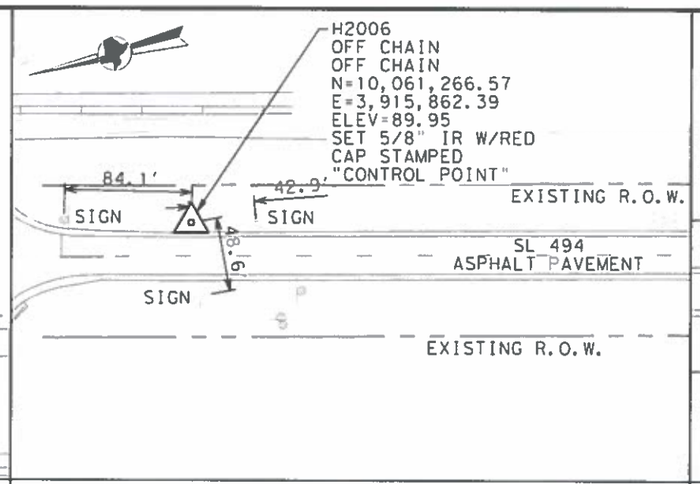
SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		37A

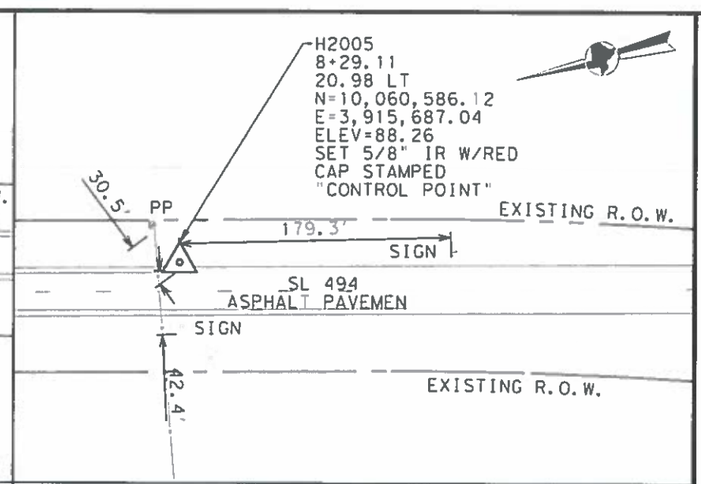
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494



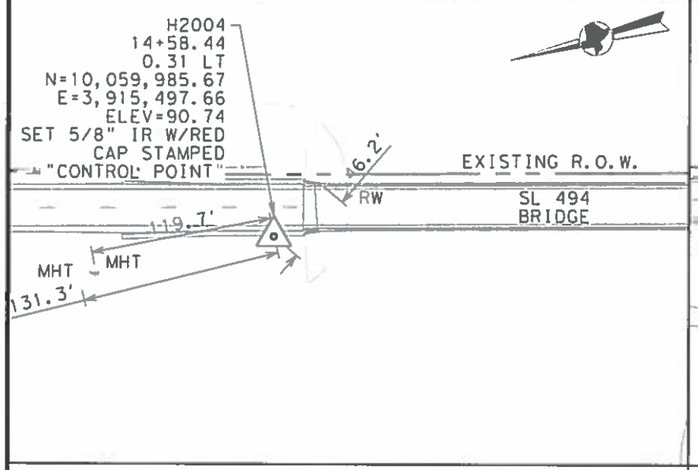
SITUATED ON THE NORTH SIDE OF VIA PRINCIPALE PKWY
APPROXIMATELY 40 FEET NORTH OF COMER RD



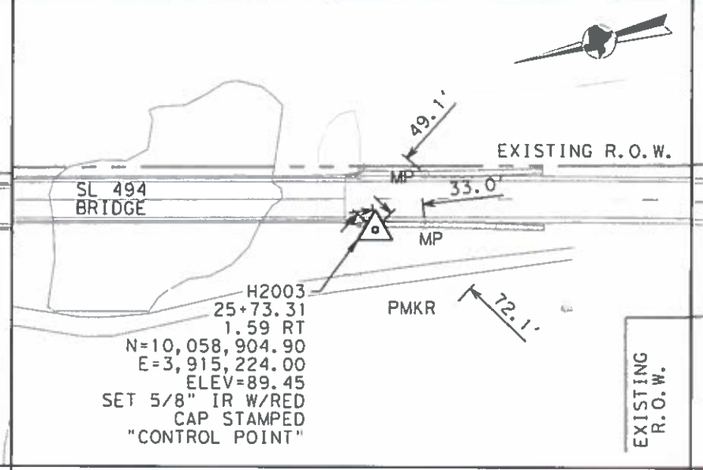
SITUATED ON THE EAST SIDE OF SL 494
APPROXIMATELY 150 FEET SOUTH OF VIA PRINCIPALE PKWY



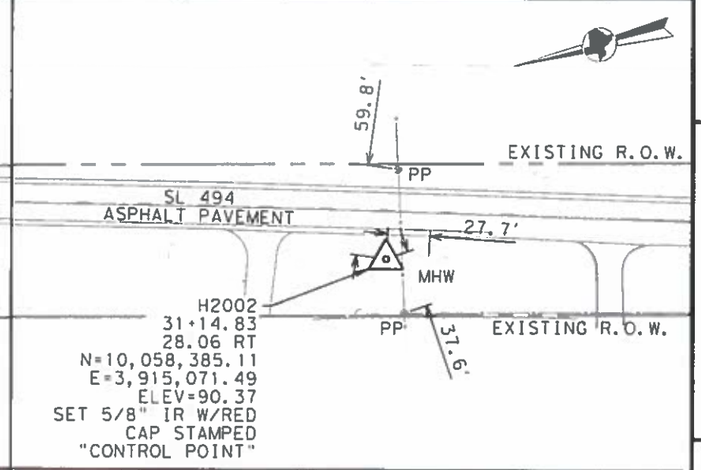
SITUATED ON THE EAST SIDE OF SL 494
APPROXIMATELY 0.16 MILES SOUTH OF VIA PRINCIPALE PKWY



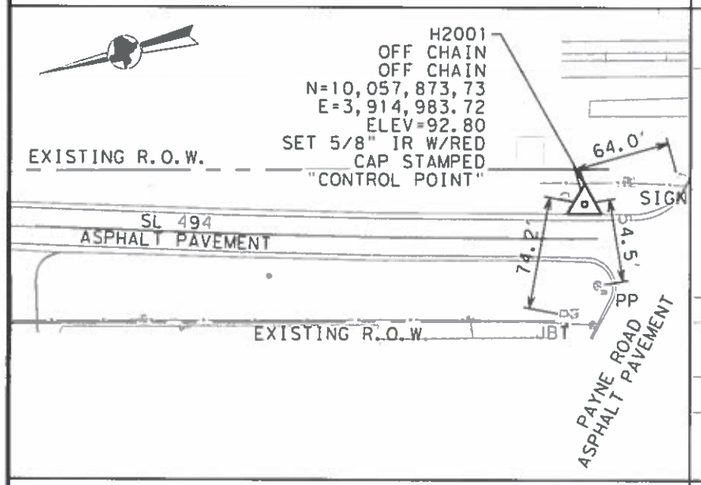
SITUATED ON THE WEST SIDE OF SL 494
APPROXIMATELY 0.28 MILES SOUTH OF VIA PRINCIPALE PKWY



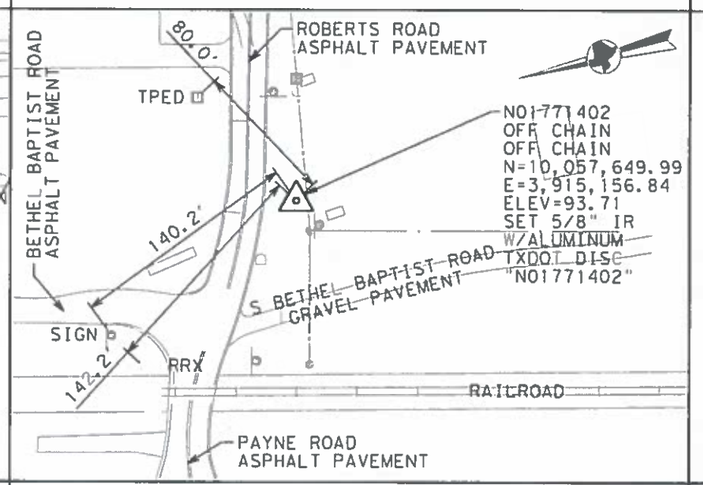
SITUATED ON THE WEST SIDE OF SL 494
APPROXIMATELY 0.28 MILES NORTH OF PAYNE RD



SITUATED ON THE WEST SIDE OF SL 494
APPROXIMATELY 0.11 MILES NORTH OF PAYNE RD



SITUATED ON THE WEST SIDE OF SL 494
APPROXIMATELY 80 FEET NORTH OF ROBERTS RD



SITUATED ON THE SOUTH SIDE OF ROBERTS ROAD
APPROXIMATELY 90 FEET EAST OF S BETHEL BAPTIST ROAD

SCALE: 1" = 50' (22" X 34")
SCALE: 1" = 100' (11" X 17")
0 50 100
GRAPHIC SCALE IN FEET
(ALL SKETCHES)

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE (4203) NAD 83 AS DETERMINED BY GPS OBSERVATIONS USING THE TXDOT VRS NETWORK. ALL COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A TXDOT COMBINED ADJUSTMENT FACTOR OF 1.000030.

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3. RIGHT-OF-WAY IS APPROXIMATE AND BASED ON TXDOT RIGHT-OF-WAY MAPS PROVIDED. NO RECORD DEED SEARCH WAS PERFORMED.

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

5. ALL MEASURMENTS ARE U.S. SURVEY FEET.

STATE OF TEXAS
REGISTERED
BRANDON M. ABSHER
6654
PROFESSIONAL
LAND SURVEYOR

SIGNED: _____
BRANDON M. ABSHER
REGISTERED PROFESSIONAL
LAND SURVEYOR TEXAS No. 6654

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E. 02/24/2022

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

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TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #100578-00

Michael Baker INTERNATIONAL
2002 W. Grand Parkway N.
Suite 325
Katy, TX 77449
TBPE Registration No. 2677

LOOP 494
STATION 6+13.78
TO
STATION 33+54.31

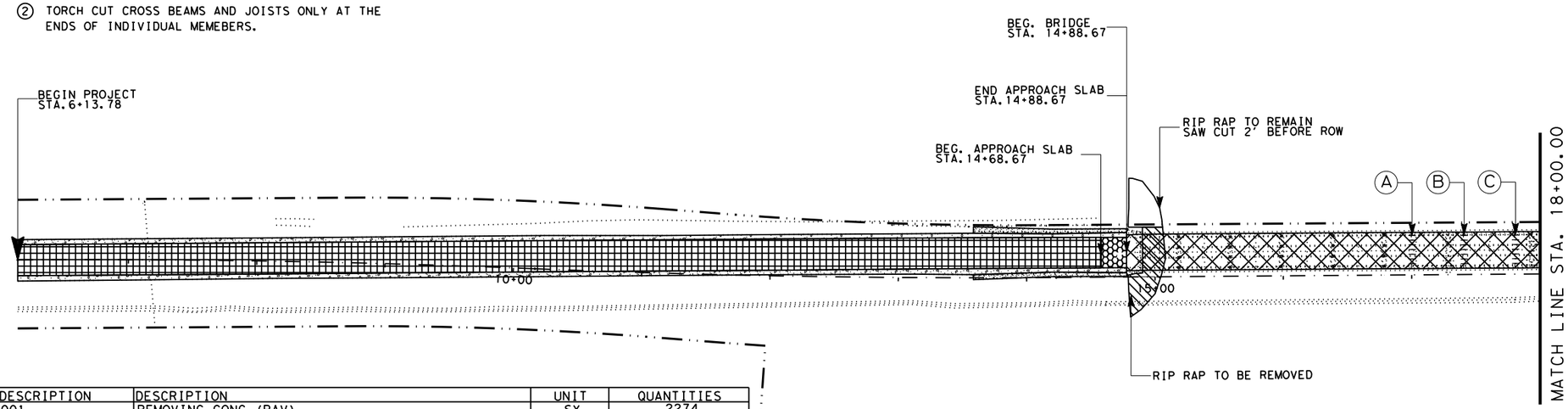
HORIZONTAL AND VERTICAL CONTROL SHEET

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			38
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494

NOTE:

① REMOVE EXISTING TRAFFIC RAIL AT BASE OF POST

② TORCH CUT CROSS BEAMS AND JOISTS ONLY AT THE ENDS OF INDIVIDUAL MEMEBERS.



ITEM	DESCRIPTION	UNIT	QUANTITIES
104-6001	REMOVING CONC (PAV)	SY	2274
104-6009	REMOV CONCRETE (RIP RAP)	SY	130
104-6054	REMOV CONCRETE (MOW STRIP)	LF	240
105-6024	REMOVING STAB BASE AND ASPH PAV (21")	SY	706
105-6062	REMOVING STAB BASE AND ASPH PAV (4"-16")	SY	2274
305-6016	SALV, HAUL, & STKPL RCL ASPH PV (3")	SY	2980
496-6025	REMOV STR (APPROACH SLAB)	EA	1
542-6001	REMOVE METAL BEAM GUARD FENCE	LF	150
544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	2

LEGEND

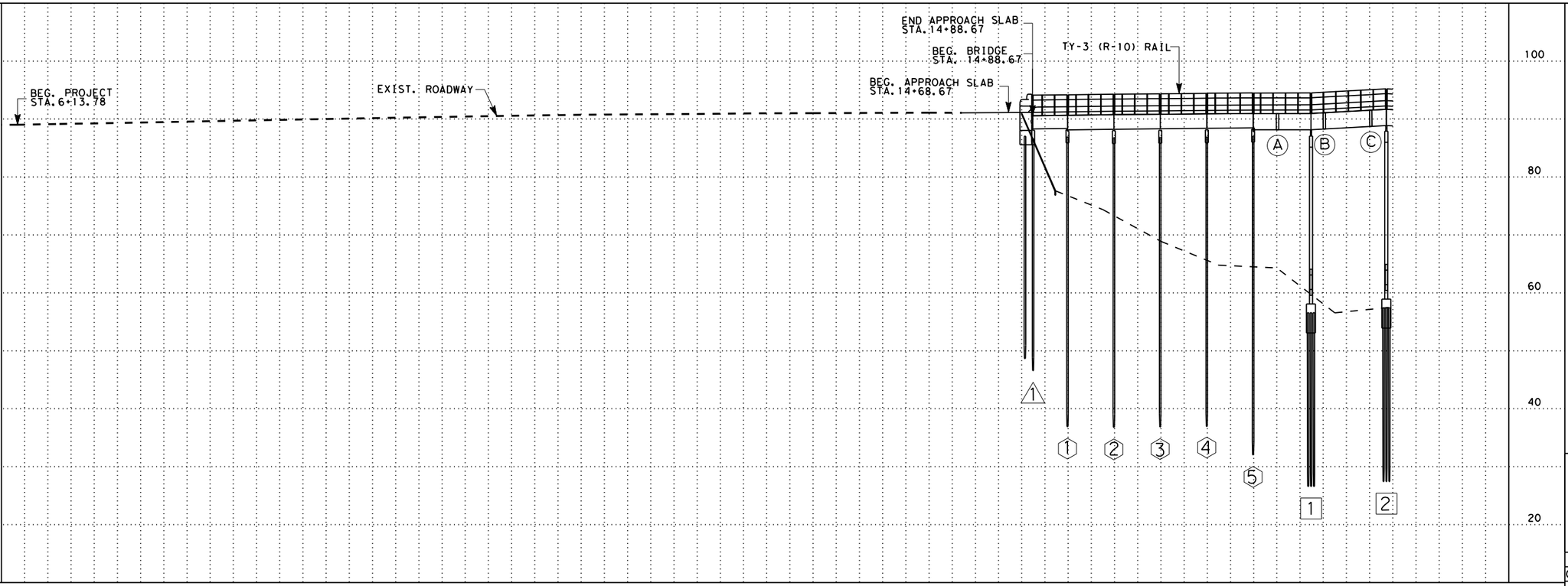
- EXIST. PAVEMENT
- EXIST. ROW
- REMOVING CONC (PAV)
- SALV, HAUL & STKPL RCL ASPH (3")
- REMOVING STAB BASE & ASPH PAV (4"-16")
- REMOV STR (APPROACH SLAB)
- REMOV STR (BRDIGE 1000 FT OR GREATER)
- REMOVE CONCRETE (MOW STRIP)
- REMOVING STAB BASE AND ASPH PAV (8"-22")
- CONCRETE (RIP RAP) TO REMAIN
- ABUTMENT
- BENT
- PIER

HORIZ 0 50 100
VERT 0 10 20
SCALE IN FEET

Ⓐ BEG BEAM CUT AT STA 16+99.00
END CUT AT STA 17+01.00

Ⓑ BEG BEAM CUT AT STA 17+40.00
END CUT AT STA 17+42.00

Ⓒ BEG BEAM CUT AT STA 17+80.00
END CUT AT STA 17+82.00



STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED PROFESSIONAL ENGINEER

Micah J. Schluter P.E.

02.24.22

SL 494
DEMO
LAYOUT

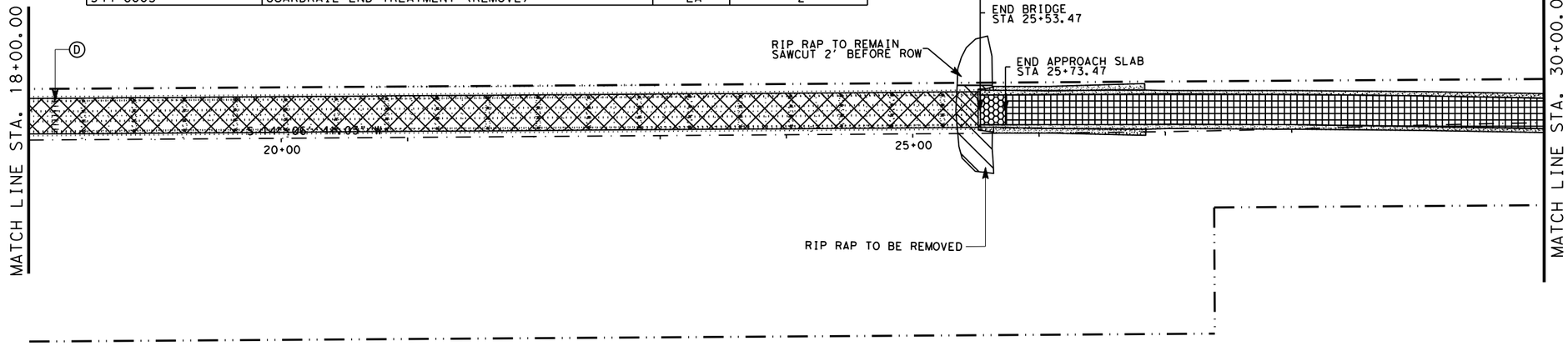
SHEET 1 OF 3

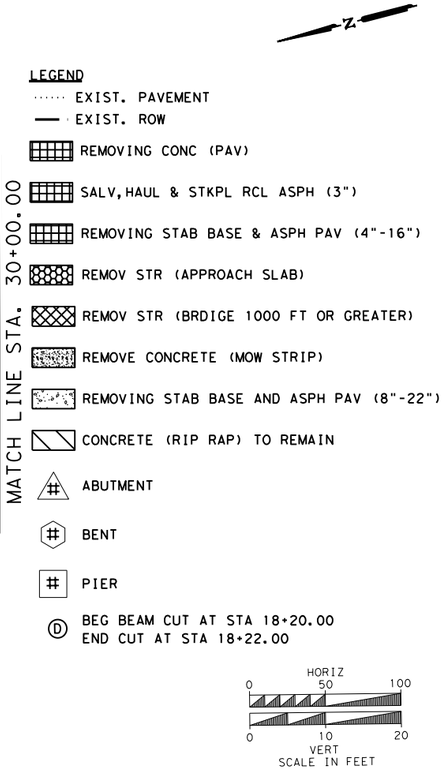
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		39

DATE: $DATE$ $TIME$
FILE: $FILE$

ITEM	DESCRIPTION	UNIT	QUANTITIES
104-6001	REMOVING CONC (PAV)	SY	1140
104-6009	REMOV CONCRETE (RIP RAP)	SY	156
104-6054	REMOV CONCRETE (MOW STRIP)	LF	242
105-6024	REMOVING STAB BASE AND ASPH PAV (21")	SY	320
105-6062	REMOVING STAB BASE AND SAPH PAV (4"-16")	SY	1140
305-6016	SALV, HAUL, & STKPL RCL APH PV (3")	SY	1460
496-6012	REMOV STR (BRIDGE OF 1000 FT OR GREATER)	EA	1
496-6025	REMOV STR (APPROCH SLAB)	EA	1
542-6001	REMOVE METAL BEAM GUARD FENCE	LF	150
544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	2

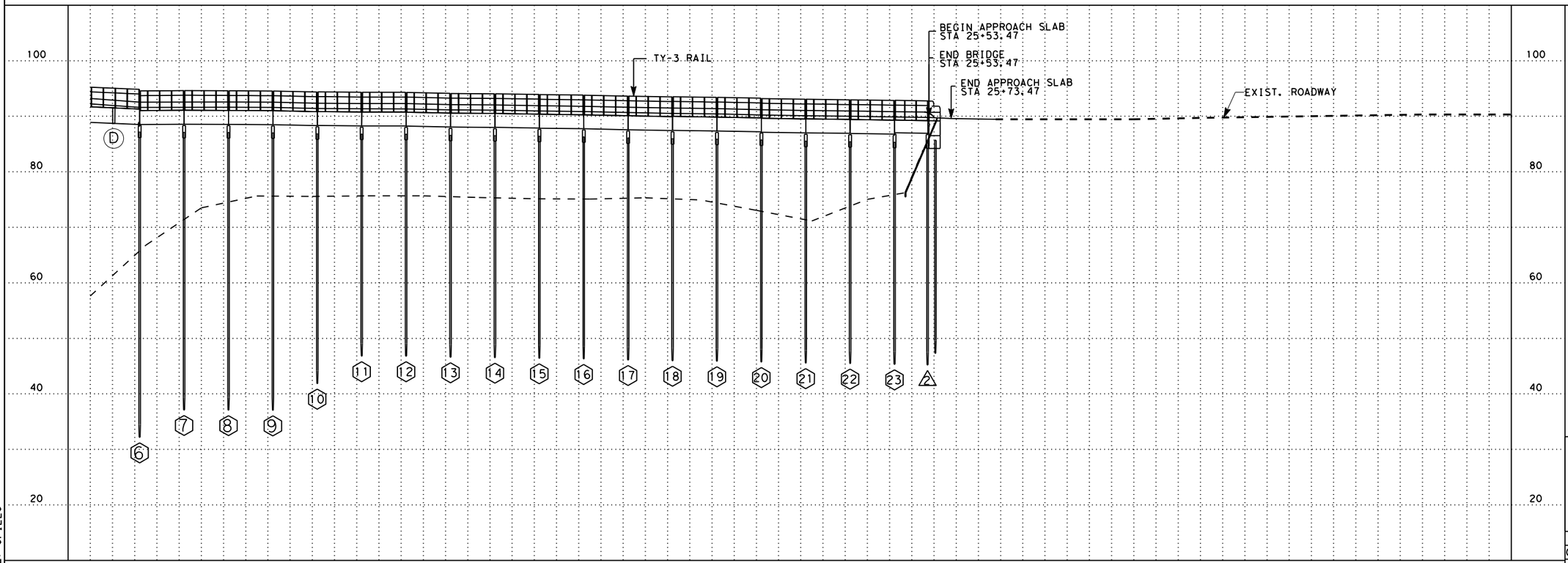




NOTE:

① REMOVE EXISTING TRAFFIC RAIL AT BASE OF POST

② TORCH CUT CROSS BEAMS AND JOISTS ONLY AT THE ENDS OF INDIVIDUAL MEMEBERS.



STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED PROFESSIONAL ENGINEER

Micah J. Schluter P.E.

02.24.22

SL 494
DEMO
LAYOUT

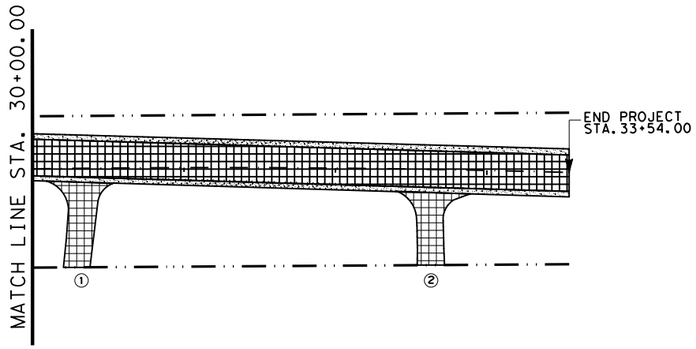
SHEET 2 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		40

DATE: $DATE$ $TIME$
FILE: $FILE$

CK'D
DR'D
CK'D
DR'N



LEGEND

EXIST. PAVEMENT

EXIST. ROW

REMOVING CONC (PAV)

SALV, HAUL & STKPL RCL ASPH (3")

REMOVING STAB BASE & ASPH PAV (4"-16")

REMOV STR (APPROACH SLAB)

REMOV STR (BRDIGE 1000 FT OR GREATER)

REMOVE CONCRETE (MOW STRIP)

REMOVING STAB BASE AND ASPH PAV (8"-22")

CONCRETE (RIP RAP) TO REMAIN

(#) DRIVEWAY

ITEM DESCRIPTION	DESCRIPTION	UNIT	QUANTITIES
104-6001	REMOVING CONC (PAV)	SY	949
105-6024	REMOVING STAB BASE AND ASPH PAV (21")	SY	283
105-6062	REMOVING STAB BASE AND SAPH PAV (4"-16")	SY	1184
305-6016	SALV, HAUL, & STKPL RCL APH PV (3")	SY	1467

HORIZ
0 50 100
0 10 20
VERT
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.

02.24.22

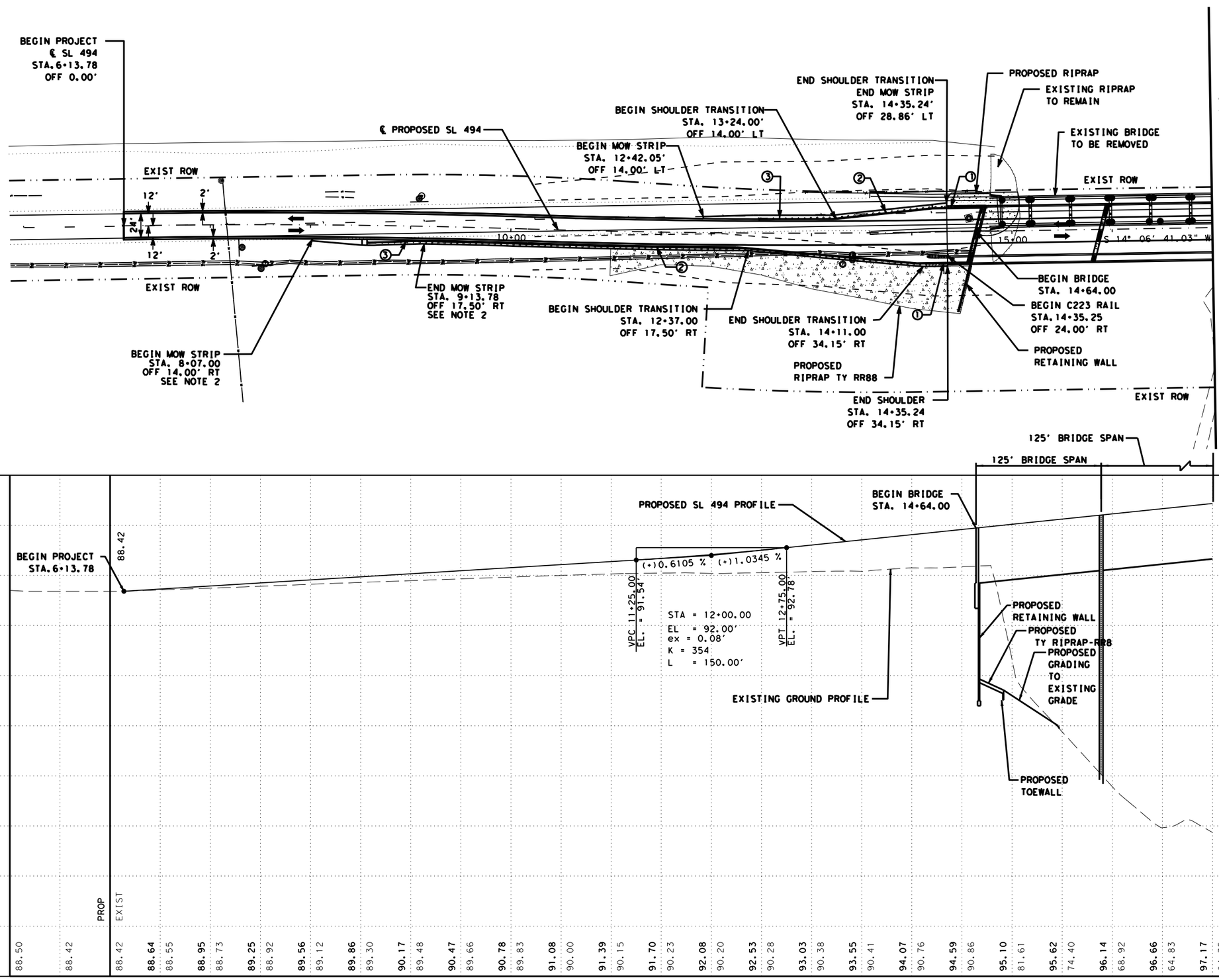
SL 494
DEMO
LAYOUT

SHEET 3 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		41

DATE: $DATE$ $TIME$
FILE: $FILE$



0 50 100 (H)
0 5 10 (V)
SCALE: 1"=100'

LEGEND

- CCA
- RETAINING WALL
- TRAFFIC FLOW
- (1) GF(31) TR TL3-19 MBGF THRIE BEAM TRANSITION
- (2) GF(31)-19 25'-0" MBGF
- (3) SGT(12S)31-18 SINGLE GUARDRAIL TERMINAL MSKT-MASH-TL-3

NOTES:

1. ALL STATIONING IS BASED ON PROPOSED SL 494 CENTERLINE UNLESS OTHERWISE NOTED.
2. FOR MOW STRIP DETAILS SEE MOW STRIP STANDARD, METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT GF(31)MS-19

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.

03.01.22

SL 494 ROADWAY PLAN & PROFILE

SHEET 1 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		42

DATE: 03/01/2022 08:59 AM
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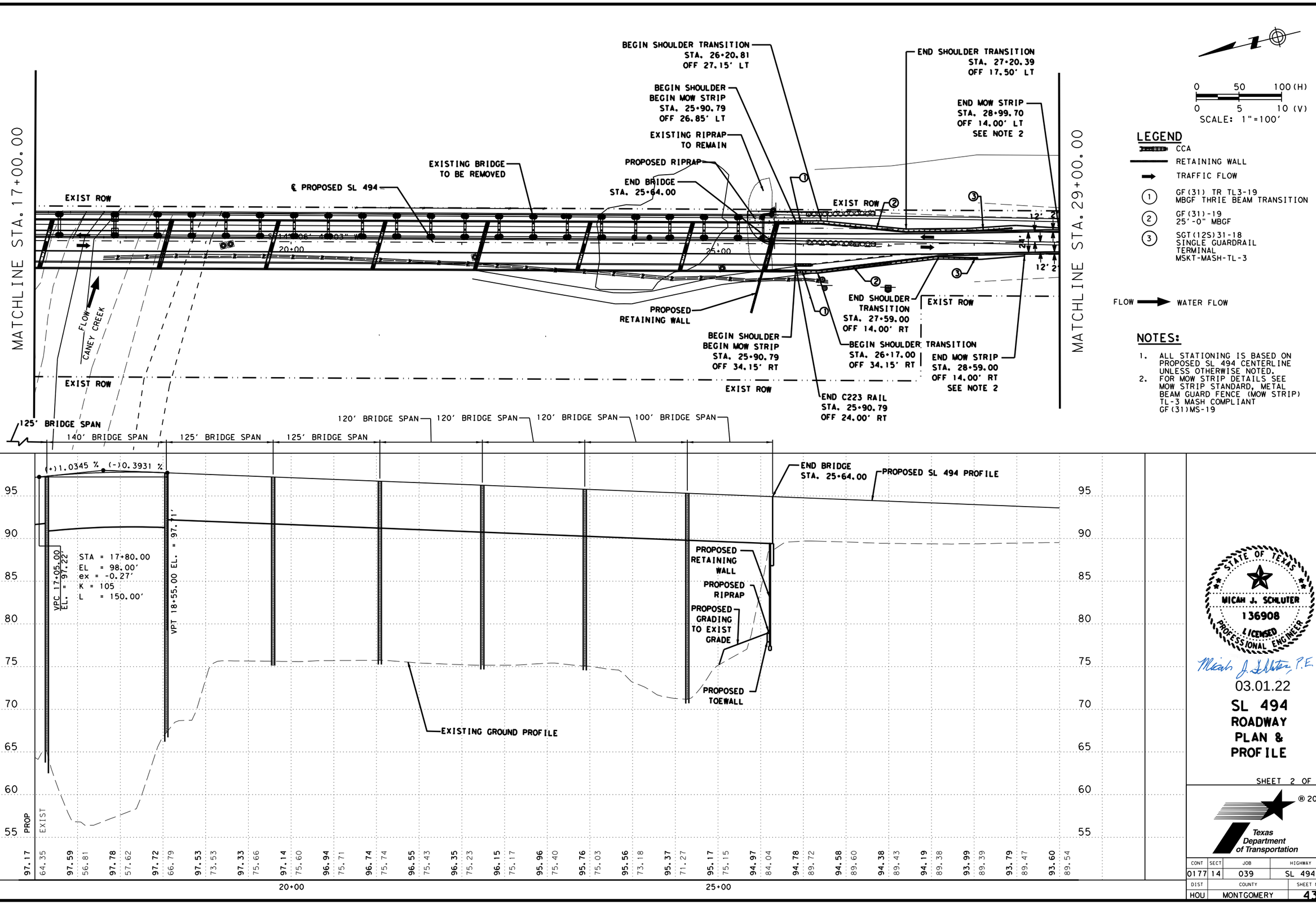


0 50 100 (H)
0 5 10 (V)
SCALE: 1"=100'

LEGEND

- CCA
- RETAINING WALL
- TRAFFIC FLOW
- (1) GF(31) TR TL3-19 MBGF THRIE BEAM TRANSITION
- (2) GF(31)-19 25'-0" MBGF
- (3) SGT(12S)31-18 SINGLE GUARDRAIL TERMINAL MSKT-MASH-TL-3
- FLOW → WATER FLOW

NOTES:

1. ALL STATIONING IS BASED ON PROPOSED SL 494 CENTERLINE UNLESS OTHERWISE NOTED.
2. FOR MOW STRIP DETAILS SEE MOW STRIP STANDARD, METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT GF(31)MS-19

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.01.22

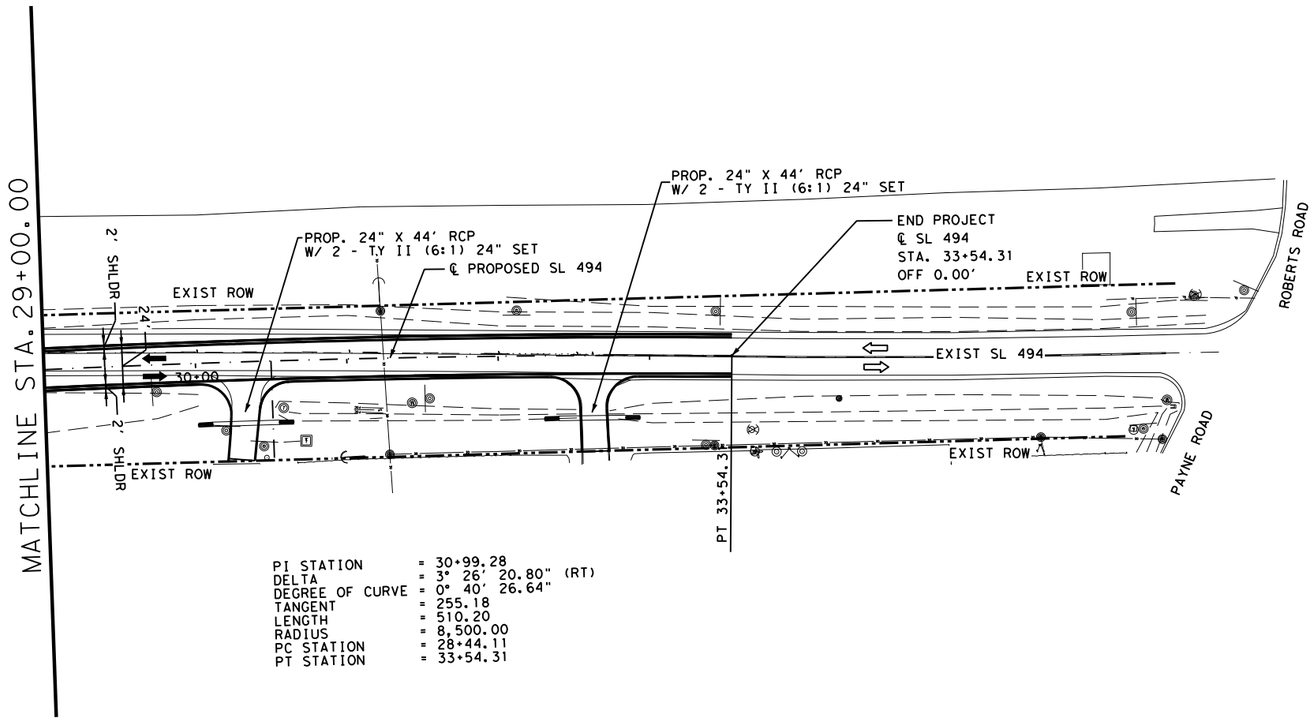
SL 494 ROADWAY PLAN & PROFILE

SHEET 2 OF 3

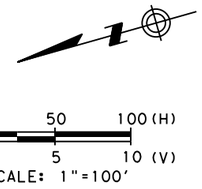
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		43

DATE: 02/23/2022 05:55 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\0177140394 - Design\Plan Set\3. Roadway\LP494_ROWY_PP2.dgn



PI STATION = 30+99.28
DELTA = 3° 26' 20.80" (RT)
DEGREE OF CURVE = 0° 40' 26.64"
TANGENT = 255.18
LENGTH = 510.20
RADIUS = 8,500.00
PC STATION = 28+44.11
PT STATION = 33+54.31

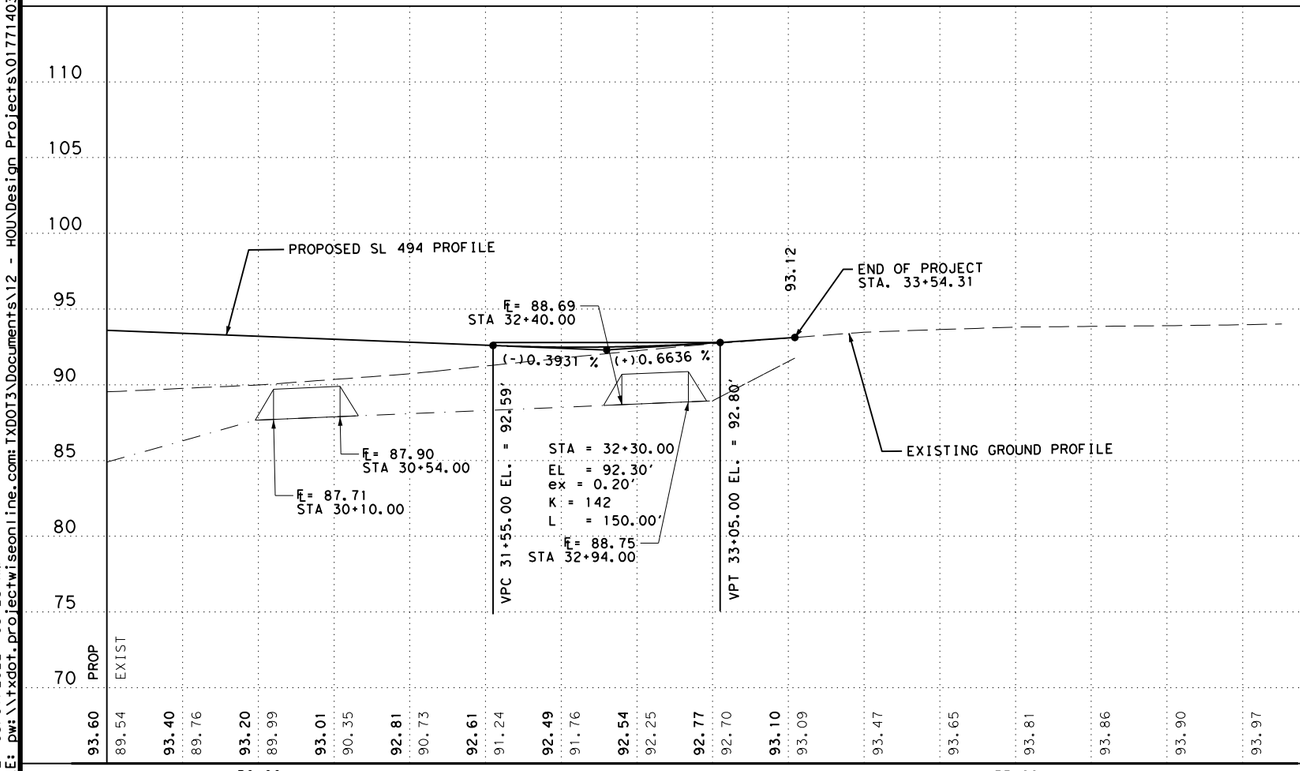


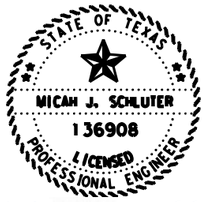
LEGEND

- RETAINING WALL
- TRAFFIC FLOW
- (1) GF(31) TR TL3-19 MBGF THRIE BEAM TRANSITION
- (2) GF(31)-19 25'-0" MBGF
- (3) SGT(12S)31-18 SINGLE GUARDRAIL TERMINAL MSKT-MASH-TL-3

NOTES:

1. ALL STATIONING IS BASED ON PROPOSED SL 494 CENTERLINE UNLESS OTHERWISE NOTED.
2. FOR DRIVEWAY INFORMATION, REFER TO "SUMMARY OF DRIVEWAYS"





Micah J. Schluter, P.E.
03.01.22

SL 494 ROADWAY PLAN & PROFILE

SHEET 3 OF 3

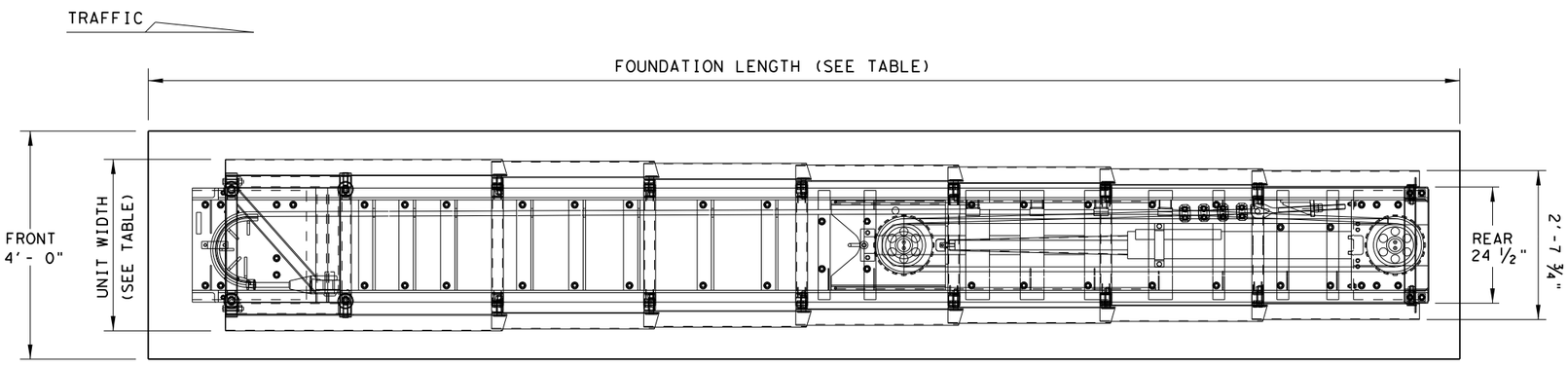
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		44

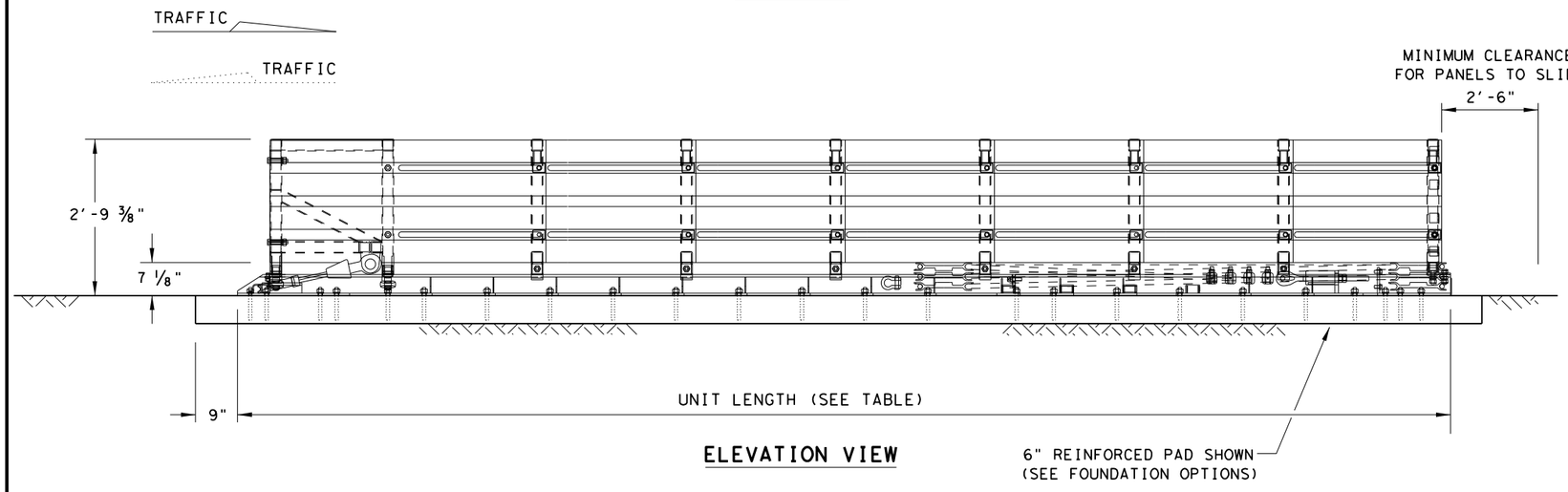
DATE: 03/01/2022 09:28 AM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\0177140394 - Design\Plan Set\3. Roadway\LP494_ROWY_PP3.dgn

DN: | CK: | DW: | CK:

DATE:
FILE:



PLAN VIEW



ELEVATION VIEW

GENERAL NOTES

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

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

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

MODEL	TEST LEVEL	UNIT LENGTH (approx.)	UNIT WIDTH	FOUNDATION LENGTH	OBSTACLE WIDTH
SCI70GM	TL-2	13′-6"	2′-10 ⅝"	15′- 6 ¼"	24"to 36"
SCI100GM	TL-3	21′-6"	3′-1 ½"	23′- 0"	24"to 36"

SYSTEM AND PAD LENGTHS VARY DEPENDING ON BACKUP TYPE.

FOUNDATION OPTIONS
6" REINFORCED CONCRETE (5 ½" ANCHOR EMBEDMENT)
8" UNREINFORCED CONCRETE (5 ½" ANCHOR EMBEDMENT)
3" MIN. ASPHALT OVER 3" MIN. CONCRETE (16 ½" ANCHOR EMBED.)
6" ASPHALT OVER 6" COMPACT SUBBASE (16 ½" ANCHOR EMBED.)
8" MINIMUM ASPHALT (16 ½" ANCHOR EMBEDMENT)

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

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

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

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

LOW MAINTENANCE

Texas Department of Transportation

Design Division Standard

WORK AREA PROTECTION CORP (SMART-NARROW)

SMTC(N)-16

FILE: smtcn16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP	
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REVISIONS	0177	14	039	SL 494	
REVISED 06, 2013 (VP)	DIST	COUNTY		SHEET NO.	
REVISED 03, 2016 (VP)	HOU	MONTGOMERY		45	

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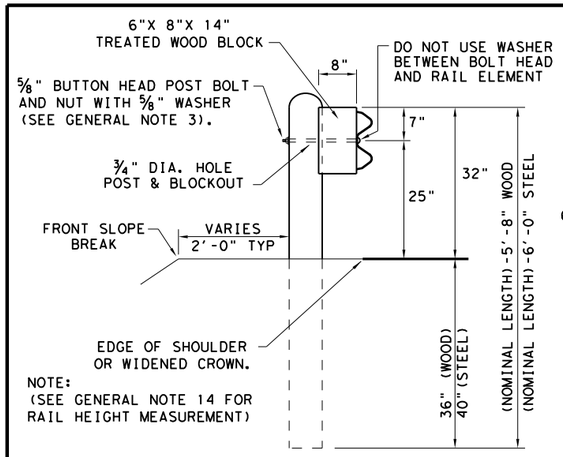
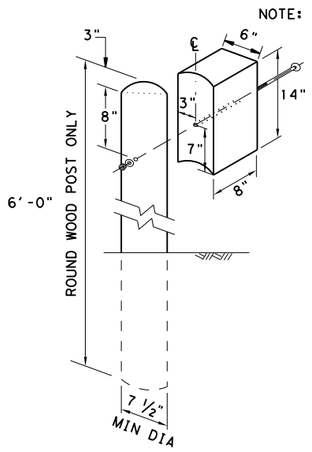
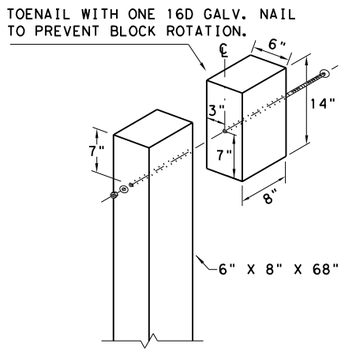


TYPICAL POST PLACEMENT

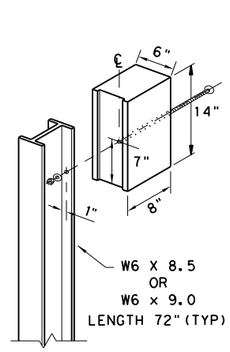


WOOD BLOCK TO ROUND WOOD POST

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

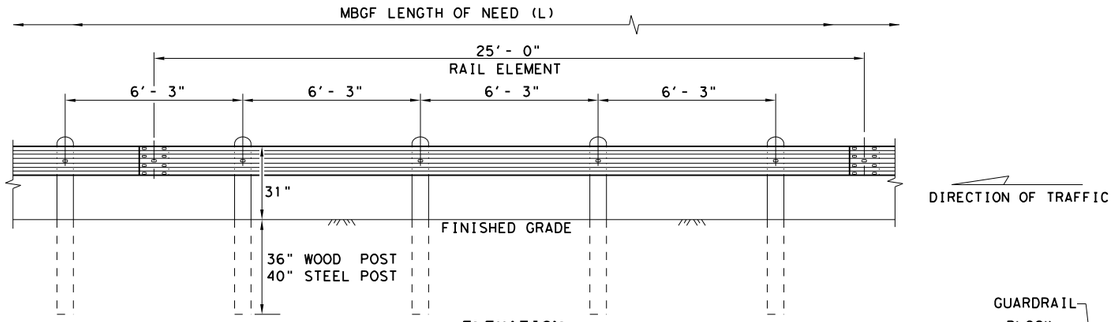


WOOD BLOCK TO RECTANGULAR WOOD POST



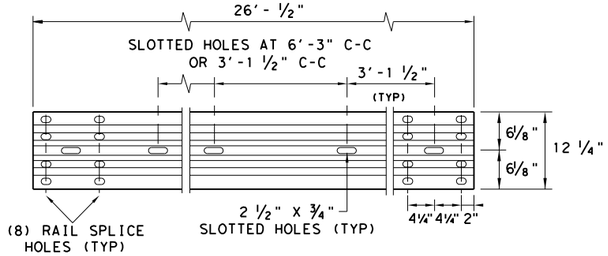
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

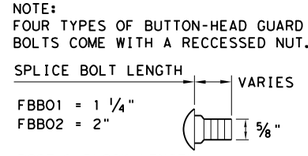
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

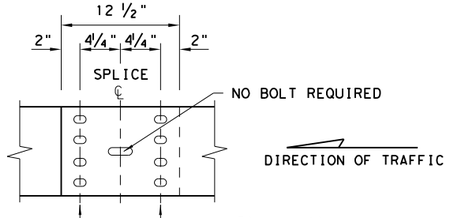
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



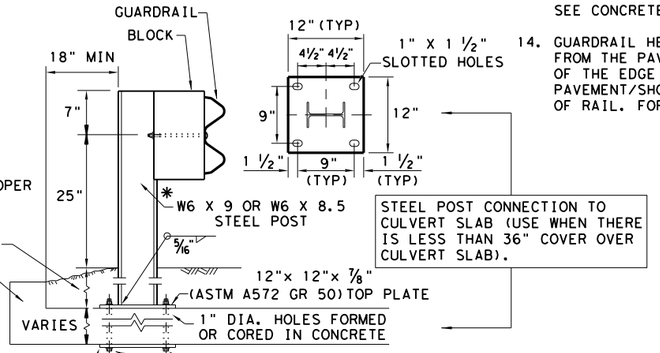
BUTTON HEAD BOLT

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.



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.

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.

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.

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
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	HOU	MONTGOMERY		46

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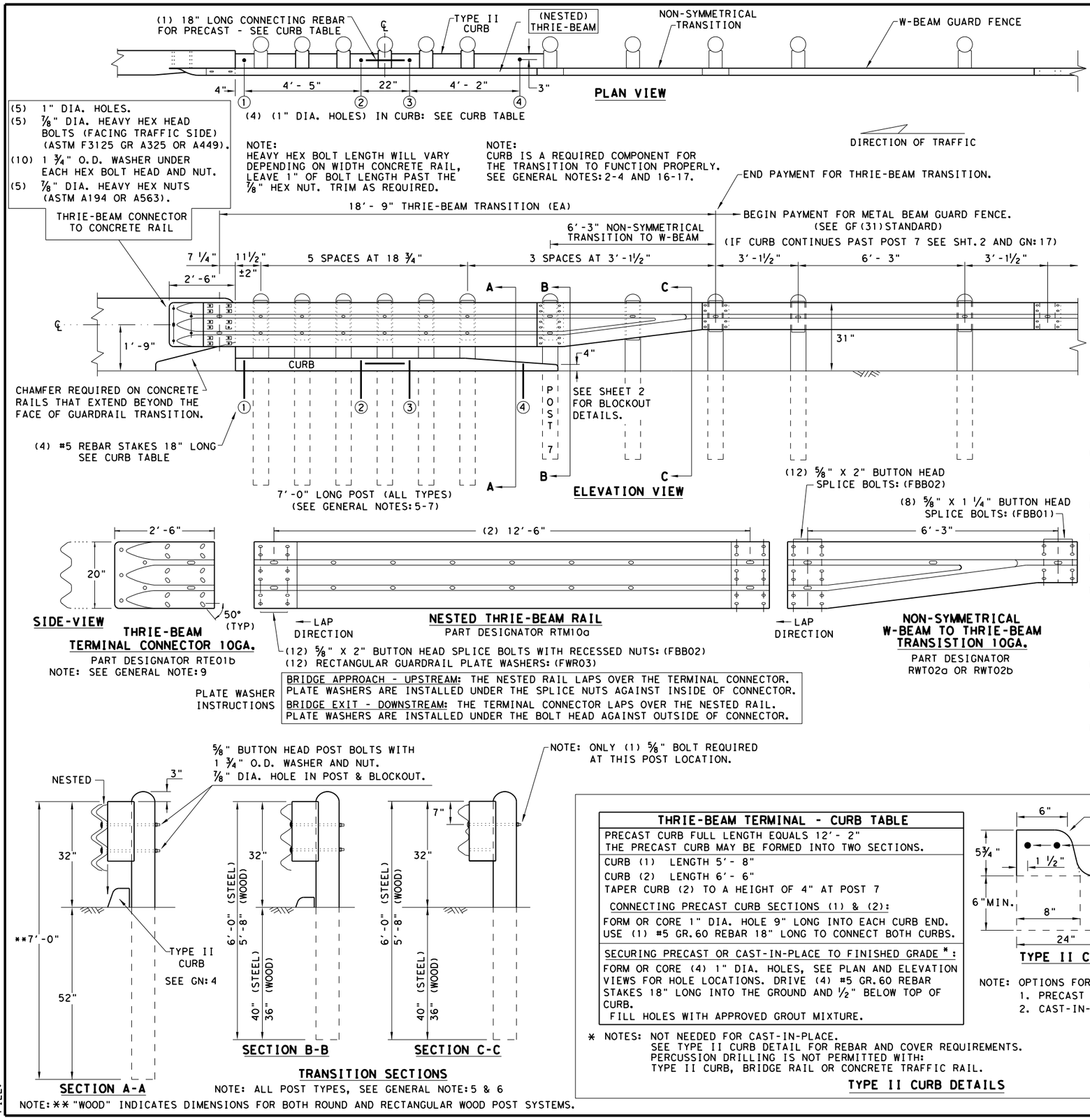


GENERAL NOTES

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 (FWC16g) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED)(TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED)(STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

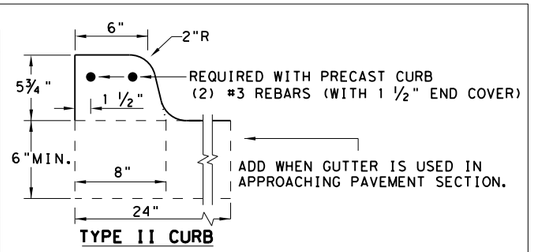
THRIE-BEAM TERMINAL - CURB TABLE

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.



TYPE II CURB

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

* 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 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
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	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		47

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.

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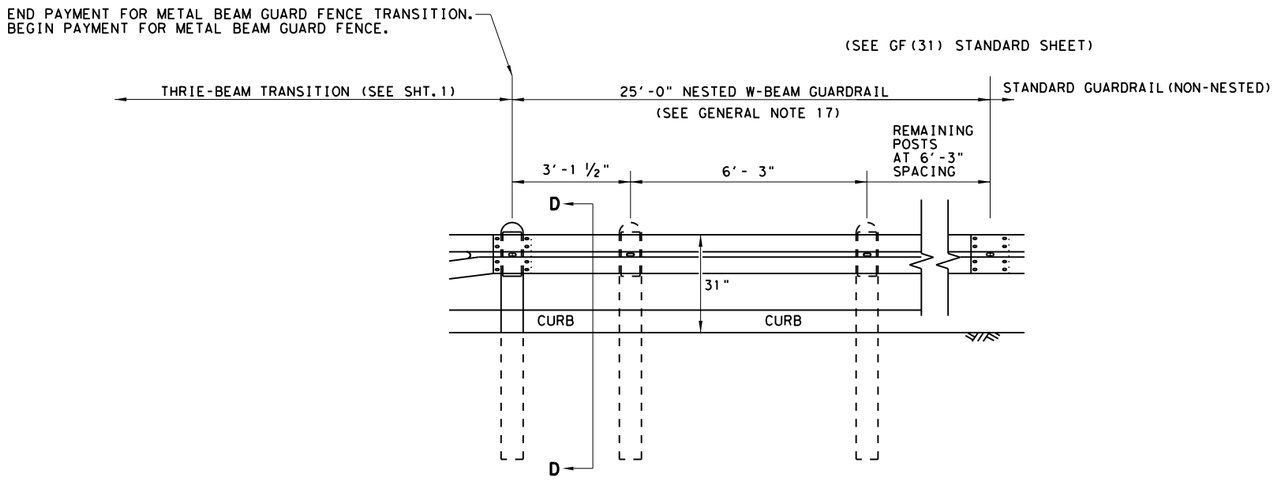
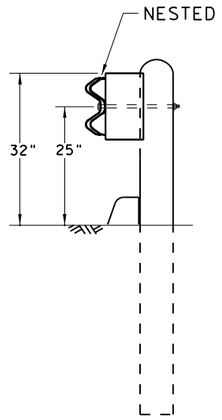
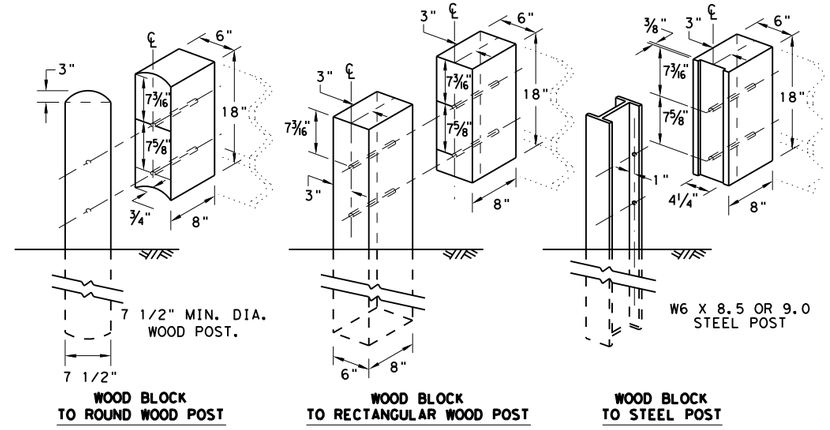
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



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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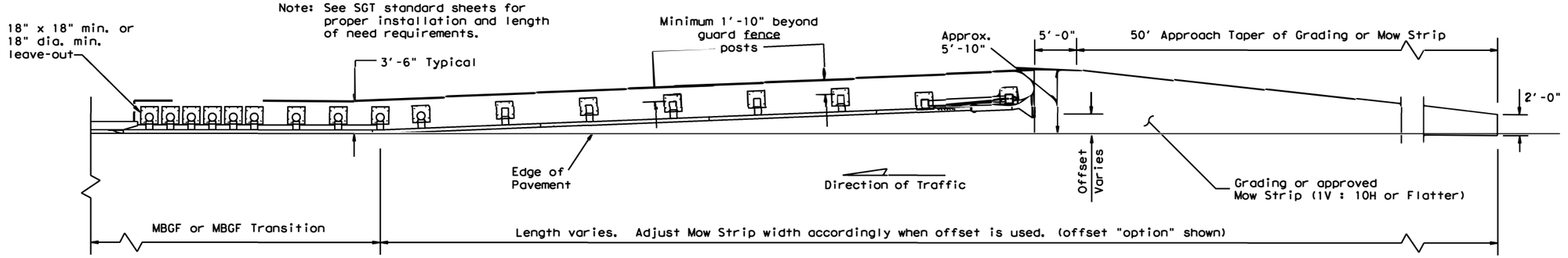
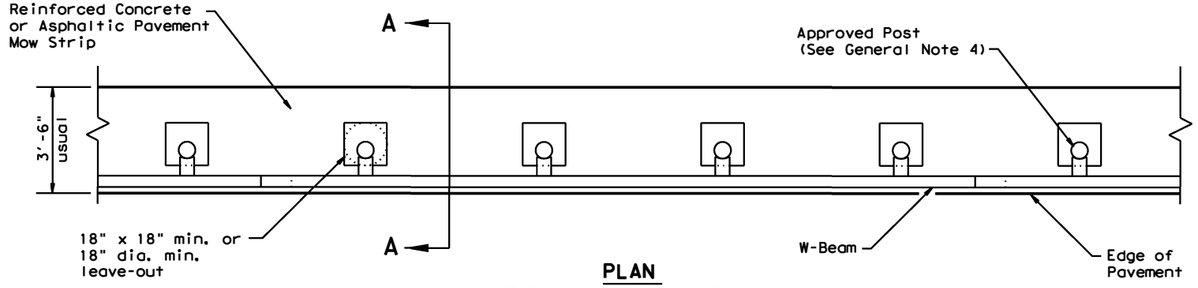
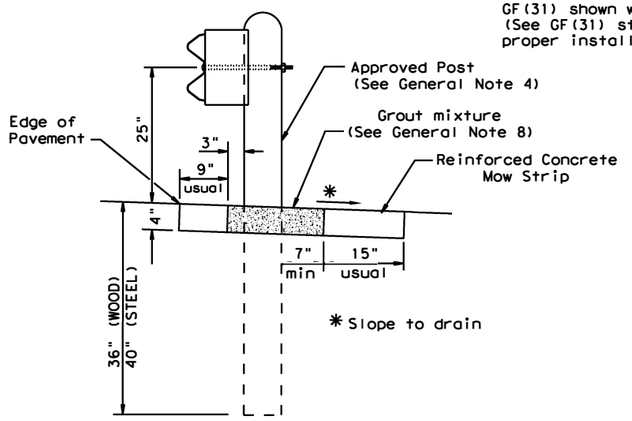


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



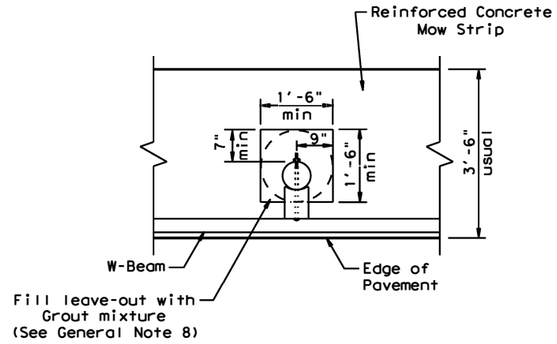
PLAN

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



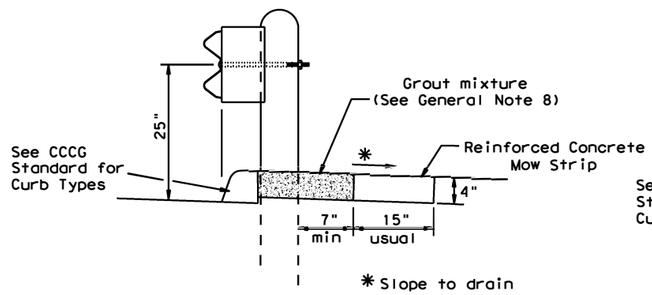
SECTION A-A

Typical



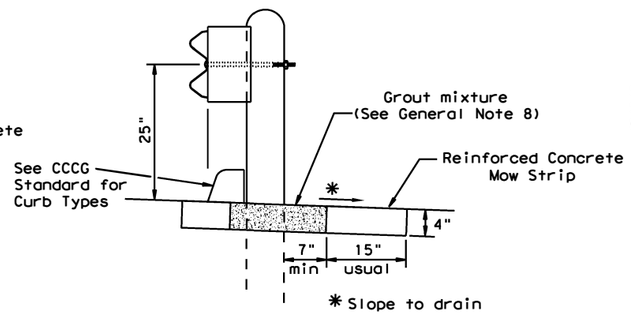
MOW STRIP DETAIL

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



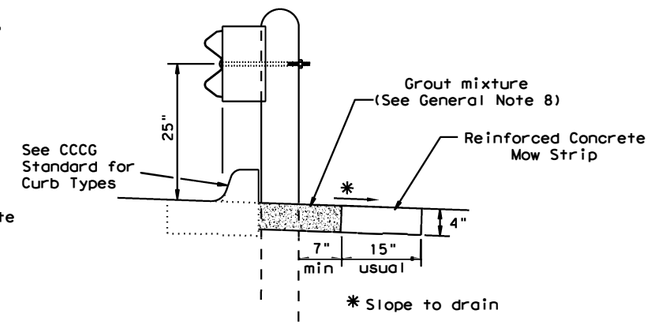
CURB OPTION (1)

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.

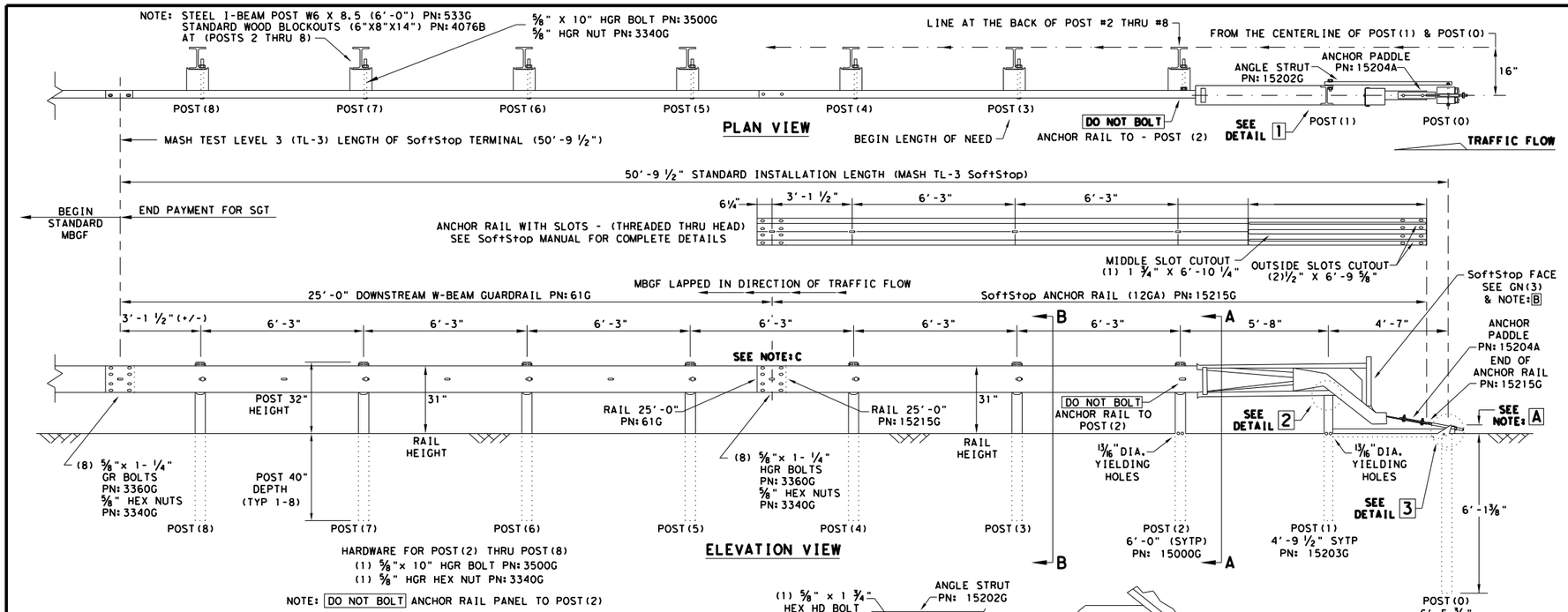
Texas Department of Transportation

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	0177	14	039	SL 494	
	DIST	COUNTY		SHEET NO.	
	HOU	MONTGOMERY		49	



GENERAL NOTES

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

NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE.
NOTE: B	PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
NOTE: C	W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN: 61G ANCHOR RAIL 25'-0" PN: 15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP		
©TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0177	14	039		SL 494	
	DIST	COUNTY			SHEET NO.	
	HOU	MONTGOMERY			50	

DATE:
FILE:

DATE:
FILE:

(SEE GN NOTE 15)
STANDARD 31" MBGF

ITEM (6)
INNER SIDE SLIDER
(ISS) PANEL FOR RAIL 3

FIELD-SIDE
(RAIL 3)

NOTE:
RECESSED HEX NUTS FACING
TRAFFIC-SIDE **SEE DETAIL (C)**

REFERENCE LINE USED TO INSTALL
LINE POST(9) THRU POST(2)

POST 1 OFFSET DISTANCE MEASURED
7-⅝" FROM REFERENCE LINE

POST 9 POST 8 POST 7 POST 6 POST 5 POST 4 POST 3 POST 2

ITEM (10)
CABLE ASSEMBLY

ITEM (2)
GROUNDSTRUT

NO BLOCKOUT
AT (POST 1)

RAIL 4 RAIL 3 RAIL 2 RAIL 1

CABLES

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

PLAN VIEW

ITEM (5)
TRAFFIC SIDE SLIDER
(TSS) PANEL FOR RAIL 2

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

INSTALL GUARD FENCE RECESSED
HEX NUTS ON TRAFFIC-SIDE

MBGF
RAIL 2

MBGF
RAIL 1

DETAIL (C)

TRAFFIC FLOW

ITEM (25)
MAX-TENSION HEAD
SEE DETAIL (A)

END PAYMENT (SGT) BY EACH

DO NOT BOLT
RAIL TO POST 6

BEGIN LENGTH OF NEED

INSTALLATION LENGTH 55'- ½"

49'-8 ⅝"

6'-3" 6'-3" 6'-3" 6'- ¾" 6'-3" 6'-3" 6'-3" 37 ½" 5'-3 ⅜"

RAIL
HEIGHT
31"

ITEM (13) RAIL 4 ITEM (13) RAIL 3 ITEM (13) RAIL 2 ITEM (13) RAIL 1

ARROWS

DETAIL (D)

RAIL
HEIGHT
31"

HEAD
HEIGHT

DETAIL (B)

32-¼"

68-⅛"

FINISHED
GRADE

CABLES

FINISHED
GRADE

ITEM (10)
CABLE
ASSEMBLY

ITEM (2)
GROUNDSTRUT

POST 9 POST 8 POST 7 POST 6 POST 5 POST 4 POST 3 POST 2

POST 1
ITEM (4)
I-BEAM
W6 X 9

NO BLOCKOUT
AT (POST 1)

SOIL
ANCHOR POST
ITEM (1)

(8) X-LITE LINE POST - ITEM (11)

ELEVATION VIEW

A

A

TSS PANEL
GALVANIZED
ITEM (5)

RSS PLATE
GALVANIZED
ITEM (8)

INSTALL THE TSS AND RSS
WITH THE ARROWS POINTING
TOWARDS THE MAX-HEAD

TSS PANEL AND RSS PLATE
DETAIL (D)

HEAD
HEIGHT
32-¼"

TOP OF POST

31-⅞"

FINISHED
GRADE

40-⅛"

68-⅛"
ANCHOR POST
DEPTH

ITEM (1)
ANCHOR

ITEM (11)
LINE POSTS
2 THRU 9
(NOTE: ITEM (4) POST 1 (NOT SHOWN),
TO BE INSTALLED AT SAME DEPTH
AS LINE POSTS.)

SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9

SECTION VIEW A-A

NOTE:
USE THE MASH APPROVED
X-TENSION CABLE ASSEMBLY.

7 ⅝"

2 ⅛"

UPPER CABLE
(BACK SIDE)

LOWER CABLE
(TRAFFIC SIDE)

DETAIL (B)

CABLE
FRICTION PLATE
HEAD UNIT
ITEM (9)

NOTE:
INSTALL ⅝" RECESSED HEX
NUTS ON TRAFFIC SIDE.

ITEM (24)

ITEM (21)

ITEM (20)
8X

ITEM (17)
8X

ITEM (23)
6X
3 SCREWS
EACH SIDE

(RAIL 1)

ITEM (22)
BRACKET
SHIPPED FLAT

ITEM (3)

ITEM (16)
4X

* ITEM (25)
HIGH INTENSITY
REFLECTIVE SHEETING

NOTE: DELINEATION MARKER IN
ACCORDANCE WITH TEXAS MUTCD.

SPLICE FOR IMPACT-HEAD
TO GUARD FENCE (RAIL1)

DETAIL (A)

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

** ALTERNATIVE ITEMS NOT SHOWN.
ITEM(26) 8" WOOD-BLOCKOUTS
ITEM(27) 25'GUARD FENCE PANELS

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

STANDARD
MBGF

2'-0"

EDGE OF PAVEMENT

NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

2'-0" MAX.
RAIL OFFSET

APPROACH GRADING
(1V:10H OR FLATTER)
SEE PRODUCT ASSEMBLY MANUAL
FOR ADDITIONAL GUIDANCE.

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

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

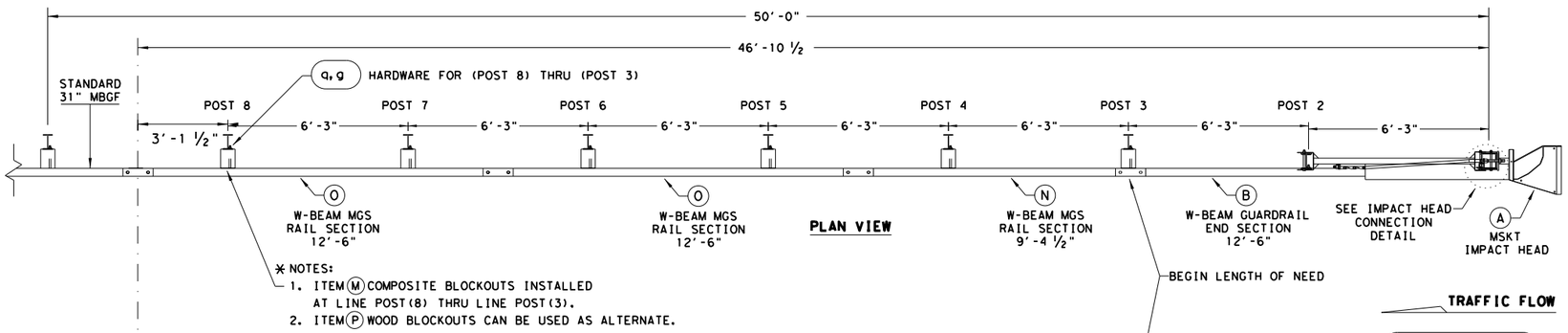
Texas Department of Transportation

Design Division Standard

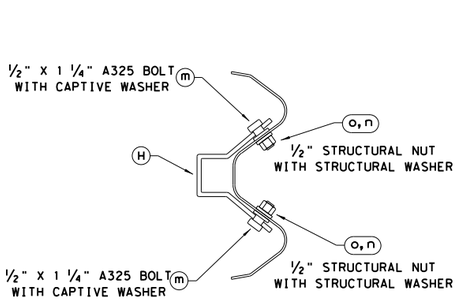
MAX-TENSION END TERMINAL
MASH - TL-3
SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		51

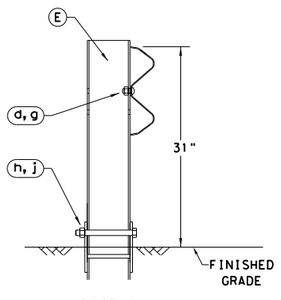
DATE:
FILE:



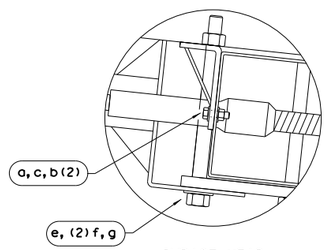
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



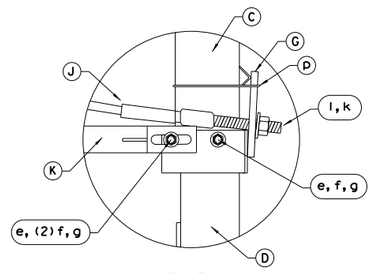
SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL

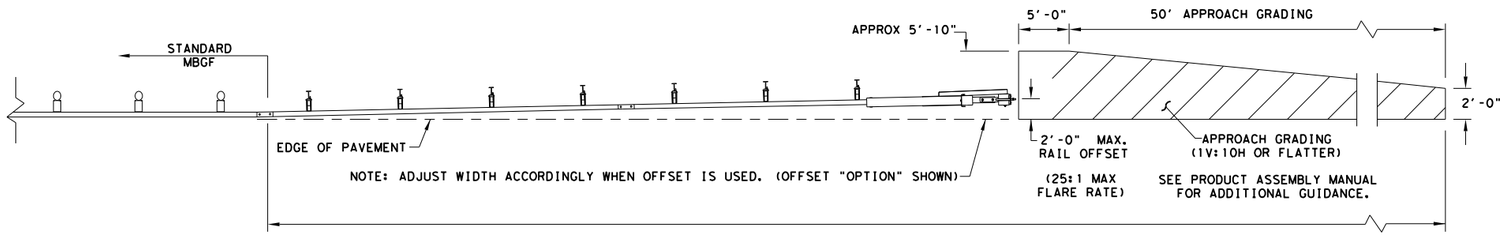
GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION~062717).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
7. A COMPOSITE MATERIAL BLOCKOUTS THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
8. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
13. THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN THEIR PLACE.
14. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 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

SEE NOTES: *

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



APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

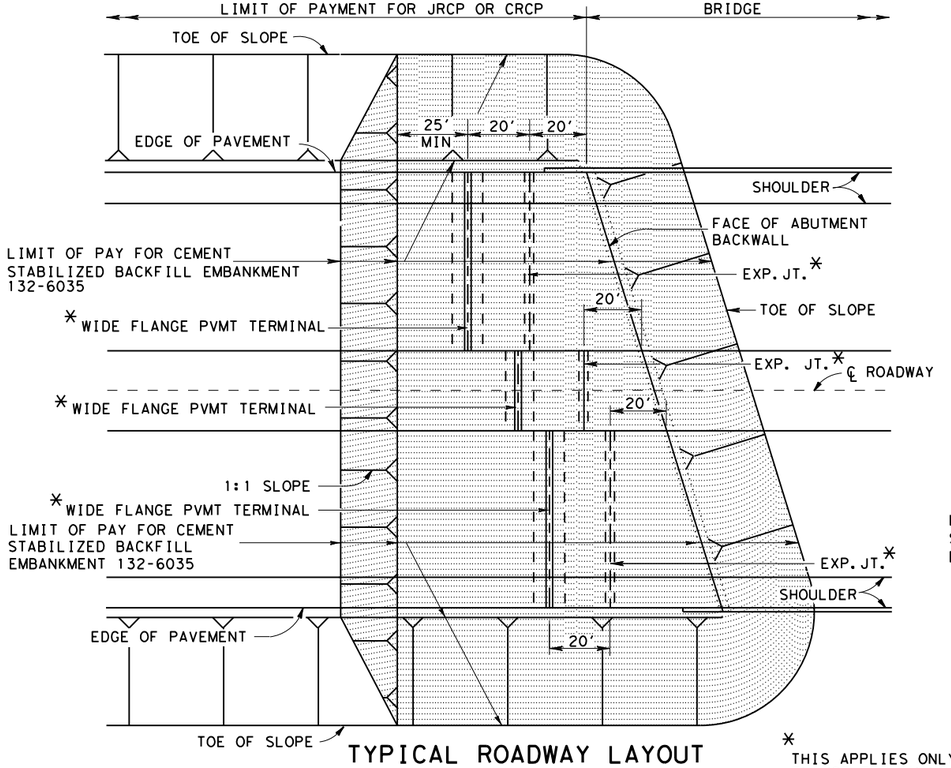
NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Texas Department of Transportation

Design Division Standard

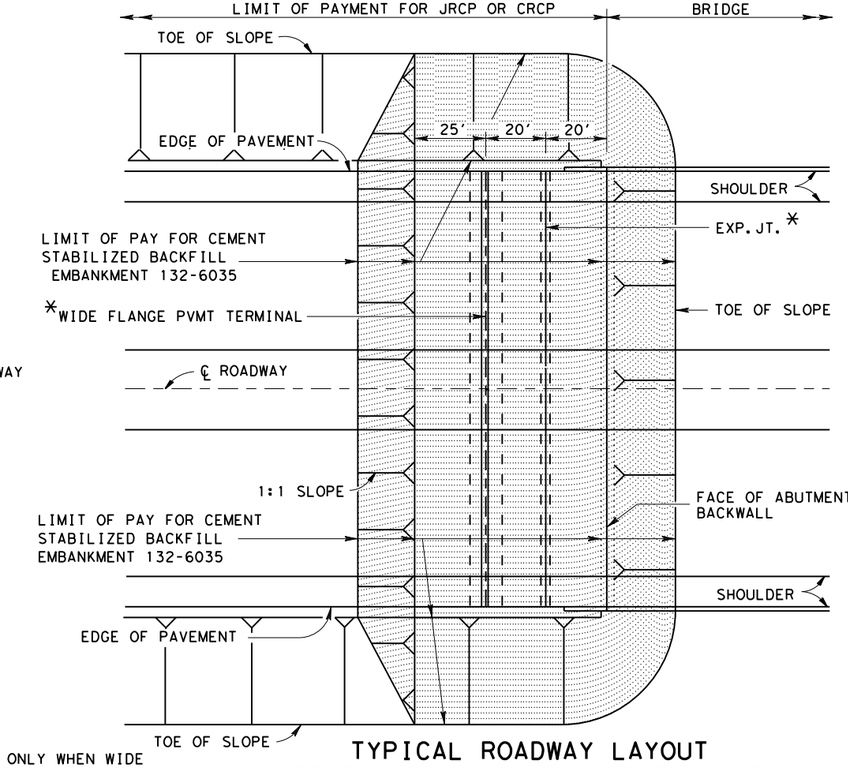
SINGLE GUARDRAIL TERMINAL
MSKT-MASH-TL-3
SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL		
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0177	14	039	SL 494		
	DIST	COUNTY		SHEET NO.		
	HOU	MONTGOMERY		52		



TYPICAL ROADWAY LAYOUT CONCRETE MEDIAN AND SHOULDERS (AT SKEWED BRIDGES)

* THIS APPLIES ONLY WHEN WIDE FLANGE TERMINALS ARE USED ON THE APPROACHES TO BRIDGES. IF NOT USING THIS SYSTEM, SEE APPROACH SLAB DETAILS ELSEWHWERE IN THE PLANS.



TYPICAL ROADWAY LAYOUT CONCRETE MEDIAN AND SHOULDERS (AT NON-SKEWED BRIDGES)

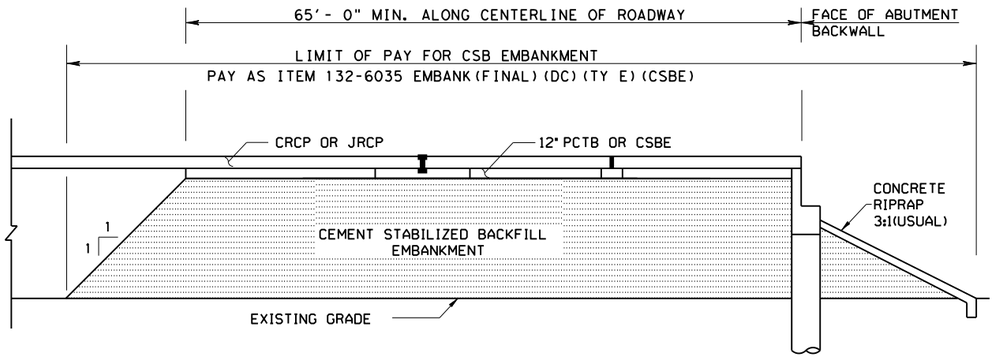
NOTES

1. PROVIDE CEMENT STABILIZED BACKFILL EMBANKMENT IN ACCORDANCE WITH ITEM 132 AND HOUSTON DISTRICT SP (132-001).
2. FOR ADDITIONAL DETAILS ON WIDE FLANGE PAVEMENT TERMINALS SEE "WIDE FLANGE PAVEMENT TERMINALS" STANDARD SHEET.

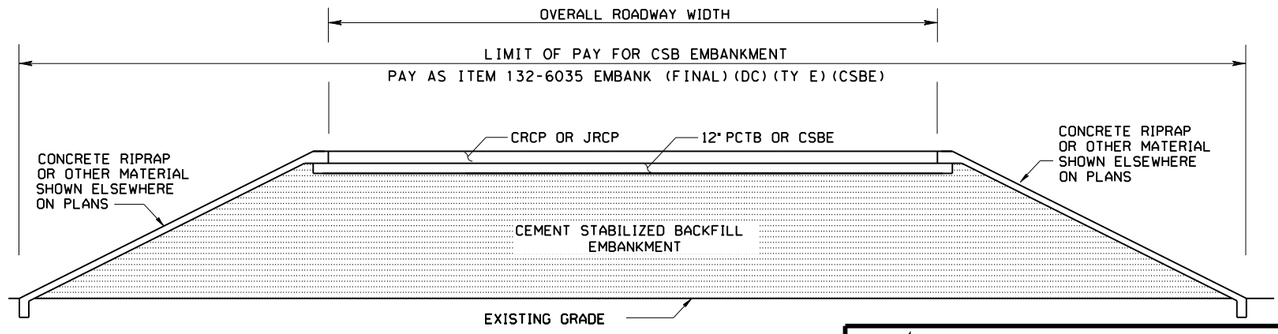
ASB - ASPHALT STABILIZED BASE
CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
CSBE - CEMENT STABILIZED BACKFILL EMBANKMENT
EXP JT - EXPANSION JOINT
JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
LTS - LIME TREATED SUBGRADE
PCTB - PORTLAND CEMENT TREATED BASE

LIMITS OF CEMENT STABILIZED BACKFILL EMBANKMENT. THIS QUANTITY IS PAID UNDER ITEM 132-6035, EMBANKMENT (FINAL)(DENSITY CONTROL) (TY E)(CSBE)

LEGEND



LONGITUDINAL SECTION



TRANSVERSE SECTION

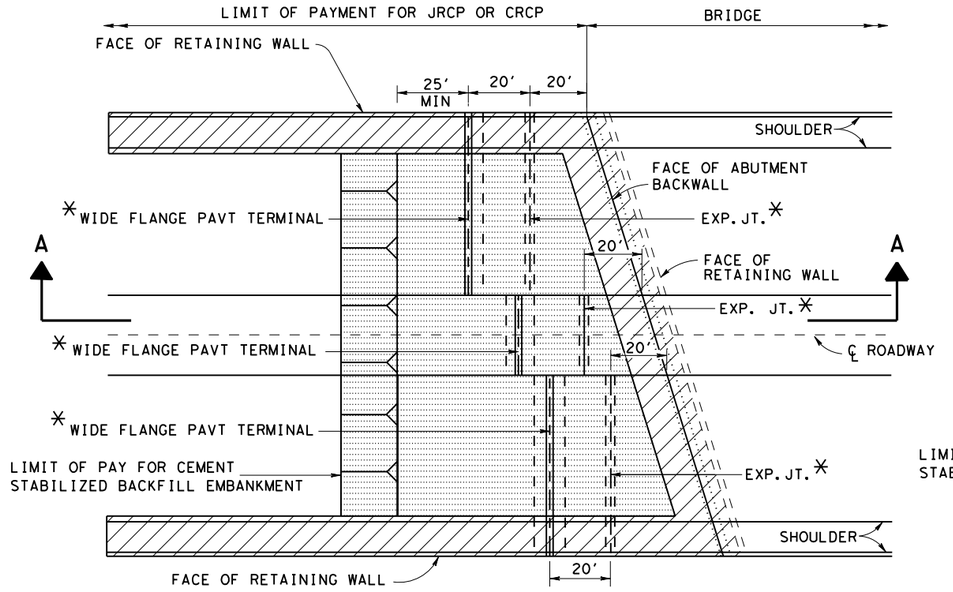
Texas Department of Transportation
Houston District

CEMENT STABILIZED BACKFILL EMBANKMENT

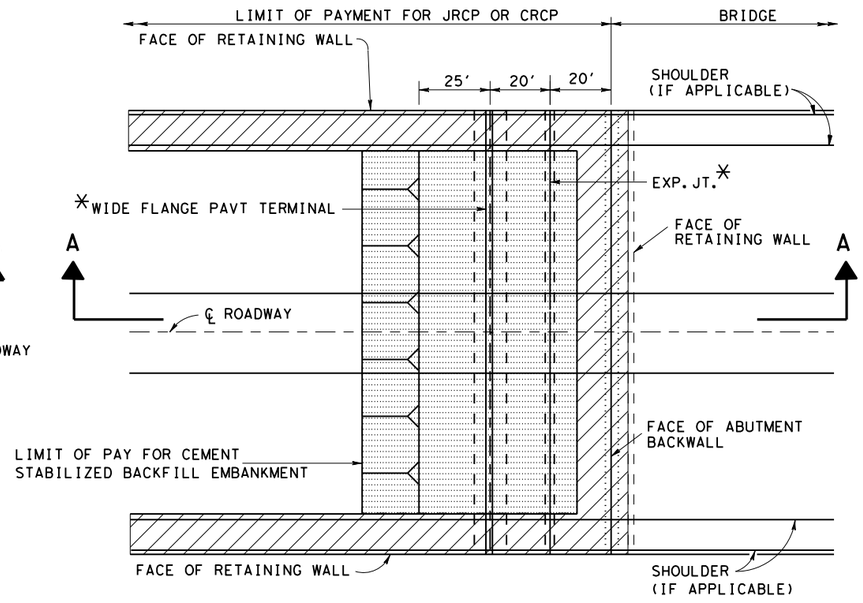
(FOR USE WITHOUT RETAINING WALLS AT BRIDGE ABUTMENTS)

CSBE SHEET 1 OF 1

FILE: STDB-7.dgn	DN:	CK:	DW:	CK:
© TxDOT 2014 REVISIONS	DIST	FED REG	PROJECT NO.	SHEET
	HOU	6		53
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY	0177	14	039	SL 494



TYPICAL ROADWAY LAYOUT CONCRETE MEDIAN AND SHOULDERS (AT SKEWED BRIDGES)



TYPICAL ROADWAY LAYOUT CONCRETE MEDIAN AND SHOULDERS (AT NON-SKEWED BRIDGES)

NOTES

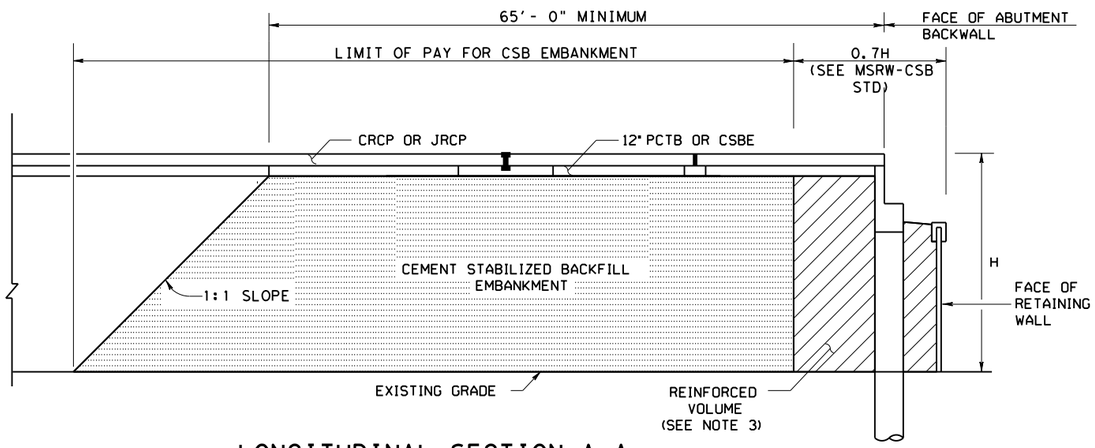
1. USE CEMENT STABILIZED BACKFILL EMBANKMENT IN ACCORDANCE WITH ITEM 132 AND HOUSTON DISTRICT-WIDE SPECIAL PROVISION (132-001).
2. FOR ADDITIONAL DETAILS ON WIDE FLANGE PAVEMENT TERMINALS SEE "WIDE FLANGE PAVEMENT TERMINALS" STANDARD SHEET.
3. FOR ADDITIONAL DETAILS ON RETAINING WALLS SEE "MECHANICALLY STABILIZED RETAINING WALL - CEMENT STABILIZED BACKFILL" MSRW-CSB STANDARD SHEET.

CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
CSBE - CEMENT STABILIZED BACKFILL EMBANKMENT
EXP JT - EXPANSION JOINT
H - HEIGHT OF RETAINING WALL
JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
MSRW - MECHANICALLY STABILIZED RETAINING WALL
PCTB - PORTLAND CEMENT TREATED BASE

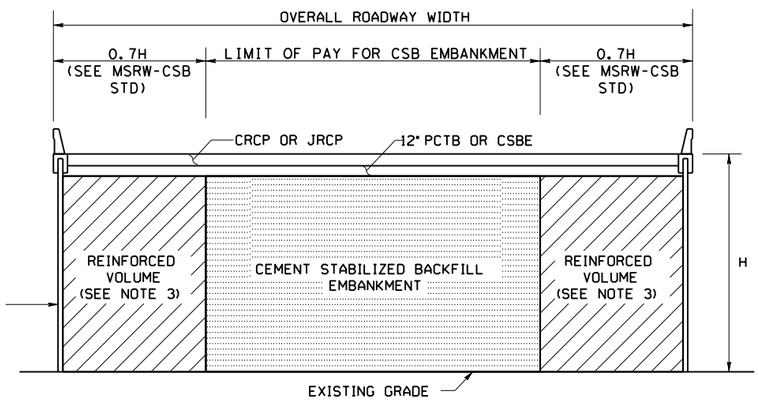
LEGEND

LIMITS OF REINFORCED VOLUME (CEMENT STABILIZED BACKFILL). THIS VOLUME IS PAID UNDER ITEM 132-6006, EMBANKMENT (FINAL) (DC) (TY C).

LIMITS OF CEMENT STABILIZED BACKFILL EMBANKMENT. THIS QUANTITY IS PAID UNDER ITEM 132-6035, EMBANKMENT (FINAL) (DENS CONT) (TY E) (CSBE).



LONGITUDINAL SECTION A-A



TRANSVERSE SECTION

* THIS APPLIES ONLY WHEN WIDE FLANGE TERMINALS ARE USED ON APPROACHES TO BRIDGES. IF NOT USING THIS SYSTEM, SEE APPROACH SLAB DETAILS ELSEWHERE IN THE PLANS.

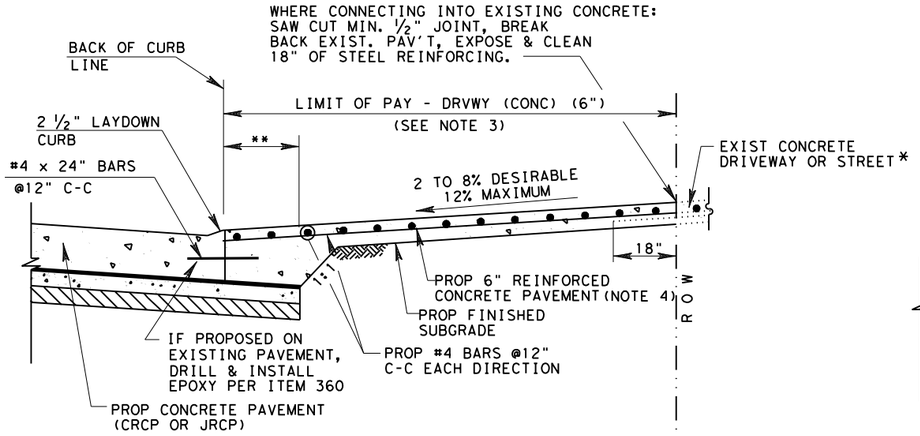
Texas Department of Transportation
Houston District

CEMENT STABILIZED BACKFILL EMBANKMENT

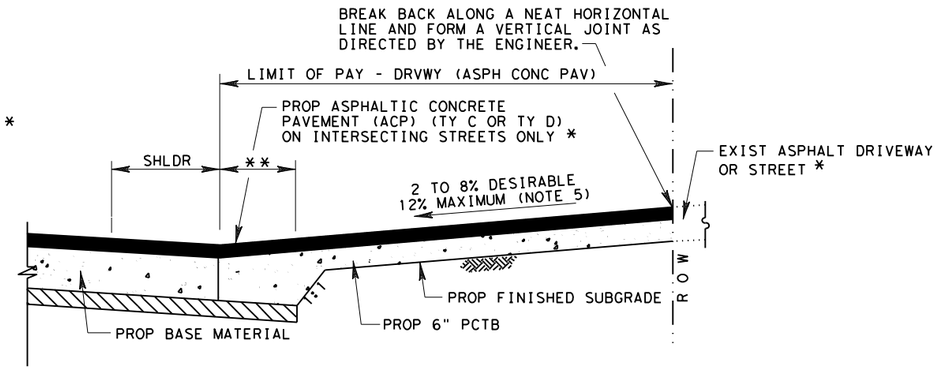
(FOR USE WITH RETAINING WALLS AT BRIDGE ABUTMENTS)

CSBE-RW

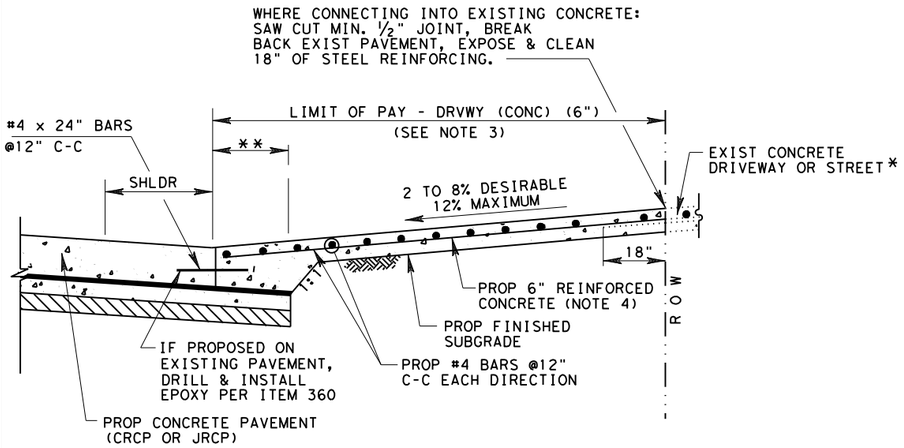
FILE: STDB-6.dgn	DN:	CK:	DW:	CK:
© TxDOT 2014 REVISIONS	DIST	FED REG	PROJECT NO.	SHEET
	HOU	6		53A
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY	0177	14	039	SL 494



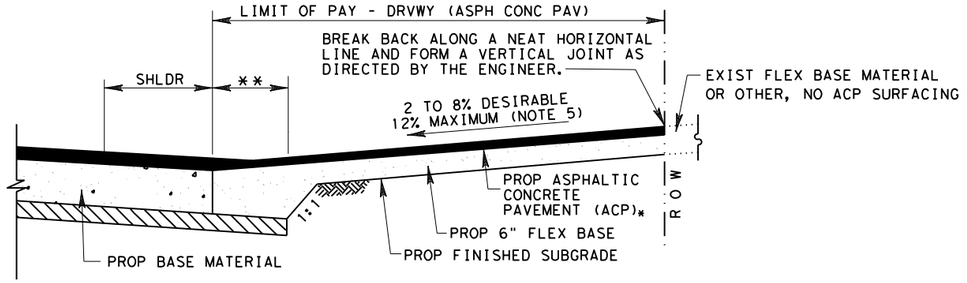
PROPOSED DRIVEWAY DETAIL
REINFORCED CONCRETE AT CONCRETE CURB AND GUTTER ROADWAY



PROPOSED DRIVEWAY DETAIL
ASPHALT W/ PCTB AT ASPHALT ROADWAY



PROPOSED DRIVEWAY DETAIL
REINFORCED CONCRETE AT CONCRETE ROADWAY



PROPOSED DRIVEWAY DETAIL
ASPHALT W/ FLEX BASE AT ASPHALT ROADWAY

NOTES:

1. ALSO SEE SHEET 2 OF 2 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. FAST TRACK CONCRETE IS PAID AS DRVWY (CONC) (FAST TRACK).
4. THICKNESS OF DRIVEWAY IS 6 INCHES FOR REGULAR AND FAST TRACK CONCRETE.
5. MAXIMUM SLOPE IS: 12% RESIDENTIAL
   8% OTHERS

LEGEND:

PCTB- PORTLAND CEMENT TREATED BASE

JRCP- JOINTED REINFORCED CONCRETE PAVEMENT

CRCP- CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

ACP- ASPHALTIC CONCRETE PAVEMENT

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

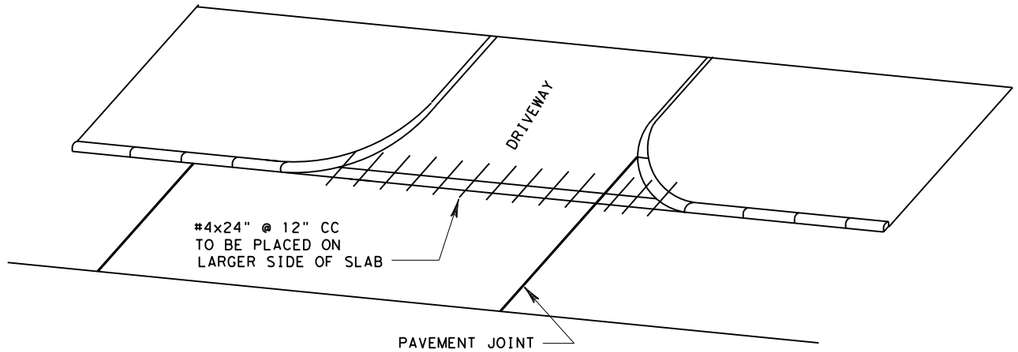
** PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE

Texas Department of Transportation
Houston District

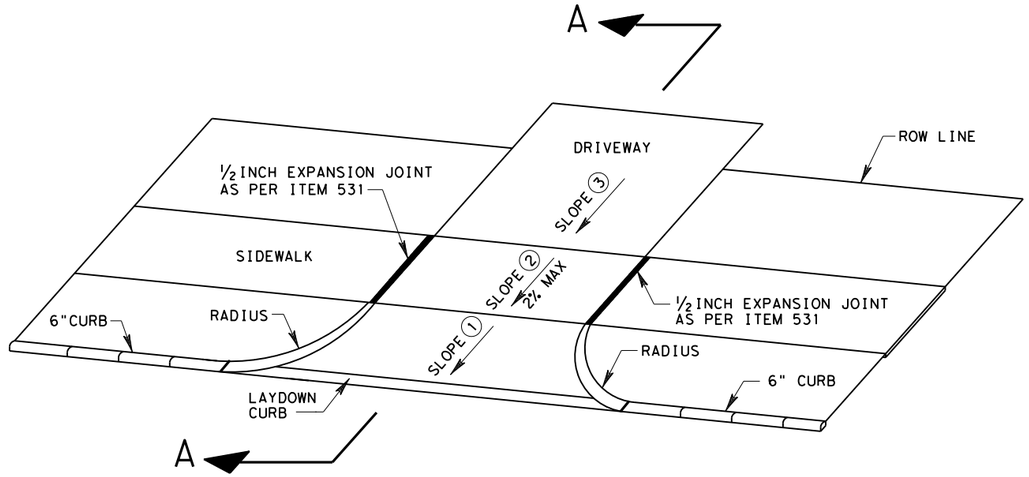
DRIVEWAY DETAILS

DD

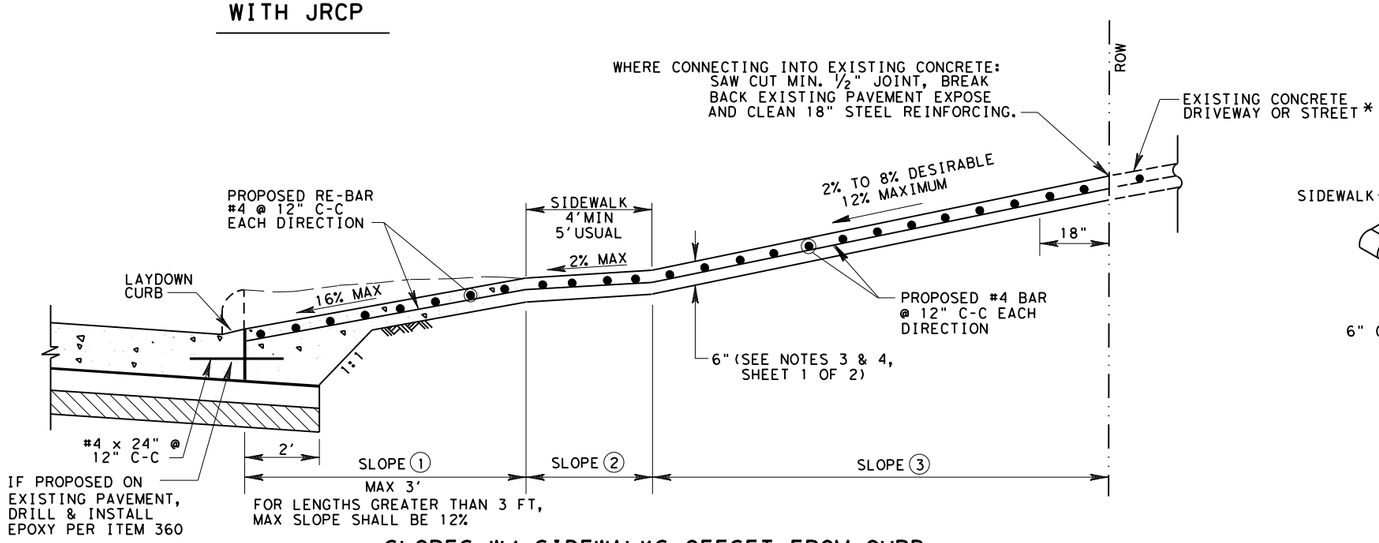
FILE: STDB-8a.dgn	DN:	CK:	DW:	CK:		
© TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 11/15 ADDED NOTE FOR PCTB 3/17 MODIFIED PAVEMENT SLOPES	HOU	6				54
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		0177	14	039	SL 494



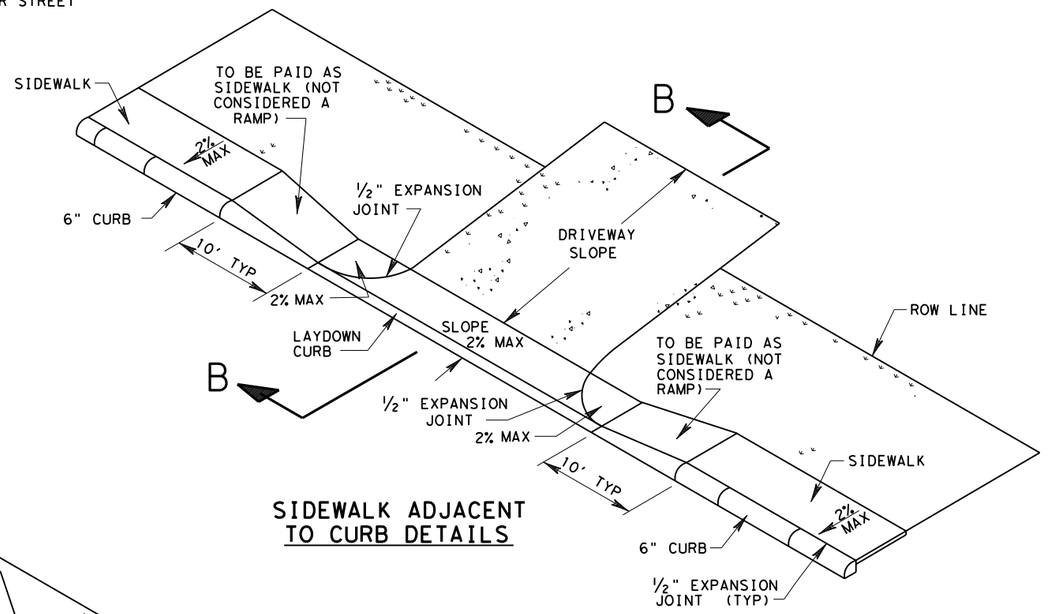
TIE BAR PLACEMENT WITH JRCP



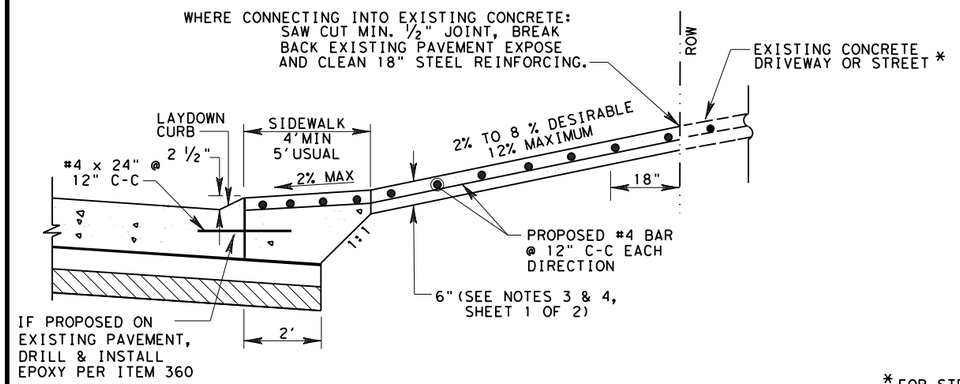
SIDEWALK OFFSET FROM CURB DETAILS



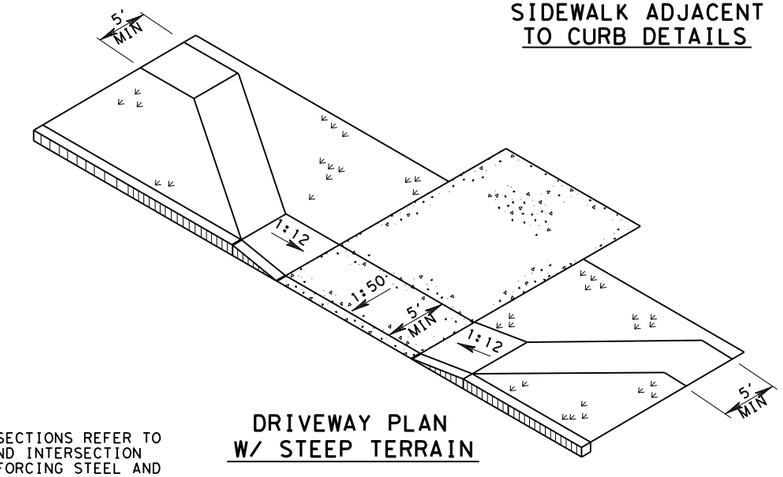
SLOPES W/ SIDEWALKS OFFSET FROM CURB (SECTION A-A)



SIDEWALK ADJACENT TO CURB DETAILS



DRIVEWAY SLOPES W/ SIDEWALKS ADJACENT TO CURB (SECTION B-B)



DRIVEWAY PLAN W/ STEEP TERRAIN

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

SHEET 2 OF 3

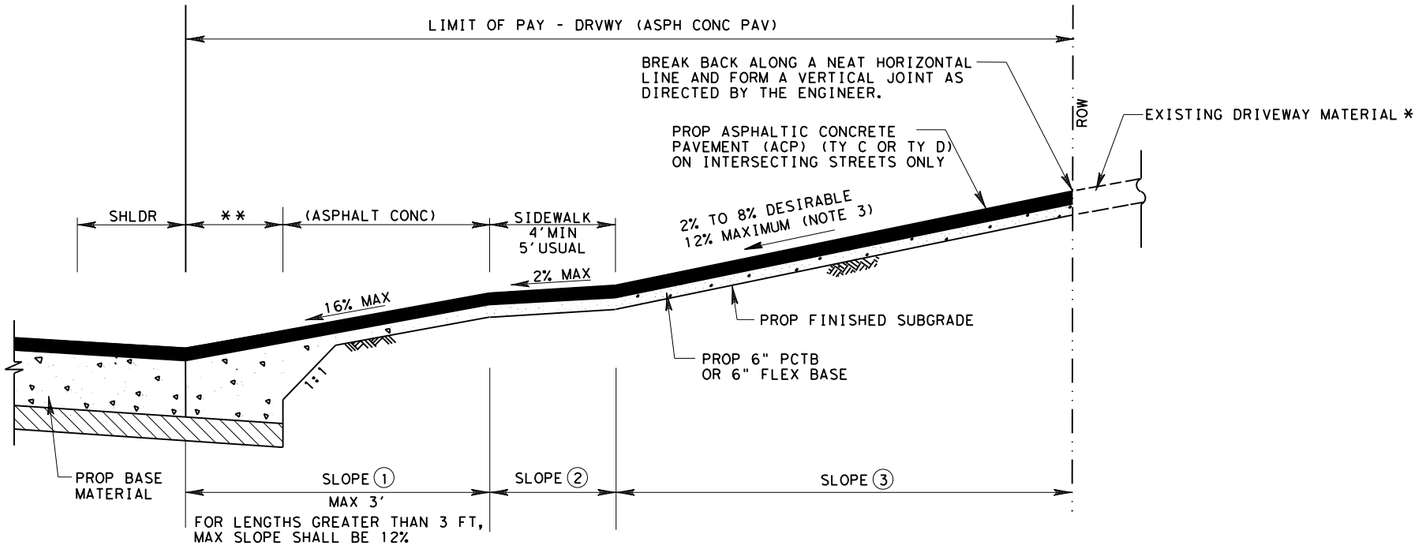
Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

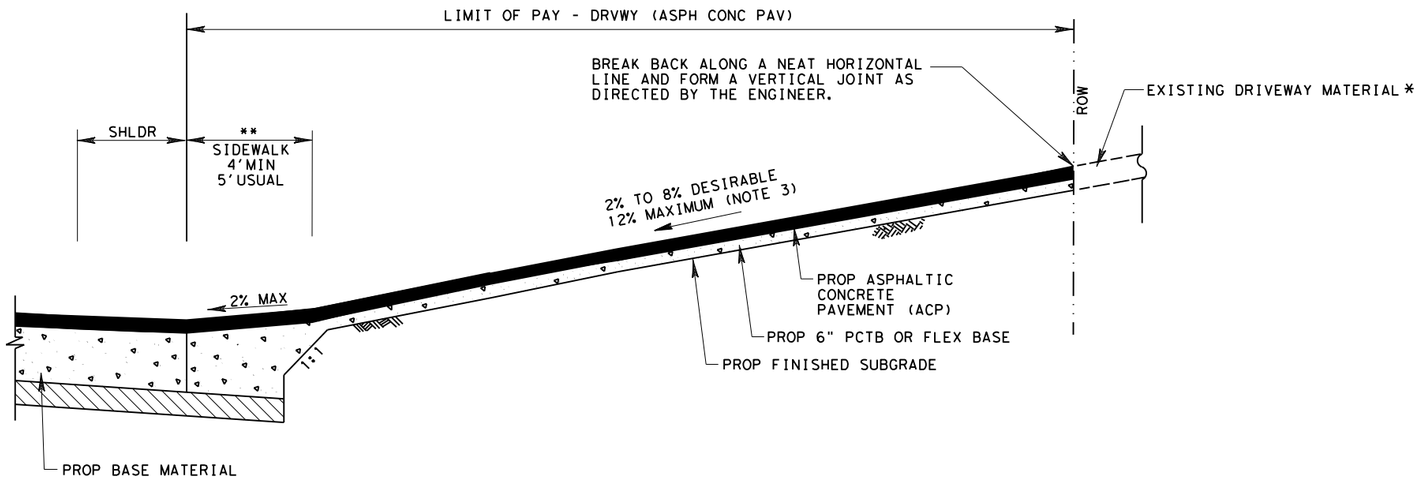
DD

FILE: STDB-8b.dgn	DN:	CK:	DW:	CK:
©TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		55
9/09 ADDED NOTE FOR ITEM 360.	COUNTY	CONTROL	SECT	JOB	HIGHWAY
1/15 ADDED NOTE FOR PCTB	MONTGOMERY	0177	14	039	SL 494

STDB8B



PROPOSED DRIVEWAY SLOPES
WITH SIDEWALKS OFFSET



PROPOSED DRIVEWAY SLOPES
WITH SIDEWALKS ADJACENT

NOTES:

1. ALSO SEE SHEET 2 OF 3 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. MAXIMUM SLOPE IS: 12% RESIDENTIAL 8% OTHERS

LEGEND:

PCTB- PORTLAND CEMENT TREATED BASE

ACP- ASPHALTIC CONCRETE PAVEMENT

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS.

** PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE

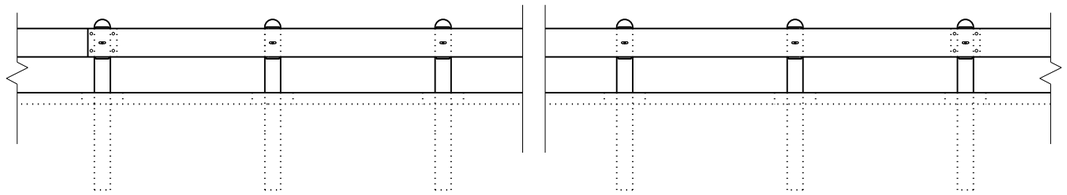
Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

DD

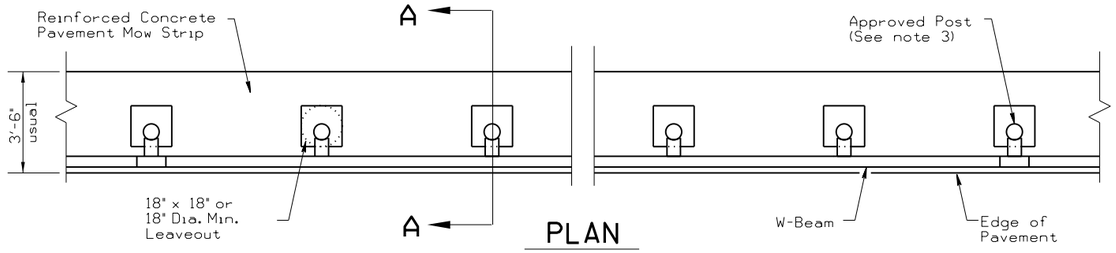
FILE: STDB-8c.dgn	DN:	CK:	DW:	CK:		
© TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 11/15 ADDED NOTE FOR PCTB 3/17 MODIFIED PAVEMENT SLOPES	HOU	6				56
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		0177	14	039	SL 494

STDB8C

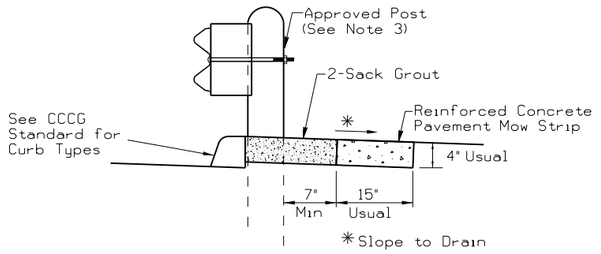


ELEVATION

TRAFFIC

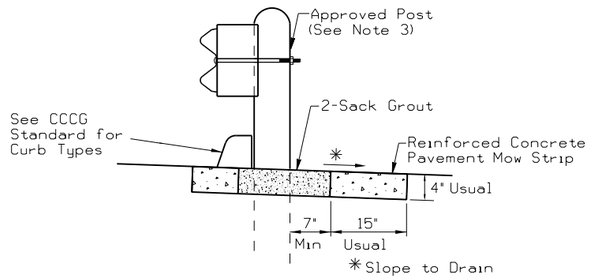


PLAN



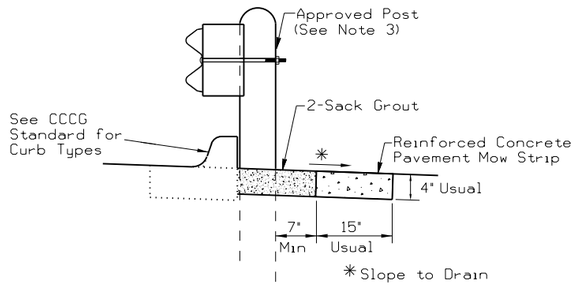
CURB OPTION (1)

Shown at Curbed Location

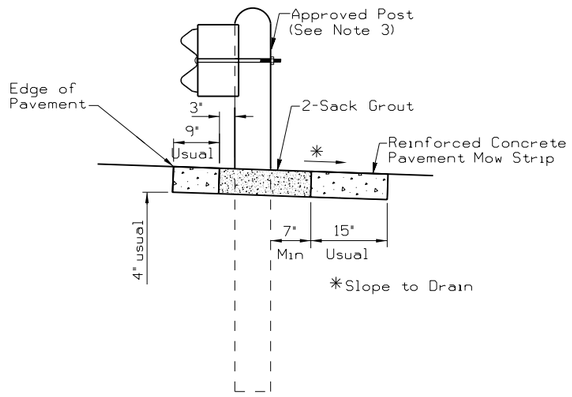


CURB OPTION (2)

Curb Shown on Top of Mow Strip

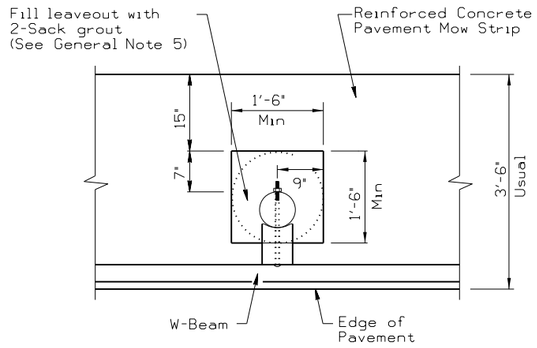


CURB OPTION (3)



SECTION A-A

Typical



MOW STRIP DETAIL

Reinforced Concrete Pavement
Mow Strip with 18" x 18"or 18"
dia. minimum leaveout.

GENERAL NOTES

1. Place concrete riprap mow strips at all Metal Beam Guard Fence locations, and in accordance with Item 432, "Riprap". Use Class B Concrete, reinforced with No. 3 bars spaced at 18 in. centers each direction and 2 in. below the surface.

2. Provide a minimum of 7 in. leave out behind the post. Do not place concrete in the leave out.

3. The type of approved post is shown elsewhere on the plans. See the applicable standard sheets for additional details and information.

4. Other curb placement options may be used. Curbs are not considered part of the mow strip and are paid for under other pertinent bid items.

5. Fill the leave outs with no more than a 2-sack grout mixture and place in accordance with Section 421.2.7, ""Mortar and Grout." Payment for furnishing and placing the grout mixture is subsidiary to the Item 432, "RIPRAP."

6. Place the mow strip the entire length of the guard fence plus any Terminal Anchor Section (TAS) or Single Guardrail Terminal (SGT) to 2 ft. beyond the face of the object marker at the end of the SGT. Do not allow concrete to adhere to the ground line strut shown on the SGT standard sheet.

Texas Department of Transportation
Houston District

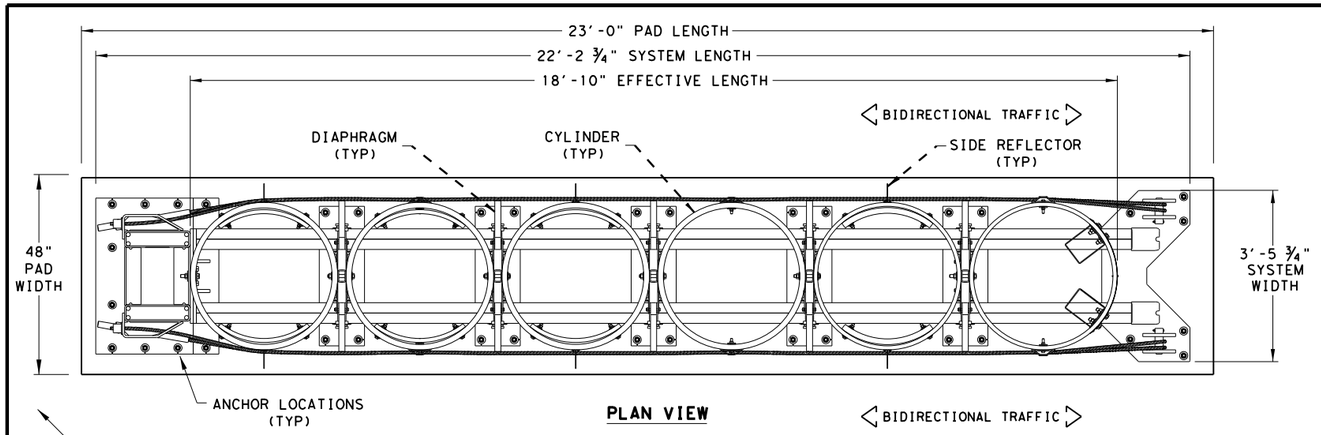
MOW STRIP

MS

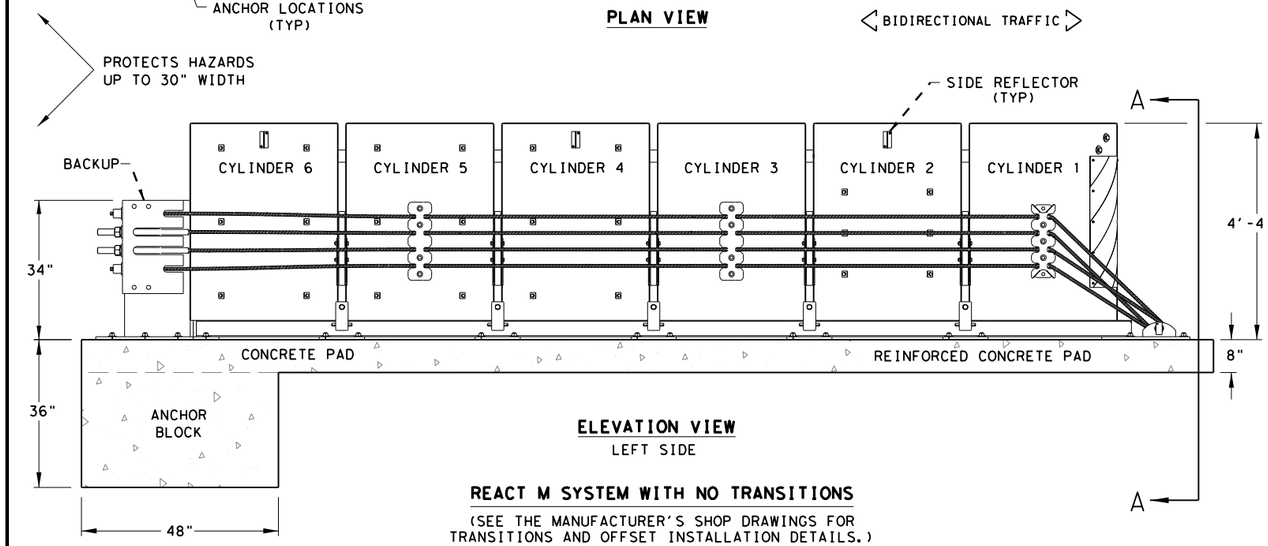
FILE:	DN:	CK:	DW:	CK:	
© TxDOT 2014	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS	HOU	6			57
03/15 2014 SPECS	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		0177	14	039	SL 494

STDE5.DGN

DATE:
FILE:



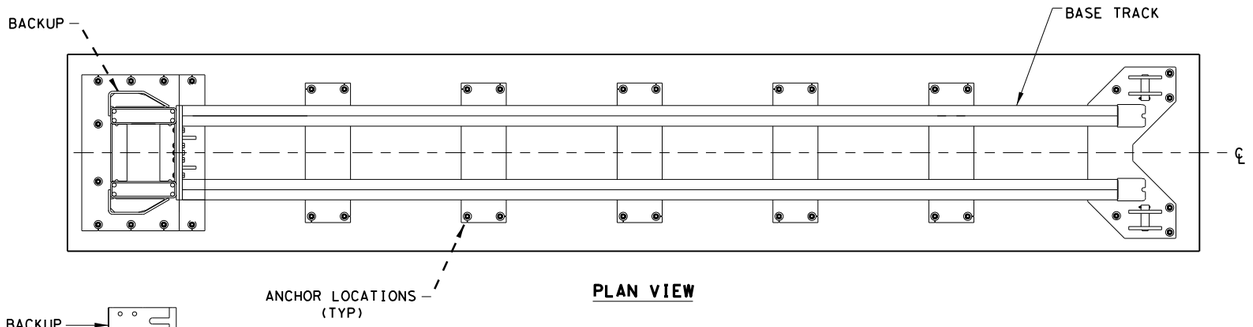
PLAN VIEW



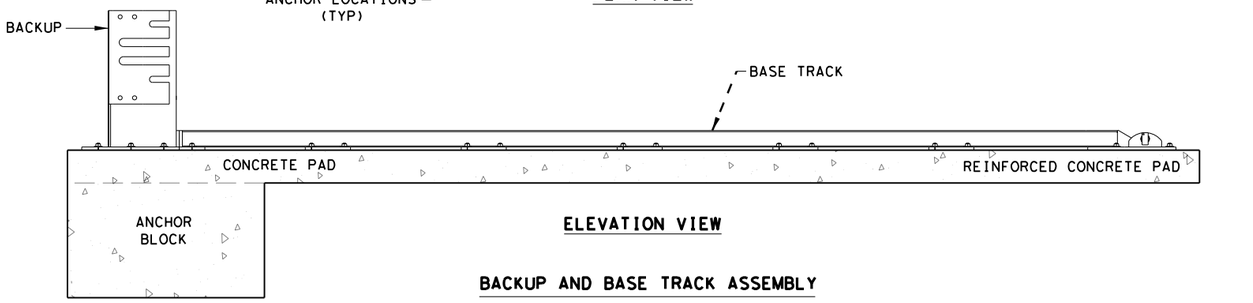
ELEVATION VIEW
LEFT SIDE

REACT M SYSTEM WITH NO TRANSITIONS

(SEE THE MANUFACTURER'S SHOP DRAWINGS FOR TRANSITIONS AND OFFSET INSTALLATION DETAILS.)



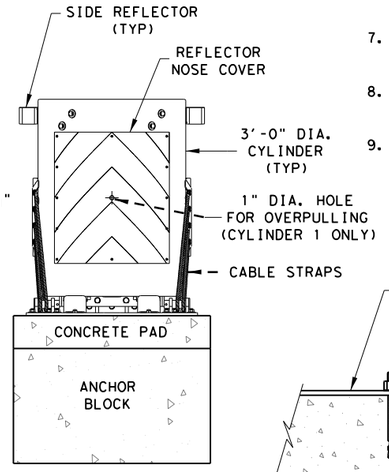
PLAN VIEW



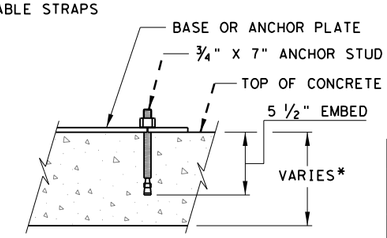
ELEVATION VIEW

BACKUP AND BASE TRACK ASSEMBLY

(SEE THE MANUFACTURER'S SHOP DRAWINGS FOR TRANSITIONS, OFFSETS, BIDIRECTIONAL AND UNIDIRECTIONAL INSTALLATION DETAILS.)

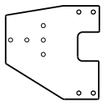


VIEW A-A

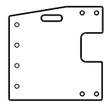


ANCHORING DETAIL
*SEE FOUNDATION TYPES TABLE

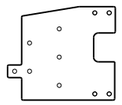
BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS



SAFETY SHAPE BARRIER TRANSITION (ADAPTER)
TRANSITION PLATE(S) (OPTIONAL)
REQUIRED W/BI-DIRECTIONAL TRAFFIC FLOWS ONLY.



VERTICAL WALL BARRIER TRANSITION (ADAPTER)
TRANSITION PLATE(S) (OPTIONAL)
REQUIRED W/UNIDIRECTIONAL TRAFFIC FLOWS ONLY.



VERTICAL WALL BARRIER TRANSITION (ADAPTER)
TRANSITION PLATE(S) (OPTIONAL)
REQUIRED W/BI-DIRECTIONAL TRAFFIC FLOWS ONLY.

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR THE CORRECT BACKUP ASSEMBLY AND TRANSITION PANELS OR SIDE PANELS USED FOR STANDARD AND BI-DIRECTIONAL INSTALLATIONS: AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM ONE OR TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW.

LOW MAINTENANCE

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION AT 1(888)323-6374 OR WEBSITE: www.trinityhighway.com.
2. THE NOSE OF THE REACT M SHALL BE CLAD WITH A PLASTIC WRAP WITH STANDARD DELINEATION ADHERED TO THE WRAP AND SHALL HAVE A SERIES OF SIDE MARKER REFLECTORS ON BOTH SIDES OF THE UNIT. SEE SITE PLAN VIEWS FOR MARKER AND PLASTIC WRAP COLOR ORIENTATION.
3. FOR BI-DIRECTIONAL TRAFFIC, APPROPRIATE TRANSITION DETAILS WILL BE AS SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS.
4. DETAILS OF COMPONENTS FOR THE REACT M, BACKUPS AND REINFORCING DETAILS WILL BE SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS FURNISHED TO THE ENGINEER.
5. IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
6. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
7. THE REACT M SYSTEM SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR CENTERLINE OF MERGING BARRIERS.
8. ALL STEEL COMPONENTS TO BE HOT DIPPED GALVANIZED EXCEPT STAKES, DRIVE SPIKES, THREADED BOLTS IN BACKUP UNIT, AND WEDGE FITTINGS ON CABLES.
9. THIS DRAWING REPRESENTS THE REACT M TL-3 SYSTEM, RE-DIRECTIVE, NON-GATING CRASH CUSHION THAT CAN PROTECT HAZARDS UP TO 30-INCHES IN WIDTH.

DESIGN DATA TABLE FOR REACT M

TEST NUMBER	TEST LEVEL	OVERALL LENGTH	TRANSITION LENGTH	SYSTEM WIDTH
3-30 TO 3-36	TL-3	22'-2 ¾"	-	3'-5 ¾"
3-37A	TL-3	22'-2 ¾"	9'-10 ¾"	3'-5 ¾"
3-38	TL-3	22'-2 ¾"	-	3'-5 ¾"

ANCHOR SYSTEM TYPE

APPROVED ADHESIVE, 7" STUDS, 5.5" EMBEDMENT

FOUNDATION TYPES

MINIMUM 8" REINFORCED PORTLAND CEMENT CONCRETE PAD (REQUIRED REINFORCING STEEL FOR CONCRETE PAD SHALL BE SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS.

MINIMUM 8" NON-REINFORCED PORTLAND CEMENT CONCRETE ROADWAY MEASURING AT LEAST 12' WIDE BY 50' LONG)

MINIMUM 7" CONCRETE DECK STRUCTURE, OR MINIMUM 6" REINFORCED CONCRETE ROADWAY

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE REACT M SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

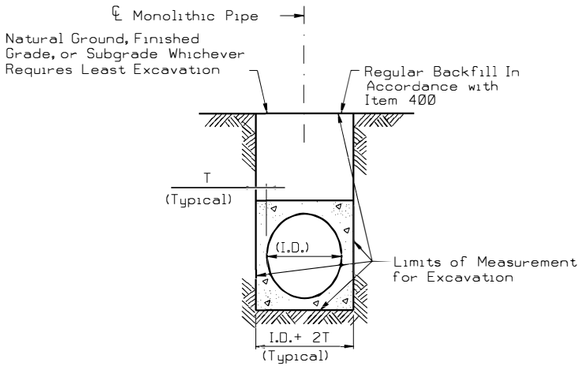
Texas Department of Transportation

Design Division Standard

TRINITY HIGHWAY ENERGY ABSORPTION CRASH CUSHION REACT M (NARROW) (MASH TL-3)

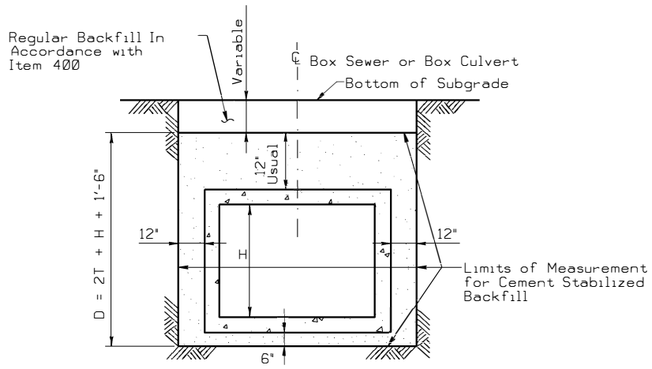
REACT(M)-21

FILE: reactm21.dgn	DN: TXDOT	CK: KM	DW: SS	CK: CL
©TxDOT: JULY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		58



EXCAVATION DETAIL

MONOLITHIC PIPE
IN A PAVED OR GRADED AREA



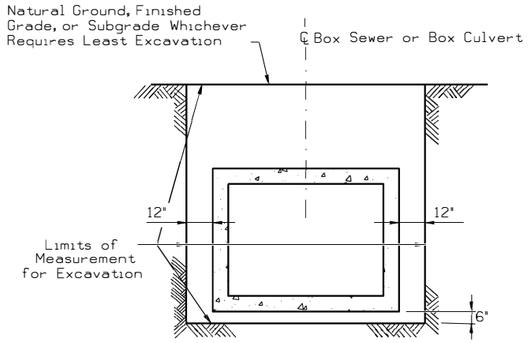
BACKFILL DETAIL

BOX CULVERTS
IN A GRADED OR PAVED AREA
INCLUDING DETOURS ▪

REINFORCED CONCRETE PIPE

EXCAVATION AND BACKFILL QUANTITIES

PIPE DIA. IN.	T FT.	CULVERT OR SEWER EXCAVATION IN A PAVED OR GRADED AREA C.Y.PER L.F.PER FT.OF DEPTH	CEMENT STABILIZED BACKFILL IN A PAVED OR GRADED AREA C.Y.PER L.F. OF PIPE
18	0.19	0.144	0.383
24	0.23	0.165	0.478
30	0.29	0.188	0.586
36	0.33	0.210	0.692
42	0.38	0.231	0.808
48	0.42	0.327	1.394
54	0.46	0.349	1.560
60	0.50	0.370	1.731
66	0.54	0.392	1.907
72	0.58	0.414	2.088
78	0.62	0.435	2.275
84	0.67	0.457	2.474



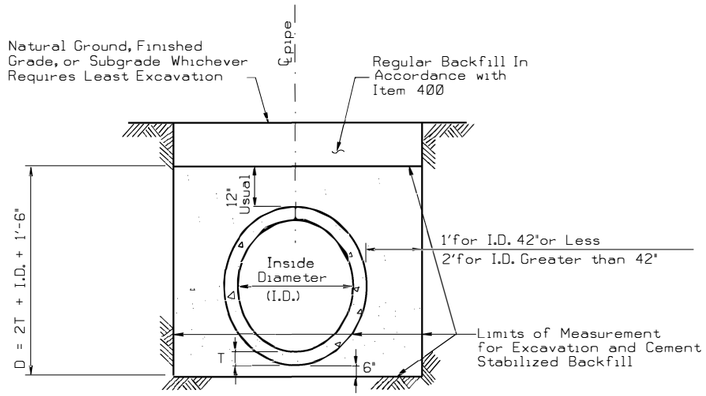
EXCAVATION DETAIL

BOX CULVERTS
IN A GRADED AREA

MONOLITHIC PIPE

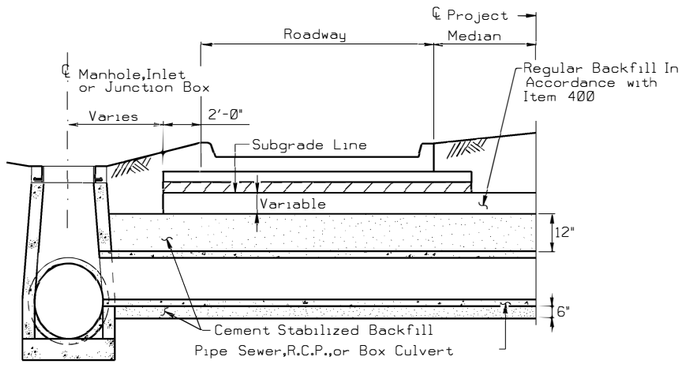
EXCAVATION QUANTITIES

PIPE DIA. IN.	T FT.	EXCAVATION C.Y.PER L.F.PER FT.OF DEPTH
36	0.417	0.142
42	0.458	0.164
48	0.458	0.182
54	0.500	0.204
60	0.583	0.228
66	0.583	0.247
72	0.625	0.269
78	0.625	0.287
84	0.625	0.306



EXCAVATION & BACKFILL DETAIL

REINFORCED CONCRETE PIPE
IN A GRADED OR PAVED AREA
INCLUDING DETOURS



BACKFILL DETAIL

AT MANHOLE, INLET OR JUNCTION BOX

D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

NOTE:

Cement stabilized backfill may be omitted in private driveways as indicated elsewhere in the plans.

Rubber gaskets shall be required for all joints on proposed cross drainage, pipe culverts and proposed storm sewer systems, unless otherwise shown in the plans.

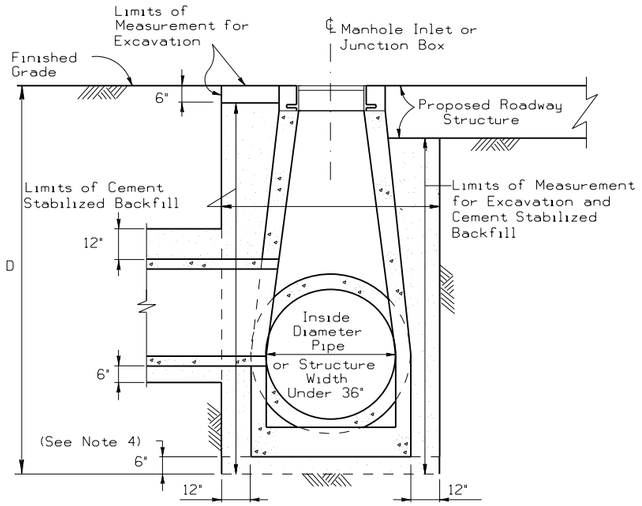
▪ Backfill with cement stabilized material will be required for all structures under detours unless noted otherwise in the General Notes.

Texas Department of Transportation
Houston District

EXCAVATION AND BACKFILL DIAGRAMS

E&BD

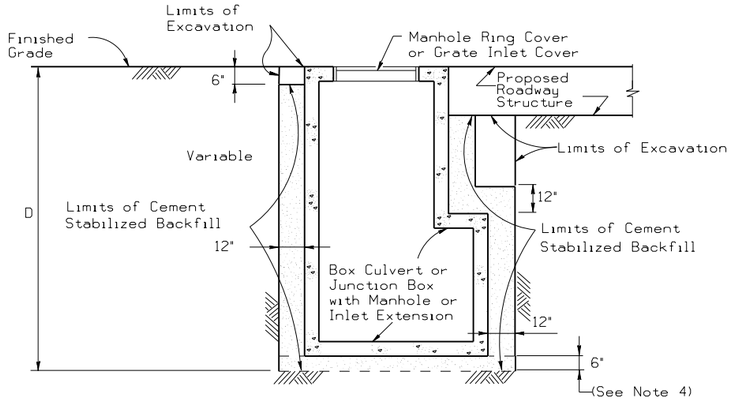
FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot	
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS	HOUSTON	6			58A
REVISED 11/05 REVISED 2/2010 Added note to Table 1,Sht 2 of 2. REVISED 6/12 REVISED 9/14	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		0177	14	039	SL 494



EXCAVATION AND BACKFILL DETAIL

MANHOLES SMALLER THAN 36 IN.
IN A PAVED OR GRADED AREAS

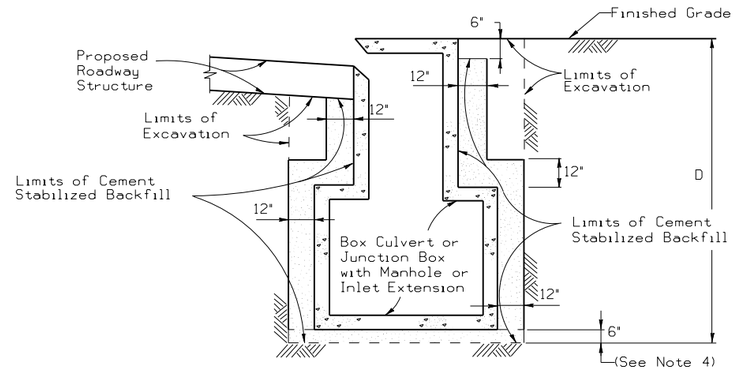
N.T.S.



EXCAVATION AND BACKFILL DETAIL

JUNCTION BOXES IN A
PAVED OR GRADED AREA

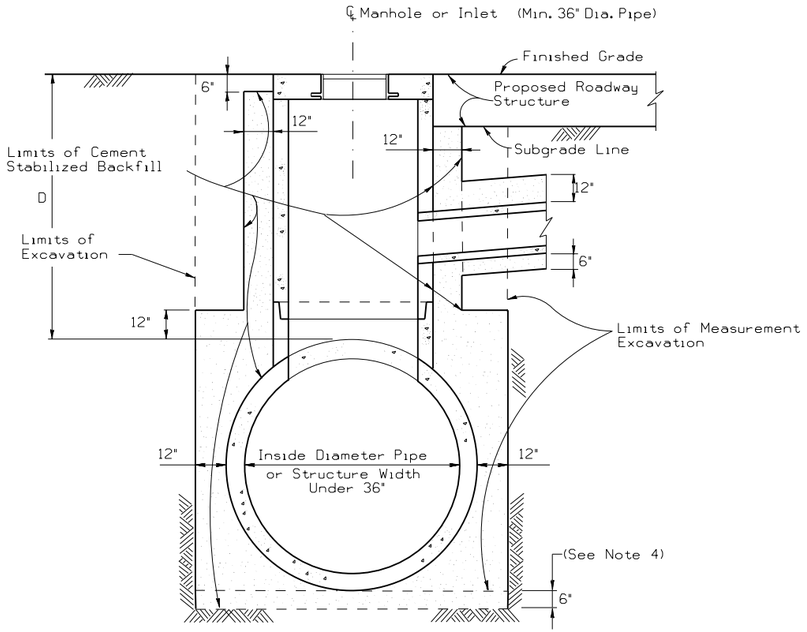
N.T.S.



EXCAVATION AND BACKFILL DETAIL

INLET EXTENSIONS ON A BOX CULVERT
IN A PAVED OR GRADED AREA

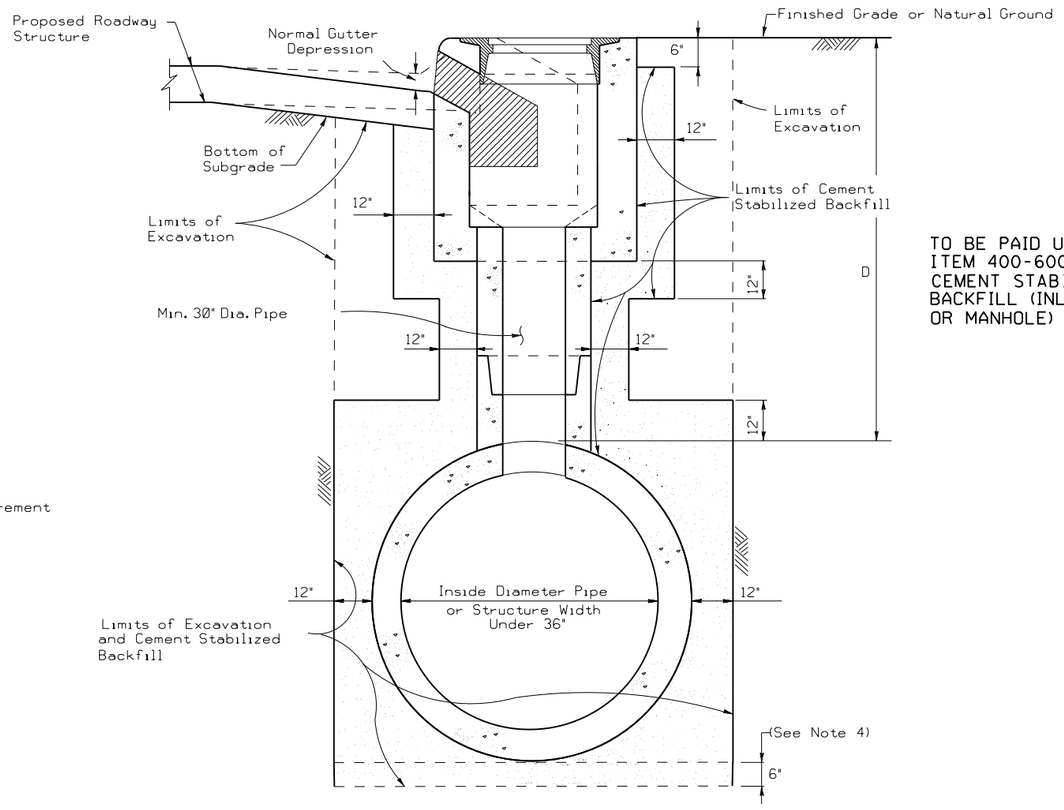
N.T.S.



EXCAVATION AND BACKFILL DETAIL

MANHOLES 36 IN. AND GREATER
IN A PAVED OR GRADED AREA

N.T.S.



EXCAVATION AND BACKFILL DETAIL

CURB INLETS IN A PAVED OR GRADED AREA

N.T.S.

D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

TABLE 1

SCHEDULE FOR PAY QUANTITIES OF CEMENT STABILIZED BACKFILL (SEE NOTE 1)

MANHOLE OR INLET DEPTH (D) IN FEET	CEMENT STABILIZED BACKFILL IN CUBIC YARDS
0 through 5	5.75
> 5 through 10	8.25
greater than 10	12.75

TO BE PAID UNDER ITEM 400-6009 CEMENT STABILIZED BACKFILL (INLET OR MANHOLE)

NOTES:

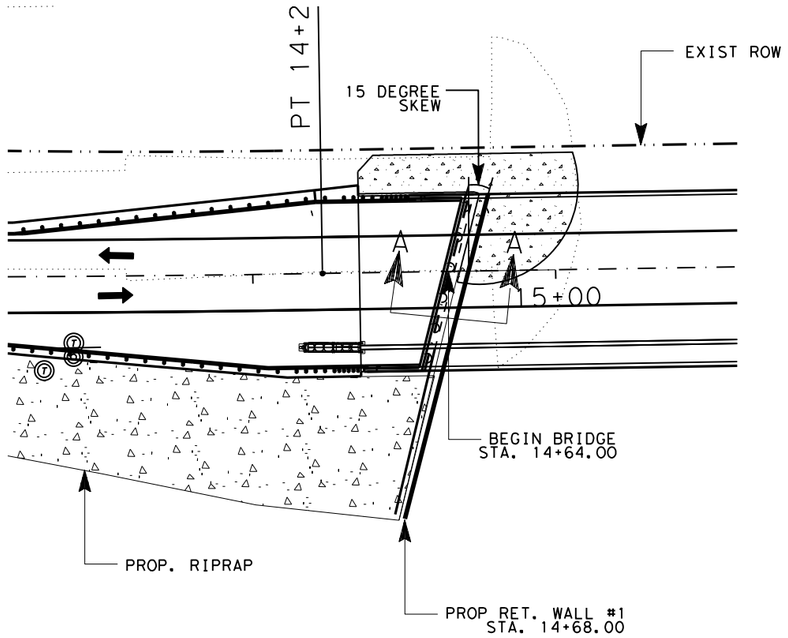
1. The Contractor is paid a fixed estimated amount for cement stabilized backfill based on depth (D) and Table. 1.
2. Proposed roadway structure includes pavement, base and any subgrade.
3. For backfill of intersecting pipes and box culverts, see "Excavation and Backfill Diagram for Pipes and Box Culverts."
4. 6" cement stabilized backfill will be required only for precast units.

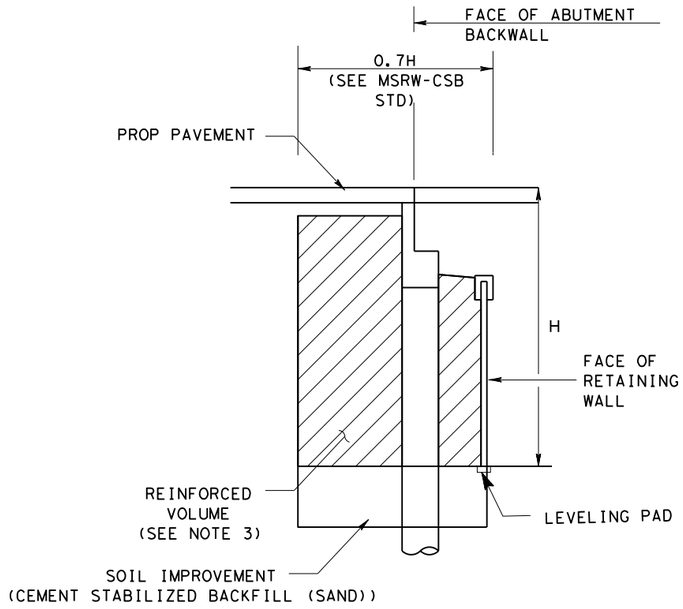
Texas Department of Transportation
Houston District

EXCAVATION AND BACKFILL DIAGRAMS

E&BD

FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS REVISED 2/2010 Added note to Table 1. REVISED 6/12 REVISED 9/14 REVISED 3/15	HOUSTON	6		588
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		0177	14	039	SL 494





TYPICAL MSE SECTION A-A
NOT TO SCALE

LEGEND

- RETAINING WALL
- TRAFFIC FLOW
- WATER FLOW

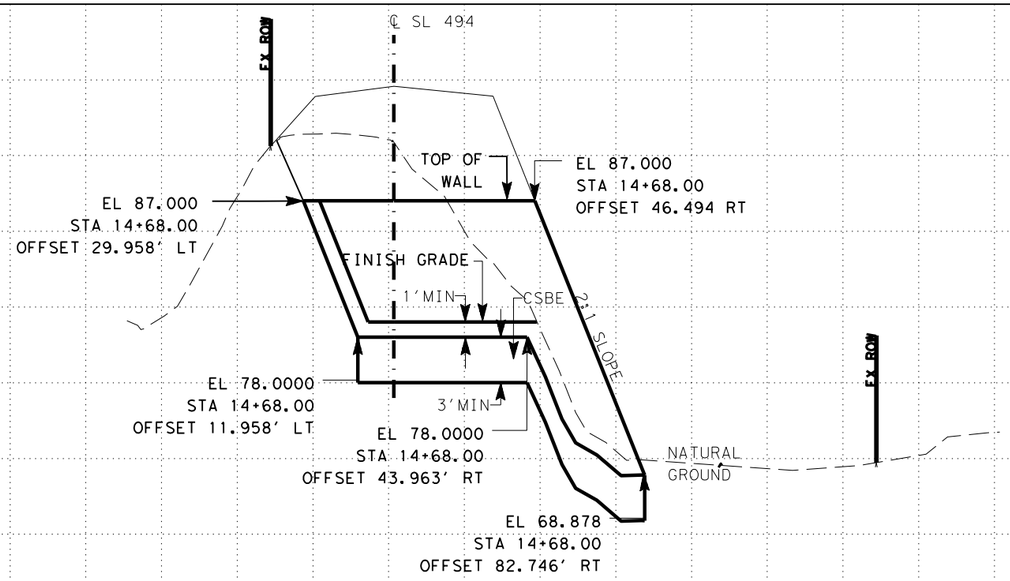
NOTE:

SEE STANDARD SHEET MSRW-CSB "MECHANICALLY STABILIZED EARTH RETAINING WALL"

EMBEDMENT DEPTH IS MEASURED FROM EXISTING NATURAL GROUND OR FINISH GRADE, WHICHEVER IS LOWER.

FOR THE SLOPES STEEPER THAN A SLOPE RATIO OF 3(H):1(V), CSBE MATERIALS SHOULD BE USED TO BACKFILL THE SLOPE. FOR THE SLOPES HAVING A SLOPE RATIO OF 3(H):1(V) OR FLATTER, THE FILLS SHOULD HAVE A MINIMUM FRICTION ANGLE OF 30 DEGREE.

0 25 50 (H)
0 5 10 (V)
SCALE: 1"=50'



STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER
Micah J. Schluter P.E.
02.24.22

SL 494
RETAINING WALL #1
PLAN & PROFILE

SHEET 1 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		59

DATE: 02/23/2022 06:04 PM
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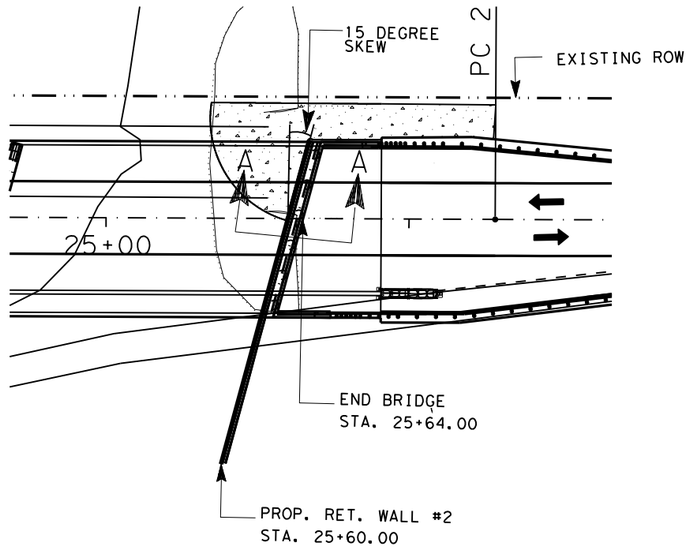
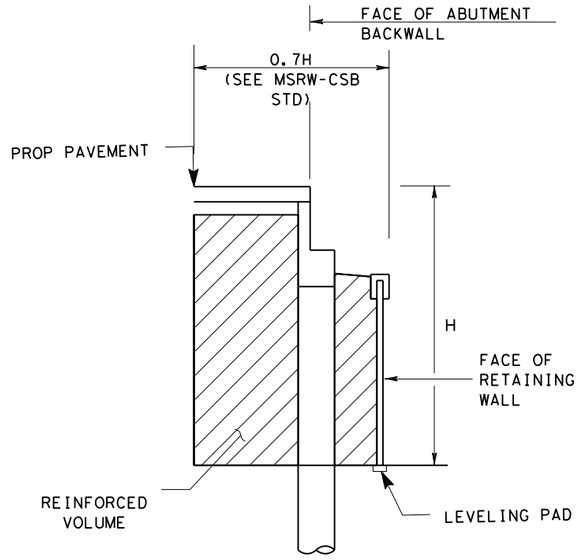




TYPICAL MSE SECTION A-A
NOT TO SCALE

LEGEND

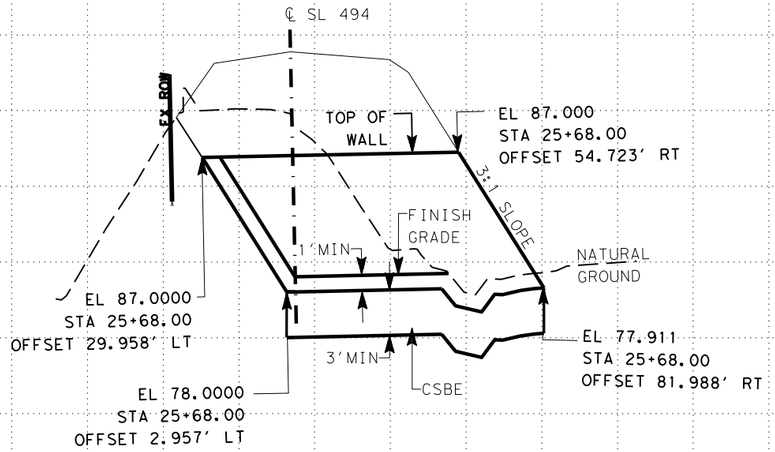
- CCA
- RETAINING WALL
- TRAFFIC FLOW
- WATER FLOW

NOTE:

SEE STANDARD SHEET MSRW-CSB "MECHANICALLY STABILIZED EARTH RETAINING WALL"

EMBEDMENT DEPTH IS MEASURED FROM EXISTING NATURAL GROUND OR FINISH GRADE, WHICHEVER IS LOWER.

0 25 50 (H)
0 5 10 (V)
SCALE: 1"=50'



95 90 85 80 75 70 65 60 55

STATE OF TEXAS
MICAH J. SCHLUTER
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PROFESSIONAL ENGINEER

Micah J. Schluter P.E.
02.24.22

SL 494
RETAINING WALL #2
PLAN & PROFILE

SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		60

DATE: 02/23/2022 05:40 PM
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Table 1: Recommendations on Retaining Wall and Roadway Slopes at the Abutments of Loop 494 at Caney Creek

Retaining Wall	Soil Boring	Sections	Approximate Wall Height (ft)	Retaining Soils	Foundation Soils	Minimum Earth Reinforcement Length	Soil Improvement Required below MSE Wall (2)	Minimum Wall Embedment	Underdrain Required	Riprap Required at the Toe of MSE Wall
North Abutment	B-	Immediately under Abutment	9 (1)	CSBE	28 degrees or 850 psf	12 ft	3 ft	1 ft	Yes	Yes
		East Side beyond Abutment	<11	CS	28 degrees or 850 psf	8 ft	No	1 ft	Yes	Yes
		West Side beyond Abutment	11 - 17	CSBE	28 degrees or 850 psf	12 ft	3 ft	1 ft	Yes	Yes
			<11	CS	28 degrees or 850 psf	8 ft	No	1 ft	Yes	Yes
		Remarks: For the slopes at west side of roadway approaching north abutment which have a slope ratio between 3(H):1(V) and 2(H):1(V), it is recommended that CSBE materials should be used to backfill the slope. For the slopes at the other locations which have a slope ratio of 3(H):1(V) or flatter, the fills should have a minimum friction angle of 30 degree. Surface protection should be provided for all the slopes to avoid erosion.								
South Abutment	B-	Immediately under Abutment	9 (1)	CSBE	30 degrees	12 ft	No (3)	1 ft	Yes	Yes
		East Side beyond Abutment	<11	CSBE	30 degrees	8 ft	No	1 ft	Yes	Yes
		West Side beyond Abutment	11 - 17	CSBE	30 degrees	12 ft	No (3)	1 ft	Yes	Yes
			<11	CSBE	30 degrees	8 ft	No	1 ft	Yes	Yes
		Remarks: The slopes at both sides of roadway approaching south abutment have a slope ratio of 3(H):1(V) or flatter. It is recommended that the fills should have a minimum friction angle of 30 degree. Surface protection should be provided for all the slopes to avoid erosion.								

Notes:

1) The wall height in the design calculation was taken as ~17 ft which is the height from the wall bottom to the top of roadway.
2) Soil improvement should extend to a minimum of 2 ft in front of the wall.
3) Based on the information of soil boring at a distance of ~50 ft from south abutment, the soils at Elevation 76' at south abutment are expected to consist of silty sand. If soft clays are encountered at the bottom of the wall during construction, it is recommended that the soils within 3-ft below the bottom of wall should be removed and replaced with CSBE fills.

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03.01.22

SL 494
RETAINING WALL ANALYSIS

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		60A

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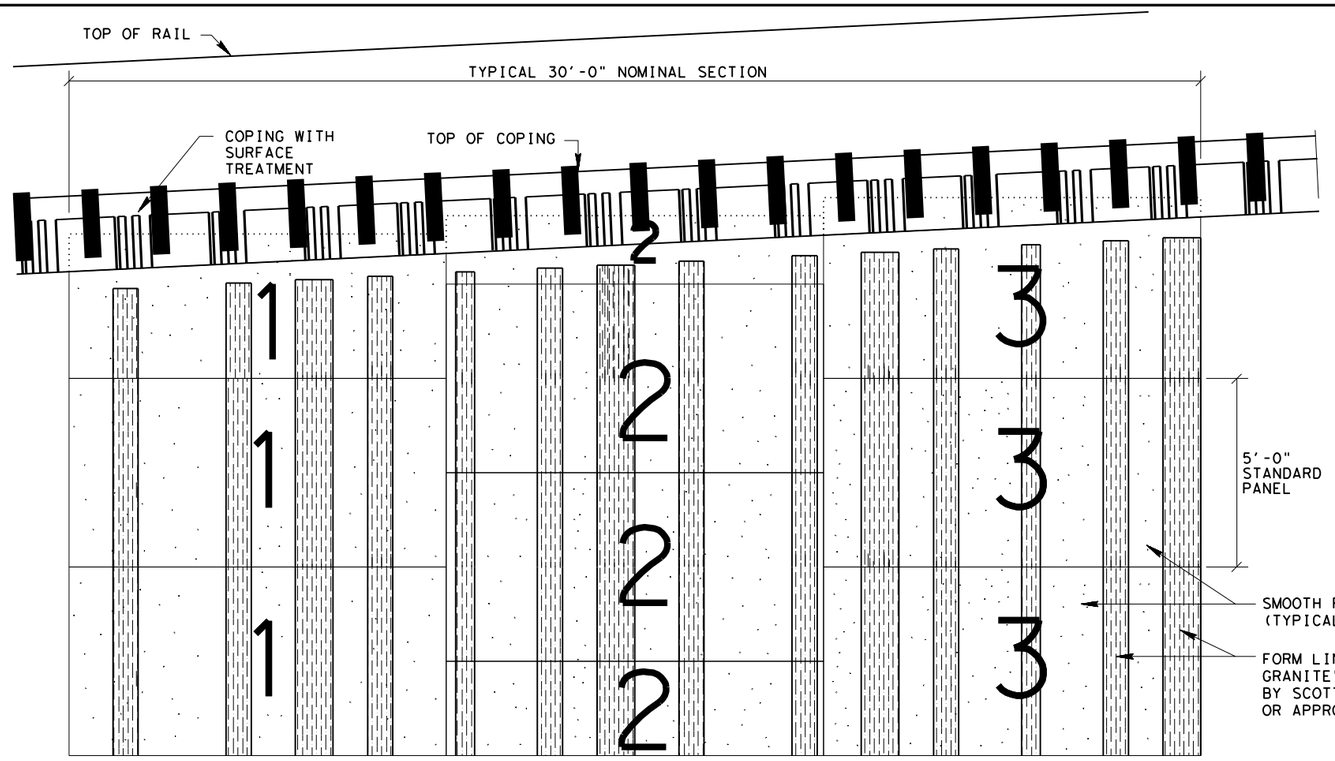
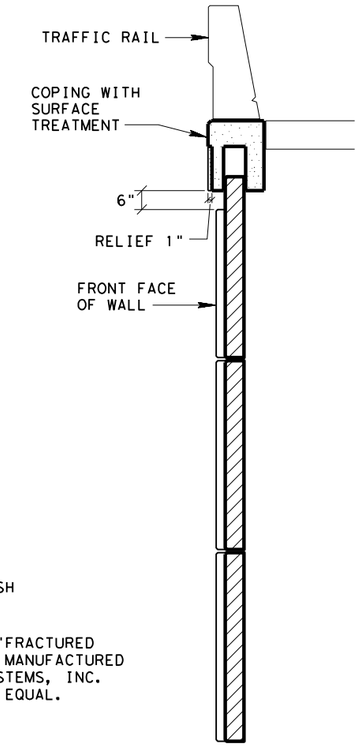


ELEVATION



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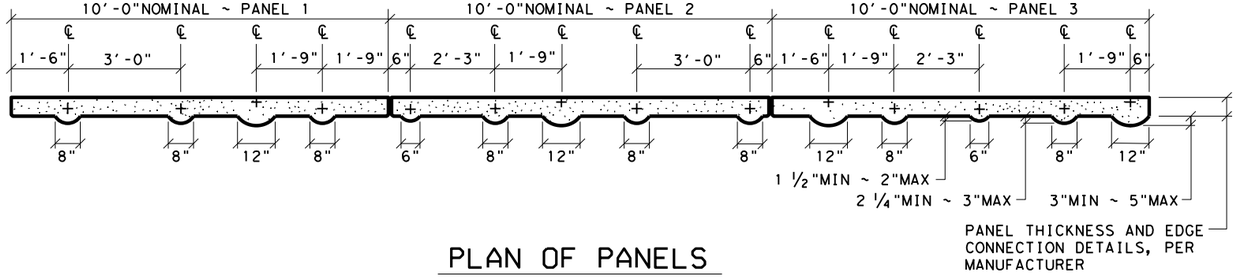
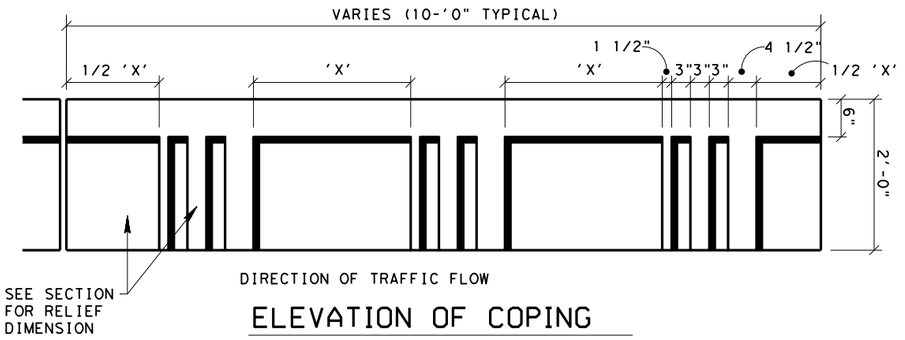


PLAN OF PANELS



ELEVATION OF COPING

NOT TO SCALE

NOTES:

1. DETAILS FOR CONSTRUCTION OF RETAINING WALLS ARE SHOWN IN THE STANDARD DRAWING " MECHANICALLY STABILIZED EARTH RETAINING WALL."
2. ITEM 427 "SURFACE FINISHES FOR CONCRETE" ARE CONSIDERED INCIDENTAL TO ITEM 423 "RETAINING WALL". SEE SHEET TITLED "SURFACE FINISHES FOR CONCRETE".
3. FORM LINER USED TO PROVIDE TEXTURE SHALL BE OF ONE PIECE CONSTRUCTION. JOINTS SHALL NOT BE PERMITTED IN FORM LINERS.
4. THE CONTRACTOR SHALL PROVIDE THE ENGINEER AND DISTRICT LANDSCAPE ARCHITECT WITH AN 18" SQUARE OR LARGER SAMPLE OF THE FRACTURED GRANITE FORM LINER FOR APPROVAL PRIOR TO MANUFACTURING RETAINING WALL PANELS.

Texas Department of Transportation
Houston District Bridge
Green Ribbon Project

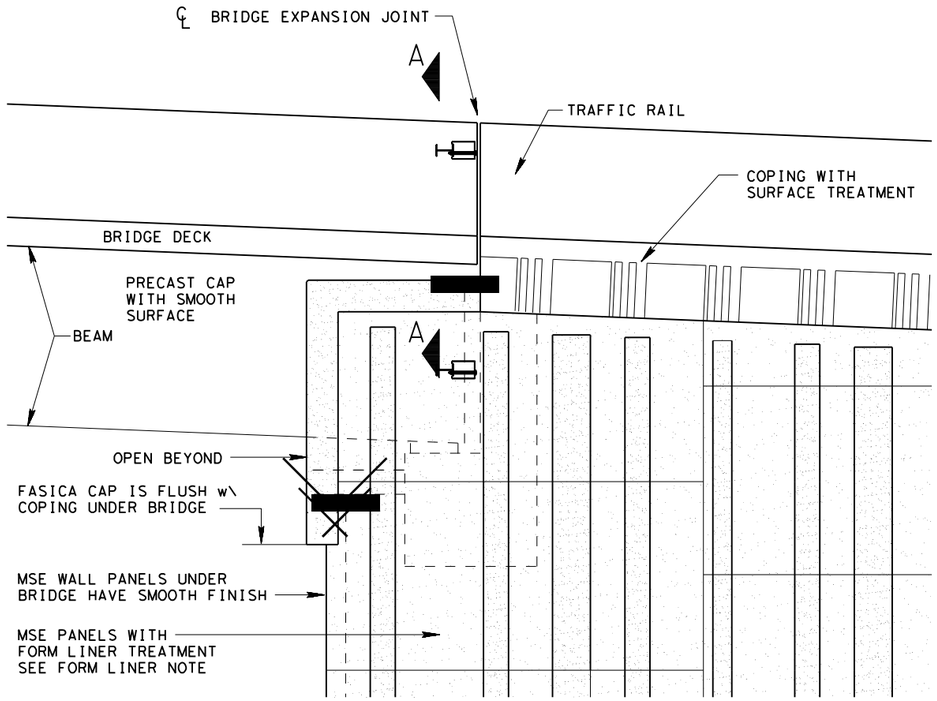
RETAINING WALL DETAILS

VERTICAL SCHEME

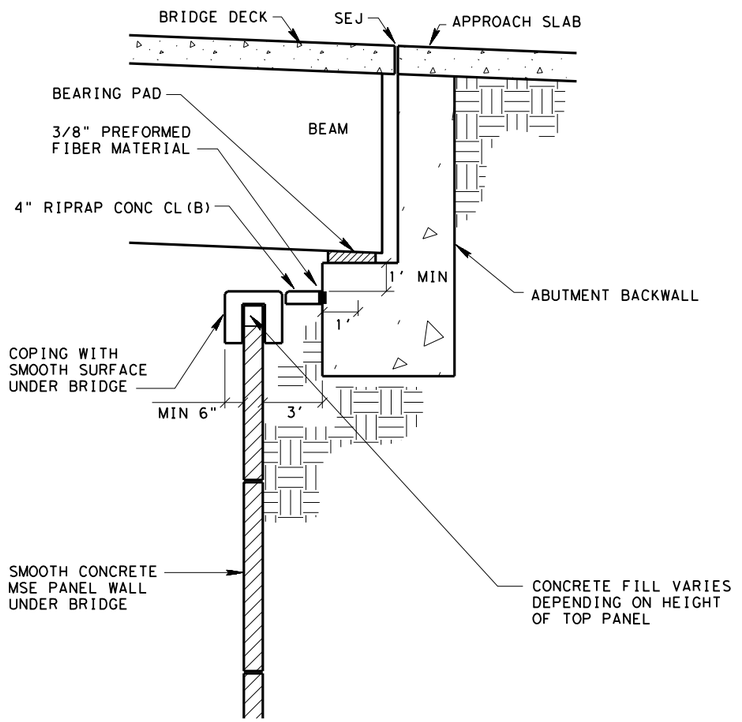
RWD-VS

FILE: STDJ1.DGN	DN:	CK:	DW:	CK:
© TxDOT DEC 2005	DISTRICT	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6		61
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY	0177	14	039	SL 494

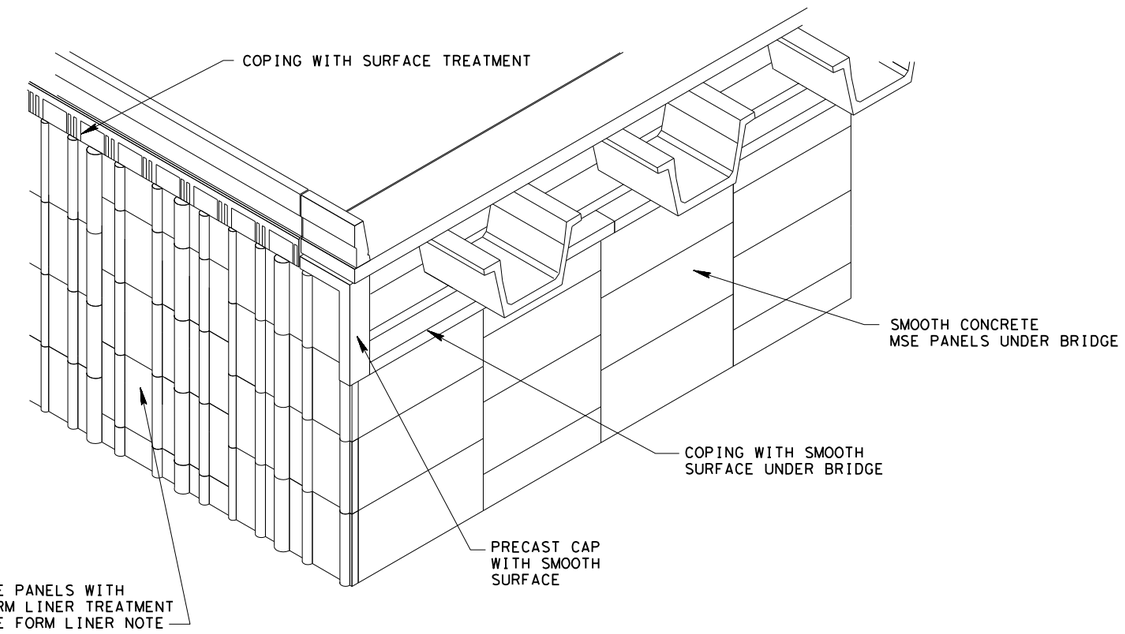
STD-J1

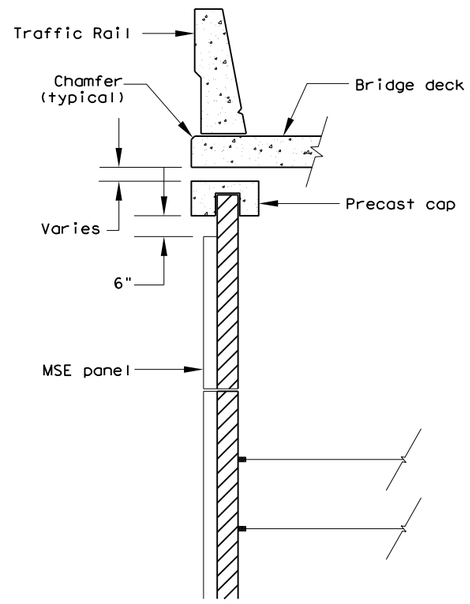


ELEVATION



TYPICAL WALL SECTION @ ABUTMENT





SECTION A-A

NOT TO SCALE

VERTICAL SCHEME: MSE Retaining Wall w/ Vertical Front Face

Texas Department of Transportation
Houston District Bridge
Green Ribbon Project

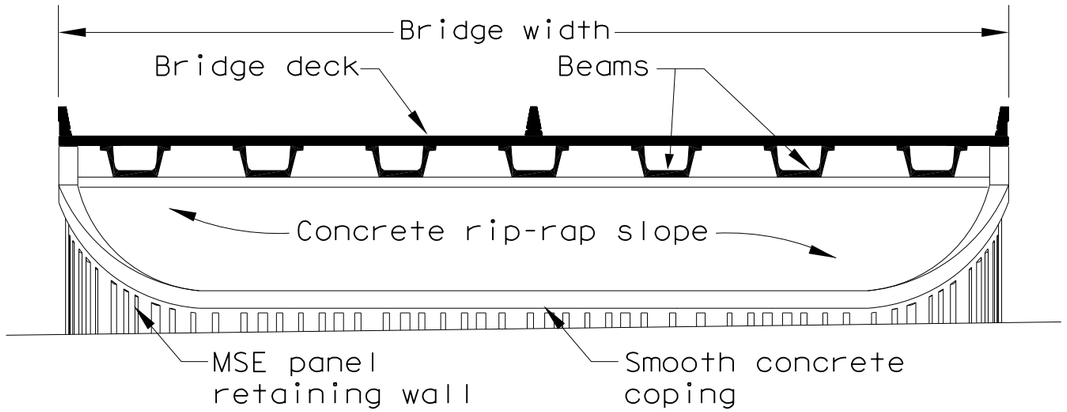
RETAINING WALL DETAILS

VERTICAL SCHEME

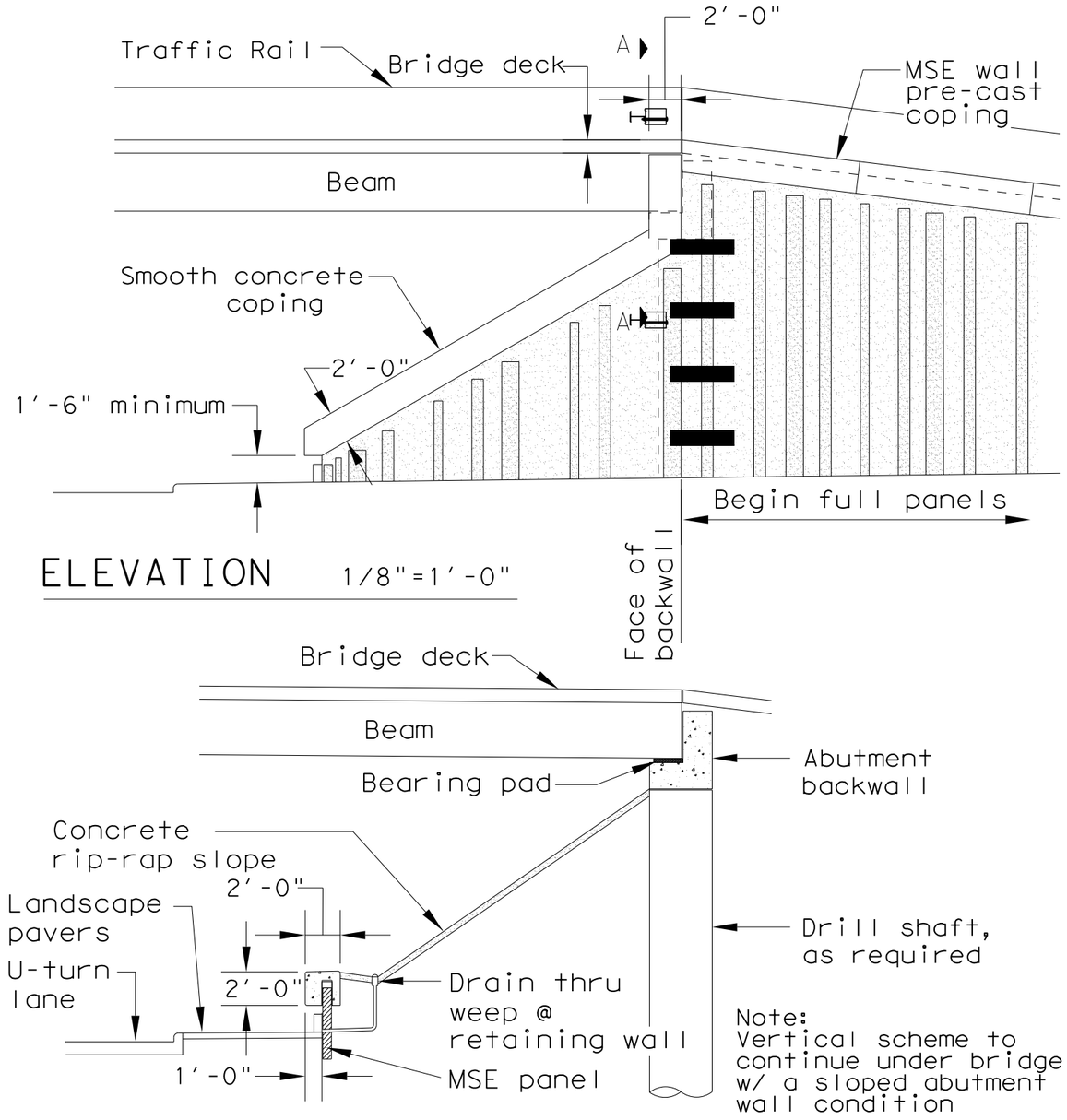
RWD-VS

FILE: STDJ1.DGN	DN:	CK:	DW:	CK:
© TxDOT DEC 2005	DISTRICT	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6		62
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY	0177	14	039	SL 494

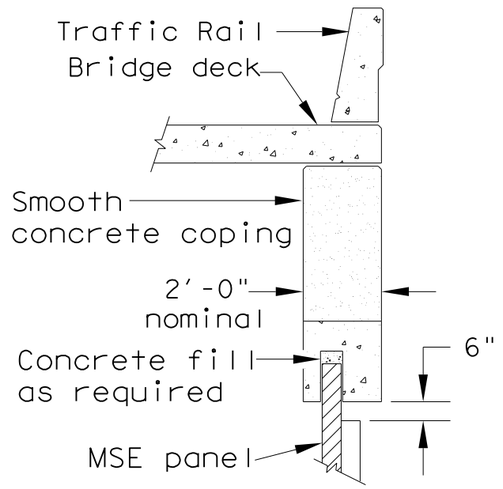
STD J-1



ELEVATION 1/16"=1'-0"



ELEVATION 1/8"=1'-0"



SECTION A-A 1/4"=1'-0"

SECTION 1/8"=1'-0"

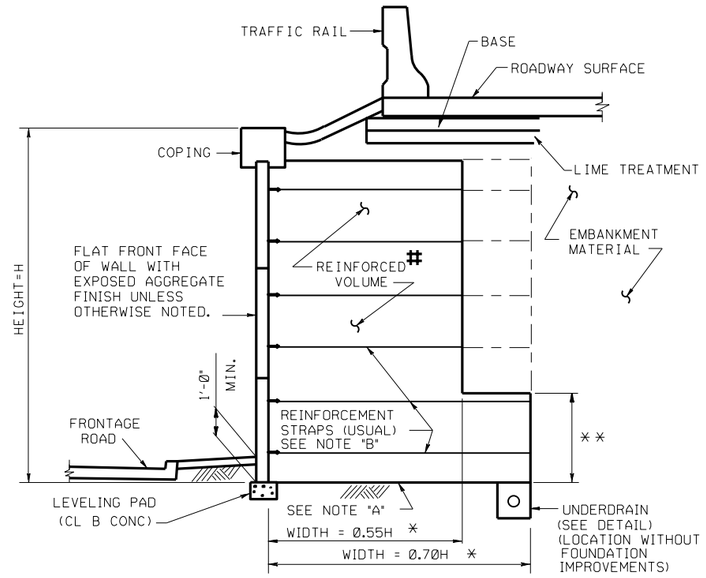
VERTICAL SCHEME: MSE Retaining Wall w/ Sloped Rip Rap

Texas Department of Transportation
Houston District Bridge
Green Ribbon Project

RETAINING WALL DETAILS
VERTICAL SCHEME

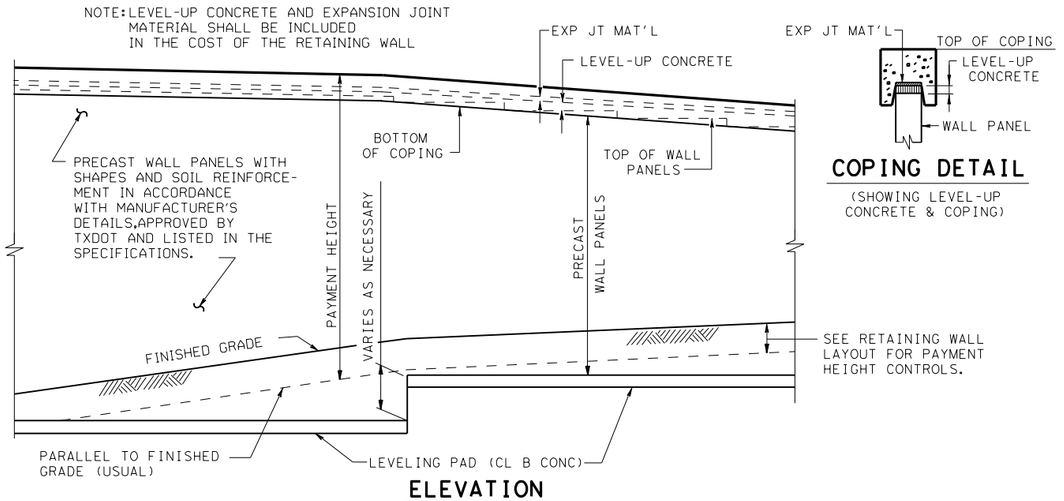
RWD-VS

FILE: STDJ1.DGN	DN:	CK:	DW:	CK:
© TxDOT DEC 2005	DISTRICT	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6		63
	COUNTY	CONTROL	SECT JOB	HIGHWAY
	MONTGOMERY	0177	14 039	SL 494



TYPICAL SECTION

(WALL AT BOTTOM OF SLOPE)



ELEVATION

COPING DETAIL

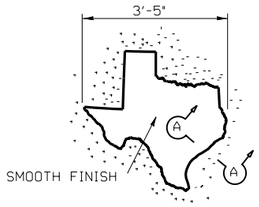
(SHOWING LEVEL-UP CONCRETE & COPING)

NOTE "A":
COMPACT THE SOIL UNDER THE LEVELING PAD AND THE REINFORCED VOLUME INCLUDING A MINIMUM OF TWO (2) FEET IN FRONT OF THE LEVELING PAD TO A MINIMUM OF 98% OF THE MAXIMUM DRY DENSITY, AS PRESENTED IN TEST METHOD TEX-114-E. THE DENSITY TESTING OF THE SOIL WILL BE OUTLINED IN TEST METHOD TEX-115-E. COST OF THIS COMPACTION WILL NOT BE PAID FOR DIRECTLY BUT IS INCIDENTAL TO THE UNIT PRICE BID FOR BID FOR "RETAINING WALL."

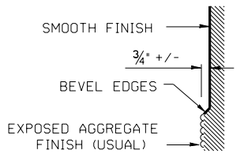
NOTE "B":
WHEN BACKFILL DOES NOT COMPLY WITH pH AND RESISTIVITY REQUIREMENTS, USE EPOXY COATED METALLIC REINFORCEMENTS. ALSO EPOXY COAT CONNECTION HARDWARE USED WITH EPOXY COATED REINFORCEMENTS. USE EPOXY CONFORMING TO THE REQUIREMENTS OF THE ITEM, "EPOXY." THIS WORK WILL NOT BE PAID FOR DIRECTLY, BUT IS CONSIDERED INCIDENTAL TO THE UNIT PRICE BID FOR "RETAINING WALL".

* THE CONTRACTOR HAS THE OPTION OF PROVIDING A REINFORCED VOLUME WITH TWO DIFFERENT WIDTHS (0.55H BUT NOT LESS THAN SIX FEET AND 0.70H BUT NOT LESS THAN EIGHT FEET), OR WITH A CONSTANT WIDTH EQUAL TO 0.70H BUT NOT LESS THAN EIGHT FEET AS SHOWN.

** 3 IN. MINIMUM ABOVE THE SECOND COURSE OF SOIL REINFORCEMENTS, BUT NO LESS THAN 4 FEET.



ELEVATION

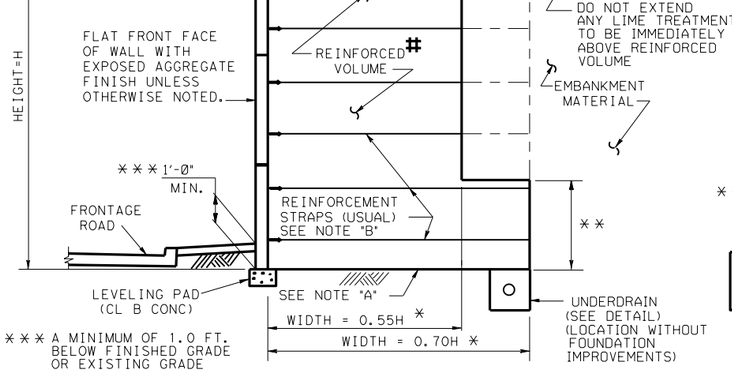


SECTION A-A

MAP OF TEXAS EMBLEM

(FOR NON - GREEN RIBBON PROJECTS ONLY)

FORM MAP OF TEXAS EMBLEM INTO A WALL PANEL NEXT TO EACH BRIDGE ABUTMENT. PLACE THE EXACT LOCATION OF EACH EMBLEM AS APPROVED BY THE ENGINEER. THE COST OF FORMING THE EMBLEMS WILL NOT BE PAID FOR DIRECTLY, BUT IS CONSIDERED INCIDENTAL TO THE UNIT PRICE BID FOR "RETAINING WALL".

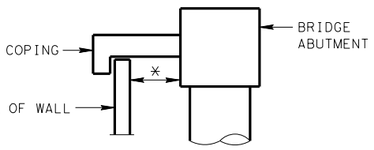


*** A MINIMUM OF 1.0 FT. BELOW FINISHED GRADE OR EXISTING GRADE WHICHEVER IS LOWER."

TYPICAL SECTION

(SHOWING ROADWAY ON WALL)

CEMENT STABILIZED BACKFILL REINFORCED VOLUME TO BE PAID AS ITEM 132-6006 EMBANKMENT (FINAL) (DENS CONT) (TY C)

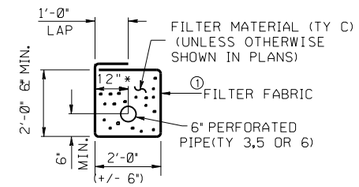


* 2' MINIMUM AND 3' DESIRABLE EDGE DISTANCE FROM BACK OF PANEL TO FRONT OF ABUTMENT.

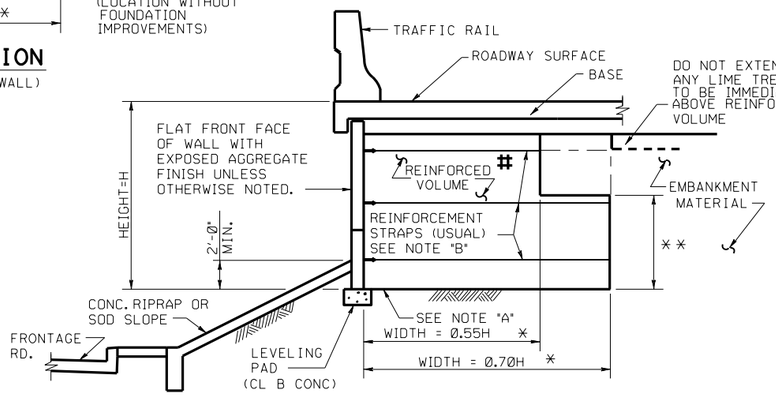
TYPICAL SECTION

(WALL AT ABUTMENT)

① FILTER FABRIC MEETING THE REQUIREMENTS OF DMS-6200 TYPE 1.



UNDERDRAIN DETAIL



TYPICAL SECTION

(WALL AT TOP OF SLOPE)

NOTES

RAILING AND ROADWAY SLAB ARE PAID FOR UNDER THE APPROPRIATE ROADWAY ITEMS. MODIFICATIONS TO THE RAIL OR ROADWAY SLAB TO FORM COPING ARE CONSIDERED INCIDENTAL TO THE SQUARE FOOT COST OF THE BID ITEM, "RETAINING WALL".

PLACE THE UPPERMOST REINFORCEMENT STRAPS NO MORE THAN 3.5' BELOW THE TOP OF THE WALL. PLACE THE LOWEST LEVEL OF REINFORCEMENT STRAPS NO MORE THAN 2.0' ABOVE THE TOP OF THE LEVELING PAD.

PROVIDE UNDERDRAINS ONLY AT LOCATIONS SHOWN ON THE PLANS. INCLUDE THE COST OF FURNISHING AND INSTALLING UNDERDRAINS IN THE UNIT PRICE BID FOR "RETAINING WALL."

THE REINFORCED VOLUME CONSISTS OF CEMENT STABILIZED BACKFILL IN ACCORDANCE WITH ITEM 132 AND HOUSTON DISTRICT SPECIAL PROVISION (132-001).

PAYMENT HEIGHT SHOWN IN RETAINING WALL LAYOUTS IS CONSIDERED THE MINIMUM HEIGHT TO BE FURNISHED. ADDITIONAL WALL FURNISHED BELOW PAYMENT LINE DUE TO DETAILING OR FABRICATOR DESIGN REQUIREMENTS WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED INCIDENTAL.

THE CONTRACTOR MAY USE A DIFFERENT TYPE OF TRAFFIC RAIL AND COPING ON RETAINING WALLS IF THE DESIGN AND DETAILS ARE APPROVED BY THE ENGINEER.

WHEN OBSTRUCTIONS (INLETS, DRILLED SHAFTS, PILING, ETC.) PREVENT PLACEMENT OF SOIL REINFORCEMENTS IN THEIR NORMAL LOCATIONS, PROVIDE DETAILS AND CALCULATIONS THAT ESTABLISH SUPPORT FOR THE AFFECTED PANELS. FURNISH THE SAME STEEL AREA OF SOIL REINFORCEMENTS AS THAT REQUIRED IN THE ABSENCE OF THE OBSTRUCTION. PROVIDE CALCULATIONS THAT JUSTIFY ANY ALTERATIONS MADE TO THE SOIL REINFORCEMENTS OR MODIFICATIONS TO THEIR NORMAL PLACEMENT. DO NOT USE PANELS WITHOUT ANY SOIL REINFORCEMENTS CONNECTED TO THEM UNLESS THEY ARE CONNECTED WITH GALVANIZED HARDWARE TO ADJACENT PANELS WHICH DO HAVE SUPPORTING SOIL REINFORCEMENTS ATTACHED TO THEM AND AS APPROVED BY THE ENGINEER.

DESIGN PARAMETERS

BASE RETAINING WALL DESIGN ON THE FOLLOWING DESIGN PATTERNS:

EMBANKMENT MATERIAL (BEHIND CEMENT STABILIZED BACKFILL)	UNIT WEIGHT - 125 PCF ø 30°C = 0 PSF KA = 0.333
CEMENT STABILIZED BACKFILL	UNIT WEIGHT = 125 PCF ø 45°C = 0 PSF

ALLOWABLE STRESSES IN STEEL AND CONCRETE ARE IN ACCORDANCE WITH CURRENT A.A.S.H.T.O. AND INTERIM SPECIFICATIONS.

THE MINIMUM LENGTH OF REINFORCEMENT STRAPS FOR A 0.55H STEP WALL IS SIX FEET AND FOR A 0.70H WALL IS EIGHT FEET.

EXTERNAL STABILITY CRITERIA

PROVIDE A FACTOR OF SAFETY IN SLIDING ALONG THE BASE OF THE STRUCTURE OF GREATER THAN OR EQUAL TO 1.5.

PROVIDE A FACTOR OF SAFETY IN OVERTURNING OF GREATER THAN OR EQUAL TO 2.0.

THE MAXIMUM ALLOWABLE BEARING PRESSURE IS ½THE ULTIMATE BEARING CAPACITY OF THE FOUNDATION.

THE WIDTHS SHOWN HEREIN ARE CONSIDERED MINIMUM UNLESS A LARGER WIDTH IS SPECIFIED ON THE WALL PLANS OR REQUIRED BY THE FABRICATOR'S DETAILS.

ENSURE THE BASE PRESSURE RESULTANT FALLS WITHIN THE MIDDLE THIRD OF THE RETAINING WALL.

PROVIDE A FACTOR OF SAFETY AGAINST PULLOUT OF THE EARTH REINFORCEMENTS OF GREATER THAN OR EQUAL TO 1.5 AT EACH LEVEL. DETERMINE PULLOUT RESISTANCE FROM TEST DATA EVALUATED AT ¾INCH STRAIN.

CORROSION CRITERIA

DESIGN THE EARTH REINFORCEMENT ELEMENTS TO HAVE A CORROSION RESISTANCE DURABILITY TO ENSURE A MINIMUM DESIGN LIFE OF 75 YEARS. COMPUTE THE MAXIMUM LOSS PER SIDE DUE TO CORROSION BY ASSUMING A UNIFORM LOSS MODEL BASED ON THE FOLLOWING:

ZINC CORROSION RATE (FIRST 2 YEARS) - 15 UM/YR.
ZINC CORROSION RATE (SUBSEQUENT YEARS) - 4 UM/YR.
CARBON STEEL CORROSION RATE - 12 UM/YR.

PERFORM STRESS AND PULLOUT CALCULATIONS ON THE CALCULATED EARTH REINFORCEMENT SECTION REMAINING AFTER 75 YEARS.

Texas Department of Transportation
Houston District

MECHANICALLY STABILIZED RETAINING WALL

CEMENT STABILIZED BACKFILL

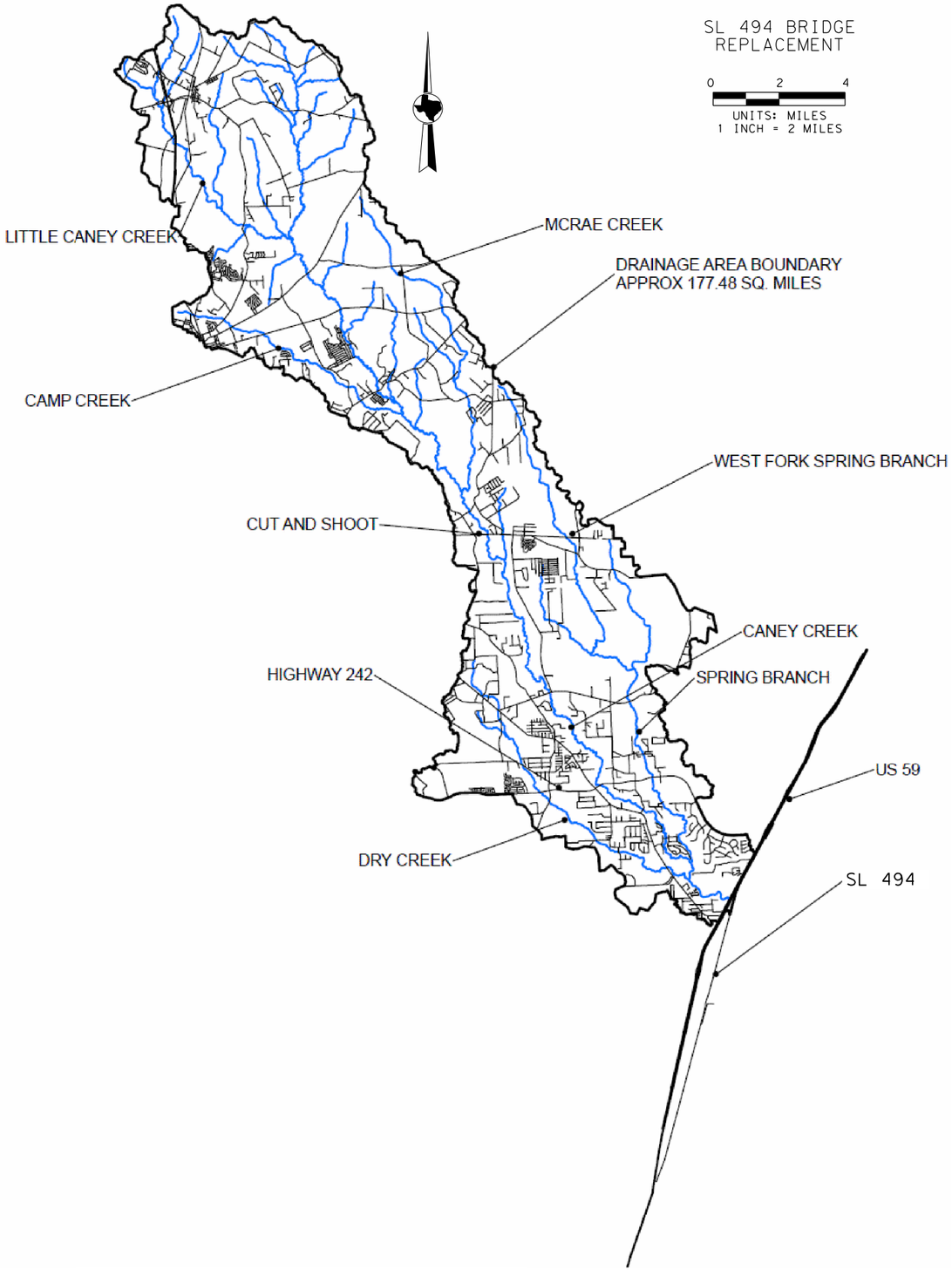
MSRW-CSB

FILE: STDJ4.DGN	DN:	CK:	DW:	CK:	
© TxDOT 2014	DIST	FED REG	PROJECT NO.		SHEET
MAR 2015 - 2014 SPECS	HOU	6			64
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		0177	14	039	SL 494

CANEY CREEK

DRAINAGE AREA MAP

SL 494 BRIDGE
REPLACEMENT



NOTES:

1. PEAK FLOW RATES AT THE CROSSING OF SL 494 AND CANEY CREEK, ARE BASED ON NOAA ATLAS 14 RAINFALL DATASET OBTAINED FROM NOAA WEBSITE FOR 10, 50, 100 AND 500 YEAR FREQUENCY FOR EACH CANEY CREEK SUBBASIN.

2. SEE CANEY CREEK DRAINAGE REPORT FOR SUBBASIN DRAINAGE AREA MAPS.

PROPOSED UNSTREADY FLOW UPSTREAM OF US 59			
10 YEAR	50 YEAR	100 YEAR	500 YEAR
13,985	30,857	42,396	76,955
PROPOSED UNSTREADY FLOW UPSTREAM OF SL 494			
10 YEAR	50 YEAR	100 YEAR	500 YEAR
13,977	30,849	42,392	76,950

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
MOHAMED A. BAGHA
102919
LICENSED
PROFESSIONAL ENGINEER

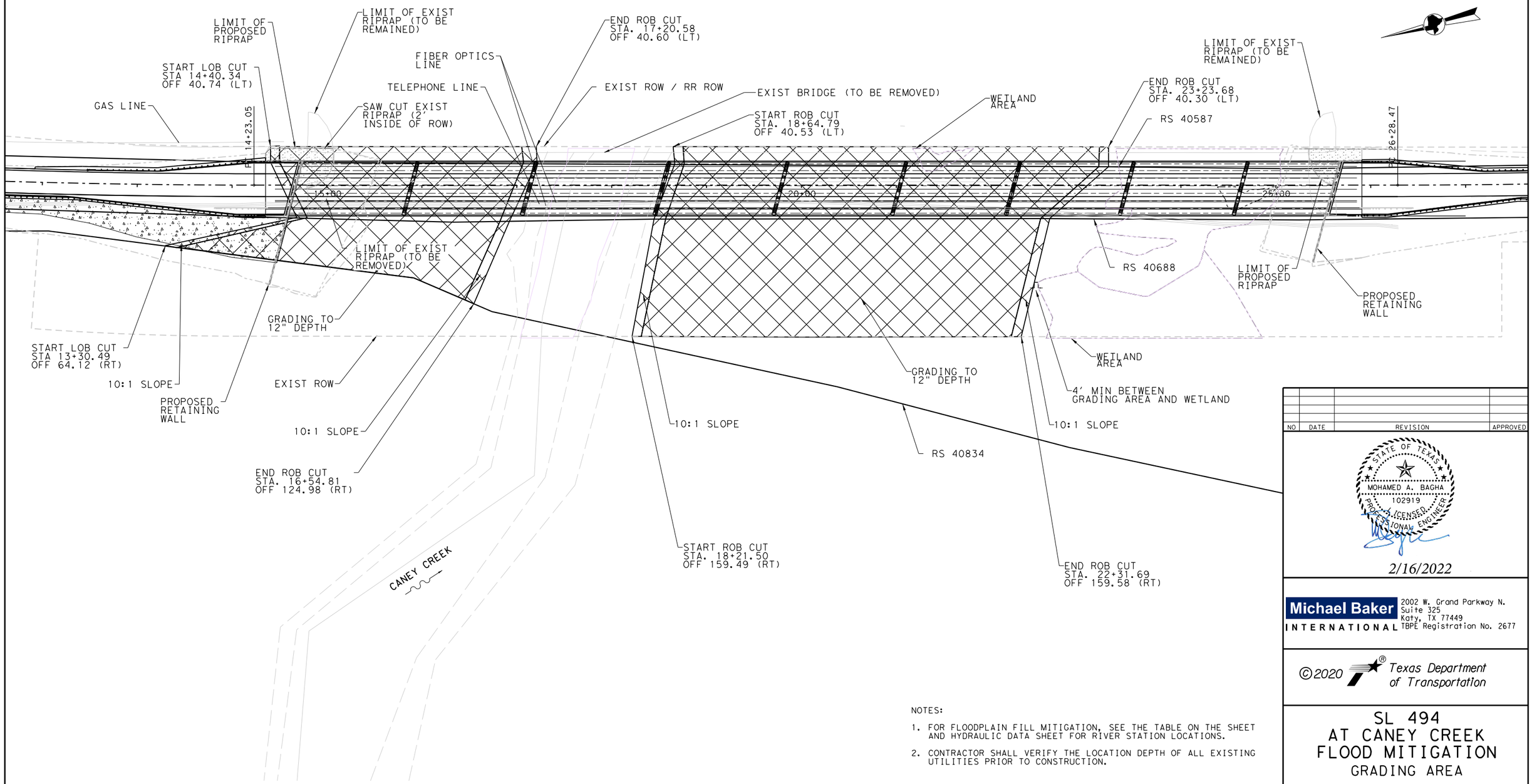
02/16/2022

Michael Baker INTERNATIONAL
2002 W. Grand Parkway N.
Suite 325
Katy, TX 77449
TBPE Registration No. 2677

SL 494
AT CANEY CREEK
BRIDGE REPLACEMENT

DRAINAGE AREA MAP

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			65
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494



RS Station	LOB CUT STARTING STATION				LOB CUT END STATION				ROB CUT STARTING STATION				ROB CUT END STATION			
	10:1 SLOPE	OFFSET	12" CUT	OFFSET	12" CUT	OFFSET	10:1 SLOPE	OFFSET	10:1 SLOPE	OFFSET	12" CUT	OFFSET	12" CUT	OFFSET	10:1 SLOPE	OFFSET
40834	13+30.49	64.12(RT)	13+42.17	66.27(RT)	16+45.61	120.86 (RT)	16+54.81	124.98(RT)	18+21.50*	159.49 (RT)*	18+31.14*	159.46 (RT)*	22+21.23*	159.65 (RT)*	22+31.69*	159.58 (RT)*
40688	14+65.45	34.58(RT)	14+76.69	34.88 (RT)	16+82.28	38.26 (RT)	16+92.24	38.10 (RT)	18+44.71	35.78 (RT)	18+56.75	35.77 (RT)	22+52.18	35.20 (RT)	22+61.63	35.25(RT)
40587	14+40.34*	40.74(LT)*	14+49.94*	40.73(LT)*	17+05.20*	40.60 (LT)*	17+20.58*	40.60 (LT)*	18+64.79*	40.53 (LT)*	18+75.21*	40.60 (LT)*	23+14.16*	40.31 (LT)*	23+23.68*	40.30 (LT)*

* OFFSET FROM THE PGL TO UPSTREAM AND DOWNSTREAM ROW

NOTES:

1. FOR FLOODPLAIN FILL MITIGATION, SEE THE TABLE ON THE SHEET AND HYDRAULIC DATA SHEET FOR RIVER STATION LOCATIONS.
2. CONTRACTOR SHALL VERIFY THE LOCATION DEPTH OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
MOHAMED A. BAGHA
102919
LICENSED
PROFESSIONAL ENGINEER

2/16/2022

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SL 494
AT CANEY CREEK
FLOOD MITIGATION
GRADING AREA

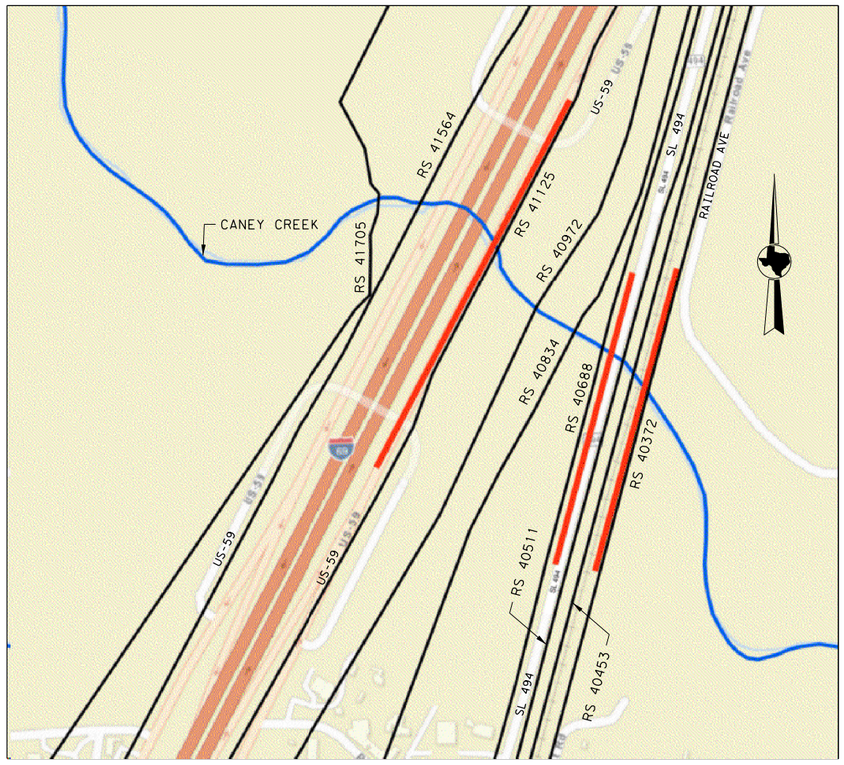
FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
6		66

STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494

EX. RIVER STA	PROP. RIVER STA	FREQ	EX WSEL	PROP WSEL	DIFF WSEL	EXISTING CONDITIONS E.G. ELEV	EXISTING CONDITIONS Q TOTAL	EXISTING CONDITIONS VEL CHNL	EXISTING CONDITIONS FLOW AREA	PROPOSED CONDITIONS E.G. ELEV	PROPOSED CONDITIONS Q TOTAL	PROPOSED CONDITIONS VEL CHNL	PROPOSED CONDITIONS FLOW AREA
		(YRS)	(FT)	(FT)	(FT)	(FT)	(CFS)	(FT/S)	(SQ FT)	(FT)	(CFS)	(FT/S)	(SQ FT)
41705	41705	50	88.32	88.27	-0.05	88.42	30857	3.36	26917.58	88.37	30866	3.38	26776.57
41705	41705	100	91.22	91.06	-0.16	91.34	42395	3.74	36461.16	91.18	42415	3.80	35876.91
41564	41564	50	88.23	88.18	-0.05	88.34	30857	4.10	22336.34	88.29	30864	4.12	22252.36
41564	41564	100	91.13	90.96	-0.16	91.25	42396	4.51	27908.11	91.09	42416	4.57	27498.93
41329	41329	US 59 BRIDGE											
41125	41125	50	87.83	87.78	-0.05	87.97	30852	3.52	17593.52	87.92	30861	3.53	17523.93
41125	41125	100	90.63	90.46	-0.17	90.81	42391	4.05	21428.84	90.64	42410	4.10	21189.89
40972	40972	50	87.68	87.63	-0.05	87.83	30849	4.04	18168.95	87.77	30859	4.06	18096.97
40972	40972	100	90.46	90.28	-0.18	90.64	42390	4.59	21980.5	90.46	42410	4.65	21733.72
40834*	40834*	50	87.57	87.53	-0.04	87.71	30849	4.09	19525.18	87.65	30857	3.95	20214.65
40834*	40834*	100	90.35	90.17	-0.18	90.50	42391	4.55	23968.79	90.32	42411	4.45	24449.32
-	40688	50	NA	87.42	NA	NA	NA	NA	NA	87.59	30858	4.27	16919.38
-	40688	100	NA	90.06	NA	NA	NA	NA	NA	90.25	42412	4.84	23790.38
40538	40637	SL 494 BRIDGE											
40511*	40511*	50	87.33	87.34	0.01	87.51	30848	4.57	16389.25	87.51	30857	4.50	18078.28
40511*	40511*	100	89.84	89.85	0.01	90.13	42389	5.88	24849.59	90.14	42410	5.88	24864.72
40453	40453	50	87.30	87.30	0	87.45	30848	4.10	17336.07	87.45	30857	4.10	17338.29
40453	40453	100	89.83	89.83	0	90.00	42389	4.65	29944.01	90.01	42410	4.65	29958.77
40422	40422	RAILROAD BRIDGE											
40372	40372	50	87.08	87.08	0	87.23	30844	3.85	17559.92	87.23	30853	3.85	17562.05
40372	40372	100	89.46	89.46	0	89.62	42385	4.32	29927.33	89.62	42407	4.32	29942.28

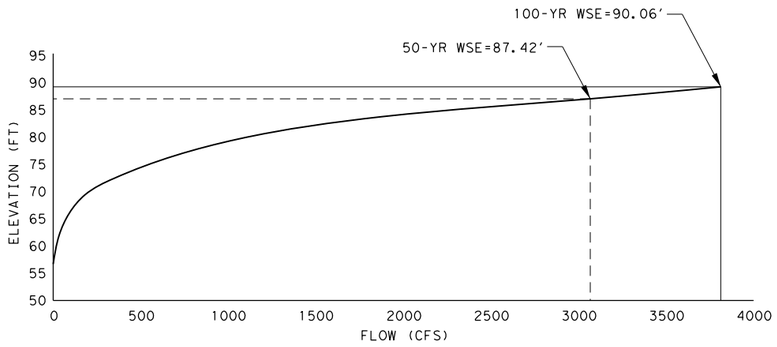
* RIGHT OF WAY LOCATION

HEC-RAS INFORMATION



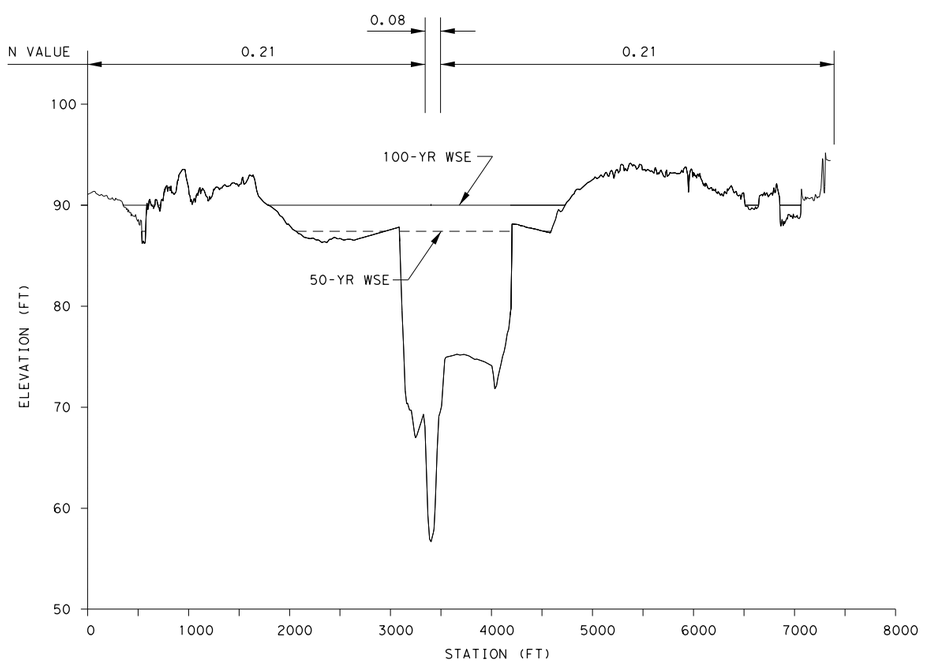
HEC-RAS CROSS SECTION LAYOUT

SCALE: NONE



ELEVATION VS DISCHARGE AT RS 40688

SCALE: NONE



CROSS SECTON UPSTREAM OF PROPOSED BRIDGE (RS 40688)

SCALE: VERT. 1" = 15'
HORIZ. 1" = 1500'

NOTES:

1. SEE SL 494 AT CANEY CREEK DRAINAGE AREA MAP FOR HYDROLOGIC DATA.
2. SL 494 AT CANEY CREEK BRIDGE DESIGN FREQUENCY = 50-YR.
3. THE BOUNDARY CONDITION USED FOR THE EXISTING AND PROPOSED HEC-RAS ANALYSIS WAS NORMAL DEPTH.
4. ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE (4203) NAD 83 AS DETERMINED BY GPS OBSERVATIONS USING THE TXDOT VRS NETWORK. ALL COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A TXDOT COMBINED ADJUSTMENT FACTOR OF 1.000030.
5. ALL PROJECT ELEVATIONS ARE BASED ON NAVD88 (GEOID12A) AS DETERMINED BY GPS OBSERVATIONS OF CONTROL POINT 2003 USING THE TXDOT VRS NETORK. ELEVATIONS OF ALL OTHER CONTROL POINTS WERE DETERMINED BY CONVENTIONAL THIRD ORDER LEVEL LOOPS.
6. SL 494 AT CANEY CREEK BRIDGE IS LOCATED ON FIRM PANEL 48339C0600G. THIS CROSSING IS LOCATED IN ZONE AE FLOODPLAIN.
7. NO DOWNSTREAM WSE OR FLOW IMPACTS OCCUR DUE TO SL 494 BRIDGE REPLACEMENT. REFER TO SL 494 BRIDGE REPLACEMENT DRAINAGE REPORT FOR ADDITIONAL INFORMATION.
8. SEE BRIDGE LAYOUT SHEET FOR BRIDGE PROFILE.
9. SEE SCOUR REPORT BY CIVILTECH ENGINEERING, INC. FOR SCOUR ANALYSIS.

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
MOHAMED A. BAGHA
102919
LICENSED
PROFESSIONAL ENGINEER
2/16/2022

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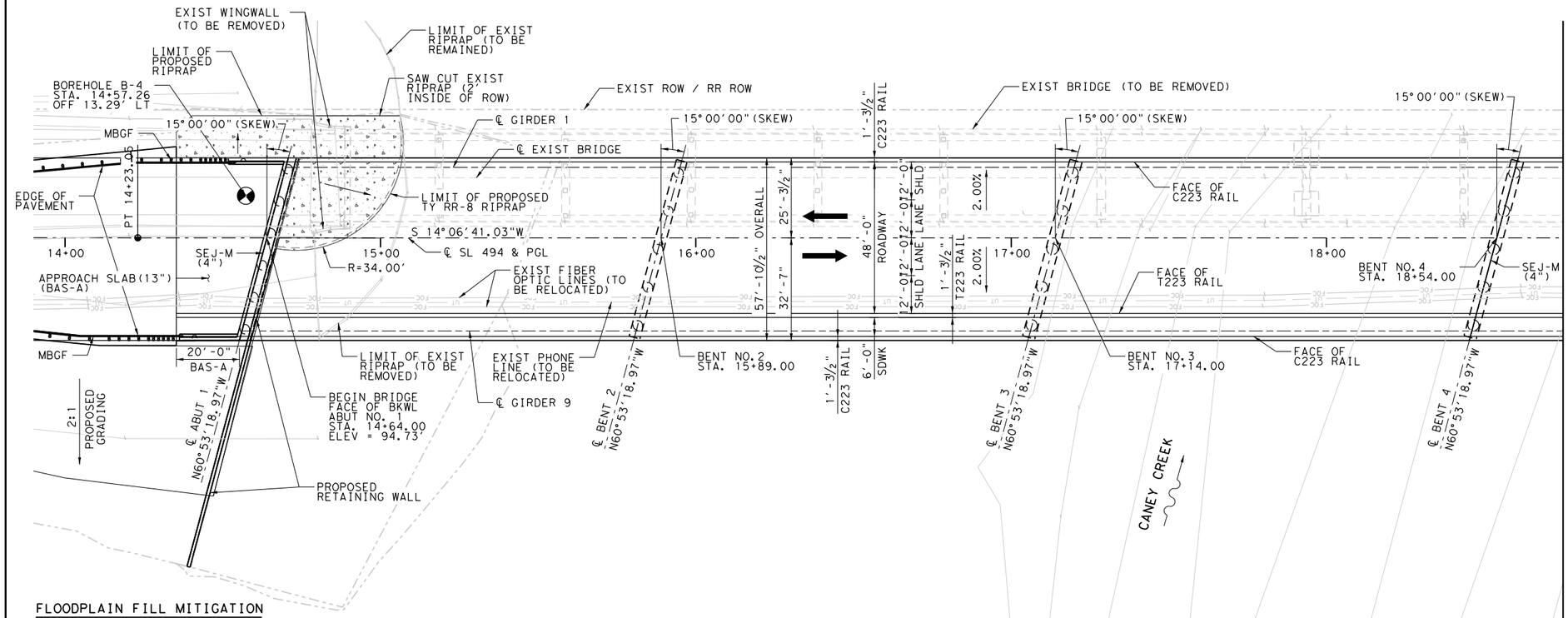
TBPE Registration No. 2677

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

HYDRAULIC DATA SHEET

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			67
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494



FLOODPLAIN FILL MITIGATION

RS STATION	LOB CUT STARTING STATION		LOB CUT END STATION		ROB CUT STARTING STATION		ROB CUT END STATION	
	10:1 SLOPE	12" CUT	12" CUT	10:1 SLOPE	10:1 SLOPE	12" CUT	12" CUT	10:1 SLOPE
40834	13+30.49	13+42.17	16+45.61	16+54.81	18+21.50	18+31.14	22+21.23	22+31.69
40688	14+65.45	14+76.69	16+82.28	16+92.24	18+44.71	18+56.75	22+52.18	22+61.63
40587	14+40.34	14+49.94	17+05.20	17+20.58	18+64.79	18+75.21	23+14.16	23+23.68

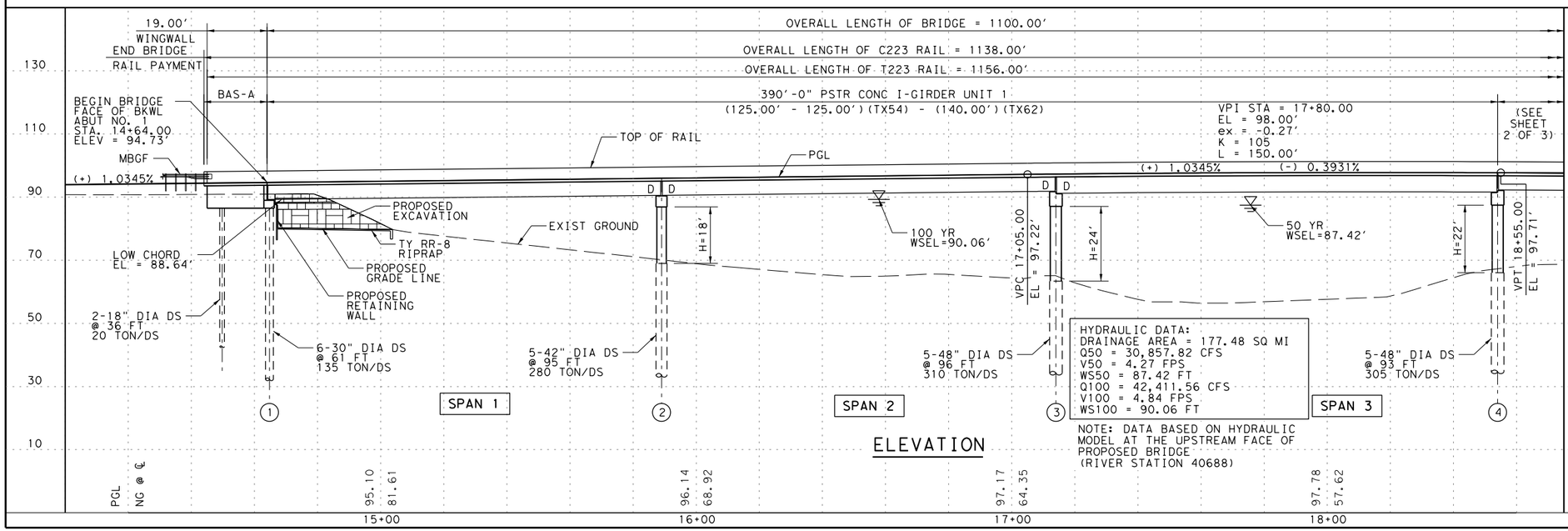
RS40834: UPSTREAM ROW
RS40688: UPSTREAM FACE OF THE PROPOSED SL494 BRIDGE
RS40586: DOWNSTREAM FACE OF THE PROPOSED SL494 BRIDGE

EXIST ROW

PLAN

EXIST NBI# 12-170-0177-14-043
PROP NBI# 12-170-0-0177-14-562

FUNCTIONAL CLASS = MINOR ARTERIAL
DESIGN SPEED = 50 MPH
ADT = 1,401 VPD (2022)
ADT = 2,593 VPD (2042)



ELEVATION

GENERAL NOTES:

1. DESIGN ACCORDING TO AASHTO 2017 LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH EDITION.
2. SEE BORING LOG SHEETS FOR TEST HOLE DATA.
3. FOUND DRILL SHAFTS TO THE LENGTH SHOWN OR DEEPER (LONGER) AS NECESSARY TO OBTAIN A MINIMUM OF THREE SHAFT DIAMETER PENETRATION INTO DENSE SAND OR STIFF/HARD CLAY.
4. GIRDER END CONDITIONS:
   D - DENOTES DOWEL AT EXTERIOR GIRDER
   BLANK: NO DOWEL IN EXT GIRDER
5. FOR TYPICAL SECTIONS, SEE TYPICAL SECTION SHEET.
6. CONTRACTOR SHALL VERIFY THE LOCATION DEPTH OF ALL UTILITIES PRIOR TO CONSTRUCTION OR FABRICATION. THE COST OF RELOCATING UTILITIES WILL BE PAID FOR UNDER SEPARATE CONTRACT.
7. FOR FOUNDATION DETAILS, SEE TXDOT STANDARD "COMMON FOUNDATION DETAILS" (FD) SHEET.
8. COLUMN HEIGHTS SHOWN ARE APPROXIMATE. CONTRACTOR SHALL VERIFY HEIGHTS BASED ON NATURAL GROUND ELEVATIONS AND PROPOSED TOP OF COLUMN ELEVATIONS.
9. FOR RIPRAP DETAILS, SEE TXDOT STANDARD "CONCRETE RIPRAP AND SHOULDER DRAINS" (CRR) SHEET.
10. FOR FLOODPLAIN FILL MITIGATION, SEE THE TABLE ON THE SHEET, GRADING AREA SHEET AND HYDRAULIC DATA SHEET.
11. THE STATE CONTRACTOR FORCES SHALL INSTALL AN ORANGE CONSTRUCTION BARRIER FENCE MARKER 50' FROM CENTERLINE OF RAILROAD RAIL.
12. THE STATE CONTRACTOR FORCES AND EQUIPMENT SHALL NOT CROSS THE ORANGE CONSTRUCTION BARRIER FENCE MARKER AND NO EQUIPMENT THAT CAN BOOM INTO THE UPRR RIGHT-OF-WAY WILL BE ALLOWED. EQUIPMENT THAT HAS A LENGTH OR HEIGHT SUFFICIENT TO REACH THE TRACK SHOULD IT TIP OVER WILL REQUIRE A FLAGMEN REGARDLESS OF THE DISTANCE FROM THE TRACK.

0 20 40

HL93 LOADING

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
MOHAMMED QUMRUZZAMAN
101613
LICENSED
PROFESSIONAL ENGINEER

M. Qumruzzaman

02/02/2022

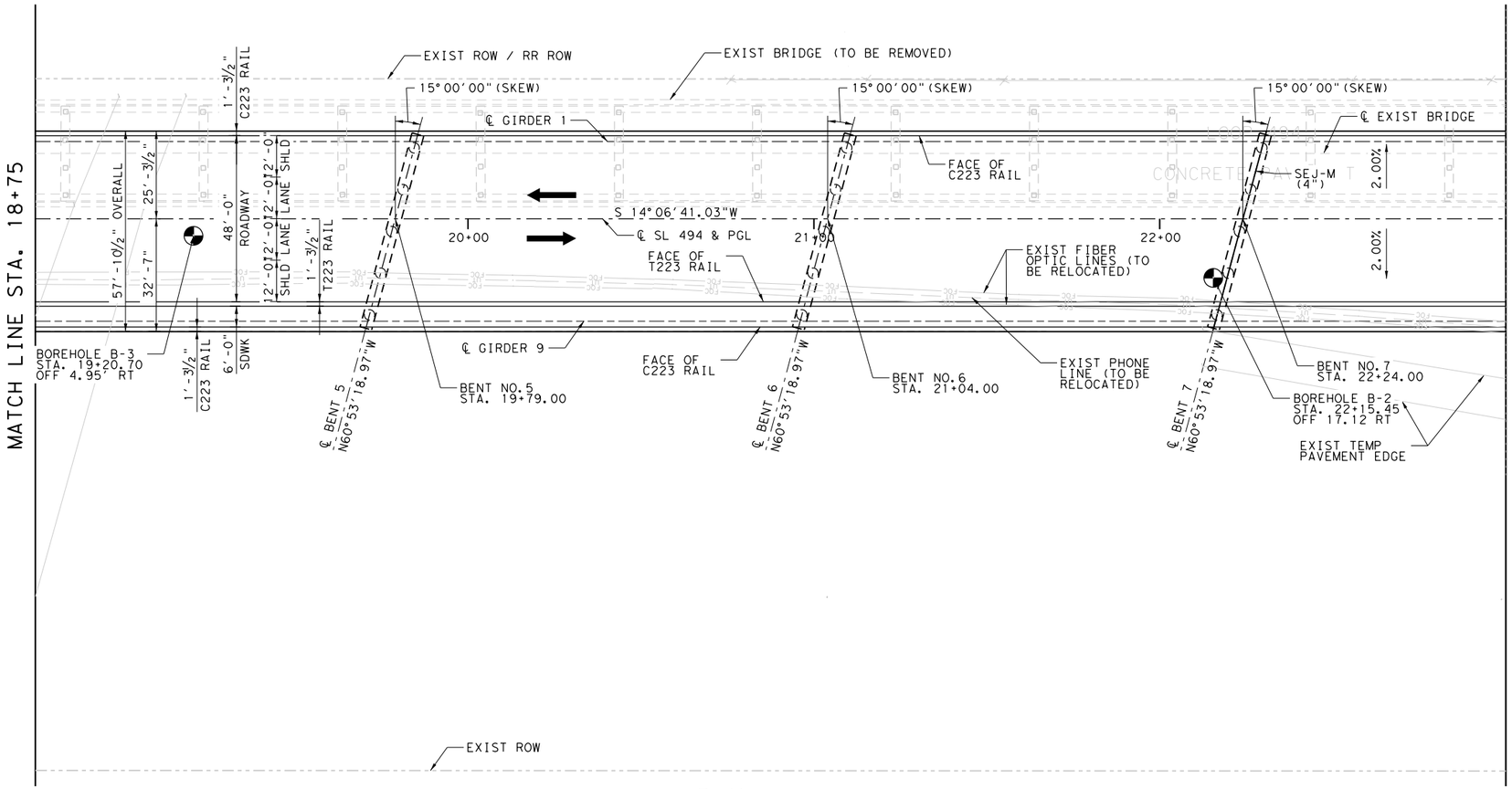
Michael Baker INTERNATIONAL
2002 W. Grand Parkway N.
Suite 325
Katy, TX 77449
TBPE Registration No. 2677

SL 494
AT CANEY CREEK
BRIDGE REPLACEMENT
BRIDGE LAYOUT

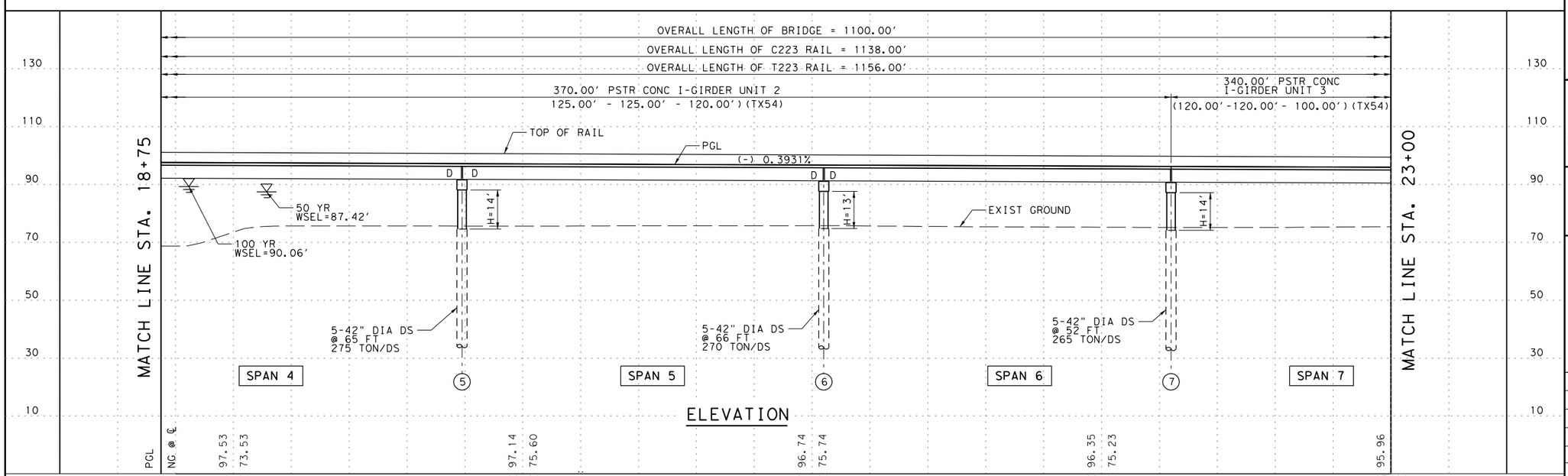
SHEET NO. 1 OF 3

FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
6		68

STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494



PLAN



ELEVATION

GENERAL NOTES:

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3. FOUND DRILL SHAFTS TO THE LENGTH SHOWN OR DEEPER (LONGER) AS NECESSARY TO OBTAIN A MINIMUM OF THREE SHAFT DIAMETER PENETRATION INTO DENSE SAND OR STIFF/HARD CLAY.
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0 20 40

HL93 LOADING

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
MOHAMMED QUMRUZZAMAN
101613
LICENSED PROFESSIONAL ENGINEER

M. Qumruzzaman

02/02/2022

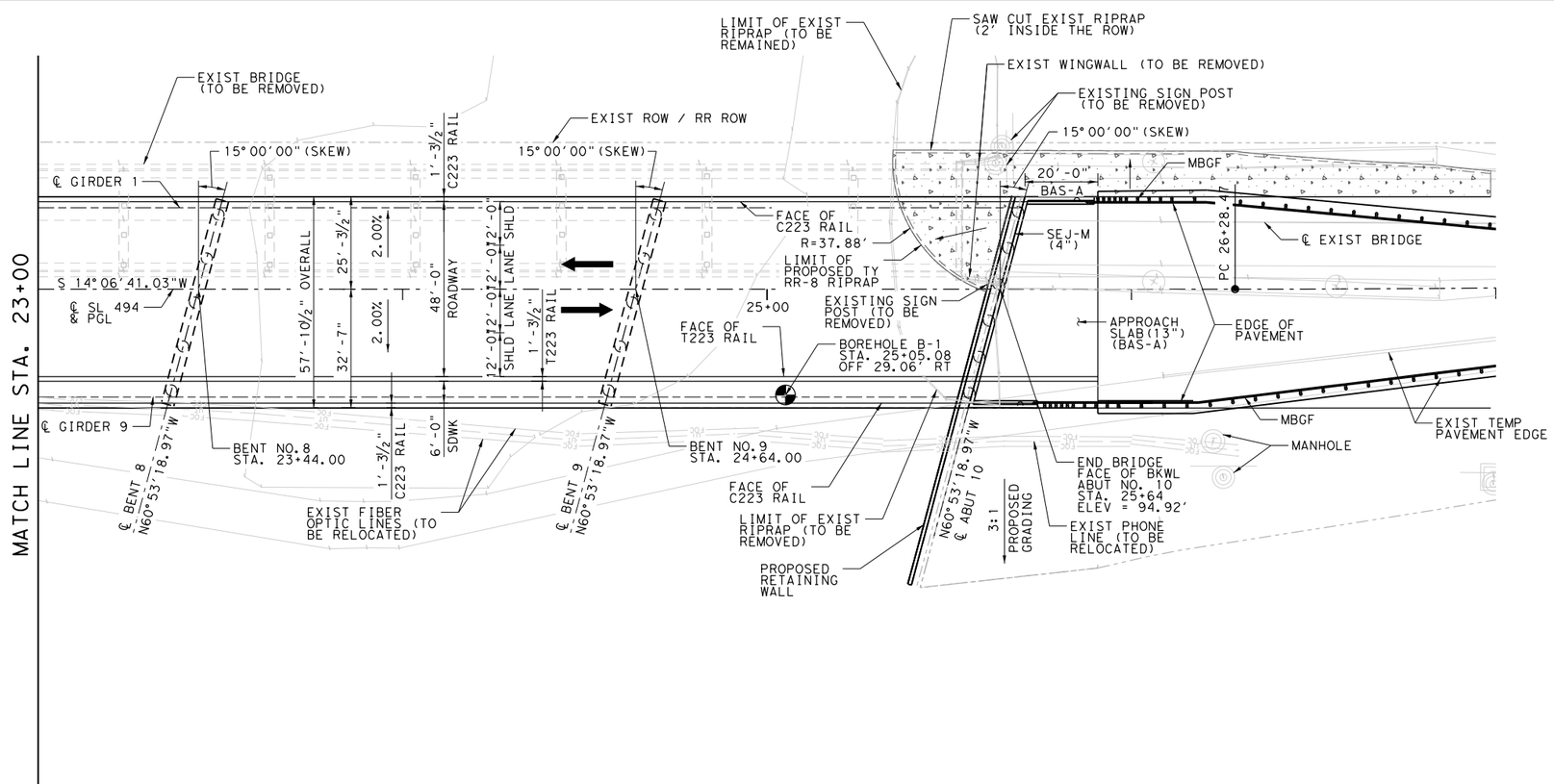
Michael Baker INTERNATIONAL
2002 W. Grand Parkway N.
Suite 325
Katy, TX 77449
TBPE Registration No. 2677

SL 494
AT CANEY CREEK
BRIDGE REPLACEMENT
BRIDGE LAYOUT

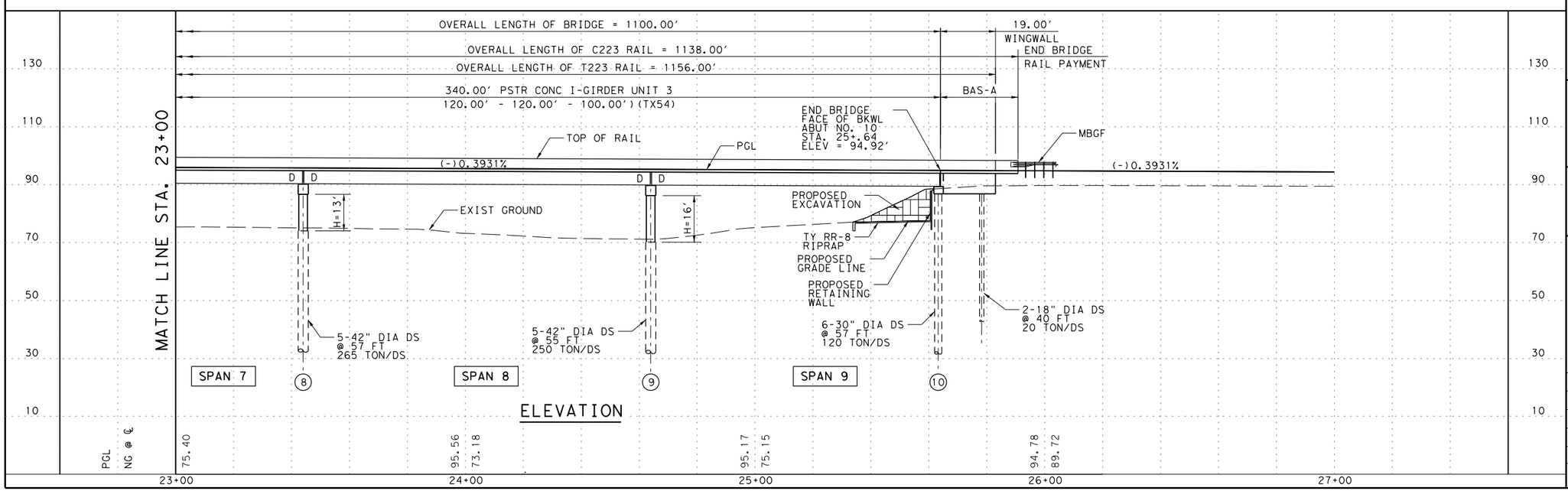
SHEET NO. 2 OF 3

FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
6		69

STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494



PLAN



ELEVATION

GENERAL NOTES:

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0 20 40

HL93 LOADING

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
MOHAMMED QUMRUZZAMAN
101613
LICENSED
PROFESSIONAL ENGINEER

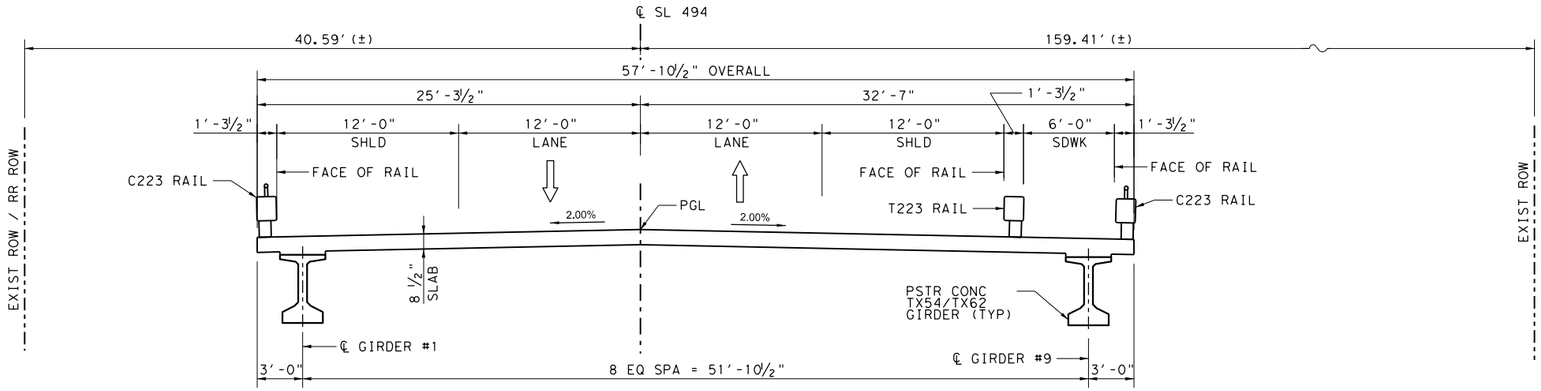
M. Qumruzzaman
02/02/2022

Michael Baker INTERNATIONAL
2002 W. Grand Parkway N.
Suite 325
Katy, TX 77449
TBPE Registration No. 2677

SL 494
AT CANEY CREEK
BRIDGE REPLACEMENT
BRIDGE LAYOUT

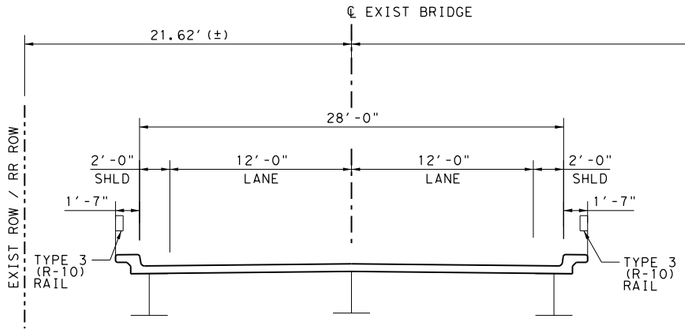
SHEET NO. 3 OF 3

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			70
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494



PROPOSED TYPICAL SECTION

STA. 14+64.00 TO STA. 17+14.00 (TX54)
STA. 17+14.00 TO STA. 18+54.00 (TX62)
STA. 18+54.00 TO STA. 25+64.00 (TX54)



EXIST TYPICAL SECTION

(TO BE REMOVED)

0 10 20

HL93 LOADING

NO	DATE	REVISION	APPROVED

STATE OF TEXAS
MOHAMMED QUMRUZZAMAN
101613
LICENSED
PROFESSIONAL ENGINEER

M. Qumruzzaman
02/02/2022

Michael Baker INTERNATIONAL
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Katy, TX 77449
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SL 494
AT CANEY CREEK
BRIDGE REPLACEMENT
TYPICAL SECTION

SHEET NO. 1 OF 1

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			71
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494

DRILLING LOG

WinCore Version 3.1	County	Montgomery	Hole	B-1	District	Houston
	Highway	Loop 494	Structure	Bridge	Date	07/28/20
	CSJ	0177-14-039	Station	25+05.08	Grnd. Elev.	76.28 ft
			Offset	29.06	GW Elev.	69.28 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			SAND, Silty, loose, brown, w/ organics at 0'-4' (SM)			14	15	2		% Passing #200 Sieve: 40.4
		6 (6) 9 (6)				12				
5										
67.3		15 (6) 15 (6)	SAND, w/ Silt, slightly compact, light brown and reddish brown, w/ calcareous nodules at 10'-12' (SP-SM)			23				% Passing #200 Sieve: 7.4
10										
62.3		4 (6) 7 (6)	SAND, Clayey, loose to slightly compact, light brown and reddish brown, w/ sandy lean clay layer at 16' (SC)			31	32	18		% Passing #200 Sieve: 50.8
15										
		10 (6) 16 (6)				21				% Passing #200 Sieve: 26.4
20										
54.3		50 (5) 50 (4.5)	SAND, w/ Silt, slightly compact to dense, light brown and reddish brown (SP-SM)							
25										
		13 (6) 38 (6)				21				% Passing #200 Sieve: 10.3
30										
		23 (6) 15 (6)								
35										
		28 (6) 21 (6)				20				% Passing #200 Sieve: 7.7
40										
34.3		50 (5) 50 (3.5)	SAND, w/ Silt, compact to dense, light brown and reddish brown, w/ silty sand layer at 61' (SP-SM)							
45										
		35 (6) 30 (6)				17				% Passing #200 Sieve: 7.1
50										
		50 (4) 50 (3.5)								
55										
		50 (5) 50 (5)								
60										

Remarks: Water level was encountered at 7 ft below the existing grade during drilling operations; at 6 ft after 5 minutes and 10 minutes.

Driller: PSI Logger: Alexandria Organization: HVJ Associates, Inc.

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DRILLING LOG

WinCore Version 3.1	County	Montgomery	Hole	B-1	District	Houston
	Highway	Loop 494	Structure	Bridge	Date	07/28/20
	CSJ	0177-14-039	Station	25+05.08	Grnd. Elev.	76.28 ft
			Offset	29.06	GW Elev.	69.28 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			SAND, w/ Silt, compact to dense, light brown and reddish brown, w/ silty sand layer at 61' (SP-SM)			16				% Passing #200 Sieve: 12.9
		50 (3) 50 (2.5)								
65										
		50 (5) 50 (3)				16				% Passing #200 Sieve: 9.5
70										
		50 (5) 50 (3)								
75										
		36 (6) 37 (6)				13				% Passing #200 Sieve: 11.8
80										
-5.7		22 (6) 32 (6)	CLAY, Sandy Lean, very stiff to hard, light brown and reddish brown, w/ sandstone at 85'-87', w/ gravel at 90'-92' (CL)							
85										
		21 (6) 22 (6)		43	32.2	23			125	
90										
		18 (6) 24 (6)								
95										
-24.2		50 (5) 50 (3)				19				% Passing #200 Sieve: 57.2
100										

Remarks: Water level was encountered at 7 ft below the existing grade during drilling operations; at 6 ft after 5 minutes and 10 minutes.

Driller: PSI Logger: Alexandria Organization: HVJ Associates, Inc.

g:\houston\hou ps\geo\lab info\gint logs\hg1910449.1.1 loop 494.gpj

STATE OF TEXAS
SHARMI P. VEDANTAM
100218
LICENSED
PROFESSIONAL ENGINEER

4/22/21

SVedantam

DATE	REV	REVISION

HVJ ASSOCIATES
HVJ Associates, Inc
6120 South Dairy Ashford Road
Houston, TX 77072
TEL: 281.933.7388
TBPE F-000646

SL 494 at Caney Creek

BORING LOGS

FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
6		72

STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494

DRILLING LOG

WinCore Version 3.1

County	Montgomery	Hole	B-2	District	Houston
Highway	Loop 494	Structure	Bridge	Date	07/28/20
CSJ	0177-14-039	Station	22+15.45	Grnd. Elev.	75.45 ft
		Offset	17.12	GW Elev.	68.45 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
62.5		3 (6) 2 (6)	SAND, Silty, very loose to slightly compact, light brown (SM)			16				% Passing #200 Sieve: 49.1
5										
		13 (6) 13 (6)				20				% Passing #200 Sieve: 35.5
10										
		21 (6) 16 (6)	SAND, w/ Silt, slightly compact to compact, reddish brown and brown (SP-SM)			15				% Passing #200 Sieve: 9.3
15										
		19 (6) 30 (6)								
20										
52.5		30 (6) 48 (6)	SAND, Silty, compact, lightbrown, reddish brown and gray, w/ sandstone at 30'-32' (SM)			21				% Passing #200 Sieve: 17.9
25										
		12 (6) 44 (6)								
30										
		32 (6) 31 (6)				18				% Passing #200 Sieve: 13.7
35										
38.5		50 (5.5) 50 (4.5)	SAND, Silty, dense, light brown, reddish brown and gray (SM)			17				% Passing #200 Sieve: 30.6
40										
		47 (6) 49 (6)								
45										
		50 (6) 50 (5.5)				14				% Passing #200 Sieve: 14.9
50										
		50 (6) 50 (5)								
55										
18.5		25 (6) 40 (6)	SAND, w/ Silt, compact, reddish brown and brown (SP-SM)							
60										

Remarks: Water level was encountered at 7 ft below the existing grade during drilling operations; caved in at 7.5' after 5 minutes and 10 minutes.

Driller: PSI Logger: Dheeraj Organization: HVJ Associates, Inc.

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DRILLING LOG

WinCore Version 3.1

County	Montgomery	Hole	B-2	District	Houston
Highway	Loop 494	Structure	Bridge	Date	07/28/20
CSJ	0177-14-039	Station	22+15.45	Grnd. Elev.	75.45 ft
		Offset	17.12	GW Elev.	68.45 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			SAND, w/ Silt, compact, reddish brown and brown (SP-SM)			13				% Passing #200 Sieve: 6.2
65		21 (6) 25 (6)								
8.5			SAND, Silty, dense, light brown, reddish brown and gray (SM)							
70		50 (2.5) 50 (2.5)				19				% Passing #200 Sieve: 26.1
75		39 (6) 50 (6)								
80		50 (5.5) 47 (6)				16				% Passing #200 Sieve: 17.9
85		50 (4) 50 (5)								
-12.6		15 (6) 15 (6)	CLAY, Sandy Lean, stiff to hard, light brown and reddish brown (CL)			18	30	14		
90										
95		16 (6) 16 (6)				23				
-25.1		47 (6) 50 (5.5)								
100										

Remarks: Water level was encountered at 7 ft below the existing grade during drilling operations; caved in at 7.5' after 5 minutes and 10 minutes.

Driller: PSI Logger: Dheeraj Organization: HVJ Associates, Inc.

g:\houston\hou ps\geo\lab info\gint logs\hg1910449.1.1 loop 494.gpj

STATE OF TEXAS
SHARMI P. VEDANTAM
100218
LICENSED
PROFESSIONAL ENGINEER

4/22/21

SVedantam

DATE	REV	REVISION

HVJ ASSOCIATES
HVJ Associates, Inc
6120 South Dairy Ashford Road
Houston, TX 77072
TEL: 281.933.7388
TBPE F-000646

SL 494 at Caney Creek

BORING LOGS

FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
6		73

STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494

DRILLING LOG

WinCore Version 3.1

County	Montgomery	Hole	B-3	District	Houston
Highway	Loop 494	Structure	Bridge	Date	07/30/20
CSJ	0177-14-039	Station	19+20.70	Grnd. Elev.	75.81 ft
		Offset	4.95	GW Elev.	60.81 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	Properties: LL	Properties: PI	Properties: Wet Den. (pcf)	Additional Remarks
			SAND, Silty, loose to slightly compact, light brown and reddish brown (SM)			5				% Passing #200 Sieve: 37.8
		6 (6) 8 (6)				8				
5										
		11 (6) 9 (6)				8				% Passing #200 Sieve: 28.1
10										% Passing #200 Sieve: 8.0
		13 (6) 11 (6)								% Passing #200 Sieve: 12.9
15										
59.8			SAND, w/ Silt, compact, light brown, w/ sandstone at 20'-22' (SP-SM)			20				% Passing #200 Sieve: 8.0
		13 (6) 29 (6)								
20										
51.8		5 (6) 6 (6)	CLAY, Sandy Lean, soft, light brown and reddish brown (CL)			18	32	18		% Passing #200 Sieve: 63.7
25										
46.8		39 (6) 48 (6)	SAND, Silty, slightly compact to dense, light brown, reddish brown and gray (SM)							% Passing #200 Sieve: 20.6
		39 (6) 42 (6)								
30										
35										
		24 (6) 24 (6)				17				
40										
		23 (6) 24 (6)				16				% Passing #200 Sieve: 16.7
45										
		13 (6) 22 (6)								
50										
21.8		50 (5) 50 (4)	SAND, w/ Silt, compact to dense, light brown (SP-SM)			18				% Passing #200 Sieve: 9.2
		45 (6) 46 (6)								
55										
60										

Remarks: Water level was encountered at 15 ft below the existing grade during drilling operations; caved in at 10' after 5 minutes and 10 minutes.

Driller: PSI Logger: Dheeraj Organization: HVJ Associates, Inc.

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DRILLING LOG

WinCore Version 3.1

County	Montgomery	Hole	B-3	District	Houston
Highway	Loop 494	Structure	Bridge	Date	07/30/20
CSJ	0177-14-039	Station	19+20.70	Grnd. Elev.	75.81 ft
		Offset	4.95	GW Elev.	60.81 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	Properties: LL	Properties: PI	Properties: Wet Den. (pcf)	Additional Remarks
			SAND, w/ Silt, compact to dense, light brown (SP-SM)							
		32 (6) 40 (6)				9				% Passing #200 Sieve: 4.2
65										
6.8		50 (5) 28 (6)	CLAY, Fat, stiff to very stiff, reddish brown and light brown (CH)			25				% Passing #200 Sieve: 81.8
70										
		29 (6) 38 (6)								
75						32	77	46		% Passing #200 Sieve: 95.4
		17 (6) 19 (6)								
80										
		19 (6) 20 (6)		40	18.2	41			116	
85										
		19 (6) 22 (6)				18				
90										
		17 (6) 18 (6)				18				% Passing #200 Sieve: 43.1
95			SAND, Clayey, dense, reddish brown and light brown, w/ sandstone at 97'-99' (SC)							
-20.2		31 (6) 50 (5.5)								
-24.7	100									

Remarks: Water level was encountered at 15 ft below the existing grade during drilling operations; caved in at 10' after 5 minutes and 10 minutes.

Driller: PSI Logger: Dheeraj Organization: HVJ Associates, Inc.

g:\houston\hou ps\geo\lab info\gint logs\hg1910449.1.1 loop 494.gpj

STATE OF TEXAS
SHARMI P. VEDANTAM
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LICENSED
PROFESSIONAL ENGINEER

4/22/21

SVedantam

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TEL: 281.933.7388
TBPE F-000646

SL 494 at Caney Creek

BORING LOGS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			74
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494

DRILLING LOG

WinCore Version 3.1

County	Montgomery	Hole	B-4	District	Houston
Highway	Loop 494	Structure	Bridge	Date	08/24/20
CSJ	0177-14-039	Station	14+57.26	Grnd. Elev.	91.35 ft
		Offset	-13.29	GW Elev.	60.35 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
88.4			PAVEMENT, 2.25" Asphalt, 3.25" Pea gravel, 8" Concrete and 24" Fill Sand							
	5	20 (6) 19 (6)	SAND, Silty, slightly compact, brown and gray (SM)			9				% Passing #200 Sieve: 26.5
82.4										
	10	4 (6) 3 (6)	CLAY, Sandy Lean, very soft to stiff, gray and brown, w/ sand seams at 26'-36' (CL)							
						18	39	22		% Passing #200 Sieve: 53.9
	15	6 (6) 7 (6)								
					40.7	16	40	22	146	% Passing #200 Sieve: 53.3
	20	6 (6) 7 (6)								
	25	10 (6) 14 (6)								
						21	31	14		% Passing #200 Sieve: 54
	30	6 (6) 6 (6)								
	35	5 (6) 7 (6)								
55.4			SAND, Silty, slightly compact to dense, gray and brown, w/ gravel at 40' to 50', w/ clay seams at 62'-66' (SM)							
	40	22 (6) 34 (6)								% Passing #200 Sieve: 17
	45	12 (6) 15 (6)								
						16				% Passing #200 Sieve: 16.3
	50	32 (6) 45 (6)								
	55	18 (6) 33 (6)								
	60	36 (6) 38 (6)								

Remarks: Water level was encountered at 31 ft below the existing grade during drilling operations; caved in at 29' after 5 minutes and 10 minutes.

Driller: PSI Logger: Dheeraj Organization: HVJ Associates, Inc.

g:\houston\hou ps\geo\lab info\gint logs\hg1910449.1.1 loop 494.gpj

DRILLING LOG

WinCore Version 3.1

County	Montgomery	Hole	B-4	District	Houston
Highway	Loop 494	Structure	Bridge	Date	08/24/20
CSJ	0177-14-039	Station	14+57.26	Grnd. Elev.	91.35 ft
		Offset	-13.29	GW Elev.	60.35 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
25.4			SAND, Silty, slightly compact to dense, gray and brown, w/ gravel at 40' to 50', w/ clay seams at 62'-66' (SM)							
	65	42 (6) 50 (4)								
			SAND, w/ Silt, loose, gray, w/ gravel at 66'-76' (SP-SM)			16				% Passing #200 Sieve: 9.4
	70	8 (6) 9 (6)								
	75	9 (6) 8 (6)								
15.9			SAND, Silty, loose to slightly compact, gray and brown (SM)			14				% Passing #200 Sieve: 22.7
	80	9 (6) 10 (6)								
	85	15 (6) 19 (6)								
5.8			CLAY, Fat w/ Sand, stiff, gray, brown and reddish brown, w/ gravels at 77'-86' (CL)			24	68	42		% Passing #200 Sieve: 82.5
	90	13 (6) 16 (6)								
	95	17 (6) 19 (6)								
-4.1			CLAY, Fat, soft, reddish brown (CL)			33				% Passing #200 Sieve: 99.1
-9.1	100	7 (6) 13 (6)								

Remarks: Water level was encountered at 31 ft below the existing grade during drilling operations; caved in at 29' after 5 minutes and 10 minutes.

Driller: PSI Logger: Dheeraj Organization: HVJ Associates, Inc.

g:\houston\hou ps\geo\lab info\gint logs\hg1910449.1.1 loop 494.gpj

STATE OF TEXAS
SHARMI P. VEDANTAM
100218
LICENSED
PROFESSIONAL ENGINEER

4/22/21

SVedantam

DATE	REV	REVISION

HVJ ASSOCIATES
HVJ Associates, Inc
6120 South Dairy Ashford Road
Houston, TX 77072
TEL: 281.933.7388
TBPE F-000646

SL 494 at Caney Creek

BORING LOGS

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			75
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
0177	14	039	SL 494

ESTIMATED QUANTITIES

ITEM NO.	416-6001	416-6003	416-6005	416-6006	420-6013	420-6029	420-6037	422-6001	425-6039	425-6040	432-6008	450-6006	450-6032	454-6018
ITEM	DRILL SHAFT (18 IN)	DRILL SHAFT (30 IN)	DRILL SHAFT (42 IN)	DRILL SHAFT (48 IN)	CL C CONC (ABUT)	CL C CONC (CAP)	CL C CONC (COLUMN)	REINF CONC SLAB	PRESTR CONC GIRDER (TX54)	PRESTR CONC GIRDER (TX62)	RIPRAP (CONC) (CLB)(RR8&RR9)	RAIL (TY T223)	RAIL (TY C223)	SEALED EXPANSION JOINT (4 IN) (SEJ - M)
UNIT	LF	LF	LF	LF	CY	CY	CY	SF	LF	LF	CY	LF	LF	LF
QUANTITY	152	704	1,934	930	93.0	225.10	198.46	63,660	8,607	1,255	85.0	1,156	2,276	235

BEARING SEAT ELEVATIONS

		GIRD 1	GIRD 2	GIRD 3	GIRD 4	GIRD 5	GIRD 6	GIRD 7	GIRD 8	GIRD 9
ABUT 1	(FWD)	88.558	88.669	88.780	88.891	88.856	88.707	88.559	88.411	88.262
BENT 2	(BK)	89.883	89.994	90.105	90.216	90.181	90.033	89.884	89.736	89.587
	(FWD)	89.904	90.015	90.126	90.237	90.202	90.054	89.906	89.757	89.609
BENT 3	(BK)	91.220	91.334	91.446	91.559	91.525	91.378	91.230	91.083	90.934
	(FWD)	90.635	90.748	90.862	90.975	90.941	90.794	90.647	90.499	90.352
BENT 4	(BK)	90.973	91.110	91.246	91.383	91.373	91.249	91.126	91.002	90.877
	(FWD)	91.569	91.706	91.842	91.979	91.970	91.846	91.723	91.599	91.475
BENT 5	(BK)	91.086	91.223	91.359	91.496	91.486	91.364	91.241	91.118	90.995
	(FWD)	91.078	91.215	91.351	91.488	91.479	91.356	91.233	91.110	90.987
BENT 6	(BK)	90.595	90.732	90.868	91.005	90.995	90.872	90.750	90.627	90.504
	(FWD)	90.587	90.724	90.860	90.997	90.987	90.865	90.742	90.619	90.496
BENT 7	(BK)	90.124	90.260	90.397	90.533	90.524	90.401	90.278	90.155	90.032
	(FWD)	90.116	90.252	90.389	90.525	90.516	90.393	90.270	90.147	90.025
BENT 8	(BK)	89.652	89.789	89.925	90.062	90.052	89.930	89.807	89.684	89.561
	(FWD)	89.644	89.781	89.917	90.054	90.045	89.922	89.799	89.676	89.553
BENT 9	(BK)	89.181	89.317	89.454	89.590	89.581	89.458	89.335	89.212	89.090
	(FWD)	89.215	89.351	89.488	89.624	89.615	89.492	89.369	89.246	89.123
ABUT 10	(BK)	88.830	88.966	89.103	89.239	89.230	89.107	88.984	88.861	88.739

HL93 LOADING

STATE OF TEXAS
WEIHUA WANG
105644
LICENSED PROFESSIONAL ENGINEER

02.25.2022

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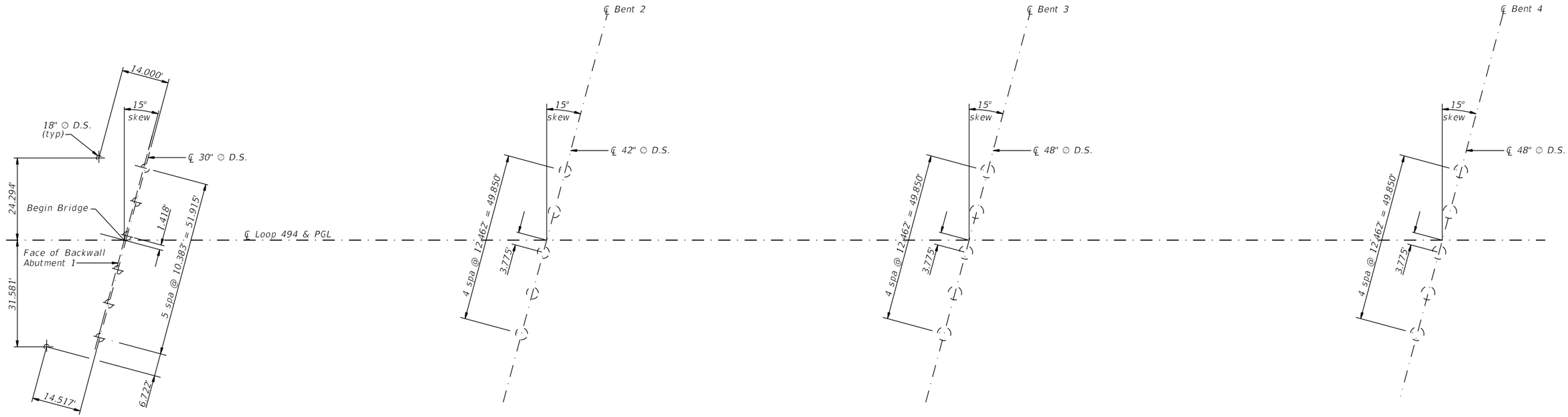
Houston District (Bridge)

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILE$	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATE$	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		76

DATE: $DATE$
FILE: pw:\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\017714039\4 - Design\Bridge\Loop494\Loop494 EQ.dgn



GENERAL NOTES:

THE CONTRACTOR SHALL VERIFY LOCATION OF ALL UTILITIES BEFORE CONSTRUCTION OR ORDERING MATERIAL.

REFER TO THE BRIDGE LAYOUT FOR BENT STATIONING AND BEARINGS.

DRILLED SHAFT LENGTHS SHOWN ON BRIDGE LAYOUT ARE FOR INFORMATION ONLY. TABLE OF FOUNDATION QUANTITIES SUPERSEDES ANY FOUNDATION DISCREPANCY ON BRIDGE LAYOUT.

ABUTMENT DRILLED SHAFT LOCATIONS ARE OFFSET FROM FACE OF BACKWALL. REFER TO ABUTMENT DETAILS FOR MORE INFORMATION. DIMENSIONS ARE MEASURED ALONG FACE OF BACKWALL.

STATE OF TEXAS
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02.03.2022

HL93 LOADING

SHEET 1 OF 3

Texas Department of Transportation ®2018

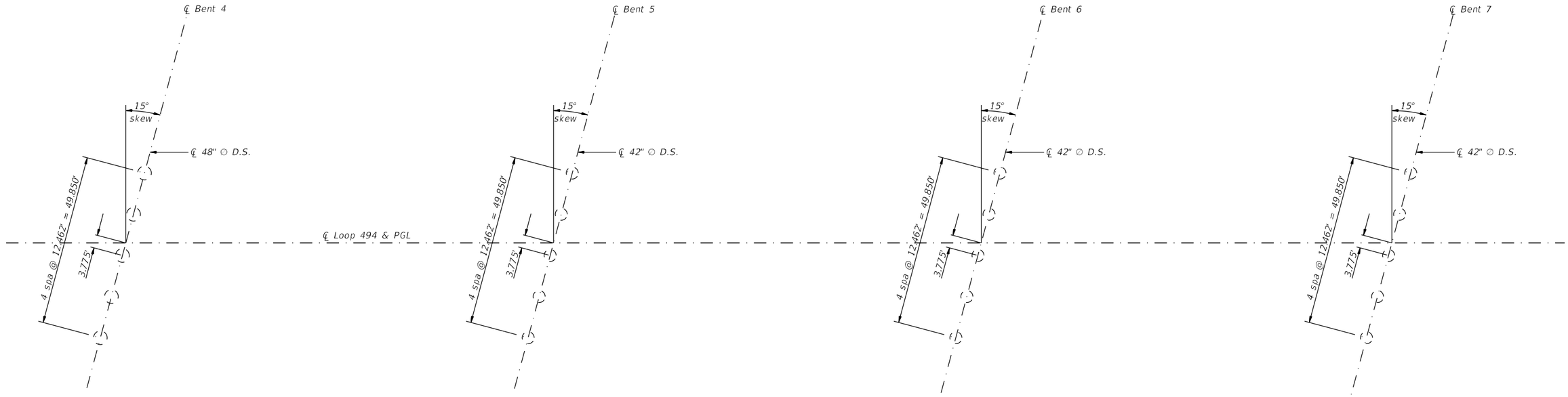
Houston District (Bridge)

FOUNDATION LAYOUT

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILES$	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATE$	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		77

DATE: $DATE$
FILE: pw:\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\017714039\4 - Design\Bridge\Loop494\Loop494 FL1.dgn



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FOUNDATION LAYOUT

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILE$$		DN: WW	CK: HM	DW: GB	CK: WW	
©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB		HIGHWAY	
	0177	14	039		SL 494	
	DIST	COUNTY			SHEET NO.	
	HOU	MONTGOMERY			78	

DATE: $DATE$
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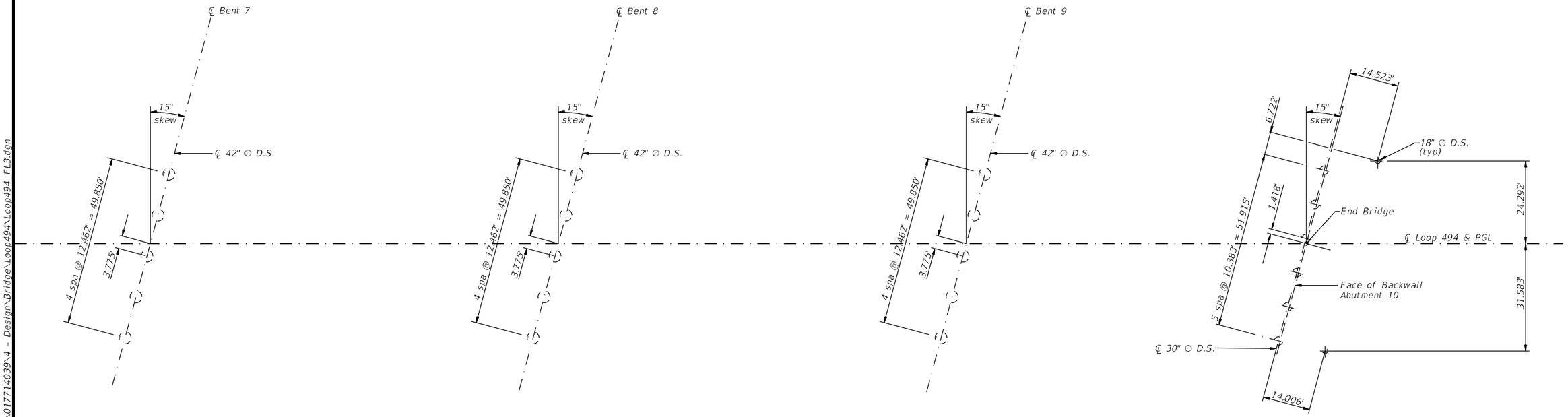

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02.03.2022

HL93 LOADING

SHEET 3 OF 3

Texas Department of Transportation

Houston District (Bridge)

FOUNDATION LAYOUT

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILE$	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		79

DATE: $DATE$
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\017714039\4 - Design\Bridge\Loop494\Loop494 FL3.dgn

FOUNDATION QUANTITY TABLE

					DRILLED SHAFTS							
						0416-6001	0416-6003	0416-6005	0416-6006	LOAD	TOP OF DS ELEV	DS TIP ELEV
BRIDGE NAME	ABUT / BENT	COLUMN NO.	PHASE	FOOTING TYPE		18" DIA DRILLED SHAFT	30" DIA DRILLED SHAFT	42" DIA DRILLED SHAFT	48" DIA DRILLED SHAFT			
					QUANTITY	LENGTH (FT) *	LENGTH (FT) *	LENGTH (FT) *	LENGTH (FT) *	(TONS) *	(FT)	(FT)
LOOP 494 @ CANEY CREEK BRIDGE REPLACEMENT	ABUT 1 WWL	1	1	DS18	1	36				20	85.50	50.00
	ABUT 1 WWR	1	1	DS18	1	36				20	85.50	50.00
	ABUT 1	1	1	DS30	1		61			135	85.45	25.00
		2	1	DS30	1		61			135	85.62	25.00
		3	1	DS30	1		61			135	85.79	25.00
		4	1	DS30	1		61			135	85.62	25.00
		5	1	DS30	1		61			135	85.39	25.00
		6	1	DS30	1		61			135	85.16	25.00
	BENT 2	1	1	DS42	1			94		280	67.97	-26.00
		2	1	DS42	1			95		280	68.03	-26.00
		3	1	DS42	1			95		280	68.13	-26.00
		4	1	DS42	1			95		280	68.08	-26.00
		5	1	DS42	1			95		280	68.69	-26.00
	BENT 3	1	1	DS48	1				95	310	65.33	-29.00
		2	1	DS48	1				92	310	62.92	-29.00
		3	1	DS48	1				92	310	62.82	-29.00
		4	1	DS48	1				93	310	63.82	-29.00
		5	1	DS48	1				96	310	66.82	-29.00
	BENT 4	1	1	DS48	1				92	305	65.08	-26.00
		2	1	DS48	1				92	305	65.13	-26.00
		3	1	DS48	1				92	305	65.46	-26.00
		4	1	DS48	1				93	305	66.07	-26.00
		5	1	DS48	1				93	305	66.69	-26.00
	BENT 5	1	1	DS42	1			65		275	73.62	9.00
		2	1	DS42	1			65		275	73.73	9.00
		3	1	DS42	1			65		275	73.59	9.00
		4	1	DS42	1			65		275	73.60	9.00
		5	1	DS42	1			65		275	73.81	9.00
	BENT 6	1	1	DS42	1			63		270	71.47	9.00
		2	1	DS42	1			65		270	73.30	9.00
		3	1	DS42	1			65		270	73.86	9.00
		4	1	DS42	1			66		270	74.16	9.00
		5	1	DS42	1			66		270	74.14	9.00

* Per Drilled Shaft

HL93 LOADING

STATE OF TEXAS
WEIHUA WANG
105644
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02.03.2022

Texas Department of Transportation

Houston District (Bridge)

FOUNDATION QUANTITY TABLE

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILES	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATES	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		80

DATE: $DATE$
FILE: pw:\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\0177 14039\4 - Design\Bridge\Loop494\Loop494 FQT-1.dgn

FOUNDATION QUANTITY TABLE

BRIDGE NAME	ABUT / BENT	COLUMN NO.	PHASE	FOOTING TYPE	DRILLED SHAFTS					LOAD	TOP OF DS ELEV	DS TIP ELEV
						0416-6001	0416-6003	0416-6005	0416-6006			
						18" DIA DRILLED SHAFT	30" DIA DRILLED SHAFT	42" DIA DRILLED SHAFT	48" DIA DRILLED SHAFT			
					QUANTITY	LENGTH (FT) *	LENGTH (FT) *	LENGTH (FT) *	LENGTH (FT) *	(TONS) *	(FT)	(FT)
LOOP 494 @ CANEY CREEK BRIDGE REPLACEMENT	BENT 7	1	1	DS42	1			50		265	71.17	22.00
		2	1	DS42	1			52		265	73.09	22.00
		3	1	DS42	1			52		265	73.20	22.00
		4	1	DS42	1			52		265	73.40	22.00
		5	1	DS42	1			52		265	73.28	22.00
	BENT 8	1	1	DS42	1			56		265	72.88	17.00
		2	1	DS42	1			57		265	73.09	17.00
		3	1	DS42	1			57		265	73.06	17.00
		4	1	DS42	1			57		265	73.05	17.00
		5	1	DS42	1			57		265	73.01	17.00
	BENT 9	1	1	DS42	1			53		250	69.30	17.00
		2	1	DS42	1			53		250	69.39	17.00
		3	1	DS42	1			53		250	69.16	17.00
		4	1	DS42	1			54		250	70.07	17.00
		5	1	DS42	1			55		250	71.90	17.00
	ABUT 10 WWL	1	1	DS18	1	40				20	86.10	47.00
	ABUT 10 WWR	1	1	DS18	1	40				20	86.10	47.00
	ABUT 10	1	1	DS30	1		56			120	85.72	30.00
		2	1	DS30	1		56			120	85.93	30.00
		3	1	DS30	1		57			120	86.14	30.00
		4	1	DS30	1		57			120	86.01	30.00
		5	1	DS30	1		56			120	85.82	30.00
		6	1	DS30	1		56			120	85.63	30.00

* Per Drilled Shaft

HL93 LOADING

STATE OF TEXAS
WEIHUA WANG
105644
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02.03.2022

Texas Department of Transportation

Houston District (Bridge)

FOUNDATION QUANTITY TABLE

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILES	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATES	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		81

DATE: $DATE$
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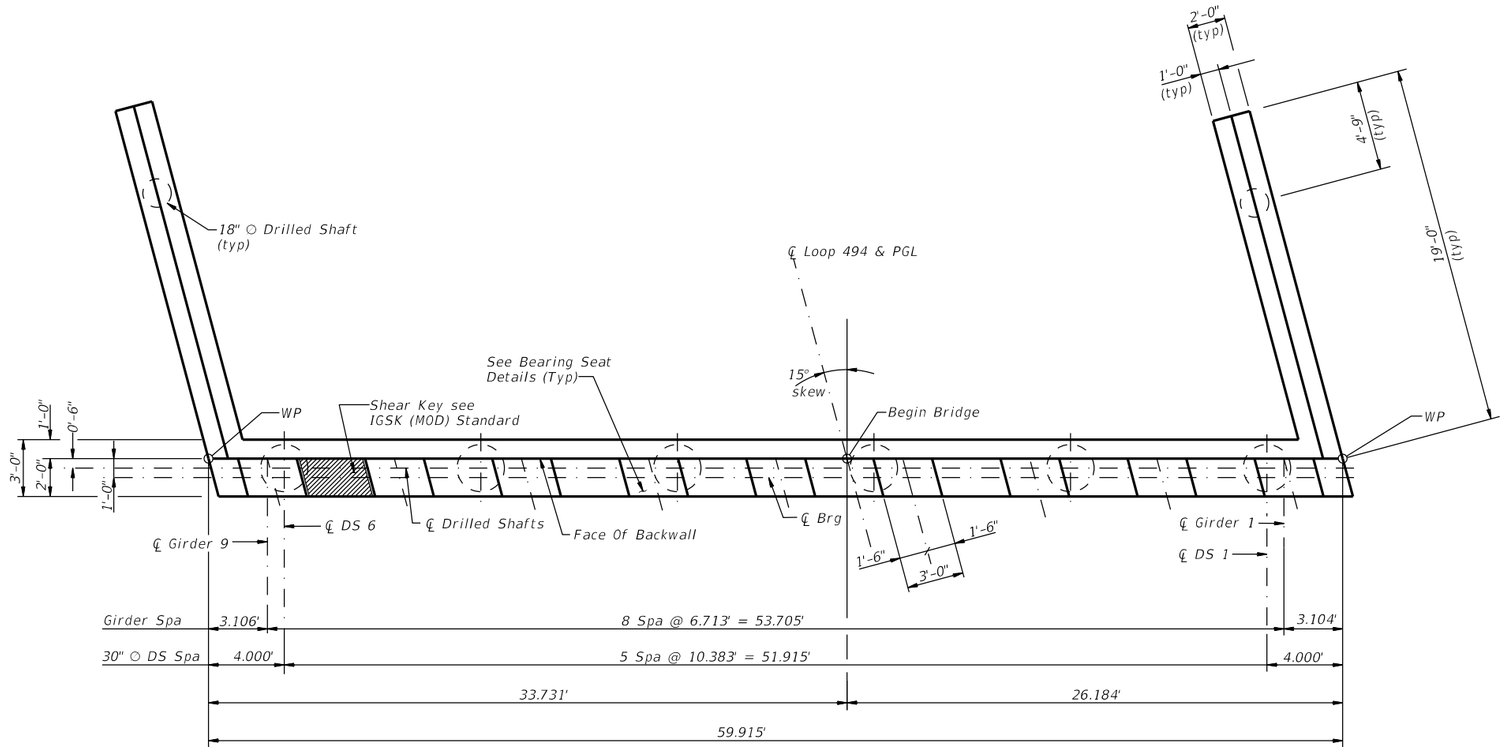
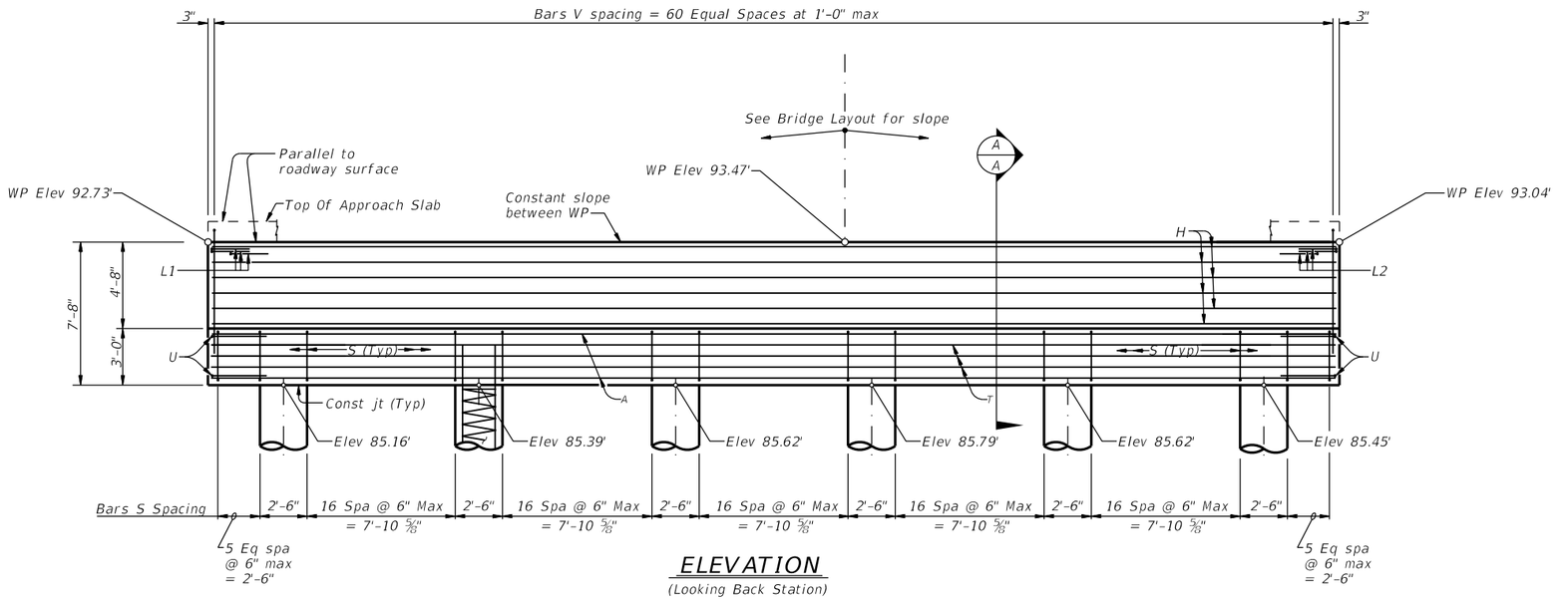


PLAN



ELEVATION

(Looking Back Station)

HL93 LOADING

SHEET 1 OF 2

STATE OF TEXAS
WEIHUA WANG
105644
LICENSED PROFESSIONAL ENGINEER

02.03.2022

Texas Department of Transportation

Houston District (Bridge)

ABUTMENT 1

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE:	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT	CONT.	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST.	COUNTY		SHEET NO.
	HOU	MONTGOMERY		82

DATE: $DATE$
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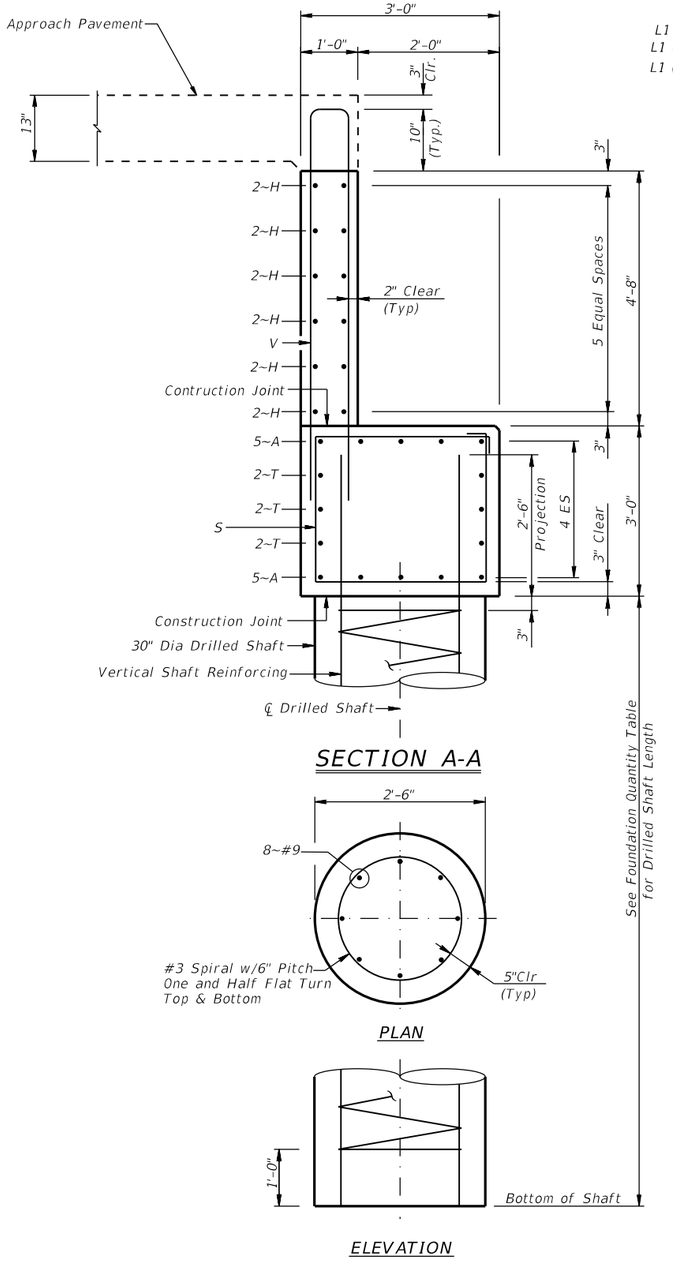
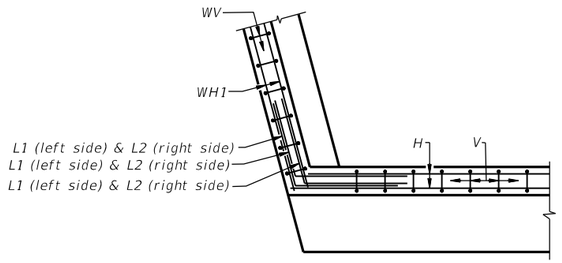


SECTION A-A

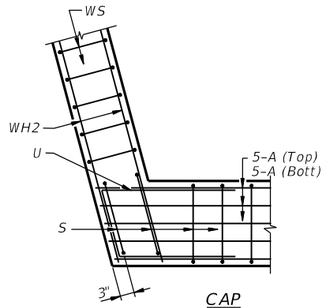
PLAN

ELEVATION

30" DIAMETER DRILLED SHAFT

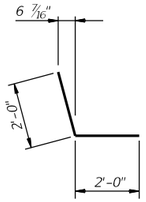


BACKWALL

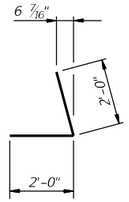


CAP

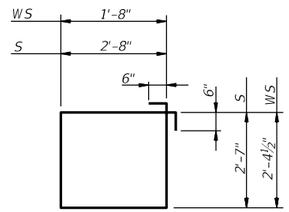
CORNER DETAILS



BARS L1



BARS L2



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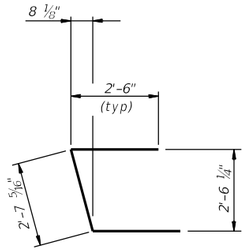

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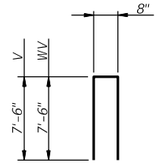
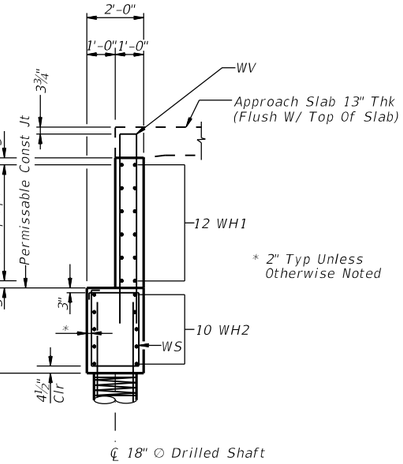
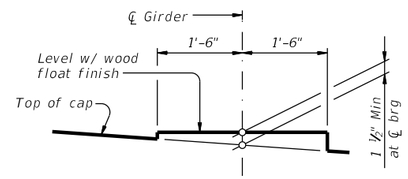


BARS V & WV

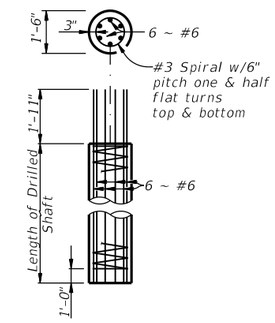


WINGWALL ELEVATION



BEARING SEAT DETAIL

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



SECTION B-B

TABLE OF ESTIMATED QUANTITIES

BAR	NO.	SIZE	LENGTH	WEIGHT
A	10	# 11	59'-7"	3,166
H	12	# 6	59'-7"	1,074
L	18	# 6	4'-0"	108
S	99	# 6	11'-6"	1,710
T	6	# 5	59'-7"	373
U	8	# 6	8'-0"	96
V	60	# 5	15'-7"	975
WH1	14	# 6	20'-8"	435
WH2	20	# 6	19'-8"	591
WS	38	# 4	8'-8"	220
WV	38	# 5	15'-7"	618

ITEM	UNIT	QUANTITY
Reinforcing Steel	LBS	9,366
Class "C" Conc (Abut)	CY	46.5

GENERAL NOTES:

- Designed According to AASHTO LRFD Bridge Design Specifications.
- Reinforcing Steel Quantity is for Contractor's information Only.
- See Table of Estimated Foundation Quantities for Foundation loads and Drilled Shaft lengths.
- Chamfer All Exposed Edges 3/4".

- 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 Grade 60 reinforcing steel.

HL93 LOADING

SHEET 2 OF 2

STATE OF TEXAS
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02.03.2022

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Houston District (Bridge)

ABUTMENT 1

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE:	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT	CONT.	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
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	HOU	MONTGOMERY		83

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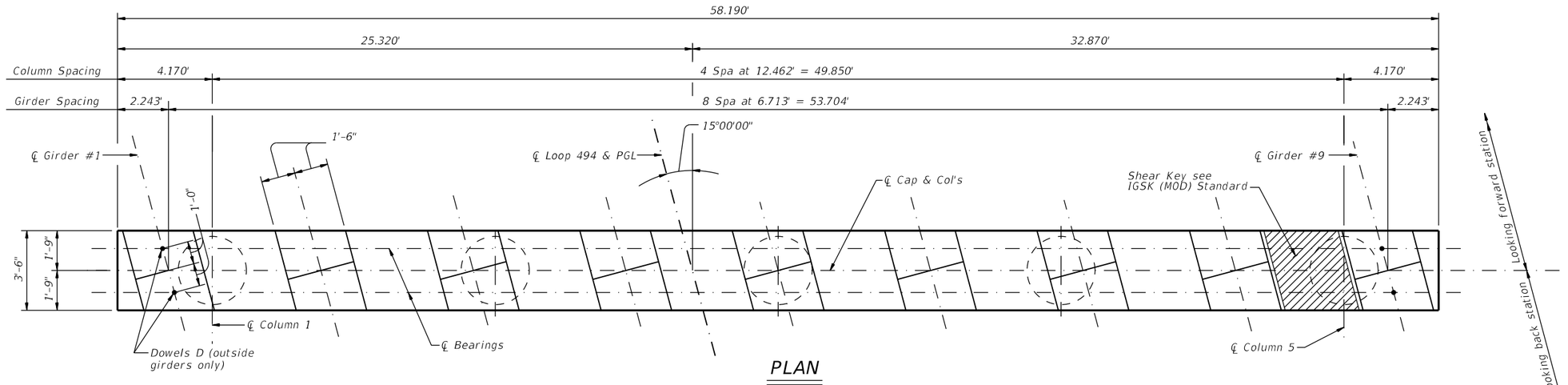

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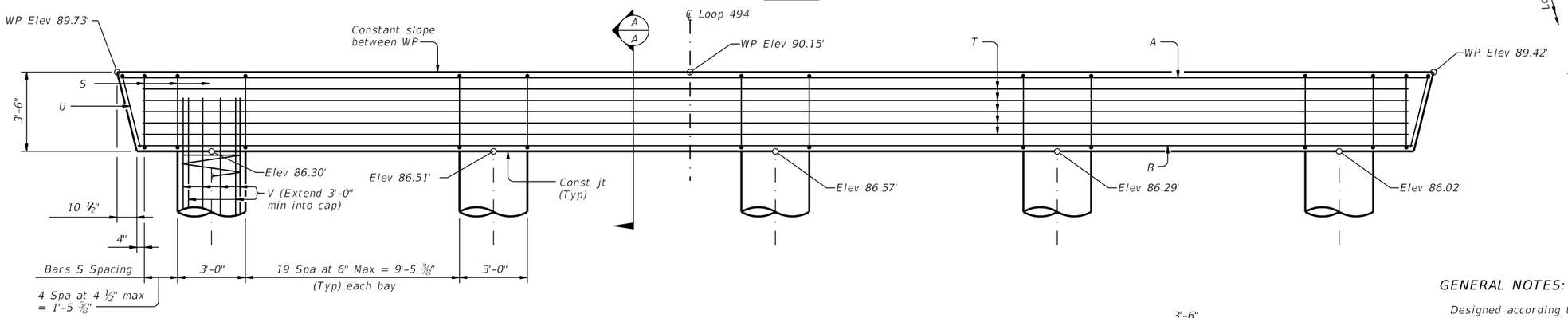
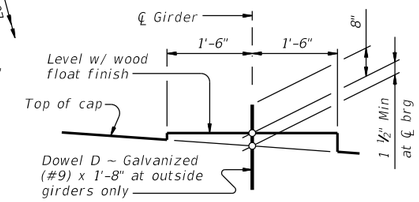
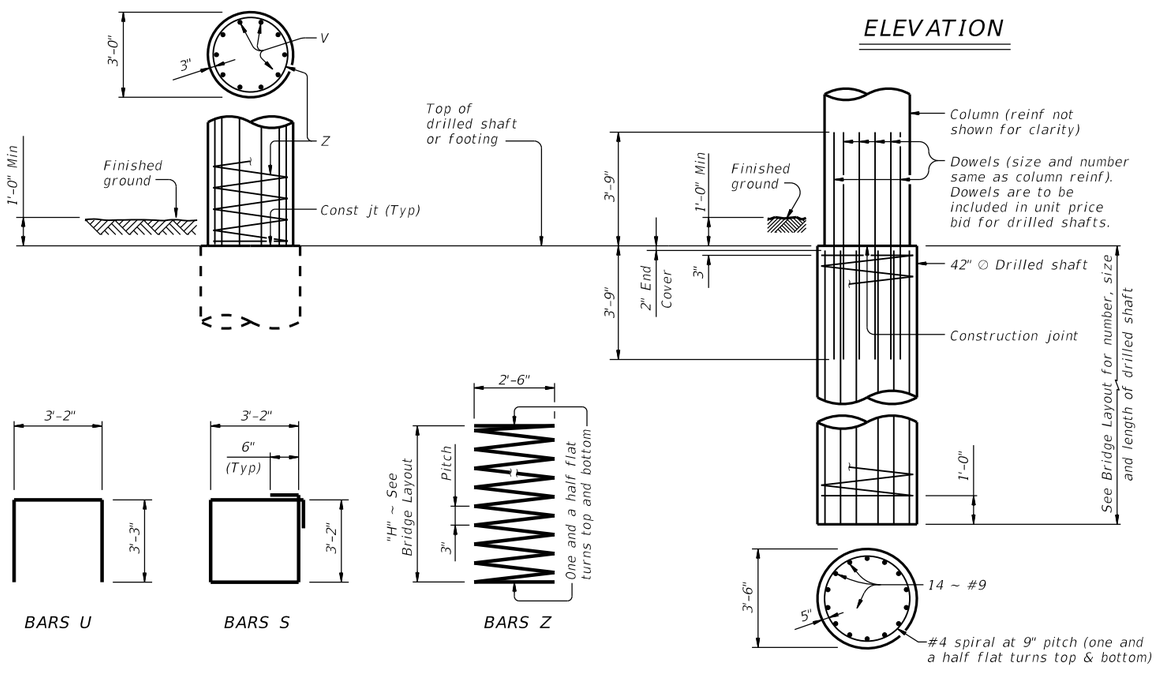


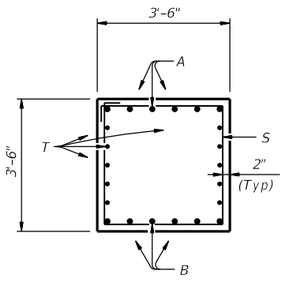


BEARING SEAT DETAIL

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

ELEVATION





SECTION A-A

TABLE OF ESTIMATED QUANTITIES

Bar	No.	Size	Length	Weight
A	6	#11	57'-10"	1,844
B	6	#11	56'-1"	1,788
D	4	#9	1'-8"	23
S	90	#5	14'-8"	1,377
T	10	#5	57'-0"	595
U	2	#5	9'-8"	20
V	50	#9	21'-0"	3,570
Z	5	#4	589'-1"	1,968
Reinforcing Steel			Lbs	11,185
Class "C" Concrete (Cap)			CY	26.9
Class "C" Concrete (Col)			CY	23.6

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Shear Key (IGSK MOD) standard sheet for all shear key details and notes, if applicable.

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

STATE OF TEXAS
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02.03.2022

Texas Department of Transportation ®2018

Houston District (Bridge)

BENT 2

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILE$	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
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	HOU	MONTGOMERY		84

DATE: $DATE$
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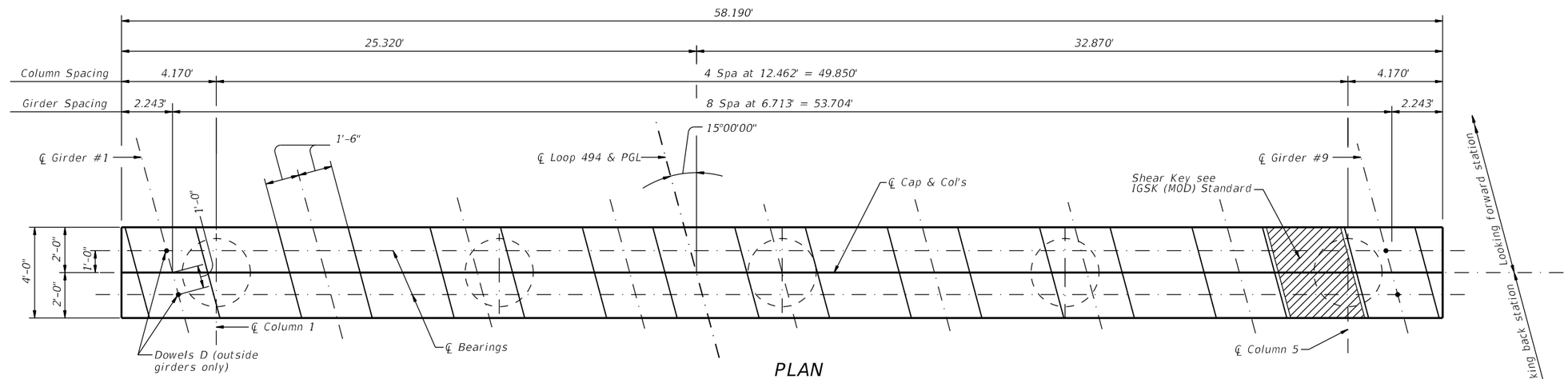


PLAN

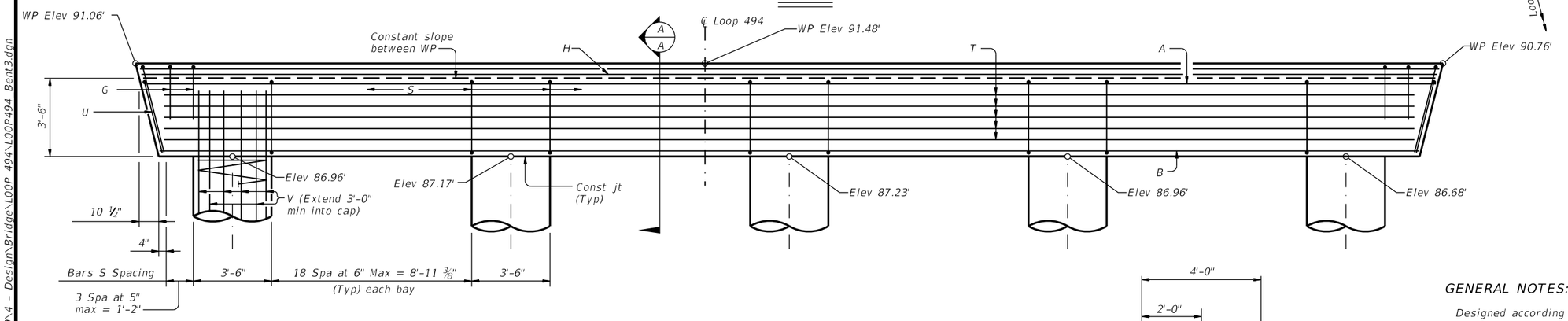
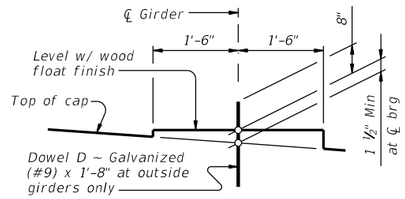


TABLE OF ESTIMATED QUANTITIES

Bar	No.	Size	Length	Weight
A	8	#11	57'-10"	2,458
B	8	#11	55'-9"	2,370
D	4	#9	1'-8"	23
G	84	#5	6'-2"	540
H	3	#11	57'-10"	922
S	84	#5	15'-8"	1,373
T	10	#5	56'-10"	593
U	2	#5	10'-2"	21
V	70	#9	27'-0"	6,426
Z	5	#4	934'-3"	3,120

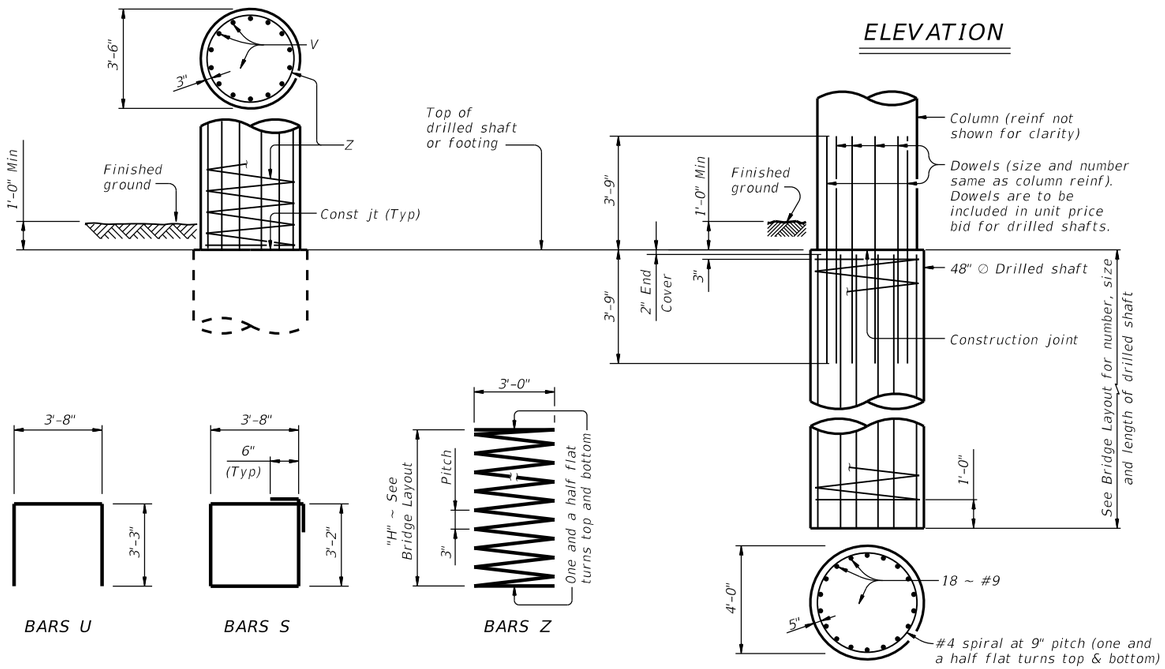
Reinforcing Steel	Lbs	17,846
Class "C" Concrete (Cap)	CY	33.1
Class "C" Concrete (Col)	CY	42.8



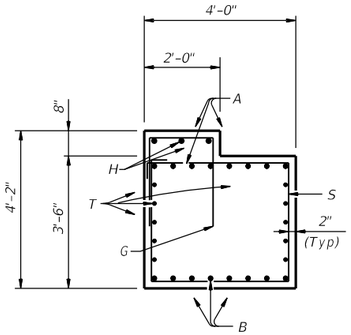
BEARING SEAT DETAIL

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

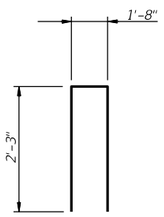
ELEVATION



BARS U | BARS S | BARS Z



SECTION A-A



BARS G

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Shear Key (IGSK MOD) standard sheet for all shear key details and notes, if applicable.

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

STATE OF TEXAS
WEIHUA WANG
105644
LICENSED PROFESSIONAL ENGINEER

02.03.2022

Texas Department of Transportation ®2018

Houston District (Bridge)

BENT 3

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

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©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
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	HOU	MONTGOMERY		85

DATE: $DATE$
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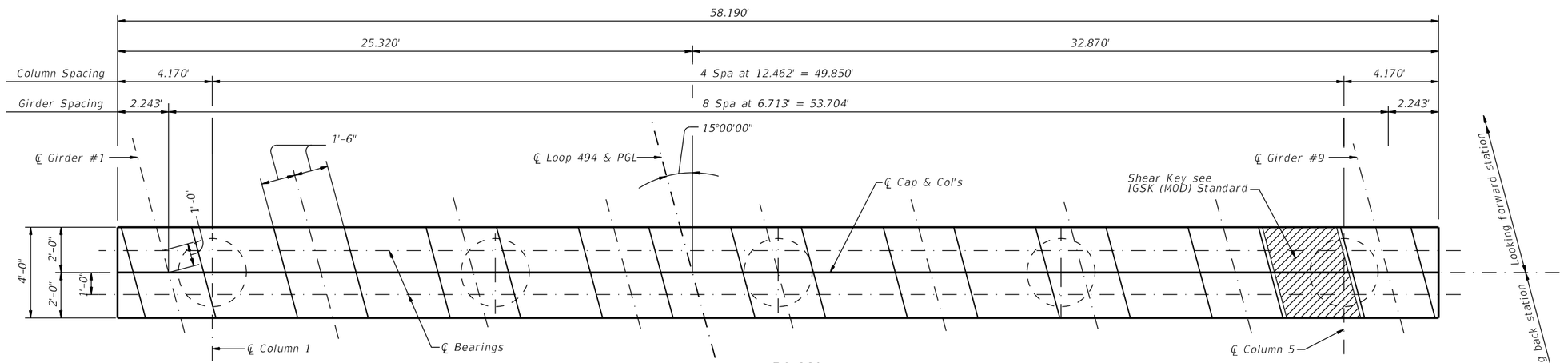

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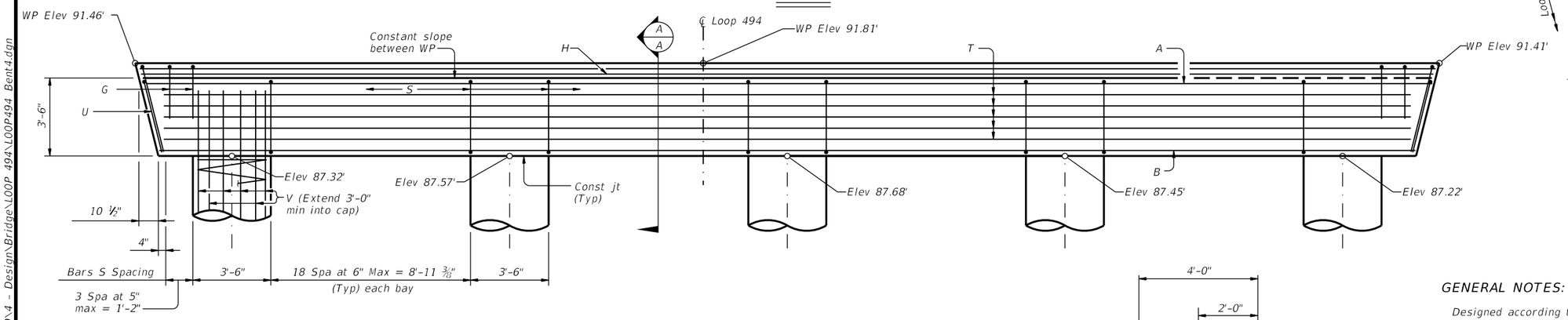

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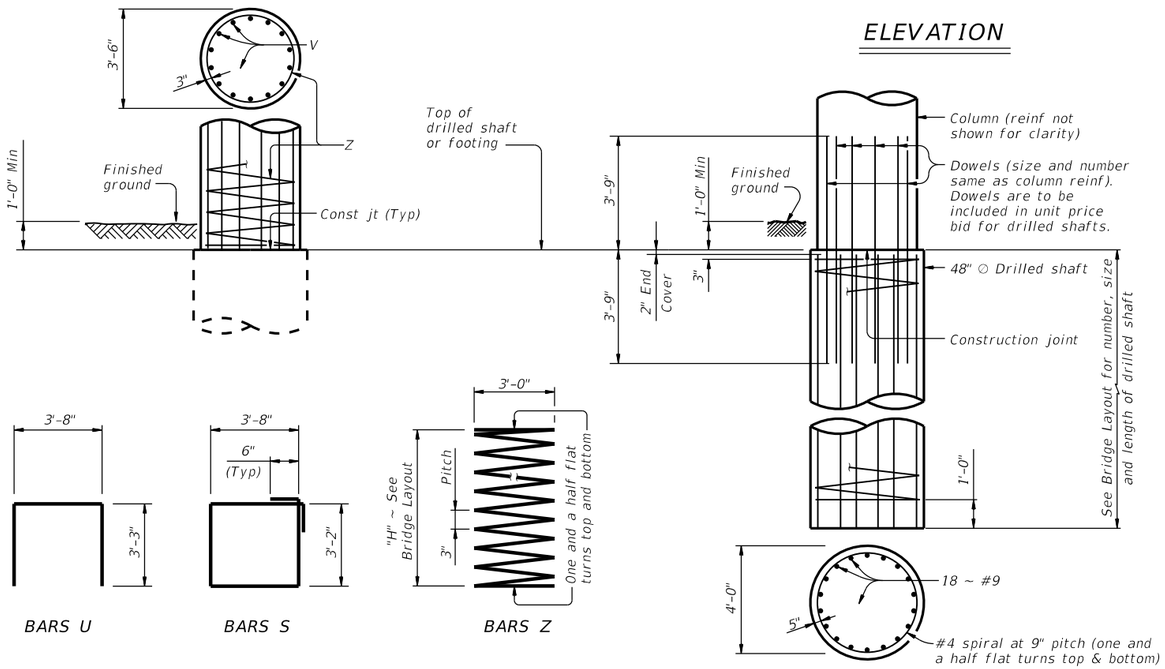
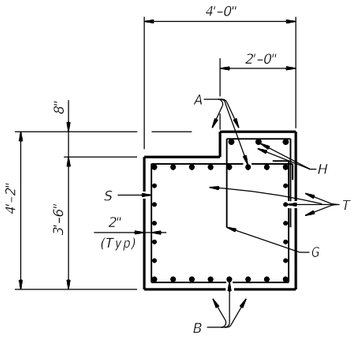
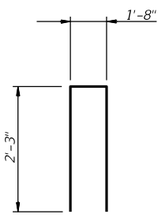




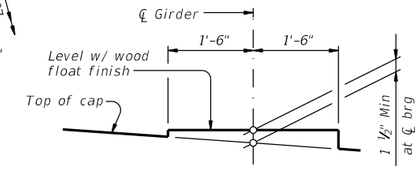
SECTION A-A



BARS G

TABLE OF ESTIMATED QUANTITIES

Bar	No.	Size	Length	Weight
A	8	#11	57'-10"	2,458
B	8	#11	56'-1"	2,384
G	84	#5	6'-2"	540
H	3	#11	57'-10"	922
S	84	#5	15'-8"	1,373
T	10	#5	57'-0"	595
U	2	#5	10'-2"	21
V	70	#9	25'-0"	5,950
Z	5	#4	858'-9"	2,868
Reinforcing Steel			Lbs	17,111
Class "C" Concrete (Cap)			CY	30.6
Class "C" Concrete (Col)			CY	39.2



BEARING SEAT DETAIL

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

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Shear Key (IGSK MOD) standard sheet for all shear key details and notes, if applicable.

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.

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02.03.2022

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Houston District (Bridge)

BENT 4

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

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©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
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	HOU	MONTGOMERY		86

DATE: $DATE$
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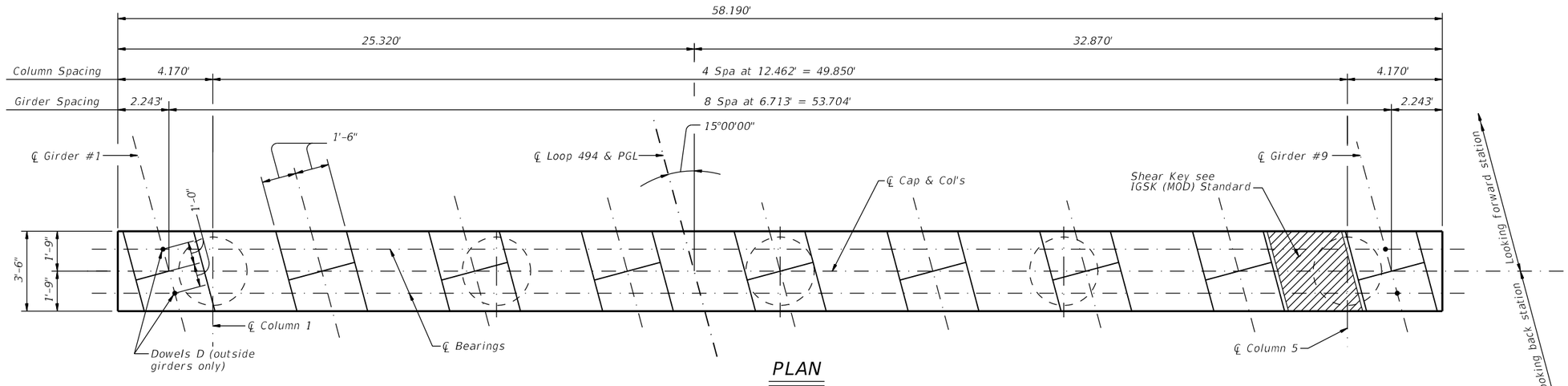

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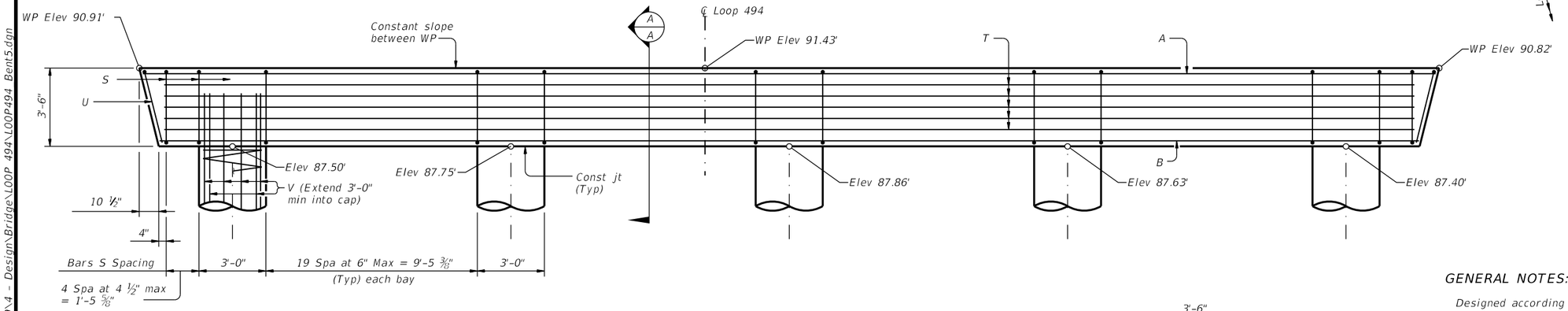
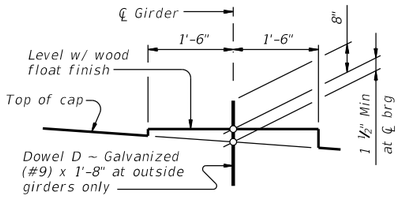
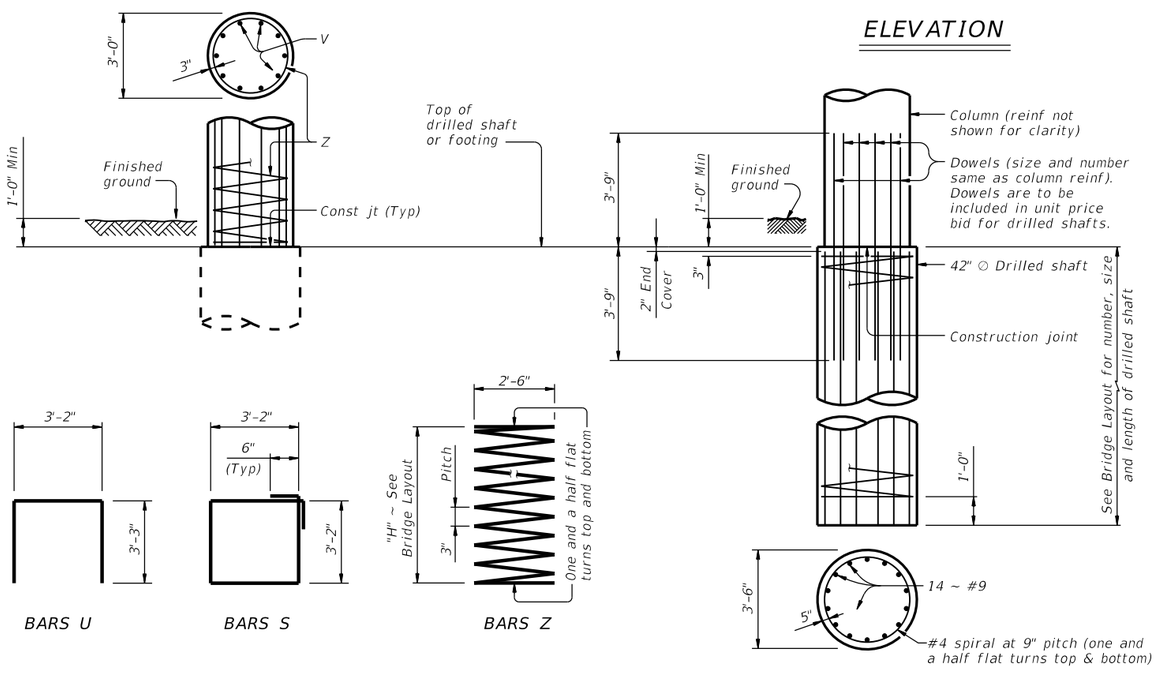


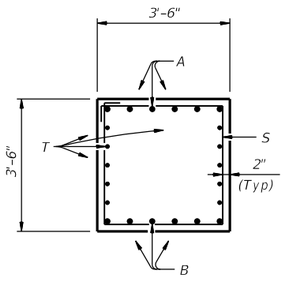


BEARING SEAT DETAIL

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

ELEVATION





SECTION A-A

TABLE OF ESTIMATED QUANTITIES

Bar	No.	Size	Length	Weight
A	6	#11	57'-10"	1,844
B	6	#11	56'-1"	1,788
D	4	#9	1'-8"	23
S	90	#5	14'-8"	1,377
T	10	#5	57'-0"	595
U	2	#5	9'-8"	20
V	50	#9	17'-0"	2,890
Z	5	#4	463'-5"	1,548
Reinforcing Steel			Lbs	10,085
Class "C" Concrete (Cap)			CY	26.9
Class "C" Concrete (Col)			CY	18.3

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Shear Key (IGSK MOD) standard sheet for all shear key details and notes, if applicable.

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

STATE OF TEXAS
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02.03.2022

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Houston District (Bridge)

BENT 5

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

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©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		87

DATE: $DATE$
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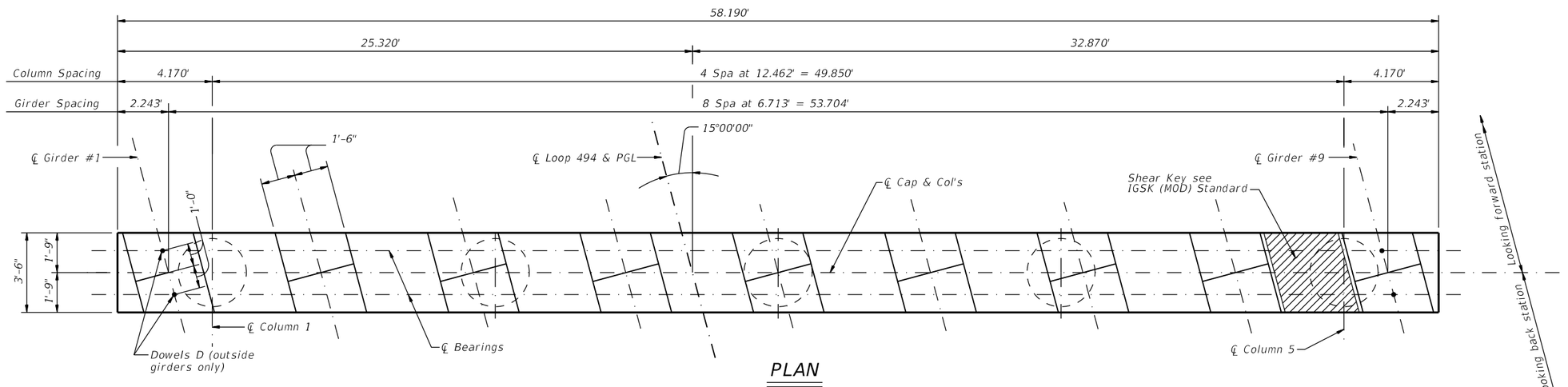

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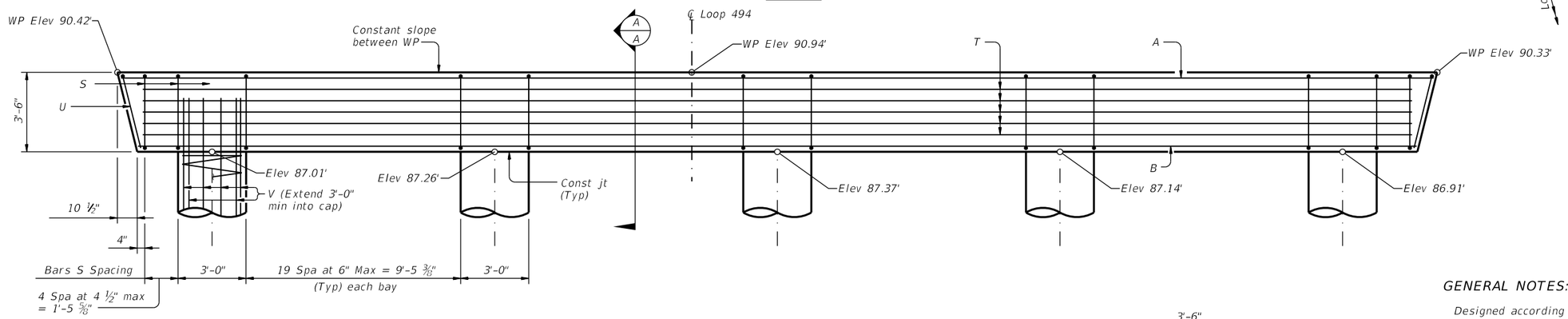
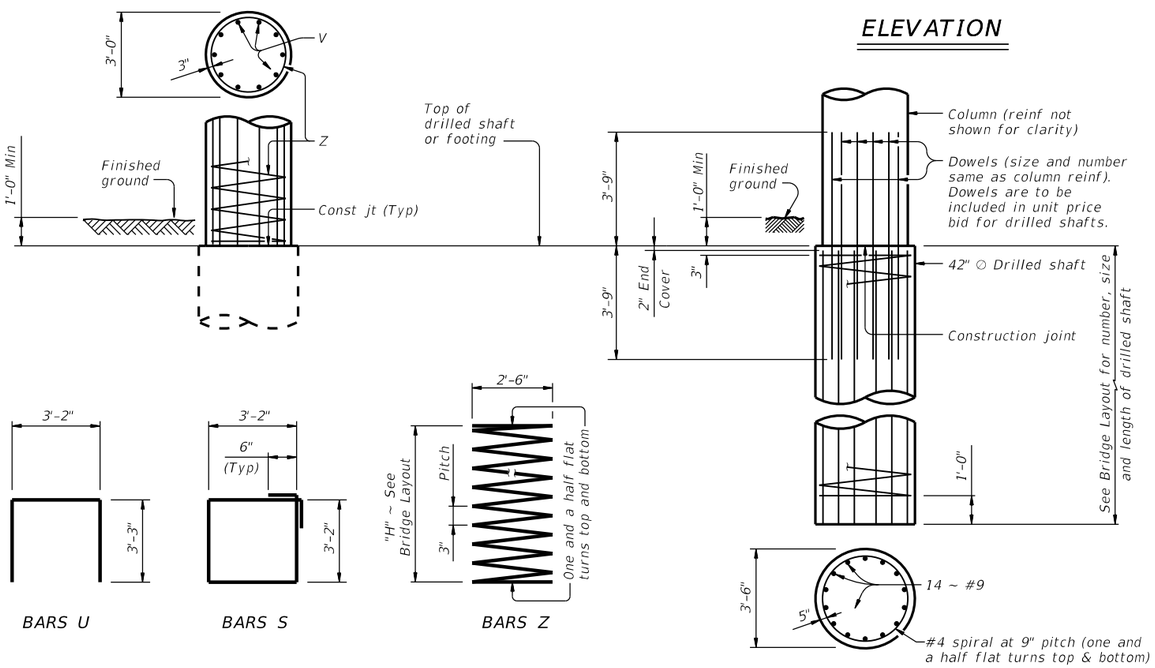
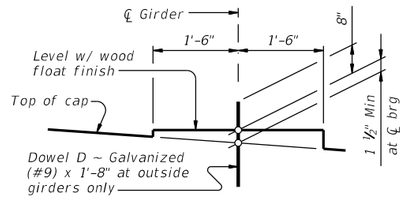
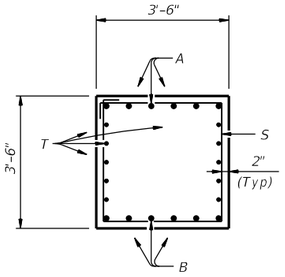






BEARING SEAT DETAIL

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



SECTION A-A

TABLE OF ESTIMATED QUANTITIES

Bar	No.	Size	Length	Weight
A	6	#11	57'-10"	1,844
B	6	#11	56'-1"	1,788
D	4	#9	1'-8"	23
S	90	#5	14'-8"	1,377
T	10	#5	57'-0"	595
U	2	#5	9'-8"	20
V	50	#9	17'-0"	2,890
Z	5	#4	463'-5"	1,548
Reinforcing Steel			Lbs	10,085
Class "C" Concrete (Cap)			CY	26.9
Class "C" Concrete (Col)			CY	18.3

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Shear Key (IGSK MOD) standard sheet for all shear key details and notes, if applicable.

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

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02.03.2022

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Houston District (Bridge)

BENT 6

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

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	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		88

DATE: $DATE$
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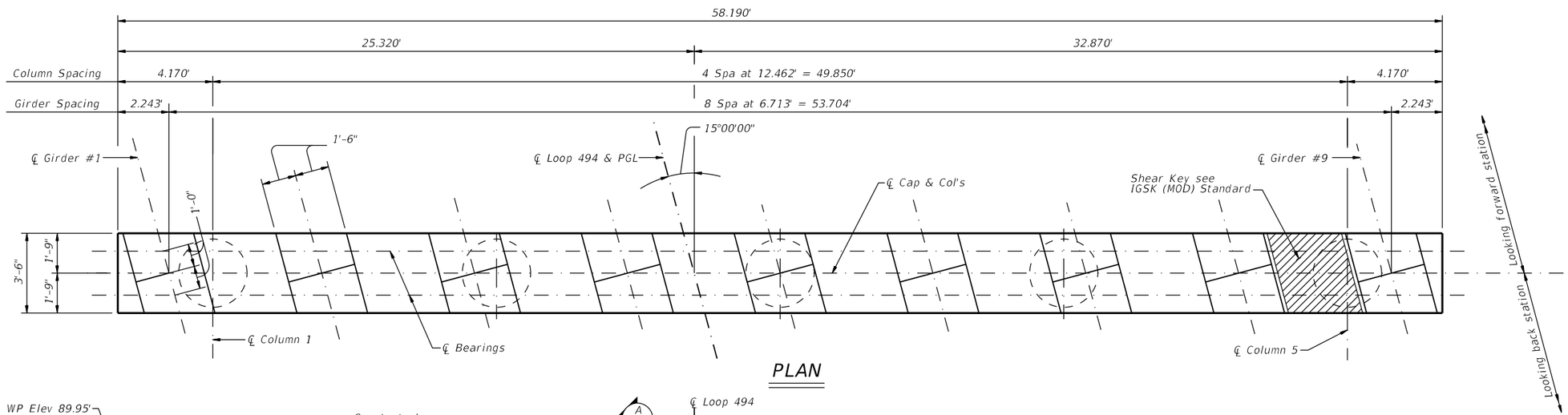
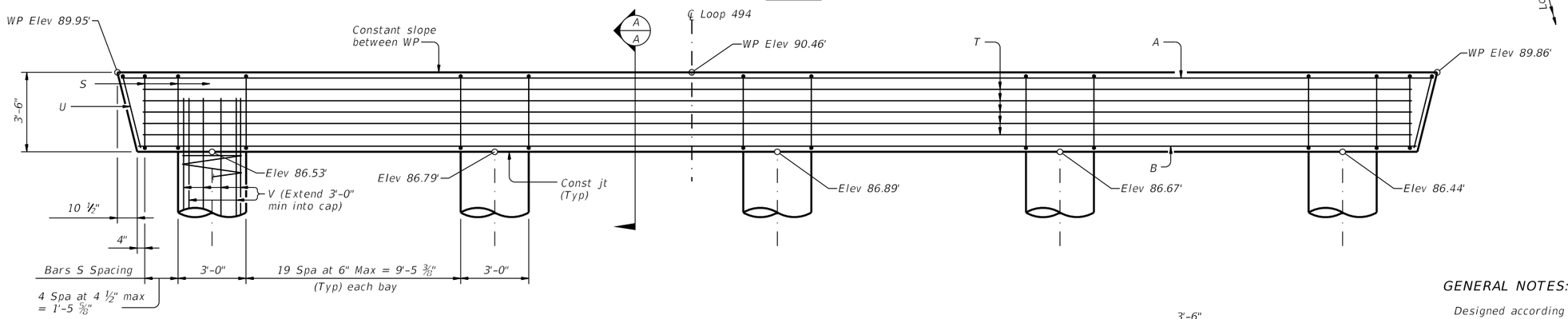
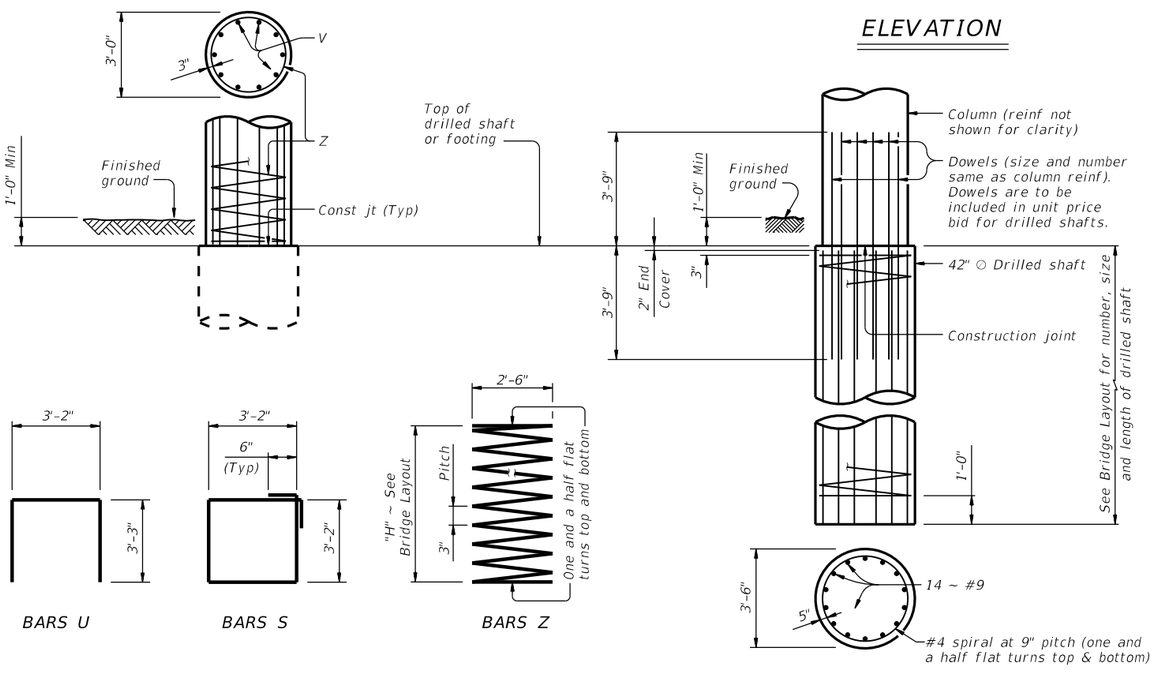
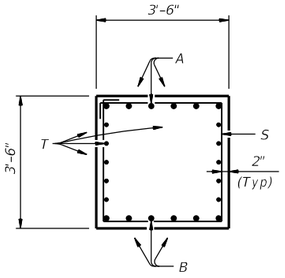


PLAN



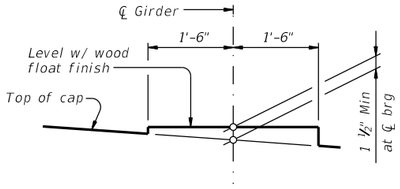




SECTION A-A

TABLE OF ESTIMATED QUANTITIES

Bar	No.	Size	Length	Weight
A	6	#11	57'-10"	1,844
B	6	#11	56'-1"	1,788
S	90	#5	14'-8"	1,377
T	10	#5	57'-0"	595
U	2	#5	9'-8"	20
V	50	#9	17'-0"	2,890
Z	5	#4	463'-5"	1,548
Reinforcing Steel			Lbs	10,062
Class "C" Concrete (Cap)			CY	26.9
Class "C" Concrete (Col)			CY	18.3



BEARING SEAT DETAIL

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

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Shear Key (IGSK MOD) standard sheet for all shear key details and notes, if applicable.

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

STATE OF TEXAS
WEIHUA WANG
105644
LICENSED PROFESSIONAL ENGINEER

02.03.2022

Texas Department of Transportation ®2018

Houston District (Bridge)

BENT 7

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILE$	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		89

DATE: $DATE$
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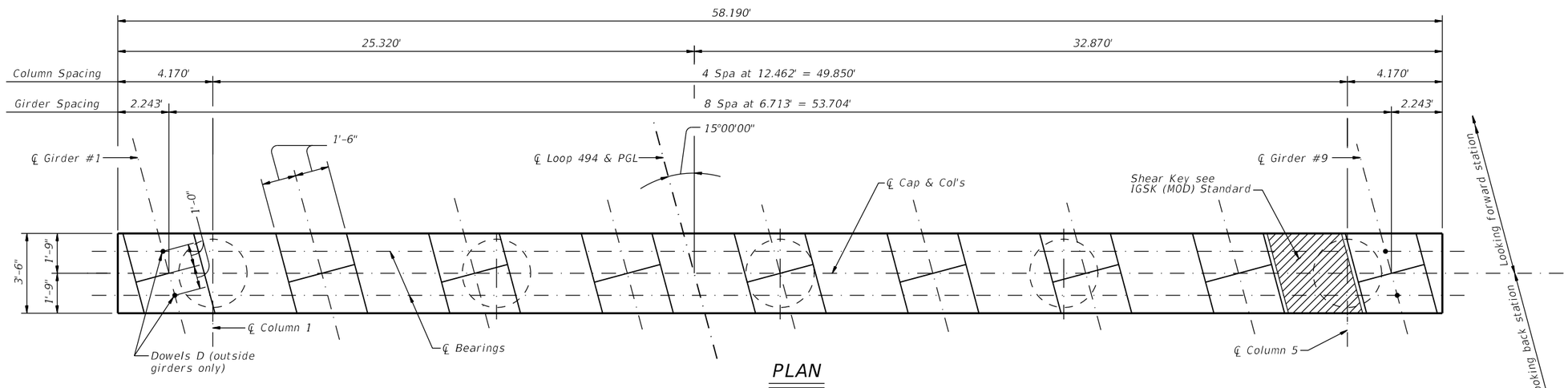
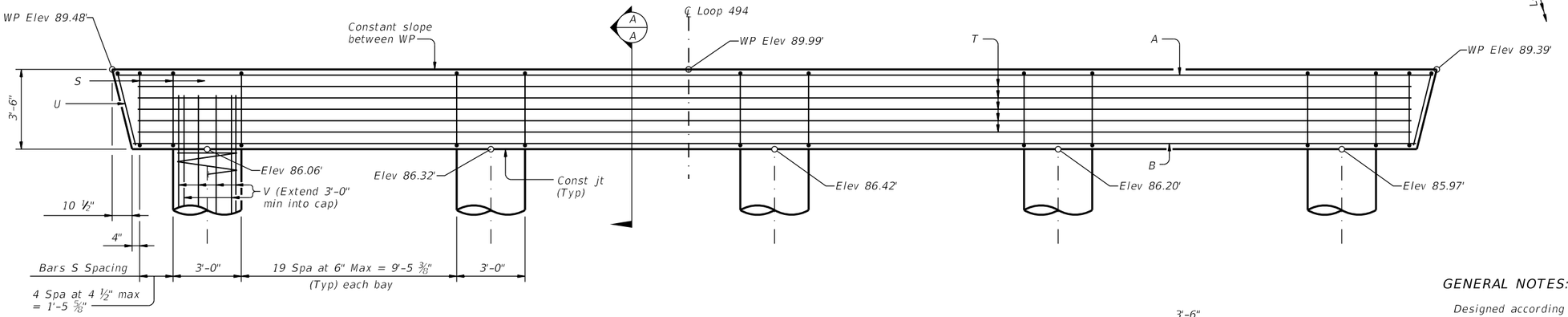
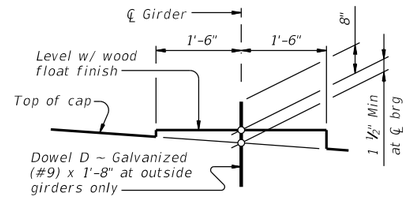


PLAN





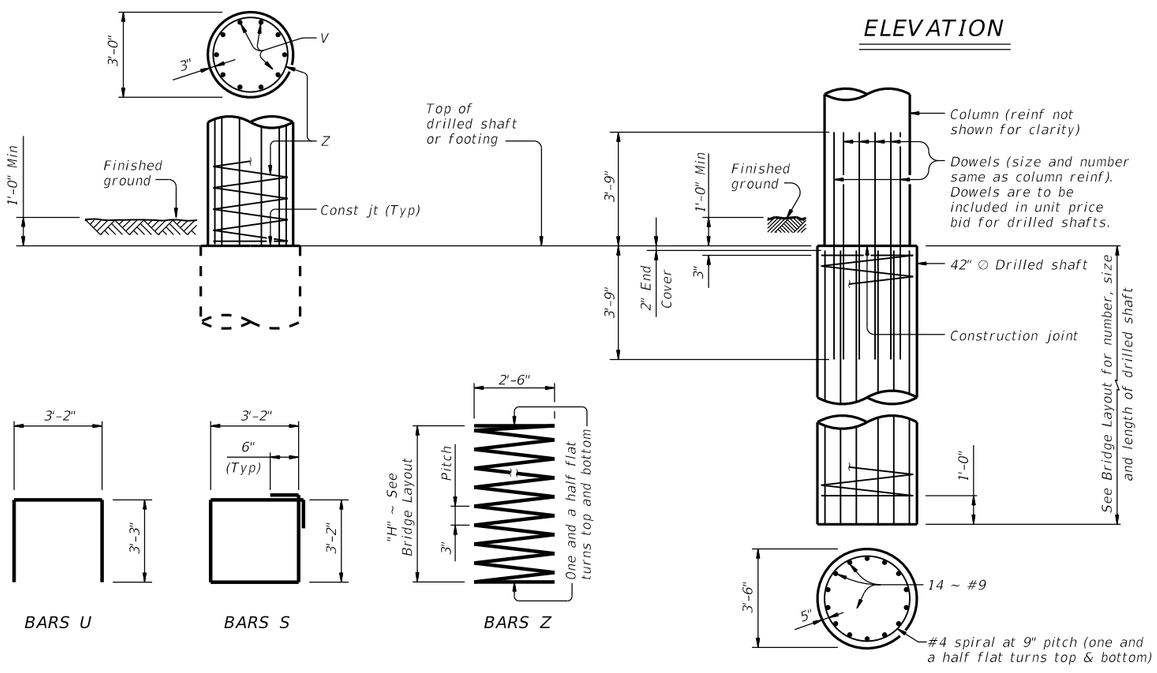
BEARING SEAT DETAIL

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

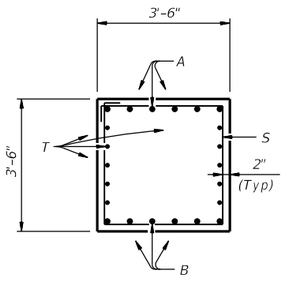
TABLE OF ESTIMATED QUANTITIES

Bar	No.	Size	Length	Weight
A	6	#11	57'-10"	1,844
B	6	#11	56'-1"	1,788
D	4	#9	1'-8"	23
S	90	#5	14'-8"	1,377
T	10	#5	57'-0"	595
U	2	#5	9'-8"	20
V	50	#9	16'-0"	2,720
Z	5	#4	432'-0"	1,443
Reinforcing Steel			Lbs	9,810
Class "C" Concrete (Cap)			CY	26.9
Class "C" Concrete (Col)			CY	17.0

ELEVATION



BARS U BARS S BARS Z



SECTION A-A

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Shear Key (IGSK MOD) standard sheet for all shear key details and notes, if applicable.

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

STATE OF TEXAS
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105644
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02.03.2022

Texas Department of Transportation

Houston District (Bridge)

BENT 8

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILE$	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
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	HOU	MONTGOMERY		90

DATE: $DATE$
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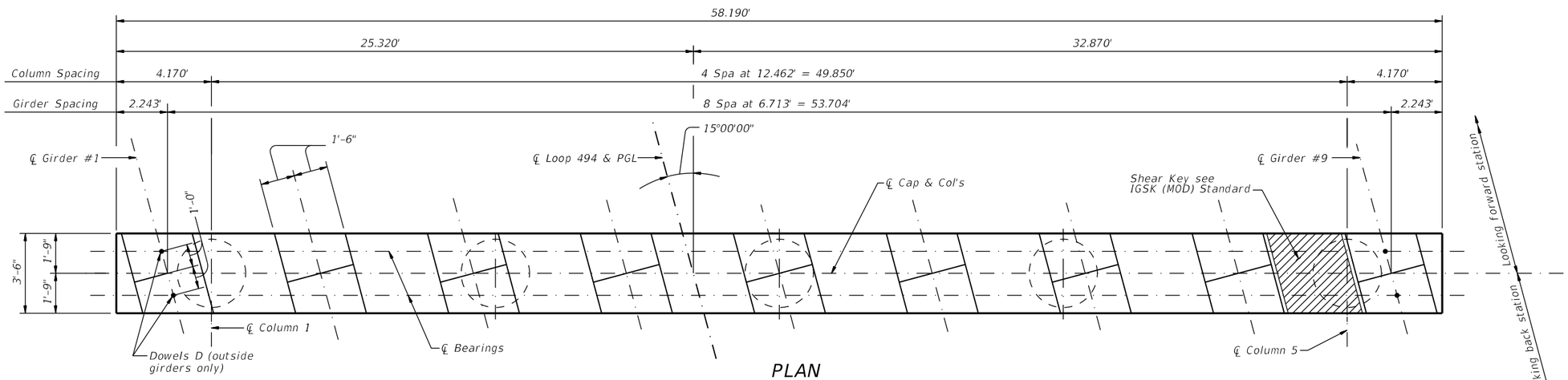
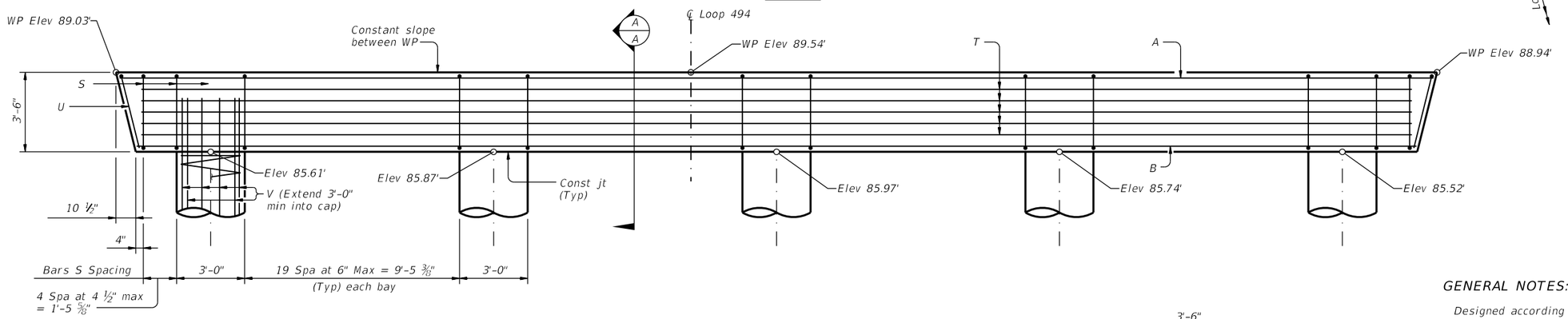
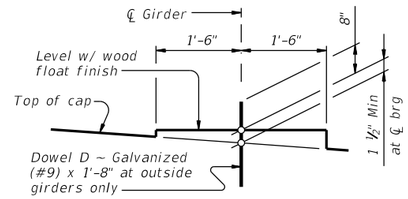


PLAN





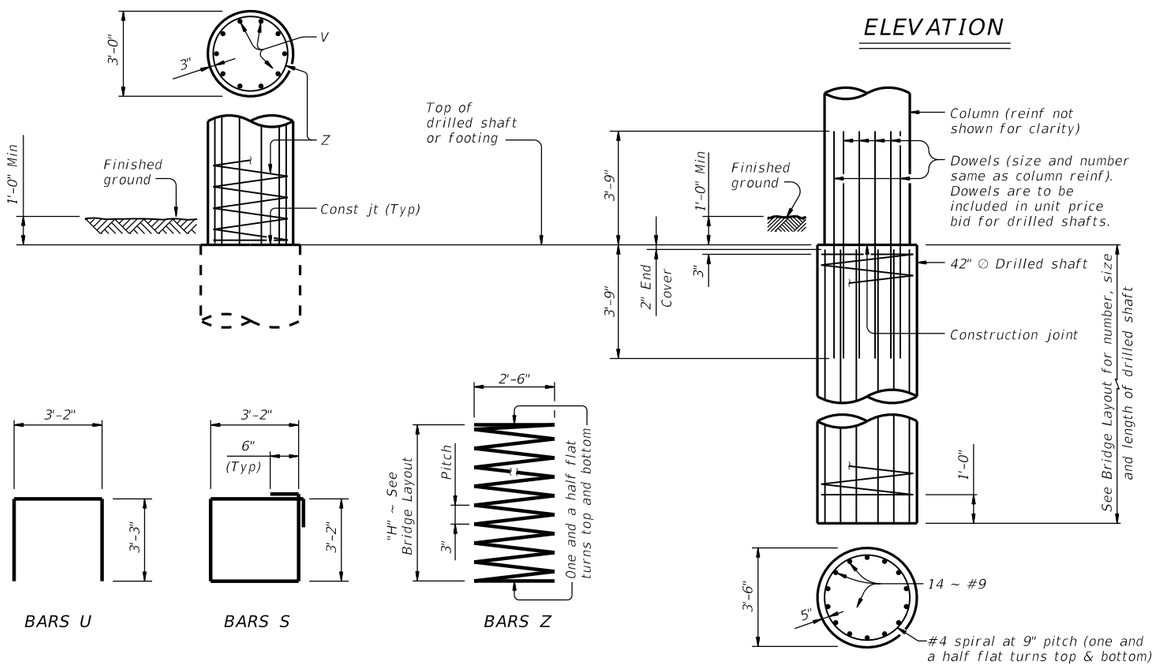
BEARING SEAT DETAIL

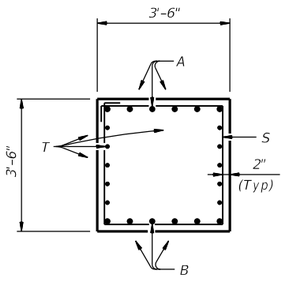
(Bearing surface must be clean and free of all loose material before placing bearing pad.)

TABLE OF ESTIMATED QUANTITIES

Bar	No.	Size	Length	Weight
A	6	#11	57'-10"	1,844
B	6	#11	56'-1"	1,788
D	4	#9	1'-8"	23
S	90	#5	14'-8"	1,377
T	10	#5	57'-0"	595
U	2	#5	9'-8"	20
V	50	#9	19'-0"	3,230
Z	5	#4	526'-3"	1,758
Reinforcing Steel			Lbs	10,635
Class "C" Concrete (Cap)			CY	26.9
Class "C" Concrete (Col)			CY	20.9

ELEVATION





SECTION A-A

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Shear Key (IGSK MOD) standard sheet for all shear key details and notes, if applicable.

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

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Houston District (Bridge)

BENT 9

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILE$	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
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	HOU	MONTGOMERY		91

DATE: $DATE$
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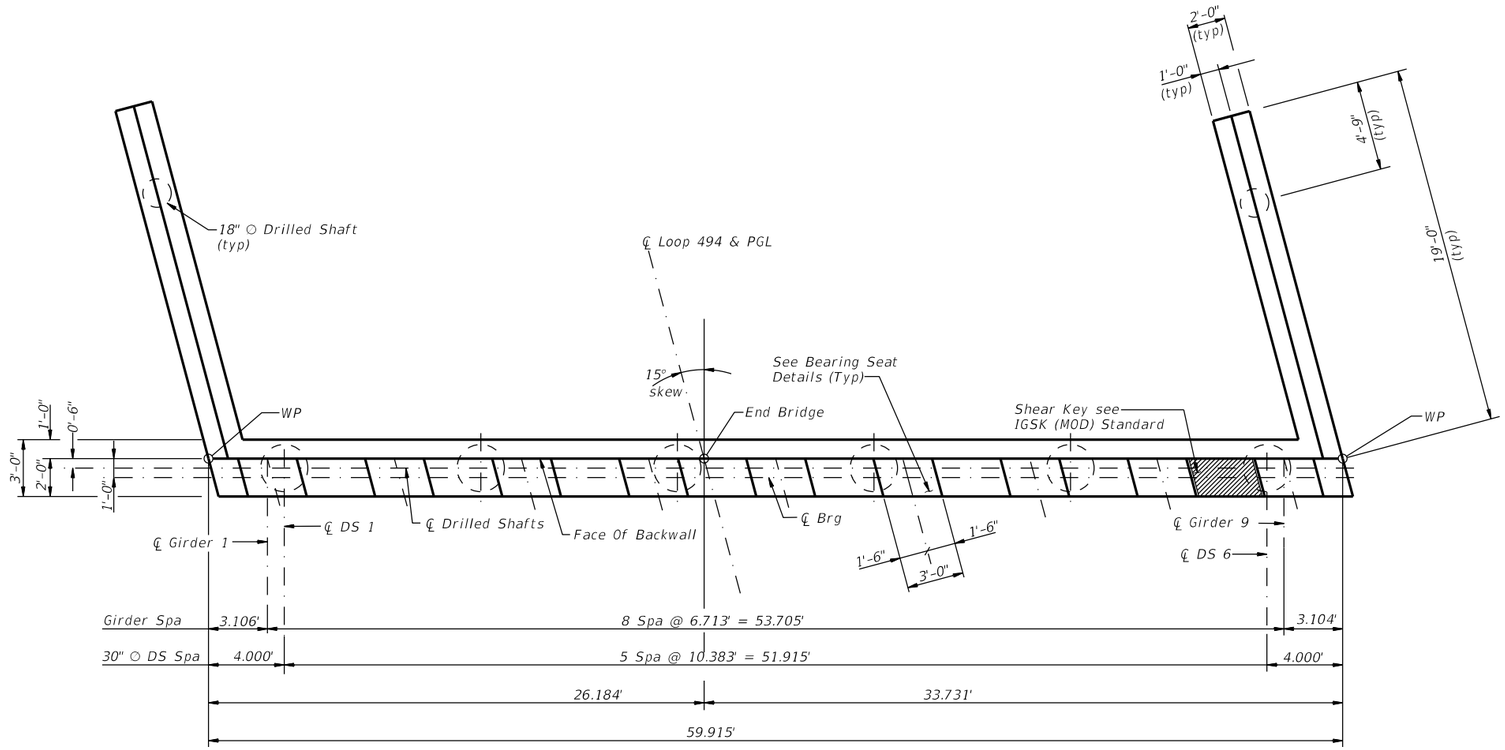
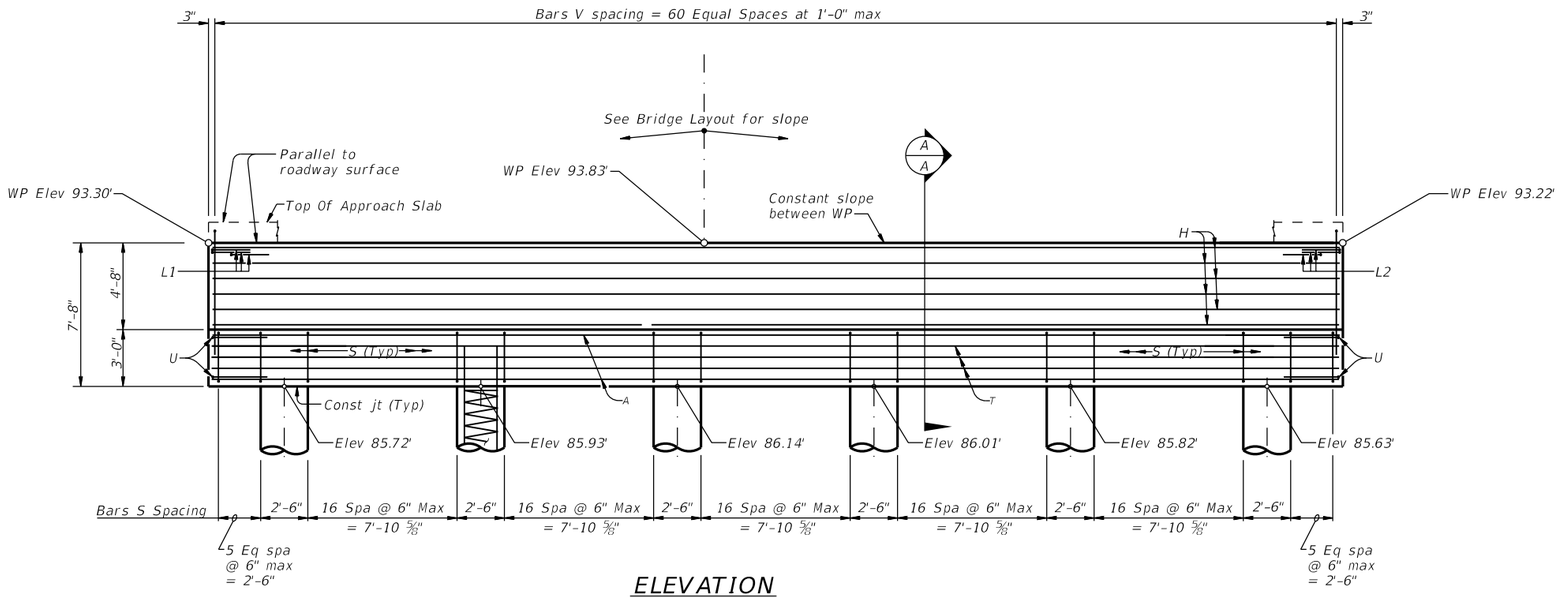


PLAN



ELEVATION

(Looking Forward Station)

HL93 LOADING

SHEET 1 OF 2

STATE OF TEXAS
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Houston District (Bridge)

ABUTMENT 10

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

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REVISIONS	0177	14	039	SL 494
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	HOU	MONTGOMERY		92

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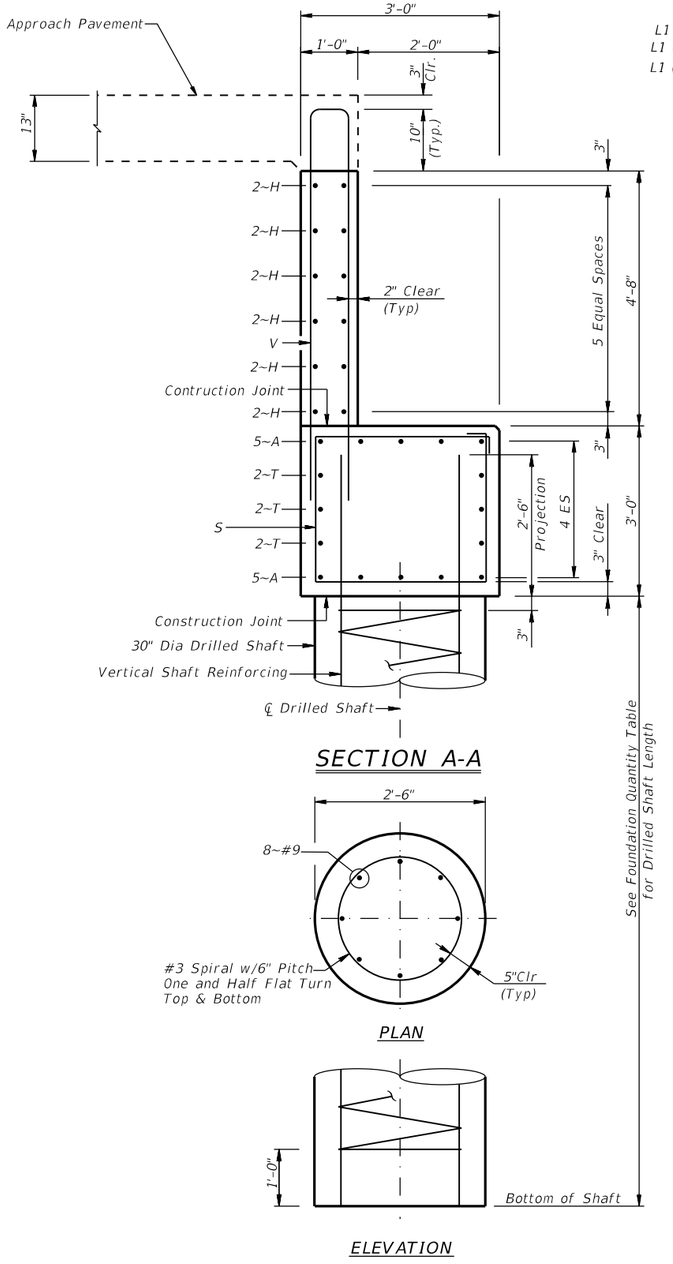
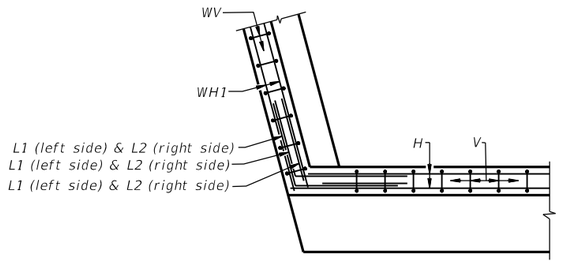


SECTION A-A

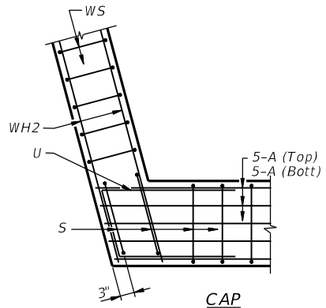
PLAN

ELEVATION

30" DIAMETER DRILLED SHAFT

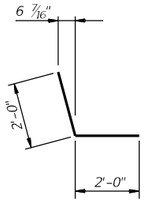


BACKWALL

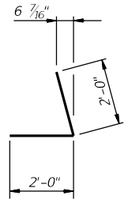


CAP

CORNER DETAILS



BARS L1



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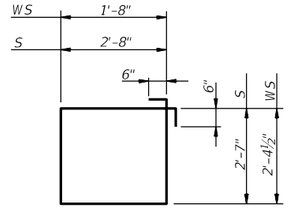
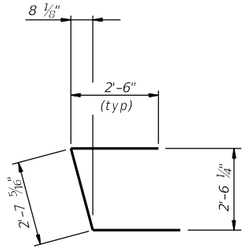


BARS S & WS



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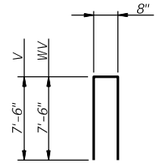

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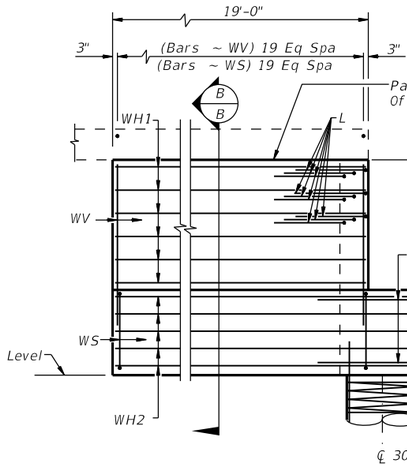
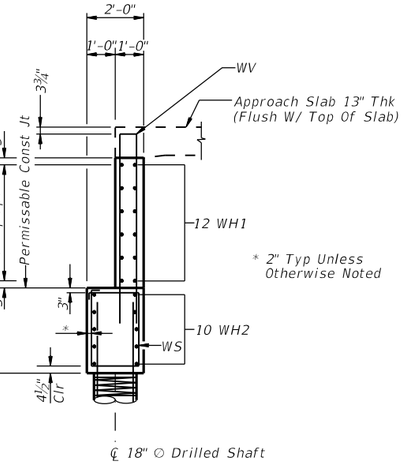
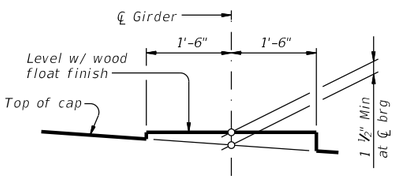


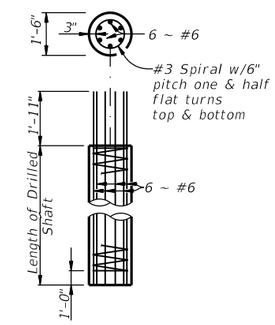


WINGWALL ELEVATION



BEARING SEAT DETAIL

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



SECTION B-B

TABLE OF ESTIMATED QUANTITIES

BAR	NO.	SIZE	LENGTH	WEIGHT
A	10	# 11	59'-7"	3,166
H	12	# 6	59'-7"	1,074
L	18	# 6	4'-0"	108
S	99	# 6	11'-6"	1,710
T	6	# 5	59'-7"	373
U	8	# 6	8'-0"	96
V	60	# 5	15'-7"	975
WH1	14	# 6	20'-8"	435
WH2	20	# 6	19'-8"	591
WS	38	# 4	8'-8"	220
WV	38	# 5	15'-7"	618

ITEM	UNIT	QUANTITY
Reinforcing Steel	LBS	9,843
Class "C" Conc (Abut)	CY	52.3

GENERAL NOTES:

- Designed According to AASHTO LRFD Bridge Design Specifications.
- Reinforcing Steel Quantity is for Contractor's information Only.
- See Table of Estimated Foundation Quantities for Foundation loads and Drilled Shaft lengths.
- Chamfer All Exposed Edges 3/4".

- 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 Grade 60 reinforcing steel.

HL93 LOADING

SHEET 2 OF 2

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Houston District (Bridge)

ABUTMENT 10

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE:	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT	CONT.	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST.	COUNTY		SHEET NO.
	HOU	MONTGOMERY		93

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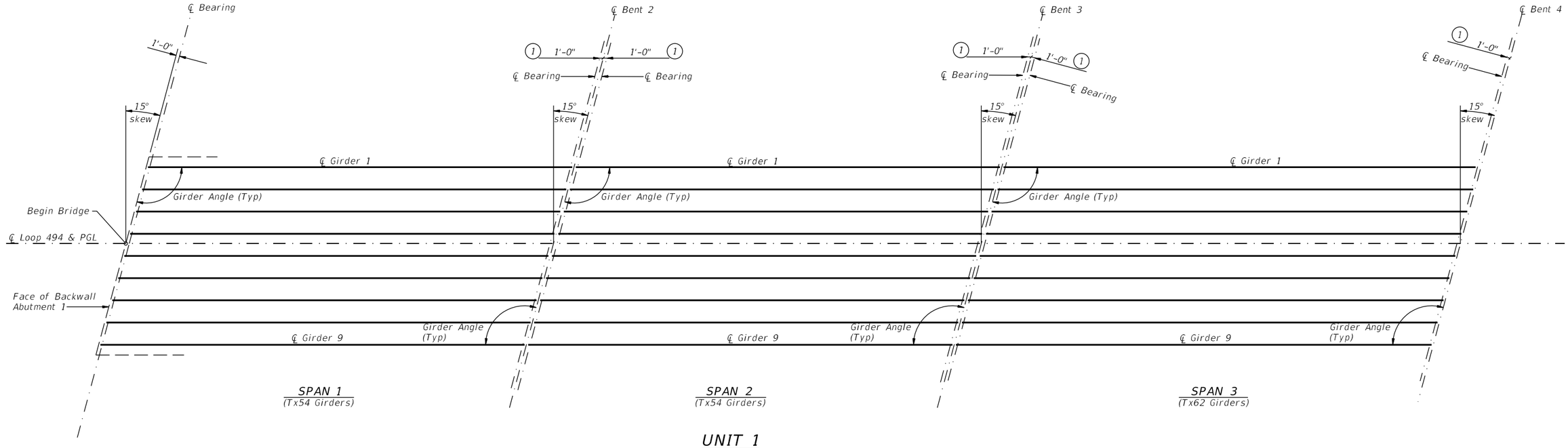

UNIT 1

BENT REPORT

ABUT NO. 1 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

			GIRD SPAC. (C.L. BENT) (3)	GIRD ANGLE D	M	S
SPAN 1	GIRD 1		0.000	75	0	0
	GIRD 2		6.712	75	0	0
	GIRD 3		6.712	75	0	0
	GIRD 4		6.712	75	0	0
	GIRD 5		6.712	75	0	0
	GIRD 6		6.712	75	0	0
	GIRD 7		6.712	75	0	0
	GIRD 8		6.712	75	0	0
	GIRD 9		6.712	75	0	0
	TOTAL		53.700			

BENT NO. 2 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

			GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 1	GIRD 1		0.000	75	0	0
	GIRD 2		6.712	75	0	0
	GIRD 3		6.712	75	0	0
	GIRD 4		6.712	75	0	0
	GIRD 5		6.712	75	0	0
	GIRD 6		6.712	75	0	0
	GIRD 7		6.712	75	0	0
	GIRD 8		6.712	75	0	0
	GIRD 9		6.712	75	0	0
	TOTAL		53.700			

BENT NO. 2 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

			GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 2	GIRD 1		0.000	75	0	0
	GIRD 2		6.712	75	0	0
	GIRD 3		6.712	75	0	0
	GIRD 4		6.712	75	0	0
	GIRD 5		6.712	75	0	0
	GIRD 6		6.712	75	0	0
	GIRD 7		6.712	75	0	0
	GIRD 8		6.712	75	0	0
	GIRD 9		6.712	75	0	0
	TOTAL		53.700			

BENT REPORT

BENT NO. 3 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

			GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 2	GIRD 1		0.000	75	0	0
	GIRD 2		6.712	75	0	0
	GIRD 3		6.712	75	0	0
	GIRD 4		6.712	75	0	0
	GIRD 5		6.712	75	0	0
	GIRD 6		6.712	75	0	0
	GIRD 7		6.712	75	0	0
	GIRD 8		6.712	75	0	0
	GIRD 9		6.712	75	0	0
	TOTAL		53.700			

BENT NO. 3 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

			GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 3	GIRD 1		0.000	75	0	0
	GIRD 2		6.712	75	0	0
	GIRD 3		6.712	75	0	0
	GIRD 4		6.712	75	0	0
	GIRD 5		6.712	75	0	0
	GIRD 6		6.712	75	0	0
	GIRD 7		6.712	75	0	0
	GIRD 8		6.712	75	0	0
	GIRD 9		6.712	75	0	0
	TOTAL		53.700			

BENT NO. 4 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

			GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 3	GIRD 1		0.000	75	0	0
	GIRD 2		6.712	75	0	0
	GIRD 3		6.712	75	0	0
	GIRD 4		6.712	75	0	0
	GIRD 5		6.712	75	0	0
	GIRD 6		6.712	75	0	0
	GIRD 7		6.712	75	0	0
	GIRD 8		6.712	75	0	0
	GIRD 9		6.712	75	0	0
	TOTAL		53.700			

GIRDER REPORT

GIRDER REPORT, SPAN 1

		C-C BENT (3)	HORIZONTAL DISTANCE C-C BRG.	TRUE DISTANCE BOT. BM. FLG. (2)	GIRDER SLOPE
GIRDER	1	125.000	122.965	124.50	0.0108
GIRDER	2	125.000	122.965	124.50	0.0108
GIRDER	3	125.000	122.965	124.50	0.0108
GIRDER	4	125.000	122.965	124.50	0.0108
GIRDER	5	125.000	122.965	124.50	0.0108
GIRDER	6	125.000	122.965	124.50	0.0108
GIRDER	7	125.000	122.965	124.50	0.0108
GIRDER	8	125.000	122.965	124.50	0.0108
GIRDER	9	125.000	122.965	124.50	0.0108

GIRDER REPORT, SPAN 2

		C-C BENT	HORIZONTAL DISTANCE C-C BRG.	TRUE DISTANCE BOT. BM. FLG. (2)	GIRDER SLOPE
GIRDER	1	125.000	123.000	124.51	0.0107
GIRDER	2	125.000	123.000	124.51	0.0107
GIRDER	3	125.000	123.000	124.51	0.0107
GIRDER	4	125.000	123.000	124.51	0.0107
GIRDER	5	125.000	123.000	124.51	0.0108
GIRDER	6	125.000	123.000	124.51	0.0108
GIRDER	7	125.000	123.000	124.51	0.0108
GIRDER	8	125.000	123.000	124.51	0.0108
GIRDER	9	125.000	123.000	124.51	0.0108

GIRDER REPORT, SPAN 3

		C-C BENT	HORIZONTAL DISTANCE C-C BRG.	TRUE DISTANCE BOT. BM. FLG. (2)	GIRDER SLOPE
GIRDER	1	140.000	137.929	139.48	0.0025
GIRDER	2	140.000	137.929	139.48	0.0026
GIRDER	3	140.000	137.929	139.48	0.0028
GIRDER	4	140.000	137.929	139.48	0.0030
GIRDER	5	140.000	137.929	139.48	0.0031
GIRDER	6	140.000	137.929	139.48	0.0033
GIRDER	7	140.000	137.929	139.48	0.0035
GIRDER	8	140.000	137.929	139.48	0.0036
GIRDER	9	140.000	137.929	139.48	0.0038

Notes:

(1) See Standard IGEB for orientation of dimension, girder end and bearing details.

(2) Girder lengths shown are bottom girder flange lengths with adjustment made for girder slope.

(3) Dimensions shown along "℄ Bent" on Bent Reports are referenced along face of backwall at abutments. Dimensions shown between "℄ Bents" on Girder Reports are referenced from face of backwall at abutments.

TABLE OF ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY SPAN 1	QUANTITY SPAN 2	QUANTITY SPAN 3
PRESTRESSED CONCRETE GIRDER Tx54	LF	1,121	1,121	—
PRESTRESSED CONCRETE GIRDER Tx62	LF	—	—	1,255

STATE OF TEXAS
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WeiHWang
02.03.2022

HL93 LOADING

SHEET 1 OF 3

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Houston District (Bridge)

FRAMING PLAN

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILES	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATES	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		94

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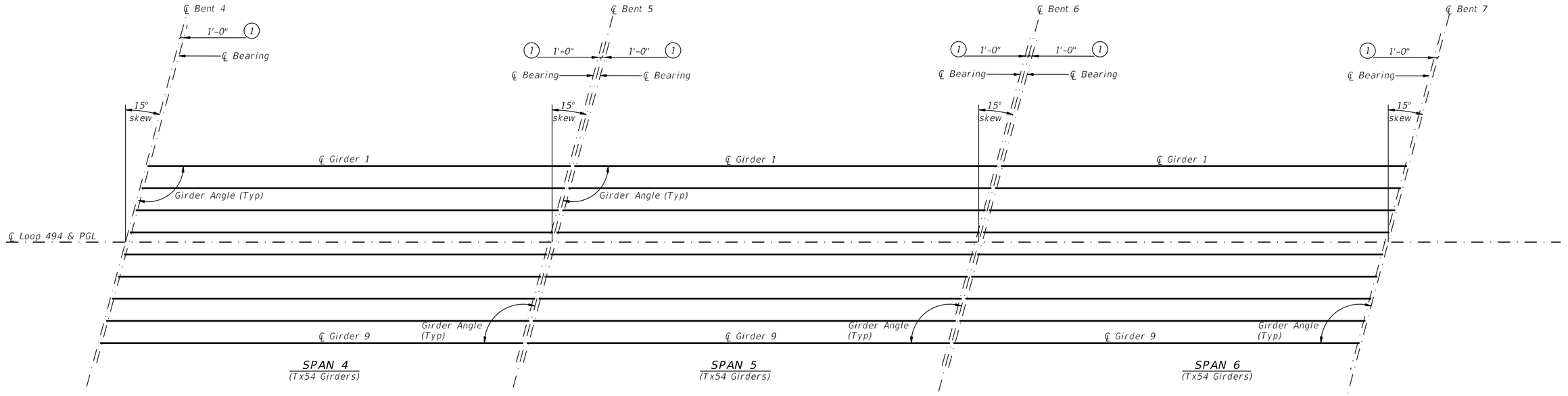

UNIT 2

BENT REPORT

BENT NO. 4 (N 60 53 18.97 W)

DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD	SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN	4	GIRD 1	0.000	75	0	0
		GIRD 2	6.712	75	0	0
		GIRD 3	6.712	75	0	0
		GIRD 4	6.712	75	0	0
		GIRD 5	6.712	75	0	0
		GIRD 6	6.712	75	0	0
		GIRD 7	6.712	75	0	0
		GIRD 8	6.712	75	0	0
		GIRD 9	6.712	75	0	0
		TOTAL	53.700			

BENT NO. 5 (N 60 53 18.97 W)

DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD	SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN	4	GIRD 1	0.000	75	0	0
		GIRD 2	6.712	75	0	0
		GIRD 3	6.712	75	0	0
		GIRD 4	6.712	75	0	0
		GIRD 5	6.712	75	0	0
		GIRD 6	6.712	75	0	0
		GIRD 7	6.712	75	0	0
		GIRD 8	6.712	75	0	0
		GIRD 9	6.712	75	0	0
		TOTAL	53.700			

BENT REPORT

BENT NO. 5 (N 60 53 18.97 W)

DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD	SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN	5	GIRD 1	0.000	75	0	0
		GIRD 2	6.712	75	0	0
		GIRD 3	6.712	75	0	0
		GIRD 4	6.712	75	0	0
		GIRD 5	6.712	75	0	0
		GIRD 6	6.712	75	0	0
		GIRD 7	6.712	75	0	0
		GIRD 8	6.712	75	0	0
		GIRD 9	6.712	75	0	0
		TOTAL	53.700			

BENT NO. 6 (N 60 53 18.97 W)

DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD	SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN	5	GIRD 1	0.000	75	0	0
		GIRD 2	6.712	75	0	0
		GIRD 3	6.712	75	0	0
		GIRD 4	6.712	75	0	0
		GIRD 5	6.712	75	0	0
		GIRD 6	6.712	75	0	0
		GIRD 7	6.712	75	0	0
		GIRD 8	6.712	75	0	0
		GIRD 9	6.712	75	0	0
		TOTAL	53.700			

BENT NO. 7 (N 60 53 18.97 W)

DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD	SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN	6	GIRD 1	0.000	75	0	0
		GIRD 2	6.712	75	0	0
		GIRD 3	6.712	75	0	0
		GIRD 4	6.712	75	0	0
		GIRD 5	6.712	75	0	0
		GIRD 6	6.712	75	0	0
		GIRD 7	6.712	75	0	0
		GIRD 8	6.712	75	0	0
		GIRD 9	6.712	75	0	0
		TOTAL	53.700			

GIRDER REPORT

GIRDER REPORT, SPAN 4

		HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG (2)	GIRDER SLOPE
GIRDER	1	125.000	123.000	124.50	-0.0039
GIRDER	2	125.000	123.000	124.50	-0.0039
GIRDER	3	125.000	123.000	124.50	-0.0039
GIRDER	4	125.000	123.000	124.50	-0.0039
GIRDER	5	125.000	123.000	124.50	-0.0039
GIRDER	6	125.000	123.000	124.50	-0.0039
GIRDER	7	125.000	123.000	124.50	-0.0039
GIRDER	8	125.000	123.000	124.50	-0.0039
GIRDER	9	125.000	123.000	124.50	-0.0039

GIRDER REPORT, SPAN 5

		HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG (2)	GIRDER SLOPE
GIRDER	1	125.000	123.000	124.50	-0.0039
GIRDER	2	125.000	123.000	124.50	-0.0039
GIRDER	3	125.000	123.000	124.50	-0.0039
GIRDER	4	125.000	123.000	124.50	-0.0039
GIRDER	5	125.000	123.000	124.50	-0.0039
GIRDER	6	125.000	123.000	124.50	-0.0039
GIRDER	7	125.000	123.000	124.50	-0.0039
GIRDER	8	125.000	123.000	124.50	-0.0039
GIRDER	9	125.000	123.000	124.50	-0.0039

GIRDER REPORT, SPAN 6

		HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG (2)	GIRDER SLOPE
GIRDER	1	120.000	118.000	119.50	-0.0039
GIRDER	2	120.000	118.000	119.50	-0.0039
GIRDER	3	120.000	118.000	119.50	-0.0039
GIRDER	4	120.000	118.000	119.50	-0.0039
GIRDER	5	120.000	118.000	119.50	-0.0039
GIRDER	6	120.000	118.000	119.50	-0.0039
GIRDER	7	120.000	118.000	119.50	-0.0039
GIRDER	8	120.000	118.000	119.50	-0.0039
GIRDER	9	120.000	118.000	119.50	-0.0039

Notes:

(1) See Standard IGEB for orientation of dimension, girder end and bearing details.

(2) Girder lengths shown are bottom girder flange lengths with adjustment made for girder slope.

TABLE OF ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY SPAN 4	SPAN 5	SPAN 6
PRESTRESSED CONCRETE GIRDER Tx54	LF	1,121	1,121	1,076

STATE OF TEXAS
WEIHUA WANG
105644
LICENSED PROFESSIONAL ENGINEER

02.03.2022

HL93 LOADING

Texas Department of Transportation ®2018

Houston District (Bridge)

FRAMING PLAN

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

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©TxDOT $DATES	CONT.	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		95

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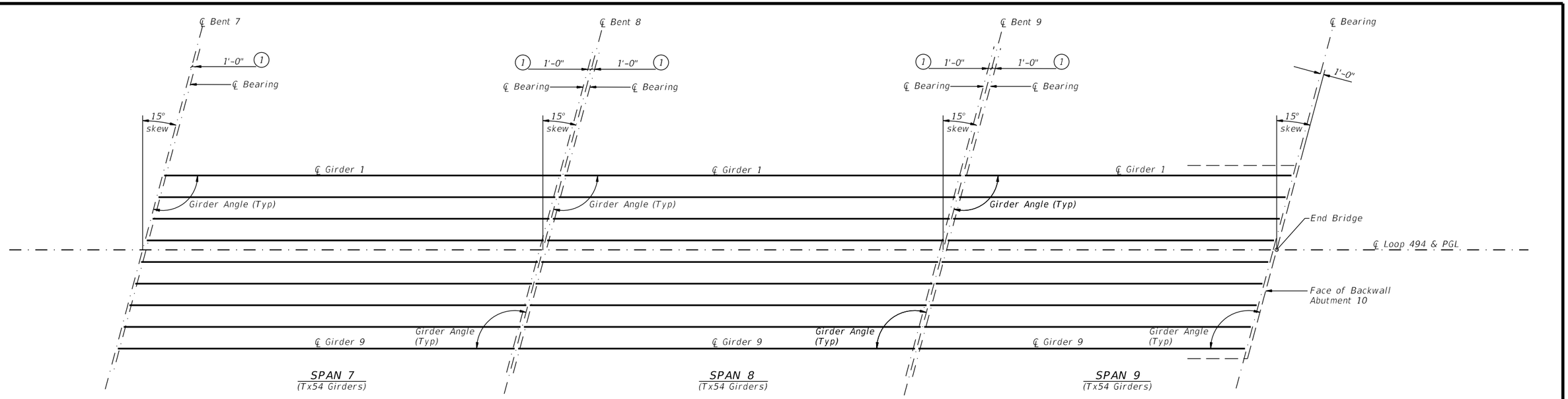

UNIT 3

BENT REPORT

BENT NO. 7 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 7	GIRD 1	0.000	75	0	0
	GIRD 2	6.712	75	0	0
	GIRD 3	6.712	75	0	0
	GIRD 4	6.712	75	0	0
	GIRD 5	6.712	75	0	0
	GIRD 6	6.712	75	0	0
	GIRD 7	6.712	75	0	0
	GIRD 8	6.712	75	0	0
	GIRD 9	6.712	75	0	0
	TOTAL	53.700			

BENT NO. 8 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 7	GIRD 1	0.000	75	0	0
	GIRD 2	6.712	75	0	0
	GIRD 3	6.712	75	0	0
	GIRD 4	6.712	75	0	0
	GIRD 5	6.712	75	0	0
	GIRD 6	6.712	75	0	0
	GIRD 7	6.712	75	0	0
	GIRD 8	6.712	75	0	0
	GIRD 9	6.712	75	0	0
	TOTAL	53.700			

BENT NO. 8 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 8	GIRD 1	0.000	75	0	0
	GIRD 2	6.712	75	0	0
	GIRD 3	6.712	75	0	0
	GIRD 4	6.712	75	0	0
	GIRD 5	6.712	75	0	0
	GIRD 6	6.712	75	0	0
	GIRD 7	6.712	75	0	0
	GIRD 8	6.712	75	0	0
	GIRD 9	6.712	75	0	0
	TOTAL	53.700			

BENT REPORT

BENT NO. 9 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 8	GIRD 1	0.000	75	0	0
	GIRD 2	6.712	75	0	0
	GIRD 3	6.712	75	0	0
	GIRD 4	6.712	75	0	0
	GIRD 5	6.712	75	0	0
	GIRD 6	6.712	75	0	0
	GIRD 7	6.712	75	0	0
	GIRD 8	6.712	75	0	0
	GIRD 9	6.712	75	0	0
	TOTAL	53.700			

BENT NO. 9 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 9	GIRD 1	0.000	75	0	0
	GIRD 2	6.712	75	0	0
	GIRD 3	6.712	75	0	0
	GIRD 4	6.712	75	0	0
	GIRD 5	6.712	75	0	0
	GIRD 6	6.712	75	0	0
	GIRD 7	6.712	75	0	0
	GIRD 8	6.712	75	0	0
	GIRD 9	6.712	75	0	0
	TOTAL	53.700			

ABUT NO. 10 (N 60 53 18.97 W)
DISTANCE BETWEEN STATION LINE AND GIRD 1, 23.076 L

		GIRD SPAC. (C.L. BENT)	GIRD ANGLE D	M	S
SPAN 9	GIRD 1	0.000	75	0	0
	GIRD 2	6.712	75	0	0
	GIRD 3	6.712	75	0	0
	GIRD 4	6.712	75	0	0
	GIRD 5	6.712	75	0	0
	GIRD 6	6.712	75	0	0
	GIRD 7	6.712	75	0	0
	GIRD 8	6.712	75	0	0
	GIRD 9	6.712	75	0	0
	TOTAL	53.700			

GIRDER REPORT

GIRDER REPORT, SPAN 7

	C-C BENT	HORIZONTAL DISTANCE C-C BRG.	TRUE DISTANCE BOT. BM. FLG. (2)	GIRDER SLOPE
GIRDER 1	120.000	118.000	119.50	-0.0039
GIRDER 2	120.000	118.000	119.50	-0.0039
GIRDER 3	120.000	118.000	119.50	-0.0039
GIRDER 4	120.000	118.000	119.50	-0.0039
GIRDER 5	120.000	118.000	119.50	-0.0039
GIRDER 6	120.000	118.000	119.50	-0.0039
GIRDER 7	120.000	118.000	119.50	-0.0039
GIRDER 8	120.000	118.000	119.50	-0.0039
GIRDER 9	120.000	118.000	119.50	-0.0039

GIRDER REPORT, SPAN 8

	C-C BENT	HORIZONTAL DISTANCE C-C BRG.	TRUE DISTANCE BOT. BM. FLG. (2)	GIRDER SLOPE
GIRDER 1	120.000	118.000	119.50	-0.0039
GIRDER 2	120.000	118.000	119.50	-0.0039
GIRDER 3	120.000	118.000	119.50	-0.0039
GIRDER 4	120.000	118.000	119.50	-0.0039
GIRDER 5	120.000	118.000	119.50	-0.0039
GIRDER 6	120.000	118.000	119.50	-0.0039
GIRDER 7	120.000	118.000	119.50	-0.0039
GIRDER 8	120.000	118.000	119.50	-0.0039
GIRDER 9	120.000	118.000	119.50	-0.0039

GIRDER REPORT, SPAN 9

	C-C BENT (3)	HORIZONTAL DISTANCE C-C BRG.	TRUE DISTANCE BOT. BM. FLG. (2)	GIRDER SLOPE
GIRDER 1	100.000	97.965	99.49	-0.0039
GIRDER 2	100.000	97.965	99.49	-0.0039
GIRDER 3	100.000	97.965	99.49	-0.0039
GIRDER 4	100.000	97.965	99.49	-0.0039
GIRDER 5	100.000	97.965	99.49	-0.0039
GIRDER 6	100.000	97.965	99.49	-0.0039
GIRDER 7	100.000	97.965	99.49	-0.0039
GIRDER 8	100.000	97.965	99.49	-0.0039
GIRDER 9	100.000	97.965	99.49	-0.0039

Notes:

1. See Standard IGEB for orientation of dimension, girder end and bearing details.
2. Girder lengths shown are bottom girder flange lengths with adjustment made for girder slope.
3. Dimensions shown along "℄ Bent" on Bent Reports are referenced along face of backwall at abutments. Dimensions shown between "℄ Bents" on Girder Reports are referenced from face of backwall at abutments.

TABLE OF ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY SPAN 7	SPAN 8	SPAN 9
PRESTRESSED CONCRETE GIRDER Tx54	LF	1,076	1,076	895

STATE OF TEXAS
WEIHUA WANG
105644
LICENSED PROFESSIONAL ENGINEER

02.25.2022

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SHEET 3 OF 3

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FRAMING PLAN

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

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	HOU	MONTGOMERY		96

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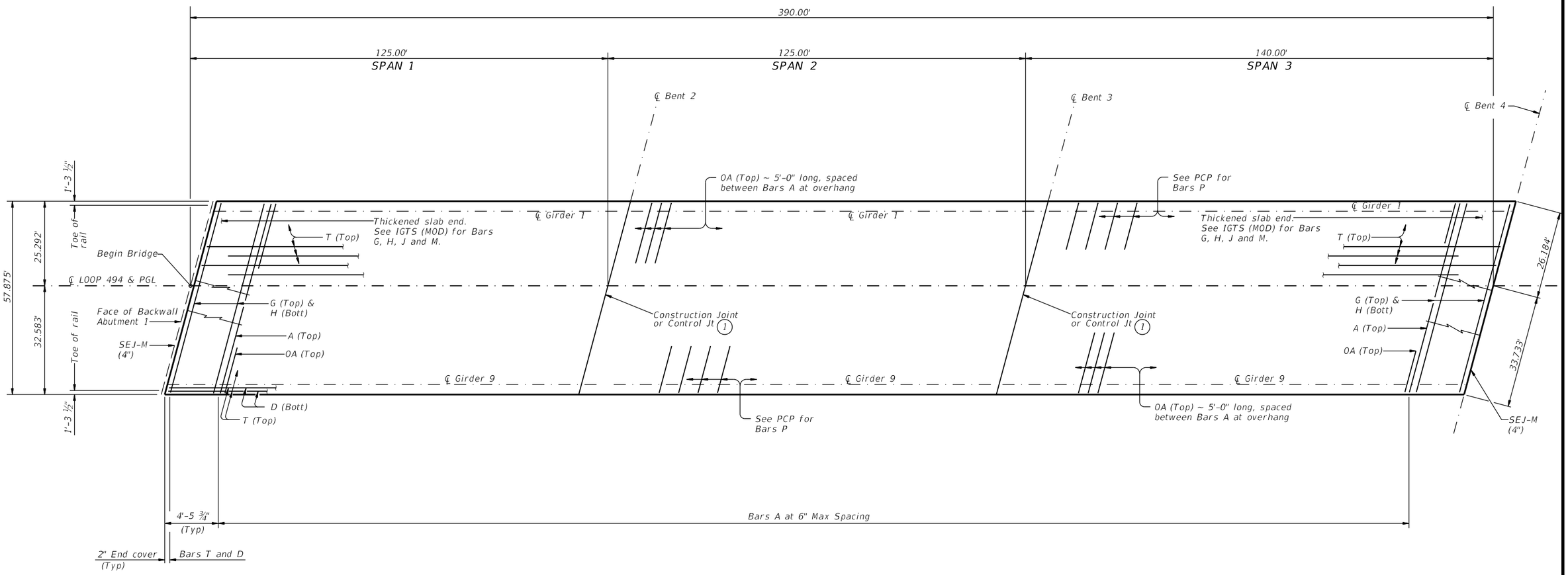

UNIT 1

Notes:

(1) See IGCS (MOD) Standard For Continuous Slab Details
See PCP Standard For Other Details.

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SLAB PLAN

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

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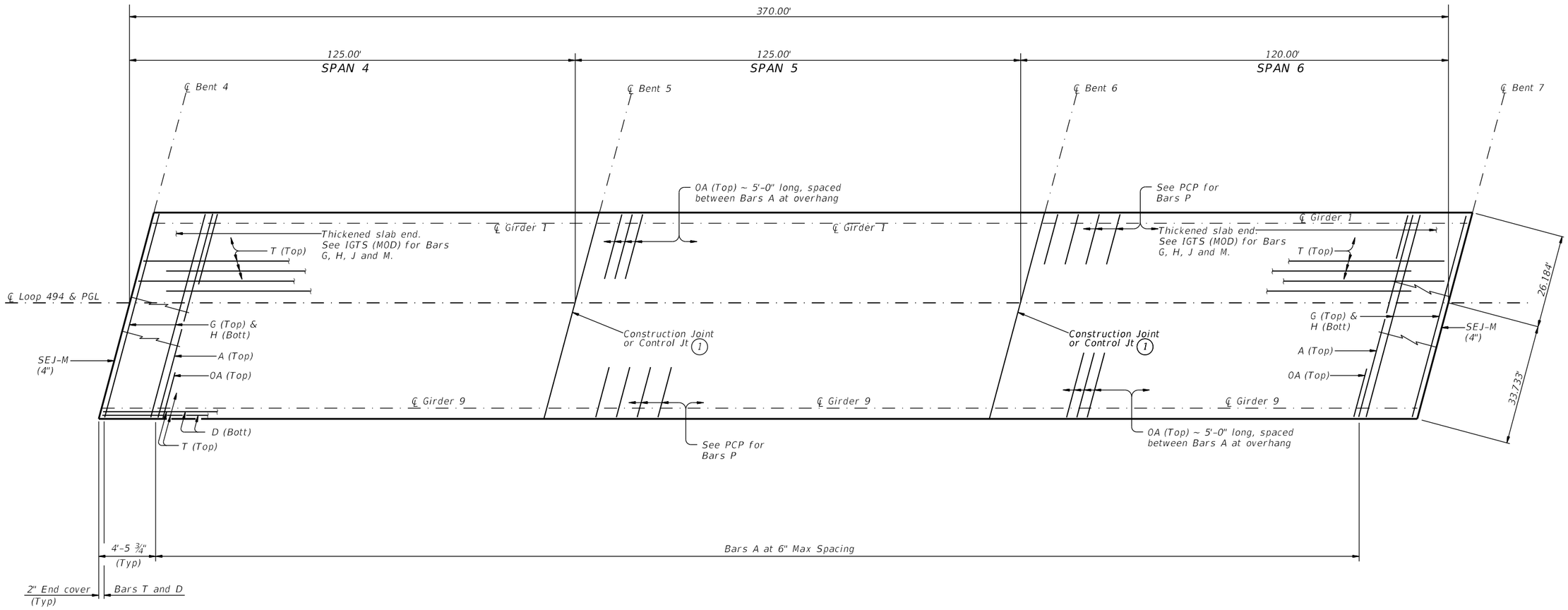

UNIT 2

Notes:

(1) See IGCS (MOD) Standard For Continuous Slab Details
See PCP Standard For Other Details.

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SLAB PLAN

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

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	HOU	MONTGOMERY		98

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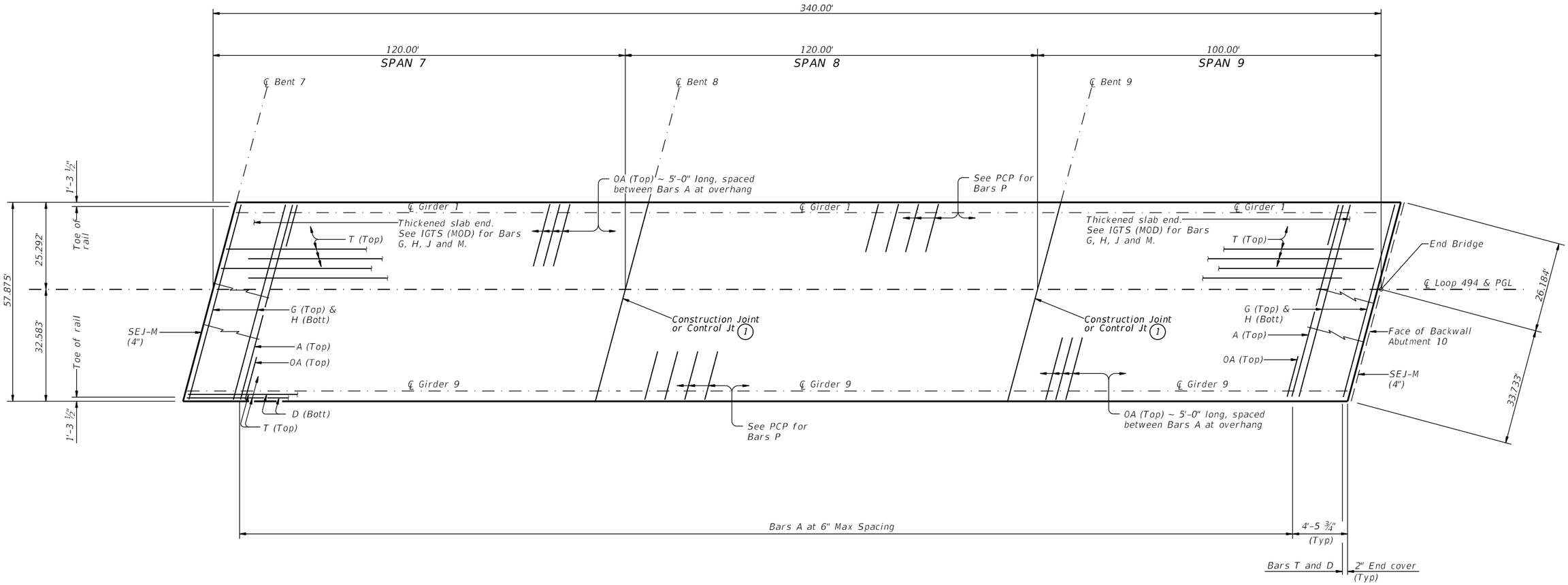

UNIT 3

HL93 LOADING

SHEET 3 OF 3

Notes:

(1) See IGCS (MOD) Standard For Continuous Slab Details
See PCP Standard For Other Details.

STATE OF TEXAS
WEIHUA WANG
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02.03.2022

Texas Department of Transportation

Houston District (Bridge)

SLAB PLAN

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

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	HOU	MONTGOMERY		99

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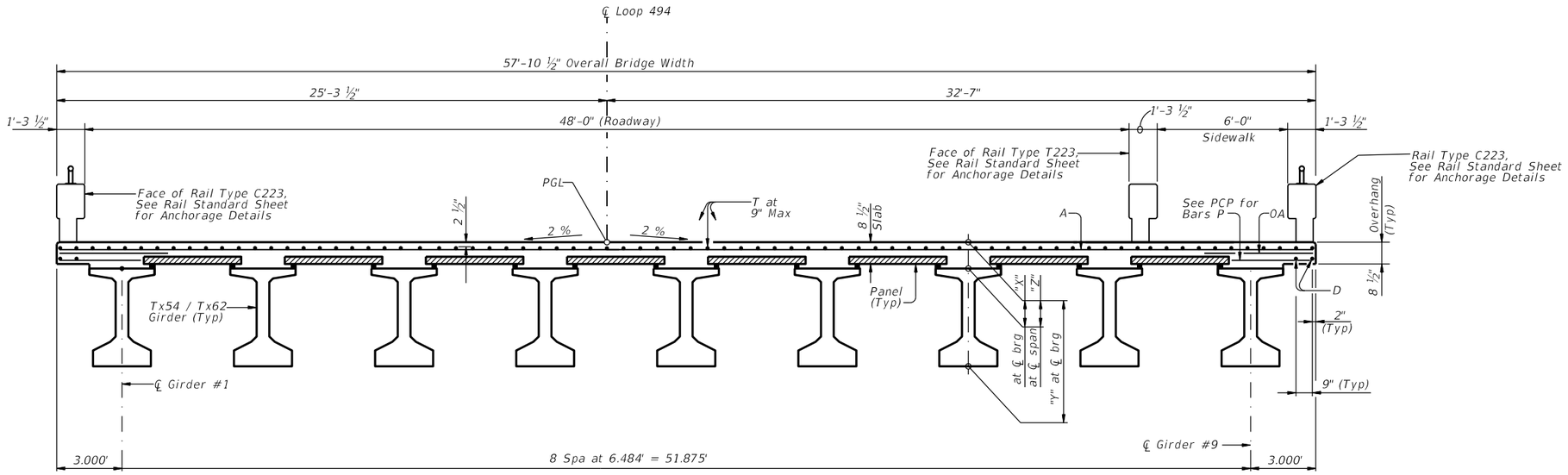
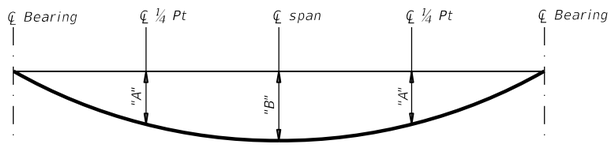


TYPICAL TRANSVERSE SECTION

(Showing girder type Tx54 at Spans 1,2, & 4 thru 9)
(Showing girder type Tx62 at Span 3)



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

ITEM	UNIT	QUANTITY
Reinf Conc Slab	SF	63,660
Reinf Steel	LB	146,418

Reinforcing steel weight is calculated using an approximate factor of 2.3 Lbs/SF and is for Contractor's information only. No Direct Payment.

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

GENERAL NOTES:

- Designed According To AASHTO LRFD Bridge Design Specifications.
- See PCP And PCP-FAB For Panel Details Not Shown.
- See IGTS Standard For Thickened Slab End Details And Quantity Adjustments
- See IGMS Standard For Miscellaneous Details
- See PMDF Standard For Details And Quantity Adjustments If This Options Is Used.

Cover Dimensions Are Clear Dimensions, Unless Noted Otherwise.

MATERIAL NOTES:

- Provide Class S concrete (f'c = 4,000 psi).
- Provide Grade 60 Reinforcing Steel.
- Provide Bar Laps, Where Required, As Follows: Uncoated ~ #4 = 1'-7", #5 = 2'-0"
- 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. Provide The Same Laps As Required For Reinforcing Bars.

HL93 LOADING

SHEET 1 OF 2

STATE OF TEXAS
WEIHUA WANG
105644
LICENSED PROFESSIONAL ENGINEER

02.03.2022

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Houston District (Bridge)

SLAB DETAILS

SL 494 AT CANEY CREEK
BRIDGE REPLACEMENT

FILE: $FILE$	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		100

DATE: $DATE$
FILE: pw:\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\017714039\4 - Design\Bridge\Loop494\Loop494 Slab Dtls1.dgn

TABLE OF SECTION DEPTHS

Span	Girder	SECTION DEPTHS		
		"X"	"Y"	"Z" *
1	1 - 9	11 1/4"	5' - 5 1/4"	9 5/8"
2	1 - 9	11 1/4"	5' - 5 1/4"	9 5/8"
3	1 - 9	10 1/2"	6' - 0 1/2"	11 3/8"
4	1 - 9	11 1/4"	5' - 5 1/4"	9 5/8"
5	1 - 9	11 1/4"	5' - 5 1/4"	9 5/8"
6	1 - 9	11 1/4"	5' - 5 1/4"	9 1/2"
7	1 - 9	11 1/4"	5' - 5 1/4"	9 1/2"
8	1 - 9	11 1/4"	5' - 5 1/4"	9 1/2"
9	1 - 9	10 3/4"	5' - 4 3/4"	9 1/2"

* Theoretical dimension

TABLE OF DEAD LOAD DEFLECTIONS

SPAN NO.	GIRDER NO.	"A"* (Feet)	"B"* (Feet)
1	1	0.135	0.189
1	2	0.140	0.197
1	3	0.140	0.197
1	4	0.140	0.197
1	5	0.140	0.197
1	6	0.140	0.197
1	7	0.140	0.197
1	8	0.140	0.197
1	9	0.136	0.190
2	1	0.135	0.189
2	2	0.140	0.197
2	3	0.140	0.197
2	4	0.140	0.197
2	5	0.140	0.197
2	6	0.140	0.197
2	7	0.140	0.197
2	8	0.140	0.197
2	9	0.136	0.190
3	1	0.138	0.194
3	2	0.144	0.202
3	3	0.144	0.202
3	4	0.144	0.202
3	5	0.144	0.202
3	6	0.144	0.202
3	7	0.144	0.202
3	8	0.144	0.202
3	9	0.139	0.195
4	1	0.135	0.189
4	2	0.140	0.197
4	3	0.140	0.197
4	4	0.140	0.197
4	5	0.140	0.197
4	6	0.140	0.197
4	7	0.140	0.197
4	8	0.140	0.197
4	9	0.136	0.190
5	1	0.135	0.189
5	2	0.140	0.197
5	3	0.140	0.197
5	4	0.140	0.197
5	5	0.140	0.197
5	6	0.140	0.197
5	7	0.140	0.197
5	8	0.140	0.197
5	9	0.136	0.190

* Theoretical dimension

TABLE OF DEAD LOAD DEFLECTIONS

SPAN NO.	GIRDER NO.	"A"* (Feet)	"B"* (Feet)
6	1	0.114	0.160
6	2	0.119	0.167
6	3	0.119	0.167
6	4	0.119	0.167
6	5	0.119	0.167
6	6	0.119	0.167
6	7	0.119	0.167
6	8	0.119	0.167
6	9	0.115	0.161
7	1	0.114	0.160
7	2	0.119	0.167
7	3	0.119	0.167
7	4	0.119	0.167
7	5	0.119	0.167
7	6	0.119	0.167
7	7	0.119	0.167
7	8	0.119	0.167
7	9	0.115	0.161
8	1	0.114	0.160
8	2	0.119	0.167
8	3	0.119	0.167
8	4	0.119	0.167
8	5	0.119	0.167
8	6	0.119	0.167
8	7	0.119	0.167
8	8	0.119	0.167
8	9	0.115	0.161
9	1	0.054	0.076
9	2	0.057	0.079
9	3	0.057	0.079
9	4	0.057	0.079
9	5	0.057	0.079
9	6	0.057	0.079
9	7	0.057	0.079
9	8	0.057	0.079
9	9	0.055	0.077

* Theoretical dimension

STATE OF TEXAS
WEIHUA WANG
105644
LICENSED
PROFESSIONAL ENGINEER

02.03.2022

HL93 LOADING

Texas Department of Transportation ®2018

Houston District (Bridge)

SLAB DETAILS

SL 494 AT CANEY CREEK BRIDGE REPLACEMENT

FILE: $FILE$	DN: WW	CK: HM	DW: GB	CK: WW
©TxDOT $DATE$	CONT.	SECT.	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST.	COUNTY		SHEET NO.
	HOU	MONTGOMERY		101

DATE: $DATE$
FILE: pw:\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\0177140394 - Design\Bridge\Loop494\Loop494 Slab Dtls2.dgn

DATE:
FILE:

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN				
	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)	
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)								Moment	Shear
LOOP 494 AT CANEY CREEK BRIDGE REPLACEMENT	1	1-9	Tx54		40	0.6	270	19.11	12.51	6	50.5	5.300	6.700	4.427	-4.255	8027	0.542	0.740
	2	1-9	Tx54		40	0.6	270	19.11	12.51	6	50.5	5.300	6.700	4.428	-4.255	8027	0.542	0.740
	3	1-9	Tx62		46	0.6	270	23.43	15.08	8	56.5	5.600	6.800	4.473	-4.521	10394	0.542	0.738
	4	1-9	Tx54		40	0.6	270	19.11	12.51	6	50.5	5.300	6.700	4.428	-4.255	8029	0.542	0.740
	5	1-9	Tx54		40	0.6	270	19.11	12.51	6	50.5	5.300	6.700	4.427	-4.255	8027	0.542	0.740
	6	1-9	Tx54		38	0.6	270	19.22	12.27	6	50.5	5.000	6.000	4.090	-3.949	7492	0.542	0.739
	7	1-9	Tx54		38	0.6	270	19.22	12.27	6	50.5	5.000	6.000	4.090	-3.949	7492	0.542	0.739
	8	1-9	Tx54		38	0.6	270	19.22	12.27	6	50.5	5.000	6.000	4.090	-3.949	7492	0.542	0.739
	9	1-9	Tx54		24	0.6	270	20.17	18.17	4	16.5	4.000	5.000	2.863	-2.827	5548	0.564	0.737

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.

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.

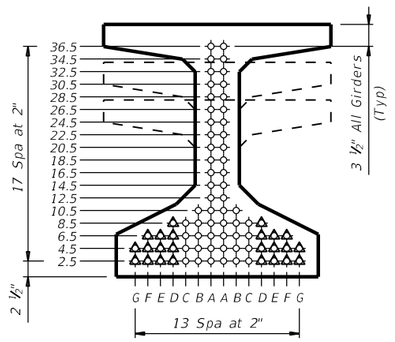
Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked Δ. Double wrap full-length debonded strands in outer most position of each row.

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

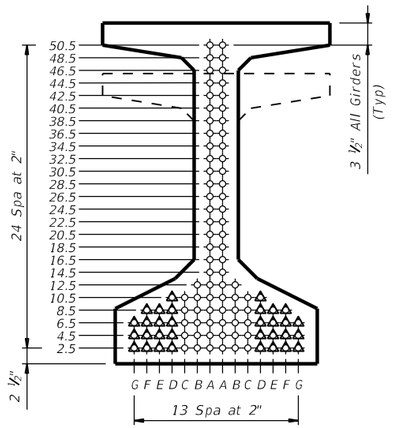
Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must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

DEPRESSED STRAND DESIGNS:

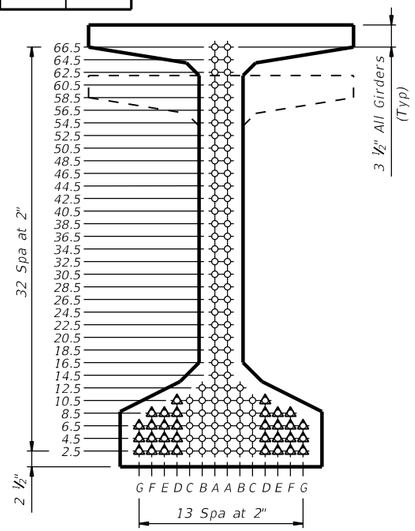
Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands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



TYPE Tx28, Tx34 & Tx40



TYPE Tx46 & Tx54



TYPE Tx62 & Tx70

HL93 LOADING

STATE OF TEXAS
WEIHUA WANG
105644
PROFESSIONAL ENGINEER

02.03.2022

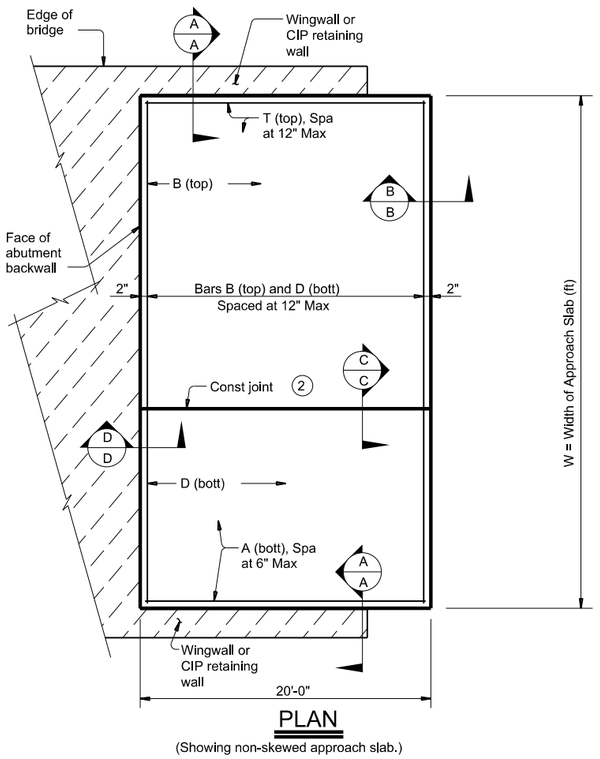
Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DESIGNS
(NON-STANDARD SPANS)
SL 494 AT CANEY CREEK BRIDGE REPLACEMENT
IGND

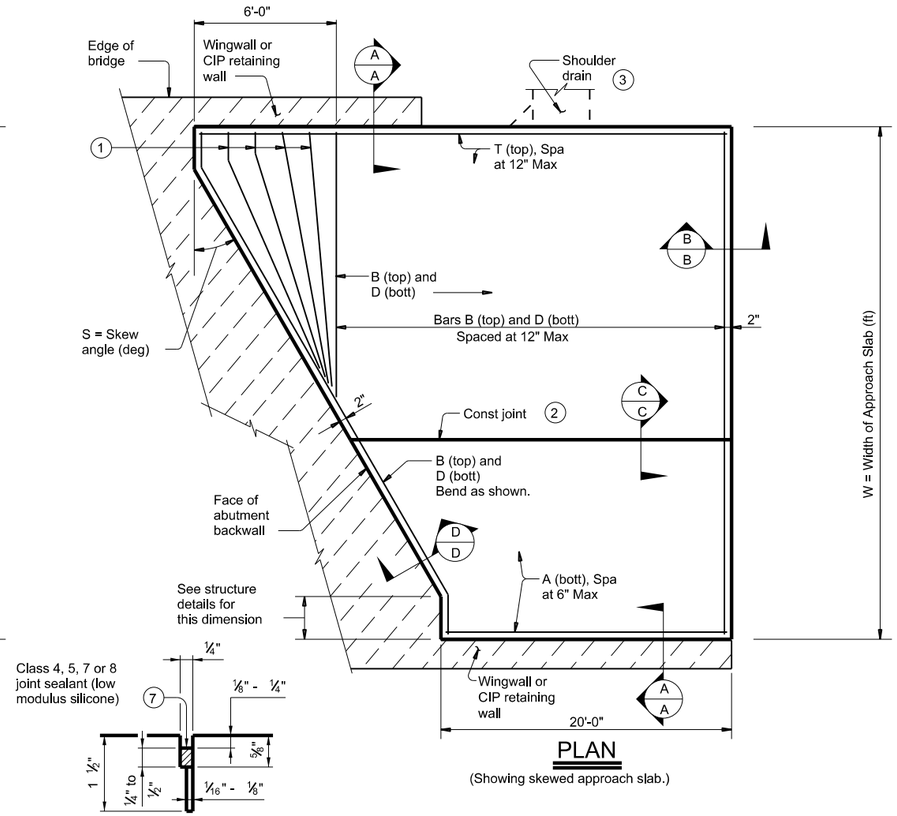
FILE: Loop494_ignd.dgn	DN: TxDOT	CK: TxDOT	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
10-19: Modified for depressed strands only.	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		102

DATE:
FILE:



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 + 0.02W² Tan S

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

(1) Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.

(2) Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.

(3) See details elsewhere in plans for shoulder drain location and details.

(4) For Contractor's information only. Quantities shown are for one approach slab.

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

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

(7) Place in accordance with Item 438.

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

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

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

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

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 ½" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 ½" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

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

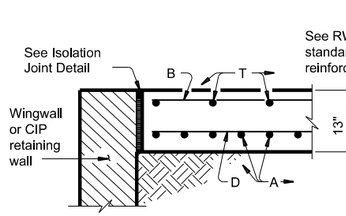
Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

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

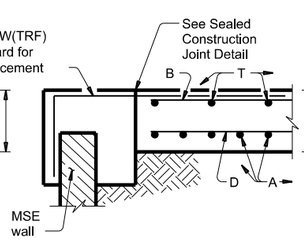
Cure for 4 days using water or membrane curing per Item 422.

All details shown herein are subsidiary to bridge approach slab.

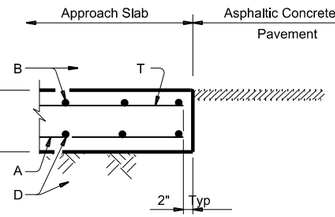
Cover dimensions are clear dimensions, unless noted otherwise.

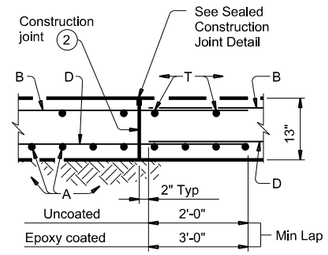


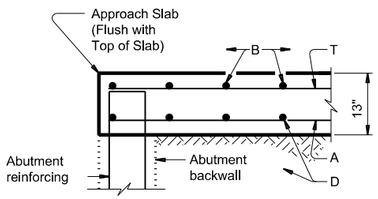
SHOWING WINGWALL OR CIP RETAINING WALL



SHOWING MSE WALL





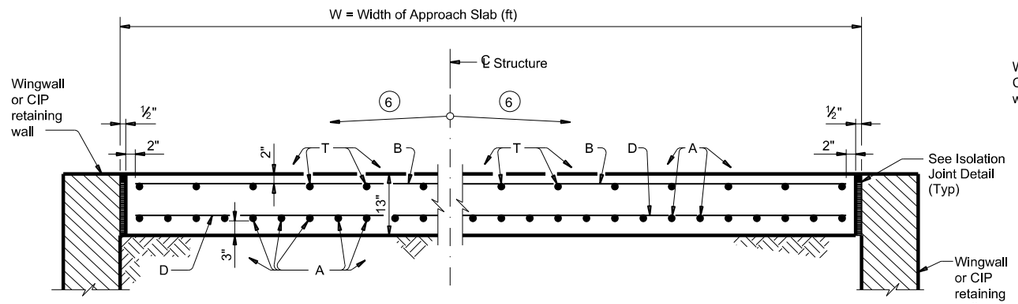


SECTION A-A

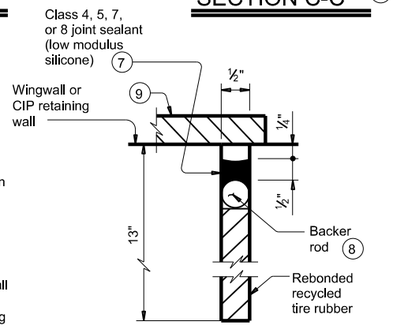
SECTION B-B

SECTION C-C (5)

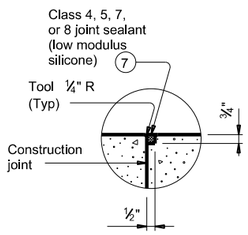
SECTION D-D



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

Texas Department of Transportation

Bridge Division Standard

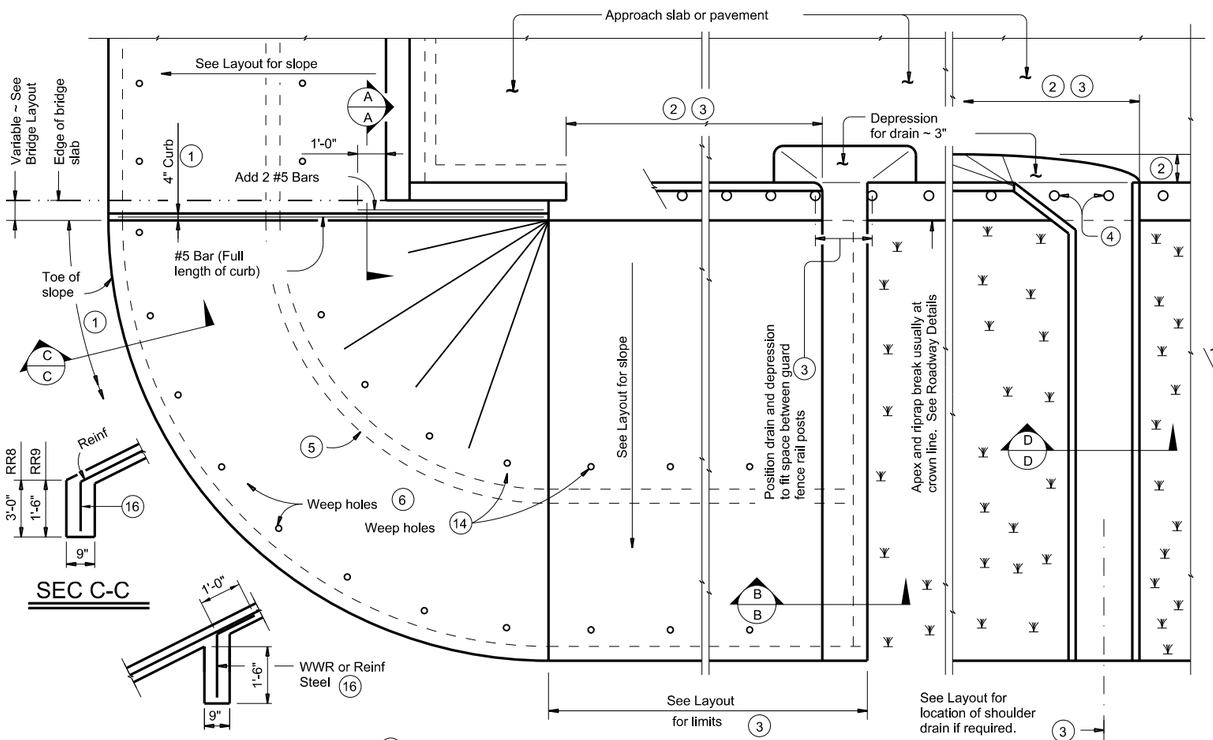
BRIDGE APPROACH SLAB

ASPHALTIC CONCRETE PAVEMENT

BAS-A

FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		103

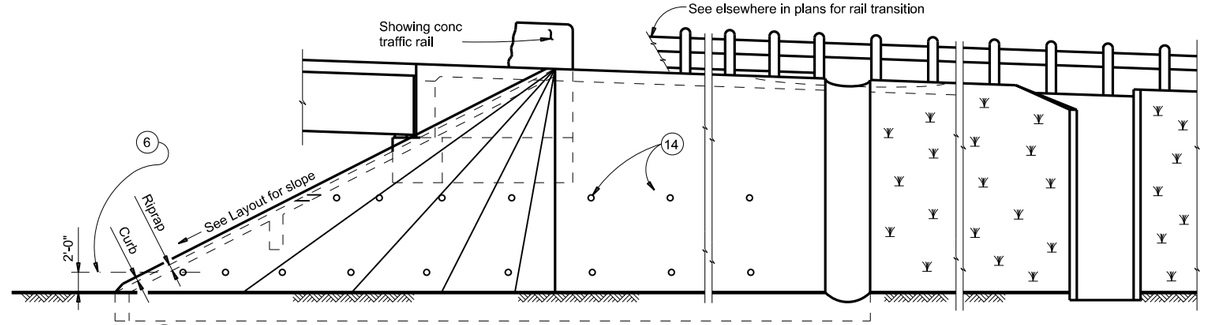
DATE:
FILE:



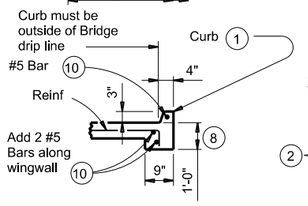
PLAN

SEC C-C

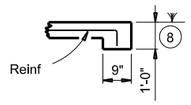
INTERMEDIATE TOEWALL (5)



ELEVATION

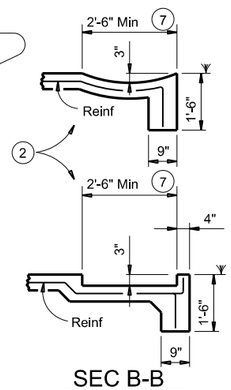


SEC A-A



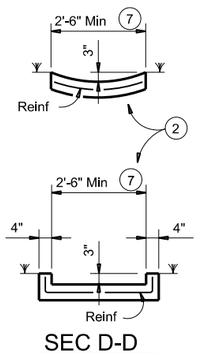
SEC B-B

(No drain)



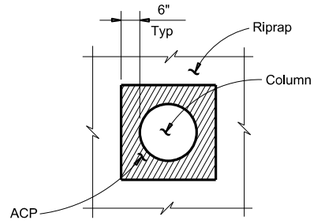
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

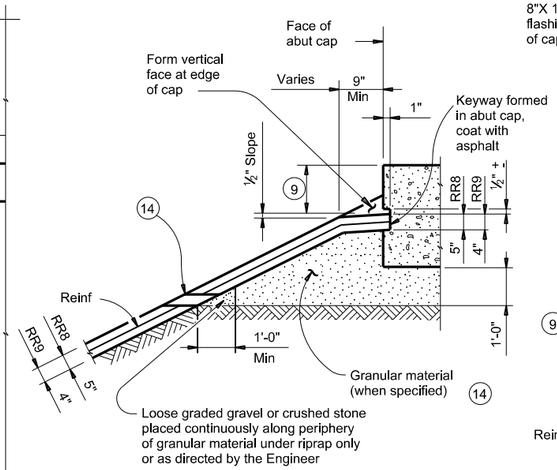
(Shoulder drain)



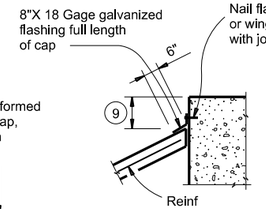
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

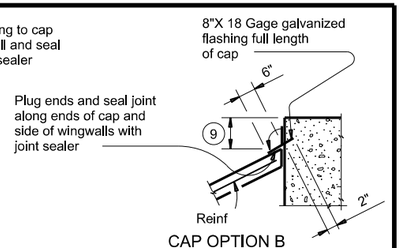
(As directed by the Engineer)



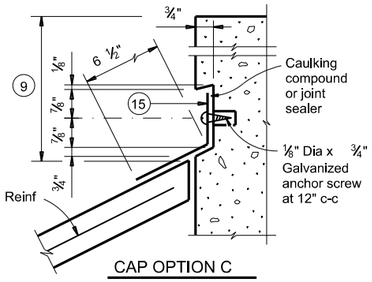
SHOWING KEYWAY OPTION



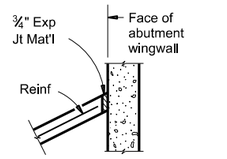
CAP OPTION A



CAP OPTION B

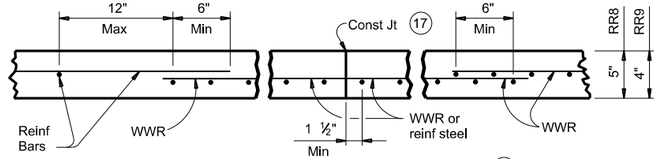


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

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

Provide Grade 60 reinforcing steel.

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

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

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

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

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

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

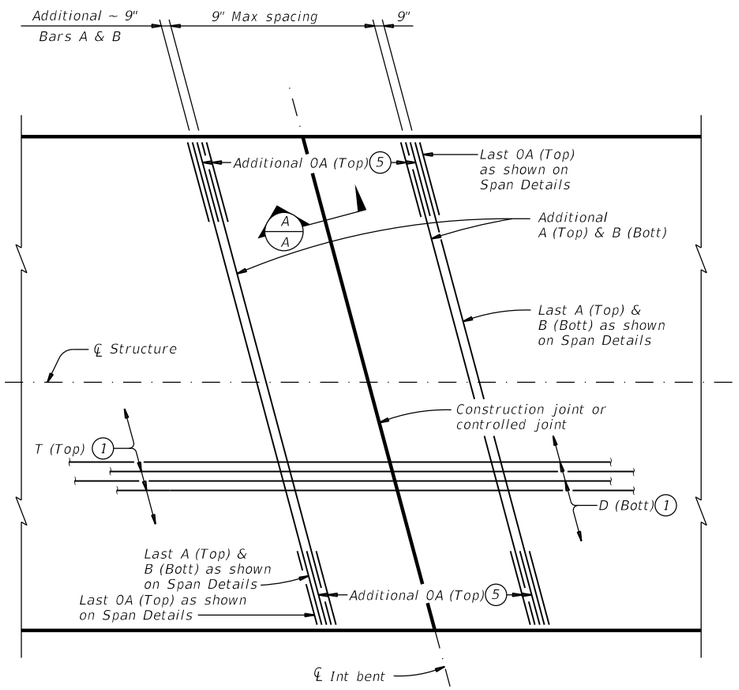
CRR

FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		104

DATE:
FILE:

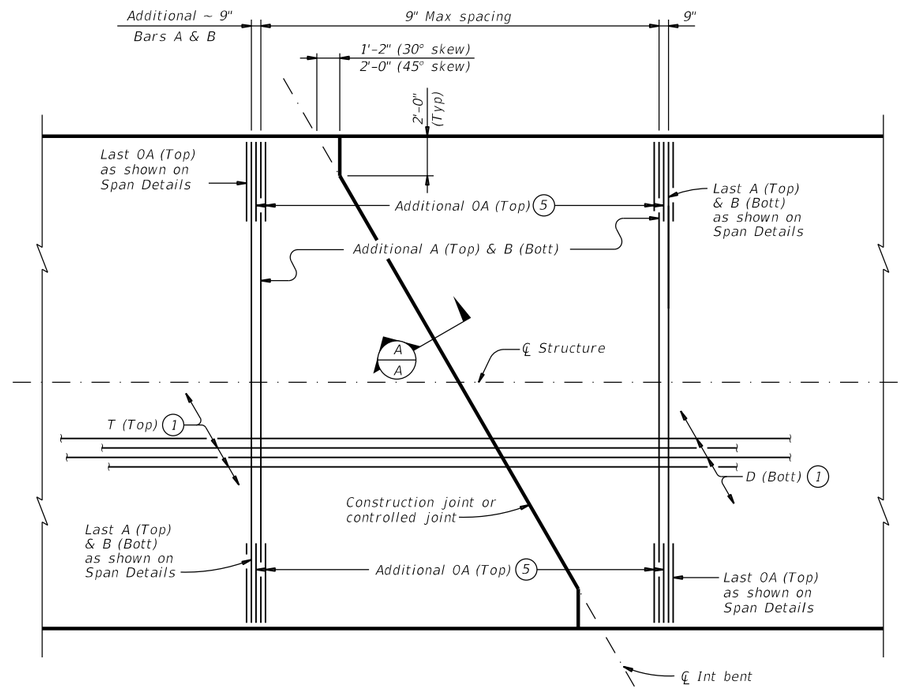
BAR TABLE

BAR	SIZE
A	#4
B	#4
D	#4
T	#4
0A	#5



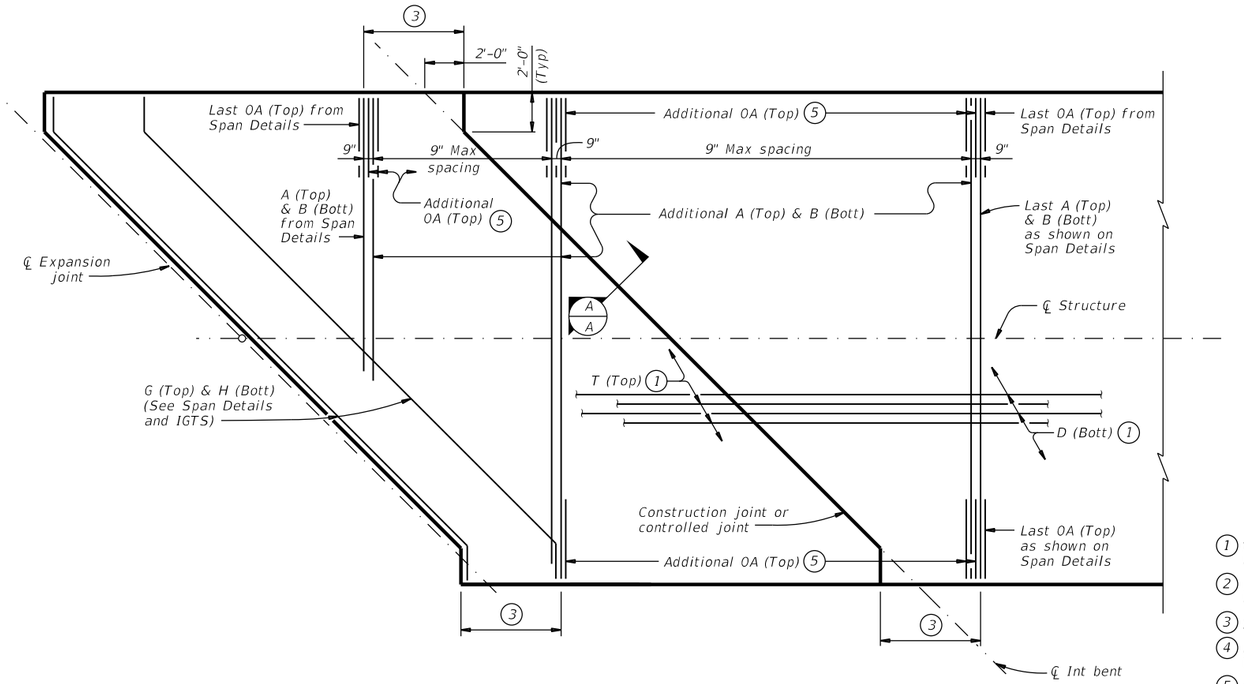
PLAN FOR 0° OR 15° SKEW

(Showing 15° skew)



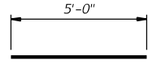
PLAN FOR 30° OR 45° SKEW

(Showing 30° skew)

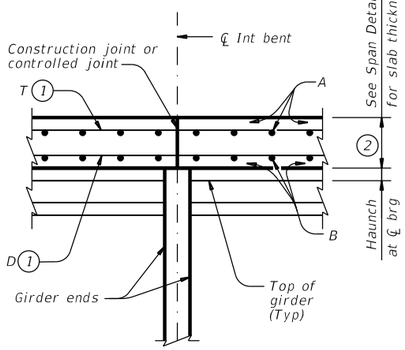


PLAN FOR 45° SKEW 4

(Showing short span condition.)



BARS 0A (#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).

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"

HL93 LOADING

STATE OF TEXAS
WEIHUA WANG
105644
LICENSED PROFESSIONAL ENGINEER

02.03.2022

Texas Department of Transportation

Bridge Division Standard

CONTINUOUS SLAB DETAILS

PRESTR CONC I-GIRDER SPANS

IGCS(MOD)

FILE: igcs1sts-19.dgn	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
~~10-19: Added bubble note 6.~~	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		105

DATE:
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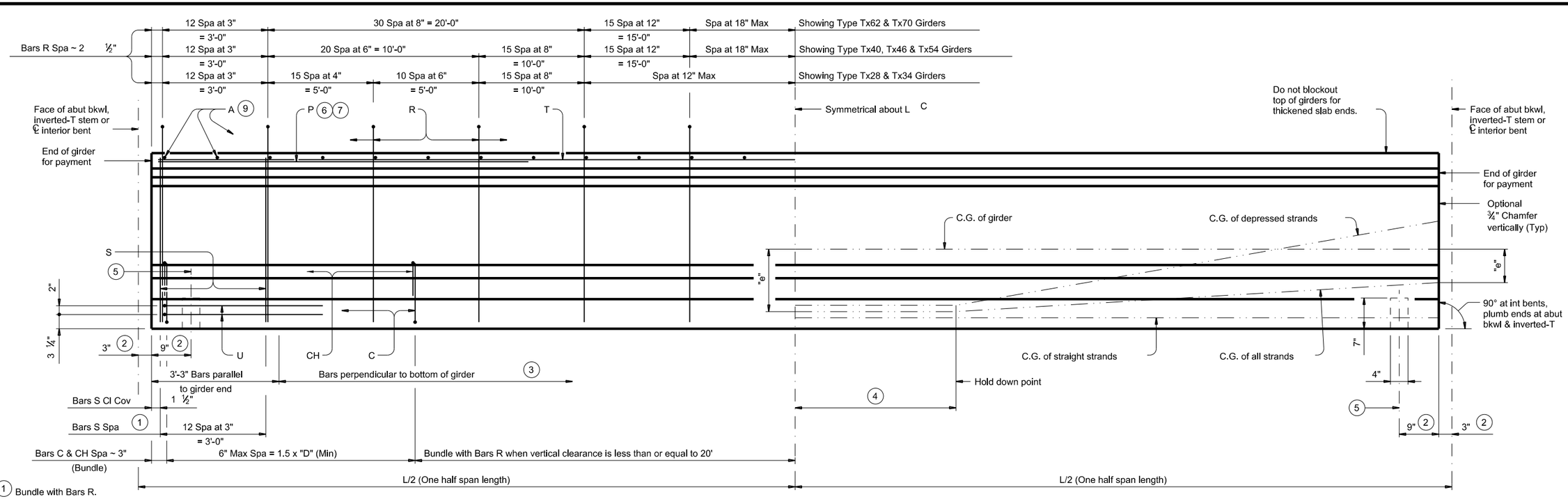
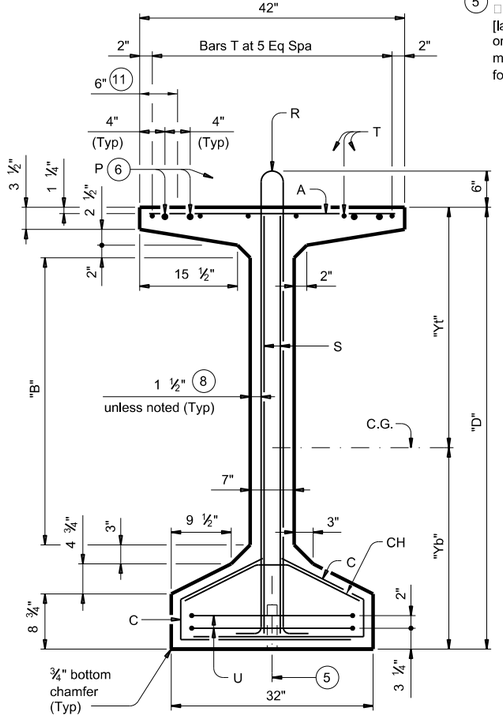


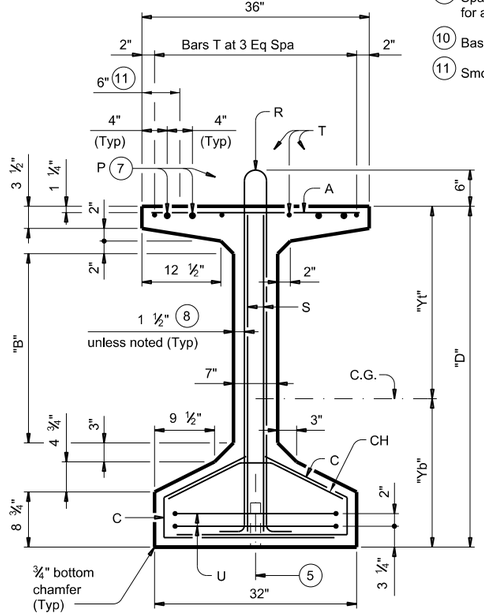
1. Bundle with Bars R.
2. Measured along ℄ Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.
3. The average of the top and bottom spacing of Bars R cannot exceed the required spacing.
4. L/20, but not less than 5'-0" (-0,+2').
5. ▭ 4" x 1 ½" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

GIRDER ELEVATION

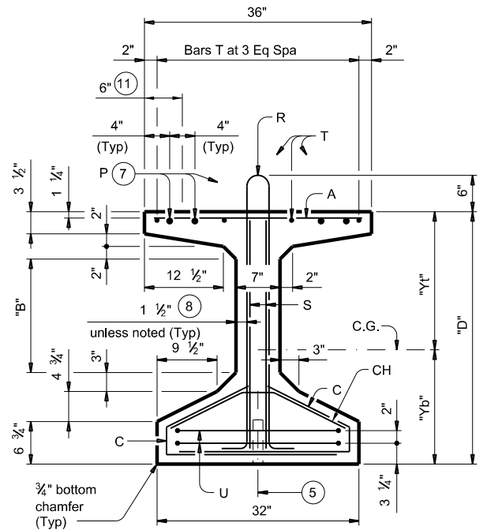
6. Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
7. Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
8. 1 ⅜" Clear Cover to Bars S.
9. Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".
10. Based on 155 pcf total weight of concrete and reinforcing steel.
11. Smooth trowel finish on the slab overhang side of exterior girder.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GIRDER DIMENSIONS AND SECTION PROPERTIES

Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.²)	"Ix" (in.⁴)	"Iy" (in.⁴)	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 ½"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 ½"	38.09	31.91	966	628,747	57,579	1,040

GENERAL NOTES:

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

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

HL93 LOADING SHEET 1 OF 2

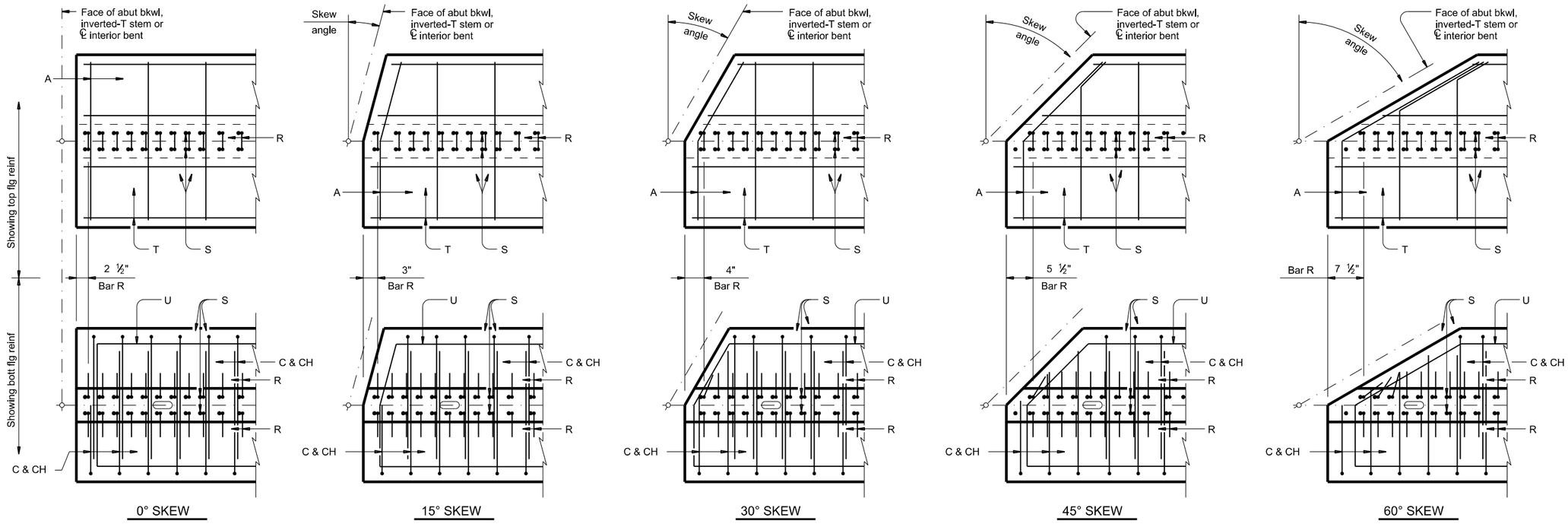
Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

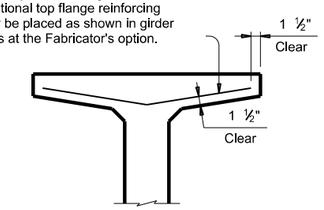
FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
10-19: Added Bars C and CH full length for VC<= 20'	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		106

DATE:
FILE:

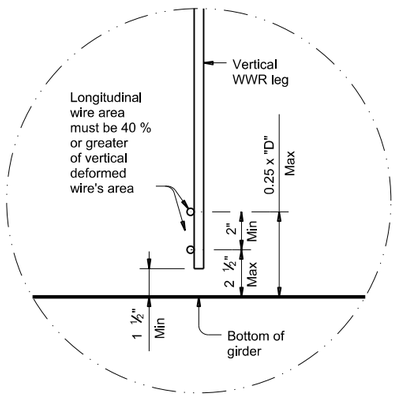


PLAN OF GIRDER ENDS (12)

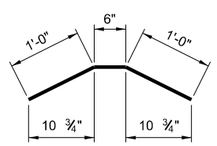
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



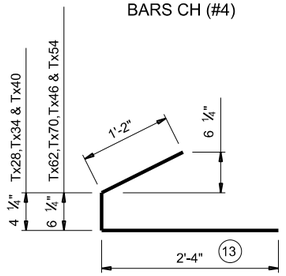
OPTIONAL TOP FLANGE REINFORCING DETAIL



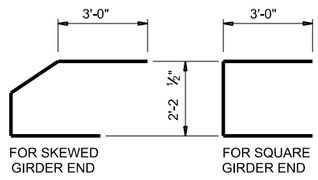
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



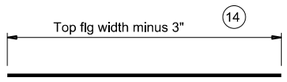
BARS CH (#4)



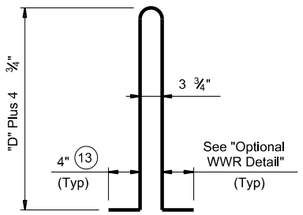
BARS C (#4)



BARS U (#5)

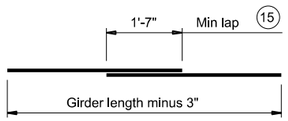


BARS A (#3)



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
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REVISIONS	0177	14	039	SL 494
10-19: Added Bars C and CH full length for VC<= 20'	DIST	COUNTY		SHEET NO.
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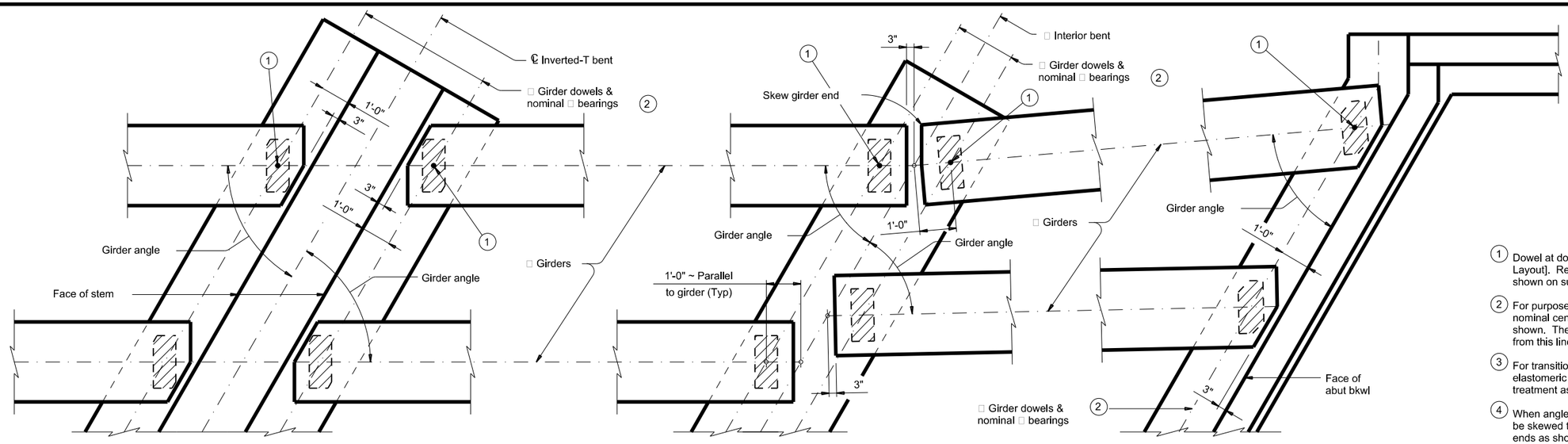
DATE:
FILE:



AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW (3)

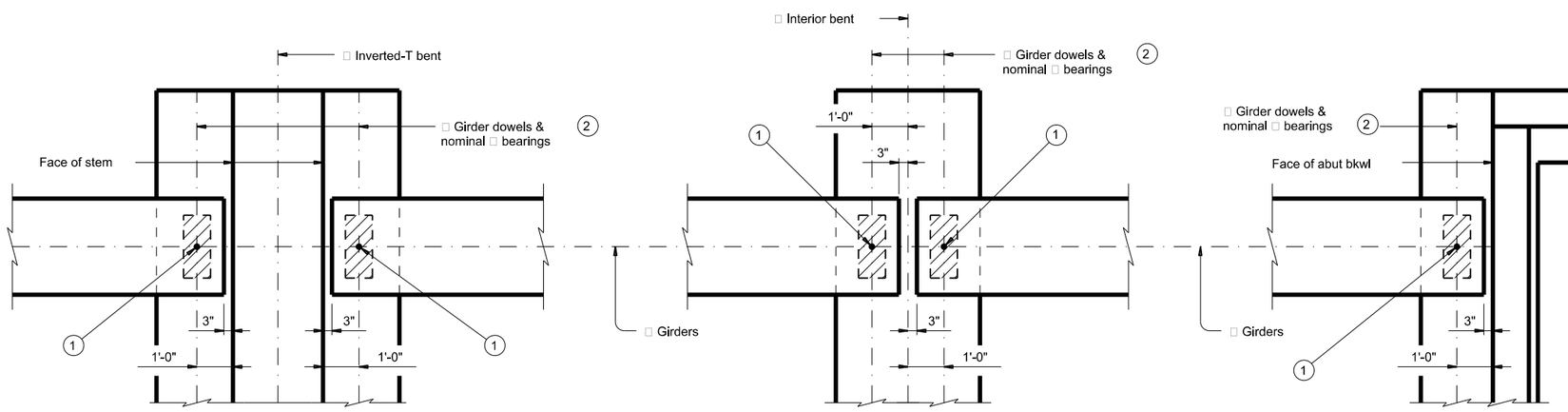
(1) Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

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

(4) When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.

(5) See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.

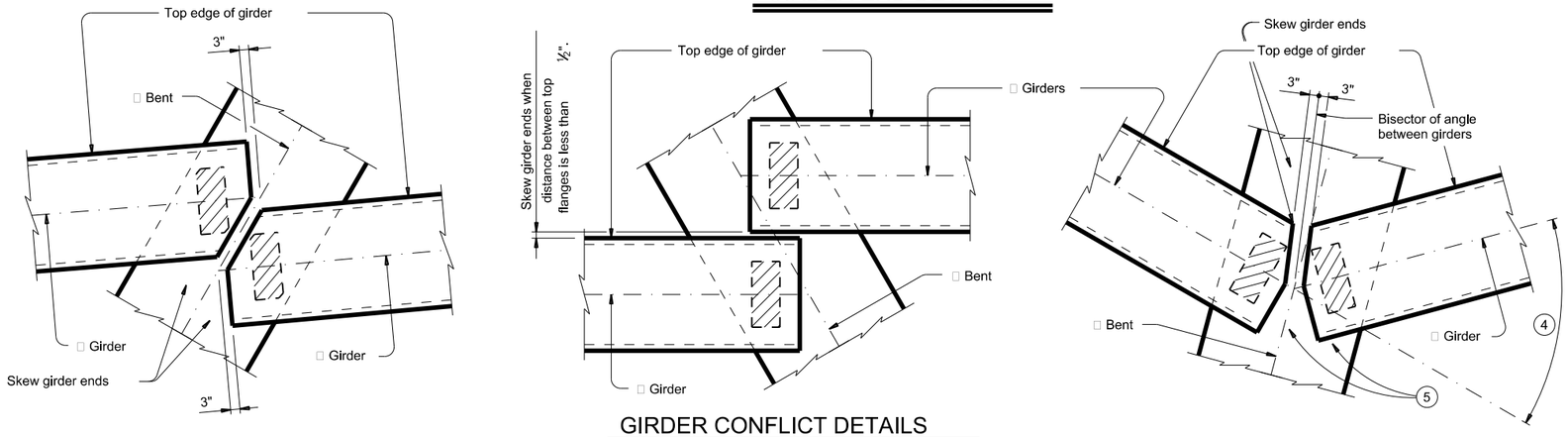


AT INVERTED-T BENT

AT CONVENTIONAL INTERIOR BENT

AT ABUTMENT (3)

GIRDER END DETAILS



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
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	HOU	MONTGOMERY		108

DATE:
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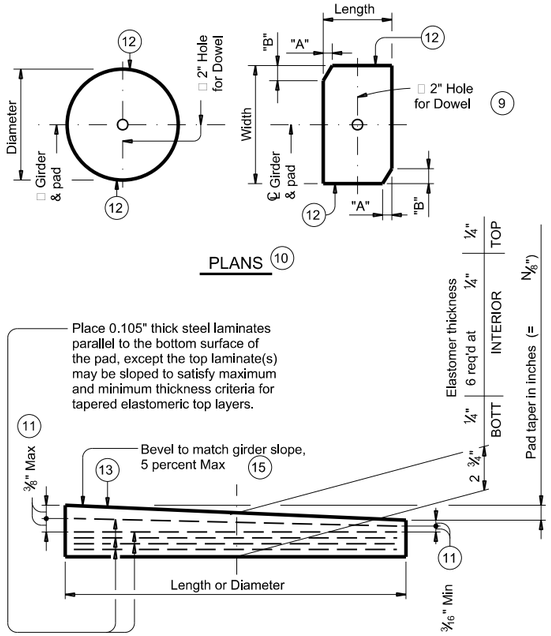
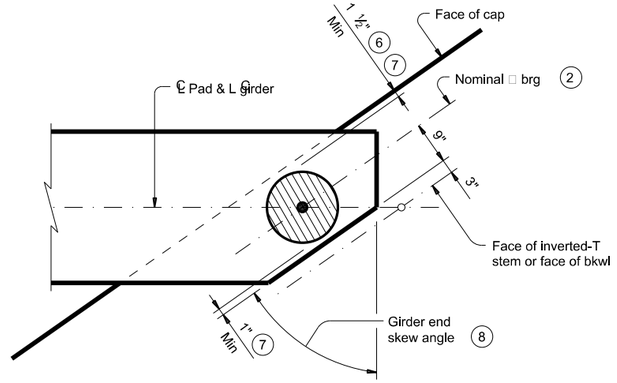
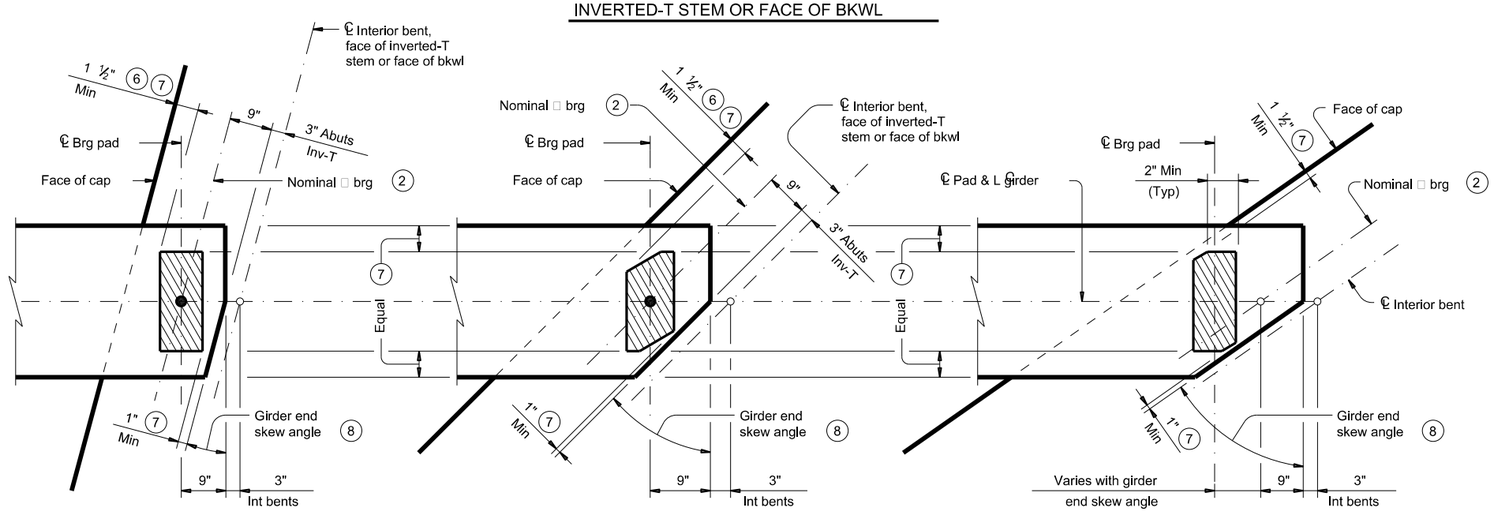


LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)



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



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

SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS 16

(NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 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 $\left(\frac{0.04 \times N}{\text{Length or Dia}}\right)$.

(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
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	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		109

DATE:
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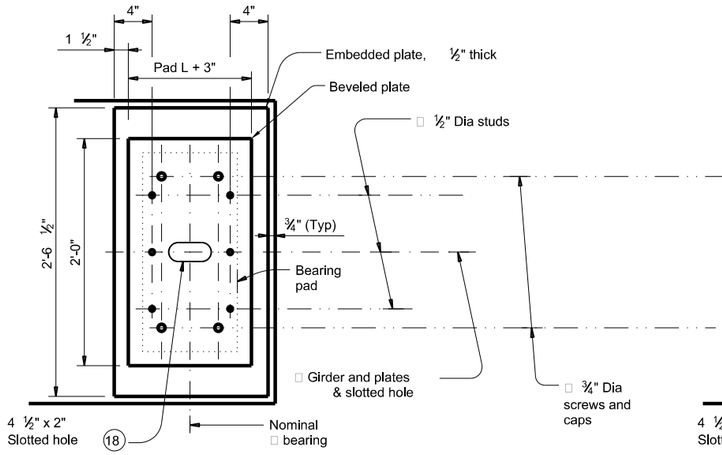
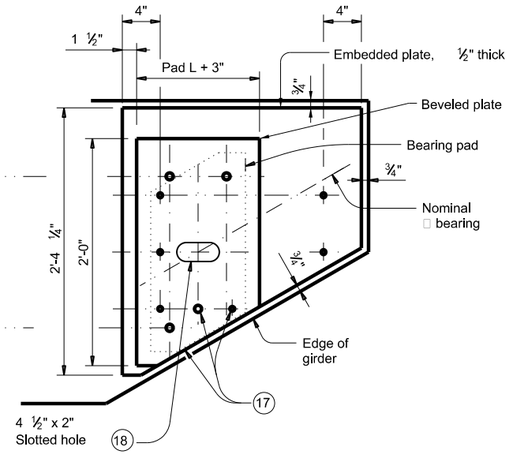
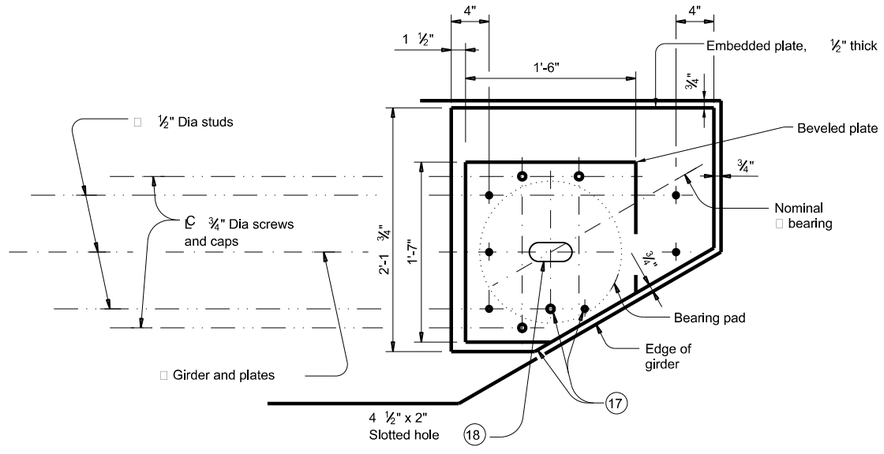


NORMAL GIRDER END
RECTANGULAR BEARING PAD

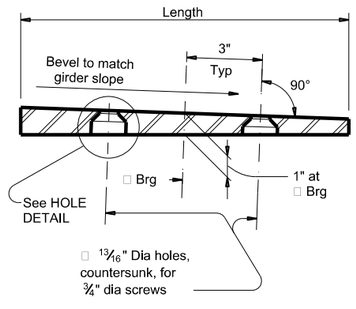


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

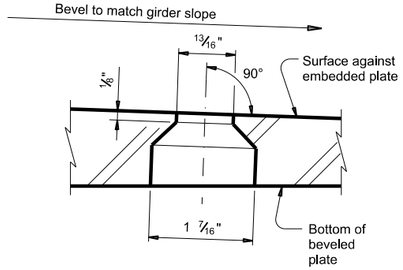


SKEWED GIRDER END
15" DIA BEARING PAD

PLAN VIEW OF SOLE PLATE DETAILS

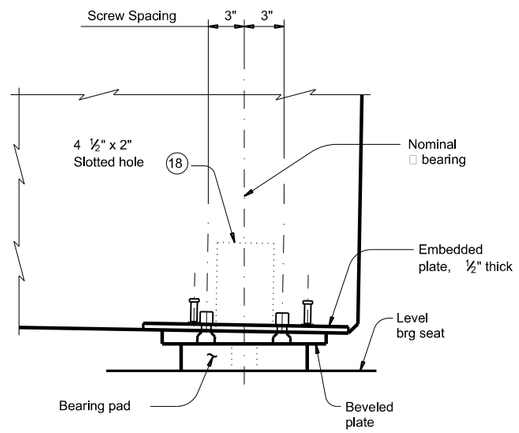


SECTION

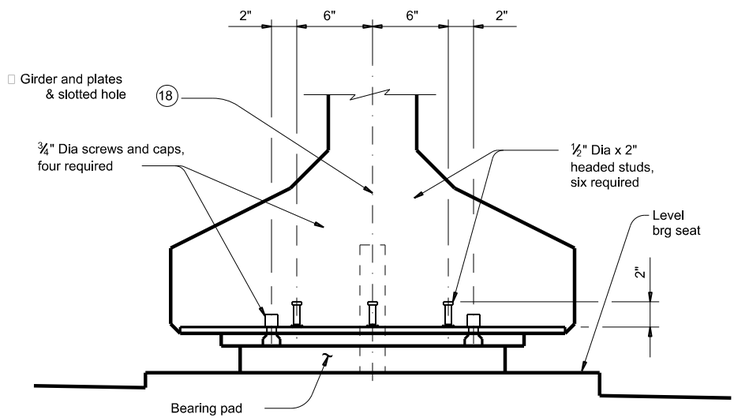


HOLE DETAIL

BEVELED PLATE DETAILS



SIDE ELEVATION



END ELEVATION
Showing normal girder end.

GIRDER DETAILS

(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 ⅛" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is ⅛"+/-, except variation from a plane parallel to the theoretical top surface can not exceed ⅛" 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 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.

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

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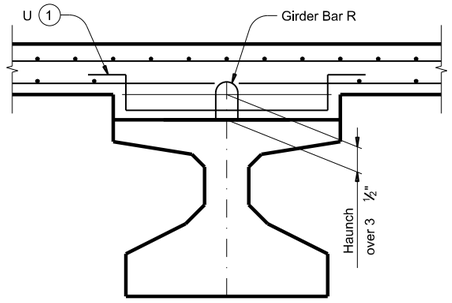
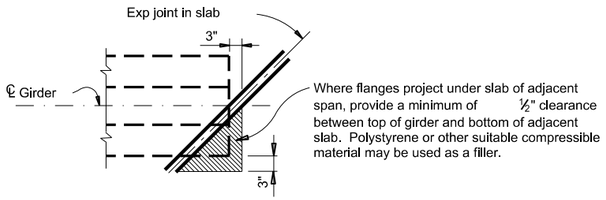
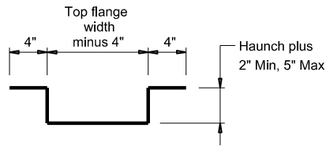


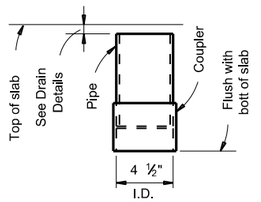
HAUNCH REINFORCING DETAIL



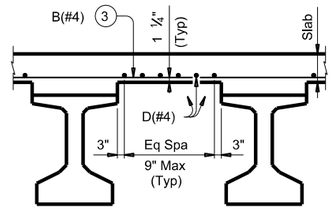
TREATMENT AT GIRDER END FOR SKEWED SPANS



BARS U (#4)

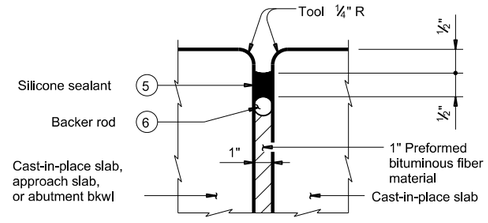


C-I-P DRAIN DETAIL (2)

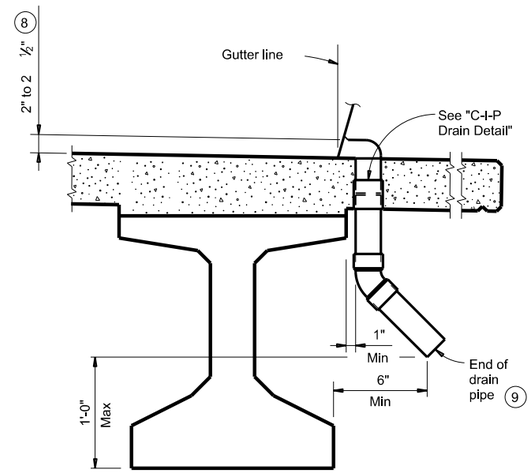


TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

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

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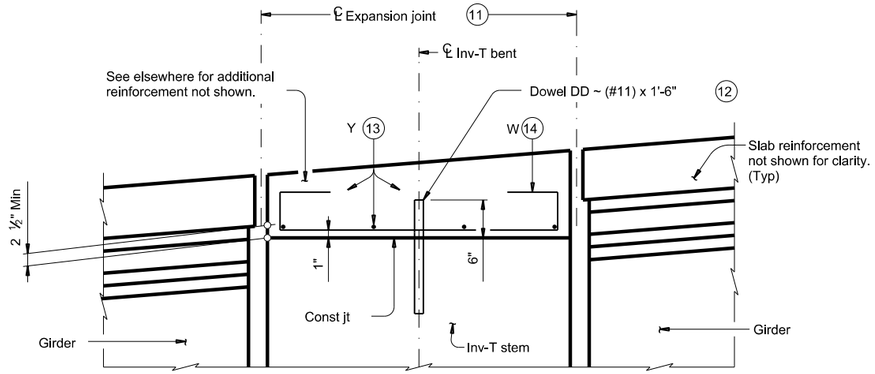
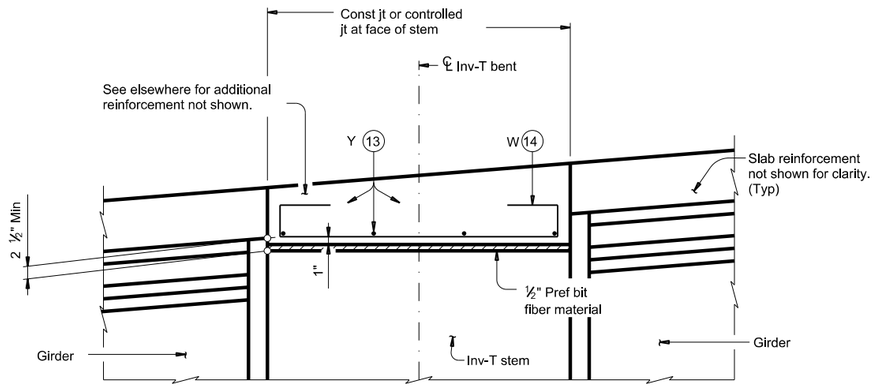
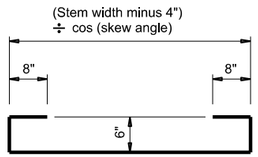


SHOWING EXPANSION JOINTS

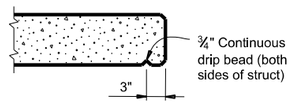


SHOWING CONST JTS OR CONTROLLED JTS

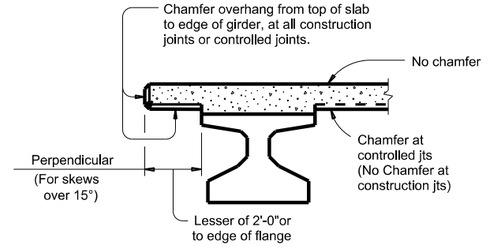
REINFORCEMENT OVER INV-T BENTS



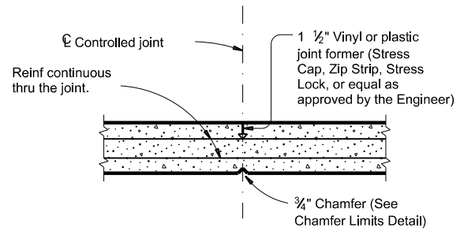
BARS W (#4)



DRIP BEAD DETAIL



CHAMFER LIMITS DETAIL (15)



CONTROLLED JOINT DETAIL

(Saw-cutting is not allowed)

(11) See Layout for joint type.

(12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.

(13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.

(14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.

(15) See Span details for type of joint and joint locations.

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SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

IGMS

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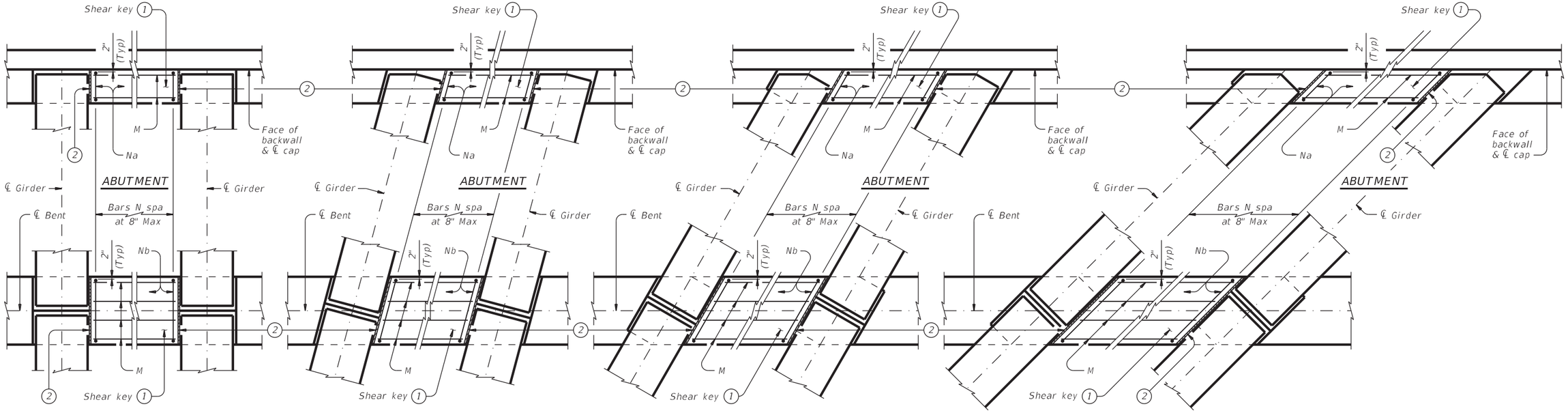


PARTIAL PLANS WITH NO SKEW

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

PARTIAL PLANS WITH 15° SKEW

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

PARTIAL PLANS WITH 30° SKEW

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

PARTIAL PLANS WITH 45° SKEW

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

(1) Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.

(2) UHMW polyethylene wear pad. (Typ)

(3) Leave a 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.

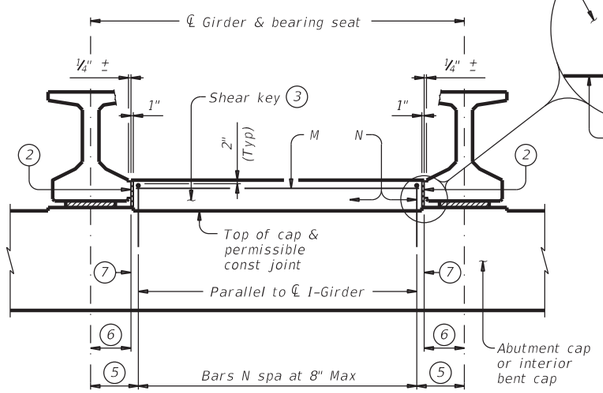
(5) With No Skew = 1'-8 ¼", measured along ℄ cap.
With Skew = 1'-8 ¼" ÷ Cos Skew, measured along ℄ cap.

(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.

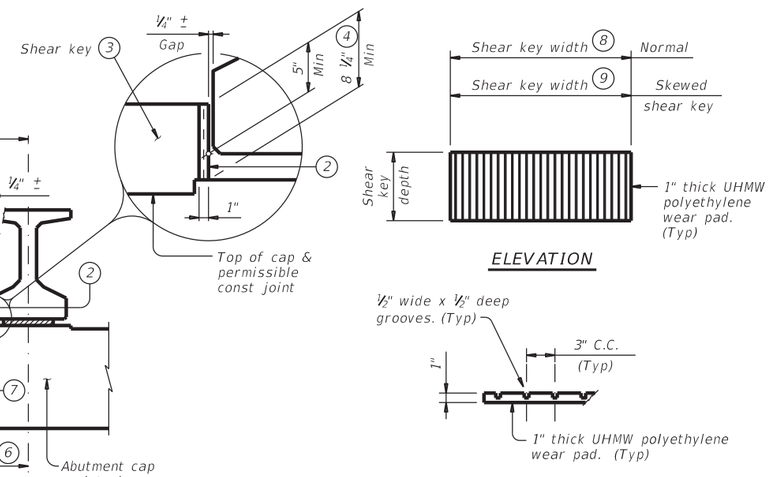
(8) Abutments = Cap width – Backwall width.
Interior bents = Cap width.

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

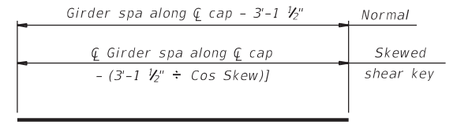


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

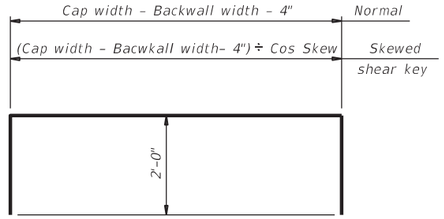
Showing shear key with girder Type Tx46. Other I-Girder types similar.



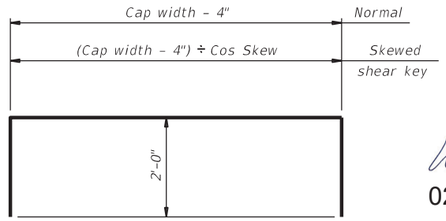
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For abutments)



BARS Nb (#5)
(For interior bents)

CONSTRUCTION NOTES:

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

GENERAL NOTES:

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

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

STATE OF TEXAS
WEIHUA WANG
105644
LICENSED PROFESSIONAL ENGINEER
02.03.2022

Texas Department of Transportation

Bridge Division Standard

SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

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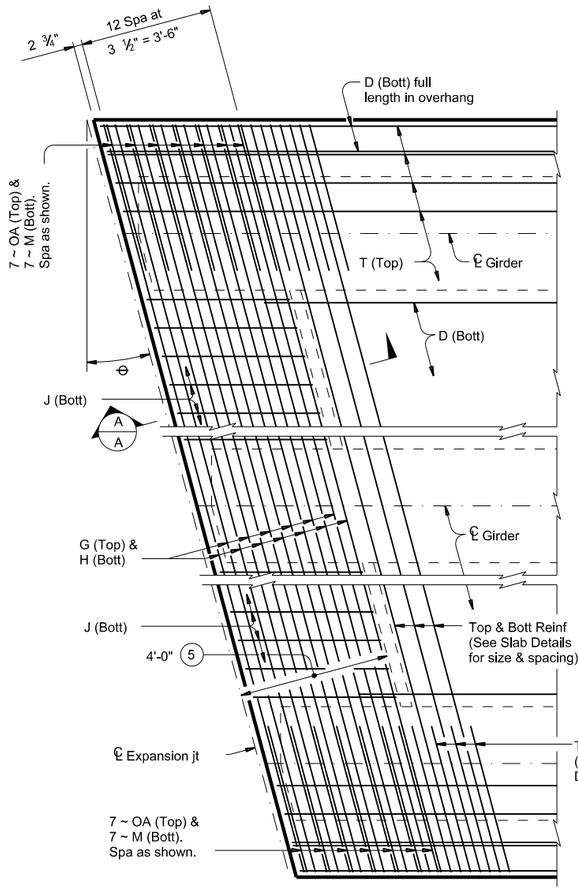
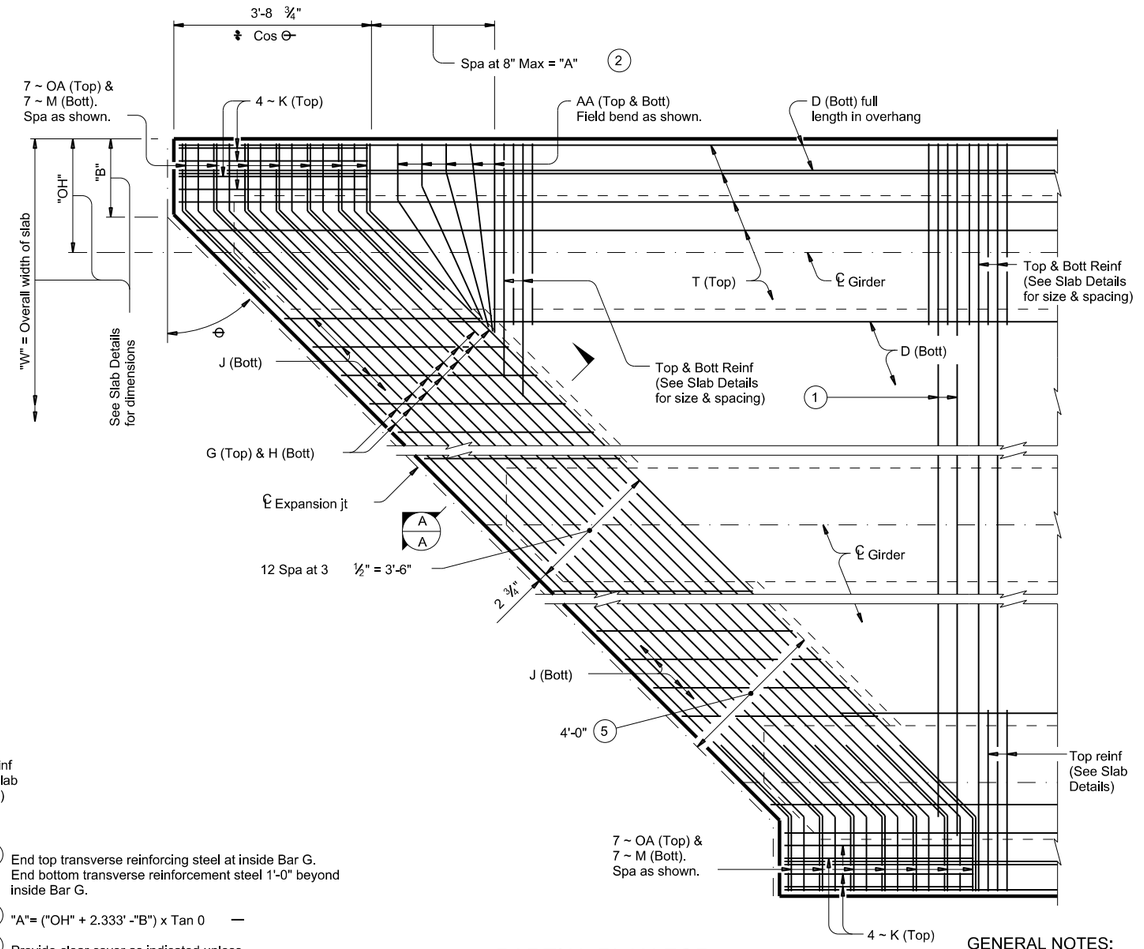
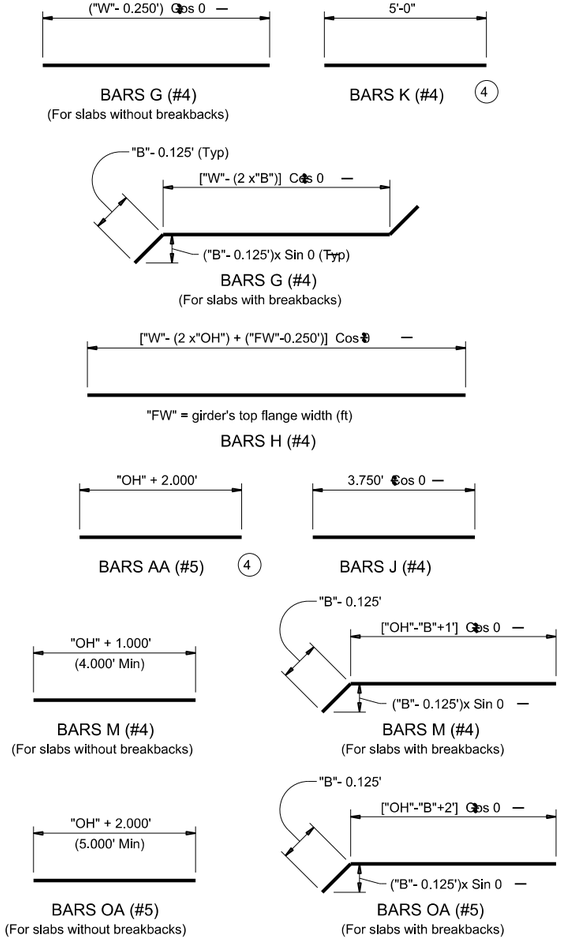


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR SLABS WITH BREAKBACK

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



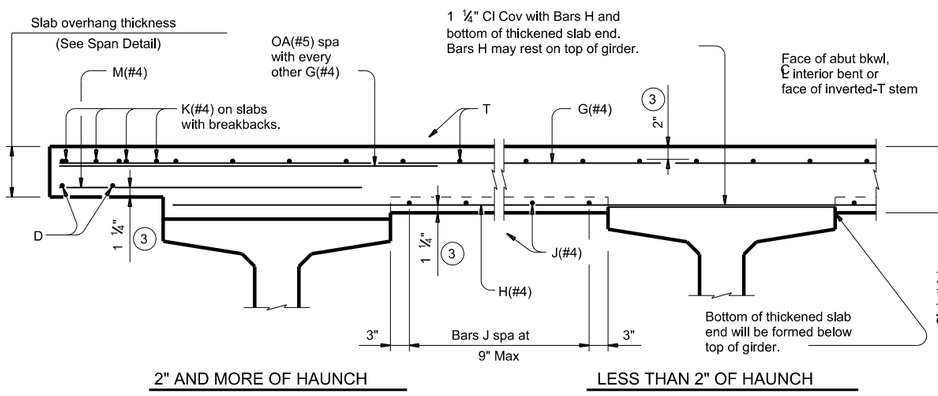
GENERAL NOTES:

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

MATERIAL NOTES:

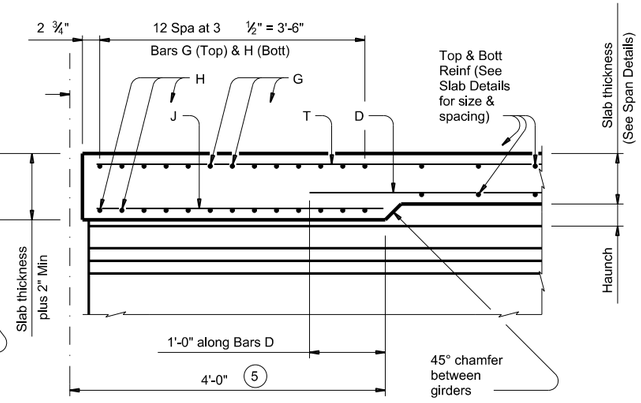
Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

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



TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at L Brg) C



SECTION A-A

(Showing with 2" and more of haunch)

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

IGTS

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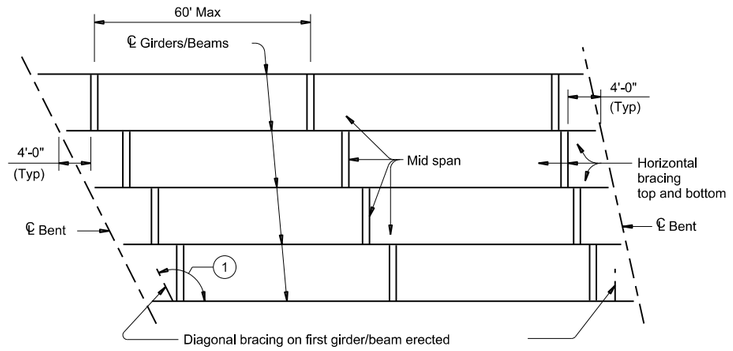
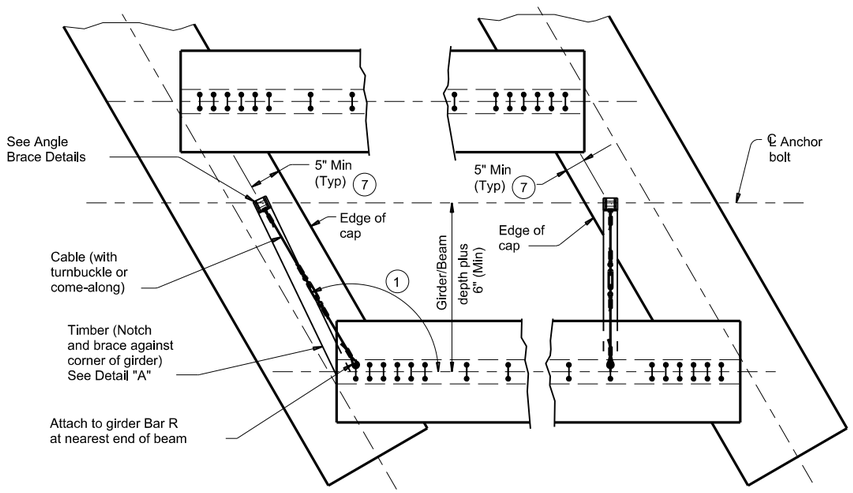
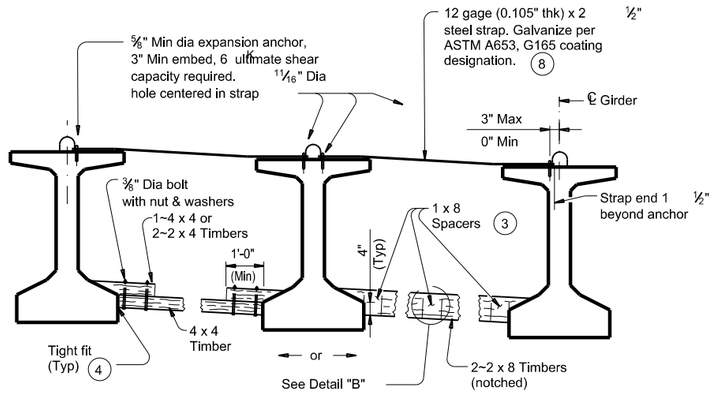


ERECTION BRACING

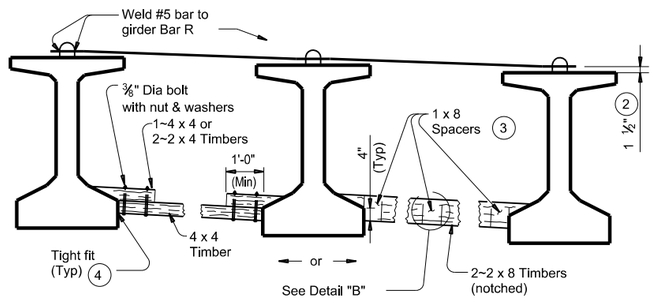


PLAN



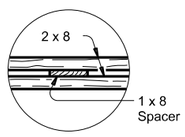
FOR ERECTION BRACING, OPTION 1

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



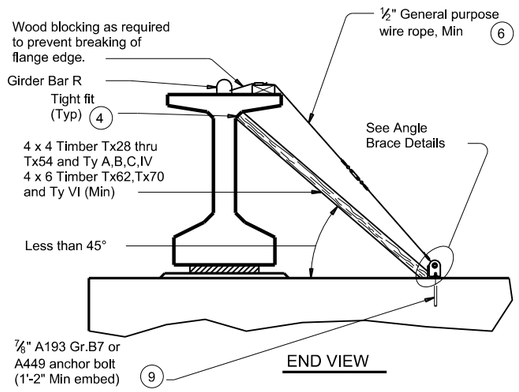
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS 5



PLAN

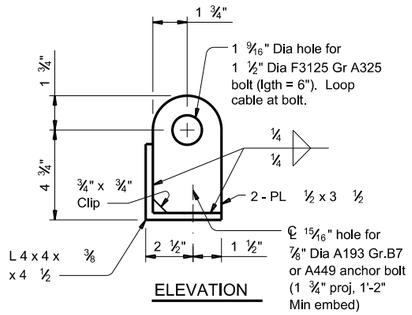
DETAIL "B"



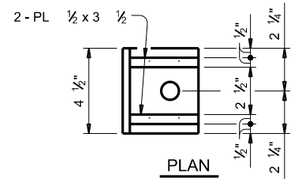
END VIEW

DIAGONAL BRACING DETAILS 5

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



ELEVATION



PLAN

ANGLE BRACE DETAILS

HAULING & ERECTION:

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

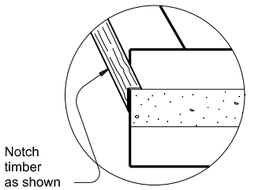
ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

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



DETAIL "A"

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

Texas Department of Transportation

Bridge Division Standard

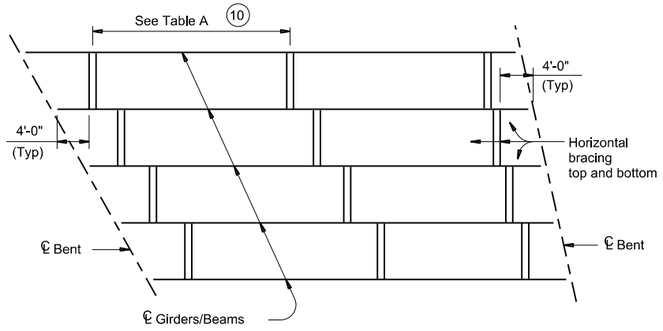
MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		115

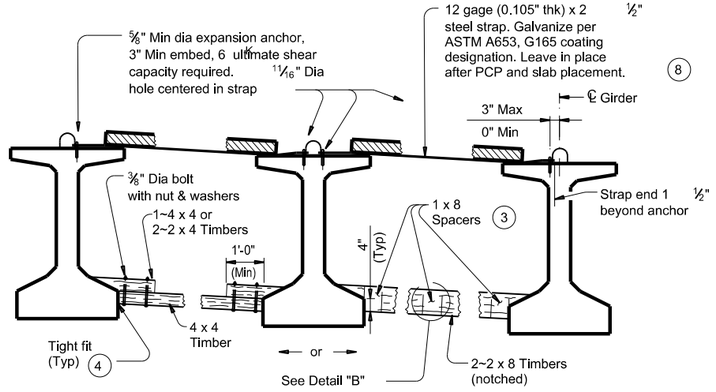
DATE:
FILE:



SLAB PLACEMENT BRACING

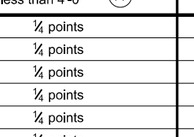
TABLE A

OPTION 1-RIGID BRACING (STEEL STRAP)			OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)		
Girder or Beam Type	Maximum Bracing Spacing		Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)		Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points	Tx28	¼ points	⅛ points
Tx34	¼ points	¼ points	Tx34	¼ points	⅛ points
Tx40	¼ points	⅛ points	Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points	Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points	Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points	Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points	Tx70	¼ points	⅛ points
A	⅛ points	⅛ points	A	2.0 ft	1.5 ft
B	⅛ points	⅛ points	B	3.0 ft	2.0 ft
C	⅛ points	⅛ points	C	4.5 ft	2.0 ft
IV	¼ points	⅛ points	IV	¼ points	4.0 ft
VI	¼ points	⅛ points	VI	¼ points	4.0 ft



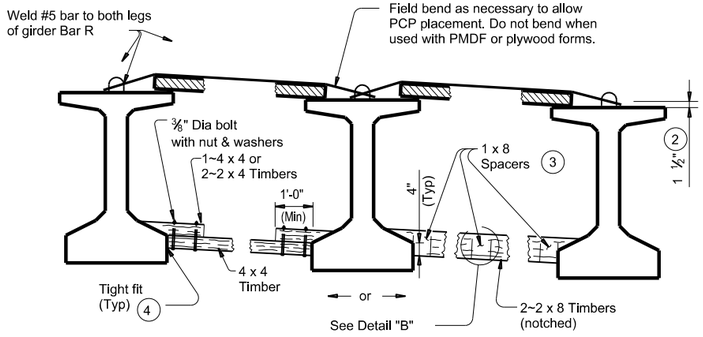
FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

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



PLAN

DETAIL "B"



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS 5

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (¼ and ⅛ points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425.

Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Removal of bracing for short periods of time to align girders and beams is permissible.

All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown.

Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		116

DATE:
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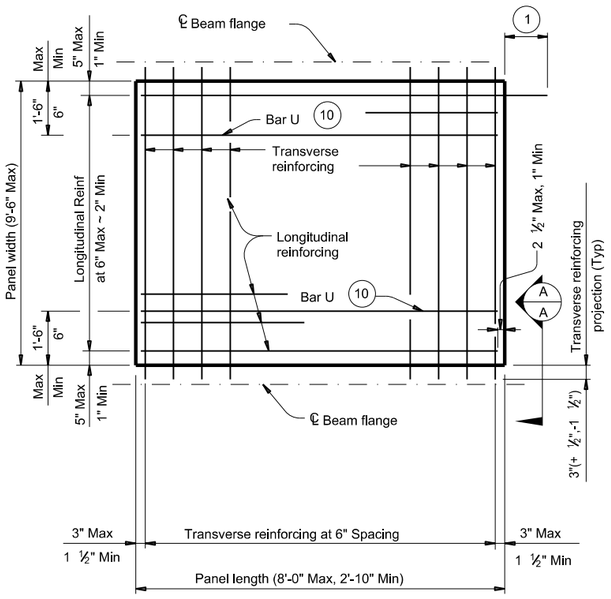
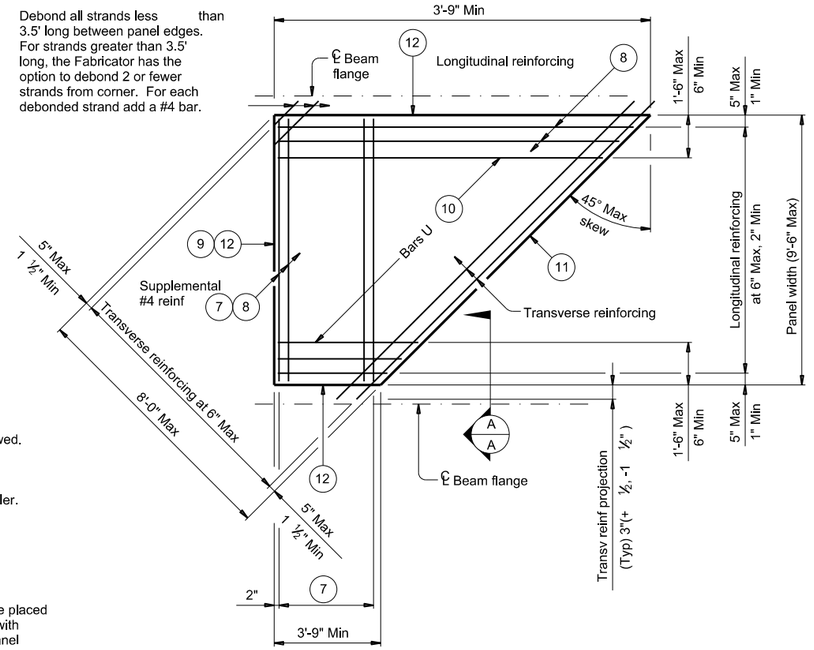


TYPICAL NON-SKEWED PANEL PLAN



Debond all strands less than 3.5' long between panel edges. For strands greater than 3.5' long, the Fabricator has the option to debond 2 or fewer strands from corner. For each debonded strand add a #4 bar.

TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3 4	½
IV	6	4 7	½
VI	6 ½	4 ½"	8 ½
U40 - 54	5 ½	5 ½	7
Tx28-70	6	5 7	½
XB20 - 40	4	3 4	½
XSB12 - 15	4	3 4	½

TABLE B (4) (5)			
Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3 3	¼
Over 15" to 18"	4	3 4	¾
Over 18"	5	3 ½	6 ¼

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.

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.

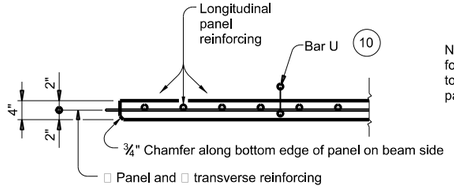
LONGITUDINAL PANEL REINFORCEMENT:

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.

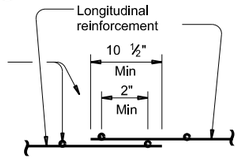
Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.



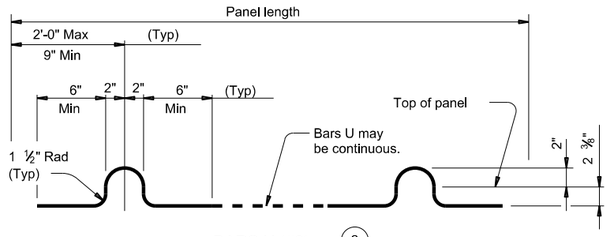
SECTION A-A

(Not showing supplemental #4 bars for skewed end panels.)

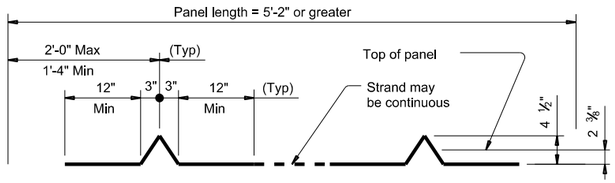
No splice required for wires parallel to strands (transverse panel reinforcement)



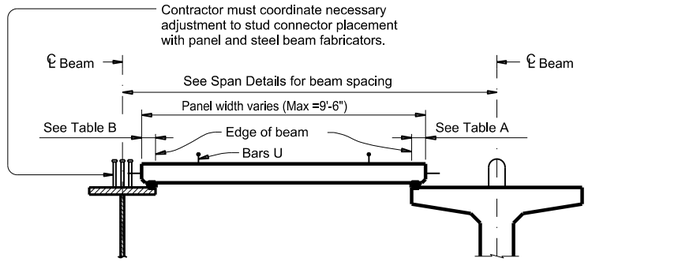
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



BARS U (#3) (2)



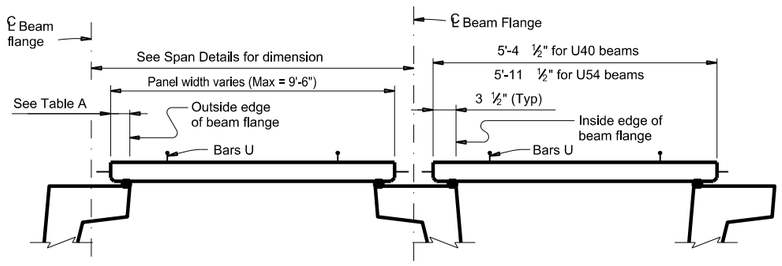
OPTIONAL STRAND FOR BARS U (3)



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



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
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		117

DATE:
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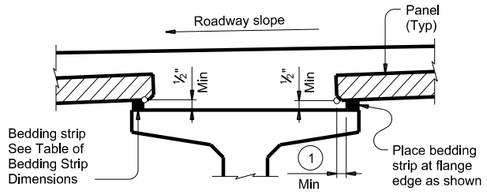
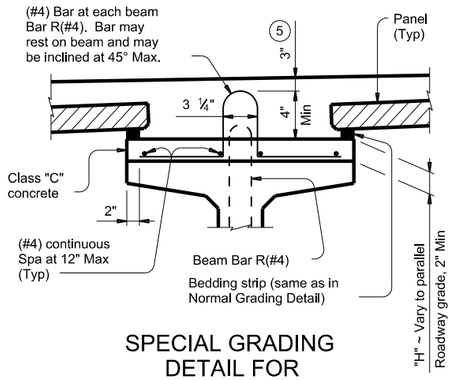


NORMAL GRADING DETAIL (3)

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.

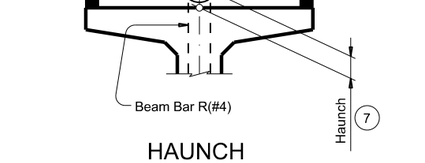
These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

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".

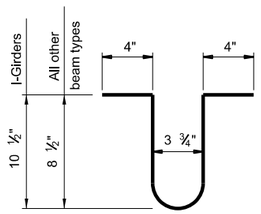
Cover dimensions are clear dimensions, unless noted otherwise.

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



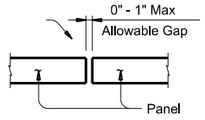
HAUNCH REINFORCING DETAIL

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



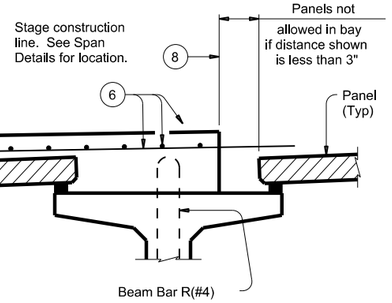
BARS UP (#4) (7)

Seal joint between panels when gap exceeds ¼" with polyurethane sealant or expanding foam sealer. Make seal flush with top of panel.

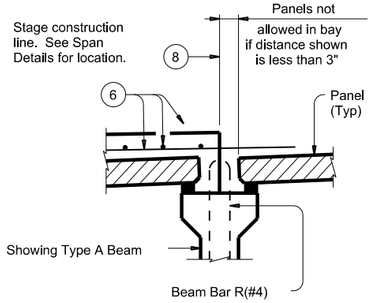


PANEL JOINTS

(Panel reinforcing not shown for clarity.
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



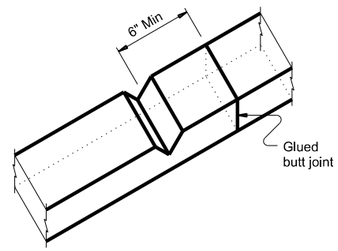
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL (9)

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PRESTRESSED CONCRETE PANELS
DECK DETAILS

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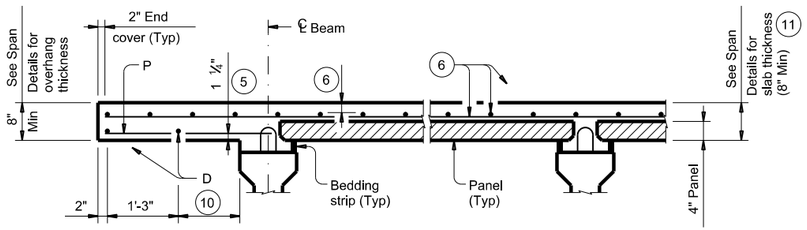
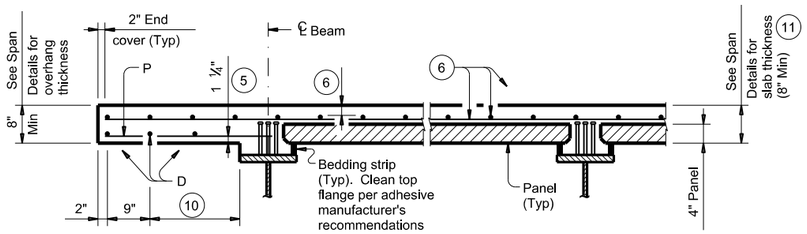
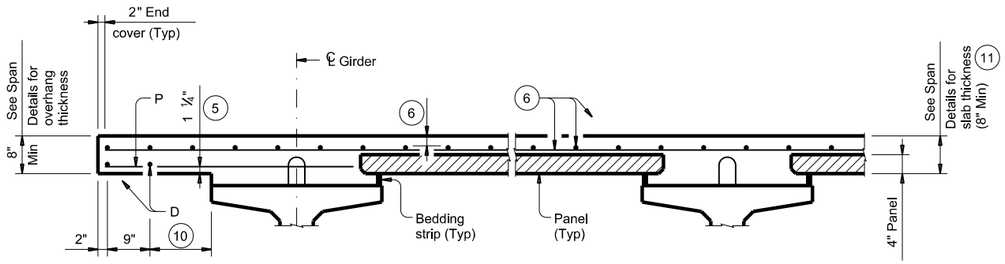


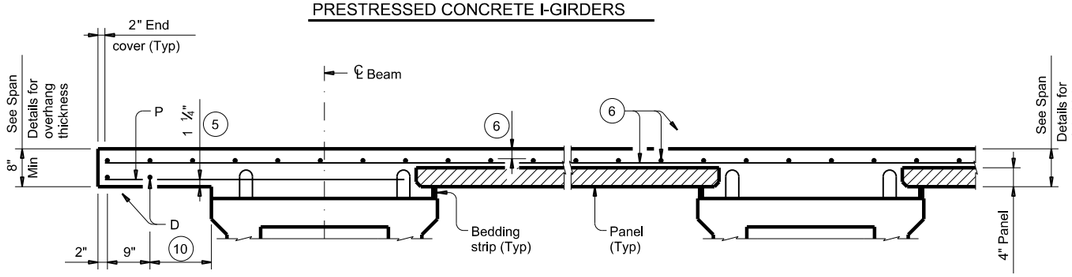
PRESTRESSED CONCRETE I-BEAMS



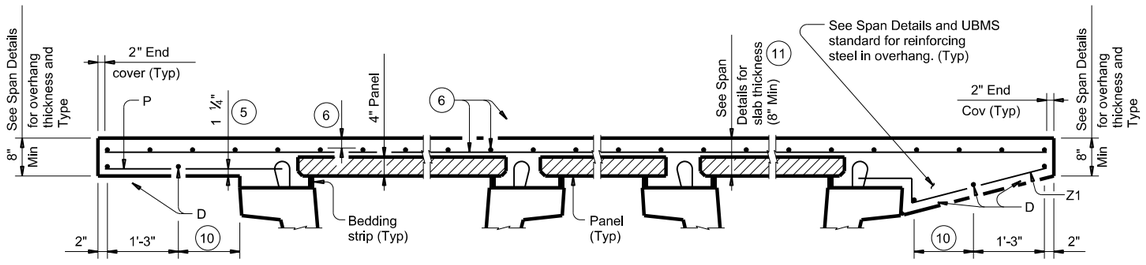
STEEL BEAMS



PRESTRESSED CONCRETE I-GIRDERS



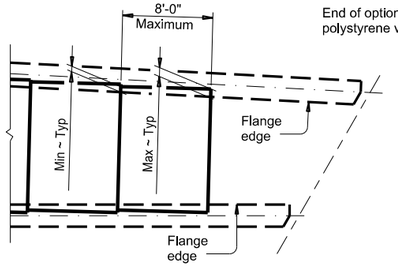
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

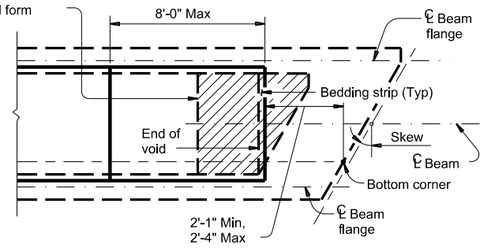
SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS

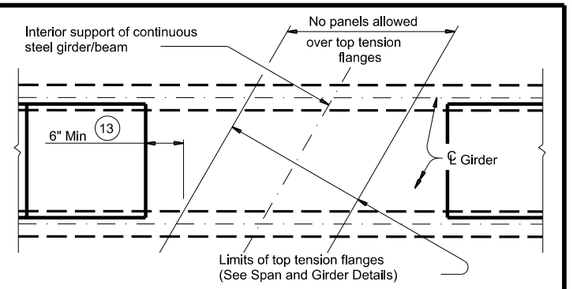


AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on 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.

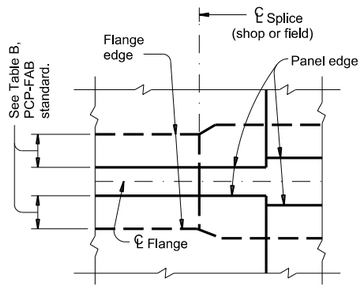
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(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.

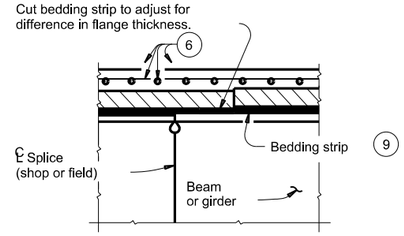
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



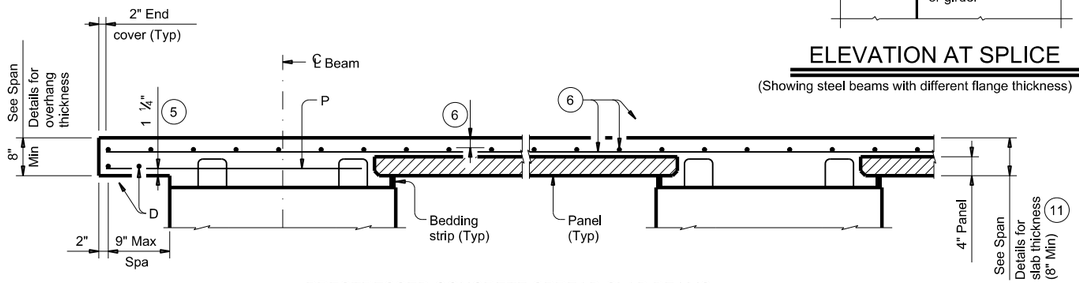
PLAN AT SPLICE

(Showing steel beams with flange width transition)



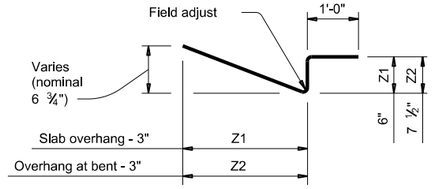
ELEVATION AT SPLICE

(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.



BARS Z (#4) (12)

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PRESTRESSED CONCRETE PANELS
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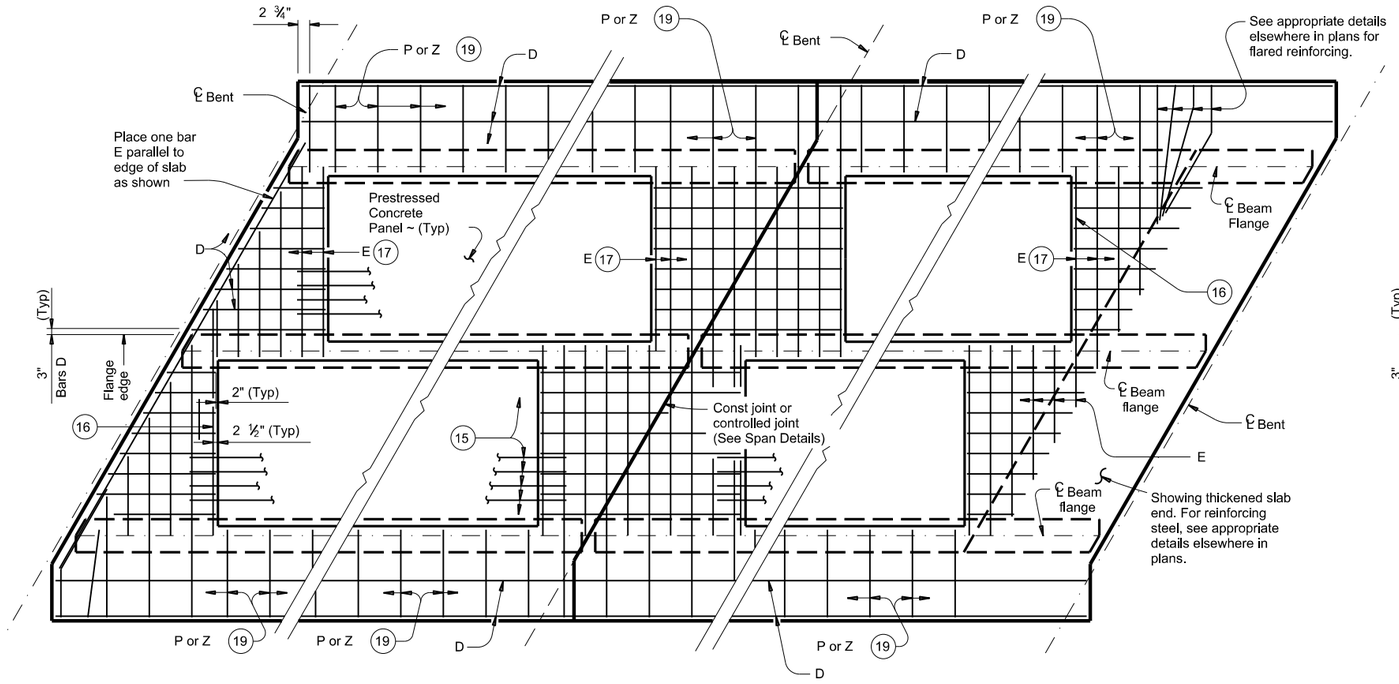
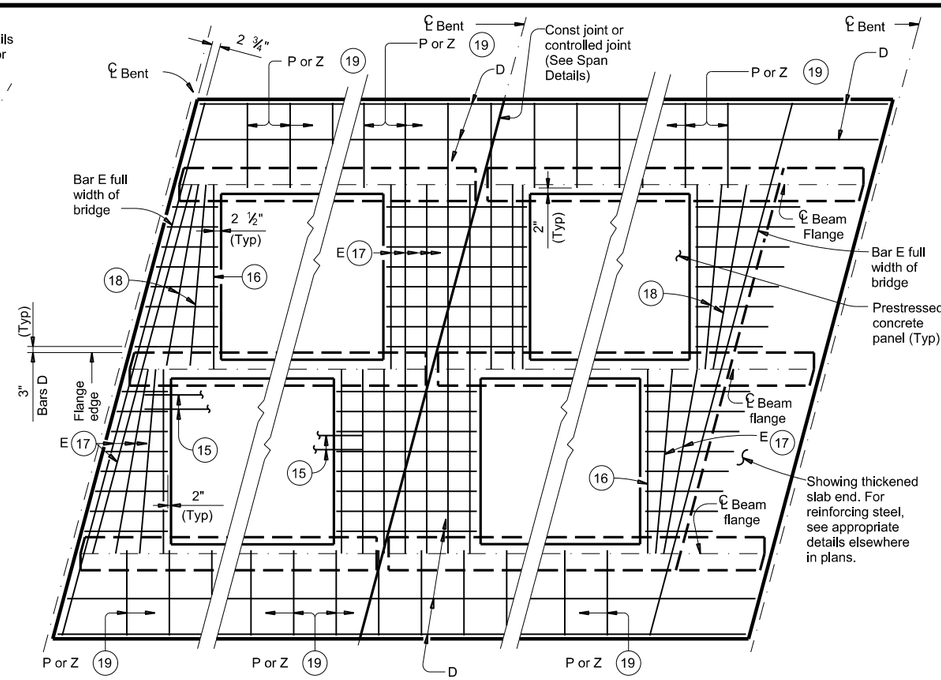


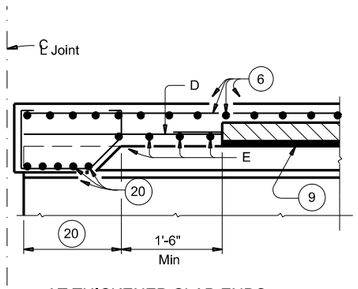
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

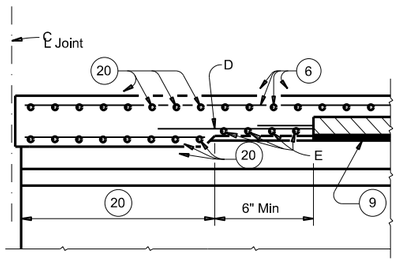


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

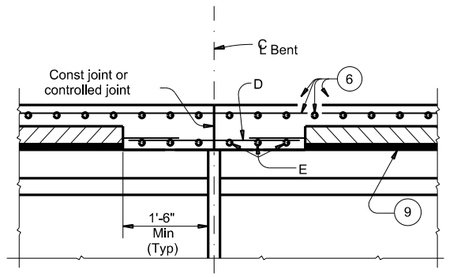
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



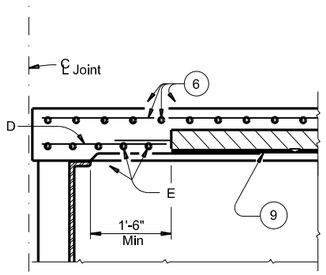
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



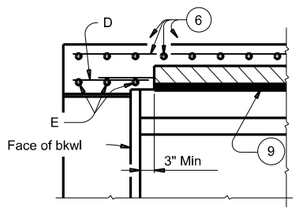
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



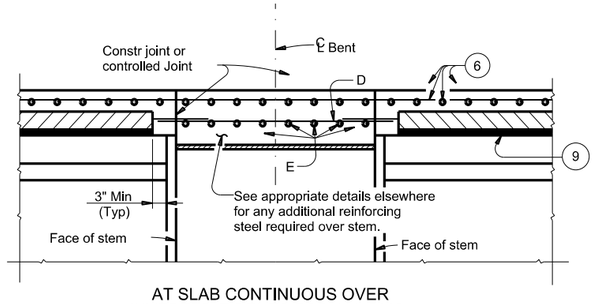
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



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

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PRESTRESSED CONCRETE PANELS
DECK DETAILS

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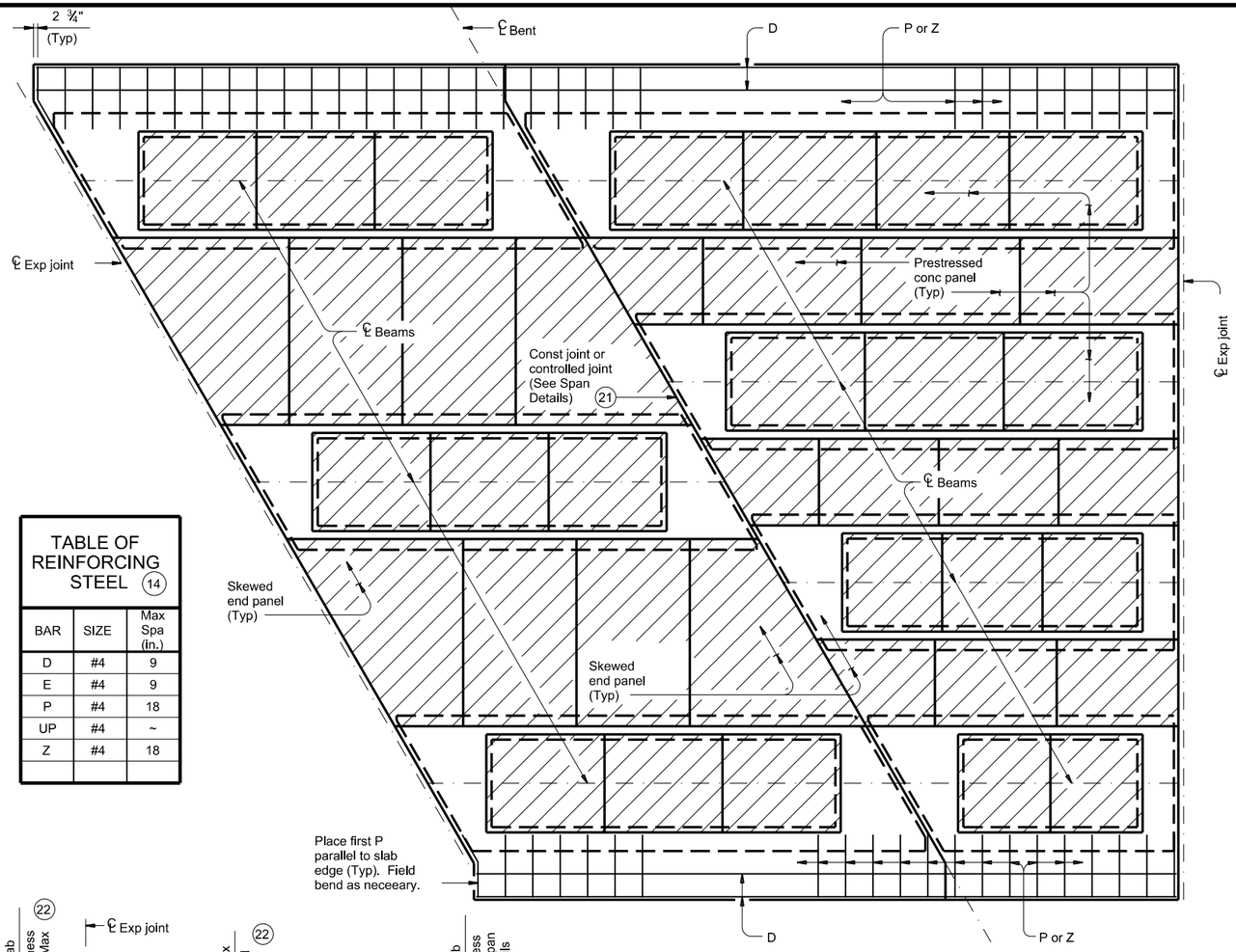
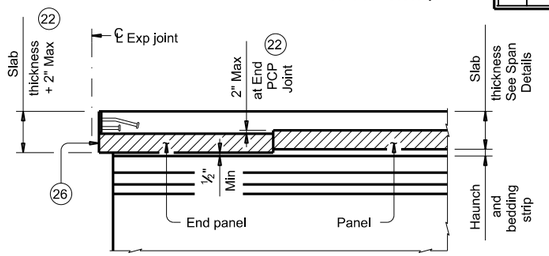


OPTION 2 ~ PLAN OF SLAB

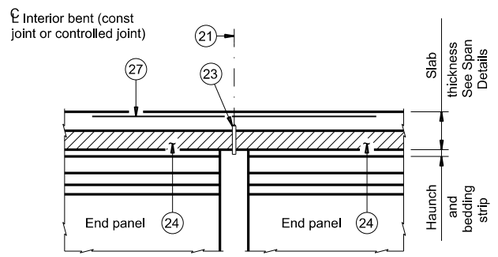
(Showing U-Beams; other beams similar)

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



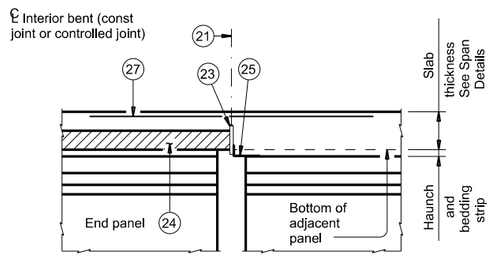
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-A, SEJ-S(O), AJ, and Type A expansion joints only.



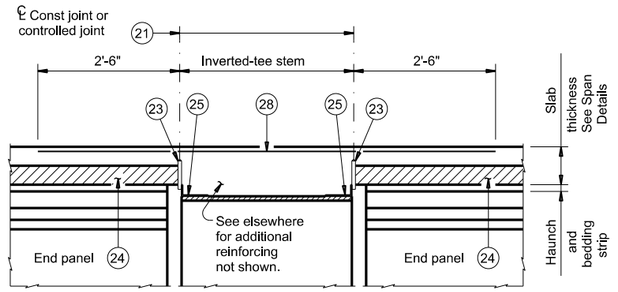
CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT

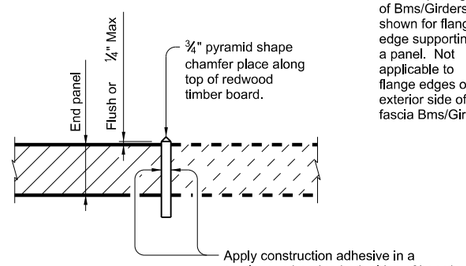
Panel against beam/girder end in adacent span.



INVERTED-T BENT

Panels against inverted-tee stem

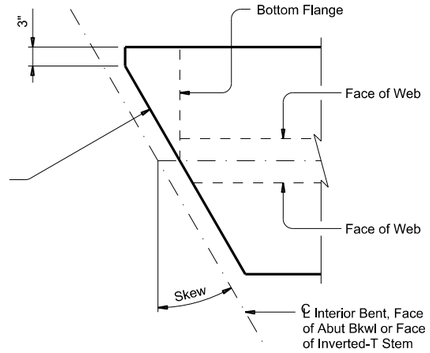
OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)



ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".

Skew top flange of Bms/Girders as shown for flange edge supporting a panel. Not applicable to flange edges on exterior side of fascia Bms/Girders.



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(O) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and OA from standard IGTS in the slab.

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PRESTRESSED CONCRETE PANELS
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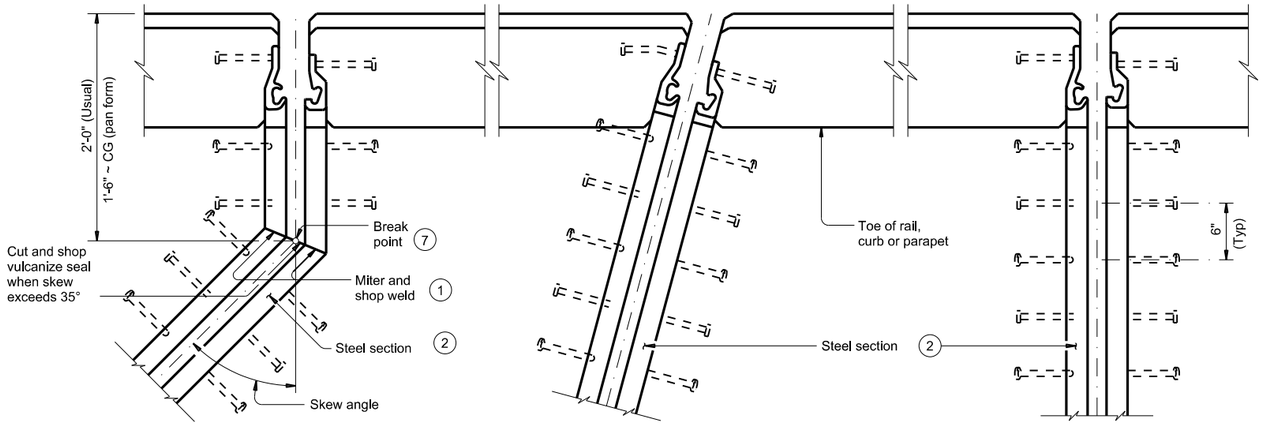
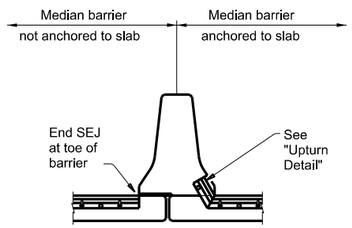


SHOWING SKEWS WITH SLAB BREAKBACKS

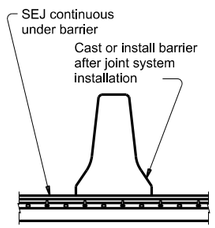
SHOWING SKEWS WITHOUT SLAB BREAKBACKS

SHOWING WITHOUT SKEWS AND SLAB BREAKBACKS

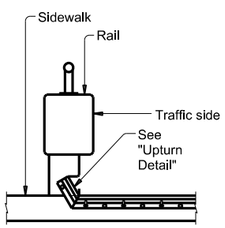
PLANS OF END CONDITIONS



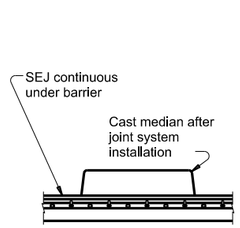
WITH OPEN DECK JOINT BELOW MEDIAN BARRIER



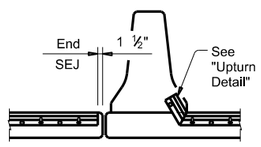
AT MEDIAN BARRIER



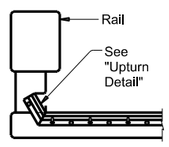
AT SIDEWALK BEHIND BRIDGE RAIL



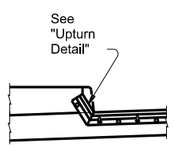
AT RAISED MEDIAN



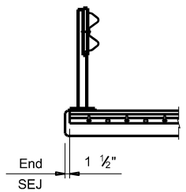
WITH OPEN DECK JOINT ADJACENT TO MEDIAN BARRIER



AT CONCRETE BRIDGE RAIL

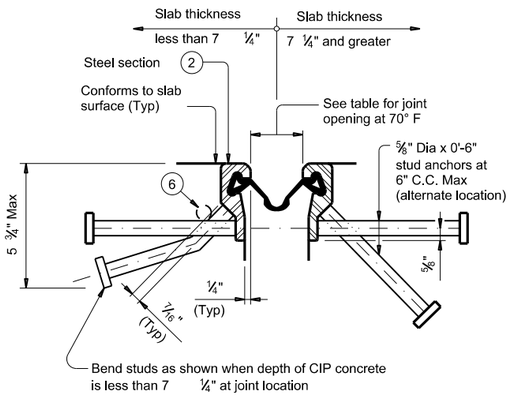


AT SIDEWALK

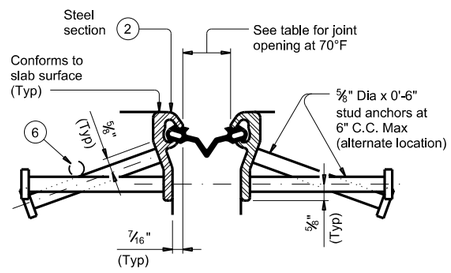


AT STEEL POST BRIDGE RAIL

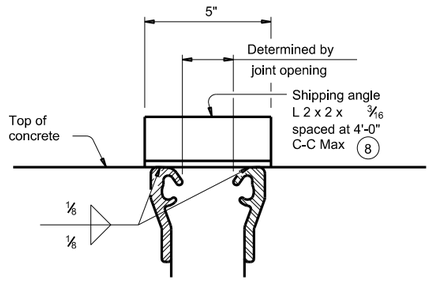
TYPICAL SECTIONS (5)



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.

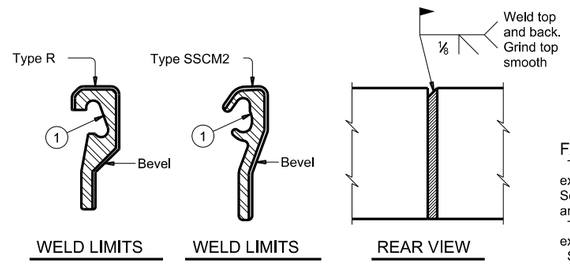
(4) Reduce for sidewalk or parapet heights less than 6".

(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.

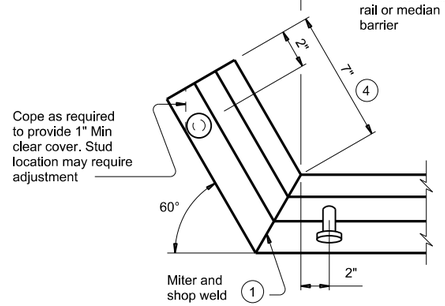
(7) See Span details for location of break point.

(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
	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		122

DATE:
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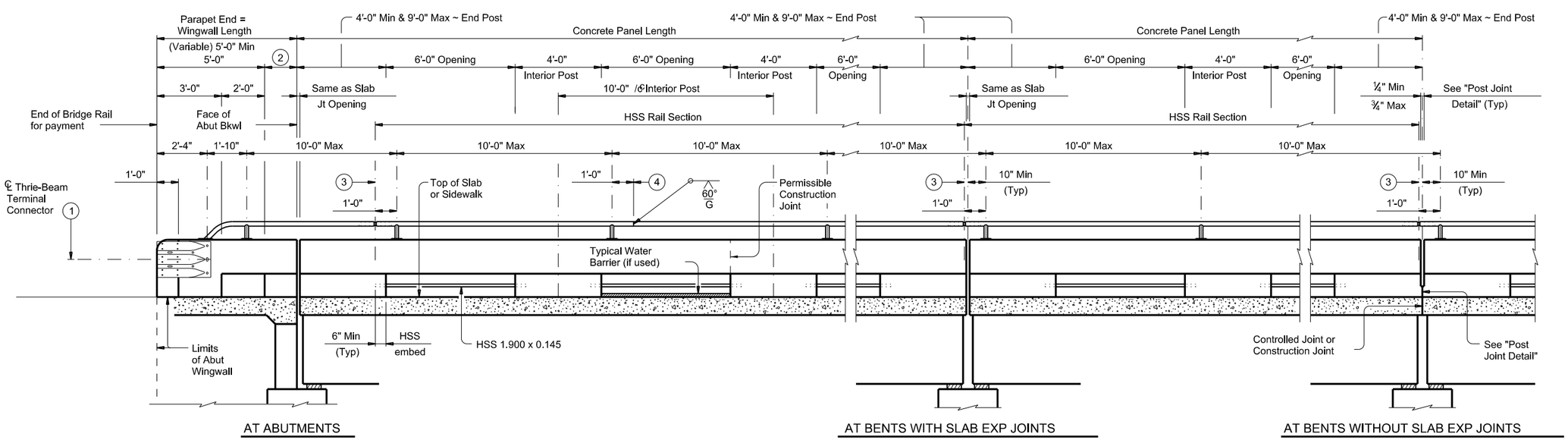


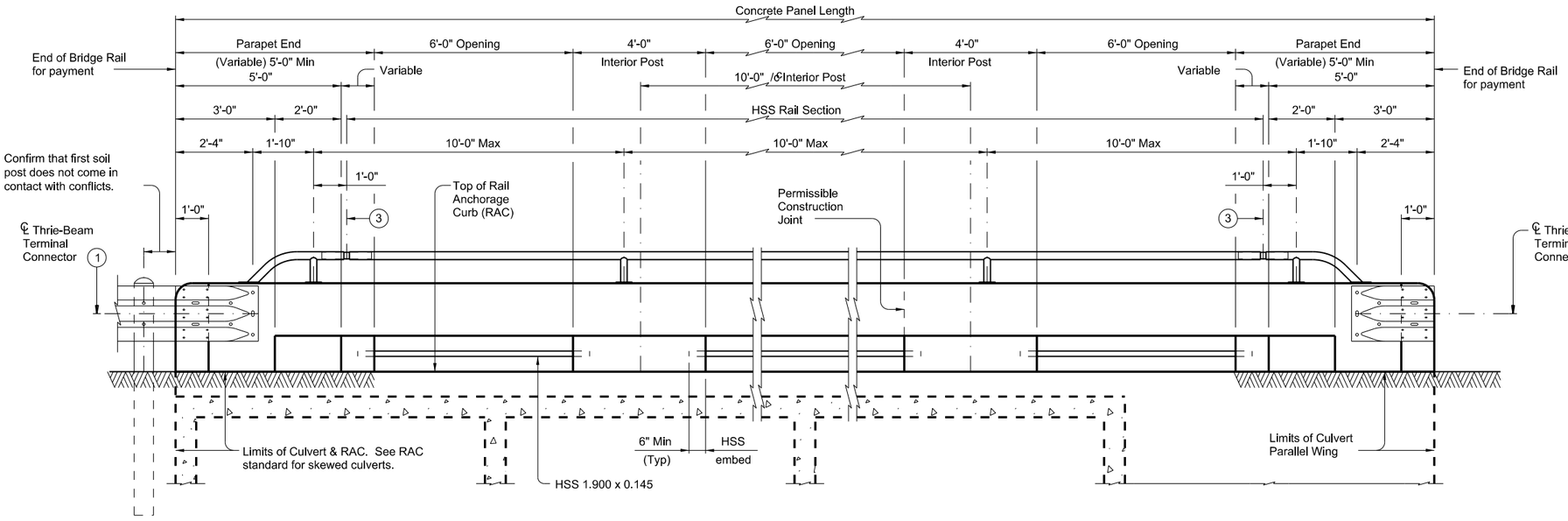
AT ABUTMENTS

AT BENTS WITH SLAB EXP JOINTS

AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL ON BRIDGE

(Showing without raised sidewalk)



AT STRAIGHT OR FLARED WINGS

AT PARALLEL WINGS

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)

(3) ℄ Splice Jt or Exp Jt

(4) One shop splice per HSS rail section is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

Texas Department of Transportation

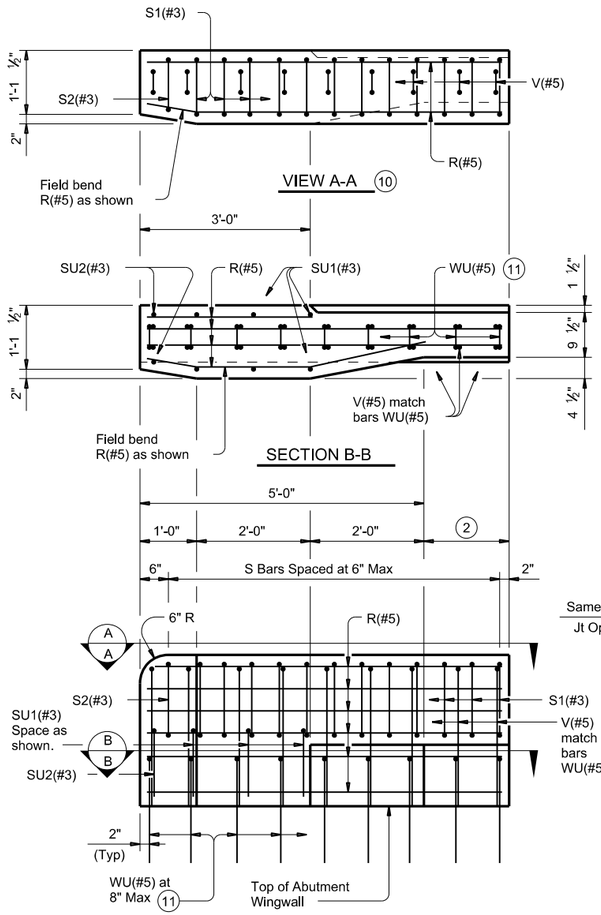
Bridge Division Standard

COMBINATION RAIL

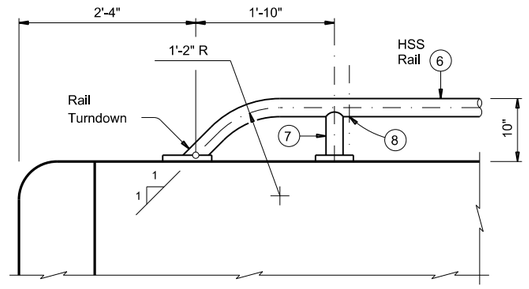
TYPE C223

FILE: rlstd019-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		123

DATE:
FILE:

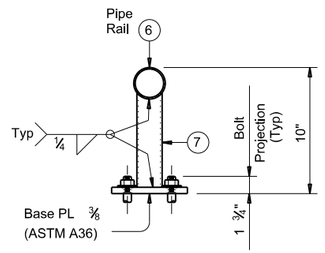


PARAPET END AT ABUT WINGWALL (11)

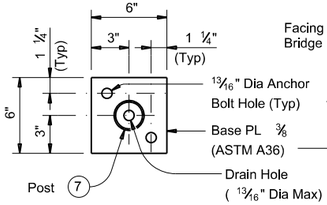


Note that at least two anchor points (as shown) are required for the Bridge Rail on the Abutment Wingwall. Longer Wingwalls may require more than two Rail anchorages.

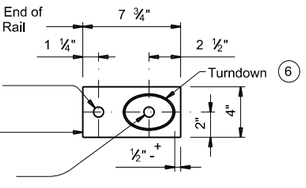
HSS RAIL TERMINAL DETAIL



TRANSVERSE SECTION

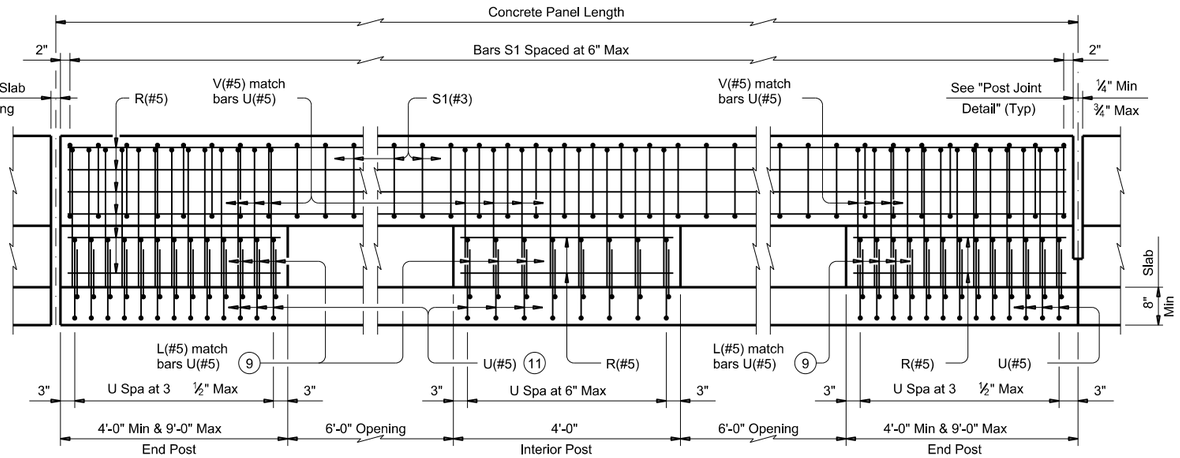


POST BASE PLATE PLAN



RAIL TURNDOWN BASE PLATE PLAN

HSS RAIL DETAILS



AT BENTS WITH SLAB EXP JOINTS

AT 4' INTERIOR POST

AT BENTS WITHOUT SLAB EXP JOINTS

ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab and without raised sidewalk. Rail on box culvert similar. HSS not shown for clarity.

(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)

(5) Increase 2" for structures with overlay.

(6) HSS 2.875 x 0.203

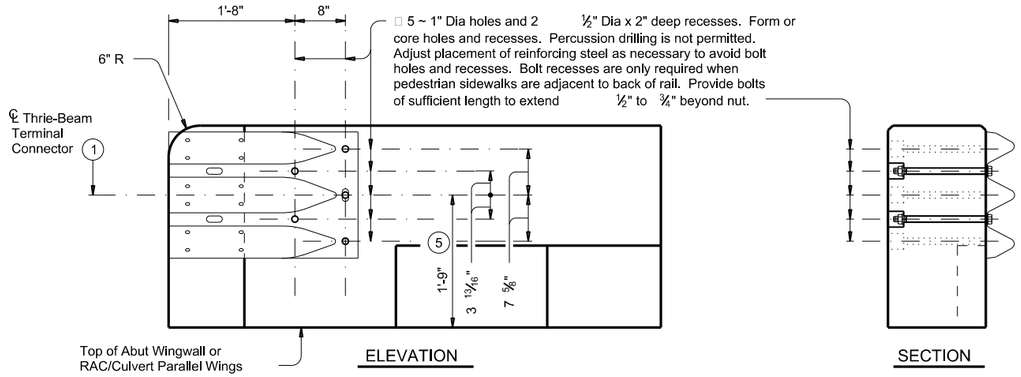
(7) HSS 2.375 x 0.154

(8) ⅜" Dia Hole in bottom of HSS rail (Minimum 1 hole between posts ~ Typ)

(9) 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.

(10) Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.

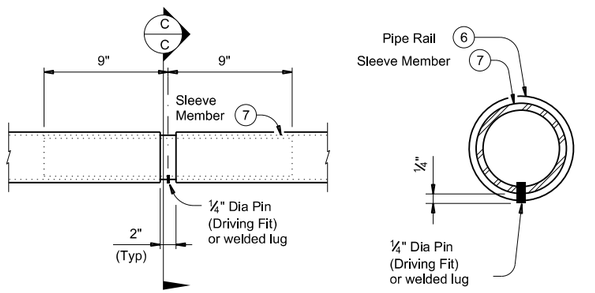
(11) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.



ELEVATION

SECTION

TERMINAL CONNECTION DETAILS



AT SPLICE OR EXP JTS

SECTION C-C

PIPE SPLICE DETAILS

SHEET 2 OF 4

Texas Department of Transportation

Bridge Division Standard

COMBINATION RAIL

TYPE C223

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REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		124

DATE:
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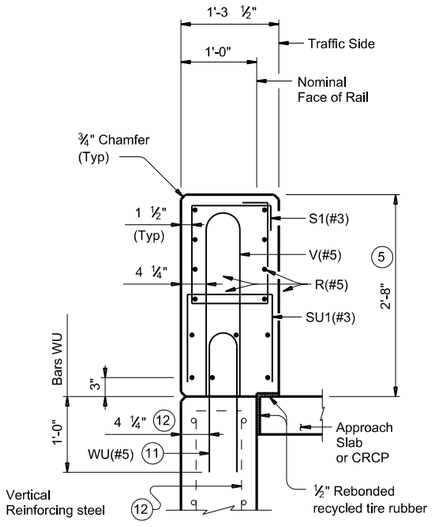
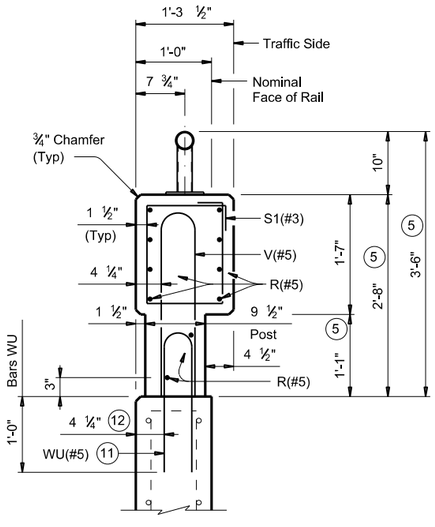
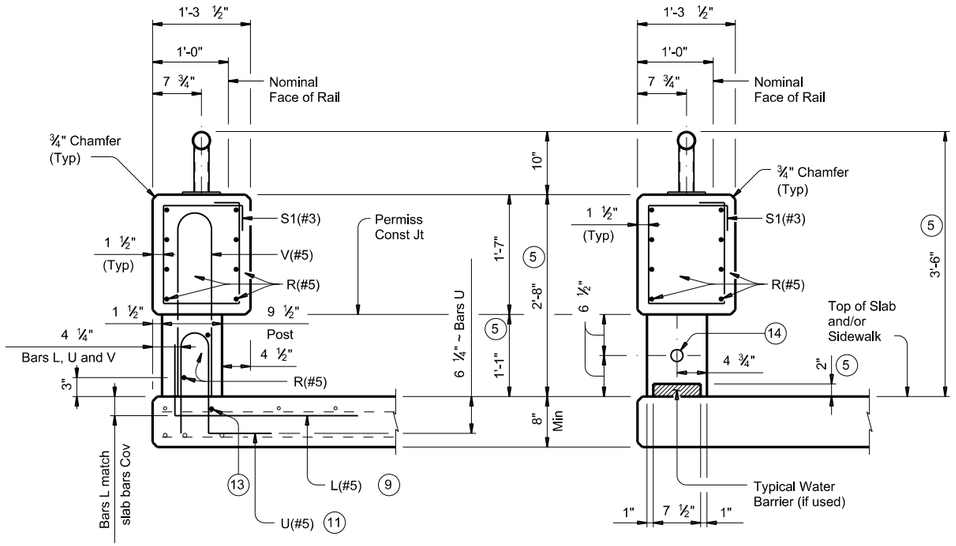


SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

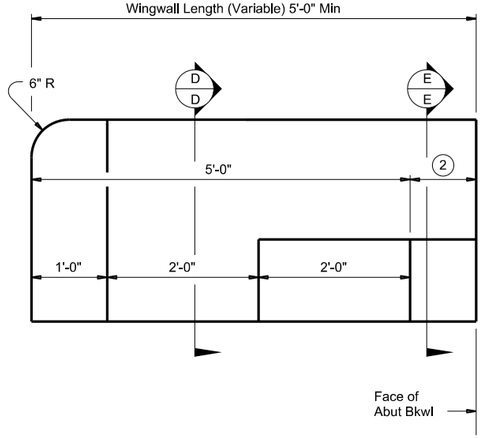


SECTION E-E
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB

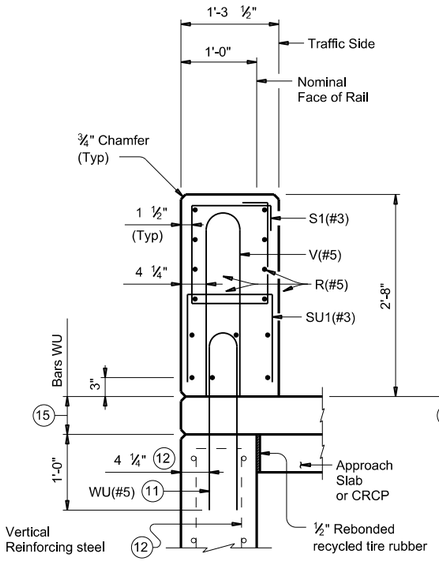


ELEVATION AT
ABUTMENT WINGWALL

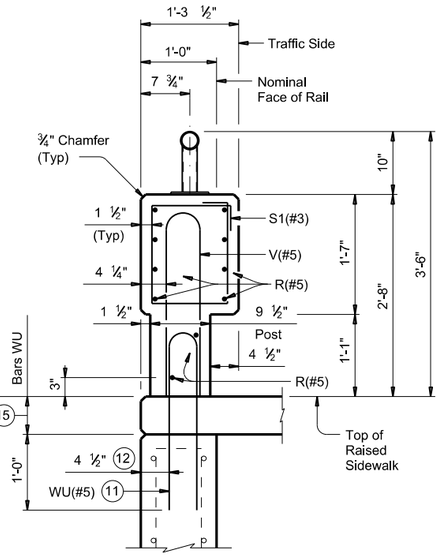
Box culvert parallel wings or rail anchorage curb similar.
HSS rail not shown for clarity.

SECTIONS THRU RAIL WITHOUT RAISED SIDEWALK

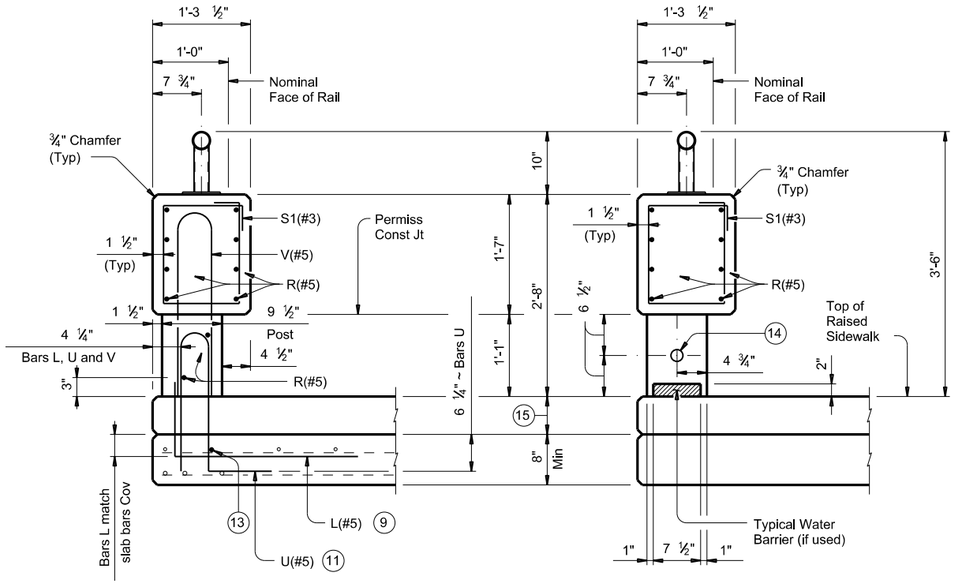
Sections on box culvert similar.



SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

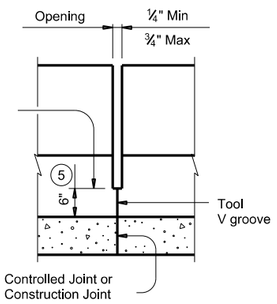


SECTION E-E
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB



POST JOINT DETAIL

(Showing without raised sidewalk)
Provide at all interior bents without slab expansion joints.

SECTIONS THRU RAIL WITH RAISED SIDEWALK

Sections on box culvert similar.

(2) Wingwall Length minus 5'-0" (Varies)

(5) Increase 2" for structures with overlay.

(9) 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.

(11) 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.

(12) 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.

(13) Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

(14) HSS 1.900 x 0.145

(15) Raised Sidewalk.

Texas Department of Transportation

Bridge Division Standard

COMBINATION RAIL

TYPE C223

FILE:	dfstd019-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
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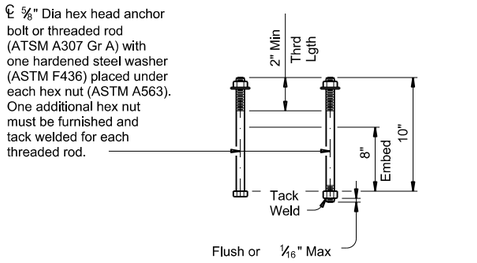
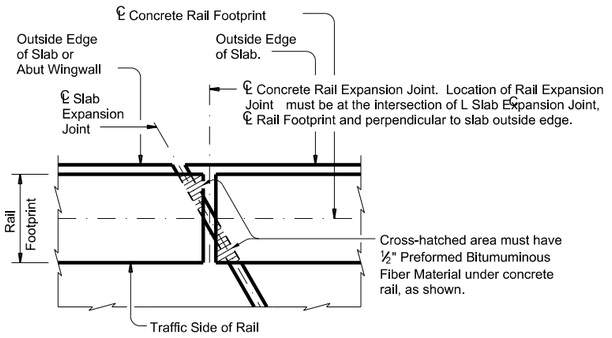
REVISIONS		0177	14	039	SL 494
		DIST	COUNTY		SHEET NO.
		HOU	MONTGOMERY		125

RAIL DATA FOR HORIZONTAL CURVES

	RADIUS TO FACE OF RAIL	MAX CHORD LENGTH	CONSTRUCT OR FABRICATE
HSS Rail	Over 2800'	29'-0"	Straight rail sections
	Over 1400' thru 2800'	14'-6"	To required radius or to chords shown
	Over 700' thru 1400'	7'-3"	
	Thru 700'	Zero	To required radius



CAST-IN-PLACE ANCHOR BOLT OPTIONS (16)



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

(5) Increase 2" for structures with overlay.

(16) See "Material Notes" for anchor bolt information.

(17) For raised sidewalks, add sidewalk height to total bar height. Use sidewalk height at rail's location.

(18) At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 ¼" above the roadway/sidewalk surface without overlay.

CONSTRUCTION NOTES:

Face of rail, posts and parapet must be vertical transversely unless otherwise approved by the Engineer. HSS rail posts and opening end faces must be perpendicular to top of adjacent concrete parapet grade. Use epoxy mortar under HSS rail post base plates if gaps larger than 1/16" exist.

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.

HSS rail sections must not include less than two posts, and no more than four (except at Abutments).

Round or chamfer exposed edges of HSS rail and HSS rail posts to approximately 1/16" by grinding.

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

At the Contractor's option anchor bolts may be cast with the parapet. See "Material Notes".

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.

Provide ASTM A1085, A500 Gr B or A53 Gr B for all HSS.

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.

Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise.

Anchor bolts must be ⅝" Dia ASTM A307 Gr A fully threaded rods with one hex nut 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. Minimum adhesive anchor embedment depth is 3". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 5 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

Optional cast-in-place anchor bolts must be ⅝" Dia ASTM A307 Gr A bolts (or threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer (ASTM F436) at each bolt. Nuts must conform to ASTM A563 requirements.

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.

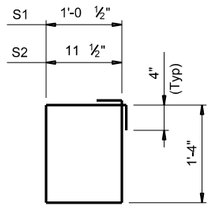
Rail anchorage details shown on this standard may require modification for select structure types.

See appropriate details elsewhere in plans for these modifications.

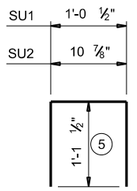
Submit erection drawings showing panel lengths, HSS rail post spacing, and anchor bolt setting to the Engineer for approval.

Average weight of railing with no overlay:
370 plf total
358 plf (Conc)
12 plf (Steel)

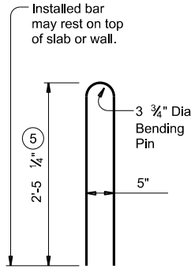
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



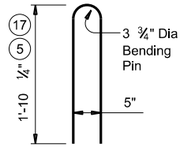
BARS S (#3)



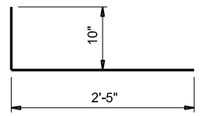
BARS SU (#3)



BARS V (#5) (18)



BARS WU (#5)



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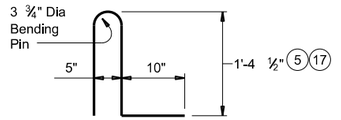

BARS U (#5) (18)

SHEET 4 OF 4

Texas Department of Transportation | Bridge Division Standard

COMBINATION RAIL

TYPE C223

FILE: rlstd019-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		126

DATE:
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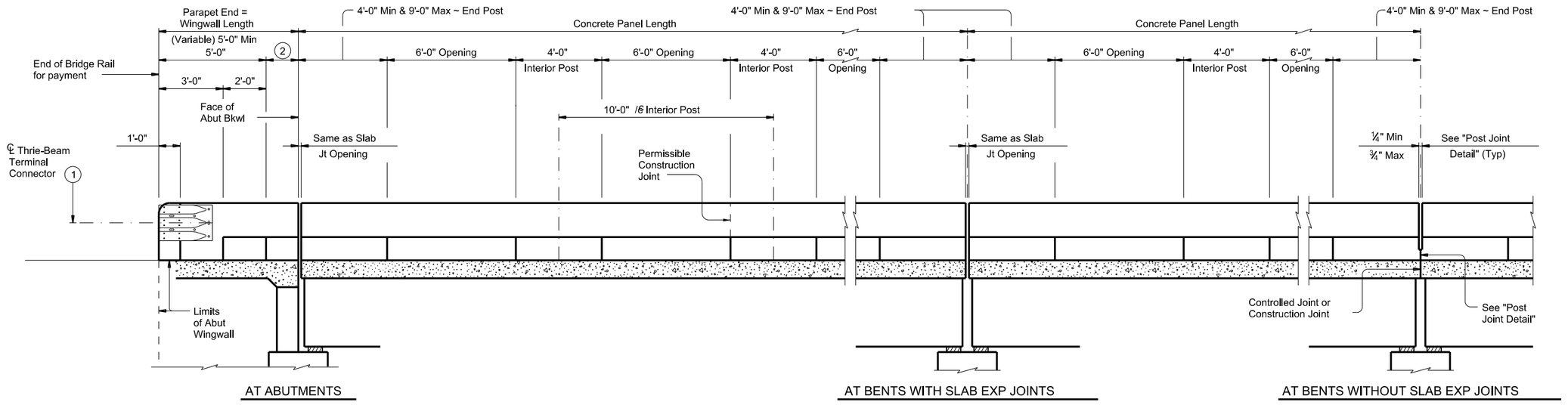
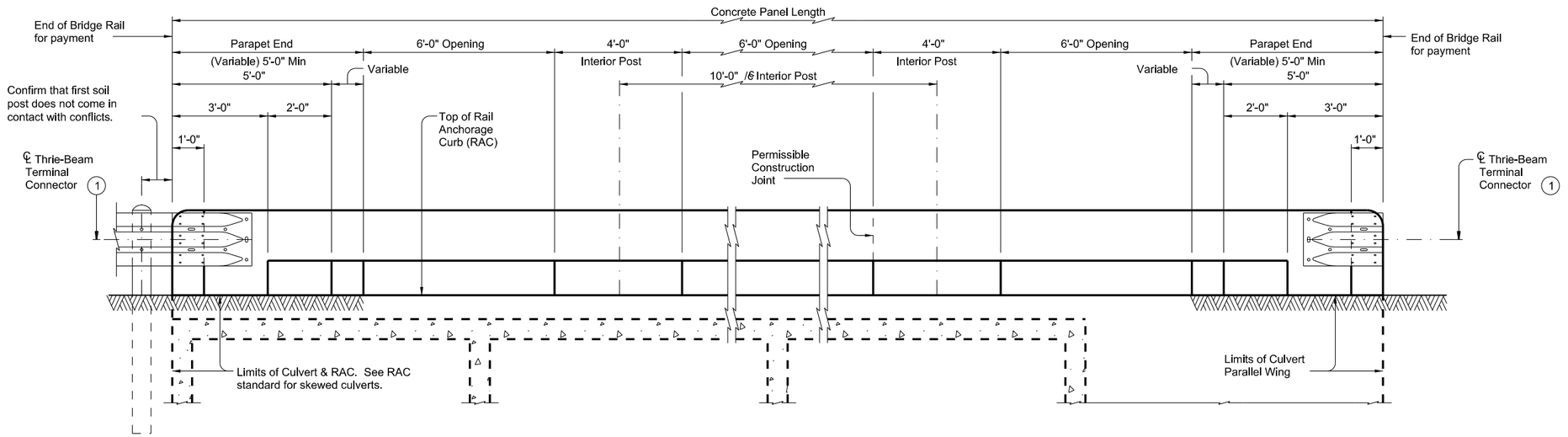


ROADWAY ELEVATION OF RAIL ON BRIDGE



ROADWAY ELEVATION OF RAIL ON BOX CULVERTS

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

(1) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.

(2) Wingwall Length minus 5'-0" (Varies)

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	0177	14	039	SL 494
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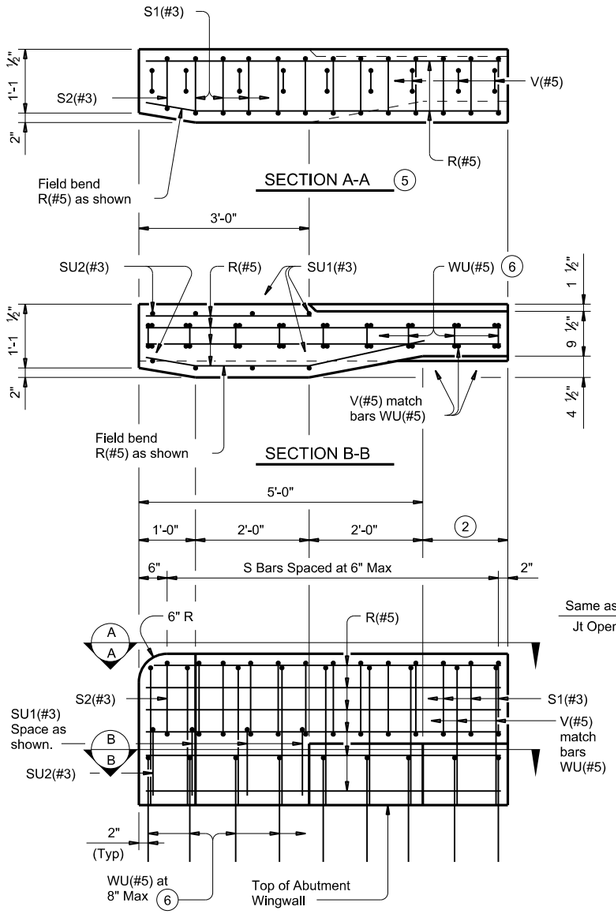
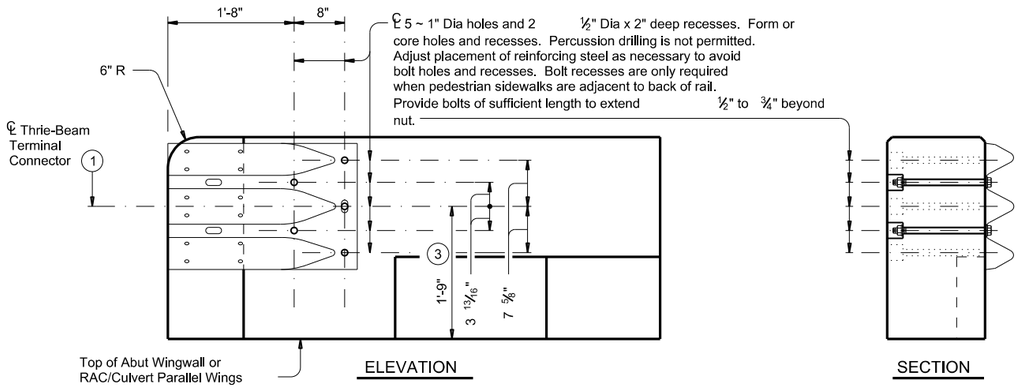
	HOU	MONTGOMERY		127

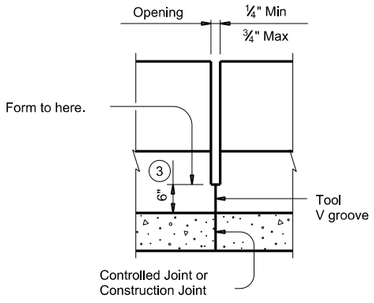
DATE:
FILE:



PARAPET END AT ABUT WINGWALL (6)

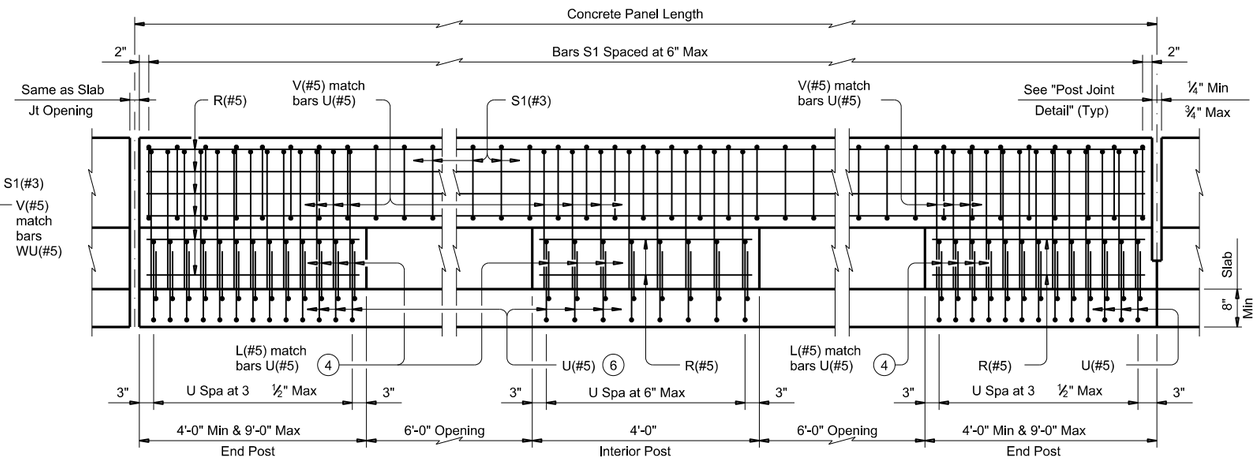


TERMINAL CONNECTION DETAILS



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.

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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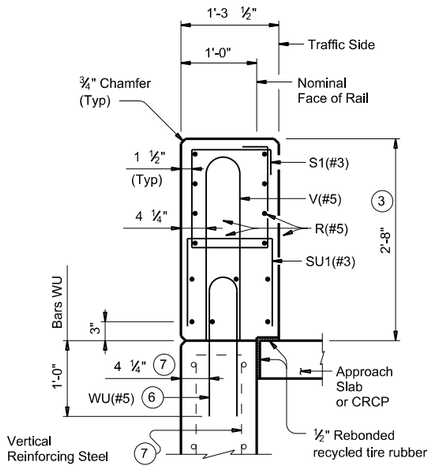
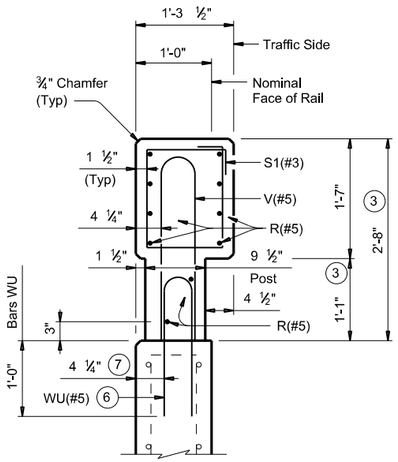
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		128

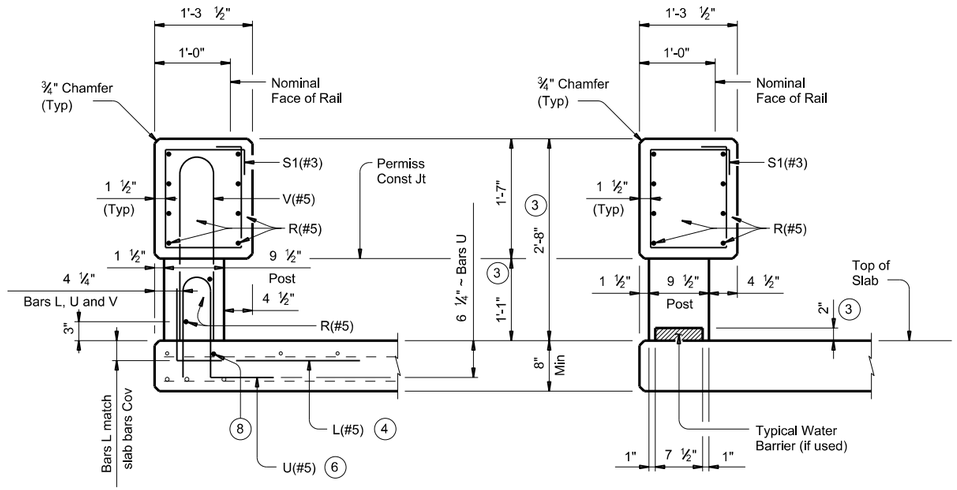
DATE:
FILE:



SECTION C-C
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

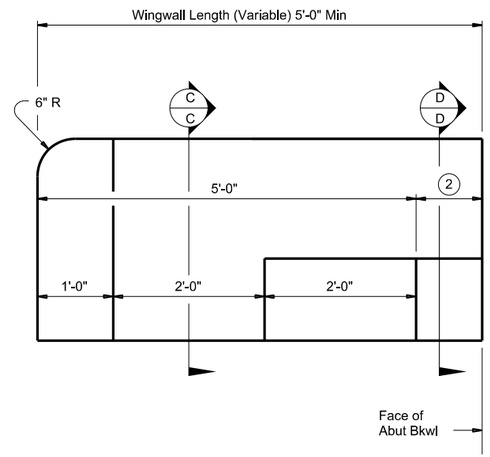


AT POST
ON BRIDGE SLAB

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.

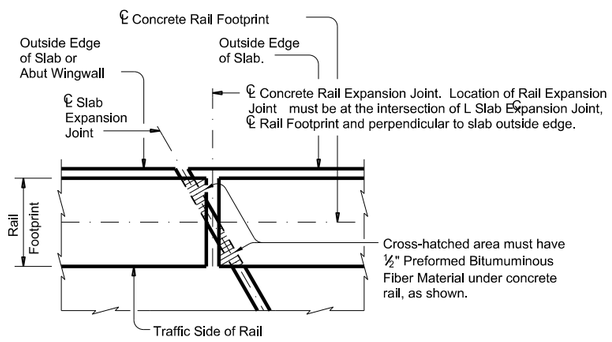
(4) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(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.

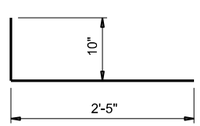
Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

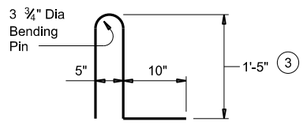
Shop drawings are not required for this rail.

Average weight of railing with no overlay is 358 plf.

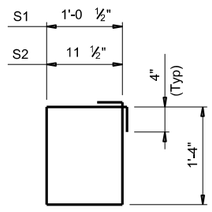
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



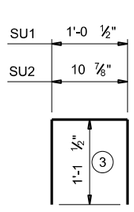
BARS L (#5)



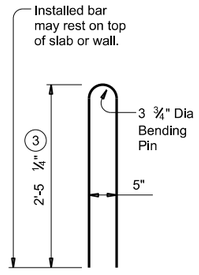
BARS U (#5) (9)



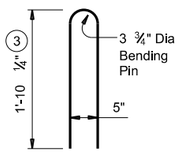
BARS S (#3)



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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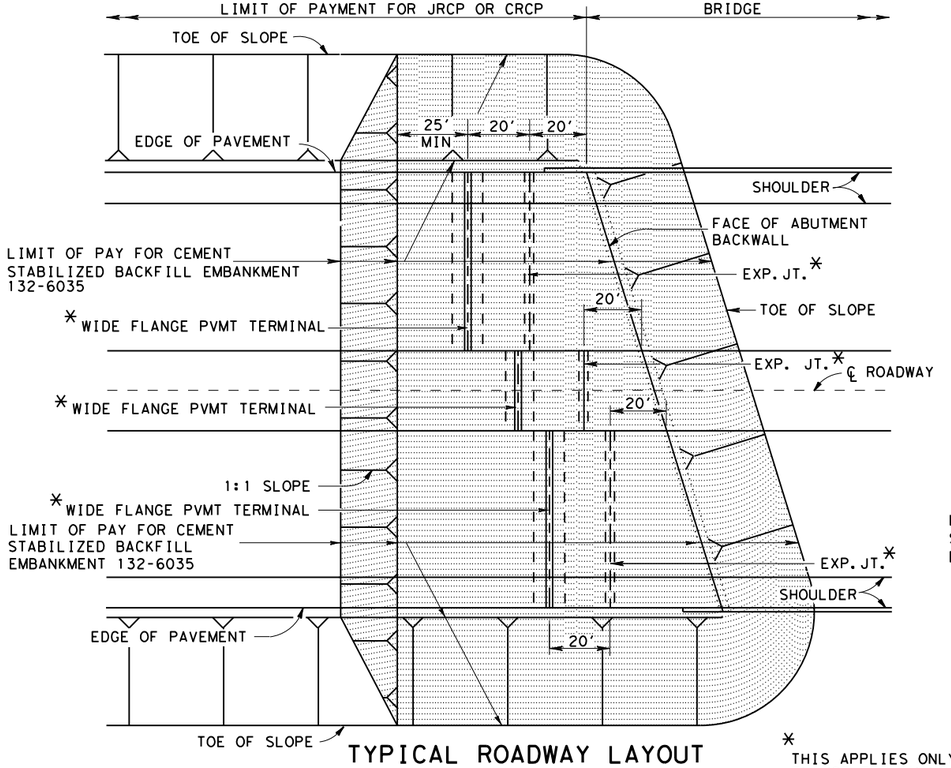
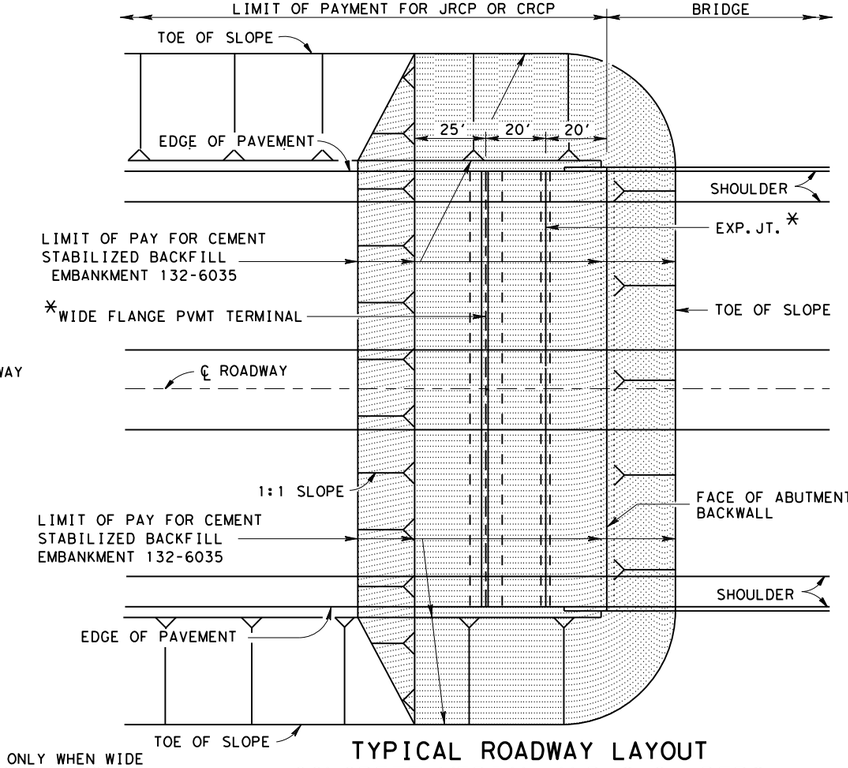
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		129



TYPICAL ROADWAY LAYOUT CONCRETE MEDIAN AND SHOULDERS (AT SKEWED BRIDGES)

* THIS APPLIES ONLY WHEN WIDE FLANGE TERMINALS ARE USED ON THE APPROACHES TO BRIDGES. IF NOT USING THIS SYSTEM, SEE APPROACH SLAB DETAILS ELSEWHWERE IN THE PLANS.



TYPICAL ROADWAY LAYOUT CONCRETE MEDIAN AND SHOULDERS (AT NON-SKEWED BRIDGES)

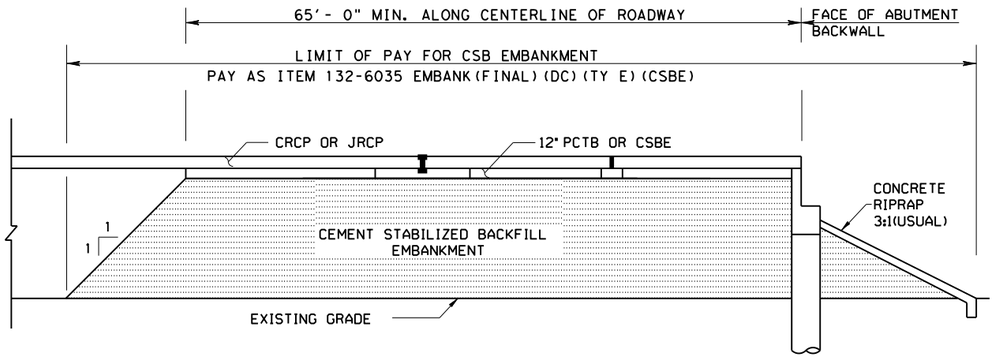
NOTES

1. PROVIDE CEMENT STABILIZED BACKFILL EMBANKMENT IN ACCORDANCE WITH ITEM 132 AND HOUSTON DISTRICT SP (132-001).
2. FOR ADDITIONAL DETAILS ON WIDE FLANGE PAVEMENT TERMINALS SEE "WIDE FLANGE PAVEMENT TERMINALS" STANDARD SHEET.

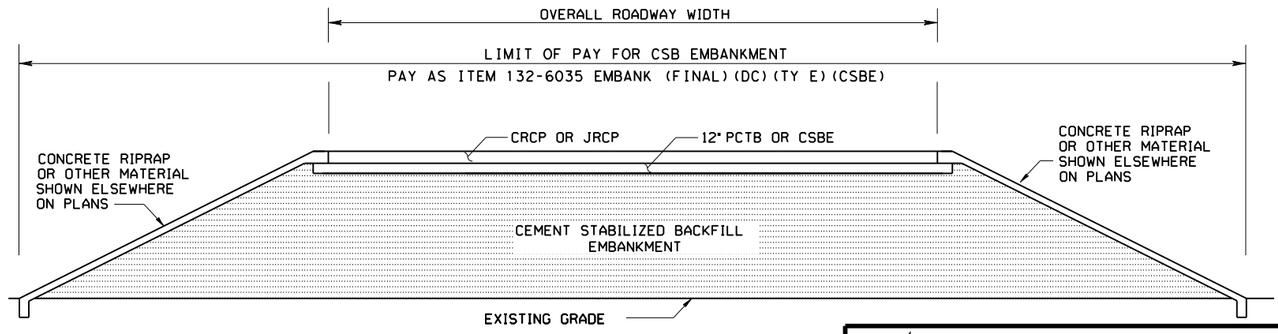
ASB - ASPHALT STABILIZED BASE
CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
CSBE - CEMENT STABILIZED BACKFILL EMBANKMENT
EXP JT - EXPANSION JOINT
JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
LTS - LIME TREATED SUBGRADE
PCTB - PORTLAND CEMENT TREATED BASE

LIMITS OF CEMENT STABILIZED BACKFILL EMBANKMENT. THIS QUANTITY IS PAID UNDER ITEM 132-6035, EMBANKMENT (FINAL)(DENSITY CONTROL) (TY E)(CSBE)

LEGEND



LONGITUDINAL SECTION



TRANSVERSE SECTION

Texas Department of Transportation
Houston District

CEMENT STABILIZED BACKFILL EMBANKMENT

(FOR USE WITHOUT RETAINING WALLS AT BRIDGE ABUTMENTS)

CSBE

SHEET 1 OF 1

FILE: STDB-7.dgn	DN:	CK:	DW:	CK:
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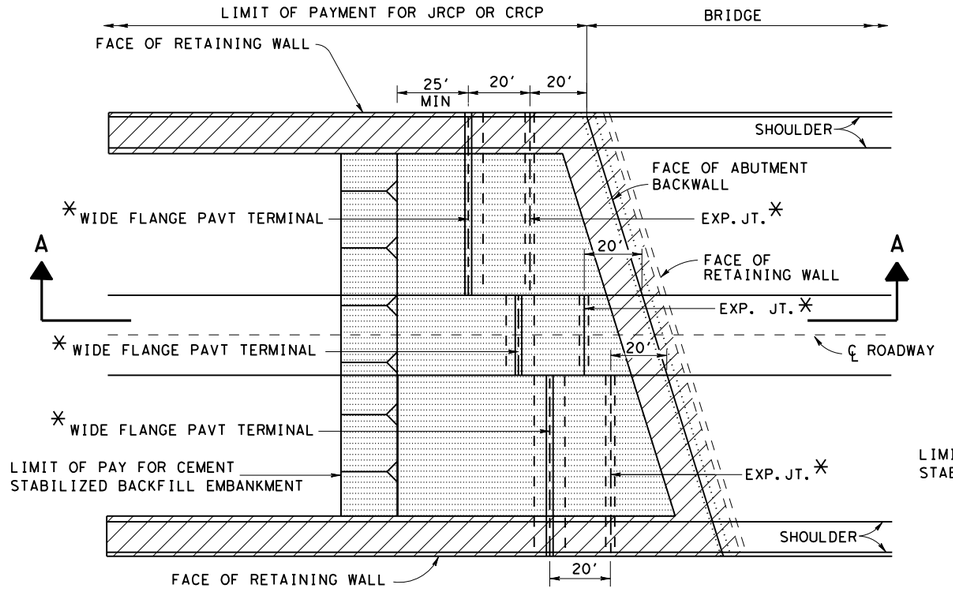
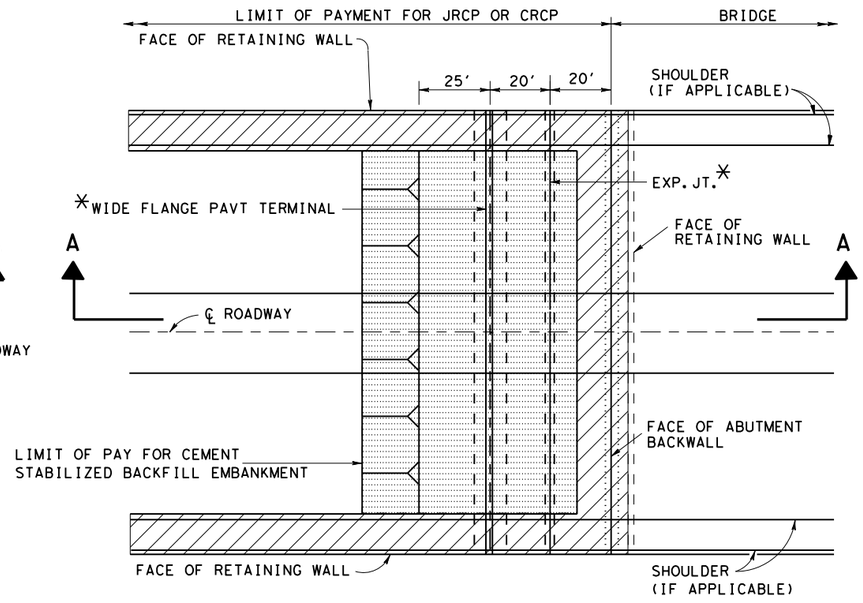
	HOU	6		129A
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY	0177	14	039	SL 494



TYPICAL ROADWAY LAYOUT CONCRETE MEDIAN AND SHOULDERS (AT SKEWED BRIDGES)



TYPICAL ROADWAY LAYOUT CONCRETE MEDIAN AND SHOULDERS (AT NON-SKEWED BRIDGES)

NOTES

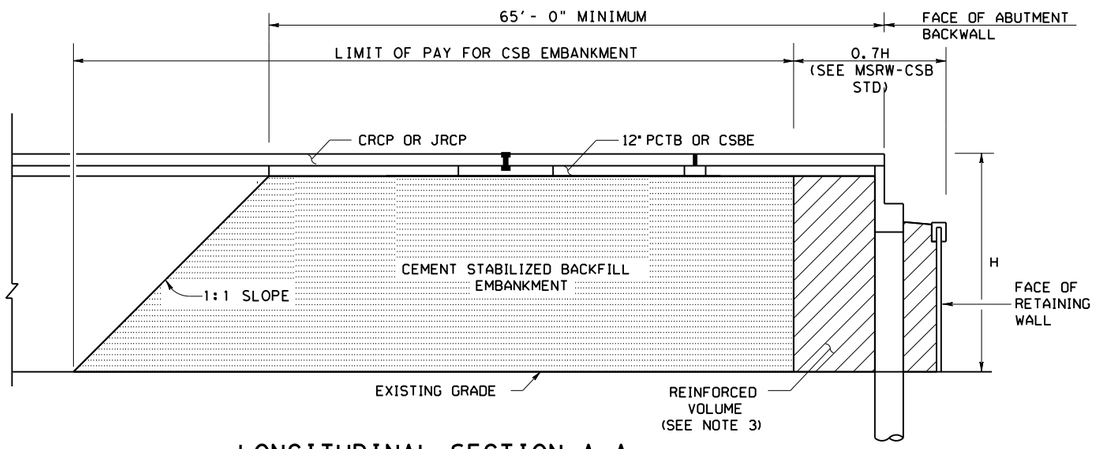
1. USE CEMENT STABILIZED BACKFILL EMBANKMENT IN ACCORDANCE WITH ITEM 132 AND HOUSTON DISTRICT-WIDE SPECIAL PROVISION (132-001).
2. FOR ADDITIONAL DETAILS ON WIDE FLANGE PAVEMENT TERMINALS SEE "WIDE FLANGE PAVEMENT TERMINALS" STANDARD SHEET.
3. FOR ADDITIONAL DETAILS ON RETAINING WALLS SEE "MECHANICALLY STABILIZED RETAINING WALL - CEMENT STABILIZED BACKFILL" MSRW-CSB STANDARD SHEET.

CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
CSBE - CEMENT STABILIZED BACKFILL EMBANKMENT
EXP JT - EXPANSION JOINT
H - HEIGHT OF RETAINING WALL
JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
MSRW - MECHANICALLY STABILIZED RETAINING WALL
PCTB - PORTLAND CEMENT TREATED BASE

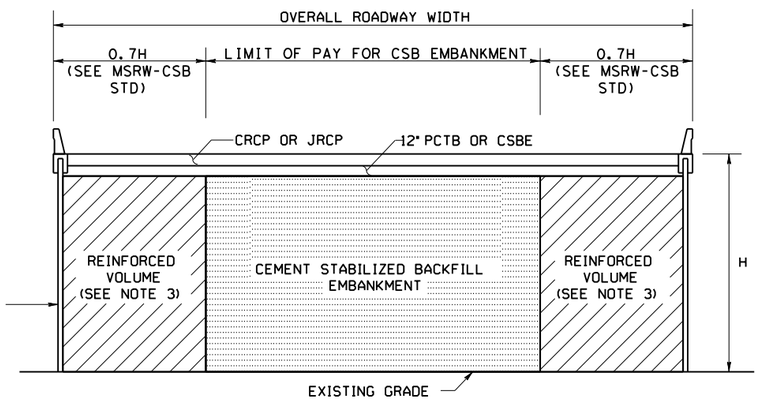
LEGEND

LIMITS OF REINFORCED VOLUME (CEMENT STABILIZED BACKFILL). THIS VOLUME IS PAID UNDER ITEM 132-6006, EMBANKMENT (FINAL) (DC) (TY C).

LIMITS OF CEMENT STABILIZED BACKFILL EMBANKMENT. THIS QUANTITY IS PAID UNDER ITEM 132-6035, EMBANKMENT (FINAL) (DENS CONT) (TY E) (CSBE).



LONGITUDINAL SECTION A-A



TRANSVERSE SECTION

* THIS APPLIES ONLY WHEN WIDE FLANGE TERMINALS ARE USED ON APPROACHES TO BRIDGES. IF NOT USING THIS SYSTEM, SEE APPROACH SLAB DETAILS ELSEWHERE IN THE PLANS.

Texas Department of Transportation
Houston District

CEMENT STABILIZED BACKFILL EMBANKMENT

(FOR USE WITH RETAINING WALLS AT BRIDGE ABUTMENTS)

CSBE-RW

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	MONTGOMERY	0177	14	039	SL 494

DATE:
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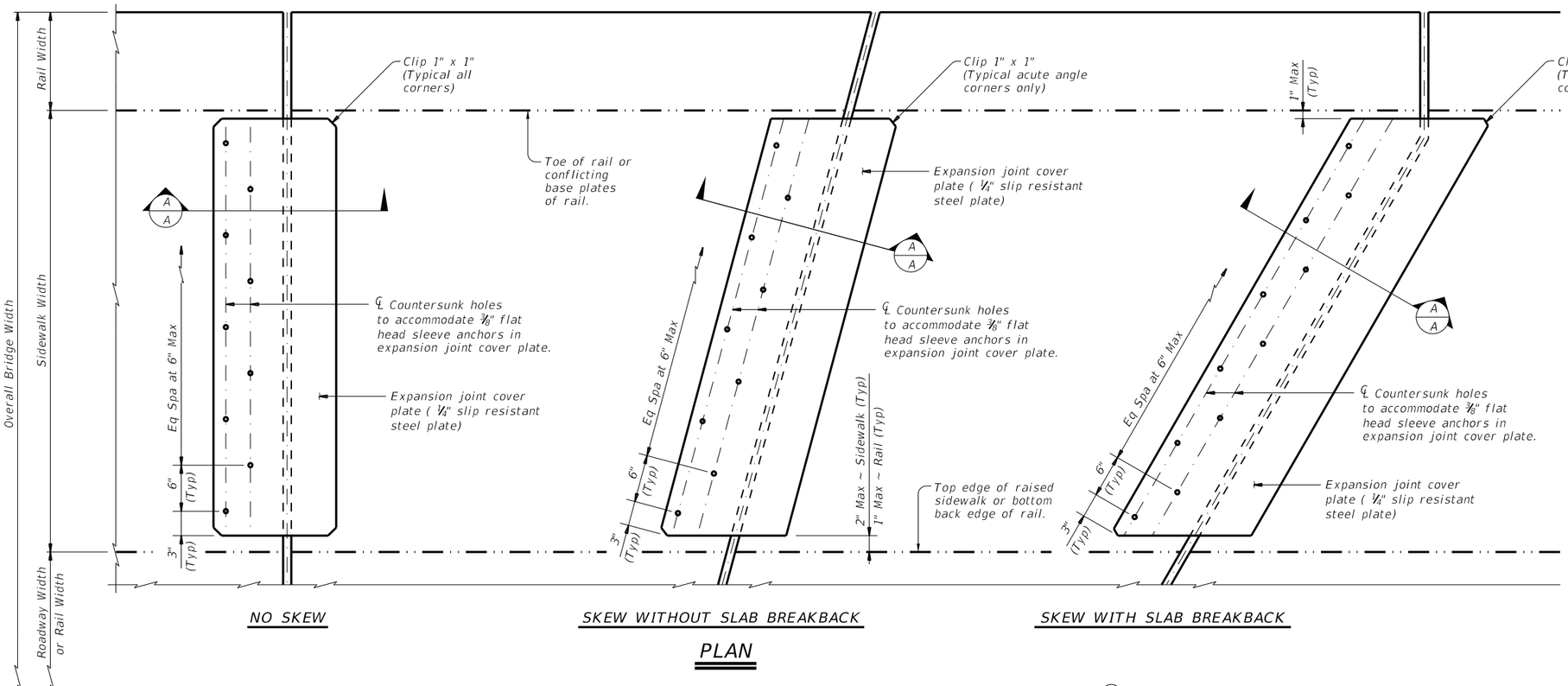
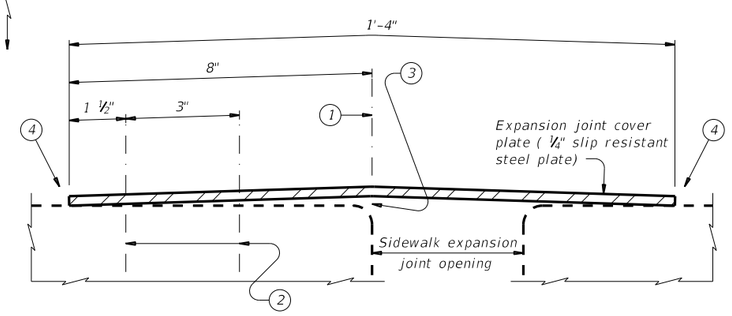
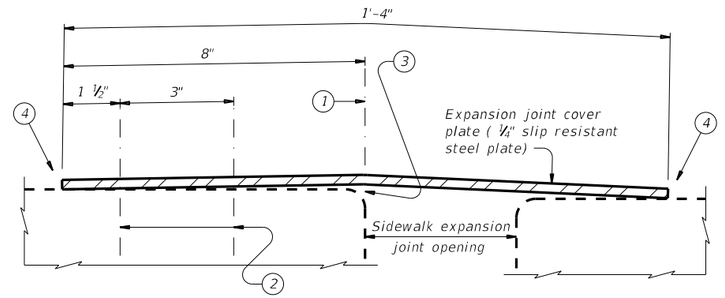


PLAN



SHOWING LEVEL EXP JOINT

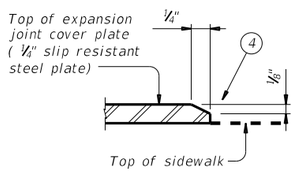


SHOWING UNLEVEL EXP JOINT

(Install sleeve anchors on high side of expansion joint)

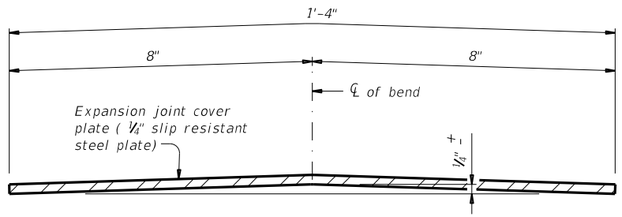
SECTION A-A

1. ℄ Expansion joint cover plate and edge of expansion joint.
2. ℄ ⅜" x 2 ½" Min, Flat Head Sleeve Anchors, Stainless Steel. Countersink Flat Head Sleeve Anchors in ¼" Slip Resistant Steel Plate.
3. It is not necessary to remove plate crown provided the plate is firmly secured to the sidewalk.
4. Transverse edges must be in contact with sidewalk surface after installation.



EXP JOINT COVER PLATE BEVEL DETAIL

Bevel all plate edges as shown.



BENDING DIAGRAM OF EXP JOINT COVER PLATE

APPROVED SLIP RESISTANT PLATE	
Product	Manufacturer Website
Algrip™, Steel	www.algrip.com
Mebac® #3, Steel	www.harscoikg.com
SlipNOT® Grade 2, Steel	www.slipnot.com

Provide cover plates fabricated with a product from this list. No exceptions are permitted.

FABRICATION NOTES:

Shop drawings for the fabrication of Bridge Sidewalk Expansion Joint Cover Plate will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A Bridge Sidewalk Expansion Joint Cover Plate Layout which identifies location side of sleeve anchors and orientation of all cover plate sections must be developed by the fabricator. Mark each steel section in accordance with the Bridge Sidewalk Expansion Joint Cover Plate Layout. A copy of the Bridge Sidewalk Expansion Joint Cover Plate Layout is to be provided to the Engineer.

Sidewalk expansion joint cover plates must be hot-dipped galvanized ¼" slip resistant steel plate. Checker plate or diamond plate is not allowed nor are slip resistant tapes, films and non-metallic coatings.

Minimum required yield strength of steel plate is 36 ksi.

Hot-dip galvanize slip resistant steel plate after fabrication in accordance with Item 445, "Galvanizing".

Provide stainless steel flat head sleeve anchors meeting the requirements of ASTM F 593, Group I, Alloy 304. Countersink holes in slip-resistant plate for sleeve anchors. Drill holes in sidewalk as per sleeve anchor manufacturer's recommendations. Install sleeve anchors flush with, or slightly recessed below, top surface of sidewalk expansion joint cover plate.

GENERAL NOTES:

Sidewalk expansion joint cover plates can only accommodate up to a 7" maximum expansion joint opening.

Details provided are applicable to concrete walkway surfaces only.

Payment for sidewalk expansion joint cover plates are by the pound of "Structural Steel (Misc Non-Bridge)" as per Item 442, "Metal for Structures".

Estimated weight of one sidewalk expansion joint cover plate is 14 plf.

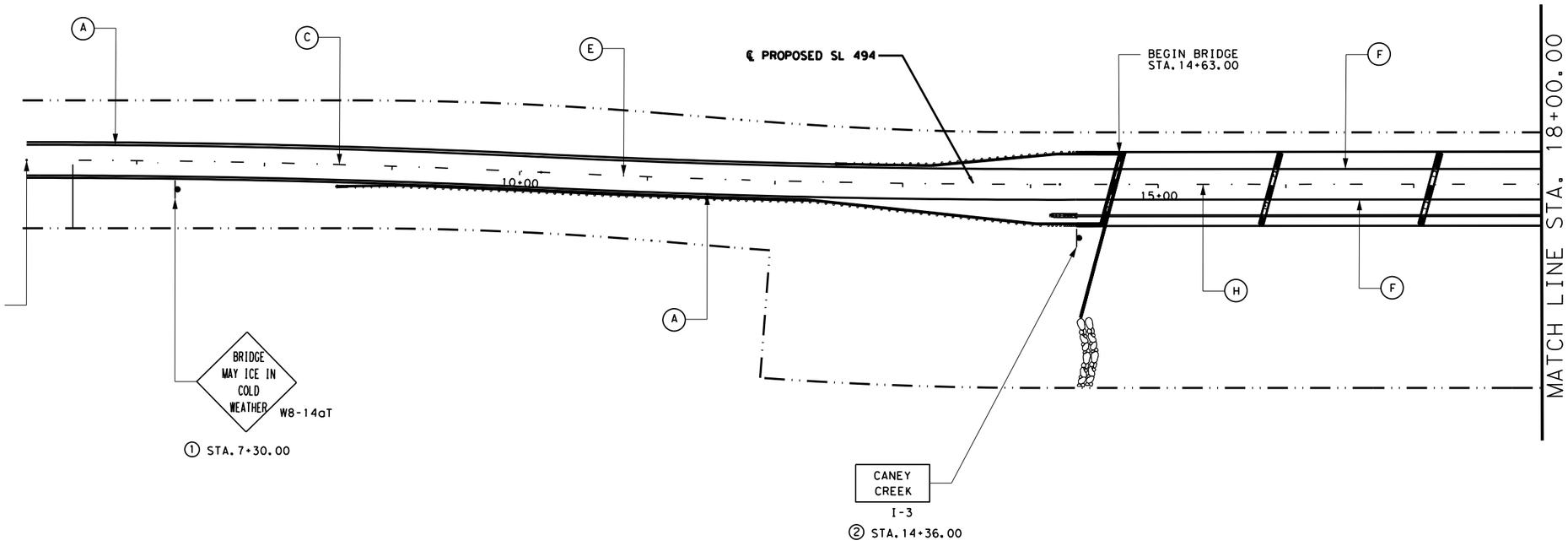
Texas Department of Transportation

Bridge Division Standard

BRIDGE SIDEWALK EXPANSION JOINT COVER PLATE (ALL SKEWS)

BS-EJCP

FILE: bsejste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
8-20: Closer tolerances on cover plate.	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		130



LEGEND

EXIST. PAVEMENT
EXIST. ROW
PROP. PAVEMENT

(A) REF PM W/RET REQ TY I (W)6"(SLD)(100MIL)

(B) REF PM W/RET REQ TY I (Y)6"(SLD)(100MIL)

(C) REF PM W/RET REQ TY I (Y)6"(BRK)(100MIL)

(D) PROP.REFL PAV MRKR TY II-A-A SPACED AT 40'

(E) PROP.REFL PAV MRKR TY II-A-A SPACED AT 80'

(F) MULTIPOLYMER PAV MRK(W)(6")(SLD)

(G) MULTIPOLYMER PAV MRK(Y)(6")(SLD)

(H) MULTIPOLYMER PAV MRK(Y)(6")(BRK)

FOR PAVEMENT MARKINGS AND MARKERS SEE STANDARDS:
PM(1)-20, PM(2)-20, PM(3)-20, PM(WAS)-07
FOR SMALL SIGN INSTALLATION, SEE SIGN MOUNTING DETAIL STANDARDS

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter P.E.
03.01.22

SL 494
PAVEMENT MARKING AND SIGNING LAYOUT

SHEET 1 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		131

DATE: 03/01/2022 11:10 AM
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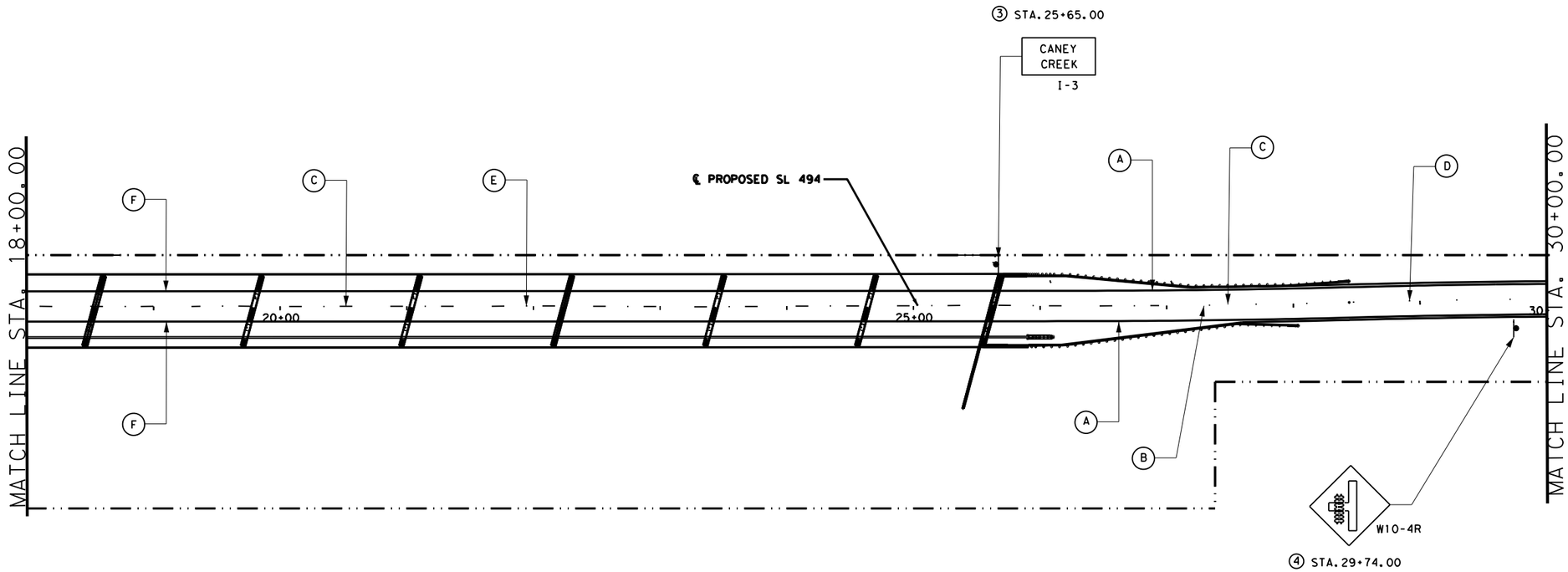

LEGEND

EXIST. PAVEMENT
EXIST. ROW
PROP. PAVEMENT

(A) REF PM W/RET REQ TY I (W)6"(SLD)(100MIL)

(B) REF PM W/RET REQ TY I (Y)6"(SLD)(100MIL)

(C) REF PM W/RET REQ TY I (Y)6"(BRK)(100MIL)

(D) PROP.REFL PAV MRKR TY II-A-A SPACED AT 40'

(E) PROP.REFL PAV MRKR TY II-A-A SPACED AT 80'

(F) MULTIPOLYMER PAV MRK(W)(6")(SLD)

(G) MULTIPOLYMER PAV MRK(Y)(6")(SLD)

(H) MULTIPOLYMER PAV MRK(Y)(6")(BRK)

FOR PAVEMENT MARKINGS AND MARKERS SEE STANDARDS:
PM(1)-20, PM(2)-20, PM(3)-20, PM(WAS)-07
FOR SMALL SIGN INSTALLATION, SEE SIGN MOUNTING DETAIL STANDARDS

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.01.22

SL 494
PAVEMENT MARKING AND SIGNING LAYOUT

SHEET 2 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		132

DATE: 02/02/2022 09:45 AM
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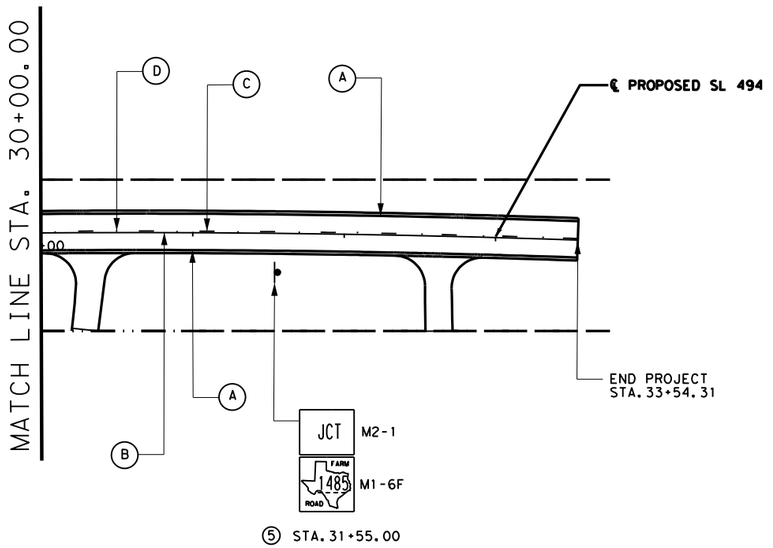


LEGEND

EXIST. PAVEMENT
EXIST. ROW
PROP. PAVEMENT

(A) REF PM W/RET REQ TY I (W)6"(SLD)(100MIL)

(B) REF PM W/RET REQ TY I (Y)6"(SLD)(100MIL)

(C) REF PM W/RET REQ TY I (Y)6"(BRK)(100MIL)

(D) PROP.REFL PAV MRKR TY II-A-A SPACED AT 40'

(E) PROP.REFL PAV MRKR TY II-A-A SPACED AT 80'

(F) MULTIPOLYMER PAV MRK(W)(6")(SLD)

(G) MULTIPOLYMER PAV MRK(Y)(6")(SLD)

(H) MULTIPOLYMER PAV MRK(Y)(6")(BRK)

FOR PAVEMENT MARKINGS AND MARKERS SEE STANDARDS:
PM(1)-20,PM(2)-20,PM(3)-20,PM(WAS)-07
FOR SMALL SIGN INSTALLATION, SEE SIGN MOUNTING DETAIL STANDARDS

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.01.22

SL 494
PAVEMENT MARKING AND SIGNING LAYOUT

SHEET 3 OF 3

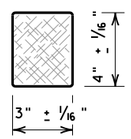
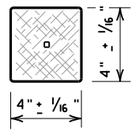
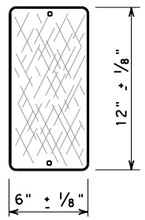
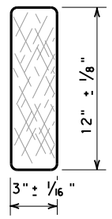
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		133

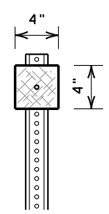
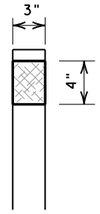
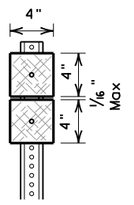
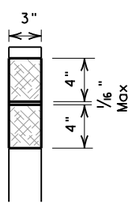
DATE: 02/02/2022 10:05 AM
FILE:

CK:
DW:
CK:
DN:

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

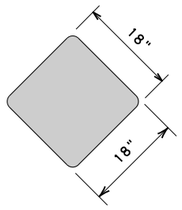
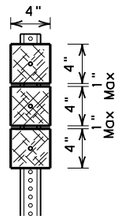
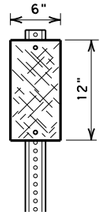
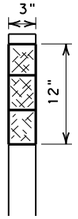
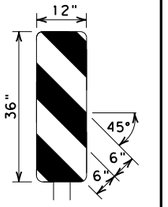
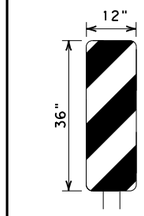
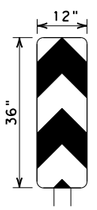
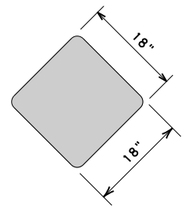
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

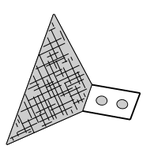
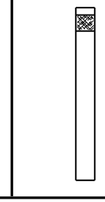
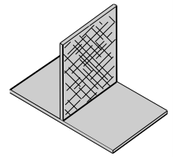
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

BARRIER REFLECTORS (BRF)

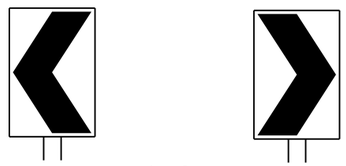
	GF1	GF2	CTB
DEVICE			

1. Barrier reflectors shall meet the requirements of DMS 8600.
2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.

SHEETING: Yellow, White, Red

NOTE
1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

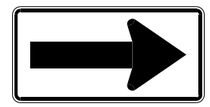
CHEVRONS

DEVICE:  W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE:  W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

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	0177	14	039	SL 494
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	HOU	MONTGOMERY		134

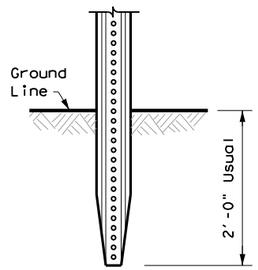
20A

DATE:
FILE:

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

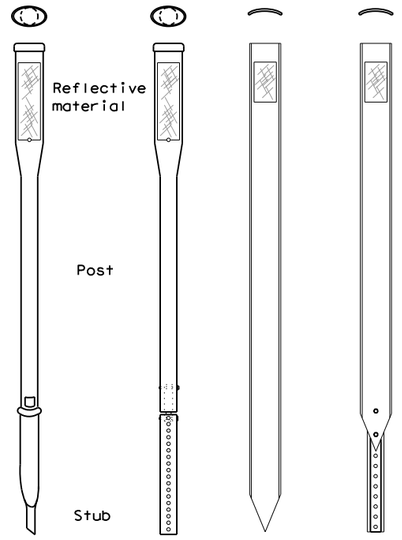


NOTES

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.

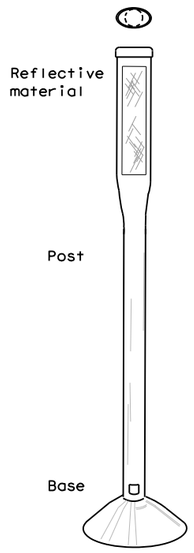
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



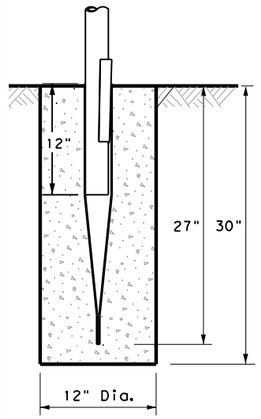
SURFACE MOUNT

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.

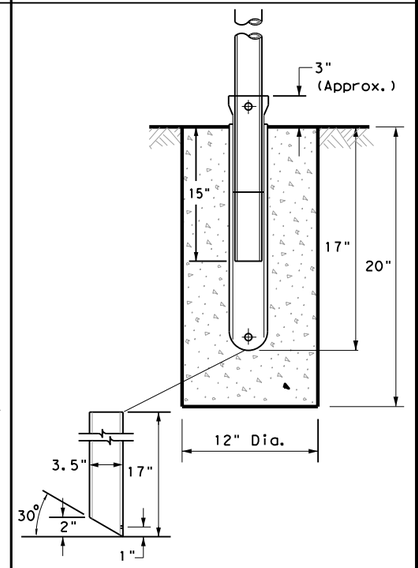
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

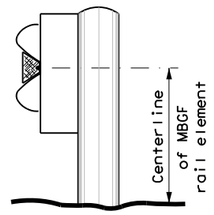
NOTE

1. Install per manufacturer's recommendations.

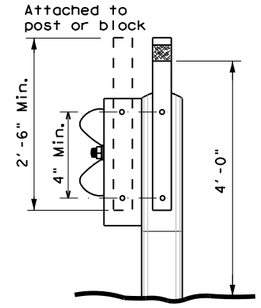
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

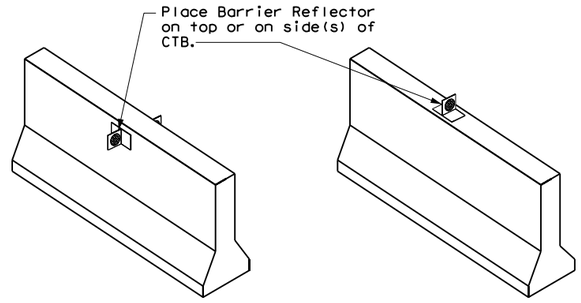
GF1



GF2



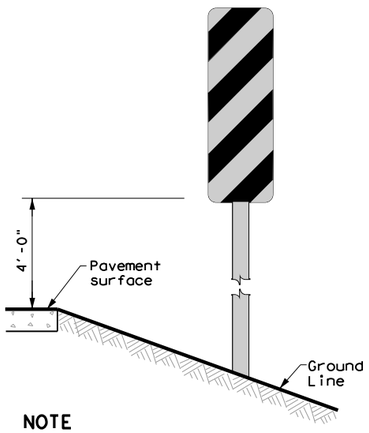
CONCRETE TRAFFIC BARRIER (CTB)



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.

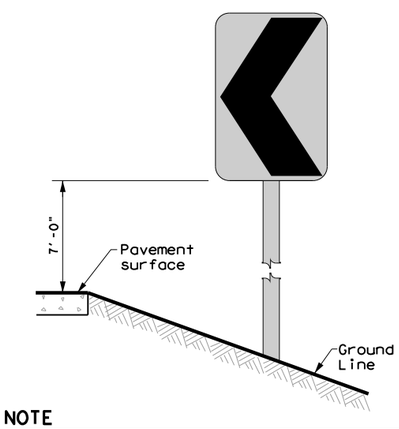
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

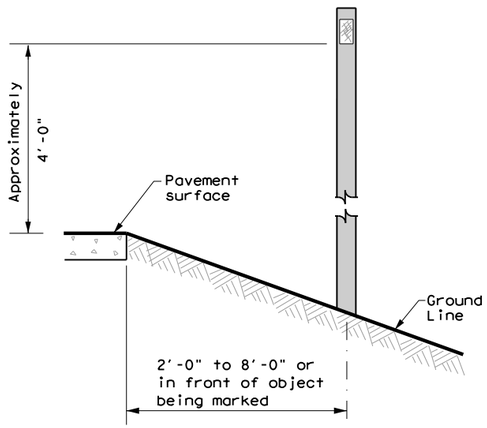
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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
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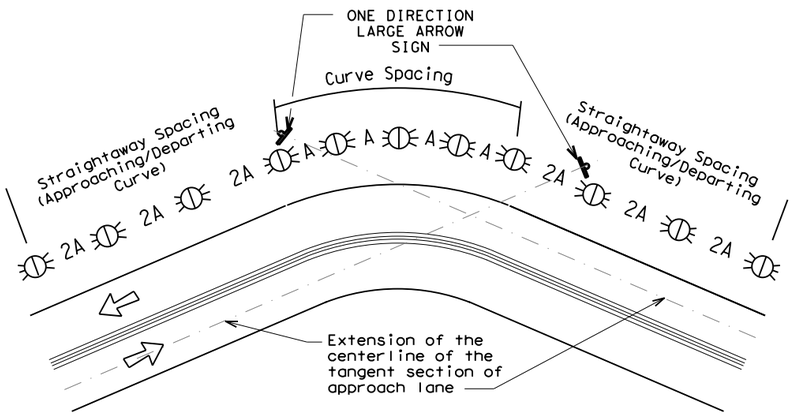
20B

DATE:
FILE:

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

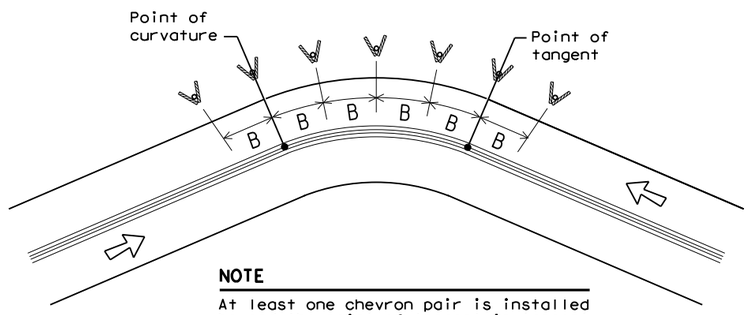
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



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
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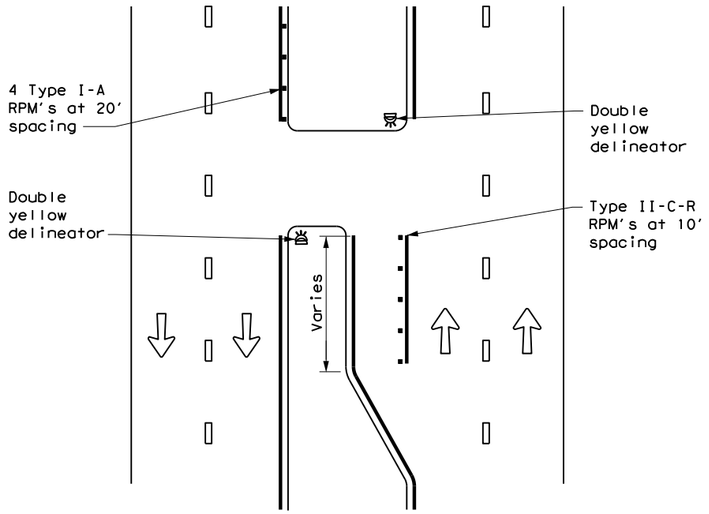
8-15 7-20	HOU	MONTGOMERY		136

20C

DATE:
FILE:

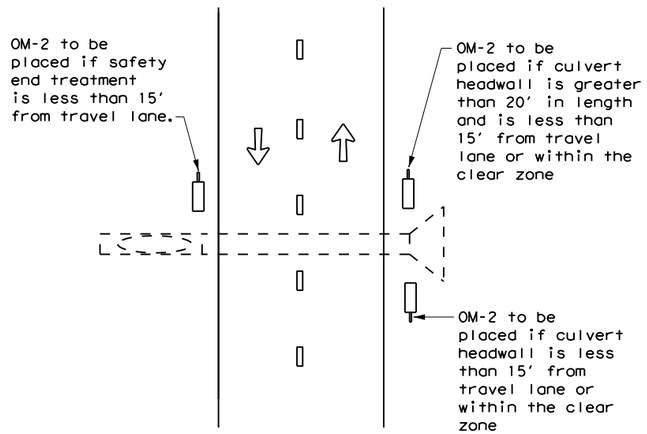
DATE:
FILE:

CROSSOVERS



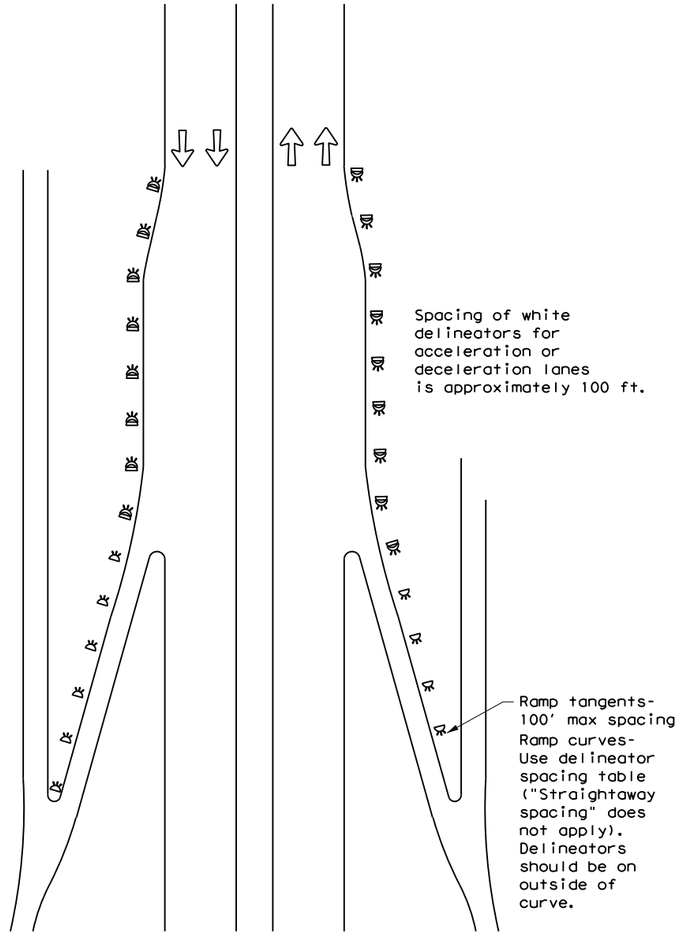
DETAIL 1

FOR CULVERTS WITHOUT MBGF



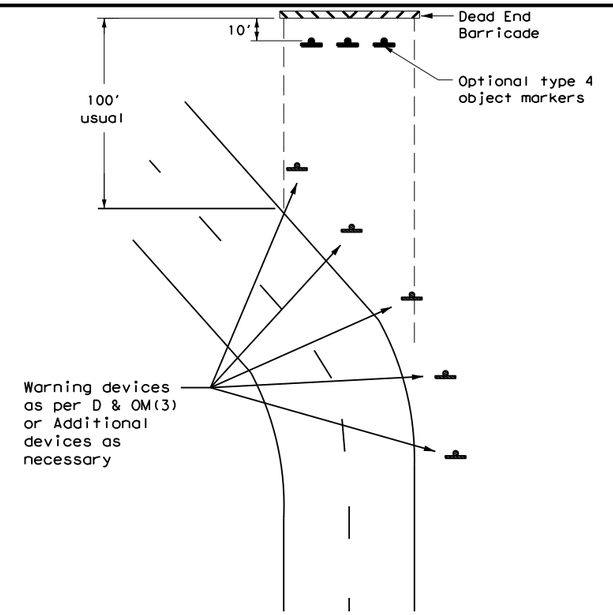
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



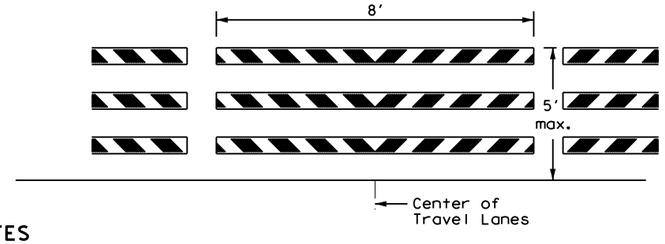
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

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

DETAIL 5

LEGEND

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

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
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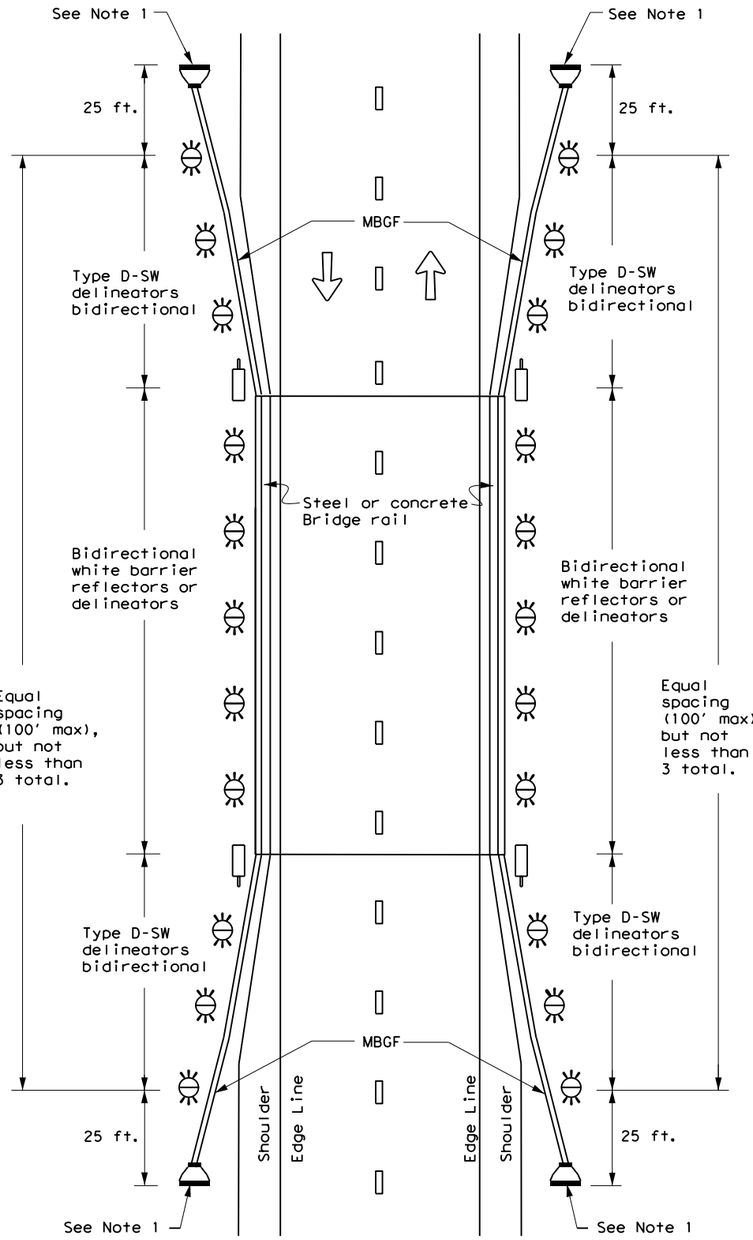
20D

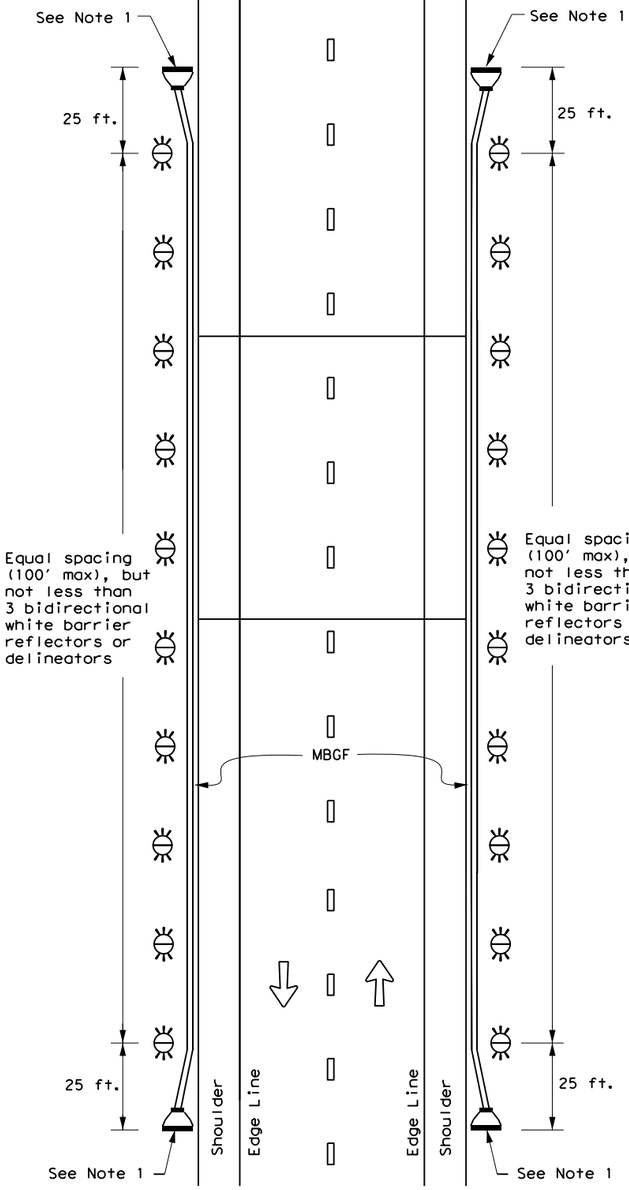
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

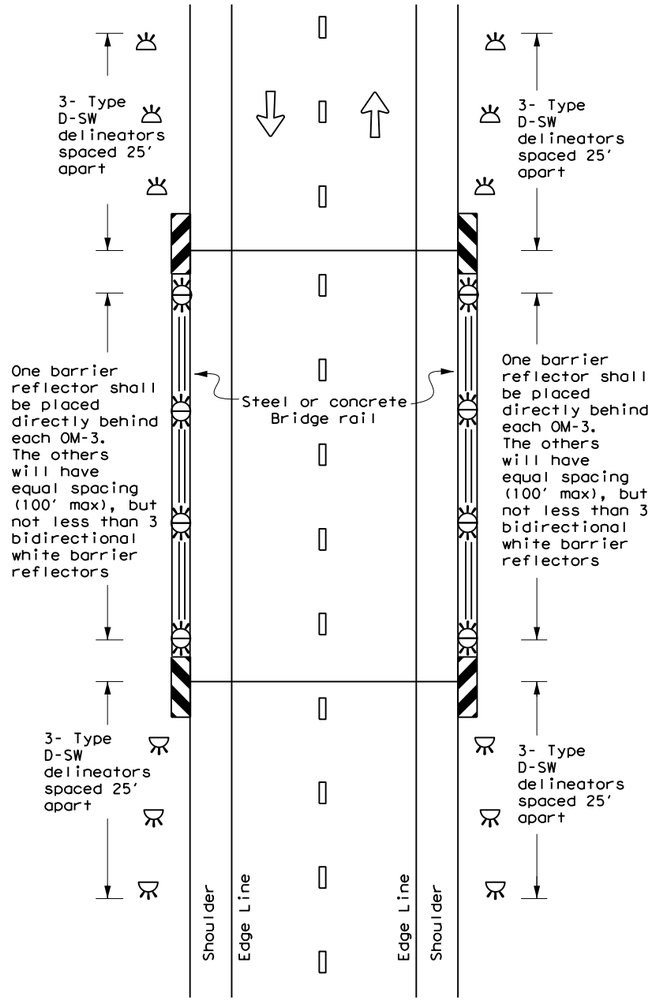
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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

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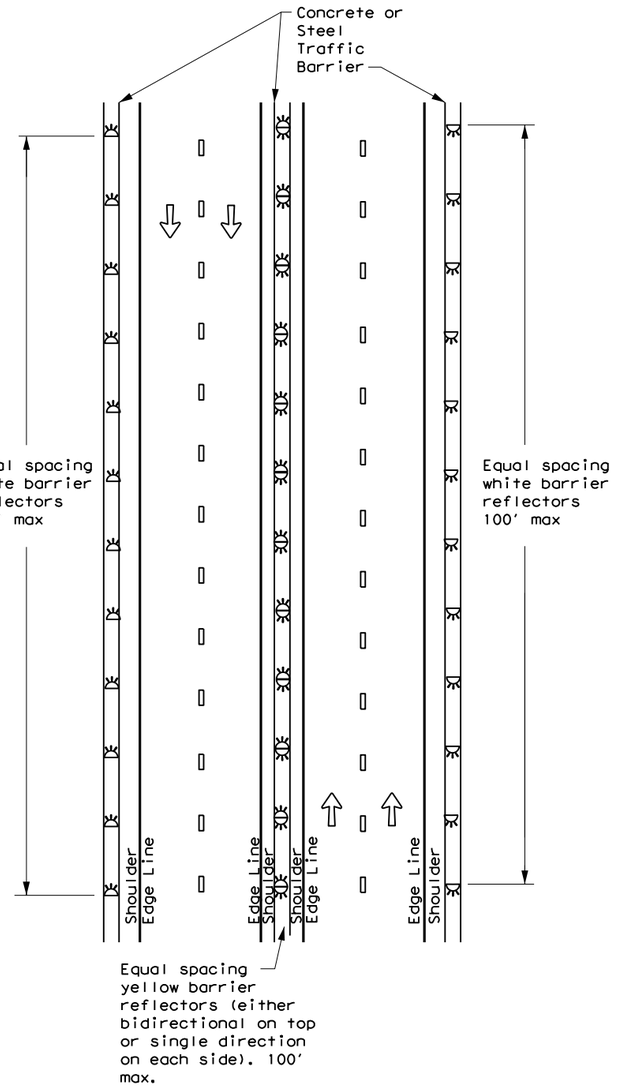
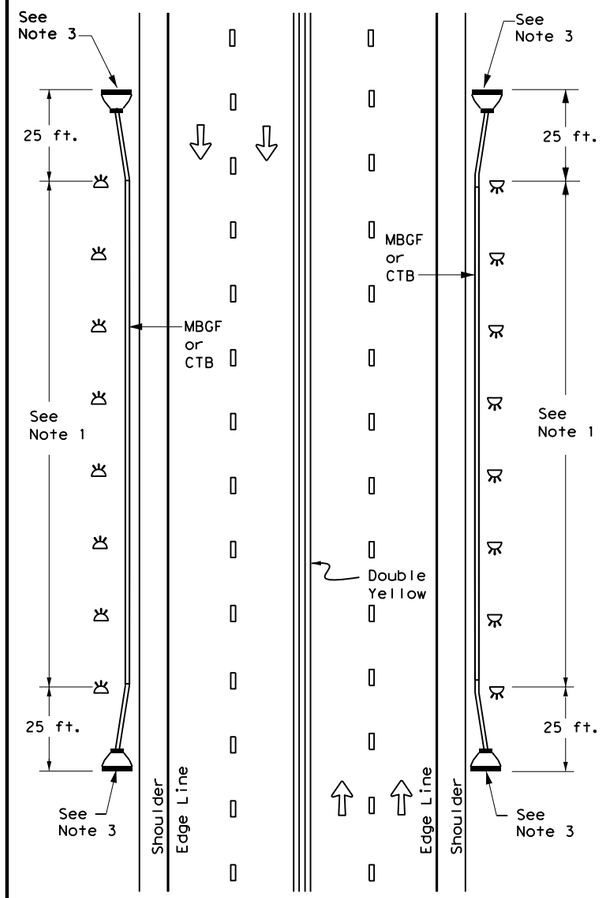
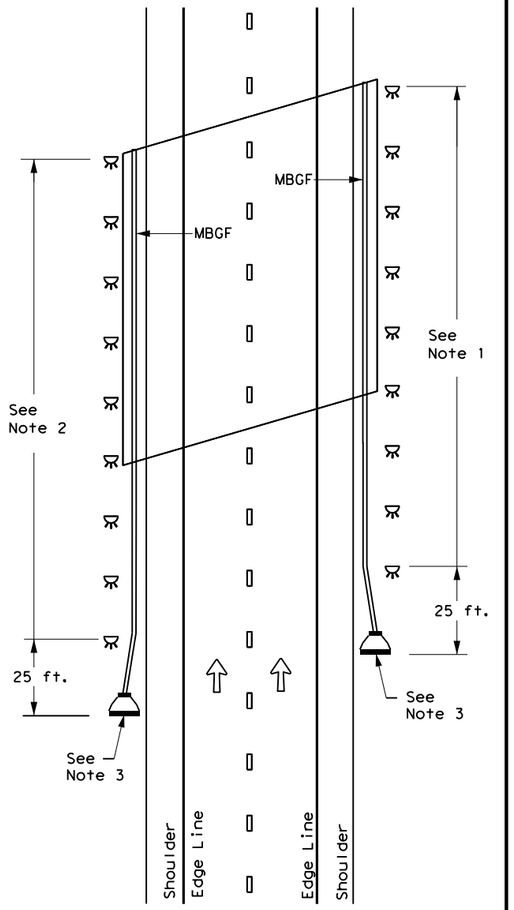
CONTINUOUS CONCRETE OR STEEL BARRIER



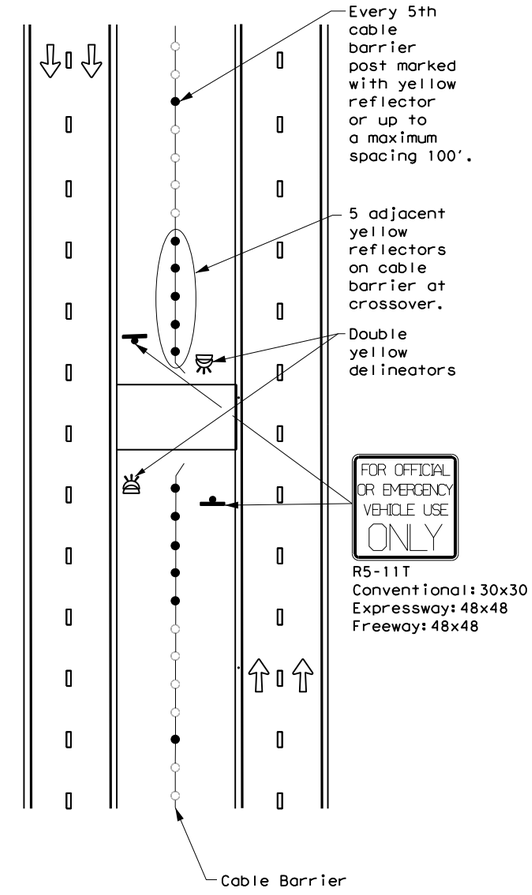
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3)in front of the terminal end.

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

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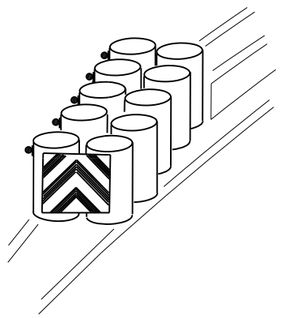
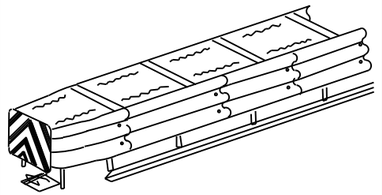
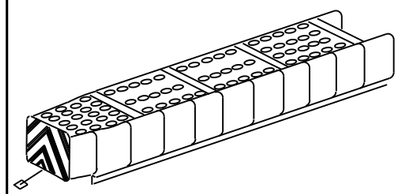
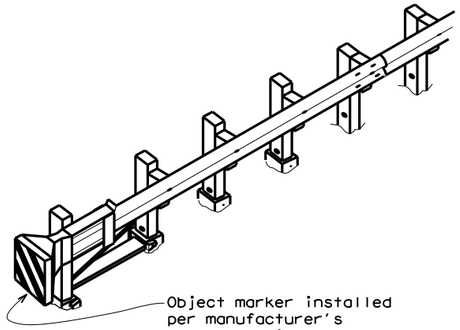
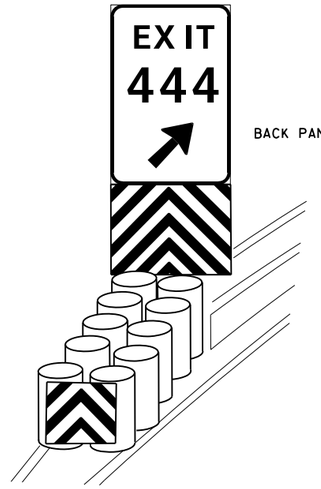
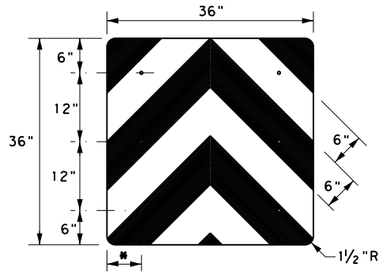


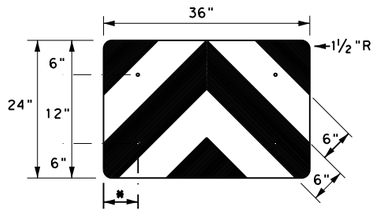




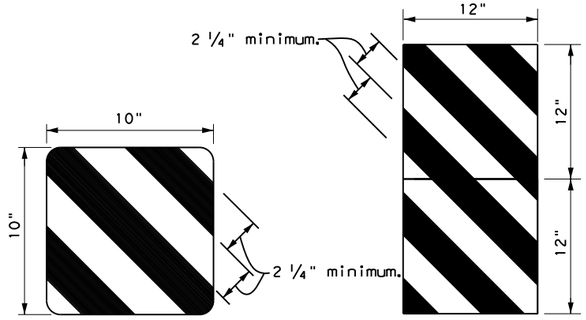




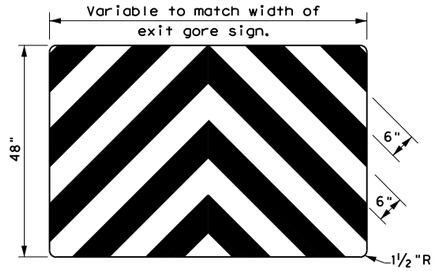


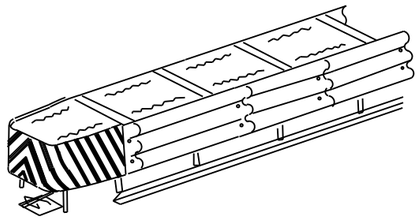


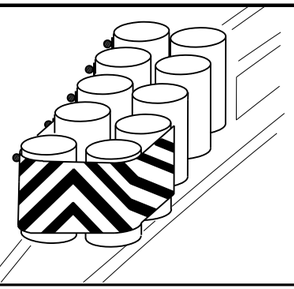
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

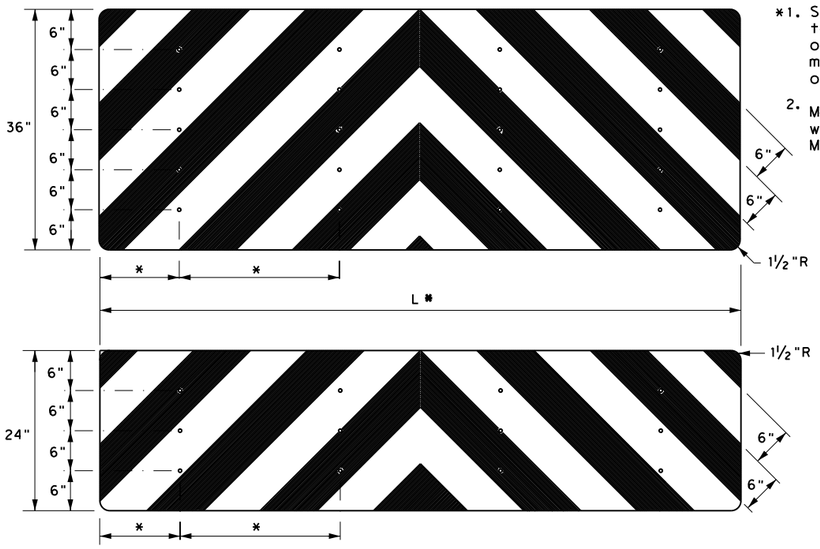


OBJECT MARKERS SMALLER THAN 3 FT^2









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

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DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	HOU	MONTGOMERY		140
4-98 7-20				

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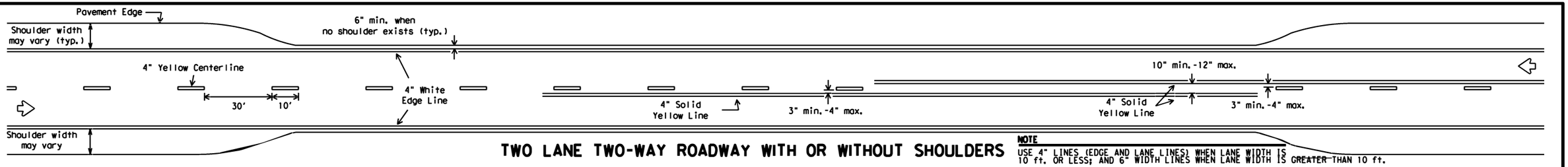
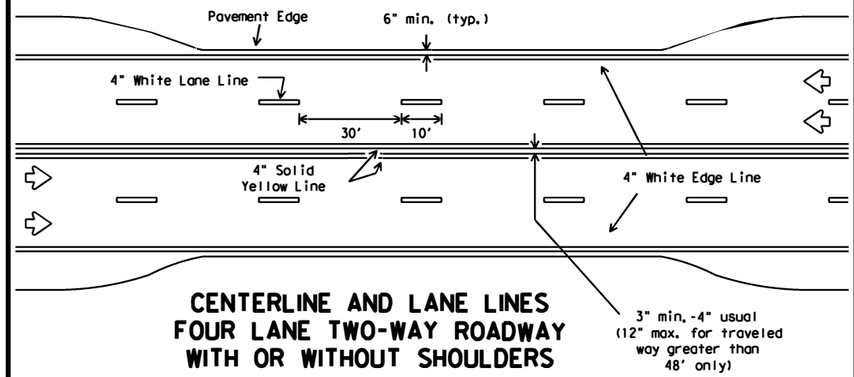
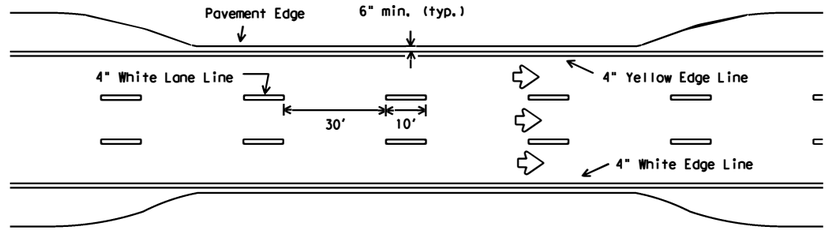


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

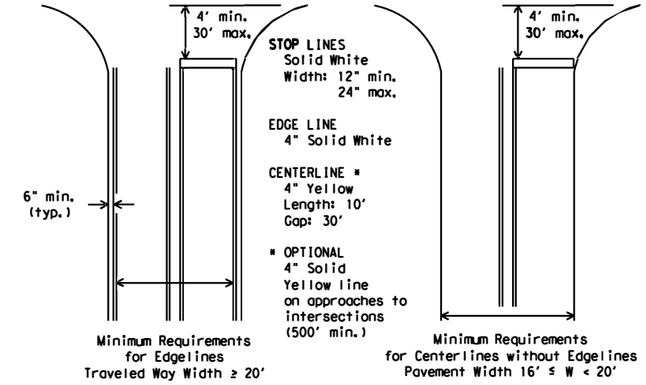
NOTE
USE 4" LINES (EDGE AND LANE LINES) WHEN LANE WIDTH IS 10 ft. OR LESS; AND 6" WIDTH LINES WHEN LANE WIDTH IS GREATER THAN 10 ft.



CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

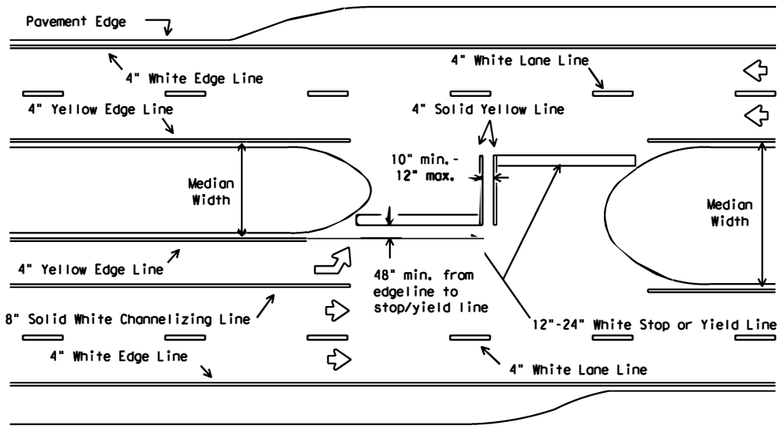


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



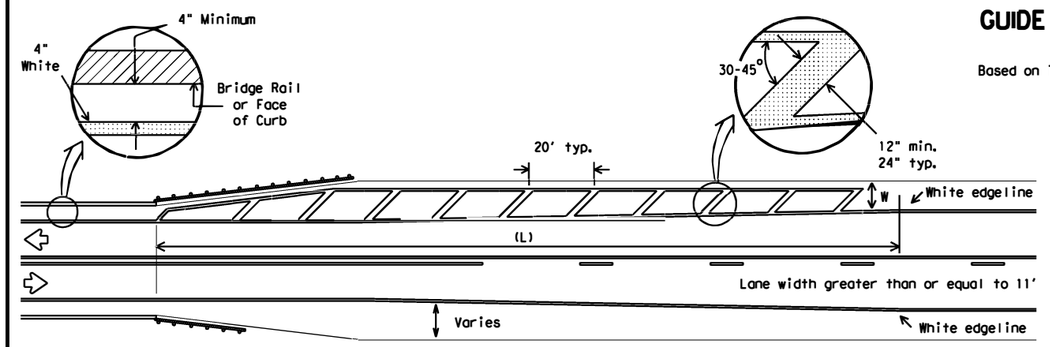
GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways



All medians shall be field measured to determine the location of necessary striping. Stop/Yield bars and centerlines shall be placed when the median width is greater than 30 ft. The median width is defined as the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges and of opposite approaches of the same intersection. The narrow median width will be the controlling width to determine if markings are required.

FOUR LANE DIVIDED ROADWAY INTERSECTIONS



NOTES:

1. No-passing zone on bridge approach is optional but if used, it shall be a minimum 500 feet long.
2. For crosshatching length (L) see Table 1.
3. The width of the offset (W) and the required crosshatching width is the full shoulder width in advance of the bridge.
4. The crosshatching is not required if delineators or barrier reflectors are used along the structure.
5. For guard fence details, refer elsewhere in the plans.

ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

TABLE 1 - TYPICAL LENGTH (L)

Posted Speed *	Formula
≤ 40	$L = \frac{WS^2}{60}$
≥ 45	L=WS

* 85th Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit. Crosshatching length should be rounded up to nearest 5 foot increment.

L=Length of Crosshatching (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

EXAMPLES:

An 8 foot shoulder in advance of a bridge reduces to 4 feet on a 70 MPH roadway. The length of the crosshatching should be:

$L = 8 \times 70 = 560$ ft.

A 4 foot shoulder in advance of a bridge reduces to 2 feet on a 40 MPH roadway. The length of the crosshatching should be:

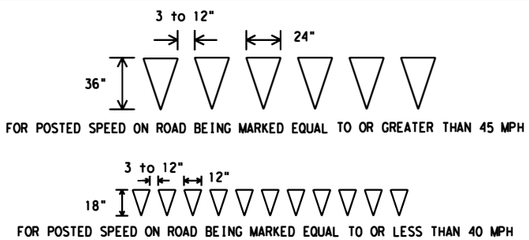
$L = 4(40)^2 / 60 = 106.67$ ft. rounded to 110 ft.

GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should typically be placed a minimum of 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 and not the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to 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.



YIELD LINES

Texas Department of Transportation
HOUSTON DISTRICT STANDARD

TYPICAL STANDARD PAVEMENT MARKINGS

PM-16

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		141

STD N-5a

DATE: $DATE$ $TIME$
FILE: $FILE$

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

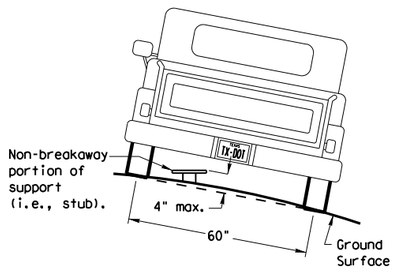
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

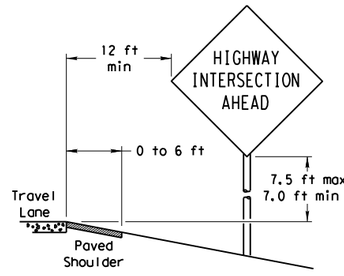
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

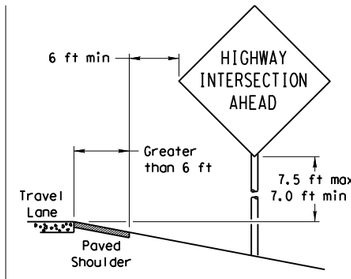
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

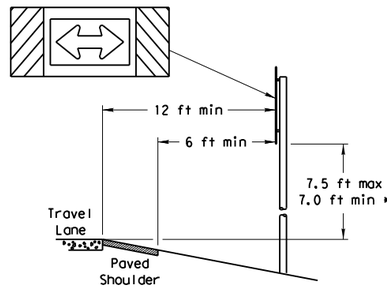
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



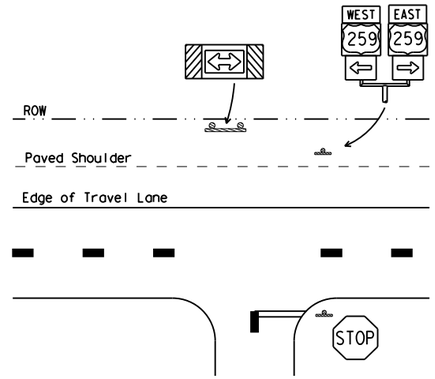
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

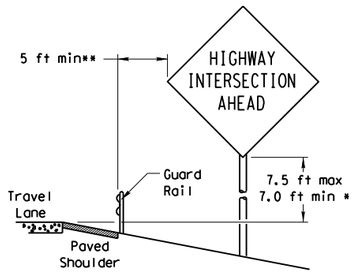
T-INTERSECTION



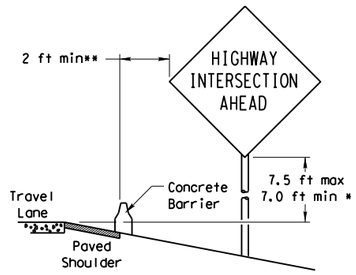
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



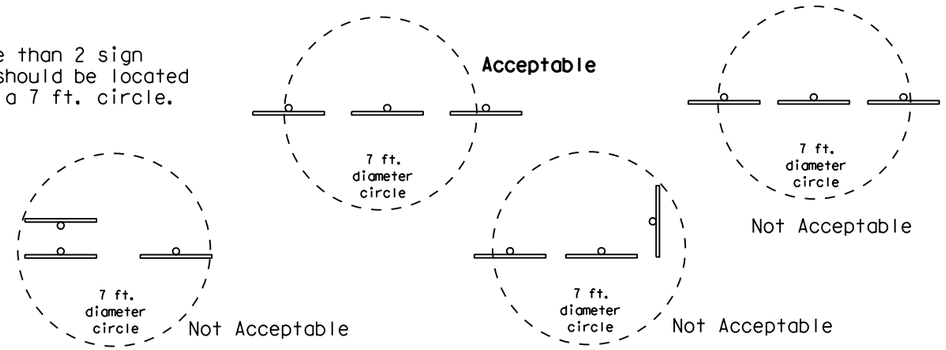
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

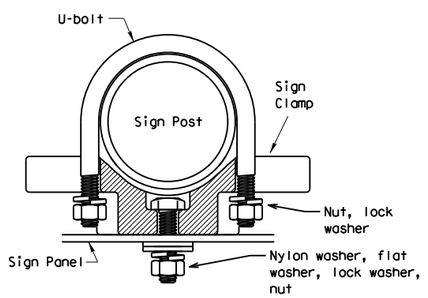
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

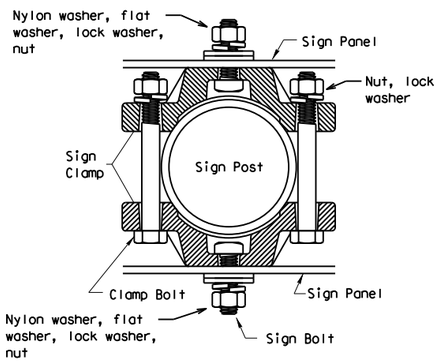


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

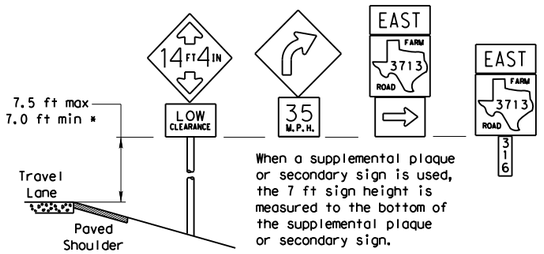
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



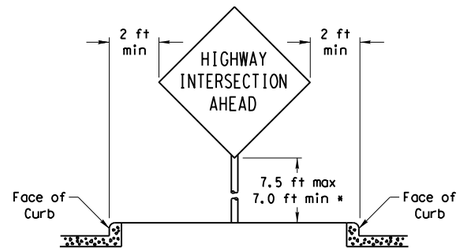
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



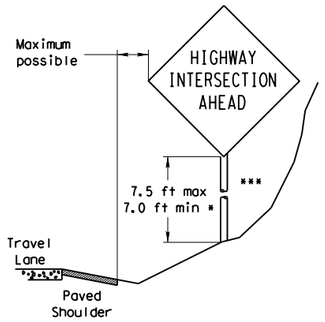
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm

Texas Department of Transportation
Traffic Operations Division

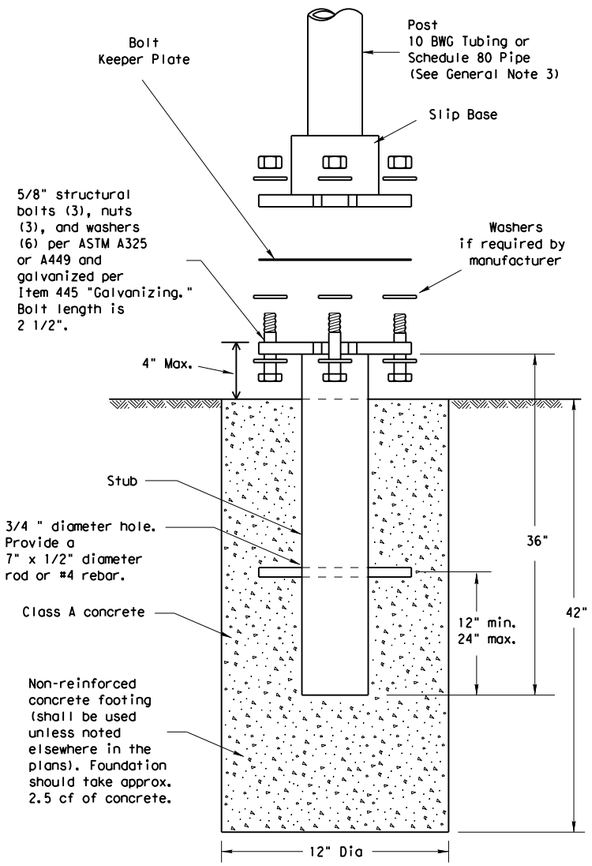
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		142

DATE:
FILE:

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.

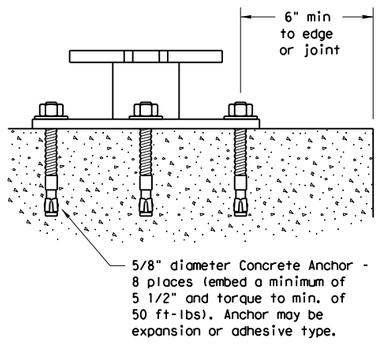
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

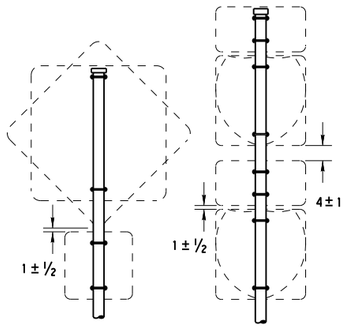
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

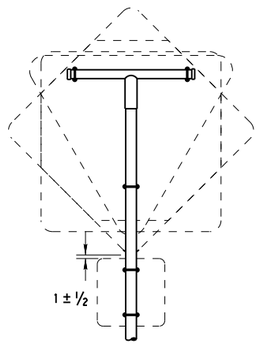
CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		143

DATE:
FILE:

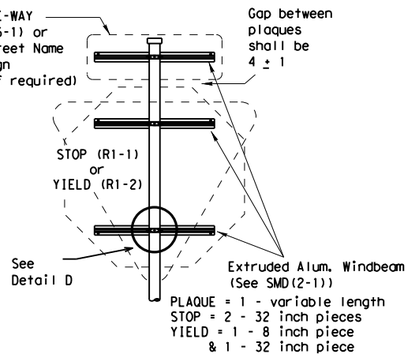
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



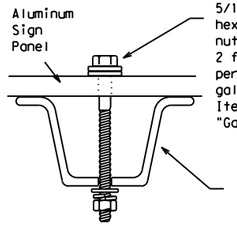
SM RD SGN ASSM TY XXXXX(1)XX(P)



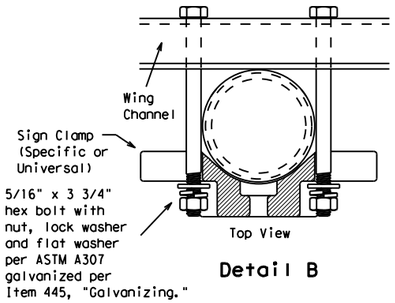
SM RD SGN ASSM TY XXXXX(1)XX(T)



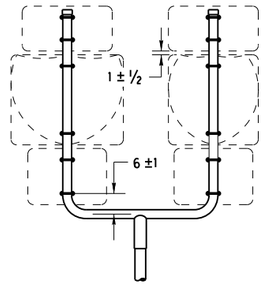
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



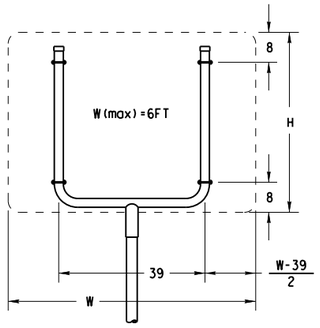
Detail A



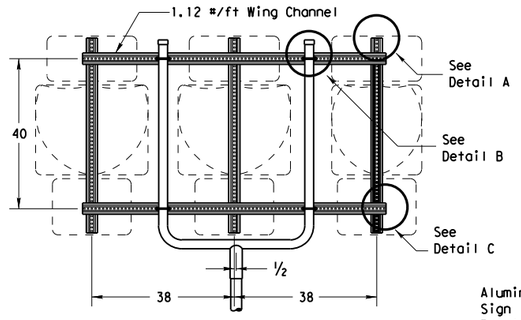
Detail B



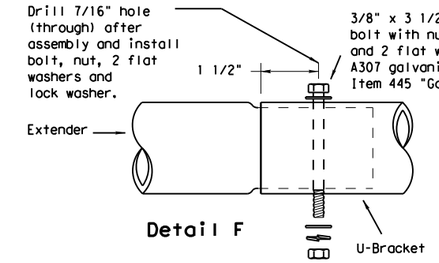
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

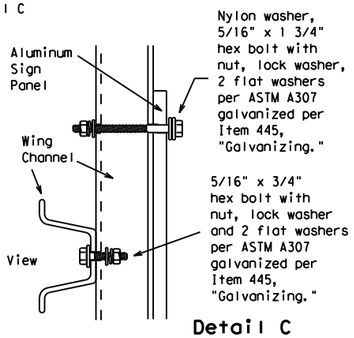


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

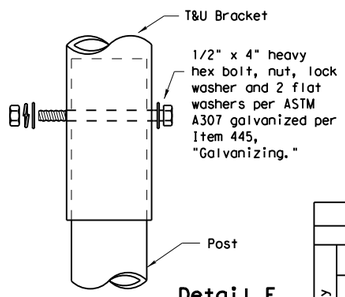


Detail F

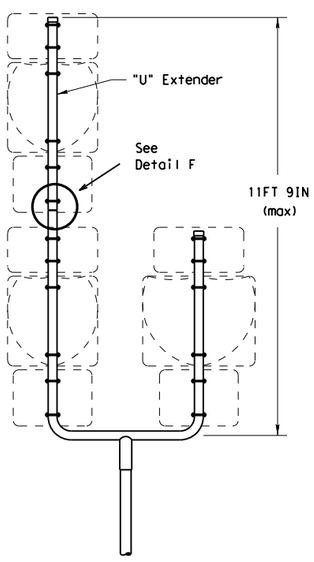
Splices shall only be allowed behind the sign substrate.



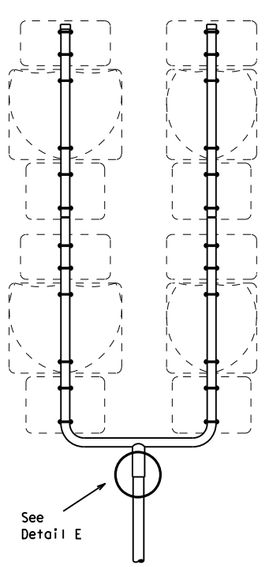
Detail C



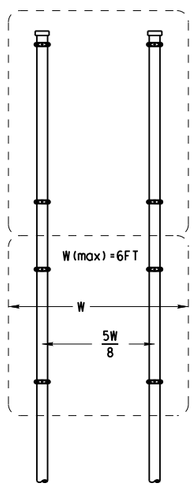
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

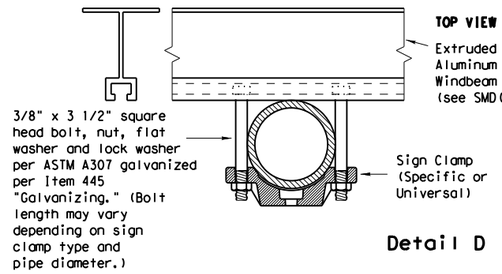


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

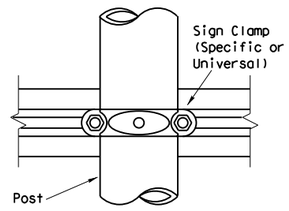


SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D



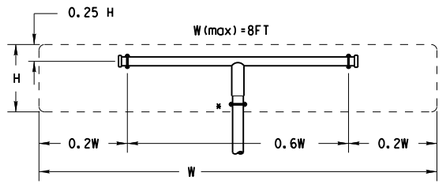
GENERAL NOTES:

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.

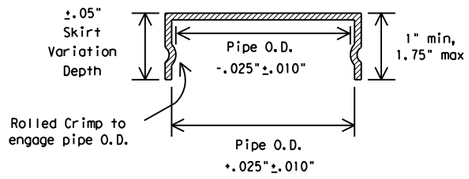
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	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)



All dimensions are in english unless detailed otherwise.

SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

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.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

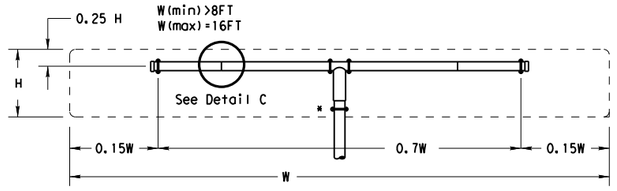
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		144

9-08 REVISIONS

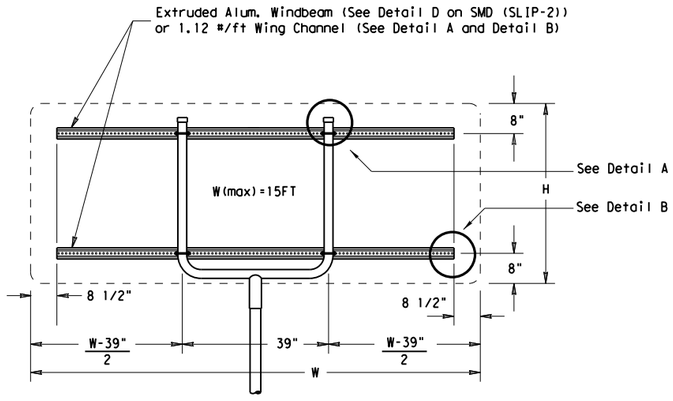
DATE:
FILE:

26C

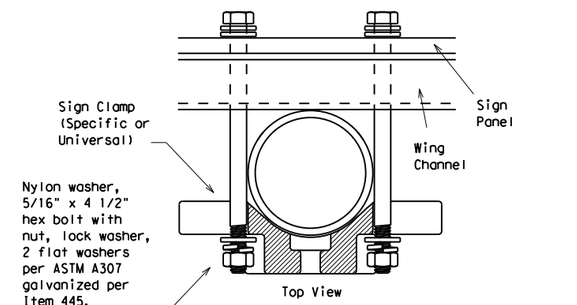
DATE:
FILE:



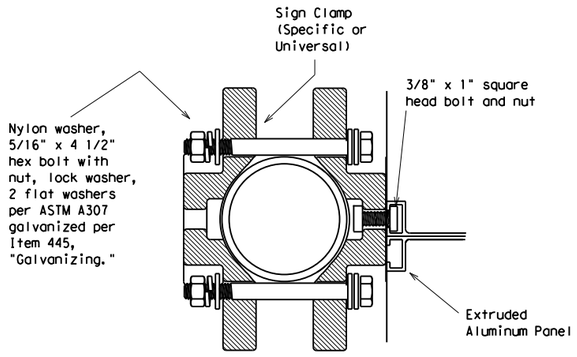
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



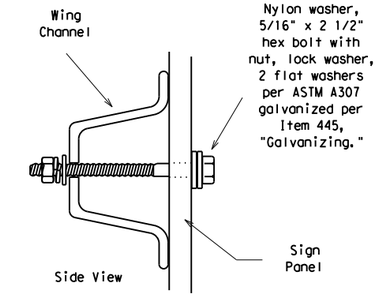
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



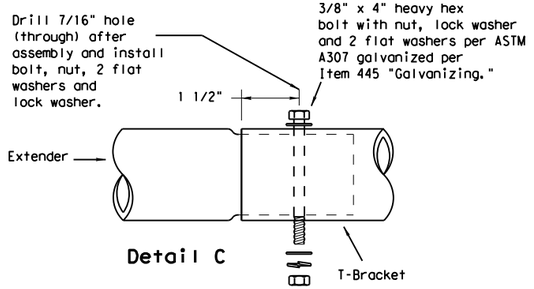
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

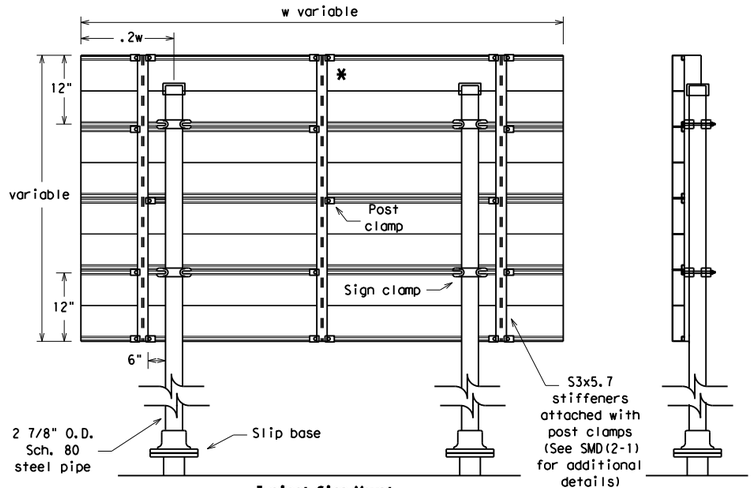


Detail B



Detail C

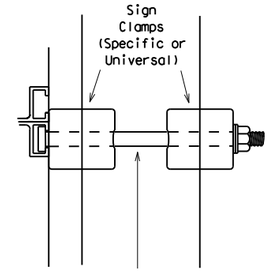
Splices shall only be allowed behind the sign substrate.



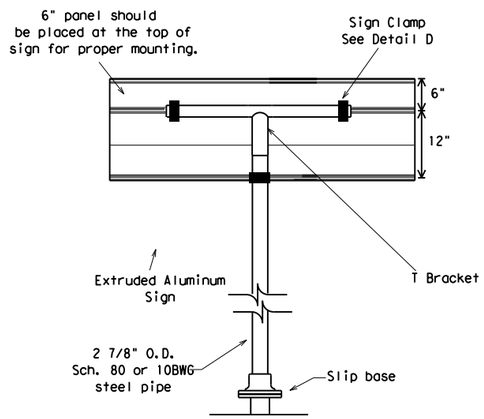
Typical Sign Mount

SM RD SGN ASSM TY S80(2)XX(P-EXAL)

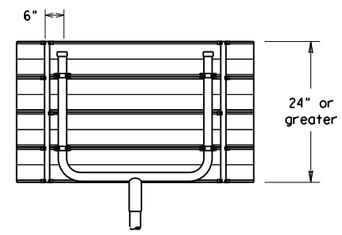
* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



Detail E



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. See table above.
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Sign blanks shall be the sizes and shapes shown on the plans.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

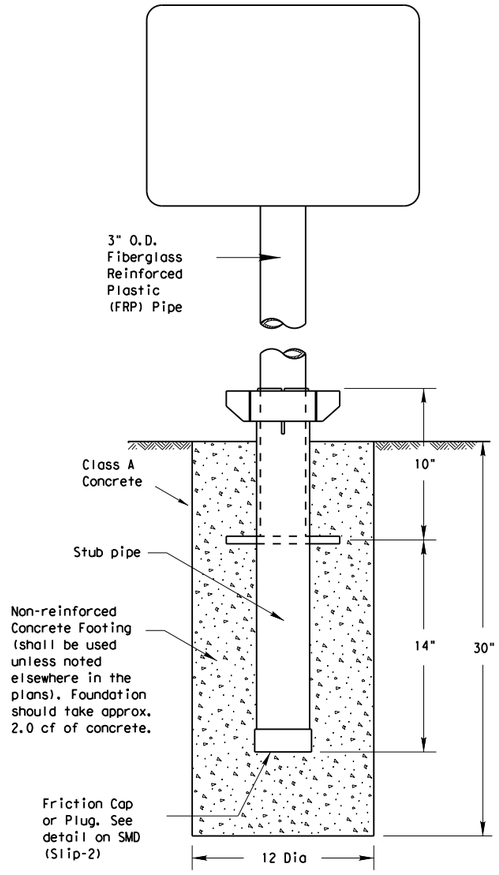
SMD(SLIP-3)-08

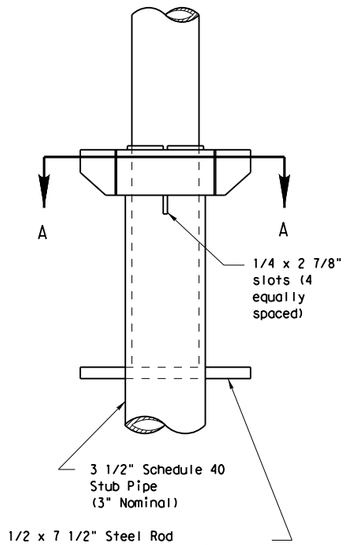
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

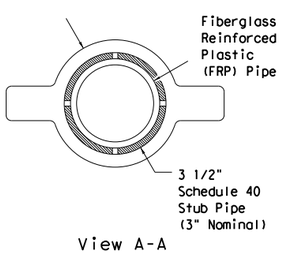
REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		145

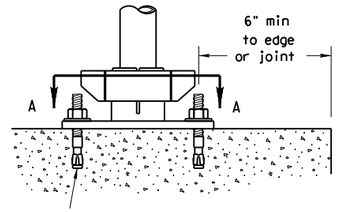
Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post







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

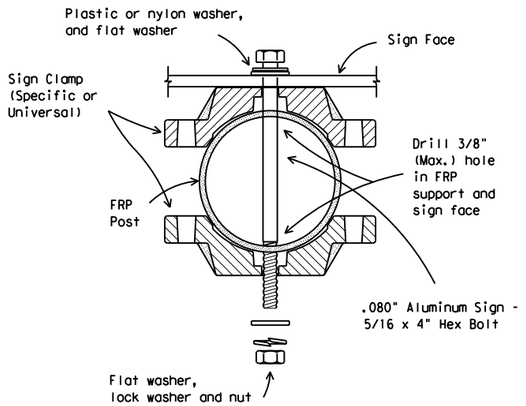
UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

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.

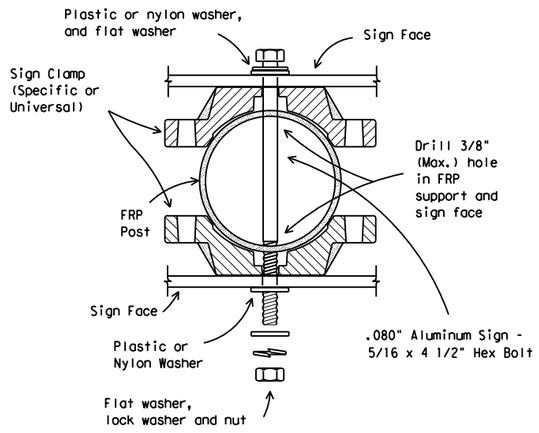
BOLT DOWN SIGN SUPPORT

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



DATE:
FILE:

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS UNIVERSAL ANCHOR SYSTEM WITH FRP POST

SMD(FRP)-08

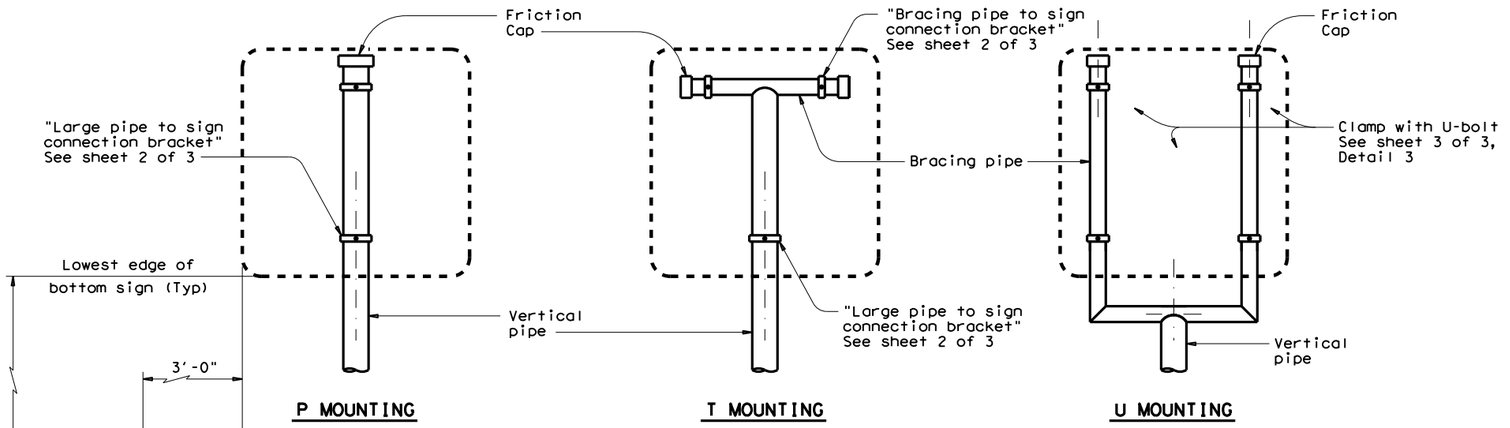
REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494

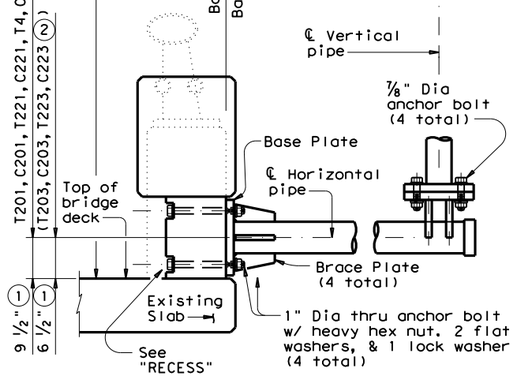
DIST	COUNTY	SHEET NO.
HOU	MONTGOMERY	146

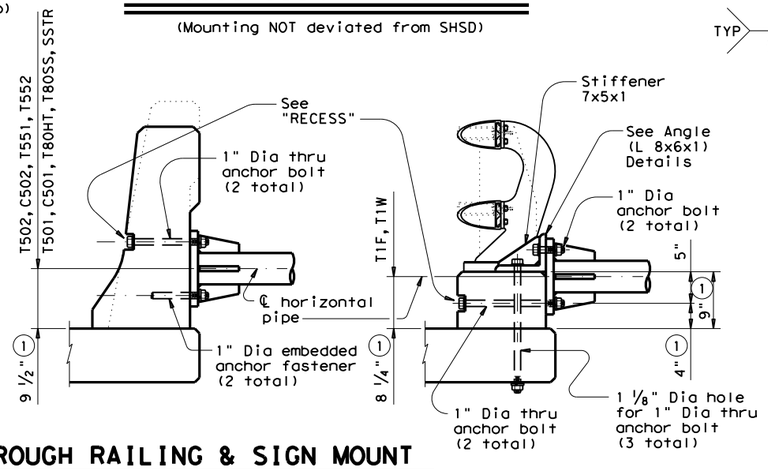
DATE:
FILE:



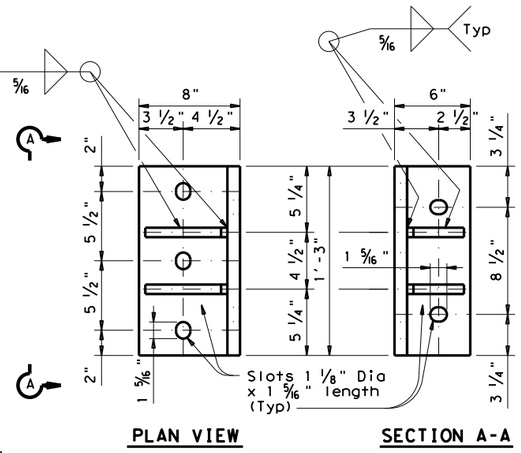
VARIOUS SIGN ATTACHMENTS

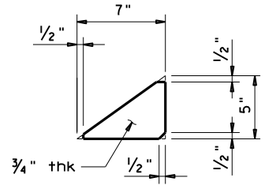
(Mounting NOT deviated from SHSD)





LONGITUDINAL SECTION THROUGH RAILING & SIGN MOUNT

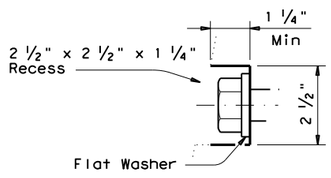




ANGLE (L 8x6x1) DETAILS

① Increase 2" for structure with overlay.

② Attached at ℄ post.



RECESS

PIPE SIZE AND THICKNESS			
Pipe Placement / Design Wind Speed	Horizontal	Vertical	Bracing
90 mph	5" X-Strong (.375")	4" X-Strong (.337")	2 ½" Standard (.203")
130 mph	6" X-Strong (.432")	5" X-Strong (.375")	3" X-Strong (.300")

GENERAL NOTES:

Design conforms to 2013 AASHTO Standard Specifications for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design 3-second gust wind speeds of 90 mph and 130 mph with a 1.14 gust factor, and a wind importance factor of 1.0 (50-year mean recurrence interval) for the supporting structures. For mounting connection between sign panel and pipe, wind importance factors of 0.71 and 0.54, for 90 mph and 130 mph winds, respectively, are applied to adjust the wind speeds to a 10-year mean recurrence interval.

See standard sheet WV & IZ(LTS2013) for the boundaries of each design wind zone. All mounting shall be based on 130 mph wind speed design except when located in 90 mph wind zone. Maximum panel area is 30 sq. ft. Maximum design height is 50 ft, with design height defined as the distance between natural ground (average elevation of surrounding terrain) and the center of sign(s) at the mounting location.

Material for pipe shall be ASTM A53 Grade B, or A501. Structural steel plates shall be ASTM A36, A572 Grade 50, or A588. Bolts used to connect pipe and mounting bracket, and wind beam to sign panel shall be ASTM A307. Anchor bolts shall be ASTM A325 or A193 B7. Each anchor bolt shall be provided with 2 flat washers, 1 lock washer, and 1 heavy hex nut. All parts shall be galvanized in accordance with Standard Specifications Item 445, "Galvanizing".

Attach horizontal pipe at least 2'-0" from the edge of any nearby drain slot.

Contractor shall verify applicable field dimensions before fabrication. Holes drilled through the railing parapet wall shall be drilled with rotary (coring or masonry drill) type equipment. Percussion (star) drilling shall not be allowed. Anchorage for pipe attached to rail shall be placed using an anchoring system approved by the engineer. Installation of anchor fasteners including hole depth, diameter and material shall be in accordance with the manufacturers' recommendation.

Each embedded anchor fastener shall resist an allowable design loading (after applying the reduction factors of bolt spacing and bolt edge distance) of:

	130 mph	90 mph
Tension	12.5 kips	7.5 kips
Shear	9.0 kips	5.0 kips

Each anchoring system shall provide a capacity to resist the required tension and shear acting simultaneously.

For sign connection to mounting, shop drill holes on sign blank in accordance with the current Standard Highway Sign Designs for Texas (SHSD). Additional hole(s) needed to meet a stipulated-type mounting may be field drilled. For multi-sign or back-to-back signs mounting, the engineer shall determine the proper type which ensures each individual mounting meets requirements.

Refer to Standard sheets SMD(GEN), SMD(SLIP-2 and SMD(2-1) for details not covered here.

Texas Department of Transportation

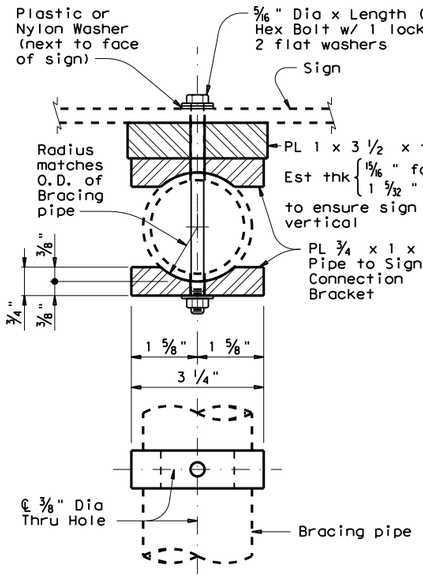
Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-1)-14

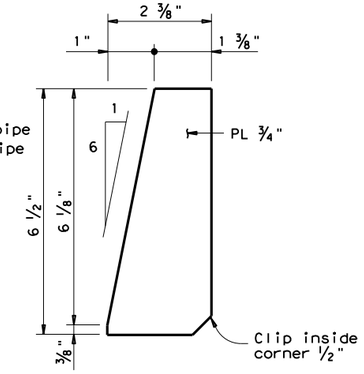
FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		147

DATE:
FILE:

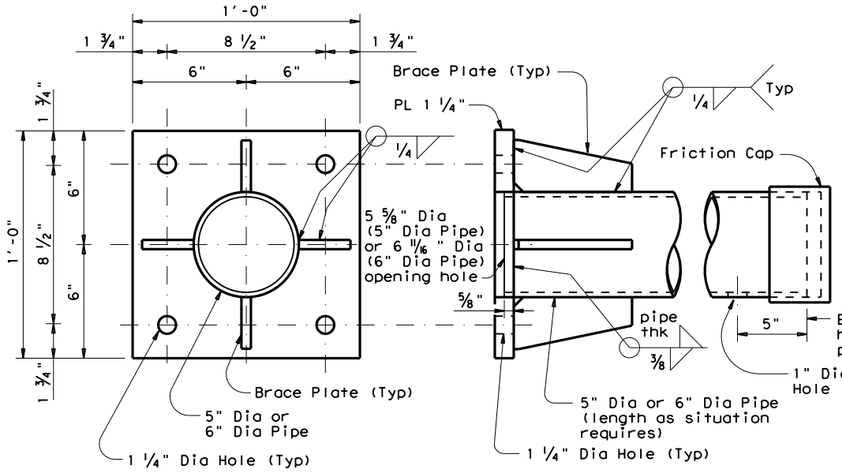


BRACING PIPE TO SIGN CONNECTION BRACKET DETAILS

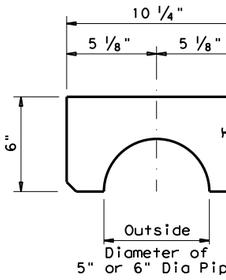
(Showing T Mounting)



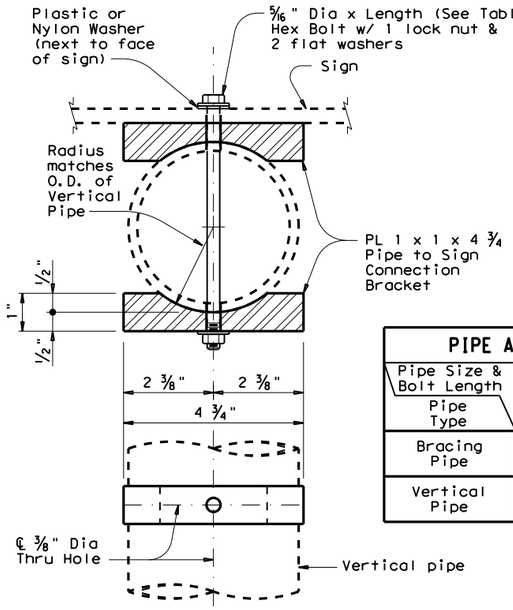
BRACE PLATE DETAILS



BASE PLATE DETAILS



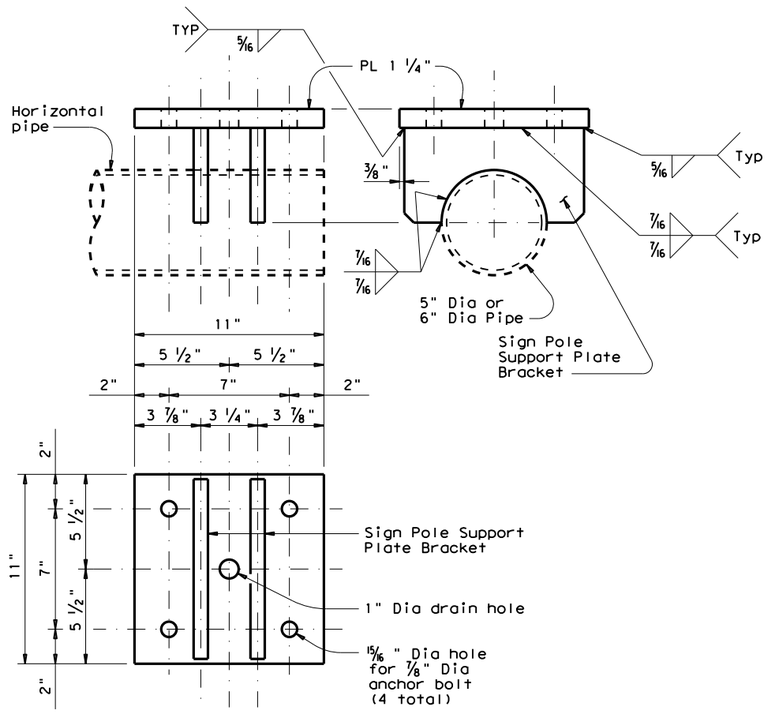
SIGN POLE SUPPORT PLATE BRACKET DETAILS



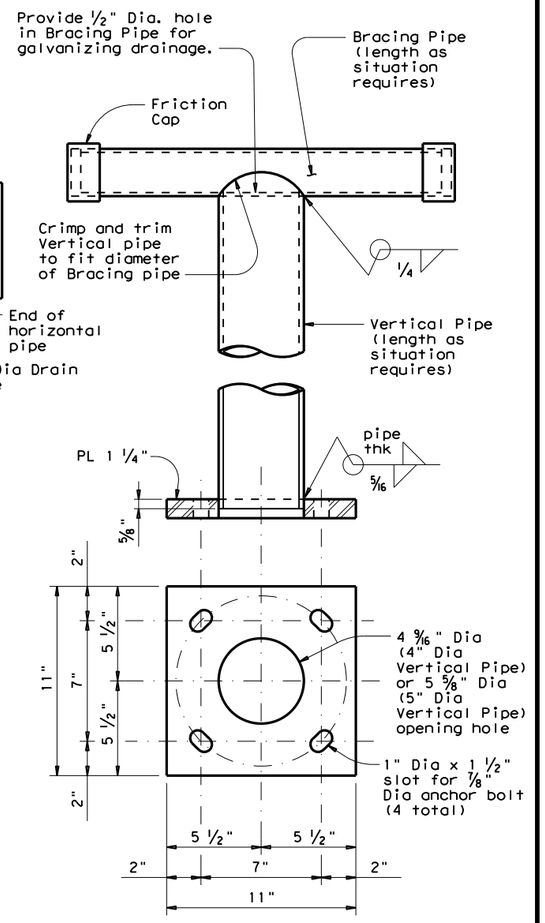
PIPE AND BOLT SPECIFICATIONS		
Pipe Size & Bolt Length / Pipe Type	Nominal Pipe Dia (in.)	Bolt Length (in.)
Bracing Pipe	2 1/2	6
	3	7
Vertical Pipe	4	7
	5	8

LARGE PIPE TO SIGN CONNECTION BRACKET DETAILS

(Showing P or T Mounting)



SIGN POLE SUPPORT PLATE DETAILS



SIGN POLE & POLE BASE PLATE DETAILS

(Showing only T Mounting)

SHEET 2 OF 3

Texas Department of Transportation

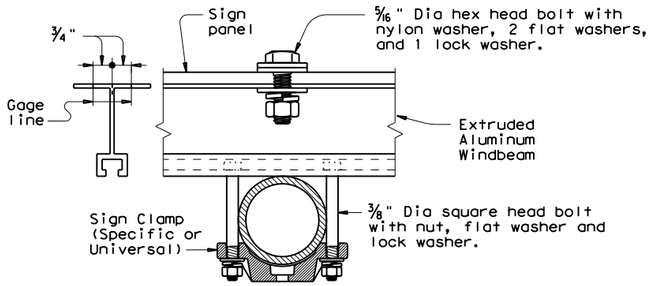
Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

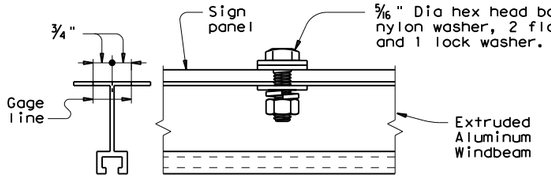
SMD(BR-2)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		148

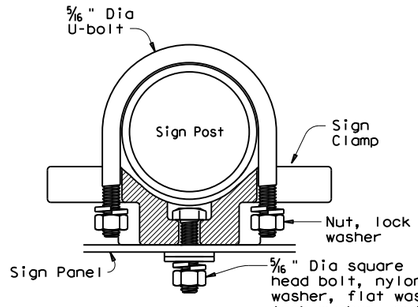
26H



DETAIL 1



DETAIL 2

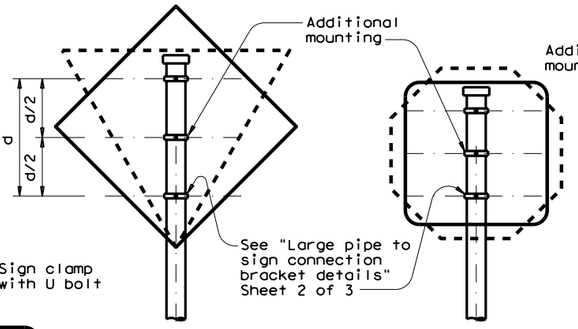


DETAIL 3

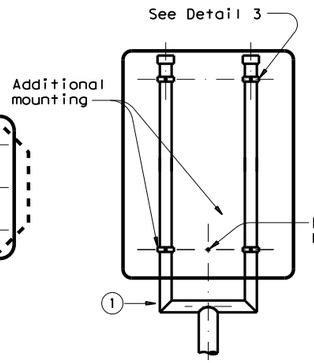
SIGN SHAPE	SQUARE			HORIZONTAL RECTANGLE			VERTICAL RECTANGLE			DIAMOND			OCTAGON			EQUILATERAL TRIANGLE			INTERSTATE SHIELD	PENTAGON (SCHOOL)	
Type of Sign Mounting on SHSD / Design Wind Speed	P	T	U	P	T	U	P	T	U	P	T	U	P	T	U	P	T	U	P	P	T
90 mph					(Type 23) 60"x48"	(Type 3) 72"x36" 78"x36" (Type 23) 72"x30" 84"x24"		(Type 2) 36"x48" (Type 32) 36"x60" 36"x72" 42"x60" 48"x54" 48"x60" 48"x72" (Type 3) 48"x84"			(Type 3) 60"x60"									(Type Special) 45"x36"		
130 mph	(Type 1) 30"x30" 36"x36"	(Type 3) 48"x48"		(Type 1) 36"x24" 36"x30"	(Type 23) 48"x42" 54"x42" 60"x30" 66"x36" 84"x24" (Type 3) 60"x48"	(Type 3) 72"x36" 78"x36" (Type 23) 72"x30" 84"x24"	(Type 1) 30"x36" 30"x42"	(Type 3) 36"x48" 36"x60" 36"x72" 42"x60" 48"x54" 48"x60" (Type 4) 48"x72" 48"x84"	(Type 3) 48"x60"	(Type 1) 36"x36"	(Type 3) 48"x48" 60"x60"					(Type 1) 48"x48"			(Type Special) 36"x36" 45"x36"		

Notes:
1. Drill holes in addition to the hole pattern of the Standard Highway Sign Designs for Texas (SHSD) at specified locations to meet a stipulated-type mounting indicated in the parenthesis ( ).
2. "Blank" in the above table indicates all other signs excluded from stipulated mounting shall be mounted in accordance with SHSD.

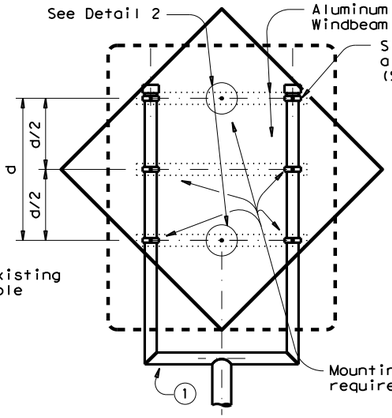
(1) In lieu of welding, the Fabricator may bend bracing pipe elbows if the following conditions are met:
a. Spacing between vertical bracing pipes is equal to or greater than 2'-6".
b. Bending radius is 12".
c. The distance between the lowest clamp and centerline of horizontal bent pipe is 13" max.

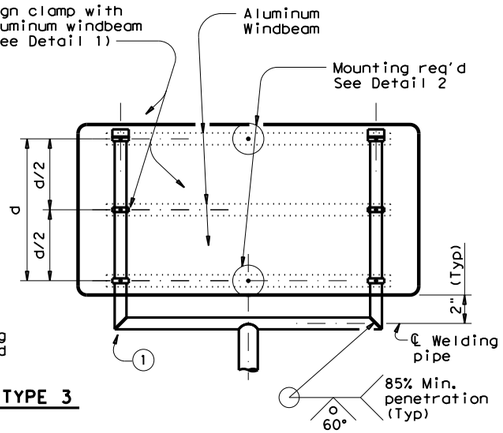


TYPE 1

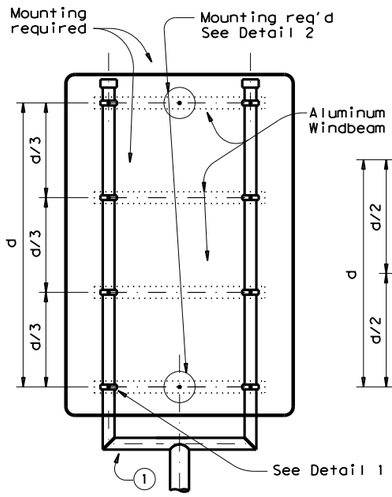


TYPE 2

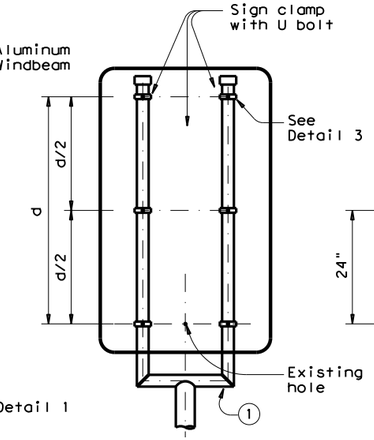




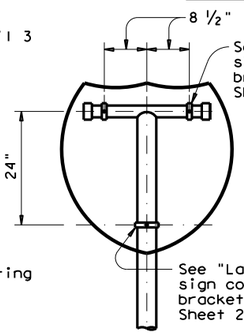
TYPE 3



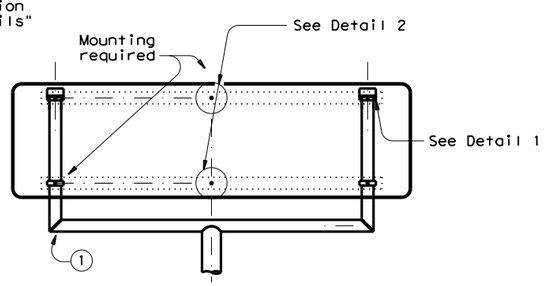
TYPE 4



TYPE 32



TYPE SPECIAL



TYPE 23

SHEET 3 OF 3

Texas Department of Transportation | Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-3)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		149

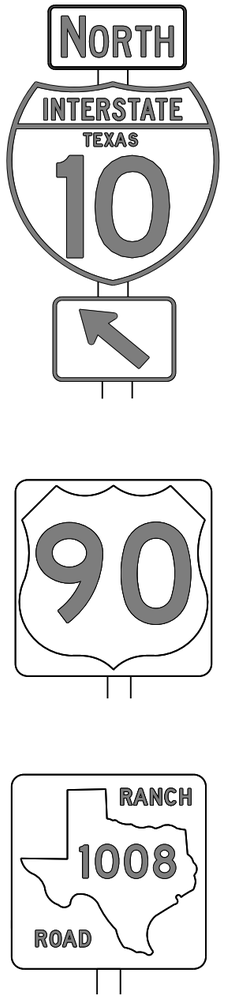
DATE:
FILE:

26J

DATE:
FILE:

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

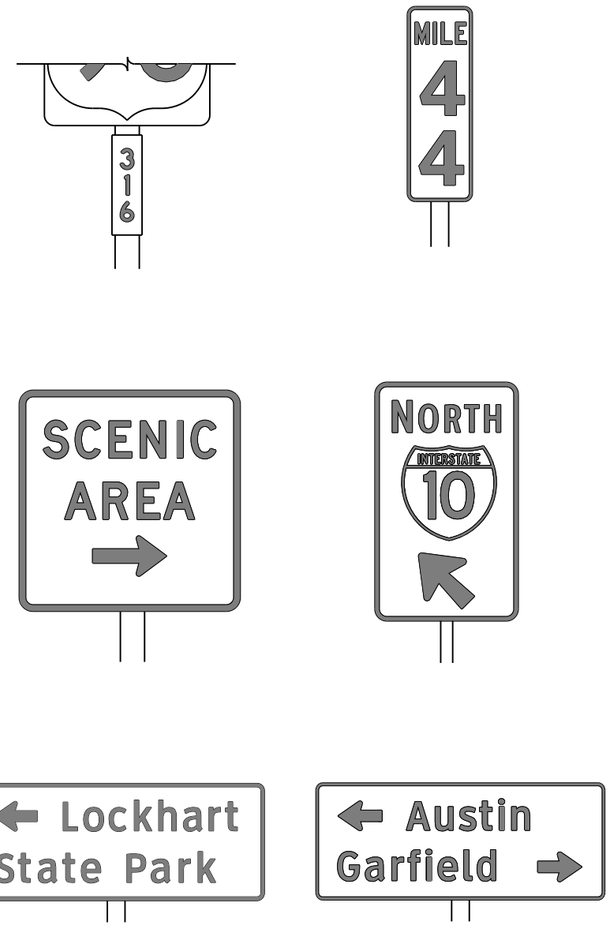
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



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
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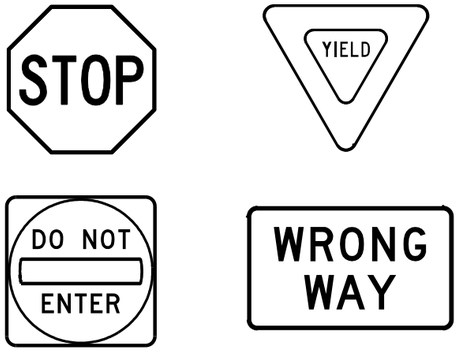
REVISIONS	0177	14	039	SL 494
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	MONTGOMERY		150

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

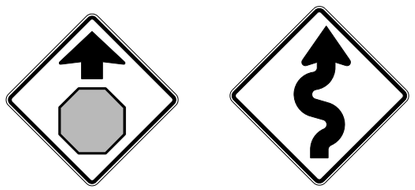
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

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. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. 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.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

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

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0177	14	039	SL 494
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	MONTGOMERY		151

DATE:
FILE:

4

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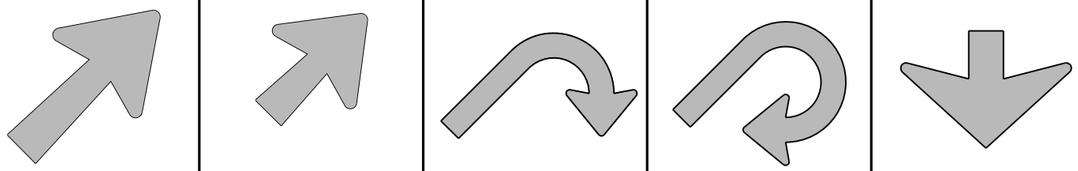
DATE:
FILE:

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

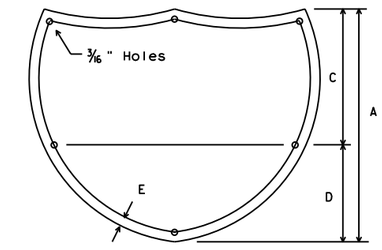
NOTE

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.

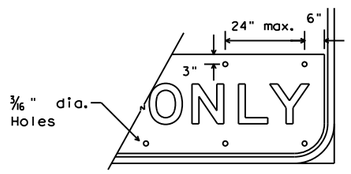
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

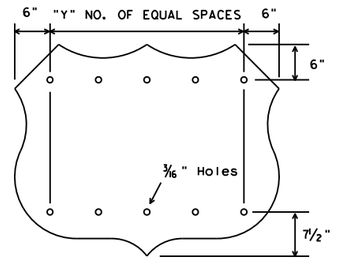


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

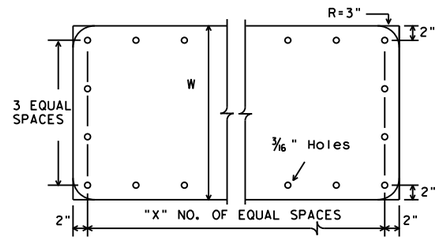


EXIT ONLY PANEL



U.S. ROUTE MARKERS

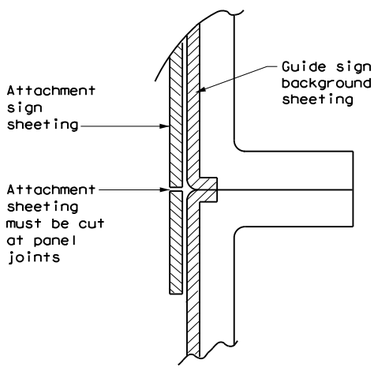
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



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

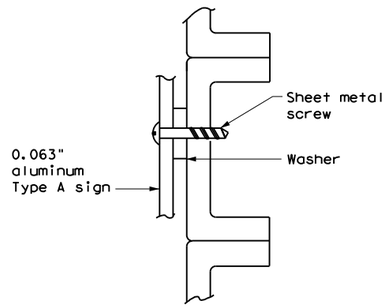
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



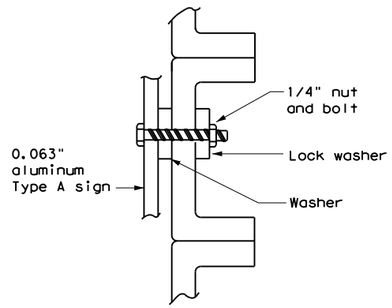
DIRECT APPLIED ATTACHMENT

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



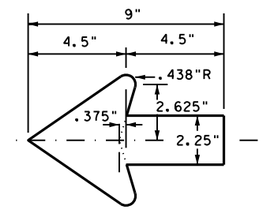
NUT/BOLT ATTACHMENT

NOTE:

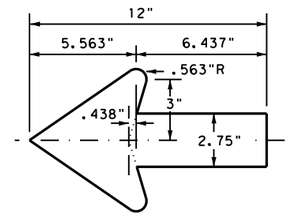
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

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
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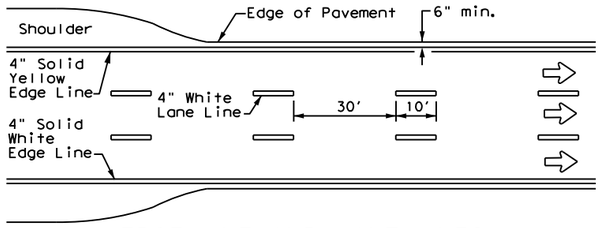
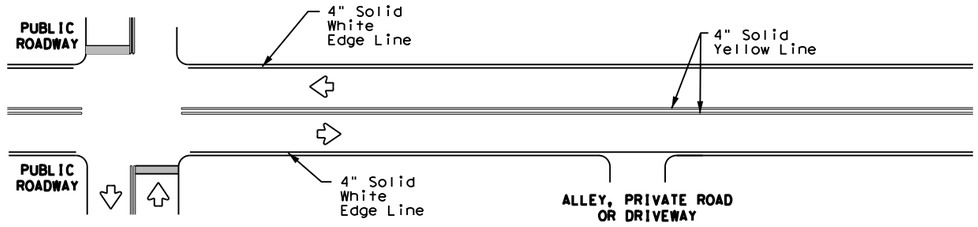
REVISIONS	0177	14	039	SL 494
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	MONTGOMERY		152

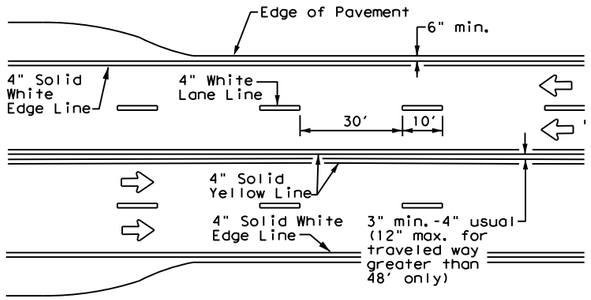
5



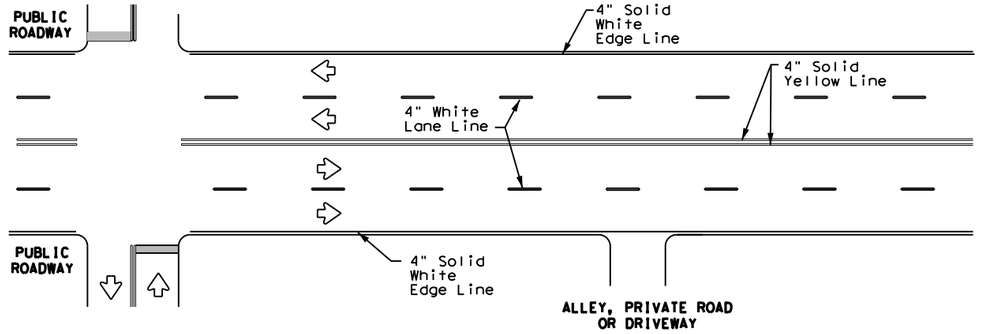
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



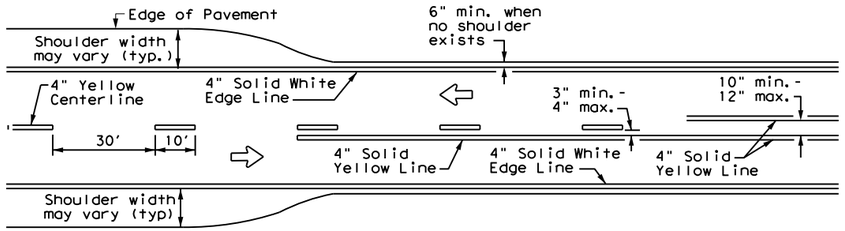
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



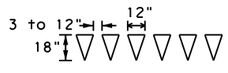
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



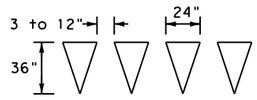
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

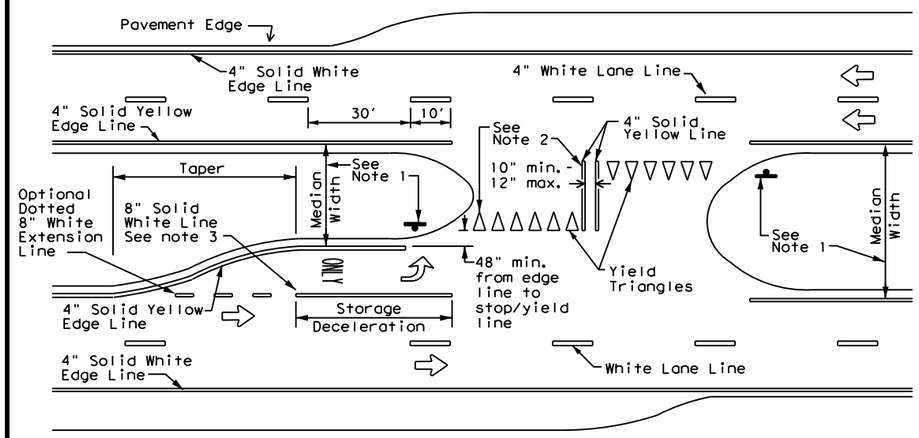


For posted speed on road being marked equal to or less than 40 MPH.



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.

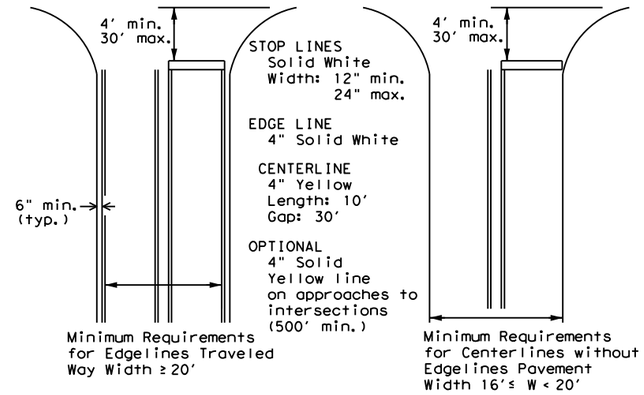
GENERAL NOTES

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

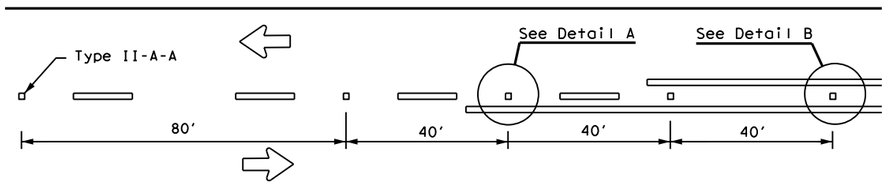
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0177	14	039	SL 494
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	HOU	MONTGOMERY		153

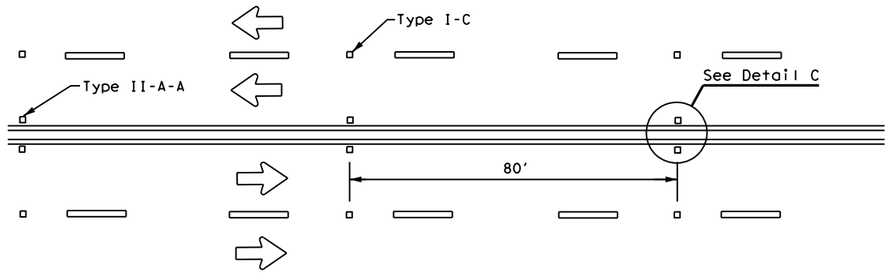
22B

DATE:
FILE:

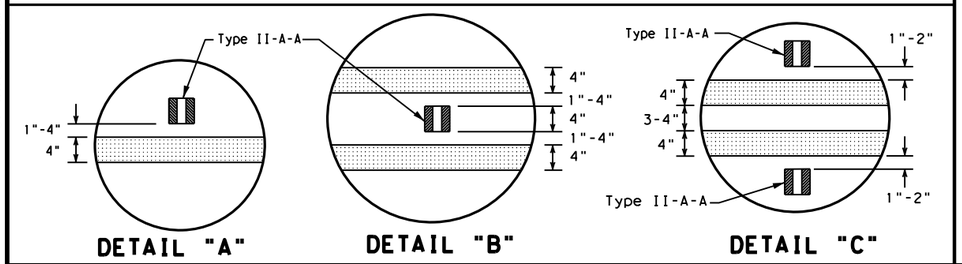
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



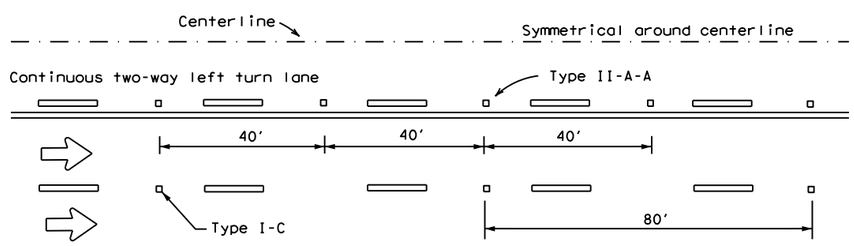
CENTERLINE FOR ALL TWO LANE ROADWAYS



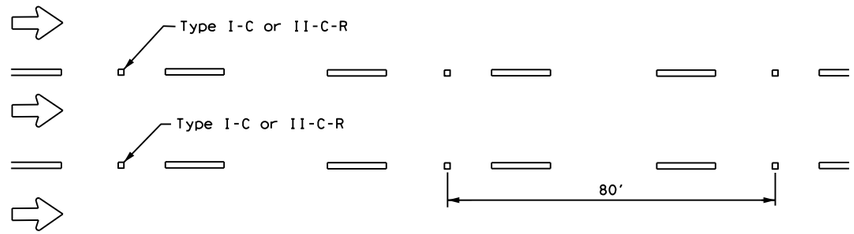
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

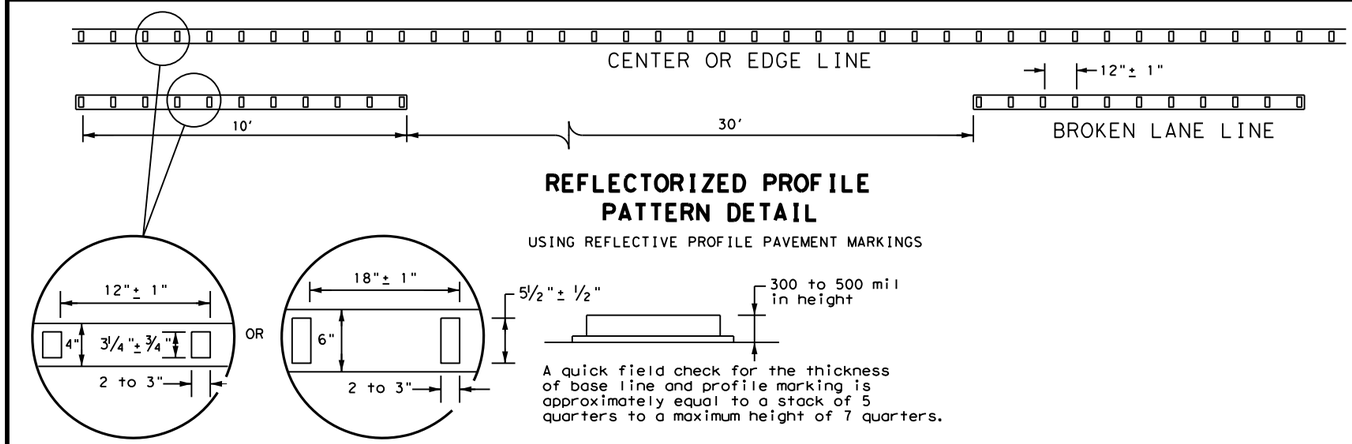


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

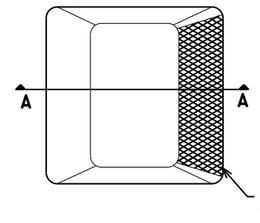
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

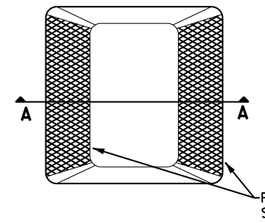
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

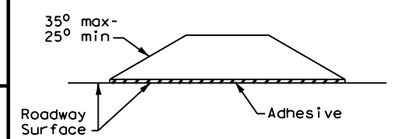
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

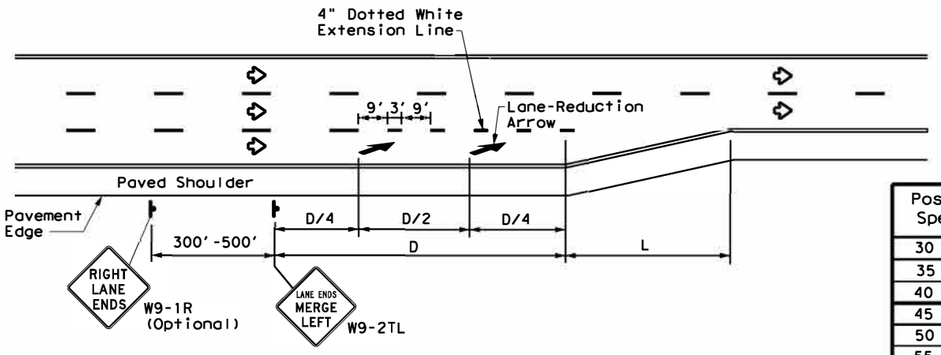
Traffic Safety Division Standard

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
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		154

22B

DATE:
FILE:

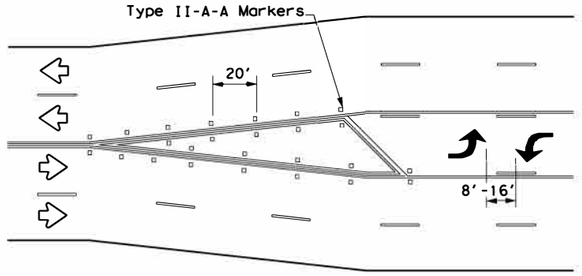


LANE REDUCTION

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

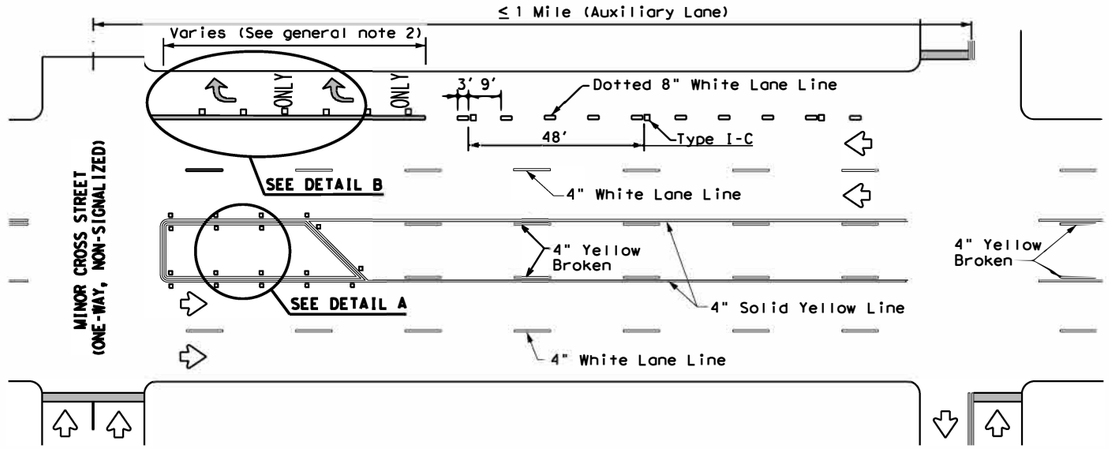
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

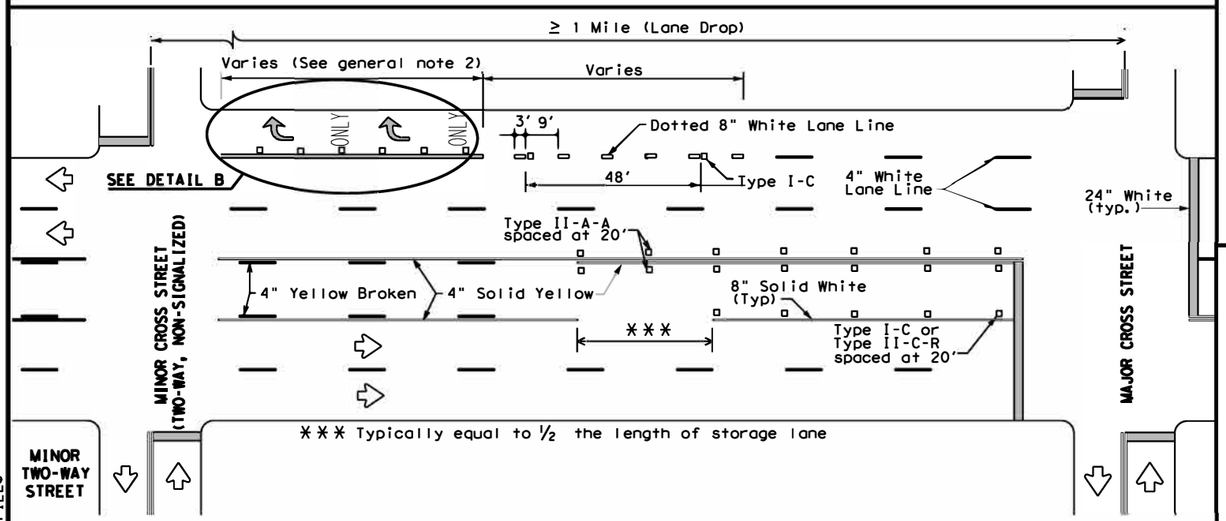
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

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

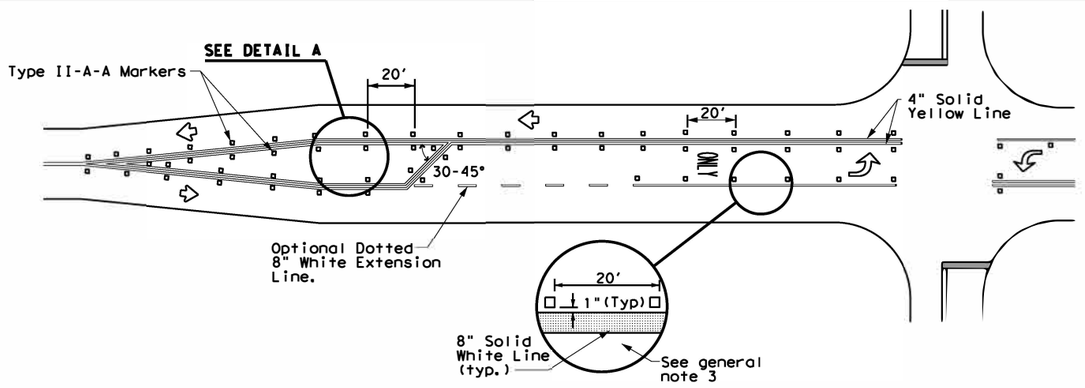
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



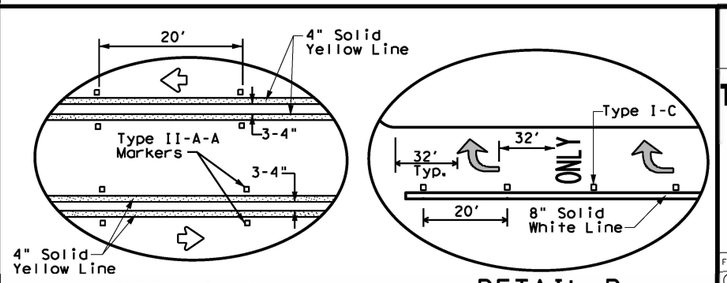
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



Texas Department of Transportation

Traffic Safety Division Standard

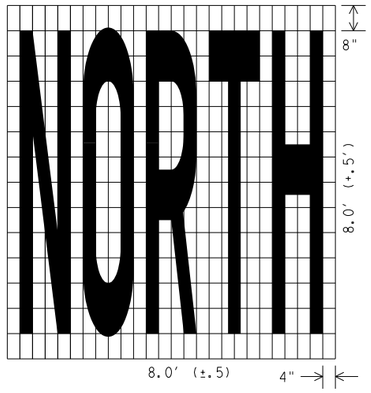
TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

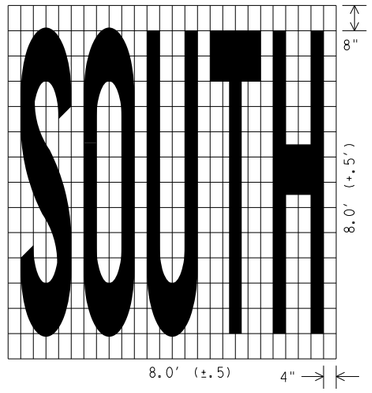
PM(3)-20

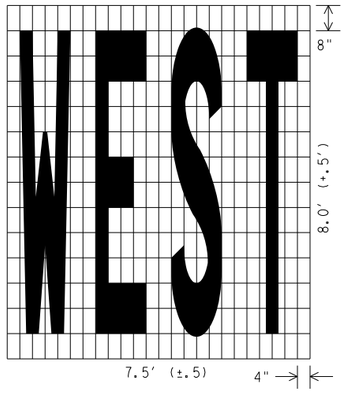
FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	HOU	MONTGOMERY		155
3-03 6-20				

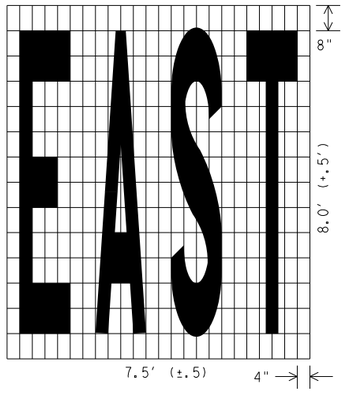
22C

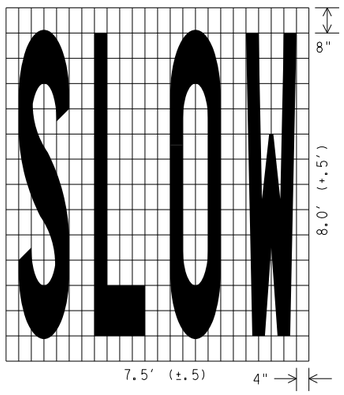
DATE: $DATE$ TIME$
FILE: $FILE$

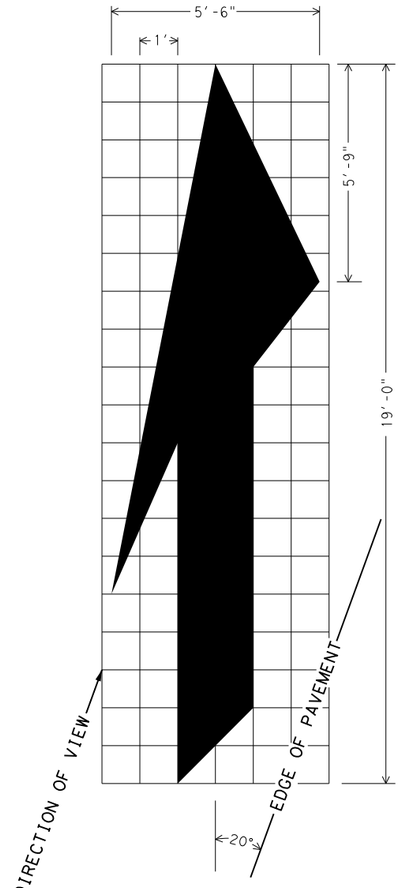






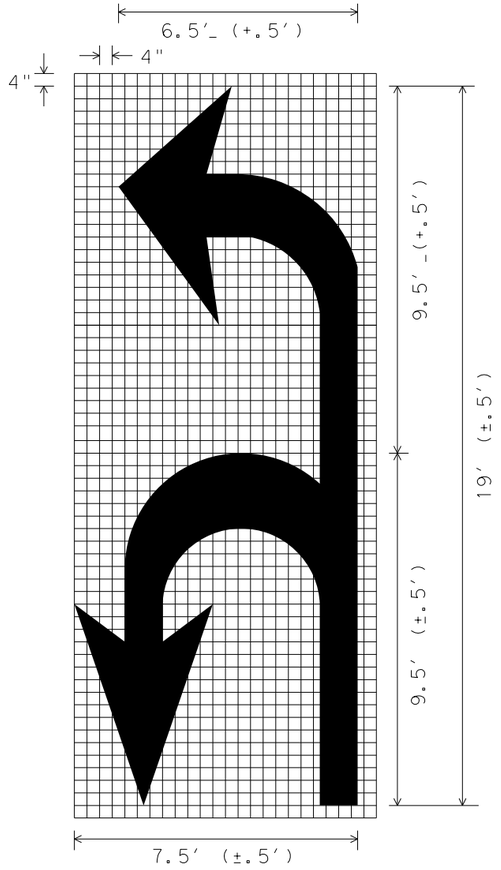




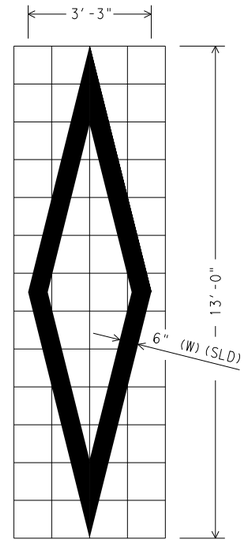


ISOMETRIC ARROW

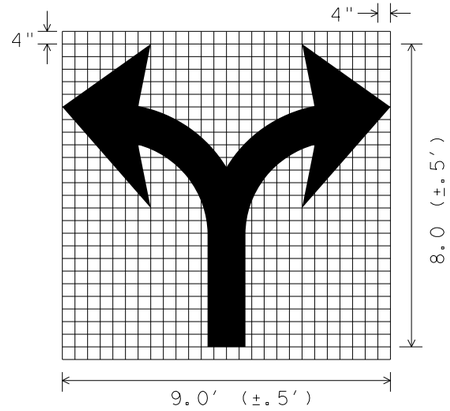
12 INCH GRID
AREA = 42 SQ. FT.
RIGHT LANE DROP ARROW
(FOR LEFT LANE, USE MIRROR IMAGE)



U-L ARROW



DIAMOND SYMBOL



SCALE 1/4" = 1′

Texas Department of Transportation
Houston District

PAVEMENT MARKINGS (WORDS, ARROWS & SYMBOLS)

PM(WAS)-07

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 03-19-07	HOU	6		156
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY	0177	14	039	SL 494

STD-N31

I. STORMWATER POLLUTION PREVENTION

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506. Refer to Storm Water Pollution Prevention Plan (SWP3) Houston District standard plan.

No Additional Comments

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

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

☐ No United States Army Corps (USACE) Permit Required

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the “General Notes."

☒ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.

☐ Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.

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

☐ No United States Coast Guard (USCG) Coordination Required

☐ United States Coast Guard (USCG) Permit

☒ United States Coast Guard (USCG) Exemption

No Additional Comments

USCG Bridge Exemption issued on 2/8/2021

USACE NWP with PCN required. SWG number and permit to be provided once aquired.

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the area and contact the Engineer immediately.

No Additional Comments

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

No Additional Comments

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

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

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

No Additional Comments

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

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

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

No Additional Comments

VII. OTHER ENVIRONMENTAL ISSUES

Comments:

Notify the United State Coast Guard (USCG) for any temporary closures or alterations to navigability 60 days in advance of channel closure.

Notify the TxDOT Engineer immediately if any vessel makes contact with a TxDOT bridge.

Notify TxDOT Engineer when activities permitted under the United States Army Corps of Engineers (USACE) Nationwide Permit (NWP) or Individual Permit (IP) has been completed.

DATE: Mar 12, 2021
FILE:

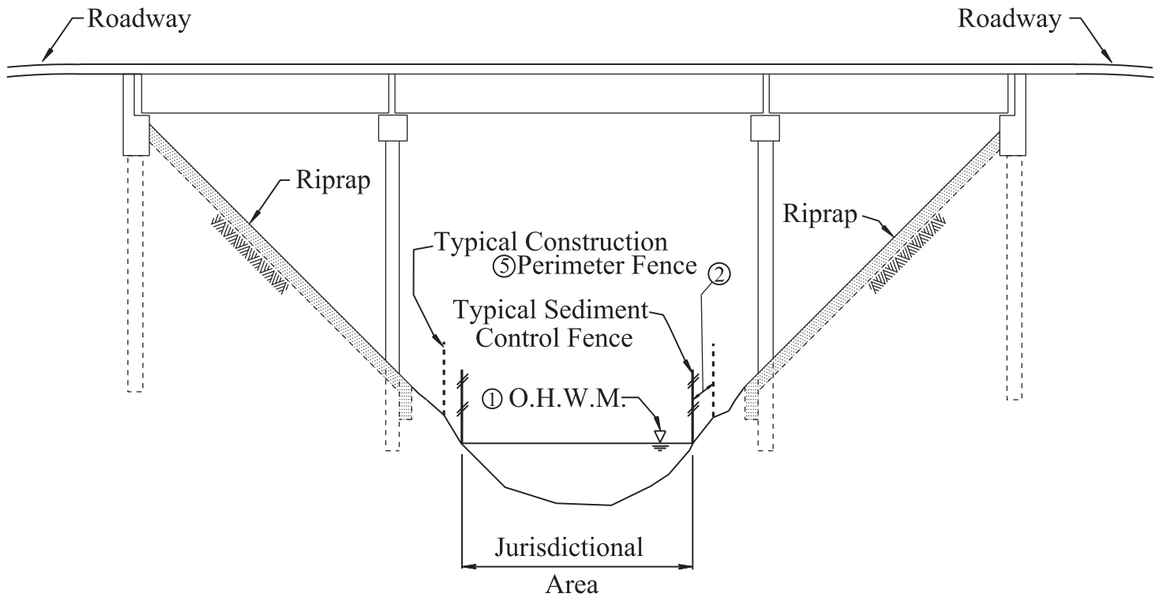
Version 2.1

Texas Department of Transportation | TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

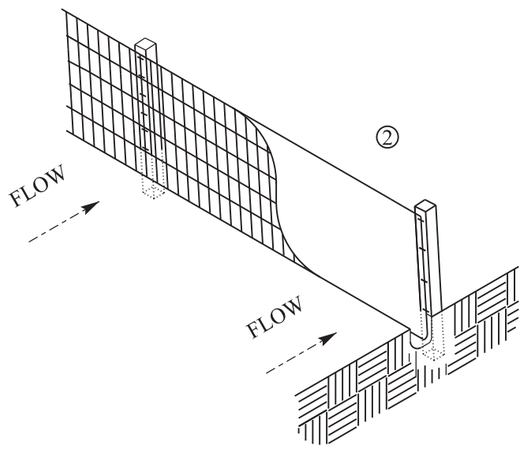
EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	12	Montgomery		157



TYPICAL RELATIONSHIP OF O.H.W.M., SEDIMENT CONTROL & CONSTRUCTION FENCING, PILING/DRILL SHAFT & RIPRAP TOE WALLS

N.T.S.



TEMPORARY SEDIMENT CONTROL FENCE

1.50" Radius, 0.50" Border, Black on White;
[WETLAND AREA] C; [DO NOT ENTER] C;
CIRCLE, DIAG LINE, RED

GENERAL DESIGN CONSIDERATIONS

1. Ordinary high water mark (elevation) (O.H.W.M.) is determined by the Environmental Project Manager and elevation is set by a Surveyor.

2. All non-permitted jurisdictional wetlands and waters within or adjacent to the project area shall be avoided and protected by signage and fencing, including both sediment control and construction fencing (see note 5). Construction equipment, materials/sediment are not allowed in the non-permitted wetlands/waters.

3. Any wetlands permitted for impacts/fill and non-permitted wetlands are shown elsewhere on plans or United States Army Corps of Engineers (USACE) permit.

4. The Contractor will be required to obtain the appropriate permits if she/he alters the construction method or deviates from the permit.

5. See item 506 for temporary sediment control fence and for construction perimeter fence. See item 502 for signs.

Texas Department of Transportation

TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: Wetland EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
ADDED construction fencing (06/17)				
UPDATED typical relationship diagram (09/17)	DIST	COUNTY		SHEET NO.
UPDATED notes 2 and 5 (09/17)	12	Montgomery		157A
UPDATED note 5 (05/18)				

DATE:
FILE:

SITE DESCRIPTION

PROJECT LIMITS: CANEY CREEK

PROJECT DESCRIPTION: REPLACE BRIDGE, APROACHES, AND ADD 5 FT SHOULDERS

MAJOR SOIL DISTURBING ACTIVITIES: DITCH WORK, BRIDGE COLUMNS, CONCRETE RIPRAP, AND SHOULDERS

TOTAL PROJECT AREA: 9.83

TOTAL AREA TO BE DISTURBED: 0.28 ACRES

WEIGHTED RUNOFF COEFFICIENT: (AFTER CONSTRUCTION): 0.42

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER: N/A

NAME OF RECEIVING WATERS: CANEY CREEK

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

____ TEMPORARY SEEDING
__X__ PERMANENT PLANTING, SODDING, OR SEEDING
____ MULCHING
____ SOIL RETENTION BLANKET
____ BUFFER ZONES
____ PRESERVATION OF NATURAL RESOURCES

OTHER:

STRUCTURAL PRACTICES:

__X__ SILT FENCES
____ HAY BALES
__X__ ROCK BERMS
____ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
____ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
____ DIVERSION DIKE AND SWALE COMBINATIONS
____ PIPE SLOPE DRAINS
____ PAVED FLUMES
____ ROCK BEDDING AT CONSTRUCTION EXIT
____ 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
____ EROSION CONTROL LOGS

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

1. INSTALL SILT FENCE AND ROCK FILTER DAMS.
2. CONSTRUCT BRIDGES, APROACHES, SHOULDERS AND DITCH WORK
3. REMOVE EROSION CONTROL FEATURES AFTER DISTURBED AREA HAS STABILIZED

STORM WATER MANAGEMENT:

STORM WATER WILL BE CONVEYED VIA EXISTING PARALLEL TO OUTFALLS. THIS SYSTEM WILL CARRY DRAINAGE WITHIN THE RIGHT OF WAY TO WHERE CROSS DRAINAGE OCCURS.

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE: All erosion and sediment controls will be maintained in good working order. If a repair is necessary it will be done at the earliest date possible, but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The area adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.

INSPECTION: All inspections will be performed by a TxDOT inspector per one of the options below as directed by the Area Engineer
1. At least every 7 calendar days
2. At least every 14 days or after 0.5 inches or more of rainfall
An inspection and maintenance report should be made for each inspection. Based on the inspection results, the controls shall be revised according to the inspection report.

WASTE MATERIALS: The dumpster used to store all waste material will meet all state and local city solid waste management regulations. All trash and construction debris will be deposited in the dumpster. The dumpster will be emptied as necessary or as required by local regulation and the trash will be hauled to a local dump. No construction waste material will be buried on site.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): In the event of a spill which may be considered hazardous, the Houston District Safety Office shall be contacted immediately at 713-802-5962.

SANITARY WASTE: ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

OFFSITE VEHICLE TRACKING:

__X__ HAUL ROADS DAMPENED FOR DUST CONTROL
__X__ LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
__X__ EXCESS DIRT ON ROAD REMOVED DAILY
__X__ STABILIZED CONSTRUCTION ENTRANCE

OTHER:

REMARKS: Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the sediment that may enter receiving waterways. Disposal areas shall not be located in any waterway, waterbody or streambed. Construction staging areas and vehicle maintenance areas shall be constructed by the contractor in a manner which minimizes the runoff of all pollutants. All waterways shall be cleared as soon as practical of temporary embankments, temporary bridges, matting, falsework, piling, debris, and other obstructions placed during construction operations that are not part of the finished work.

Texas Department of Transportation
Houston District

TxDOT STORM WATER POLLUTION PREVENTION PLAN

SW3P

FILE: STDG1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT JANUARY 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		158
9/2010 INSPECTION NOTE	COUNTY		CONTROL SECT JOB	HIGHWAY
9/2013 INSPECTION NOTE 11/2013 SW3P TO SWP3 03/2015 2014 SPECS	MONTGOMERY		0177 14 039	SL 494

STD G-1

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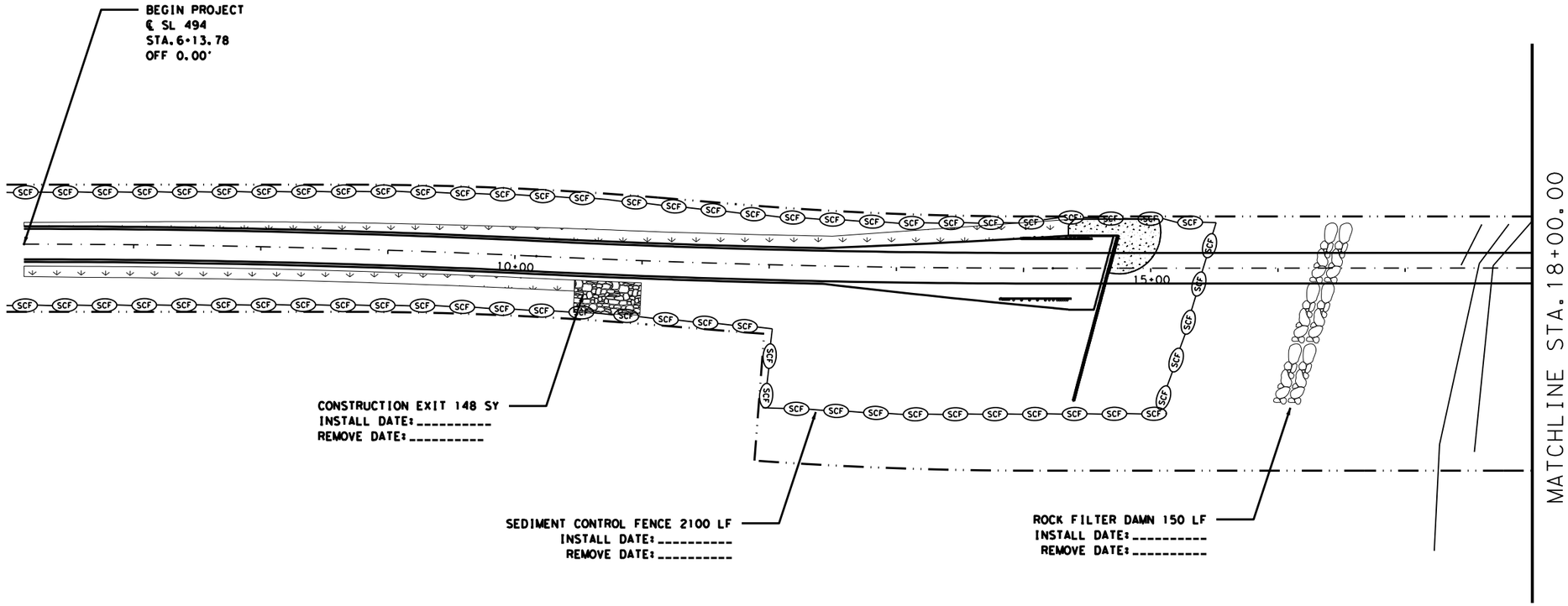
DW:
CK:
DN:



LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
- BLOCK SOD
- ROCK FILTER DAM
- CONSTRUCTION ENTRANCE

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.

03.01.22

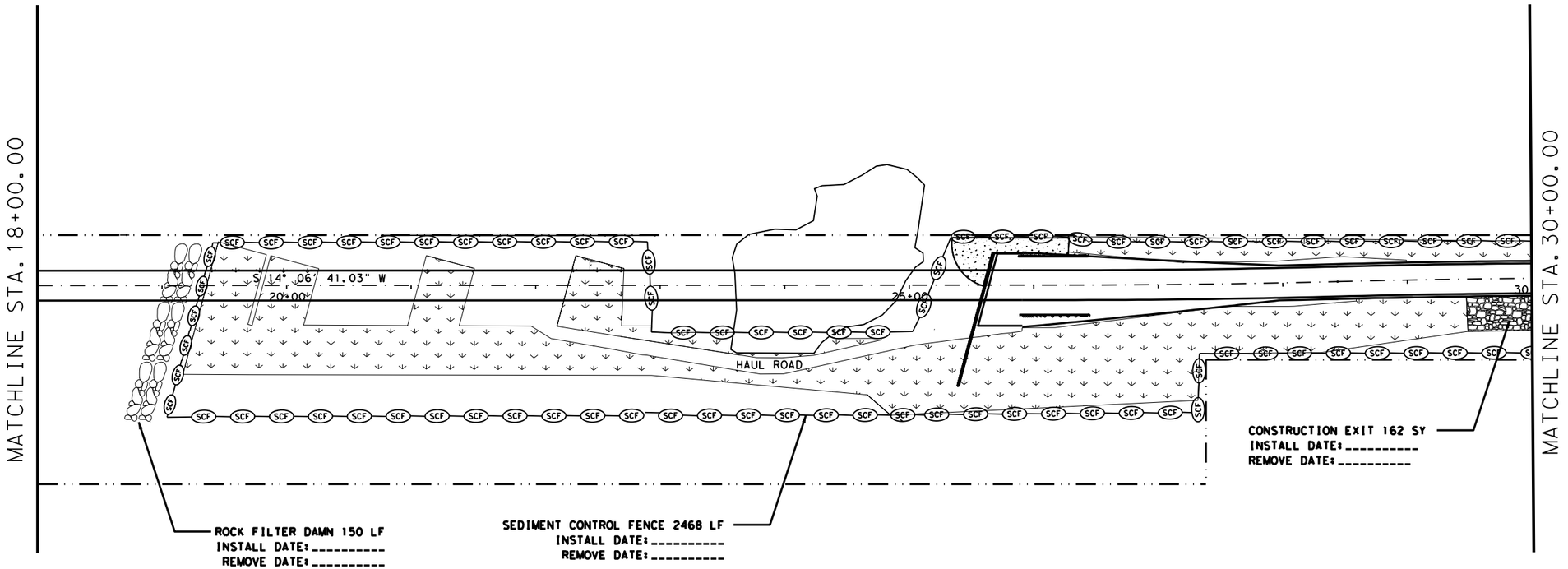
SL 494
SW3P LAYOUT

SHEET 1 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		159

DATE: 02/03/2022 03:23 PM
FILE: DOCUMENT NAME



LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
- BLOCK SOD
- ROCK FILTER DAM
- CONSTRUCTION ENTRANCE

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
02.24.22

SL 494
SW3P LAYOUT

SHEET 2 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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HOU	MONTGOMERY		160

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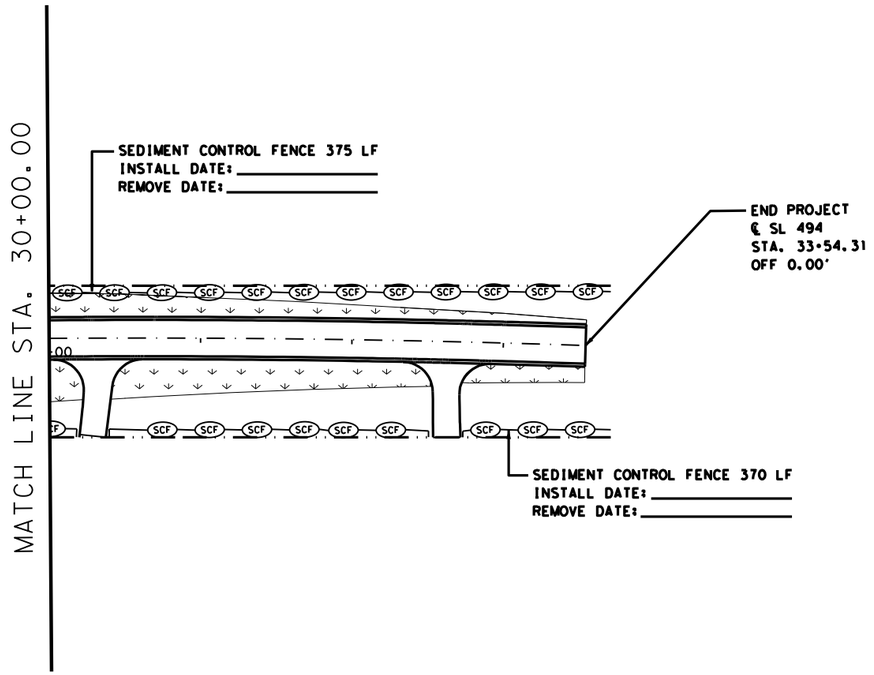

LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
- BLOCK SOD
- ROCK FILTER DAM
- CONSTRUCTION ENTRANCE

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.

03.01.22

SL 494
SW3P LAYOUT

0 50 100
SCALE IN FEET

SHEET 3 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0177	14	039	SL 494
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		161

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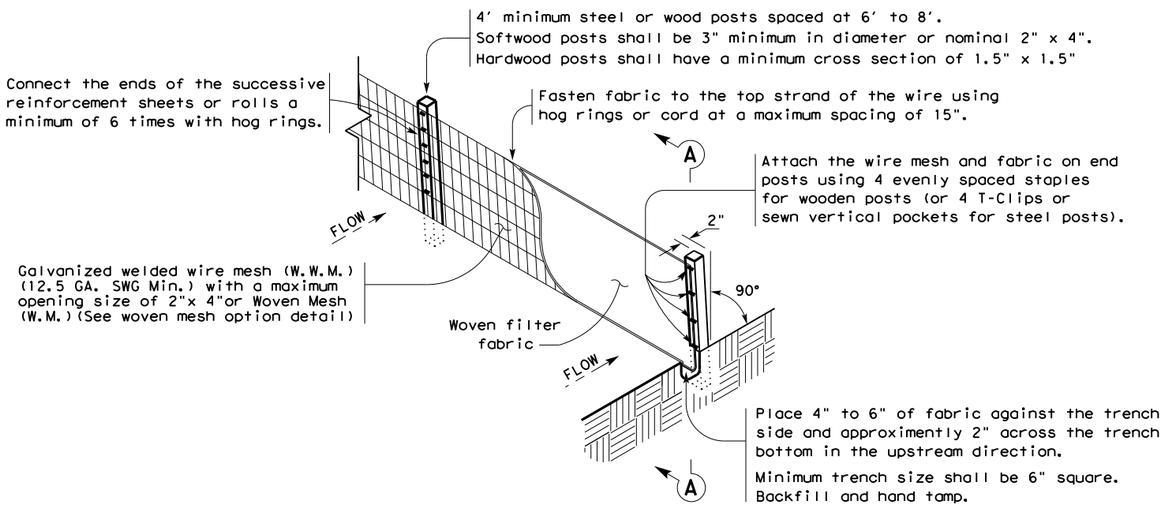
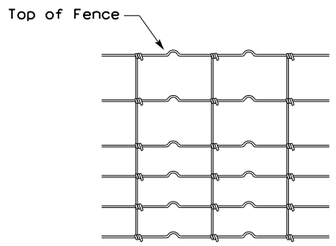
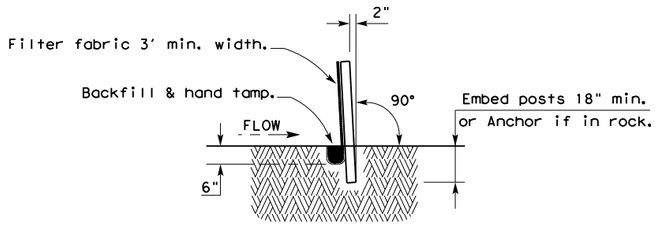
DN:



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

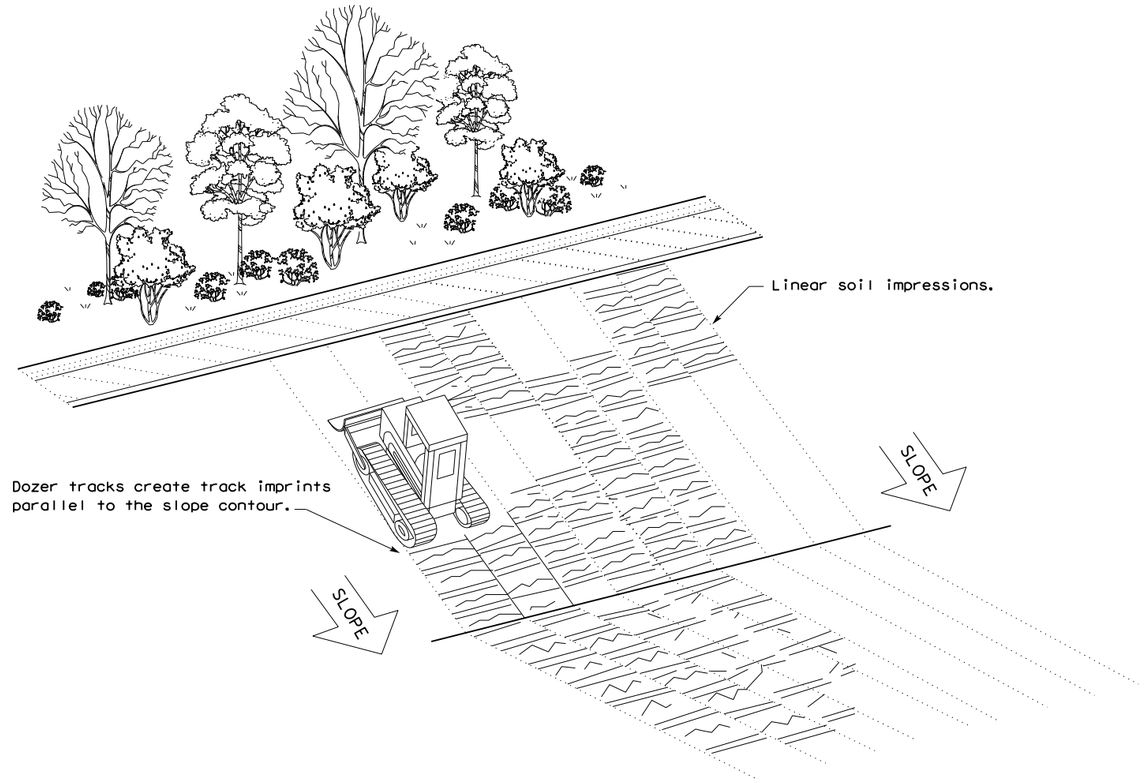
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

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



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

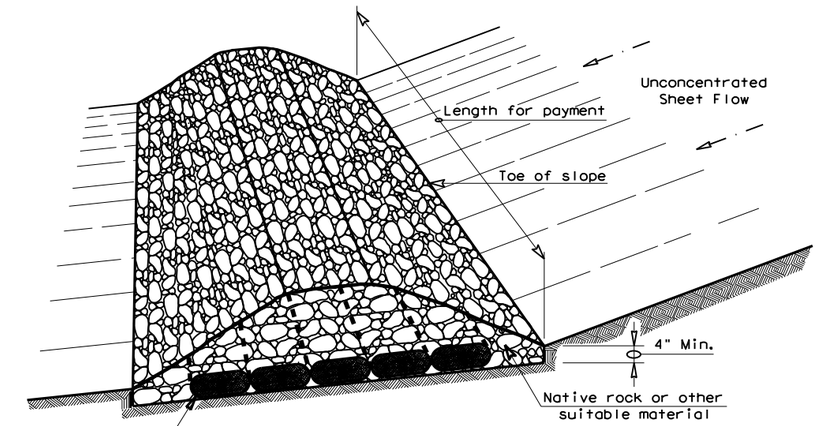
FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0177	14	039		SL 494	
	DIST	COUNTY			SHEET NO.	
	HOU	MONTGOMERY			162	

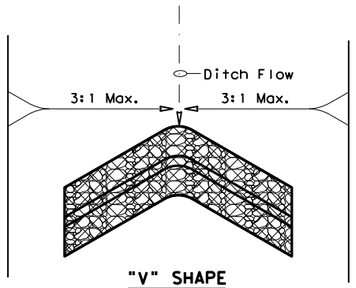
DATE
FILE

DATE:
FILE:

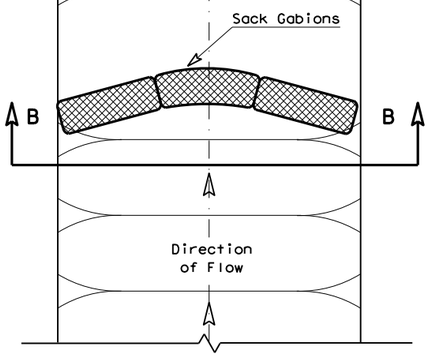


FILTER DAM AT TOE OF SLOPE

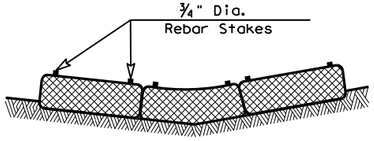
RFD1



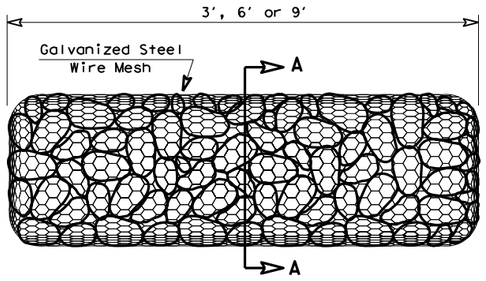
"V" SHAPE PLAN VIEW



PLAN VIEW

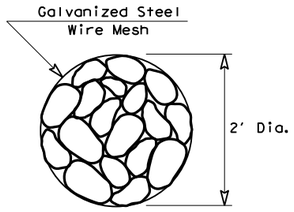


SECTION B-B

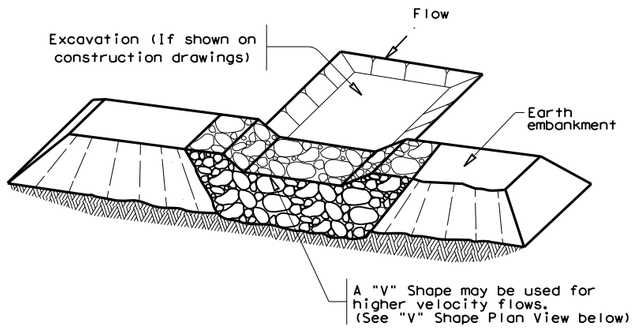


TYPE 4 (SACK GABIONS)

RFD4

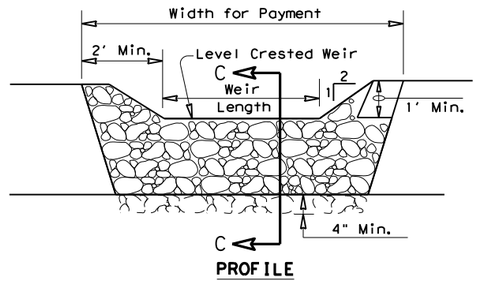


SECTION A-A

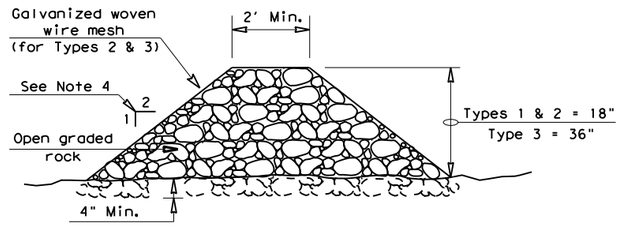


FILTER DAM AT SEDIMENT TRAP

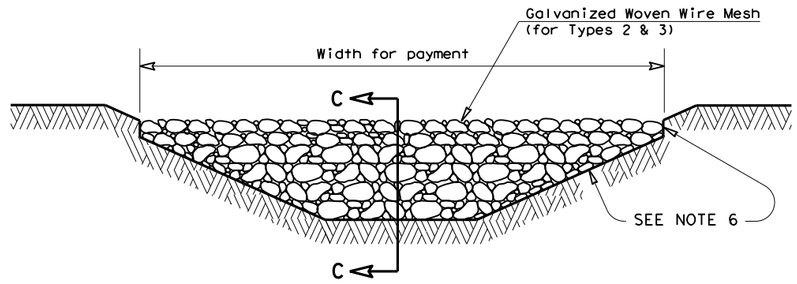
RFD1 OR RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

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.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation

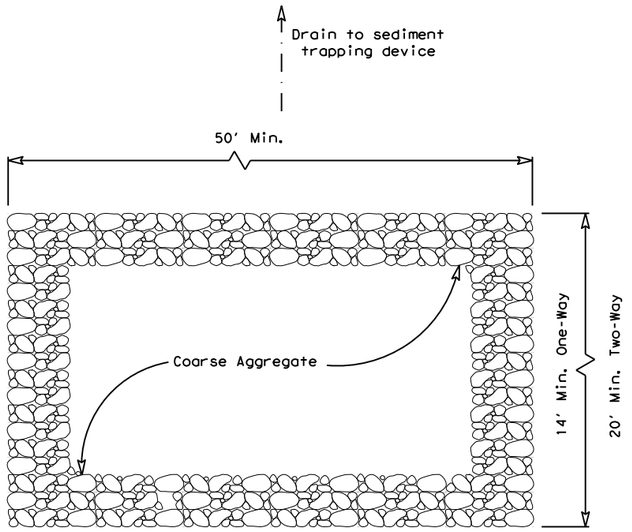
Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

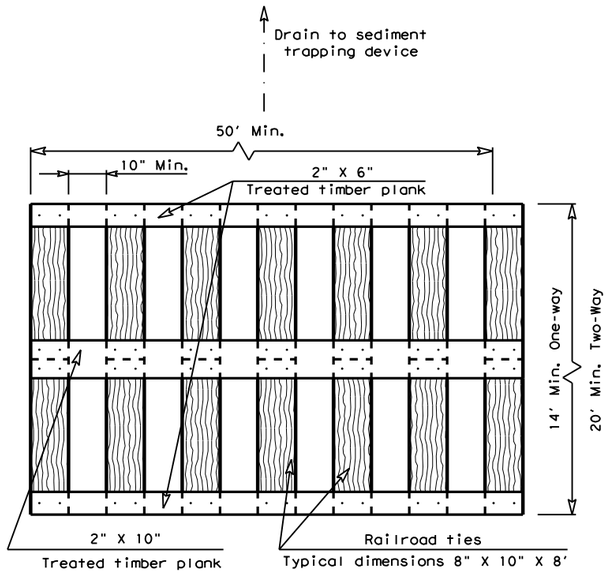
ROCK FILTER DAMS

EC(2)-16

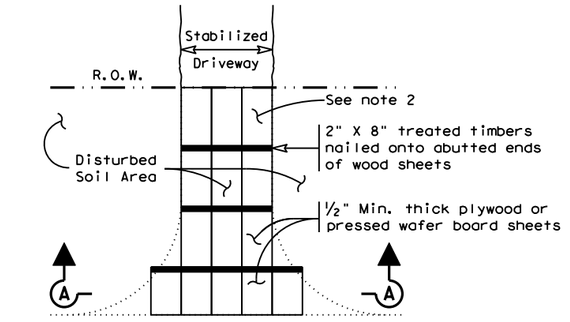
FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		163



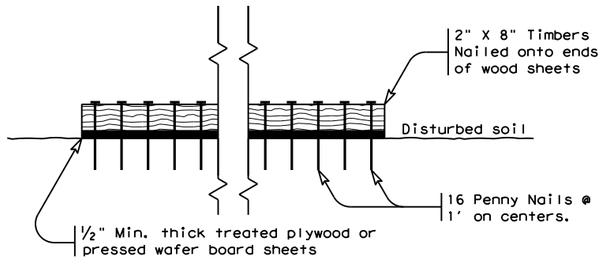
PLAN VIEW



PLAN VIEW



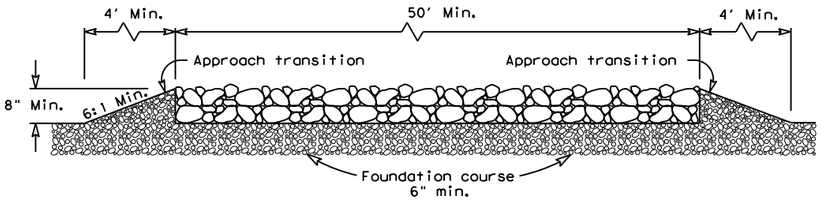
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

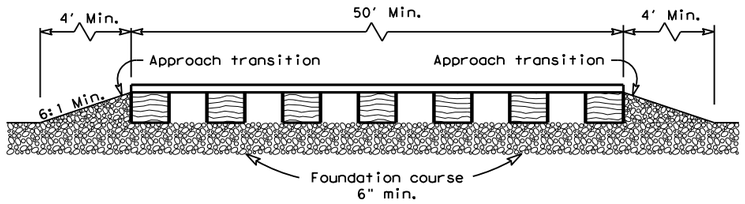
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

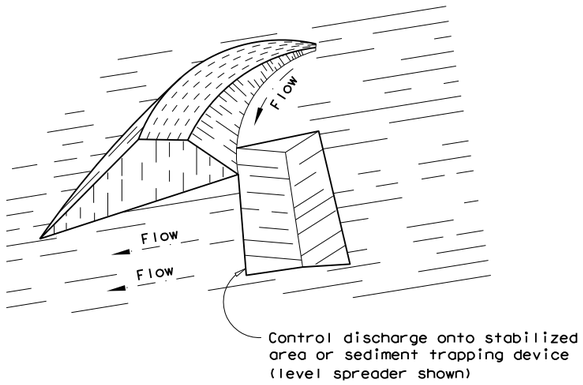
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

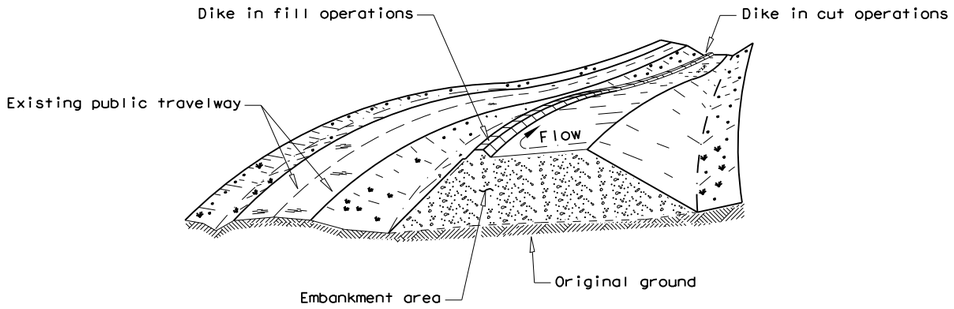
FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		164

DATE: $DATE$
FILE: $FILE$



PERIMETER DIKE

→(D)→

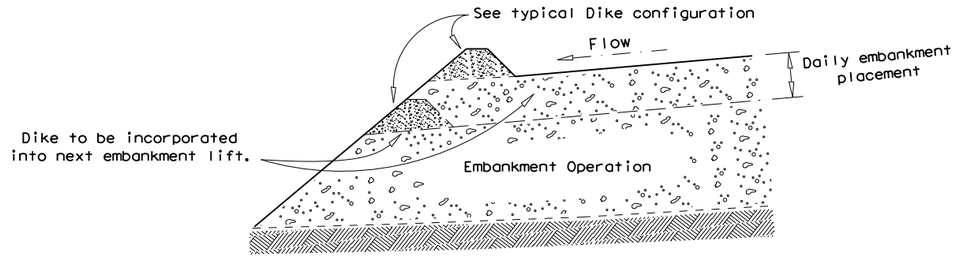


DIVERSION DIKE

→(D)→

GENERAL NOTE

1. Soil used in dike construction shall be machine compacted.
2. Top width and height of dike may be modified with prior approval of the Engineer.
3. Side slopes within the safety clear zone of a roadway shall be 6:1 or flatter.
4. Grading shall be shown elsewhere in the plans or as directed by the Engineer.
5. The Engineer reserves the right to modify the dimensions shown for the dike dependent on runoff volume characteristics.
6. Dikes that are in place for more than 14 calendar days should be stabilized to prevent sediment runoff.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Remove sediment and debris when accumulation affects the performance of the devices, after a rain and when directed by the engineer.



EMBANKMENT SECTION - DIVERSION DIKE

→(D)→

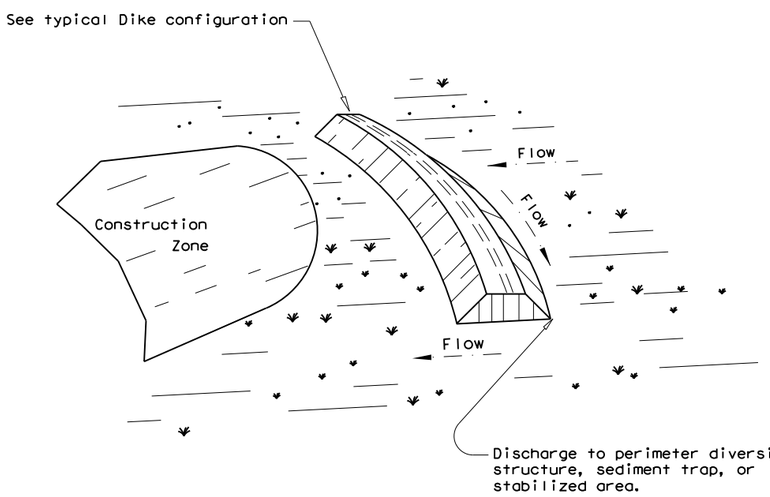
DIKE USAGE GUIDELINES

A Dike may be used to intercept runoff and divert it around unstabilized areas or to divert sediment laden runoff to an erosion control device (sediment basin or trap, rock filter dam, etc.).

The drainage area contributing runoff to a dike should not exceed 5 acres. The spacing of dikes should be as follows:

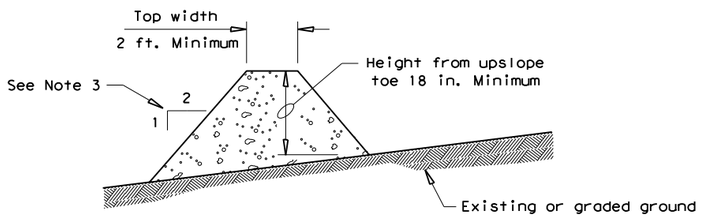
Slope of disturbed areas above dike	greater than 10%	5 - 10%	less than 5%
Maximum distance between dikes	100′	200′	300′

Intercepted runoff flowing along a dike should outlet to a stabilized area (vegetation, rock, etc.).



INTERCEPTOR DIKE

→(D)→



TYPICAL DIKE CONFIGURATION

→(D)→

PLANS SHEET LEGEND

DIKE →(D)→

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES DIKES (EARTHWORK FOR EROSION CONTROL)

EC(4)-16

FILE: ec416	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		165

DATE: $DATE$
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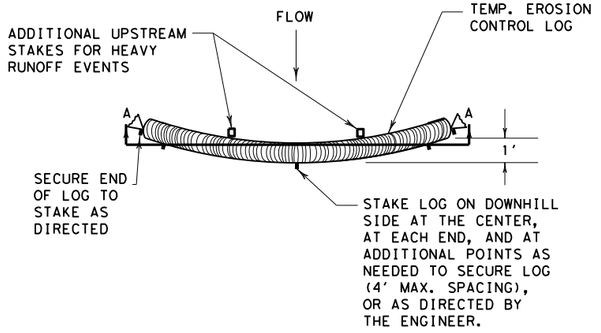
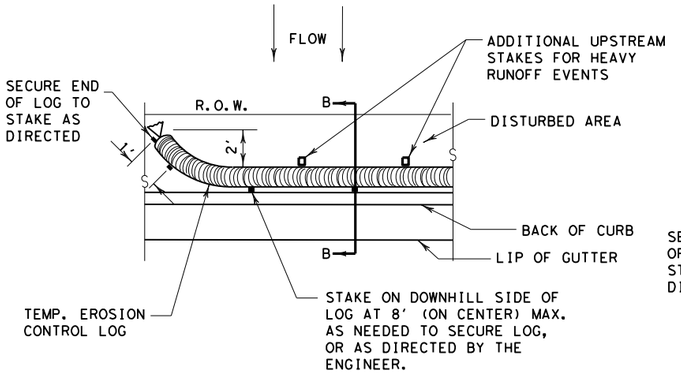
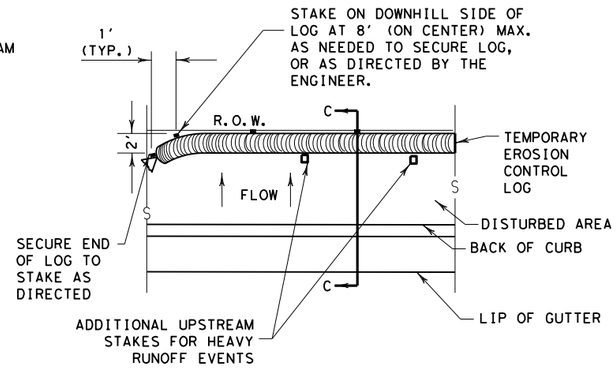


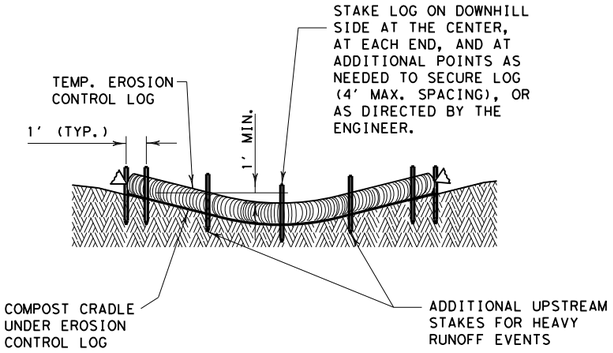
PLAN VIEW



PLAN VIEW



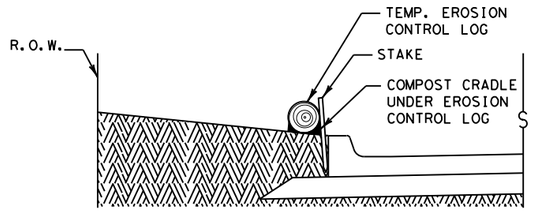
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

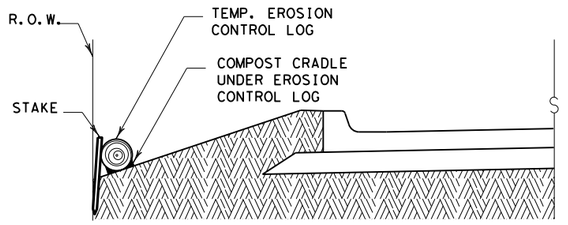
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

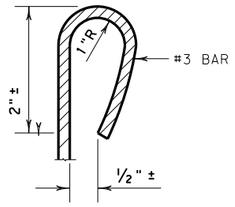
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

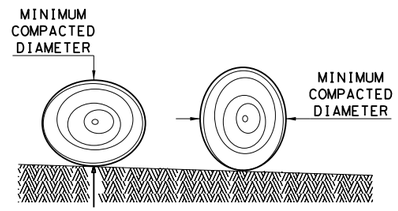
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0177	14	039		SL 494	
	DIST	COUNTY			SHEET NO.	
	HOU	MONTGOMERY			166	

DATE:
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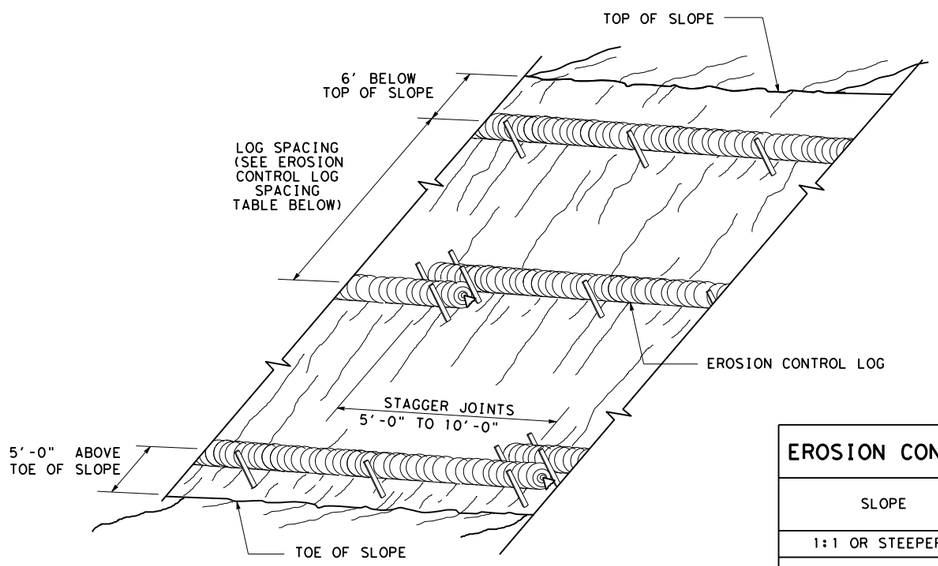
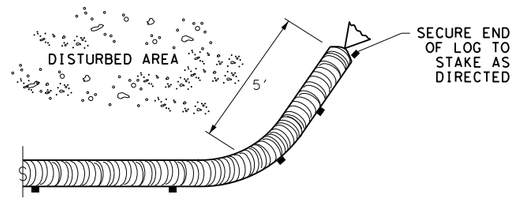


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

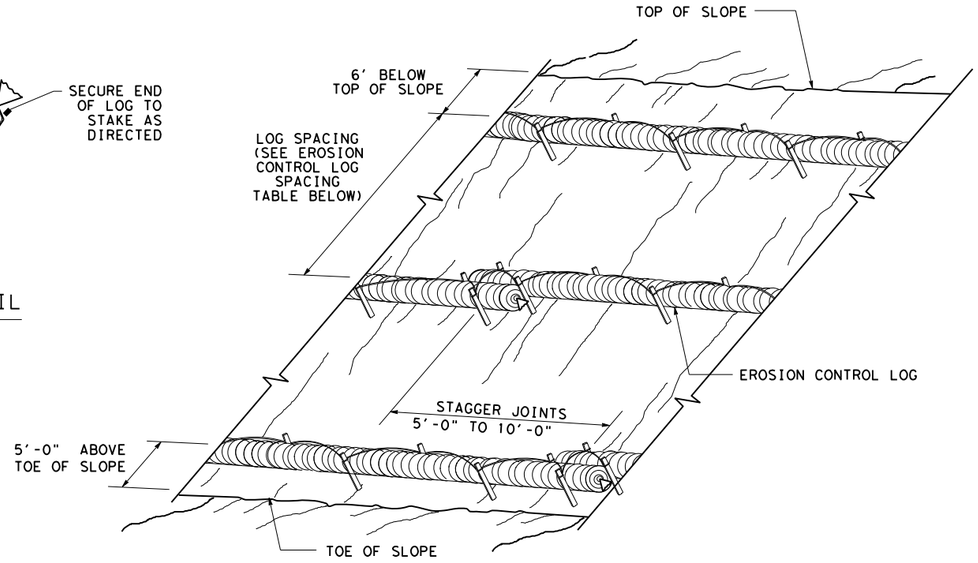
CL-SST



END SECTION RAP DETAIL

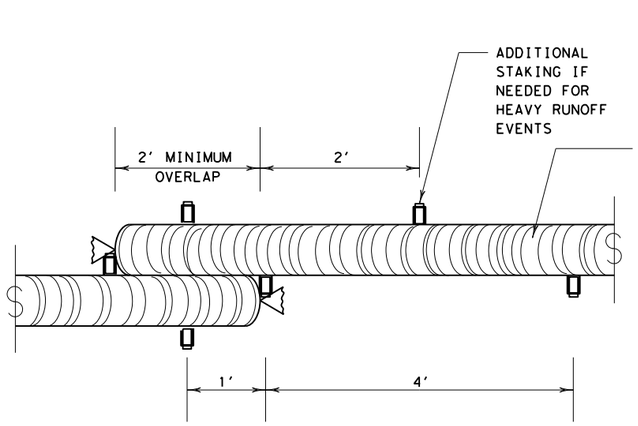
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

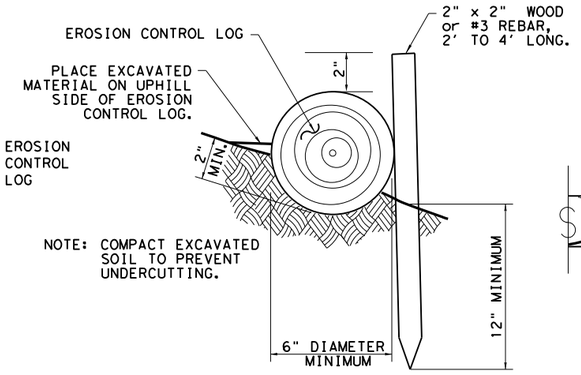
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

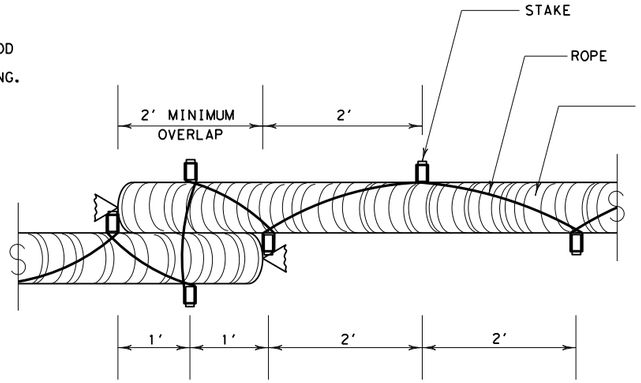


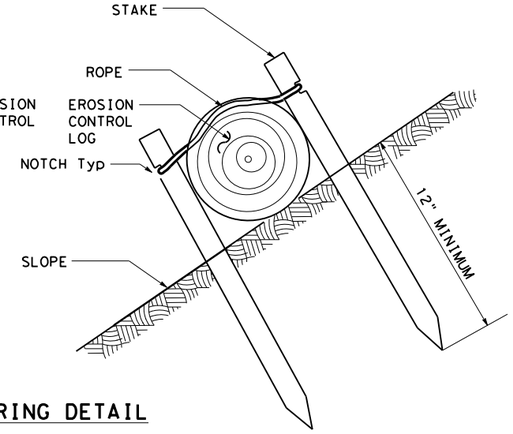


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

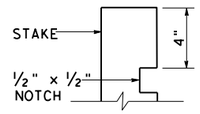
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0177	14	039		SL 494	
	DIST	COUNTY			SHEET NO.	
	HOU	MONTGOMERY			167	

DATE:
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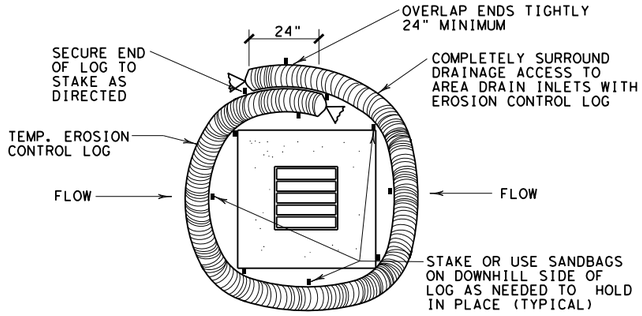
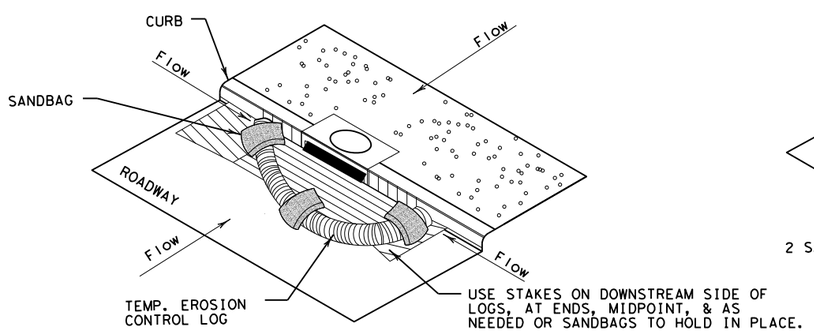


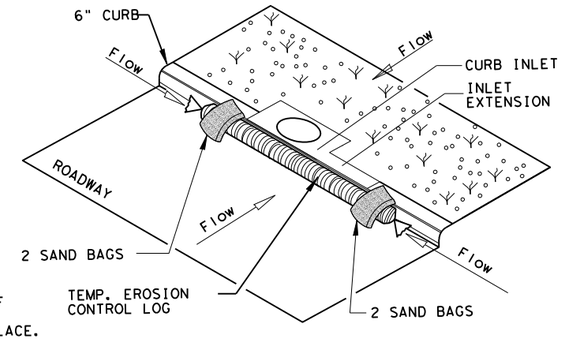
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

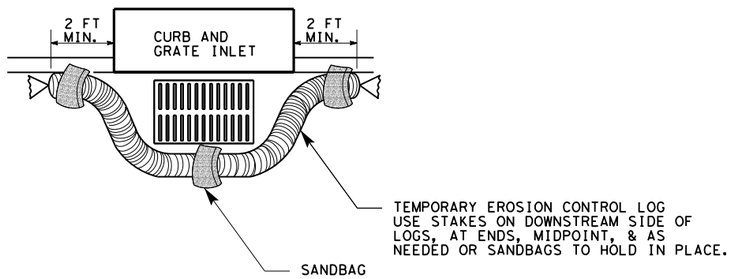
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

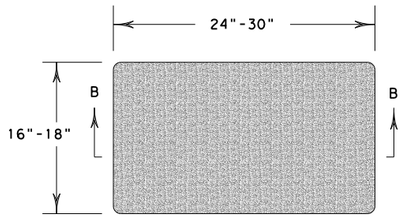
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM	DW: LS/PT		CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0177	14	039		SL 494		
	DIST	COUNTY				SHEET NO.	
	HOU	MONTGOMERY				168	

TYPE OF WORK — ITEMS AND REQUIREMENTS FOR EACH TYPE OF WORK

SODDING	PERMANENT SEEDING	TEMPORARY SEEDING	Reference Item 161, 162, 164, 166, 168 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown. Use latest Houston District, Special Provisions for those items indicated.		
	✓		**161-6017 COMPOST MANUF TOPSOIL (BIP)(4") SY**	APPLICATION RATE Item 161.2.1. Compost Manufactured Topsoil (CMT)	Item 161.2. Materials. Submit quality control (QC) documentation to the Engineer. Compost producer's STA certification must be dated to meet STA requirements (certification must be within 30 or 90 days per STA requirements). Lab analysis performed by an STA-certified lab must be dated within 30 days before delivery of the compost.
✓			**162-6002 BLOCK SODDING SY**	GRASS SPECIES Item 162.2. Materials. Common Bermuda (Cynodon Dactylon)	Item 162.2.1. Block Sod. Use block palletized or roll type sod. **REMOVE PLASTIC BACKING FROM ROLL TYPE SOD.** Place sod within 48 hours of delivery to site. No exceptions. Place sod with joints alternating on each row to prevent continuous joint lines. Peg sod as needed with wood pegs to hold sod in place. Pegging sod is subsidiary to Item 162.
	✓		**164-6066 DRILL SEEDING(PERM)(WARM OR COOL) SY** Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, May, June, July, August, September, October: Hulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre; Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre; Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre; Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre; Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre November, December, January, February: Unhulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre; Oats (Avena sativa) - 72.0 lbs PLS/acre; Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre; Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre; Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre	PLS (Pure Live Seed) Provide documentation of PLS requirements per Item 164.2.1. CONSTRUCTION. Cultivate the area to a depth of 4 inches before placing the seed unless otherwise directed. When performing permanent seeding after an established temporary seeding, cultivate the seedbed to a depth of 4 inches or mow the area before placement of the permanent seed. Plant the seed and place the straw or hay mulch after the area has been completed to lines and grades as shown on the plans. Drill Seeding. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 inch using a cultipacker(turfgrass) type seeder. Plant seed along the contour of the slopes. Use broadcast seeding method where site conditions prevent drill seeding method. Broadcast Seeding. Distribute the dry seed or dry seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution on top of soil.
	✓		**164-6052 BROADCAST SEED(PERM)(SPECIAL MIX) SY** Item 164.1. Description Provide and install seeding as shown on District Standard		
		✓	**164-6051 DRILL SEED(TEMP)(WARM OR COOL) SY** Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, May, June, July, August, September, October: Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre November, December, January, February: Oats (Avena sativa - 72.0 lbs PLS/acre	
		✓	**164-6009 BROADCAST SEED(TEMP)(WARM) SY** Item 164.1. Description Provide and install seeding as shown on District Standard		
	✓	✓	**162-6003 STRAW OR HAY MULCH SY**	APPLICATION RATE Immediately after planting the seed or seed mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw or hay mulch at 2 tons per acre. Use tacking agent with straw or hay mulch as described on this sheet.	Use straw or hay mulch in conformance with Article 162.2.5, "Mulch." Use biodegradable tacking agents only applied at a rate in accordance with manufacturer's recommendations. Use the following products or an approved equal(see note this sheet): Conweb/Contac Guar Gum, Profile Products Corporation, (307) 655-9565, Ramtec/Procol/Viscol Guar Gum, Ramtec Corporation, (800) 366-1180
✓	✓	✓	**166-6001 FERTILIZER AC** Item 166.2. Materials Use fertilizer as shown on District Standard	APPLICATION RATE Deliver and evenly distribute fertilizer at a rate of 4000 lbs/acre.	Use a **NON-CHEMICAL** fertilizer which meets all the following criteria: (1) BRAND NAME must be registered with the Texas State Chemist as a commercial fertilizer. (2) Meets USEPA guidelines for unrestricted use. (3) Derived from biological sources such as, but not limited to: sewage sludge, manures, vegetation, etc. (4) In granular form and essentially dust free. Submit proof of registration and nutrient source to Engineer. Use the following products or an approved equal(see note this sheet): Sigma, SIGMA AgriScience, 281-851-6749 Sustanite-standard grade, Automation Nation, Inc., 713-675-4999 Milorganite, MMSD, 800-287-9645 Agricultural Organic P/L, Ag Org, INC., 713-523-4396
✓	✓	✓	**168-6001 VEGETATIVE WATERING MG**	APPLICATION RATE Item 168.3 Construction. 6000 gallons/acre per working day x 20 consecutive working days = 120,000 gallons total/acre	Begin watering immediately after installation of seed or sod. Replace, fertilize, and water any seed or sod in poor condition due to the failure to apply the specified amount of water within the time allowed at no expense to the Department.

SEQUENCE OF WORK

BLOCK SOD	PERMANENT SEEDING	TEMPORARY SEEDING
1. FERTILIZER 2. CULTIVATE SOIL (ITEM 162.3) 3. SOD 4. VEGETATIVE WATERING	1. FERTILIZER 2. COMPOST MANUFACTURED TOPSOIL 3. CULTIVATE SOIL (ITEMS 164.3 AND 161.3.1) 4. PERMANENT SEEDING 5. STRAW OR HAY MULCH 6. VEGETATIVE WATERING	1. FERTILIZER 2. CULTIVATE SOIL (PER ITEM 164.3) 3. TEMPORARY SEEDING 4. STRAW OR HAY MULCH 5. VEGETATIVE WATERING

Texas Department of Transportation

HOUSTON DISTRICT

FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER

SHEET 1 OF 1

REVISIONS								
10/2014 UPDATED TO 2014 SPECS 3/2015 MINOR CORRECTIONS	FILE: OCT 2014	FED DIV	STATE	PROJECT NUMBER			SHEET
		6	TEXAS				169
	ORIGINAL:	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
		12	MONTGOMERY	0177	14	039	SL 494

HOU MONTGOMERY STD K-1

PART 1 - GENERAL

1.01 DESCRIPTION

This project includes construction work within the right of way and/or properties of the Railroad and adjacent to its tracks, wire lines and other facilities. These sheets describe the minimum special requirements for coordination with the Railroad when working upon, over or under Railroad Right of Way or when impacting current or future Railroad operations. Coordinate with the Railroad while performing the work outlined herein, and afford the same cooperation with the Railroad as with TxDOT. Complete all submittals and work in accordance with TxDOT Standard Specifications, Railroad Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the Railroad Designated Representative.

For purposes of this project, the Railroad Designated Representative is the person or persons designated by the Railroad Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 REQUEST FOR INFORMATION / CLARIFICATION

Submit Requests for Information ("RFI") involving work within any Railroad Right of Way to the TxDOT Engineer. The TxDOT Engineer will submit the RFI to the Railroad Designated Representative for review and approval for RFI's corresponding to work within Railroad Right of Way. Allow six (6) weeks total time for review and approval, which includes four (4) weeks for review and approval by the Railroad.

1.03 PLANS / SPECIFICATIONS

TxDOT has received written Railroad approval of the plans and specifications for this project. Any revisions or changes in the plans after award of the Contract must have the approval of TxDOT and the Railroad.

PART 2 - UTILITIES AND FIBER OPTIC

Construct all utility installations in accordance with current AREMA recommendations, Railroad, TxDOT and owning utility specifications and requirements. Railroad general guidelines can be found on the Railroad website or by contacting the Railroad Designated Representative.

PART 3 - CONSTRUCTION

3.01 GENERAL

A. Perform all work in compliance with all applicable Railroad, Federal Railroad Administration (FRA), and TxDOT rules and regulations. Arrange and conduct work in a manner that does not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, or the wires, signals and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Work. The safe operation of railroad train movements takes precedence over any work to be performed by the Contractor. The Contractor is responsible for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.

B. Construction activities within 15 feet of the operational tracks will only be allowed if absolutely necessary and the Railroad's Designated Representative grants approval. Construction activities within 15 feet of the operational track(s) preferably allow the tracks to stay operational. In such cases, coordination and approval by the Railroad Track Manager is required with regard to schedule, flagging, and slow orders. See Sections 3.07 and 3.08 for additional information.

C. Provide track protection for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail. When not in use, keep Contractor machinery and materials at least 50 feet from the Railroad's nearest track.

D. Vehicular crossings of railroad track are allowed only at existing crossings, or haul road crossings developed with Railroad approval.

E. The Contractor is also advised that new railroad facilities within the project may be built by the Railroad. If applicable, these facilities are delineated in the plans. Be aware of the limits of responsibilities and coordinate efforts with the Railroad and TxDOT.

F. Railroad requirements do not allow work within 50 feet of track centers when a train passes the work site and all personnel must clear the area within 50 feet of the track centerline and secure all equipment. Additional allowances may be pursued as outlined in 3.02 and 3.03.

G. All permanent clearances shall be verified before project closing.

3.02 RAILROAD OPERATIONS

A. Trains and/or equipment are expected on any track, at any time, in either direction. Become familiar with the train schedules in this location and structure bid assuming intermittent track windows in this period, as defined in Paragraph B that follows.

B. All railroad tracks within and adjacent to the contract site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Coordinate work windows with TxDOT and the Railroad's Designated Representative. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and/or adjacent to the railroad tracks within 25 feet of the nearest track, a railroad flag person will be required. At the direction of the railroad flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the Railroad Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame, the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window, the railroad tracks and/or signals must be completely operational for train operations and all Railroad, Public Utilities Commission (PUC) and FRA requirements, codes and regulations for operational tracks must be satisfied. In the situation where the operating tracks and/or signals have been affected, the Railroad will perform inspections of the work prior to placing that track back into service. Railroad flag persons will be required for construction activities requiring an Absolute Work Window. Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for Railroad review.

3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Do not perform any work within Railroad Right of Way without a valid executed Right of Entry Agreement if required on this project.

B. Give advance notice to the Railroad as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over Railroad Right of Way and observe the Railroad's rules and regulations with respect thereto.

C. Perform all work upon Railroad Right of Way in a manner to avoid interference with or endanger the operations of the Railroad. Whenever work may affect the operations or safety of trains, submit the work method to the Railroad Designated Representative for approval. Approval does not relieve the Contractor from liability. Do not commence any work which requires flagging service or inspection service until the flagging protection required by the Railroad is available at the job site. See Section 3.15 for railroad flagging requirements.

D. Make requests in writing for both Absolute and Conditional Work Windows, at least 30 days in advance of any work. Include in the written request:
1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

Provide a written confirmation notice to the Railroad at least 48 hours before commencing work in connection with approved work windows when work is within 25 feet of nearest rail. Perform all work in accordance with previously approved work plans.

E. Make provisions to protect operations and property of the Railroad should a condition arising from, or in connection with the work, require immediate and unusual action. If in the judgment of the Railroad Designated Representative such provisions are insufficient, the Railroad Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the Railroad or TxDOT. The Railroad or TxDOT shall have the right to order the Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the Railroad Designated Representative, the Contractor's operations could endanger railroad operations. In the event of such an order, immediately notify TxDOT of the order.

3.04 INSURANCE

Do not begin work upon or over Railroad Right of Way until furnishing the Railroad with the insurance policies, binders, certificates and endorsements required by the "Contractor's Right of Entry Agreement", and until the Railroad Designated Representative has advised TxDOT that such insurance is in accordance with the Agreement.

3.05 RAILROAD SAFETY ORIENTATION

A. Complete the railroad course "Orientation for Contractor's Safety", and maintain current registration prior to working on railroad property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

"UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other railroads. Refer to Railroad specific contractor right of entry for training information."

B. Know and follow the "Contractor's Right of Entry Agreement" EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

3.06 COOPERATION

The Railroad will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of Railroad Right of Way in performing the work.

3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

Abide by the following minimum temporary clearances during the course of construction:
A. 15' - 0" (BNSF)(UPRR)and 14'-0" (KCS) horizontal from centerline of track
B. 22' (KCS) and 21' - 6" (UPRR & BNSF) vertically above top of rail.

For construction clearance less than listed above, obtain local Railroad Operating Unit review and approval.

3.08 APPROVAL OF REDUCED CLEARANCES

A. Maintain minimum track clearances during construction as specified in Section 3.07.

B. Submit any proposed infringement on the specified minimum clearances to the Railroad Designated Representative through TxDOT at least 30 days in advance of the work. Do not proceed with such infringement without written approval by the Railroad Designated Representative.

C. Do not commence work involving an approved infringement without receiving written assurance from the Railroad Designated Representative that arrangements have been made for any necessary flagging service.

Texas Department of Transportation | Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	CONT	SECT	JOB	HIGHWAY
REVISIONS March 2020	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		170

DATE:
FILE:

3.09 MAINTENANCE OF RAILROAD FACILITIES

A. Maintain all ditches and drainage structures free of silt or other obstructions resulting from Contractor's operations. Repair eroded areas and any other damage within Railroad Right of Way and repair any other damage to the property of the Railroad, or its tenants.

B. Perform all such maintenance and repair of damages due to the Contractors's operations at Contractor's expense.

C. Submit a proposed method of erosion control for review by the Railroad prior to beginning any grading on the project site. Comply with all applicable local, state and federal regulations when developing and implementing such erosion control.

3.10 SITE INSPECTIONS BY RAILROAD's DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by the Railroad Designated Representative at significant points during construction, including the following if applicable:
   1. Pre-construction meetings.
   2. Pile driving/drilling of caissons or drilled shafts.
   3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
   4. Erection of precast concrete or steel bridge superstructure.
   5. Placement of waterproofing (prior to placing ballast on bridge deck).
   6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.

C. Provide a detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to TxDOT for submittal to the Railroad Designated Representative for review prior to commencement of work. Include the anticipated dates when the above listed events will occur. Update this schedule for the above listed events as necessary and each month at a minimum to allow the Railroad to schedule site inspections.

3.11 RAILROAD REPRESENTATIVES

Railroad representatives, conductors, flag person or watch person will be provided by the Railroad at expense of TxDOT to protect Railroad facilities, property and movements of its trains or engines. In general, the Railroad will furnish such personnel or other protective services as follows:

A. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from nearest rail of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

B. For any excavation below elevation of track subgrade if, in the opinion of the Railroad Designated Representative, track or other railroad facilities may be subject to settlement or movement.

C. During any clearing, grubbing, excavation or grading in proximity to railroad facilities, which, in the opinion of the Railroad Designated Representative, may endanger railroad facilities or operations.

D. During any Contractor's operations when, in the opinion of the Railroad Designated Representative, railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

E. Arrange with the Railroad Designated Representative to provide the adequate number of flag persons to accomplish the work.

3.12 COMMUNICATIONS AND SIGNAL LINES

If required, the Railroad will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by the Railroad's forces in connection with its operation at expense of TxDOT. This work by the Railroad will be done by its own forces and it is not a part of the Work under this Contract.

3.13 TRAFFIC CONTROL

Coordinate any operations that control traffic across or around railroad facilities with the Railroad Designated Representative.

3.14 CONSTRUCTION EXCAVATIONS AND BORING ACTIVITIES UNDER TRACK

A. Take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of TxDOT, OSHA, AREMA and Railroad "Guidelines for Temporary Shoring".

B. The project plans indicate whether there are fiber optic lines or other such telecommunications systems that require consideration. Regardless, contact the necessary call center to determine if such cable systems are present:

   UPRR 1-800-336-9193
   7:00 AM to 9:00 PM CST Monday-Friday except holidays,
   staffed 24 hrs/day for emergencies
   48 hrs notice required

   BNSF 1-800-533-2891
   24 hour number
   5 working days notice required

   KCS 1-800-344-8377
   Texas One Call, a 24 hour number
   48 hrs notice required, excluding weekends and holidays

   If a telecommunications system is buried anywhere on or near railroad property, coordinate with TxDOT, the Railroad and the Telecommunication Company(ies) to arrange for relocation or protective measures prior to beginning work on or near railroad property. Refer to the project General Notes for additional information.

C. Projects involving a boring or jack and bore operation under track such as drainage pipes or culverts and utilities require an installation plan reviewed and approved by the Railroad and TxDOT prior to proceeding with such construction. A railroad inspector and contractor assisted monitoring of ground and track movement is required to maintain safe passage of rail traffic. Stop installation and do not allow passage of trains if movements in excess of 1/4 inch vertical or horizontal is detected in the tracks. Immediately repair the damage to the satisfaction of TxDOT and the Railroad before proceeding.

3.15 RAILROAD FLAGGING

Per the Right of Entry Agreement for flagging, notify the Railroad Representative at least 10 working days in advance of Contractor's work and at least 30 working days in advance of any Contractor's work in which any person or equipment will be within 25 feet of nearest rail or as specified in the Contractor Right of Entry (CROE).

3.16 CLEANING OF RIGHT-OF-WAY

When work is complete, remove all tools, implements, and other materials brought into Railroad Right of Way and leave the right of Way in a clean and presentable condition to the satisfaction of TxDOT and the Railroad.

Texas Department of Transportation | Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS March 2020	0177	14	039	SL 494
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		171

DATE:
FILE:

DATE:
FILE:

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

DOT #: 755893U
Crossing Type: AT GRADE
RR Company Owning Track at Crossing: UNION PACIFIC RAILROAD (UPRR)
Operating RR Company at Track: UNION PACIFIC RAILROAD (UPRR)
RR MP: 28.370
RR Subdivision: LUFKIN
City: PORTER
County: MONTGOMERY
CSJ at this Crossing: 0177-14-039
Highway/Roadway name crossing the railroad: ROBERTS ROAD
# of regularly scheduled trains per day at this crossing: 8
# of switching movements per day at this crossing: 0
% of estimated contract cost of work within railroad ROW: 0%

Scope of Work at this Crossing to Be Performed by State Contractor:
None. Proposed work is parallel to Railroad Crossing between RR MP 28.370 and RR MP 29.070. All work to be done 2 ft inside TXDOT's ROW.

Scope of Work at this Crossing to Be Performed by Railroad Company:
None. Proposed work is parallel to Railroad Crossing.
All work to be done 2 ft inside TXDOT's ROW

II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)

III. FLAGGING & INSPECTION

of Days of Railroad Flagging Expected: 0

On this project, night or weekend flagging is:

☐ Expected
☒ Not Expected

Flagging services will be provided by:

☐ Railroad Company: TxDOT will pay flagging invoices
☒ Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☒ UPRR - UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
- UP.request@nrssinc.net
Call Center 877-984-6777

☐ BNSF - BNSF.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging

☐ KCS - KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
- Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS

Contractor must incorporate Construction Inspection into anticipated construction schedule.

☒ Not Required

☐ Required: Contact Information for Construction Inspection:

IV. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

On this project, construction work to be performed by a railroad company is:

☐ Required
☒ Not Required

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

V. RAILROAD INSURANCE REQUIREMENTS

Railroad reference number shall be provided by TxDOT CST or DO.

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies must be issued for and on behalf of the Railroad. Where more than one Railroad Company is operating on the same right of way or where several Railroad Companies are involved and operate on their own separate rights of way, provide separate insurance policies in the name of each Railroad Company.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000 combined single limit

Railroad Protective Liability		
☐	Not Required	
☒	Non - Bridge Projects	$2,000,000 / $6,000,000
☐	Bridge Projects	$5,000,000 / $10,000,000
☐	Other	

VI. CONTRACTOR'S RIGHT OF ENTRY (ROE) AGREEMENT

On this project, an ROE agreement is:

☒ Not Required

☐ Required: TxDOT CST to assist in obtaining with the UPRR (see Item 5, Article 8.3)

☐ Required: UPRR Maintenance Consent Letter. TxDOT CST to assist.

☐ Required: Contractor to obtain (see Item 5, Article 8.4)
With the following railroad companies:

To view previously approved ROE Agreement templates agreed upon between the State and Railroad, see:

http://www.txdot.gov/inside-txdot/division/rail/samples.html

Approved ROE Agreement templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed ROE agreement between the Contractor and the Railroad if required on project.

VII. RAILROAD COORDINATION MEETING

On this project, a Railroad Coordination Meeting is:

☒ Not Required
☐ Required

See Item 5, Article 8.1 for more details.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are required to maintain the same insurance coverage as required of the Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call Union Pacific Railroad (UPRR)
Railroad Emergency Line at 888-877-7267
Location: DOT 755893U
RR Milepost 28.370
Subdivision LUFKIN

Texas Department of Transportation | Rail Division

RAILROAD SCOPE OF WORK
PROJECT SPECIFIC DETAILS

FILE: RR Scope of Work.dgn	DN: TxDOT	CK:	DW:	CK:		
©TxDOT June 2014	CONT	SECT	JOB		HIGHWAY	
REVISIONS 9/2021	0177	14	039		SL 494	
	DIST	COUNTY			SHEET NO.	
	HOU	MONTGOMERY			172	

DATE:
FILE:

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

DOT #: 755894B
Crossing Type: AT GRADE
RR Company Owning Track at Crossing: UNION PACIFIC RAILROAD (UPRR)
Operating RR Company at Track: UNION PACIFIC RAILROAD (UPRR)
RR MP: 29.070
RR Subdivision: LUFKIN
City: PORTER
County: MONTGOMERY
CSJ at this Crossing: 0177-14-039
Highway/Roadway name crossing the railroad: RAILROAD AVENUE RINEHART RD
# of regularly scheduled trains per day at this crossing: 8
# of switching movements per day at this crossing: 0
% of estimated contract cost of work within railroad ROW: 0%

Scope of Work at this Crossing to Be Performed by State Contractor:
None. Proposed work is parallel to Railroad Crossing between RR MP 28.370 and RR MP 29.070. All work to be done 2 ft inside TXDOT's ROW.

Scope of Work at this Crossing to Be Performed by Railroad Company:
None. Proposed work is parallel to Railroad Crossing.
All work to be done 2 ft inside TXDOT's ROW

II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)

III. FLAGGING & INSPECTION

of Days of Railroad Flagging Expected: 0

On this project, night or weekend flagging is:

☐ Expected
☒ Not Expected

Flagging services will be provided by:

☐ Railroad Company: TxDOT will pay flagging invoices
☒ Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

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Call Center 877-315-0513, Select #1 for flagging
- UP.request@nrssinc.net
Call Center 877-984-6777

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Call Center 877-315-0513, Select #1 for flagging
- Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS

Contractor must incorporate Construction Inspection into anticipated construction schedule.

☒ Not Required

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Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
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Business Automobile	$2,000,000 combined single limit

Railroad Protective Liability		
☐	Not Required	
☒	Non - Bridge Projects	$2,000,000 / $6,000,000
☐	Bridge Projects	$5,000,000 / $10,000,000
☐	Other	

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On this project, a Railroad Coordination Meeting is:

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PROJECT SPECIFIC DETAILS

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©TxDOT June 2014	CONT	SECT	JOB		HIGHWAY	
REVISIONS 9/2021	0177	14	039		SL 494	
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