INDEX OF SHEETS

SEE PLAN SHEET 2

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

BRAZORIA COUNTY
FM 2403
CSJ 2950-01-008, etc

FEDERAL AID PROJECT NO. BR 2023(995)

PROJECT LENGTH: 2733.00 FT = 0.521 MILES

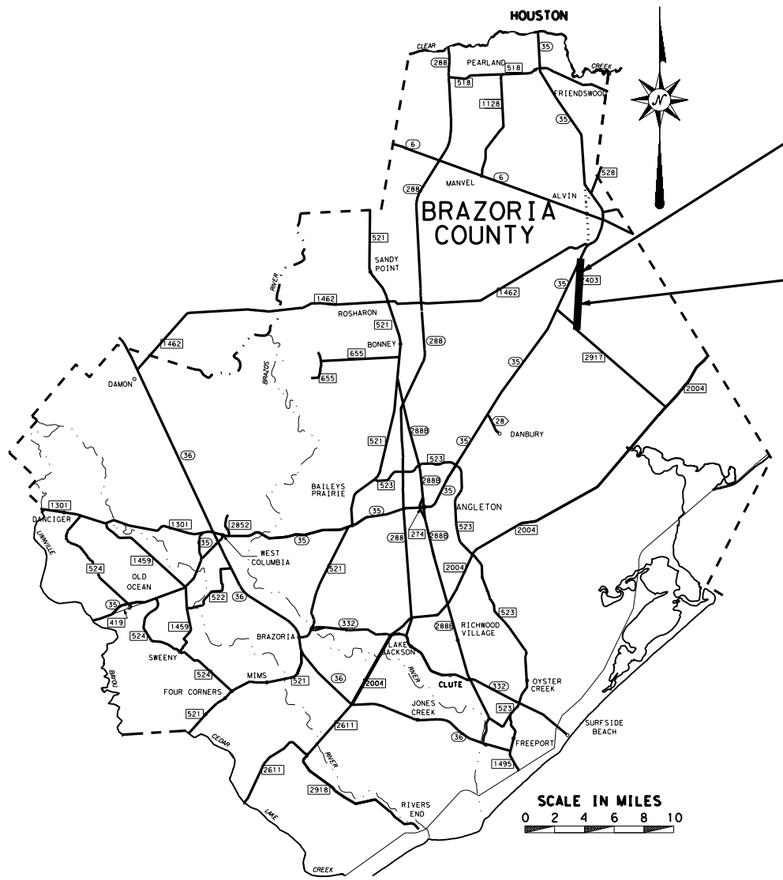
LIMITS: AT DRAINAGE DITCH, ETC

FOR THE CONSTRUCTION OF REMOVE AND REPLACE BRIDGE AND APPROACHES, MBGF, AND STRIPING

DESIGN SPEED- 60 MPH
ADT- 7,200(2023)
10,200(2043)
RURAL MAJOR COLLECTOR
URBAN MAJOR COLLECTOR

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2023(995)		1
STATE	DIST.	COUNTY	
TEXAS	HOU	BRAZORIA	
CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, etc	FM 2403

CSJ	ROADWAY LENGTH		BRIDGE LENGTH		TOTAL LENGTH	
	FEET	MILE	FEET	MILE	FEET	MILE
2950-01-008	1139.63' =	0.215	170.00' =	0.032	1309.63' =	0.247
2950-01-009	1222.40' =	0.231	220.00' =	0.041	1442.40' =	0.272
PROJECT LENGTH	2363.00' =	0.448	390.00' =	0.074	2753.00' =	0.521



PROJECT VICINITY MAP

CSJ 2950-01-009
REF MRKR 498-0.455
EXIST NBI 12-020-0-2950-01-001
PROP NBI 12-020-0-2950-01-004
AT BRISCOE CANAL (DRAINAGE DITCH)

CSJ 2950-01-008
REF MRKR 500-0.285
EXIST NBI 12-020-0-2950-01-002
PROP NBI 12-020-0-2950-01-003
AT DRAINAGE DITCH

RAILROAD CROSSING: NONE
EXCEPTIONS: NONE
EQUATIONS: NONE

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, JULY 5, 2022).

Texas Department of Transportation®

SUBMITTED FOR LETTING: 4/20/2023

DocuSigned by:
Maria Pilar Aponte, P.E.
C8B39625B1F14DE...
AREA ENGINEER

APPROVED FOR LETTING: 4/25/2023

DocuSigned by:
Larry W. Blackburn, P.E.
B9928A69E03E42F...
For DISTRICT ENGINEER

4/20/2023
c:\txdot\pw*online\txdot3\jamie.howell\d0304374\Titlesheet.dgn

GENERAL

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STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

THE STANDARD SHEET (#) SPECIFICALLY IDENTIFIED ABOVE, HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

Jamie A.H. Jones, P.E. 5/19/2023

JAMIE A.H. JONES, P.E. — DATE

SHEET 1 OF 1

INDEX OF SHEETS

Texas Department of Transportation®

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2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		2

5/19/2023
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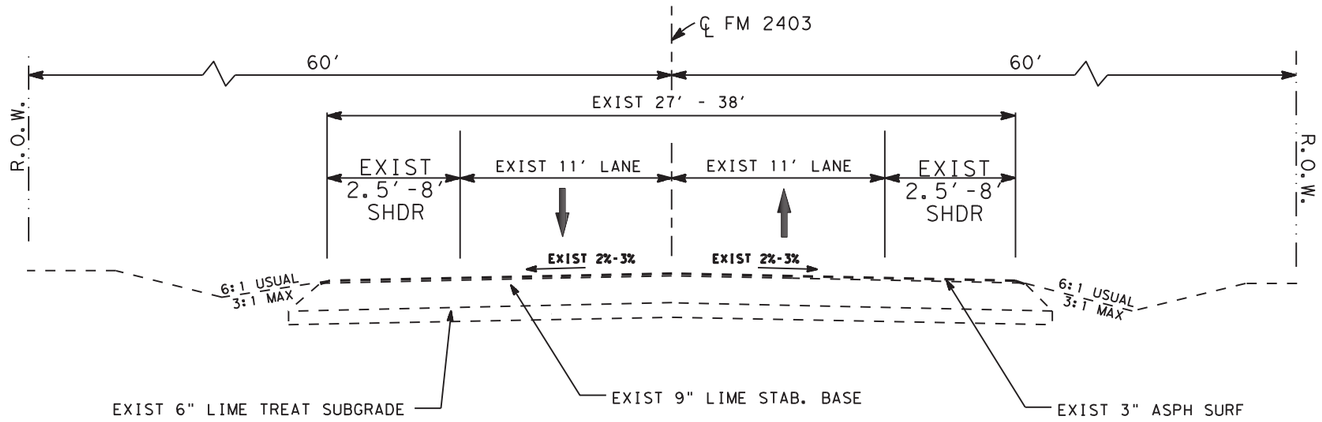

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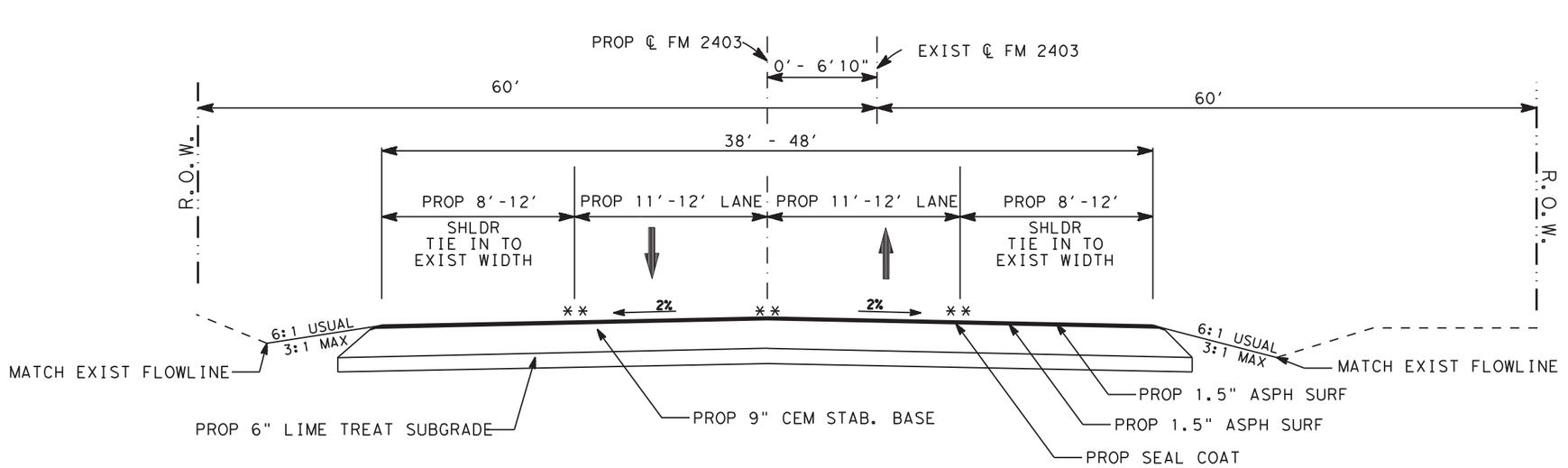

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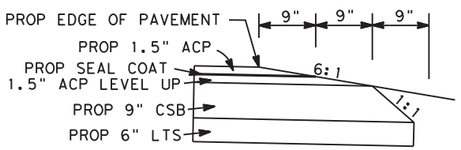
STA 42+72 TO STA 45+46.28

STA 156+97.43 TO STA 159+78
STA 160+90 TO STA 168+43



PROP EDGES DETAIL
N.T.S.

** MILLED RUMBLE STRIPS

NOTE:

TYPICAL SECTION ARE REVERSE SYMMETRICAL
STATIONS 156+97-171+39

SHEET 1 OF 2

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

FM 2403
TYPICAL SECTION

Texas Department of Transportation®

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		3

4/20/2023
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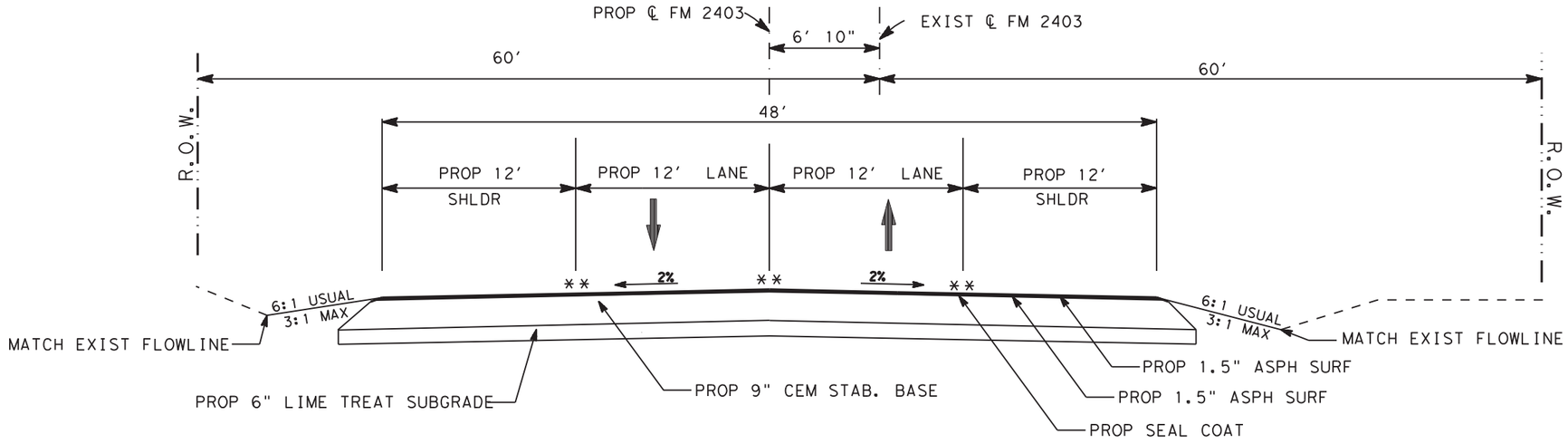
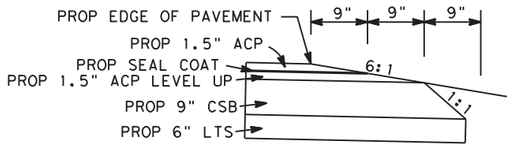


PROP TYPICAL SECTION

STA 35+20 TO STA 38+23
(SOUTH BRIDGE)
STA 39+93 TO STA 42+72

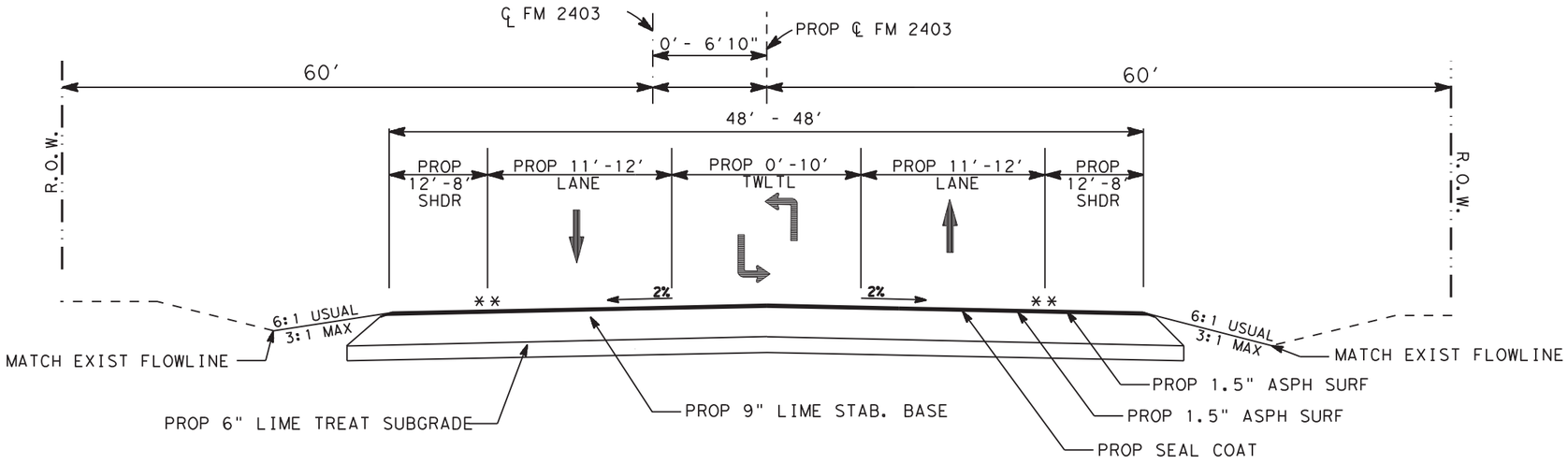
STA 159+78 TO STA 163+00
(NORTH BRIDGE)
STA 165+20 TO STA 168+43



PROP EDGES DETAIL
N.T.S.

** MILLED RUMBLE STRIPS

NOTE:
TYPICAL SECTION ARE REVERSE SYMMETRICAL
STATIONS 156+97-171+39



PROP TYPICAL SECTION

STA 168+43 TO STA 171+39.83

SHEET 2 OF 2

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

FM 2403
TYPICAL SECTION

Texas Department of Transportation®

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		4

4/20/2023
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General Notes:

General:

Area Engineer contact information for this project follows:

Maria P. Aponte, P.E., Area Engineer, Maria.Aponte@txdot.gov
Raj P. Hada, P.E., Assistant Area Engineer, Rajendra.Hada@txdot.gov

Submit any questions about this project via the Letting Pre-Bid Q&A web page, located at:

https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

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

Large files with relevant project documentation, such as Geotech reports, As-Built plans, and cross-sections will continue to be provided on the following FTP site:

Index of /pub/txdot-info/Pre-Letting Responses/Houston District (state.tx.us) or
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/Houston%20District/

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.
The following standard detail sheets are modified:

Modified Standards

BAS-A (HOU)
IGCS
IGSK

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.

Fabricate and install National Bridge Inventory (NBI) number on each existing bridge shown on these plans per the included NBIS standard. 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.

Any groundwater elevation information provided is representative of conditions existing on the day when and for the specific location where this information was collected. The actual groundwater elevation may fluctuate with time, climatic conditions, and construction activity.

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

The existing bridge located at South Bridge Drainage Ditch has been tested for Asbestos Containing Materials (ACM) and found to contain 1% or less ACM. No mitigation was required.

The existing bridge located at North Bridge Drainage Ditch has been tested for Asbestos Containing Materials (ACM) and found to contain 1% or less ACM. No mitigation was required.

General: Site Management

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 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.

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, or by e-mailing the Department’s Houston District Traffic Signal Operations Office at: HOU-LocateRequest@txdot.gov, to schedule marking of underground lines on the ground. Use caution if working in these areas to avoid damaging or interfering with existing facilities.

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.

Before beginning any underground work, notify the City of Houston’s Chief Inspector, Public Works and Engineering, to establish the locations of any existing electrical systems for lighting facilities within the limits of this project.

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
Brazoria Area Office	HOU-BRZAShpDrwgs@txdot.gov
Fort Bend Area Office	HOU-FBAShpDrwgs@txdot.gov
Galveston Area Office	HOU-GALVAShpDrwgs@txdot.gov
Montgomery Area Office	HOU-MONTAShpDrwgs@txdot.gov
North Harris Area Office	HOU-NHAShpDrwgs@txdot.gov
Southeast Area Office	HOU-SEHAShpDrwgs@txdot.gov
Traffic Systems Construction Office	HOU-TSCShpDrwgs@txdot.gov
West/Central Harris Area Office	HOU-WWCHAOShpDrwgs@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
T - Traffic Engineer	
Traffic Operations	HOU-TrfShpDrwgs@txdot.gov
TMS – Traffic Management System	
Computerized Traffic Management Systems (CTMS)	HOU-CTMSShpDrwgs@txdot.gov

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.

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

Item 6: Control of Materials

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

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

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

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

Item 7: Legal Relations and Responsibilities

Do not initiate activities in a Project Specific Location (PSL), associated with a U.S. Army Corps of Engineers (USACE) permit area, that 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.

The total area disturbed for this project is 2.57 acres. The disturbed area in this project, the project locations in the Contract, and Contractor project specific locations (PSLs) within 1 mile of the project limits for the Contract, will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer (to the appropriate MS4 operator when on an off-state system route) and to the local government that operates a separate storm drain system.

Before bidding on this project, obtain a copy of the complete U.S. Army Corps of Engineers Nationwide Permit 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.

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.

This project requires a permit from the United States Army Cops of Engineers with environmental resource agencies. There is a high probability of encountering environmentally sensitive areas on Contractor designated project specific locations (PSLs) for this project (haul roads, equipment staging areas, borrow pits, disposal sites, field offices, storage areas, parking areas, etc.). This Item provides listings of regulatory agencies the Contractor may need to contact for this project.

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

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 road-user cost liquidated damages are $8,067 per day. These costs will only be applied until the end of Phase I and Northbound traffic has been re-opened along the length of FM 2403.

The Contractor will receive a credit in the amount of $ 8,067 per day for substantially completing the project in less than the number of days stipulated on the proposal cover. The maximum number of days for computing the incentive credit is 34 days. The maximum amount of incentive is $403,350.

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.

Working days will be computed and charged based on a 6-day workweek in accordance with Section 8.3.1.2.

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 60 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 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.

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.

For unpaved areas, provide a finished grade with the top 4 in. capable of sustaining vegetation. Use fertile soil that is easily cultivated, free from objectionable material and highly resistant to erosion.

Item 161: Compost
Item 162: Sodding for Erosion Control
Item 164: Seeding 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 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.

If using Type A aggregate in accordance with the Item, "Flexible Base," use only crushed stone, Grade 1.

Item 276: Cement Treatment (Plant-Mixed)

Before placing the new base, wet and coat the vertical construction joints between the new base and the previously placed base with dry cement.

If the total thickness of the cement treatment is greater than 8 in., compact it in multiple lifts in accordance with Section 276.4.3, "Compaction." Place the courses in the same working day unless otherwise approved.

Use Class N Cement Treatment containing 4.5 percent cement based on the dry weight of the aggregate. There is no minimum compressive strength requirement for this Item.

The requirement for core drilling to determine the thickness of cement treatment is waived if using less than 500 sq. yd. at one location.

For widening the existing pavement, the Engineer may waive the requirements for preparing the subgrade by scarifying and compacting if the as-cut subgrade can be maintained to the density of the natural ground and to a uniform consistency when placing the base course. Keep the subgrade wet.

Compact in accordance with the standard specifications and complete the finishing operations within a period of 5 hours after adding the cement to the base material.

Cure the final course of cement treatment using an asphalt distributor that distributes the approved curing material and water mixture material at a rate of 0.25 gallons per square-yard evenly and smoothly or as recommended by the manufacturer at the recommended dilution rate, under a pressure necessary for proper distribution. Provide a curing material meeting the requirements of the Item, "Asphalts, Oils, and Emulsions" for curing the cement treatment. Use the following materials for curing the courses of cement treatment:

Curing Material	Application
Water	All courses, except final course
PCE	Final course

Continue curing until placing another course or opening the finished section to traffic.

Spread the material so that the layers of base are uniform in depth and in loose density before compacting.

Type E material consists of Type A material, crushed concrete (except under flexible pavement), or Reclaimed Asphalt Pavement (RAP) meeting the requirements of the Item, "Flexible Base." If approved, the 50 percent maximum RAP limitation may be waived.

Unless otherwise directed, place the next pavement layer within 7 working days of placing the base.

If using crushed stone for the Type E material under this Item, ensure it meets the requirements for the Item, "Flexible Base," Type A, Grade 1-2. Texas Test Method TEX-117-E is not required for this Item.

If using Recycled Type E cement treatment under proposed flexible pavement, produce it using the existing base salvaged from within this project or from other approved Department projects and salvaged asphalt concrete pavement. Do not use crushed concrete under flexible pavement.

If using Recycled Type E cement treatment under proposed concrete pavement, produce it using the existing base salvaged from within this project or from other approved Department projects, salvaged asphalt concrete pavement, or crushed concrete. If using crushed concrete as an aggregate, meet the requirements of Grade 3.

If using salvaged existing base and asphalt concrete pavement as described above, size it so that all the material, except the existing individual aggregate, passes the 2-in. sieve and is of a gradation that allows satisfactory compaction. Provide salvaged material that does not contain deleterious material such as clay or organic material. Provide material passing the No. 40 sieve, defined as soil binder, with a maximum Plasticity Index of 10 and a maximum Liquid Limit of 35 when tested in accordance with test method TEX-106-E.

Meet the following additional requirements if the base and ACP are salvaged from other Department projects:

1. Obtain written approval before using the material.
2. Salvage and stockpile by approved methods.
3. Stockpile the material for exclusive use by the Department.

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.

Item 316: Seal Coat

The asphalt application rate shown on the "Basis of Estimate" is an average rate for calculating asphalt quantities. Vary the rate based on the pavement conditions and other factors such as the type and grade of aggregate used, weather, and traffic.

The Department will furnish the material under this Item at locations shown on the plans.

Allowable Asphalt Cements based on Average Daily Traffic (ADT) are shown below:

For ADT greater than 5000	ADT 1000 to 5000	ADT less than 1000
AC-20 XP	AC-15P	AC-10-2TR
AC-20-5TR	AC-20-5TR	AC-10 w/2% SBR
	AC-20-XP	AC-15P
	AC-10-2TR	

Items 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.

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 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.

Items 496: Removing Structures

Assume ownership and remove from the project site, items salvaged from the existing bridge decks and steel beams.

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."

The existing paint on the barrier rail stanchions may contain lead. Unbolt without cutting as per SP006-012 and properly dispose of the removed old steel in accordance with Article 6.10, "Hazardous Materials."

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. The latest versions of Work Zone Standard Sheets WZ (BTS-1) and WZ (BTS-2) are the traffic control plan for the signal installations.

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.

Replace the overhead signs, informational signs, and exit signs to be removed, with temporary signs providing the correct information to the traveling public. Size the replacement signs and include them in the traffic control plan.

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.

A minimum of 7 days in advance of any total closure, notify the Houston District Public Information Office of which roadways, ramps, intersections, or lanes will be closed, the dates they will remain closed, and when they will be opened again to traffic.

A minimum of 7 days in advance of any total closure, place a portable changeable message (PCM) sign at the location of each total closure which informs the traveling public of the details of the closure. Alternately, if the Traffic Control Plan provides a positive barrier at the location, a non-trailer mounted static message board sign behind the positive barrier may be used in place of a PCM.

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

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 512: Portable Traffic Barrier

Use only the J-J Hook type connection between barriers.

After completing the project, Standard Height Safety Shape Portable Traffic Barriers used for traffic handling and the associated connecting hardware will become the property of the Contractor.

Item 530: Intersections, Driveways, and Turnouts

An air-entraining admixture is not required.

For concrete curbs, use Grade 7 aggregate conforming to Section 421.2.6 of the Item, "Hydraulic Cement Concrete."

For driveways and turnouts, coarse aggregate Grade No. 3 through No. 8 conforming to the gradation requirements specified in the Item, "Hydraulic Cement Concrete" will be permitted.

For reinforcing steel in sidewalks and pedestrian ramps, use No. 4 bars at a maximum 18 in. spacing center-to-center in both directions.

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

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 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 662: Work Zone Pavement Markings

At the end of each workday, mark roadways that remain open to traffic during construction operations with standard pavement markings, in accordance with the latest "Texas Manual on Uniform Traffic Control Devices."

Using raised markers for removable work zone pavement markings on final concrete surfaces is optional.

Do not use raised pavement markers as optional work zone pavement markings on final asphalt surfaces.

For transition lane lines and detour lane lines, use raised pavement markers as shown for solid lines on the latest Barricade and Construction standard sheet for "Work Zone Pavement Marking Details."

Item 662: Work Zone Pavement Markings
Item 666: Reflectorized Pavement Markings

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 677: Eliminating Existing Pavement Markings and Markers

Remove existing pavement markings on concrete or asphalt surfaces by flail milling or as directed.

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
310	Prime Coat	0.25 Gal. / Sq. Yd.	GAL
316	Seal Coat • Asphalt • Aggregate (Gr 4) A-R Binder • Asphalt • Aggregate (Gr 4)	 0.32 Gal. / Sq. Yd. 1/130 Cu. Yd. / Sq. Yd. 0.42 Gal. / Sq. Yd. 1/130 Cu. Yd. / Sq. Yd.	 GAL CY GAL CY
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 GAL

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

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2950-01-008 **DISTRICT** Houston **COUNTY** Brazoria
HIGHWAY FM 2403

			CONTROL SECTION JOB		**2950-01-008**		**2950-01-009**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00122489**		**A00122490**			
			COUNTY		**Brazoria**		**Brazoria**			
			HIGHWAY		**FM 2403**		**FM 2403**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW	STA	13.100		14.430		27.530	
	104-6009	REMOVING CONC (RIPRAP)	SY	157.000		309.000		466.000	
	104-6033	REMOVING CONC (DRAIN)	SY	33.000		35.000		68.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)	LF	650.000		537.000		1,187.000	
	105-6013	REMOVING STAB BASE & ASPH PAV (9")	SY	4,943.000		5,241.000		10,184.000	
	110-6001	EXCAVATION (ROADWAY)	CY	703.140		1,254.000		1,957.140	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	2,580.380		1,758.200		4,338.580	
	162-6002	BLOCK SODDING	SY	4,936.220		5,309.950		10,246.170	
	166-6001	FERTILIZER	AC	1.020		1.100		2.120	
	168-6001	VEGETATIVE WATERING	MG	123.000		132.000		255.000	
	260-6006	LIME TRT (EXST MATL) (6")	SY	6,584.000		6,219.000		12,803.000	
	260-6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	TON	103.000		102.000		205.000	
	276-6229	CEM TRT(PLNT MX) (CL N)(TYA)(GR1-2)(9")	SY	1,646.000		1,556.000		3,202.000	
	305-6016	SALV, HAUL & STKPL RCL APH PV (3")	SY	4,894.000		5,189.000		10,083.000	
	316-6001	ASPH (MULTI OPTION)	GAL	1,936.000		1,806.000		3,742.000	
	316-6224	AGGR(TY-PB GR-4 SAC-B)	CY	48.000				48.000	
	316-6434	AGGR (TY-PB GR-4 OR TY-PL GR-4 (SAC-B)	CY			46.000		46.000	
	400-6005	CEM STABIL BKFL	CY	300.000		300.000		600.000	
	416-6001	DRILL SHAFT (18 IN)	LF	128.000		138.000		266.000	
	416-6003	DRILL SHAFT (30 IN)	LF	560.000		927.000		1,487.000	
	416-6005	DRILL SHAFT (42 IN)	LF	455.000		756.000		1,211.000	
	420-6013	CL C CONC (ABUT)	CY	58.600		109.100		167.700	
	420-6029	CL C CONC (CAP)	CY	47.200		90.000		137.200	
	420-6037	CL C CONC (COLUMN)	CY	23.500		35.800		59.300	
	422-6001	REINF CONC SLAB	SF	8,599.500		11,128.500		19,728.000	
	425-6035	PRESTR CONC GIRDER (TX28)	LF	1,179.500				1,179.500	
	425-6036	PRESTR CONC GIRDER (TX34)	LF			1,630.000		1,630.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	7.000		8.000		15.000	
	432-6026	RIPRAP (STONE COMMON)(DRY)(18 IN)	CY	674.900		674.900		1,349.800	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	20.320		15.000		35.320	
	450-6006	RAIL (TY T223)	LF	388.000		520.000		908.000	
	454-6018	SEALED EXPANSION JOINT (4 IN) (SEJ - M)	LF	108.000		204.000		312.000	
	496-6010	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	EA	1.000		1.000		2.000	
	500-6001	MOBILIZATION	LS	0.451		0.549		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	5.000		7.000		12.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	1,200.000		1,200.000		2,400.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	1,200.000		1,200.000		2,400.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2950-01-008 **DISTRICT** Houston **COUNTY** Brazoria
HIGHWAY FM 2403

			CONTROL SECTION JOB	**2950-01-008**		**2950-01-009**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00122489**		**A00122490**			
			COUNTY	**Brazoria**		**Brazoria**			
			HIGHWAY	**FM 2403**		**FM 2403**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL		
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	200.000		355.000		555.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	200.000		225.000		425.000	
	512-6001	PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)	LF	660.000		960.000		1,620.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	480.000		390.000		870.000	
	512-6049	PORT CTB (REMOVE)(SGL SLP)(TY 1)	LF	660.000		960.000		1,620.000	
	529-6002	CONC CURB (TY II)	LF	38.000		38.000		76.000	
	530-6021	DRIVEWAYS (ACP) (TYPE 2)	SY	376.000		154.000		530.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF	2,884.000		2,620.000		5,504.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	1,442.000		1,310.000		2,752.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	100.000		75.000		175.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		3.000		7.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	450.000		337.000		787.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	4.000		4.000		8.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		3.000		7.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4.000		4.000		8.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	1.000		2.000		3.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	6.000		4.000		10.000	
	545-6010	CRASH CUSH ATTEN (INSTL)(L)(W)(TL3)	EA	6.000		5.000		11.000	
	560-6025	RELOCATE EXISTING MAILBOX	EA	3.000		3.000		6.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	7.000		8.000		15.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	3.000		5.000		8.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	6.000		6.000		12.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	12.000		9.000		21.000	
	662-6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	LF	2,500.000		1,714.000		4,214.000	
	662-6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	LF	2,500.000		1,714.000		4,214.000	
	662-6067	WK ZN PAV MRK REMOV (W)6"(SLD)	LF	4,460.000		5,290.000		9,750.000	
	662-6098	WK ZN PAV MRK REMOV (Y)6"(SLD)	LF	4,460.000		5,290.000		9,750.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	2,620.000		2,886.000		5,506.000	
	666-6343	REF PROF PAV MRK TY I(W)6"(SLD)(100MIL)	LF	2,620.000		2,886.000		5,506.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	34.000		38.000		72.000	
	677-6002	ELIM EXT PAV MRK & MRKS (6")	LF	5,000.000		5,000.000		10,000.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF	5,240.000		5,772.000		11,012.000	
	3076-6066	TACK COAT	GAL	365.000		341.000		706.000	
	3076-6077	D-GR HMA TY-D SAC-B PG70-22 (EXEMPT)	TON	501.000		468.000		969.000	
	3076-6081	D-GR HMA TY-D PG70-22 (EXEMPT)	TON	577.000		567.000		1,144.000	
	5092-6001	FILLING MILLED ASPHALT RUMBLE STRIPS	LF	1,160.000		1,292.000		2,452.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	7.000		7.000		14.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2950-01-008 **DISTRICT** Houston **COUNTY** Brazoria
HIGHWAY FM 2403

			CONTROL SECTION JOB		**2950-01-008**		**2950-01-009**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00122489**		**A00122490**			
			COUNTY		**Brazoria**		**Brazoria**			
			HIGHWAY		**FM 2403**		**FM 2403**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	6185-6005	TMA (MOBILE OPERATION)		DAY	6.000		6.000		12.000	
	08	CONTRACTOR FORCE ACCOUNT LAW ENFORCEMENT (NON-PARTICIPATING)		LS	1.000		1.000		2.000	
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)		LS	1.000		1.000		2.000	
		CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)		LS	1.000		1.000		2.000	

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	512 6001 PORT CTB (FUR & INST) (SGL SLOPE) (TY 1) LF	512 6025 PORT CTB (MOVE) (SGL SLP) (TY 1) LF	512 6049 PORT CTB (REMOVE) (SGL SLP) (TY 1) LF	545 6003 CRASH CUSH ATTEN (MOVE & RESET) EA	545 6005 CRASH CUSH ATTEN (REMOVE) EA	545 6010 CRASH CUSH ATTEN (INSTL) (L) (W) (TL3) EA	662 6008 WK ZN PAV MRK NON-REMOV (W)6" (SLD) LF	662 6037 WK ZN PAV MRK NON-REMOV (Y)6" (SLD) LF	662 6067 WK ZN PAV MRK REMOV (W)6" (SLD) LF	662 6098 WK ZN PAV MRK REMOV (Y)6" (SLD) LF	677 6002 ELIM EXT PAV MRK & MRKS (6") LF	6001 6001 PORTABLE CHANGEABLE MESSAGE SIGN DAY	6185 6005 TMA (MOBILE OPERATION) DAY
SOUTH BRIDGE P1	480					1	2500	2500			5000	7	3
SOUTH BRIDGE P2	180	480	660	1	6	5			4460	4460			3
NORTH BRIDGE PH1	390					3	1714	1714			5000	7	3
NORTH BRIDGE PH2	570	390	960	2	4	2			5290	5290			3
PROJECT TOTALS	1620	870	1620	3	10	11	4214	4214	9758	9757	10000	14	12

SUMMARY OF REMOVAL ITEMS

LOCATION	100 6002 PREPARING ROW STA	104 6009 REMOVING CONC (RIPRAP) SY	496 6010 REMOV STR (BRIDGE 100 - 499 FT LENGTH) EA	105 6013 REMOVING STAB BASE & ASPH PAV (9") SY	305 6016 SALV, HAUL & STKPL RCL APH PV (3") SY
SOUTH BRIDGE	13.1	157	1	4943	4894
NORTH BRIDGE	14.43	309	1	5241	5189
PROJECT TOTALS	27.53	466	2	10200	10099

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	666 6343 REF PROF PAV MRK TY I (W)6" (SLD) (100MIL) LF	666 6318 RE PM W/RET REQ TY I (Y)6" (BRK) (100MIL) LF	672 6009 REFL PAV MRKR TY II-A-A EA	678 6002 PAV SURF PREP FOR MRK (6") LF
SOUTH BRIDGE	2620	2620	34	5240
NORTH BRIDGE	2886	2886	38	5772
PROJECT TOTALS	5506	5506	72	11012

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	162 6002 BLOCK SODDING SY	166 6001 FERTILIZER AC	168 6001 VEGETATIVE WATERING MG	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
SOUTH BRIDGE	4936.22	1.02	123	1200	1200	200	200
NORTH BRIDGE	5309.95	1.1	132	1200	1200	355	225
PROJECT TOTALS	10246.17	2.12	255	2400	2400	555	425

SUMMARY OF ROADWAY QUANTITIES

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		20

SHEET 1 OF 1

SUMMARY OF ROADWAY ITEMS

LOCATION	110 6001 EXCAVATION (ROADWAY) CY	132 6006 EMBANKMENT (FINAL) (DENS CONT) (TY C) CY	260 6006 LIME TRT (EXST MATL) (6") SY	260 6012 LIME (HYD, COM OR QK) (SLRY) OR QK (DRY) TON	276 6229 CM TRT (PLNT MX) (CL N) (TYA) (GR1-2) (9") CY	316 6001 ASPH (MULTI OPTION) GAL	316 6224 AGGR (TY-PB GR-4 SAC-B) CY	400 6005 CEM STABIL BKFL CY	530 6021 DRIVEWAYS (ACP) (TYPE 2) SY	533 6001 RUMBLE STRIPS (SHOULDER) LF	533 6002 RUMBLE STRIPS (CENTERLINE) LF	560 6025 RELOCATE EXISTING MAILBOX EA	3076 6042 D-GR HMA TY-D SAC-B PG70-22 TON	3076 6043 D-GR HMA TY-D PG70-22 (LEVEL-UP) TON	3076 6066 TACK COAT GAL
SOUTH BRIDGE	703	2580	6,584	103	1646	1,936	48	300	376	2884	1442	3	501	577	365.0
NORTH BRIDGE	1254	1758	6,219	102	1556	1,806	46	300	154	2620	1310	3	468	567	341
PROJECT TOTALS	1988	4292	12,803	205	3202	3,742	94	600	530	5,504	2,752	6	969	1,144	706

SUMMARY OF MBGF ITEMS

LOCATION	104 6054 REMOVING CONCRETE (MOW STRIP) LF	432 6045 RIPRAP (MOW STRIP) (4 IN) CY	540 6001 MTL W-BEAM GD FEN (TIM POST) LF	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM) EA	542 6001 REMOVE METAL BEAM GUARD FENCE LF	542 6004 RM MTL BM GD FENCE TRANS (THRIE-BEAM) EA	544 6001 GUARDRAIL END TREATMENT (INSTALL) EA	544 6003 GUARDRAIL END TREATMENT (REMOVE) EA	658 6062 INSTL DEL ASSM (D-SW) SZ 1 (BRF) GF2 (BI) EA	658 6014 INSTL DEL ASSM (D-SW) SZ (BRF) CTB (BI) EA	432 6002 RIPRAP (CONC) (5 IN) CY	529 6002 CONC CURB (TY II) LF	104 6033 REMOVING CONC (DRAIN) SY
South										6	7	38	33
SE corner	200	5	25	1	150	1	1	1	3				
NE corner	125	5	25	1	75	1	1	1	3				
NW corner	200	5	25	1	150	1	1	1	3				
SW corner	125	5	25	1	75	1	1	1	3				
North										6	8	38	35
SE corner	162	5	25	1	112	1	1	1	3				
NE corner	50					1		1					
NW corner	200	5	25	1	150	1	1	1	3				
SW corner	125	5	25	1	75	1	1	1	3				
PROJECT TOTALS	1187	36	175	7	787	8	7	8	21	12	15	76	68

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SHEET 1 OF 1

SUMMARY OF ROADWAY QUANTITIES

Texas Department of Transportation®

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		21

SUMMARY OF EARTHWORK ITEMS	*	*
	*	*
LOCATION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY C)
	CY	CY
156+97.4339	0	0
157+00.0000	4	0
157+25.0000	44	2
157+50.0000	44	3
157+75.0000	43	4
158+00.0000	44	5
158+25.0000	43	5
158+50.0000	43	5
158+75.0000	41	6
159+00.0000	39	7
159+25.0000	39	10
159+50.0000	37	15
159+75.0000	33	20
160+00.0000	29	22
160+25.0000	24	22
160+50.0000	19	22
160+75.0000	12	2
161+00.0000	4	4
161+25.0000	0	21
161+50.0000	0	46
161+75.0000	0	77
162+00.0000	0	105
162+19.2077	0	0
162+25.0000	0	116
162+50.0000	0	125
162+75.0000	0	55
163+00.0000	0	0
163+25.0000	0	0
163+50.0000	0	0
163+75.0000	0	0
164+00.0000	0	0
164+25.0000	0	0
164+50.0000	0	0
164+75.0000	0	0
165+00.0000	0	86
165+25.0000	0	125
165+50.0000	0	123
165+75.0000	0	102
166+00.0000	0	84
166+02	202	0
166+25.0000	0	76
166+50.0000	0	86
166+75.0000	0	75
167+00.0000	0	66
167+25.0000	0	49
167+50.0000	1	22
167+75.0000	6	17
168+00.0000	13	22
168+25.0000	20	24
168+50.0000	26	23
168+75.0000	33	19
169+00.0000	37	16
169+25.0000	39	16
169+50.0000	39	13
169+75.0000	39	9
170+00.0000	39	5
170+25.0000	39	1
170+50.0000	39	0
170+75.0000	38	0
171+00.0000	39	0
171+25.0000	39	0
171+39.8295	22	0
PROJECT TOTALS	1254	1758

SUMMARY OF EARTHWORK ITEMS	*	*
	*	*
LOCATION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY C)
	CY	CY
32+36.6469 R1	0	0
32+50.0000 R1	18	0
32+75.0000 R1	35	0
33+00.0000 R1	37	4
33+25.0000 R1	36	13
33+50.0000 R1	37	17
33+75.0000 R1	37	10
34+00.0000 R1	37	3
34+25.0000 R1	34	11
34+50.0000 R1	30	23
34+75.0000 R1	24	33
35+00.0000 R1	19	43
35+25.0000 R1	13	42
35+50.0000 R1	5	44
35+75.0000 R1	1	46
36+00.0000 R1	0	46
36+25.0000 R1	0	58
36+50.0000 R1	0	59
36+75.0000 R1	0	69
37+00.0000 R1	0	74
37+25.0000 R1	0	96
37+50.0000 R1	0	115
37+75.0000 R1	0	108
38+00.0000 R1	0	100
38+25.0000 R1	0	26
38+50.0000 R1	0	0
38+75.0000 R1	0	0
39+00.0000 R1	0	0
39+25.0000 R1	0	0
39+50.0000 R1	0	0
39+75.0000 R1	0	0
40+00.0000 R1	0	94
40+25.0000 R1	0	171
40+50.0000 R1	0	152
40+75.0000 R1	0	152
41+00.0000 R1	0	150
41+25.0000 R1	0	136
41+50.0000 R1	0	119
41+75.0000 R1	0	109
42+00.0000 R1	0	98
42+25.0000 R1	0	88
42+50.0000 R1	1	81
42+75.0000 R1	4	20
43+00.0000 R1	13	36
43+25.0000 R1	22	40
43+50.0000 R1	28	46
43+75.0000 R1	32	41
44+00.0000 R1	35	1
44+25.0000 R1	36	1
44+50.0000 R1	37	0
44+75.0000 R1	35	0
45+00.0000 R1	34	1
45+25.0000 R1	35	0
45+46.2787 R1	29	0
PROJECT TOTAL	703	2580

* FOR CONTRACTOR'S INFORMATION ONLY

SUMMARY OF ROADWAY QUANTITIES

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		22

SHEET 1 OF 1

5/18/2023
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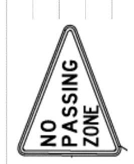
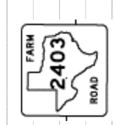
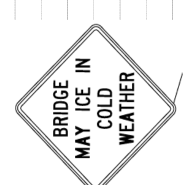
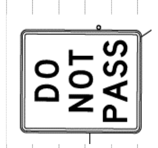
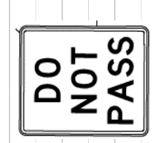
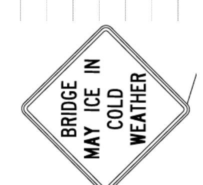
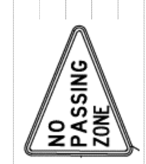
SUMMARY OF SMALL SIGNS

Item	Code	Description	Unit	1	2	3	4	5	6	7	SHEET TOTAL
636	6007	REPLACE EXT ALUM SIGNS (TY A)	SF								
636	6001	ALUM SIGNS (TY A)	SF								
644-INS SM RD SN SUP & AM	6076	REMOVE SM RD SN SUP & AM	EA		X	X			X		3
644-INS SM RD SN SUP & AM	6070	RELOCATE SM RD SN SUP&AM TY S80	EA								
644-INS SM RD SN SUP & AM	6068	RELOCATE SM RD SN SUP&AM TY 10BWG	EA								
644-INS SM RD SN SUP & AM	6051	TY S80 (2) SA (P-EXAL)	EA								
644-INS SM RD SN SUP & AM	6044	TY S80 (1) SB (U)	EA								
644-INS SM RD SN SUP & AM	6036	TY S80 (1) SA (U-BM)	EA								
644-INS SM RD SN SUP & AM	6033	TY S80 (1) SA (U)	EA								
644-INS SM RD SN SUP & AM	6031	TY S80 (1) SA (T-2EXT)	EA								
644-INS SM RD SN SUP & AM	6030	TY S80 (1) SA (T)	EA								
644-INS SM RD SN SUP & AM	6028	TY S80 (1) SA (P-BM)	EA								
644-INS SM RD SN SUP & AM	6027	TY S80 (1) SA (P)	EA								
644-INS SM RD SN SUP & AM	6012	TY 10BWG (1) SB (T)	EA								
644-INS SM RD SN SUP & AM	6009	TY 10BWG (1) SB (P)	EA								
644-INS SM RD SN SUP & AM	6007	TY 10BWG (1) SA (U)	EA								
644-INS SM RD SN SUP & AM	6005	TY 10BWG (1) SA (T-2EXT)	EA								
644-INS SM RD SN SUP & AM	6004	TY 10BWG (1) SA (T)	EA								
644-INS SM RD SN SUP & AM	6002	TY 10BWG (1) SA (P-BM)	EA								
644-INS SM RD SN SUP & AM	6001	TY 10BWG (1) SA (P)	EA	X	X	X	X	X	X	X	7
		ALUMINUM TYPE A		X	X	X	X	X	X	X	
		PLYWOOD TYPE A									
		SIGN DIMENSIONS		48X48X36	24X24	36X36	24X30	24X30	36X36	48X48X36	
		SIGN TEXT (PROPOSED)									
		SIGN TYPE		W14-3	M1-6F	W8-13aT	R4-1	R4-1	W8-13aT	W14-3	
		SIGN NO.		1	2	3	4	5	6	7	
		PLAN SHEET NO.		1							

Sign support shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.

ALUMINUM SIGN BLANKS (TYPE A)

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

SUMMARY OF SMALL SIGNS

SHEET 1 OF 2

STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT NO.			SHEET
12	6				23
COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.
BRAZORIA		2950	01	008 ,EC	FM 2403

SUMMARY OF SMALL SIGNS

Bid Item	No.	Description	Unit	Sign 1	Sign 2	Sign 3	Sign 3 (plaque)	Sign 4	Sign 5	Sign 6	Sign 6 (plaque)	Sign 7	Sign 8	Sign X1	SHEET TOTAL	PROJECT TOTAL
636	6007	REPLACE EXT ALUM SIGNS (TY A)	SF													
636	6001	ALUM SIGNS (TY A)	SF													
644-INS SM RD SN SUP & AM	6076	REMOVE SM RD SN SUP & AM	EA		X	X				X		X		X	5	8
644-INS SM RD SN SUP & AM	6070	RELOCATE SM RD SN SUP&AM TY S80	EA													
644-INS SM RD SN SUP & AM	6068	RELOCATE SM RD SN SUP&AM TY 10BWG	EA													
644-INS SM RD SN SUP & AM	6051	TY S80 (2) SA (P-EXAL)	EA													
644-INS SM RD SN SUP & AM	6044	TY S80 (1) SB (U)	EA													
644-INS SM RD SN SUP & AM	6036	TY S80 (1) SA (U-BM)	EA													
644-INS SM RD SN SUP & AM	6033	TY S80 (1) SA (U)	EA													
644-INS SM RD SN SUP & AM	6031	TY S80 (1) SA (T-2EXT)	EA													
644-INS SM RD SN SUP & AM	6030	TY S80 (1) SA (T)	EA													
644-INS SM RD SN SUP & AM	6028	TY S80 (1) SA (P-BM)	EA													
644-INS SM RD SN SUP & AM	6027	TY S80 (1) SA (P)	EA													
644-INS SM RD SN SUP & AM	6012	TY 10BWG (1) SB (T)	EA													
644-INS SM RD SN SUP & AM	6009	TY 10BWG (1) SB (P)	EA													
644-INS SM RD SN SUP & AM	6007	TY 10BWG (1) SA (U)	EA													
644-INS SM RD SN SUP & AM	6005	TY 10BWG (1) SA (T-2EXT)	EA													
644-INS SM RD SN SUP & AM	6004	TY 10BWG (1) SA (T)	EA													
644-INS SM RD SN SUP & AM	6002	TY 10BWG (1) SA (P-BM)	EA													
644-INS SM RD SN SUP & AM	6001	TY 10BWG (1) SA (P)	EA	X	X	X		X	X	X		X	X		8	15
		ALUMINUM TYPE A		X	X	X	X	X	X	X	X	X	X	X		
		PLYWOOD TYPE A														
		SIGN DIMENSIONS		48X48X36	36X36	36X36	24X30	24X30	24X30	36X36	24X30	36X36	48X48X36	36X36		
		SIGN TEXT (PROPOSED)		NO PASSING ZONE	BRIDGE MAY ICE IN COLD WEATHER	(bicycle symbol)	SHARE THE ROAD	DO NOT PASS	DO NOT PASS	(bicycle symbol)	SHARE THE ROAD	BRIDGE MAY ICE IN COLD WEATHER	NO PASSING ZONE	NARROW BRIDGE		
		SIGN TYPE		W14-3	W8-13aT	W11-1	W16-1P	R4-1	R4-1	W11-1	W16-1P	W8-13aT	W14-3	W5-2		
		SIGN NO.		1	2	3		4	5	6		7	8	X1		
		PLAN SHEET NO.		2												

Sign support shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.

ALUMINUM SIGN BLANKS (TYPE A)

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

SUMMARY OF SMALL SIGNS

 SHEET 2 OF 2

STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT NO.		SHEET
12	6			24
COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
BRAZORIA	2950	01	008 ,EC	FM 2403

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.

LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		FURNISH INSTALL	REMOVE	MOVE/ RESET	FROM LOC.#	N	W	N	W	N	W
	PHASE I		NE CORNER OF NORTH BRIDGE (PERMANENT)	165+10	TL3	BI	ACP/CTB	3"/9"	CONCRETE WINGWALL	24"			1				X					
1	PHASE I		NORTH BRIDGE	165+70	TL3	UNI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"		1				X					
2	PHASE I		NORTH BRIDGE	167+06	TL3	UNI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"		1				X					
3	PHASE I		SOUTH BRIDGE	42+64	TL3	UNI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"		1				X					
4	PHASE II		NORTH BRIDGE	158+34	TL3	BI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"			1	1	1	X					
5	PHASE II		NORTH BRIDGE	160+44	TL3	BI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"		1	1								
6	PHASE II		NORTH BRIDGE	162+21	TL3	BI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"		1	1								
7	PHASE II		NORTH BRIDGE	169+74	TL3	BI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"			1	1	2						
8	PHASE II		SOUTH BRIDGE	34+49	TL3	BI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"		1	1								
9	PHASE II		SOUTH BRIDGE	36+28	TL3	BI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"		1	1								
10	PHASE II		SOUTH BRIDGE	37+39	TL3	BI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"		1	1								
11	PHASE II		SOUTH BRIDGE	41+32	TL3	BI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"		1	1								
12	PHASE II		SOUTH BRIDGE	42+34	TL3	BI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"		1	1								
13	PHASE II		SOUTH BRIDGE	43+13	TL3	BI	ACP/CTB	3"/9"	PORTABLE CTB	24"	36"			1	1	3						

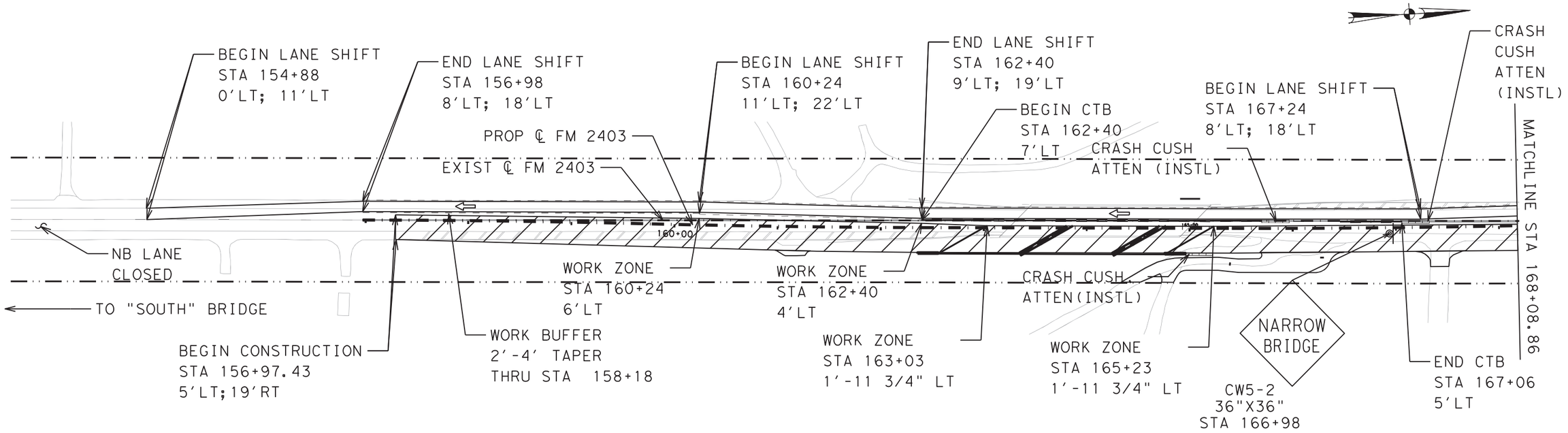
	IN	REM	MOV
NORTH	5	4	2
SOUTH	6	6	1
TOTALS	11	10	3

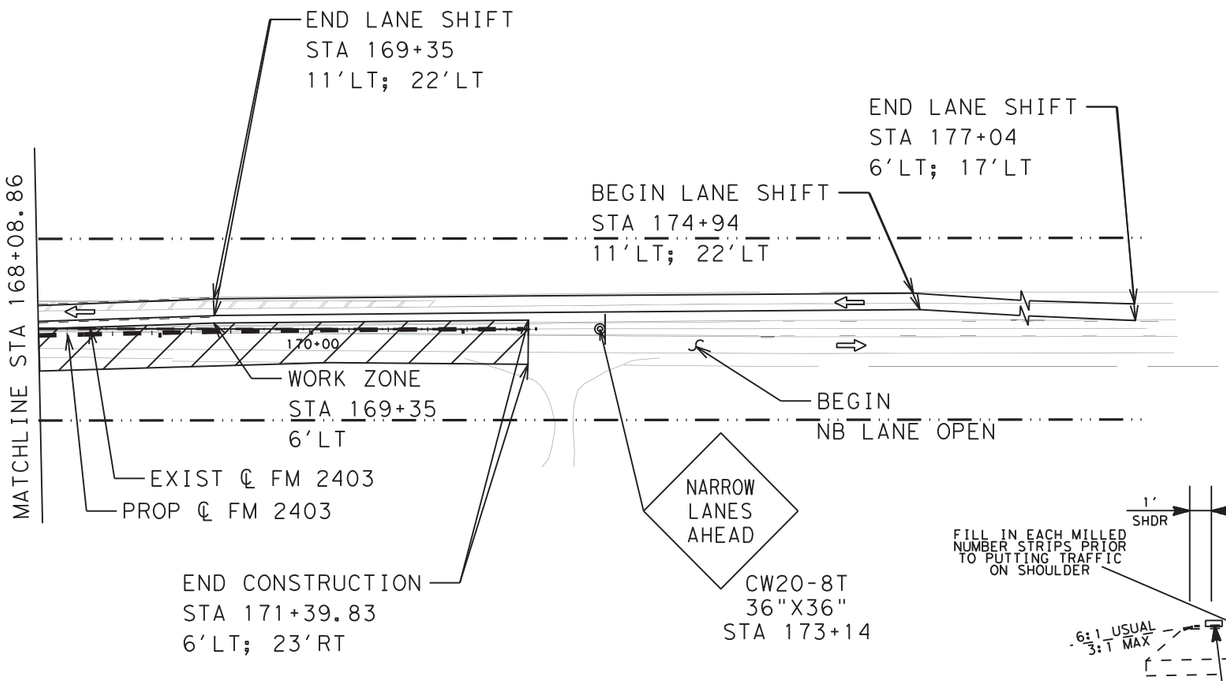
LEGEND:
L=LOW MAINTENANCE
R=REUSABLE
S=SACRIFICIAL
N=NARROW
W=WIDE

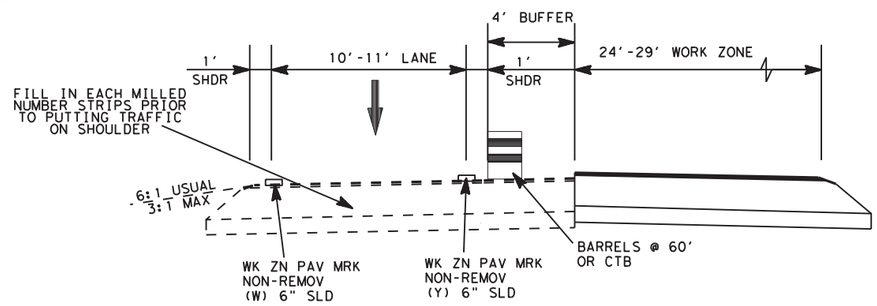
FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.
http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/rdwyise.htm

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:	CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01008, ETC	FM 2403
	DIST	COUNTY	
	HOU	BRAZORIA	
	FEDERAL AID PROJECT		SHEET NO.
			25







TYPICAL SECTION
PHASE I
N.T.S.

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- DIRECTION OF TRAFFIC (PROP)
- PORT CTB
- CRASH CUSH ATTEN

NOTES

1. USE DETOUR SHEET TO CLOSE NB LANE.
2. ALL STATIONS CALLOUTS ARE REFERRING TO PROPOSED ℄ STATIONS.
3. REFER TO TCP(2-3)-23 FOR SIGNS AND DETAILS NOT SHOWN.

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED
PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

FM 2403 "NORTH" TRAFFIC CONTROL PLAN PHASE 1

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		26

SCALE 1"=100'
SHEET 1 OF 1

4/20/2023
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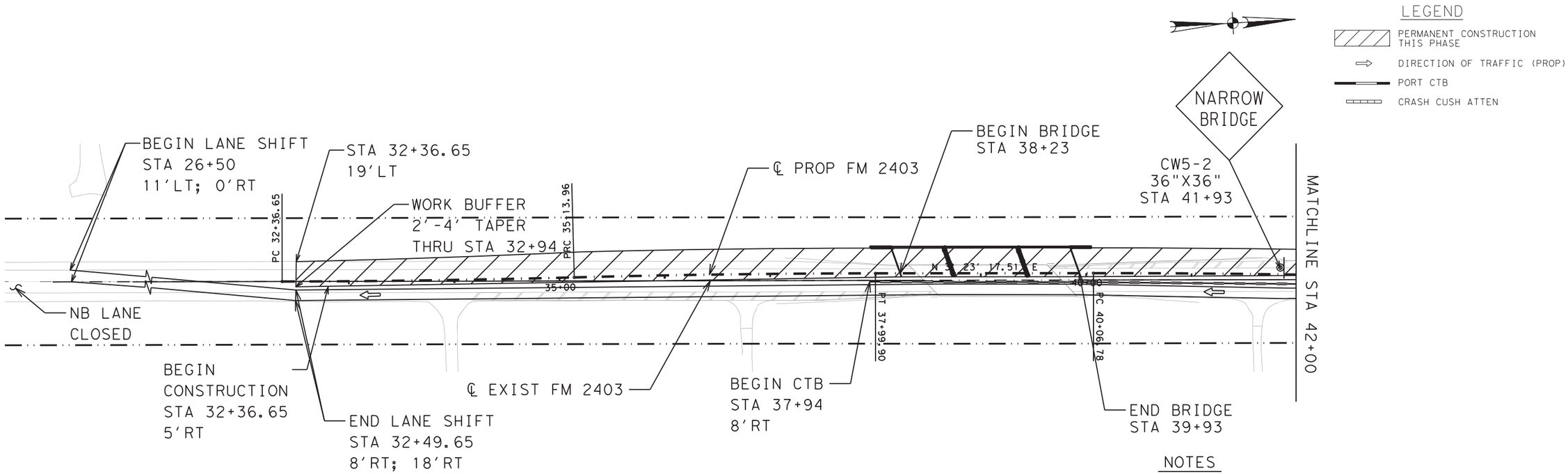

TYPICAL SECTION
PHASE I
N.T.S.

NOTES

1. USE DETOUR SHEET TO CLOSE NB LANE.
2. ALL STATIONS CALLOUTS ARE REFERRING TO PROPOSED ℄ STATIONS.
3. REFER TO TCP(2-3)-23 FOR SIGNS AND DETAILS NOT SHOWN.

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

FM 2403 "SOUTH" TRAFFIC CONTROL PLAN PHASE 1

Texas Department of Transportation
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CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		27

SCALE 1"=100'
SHEET 1 OF 1

4/20/2023
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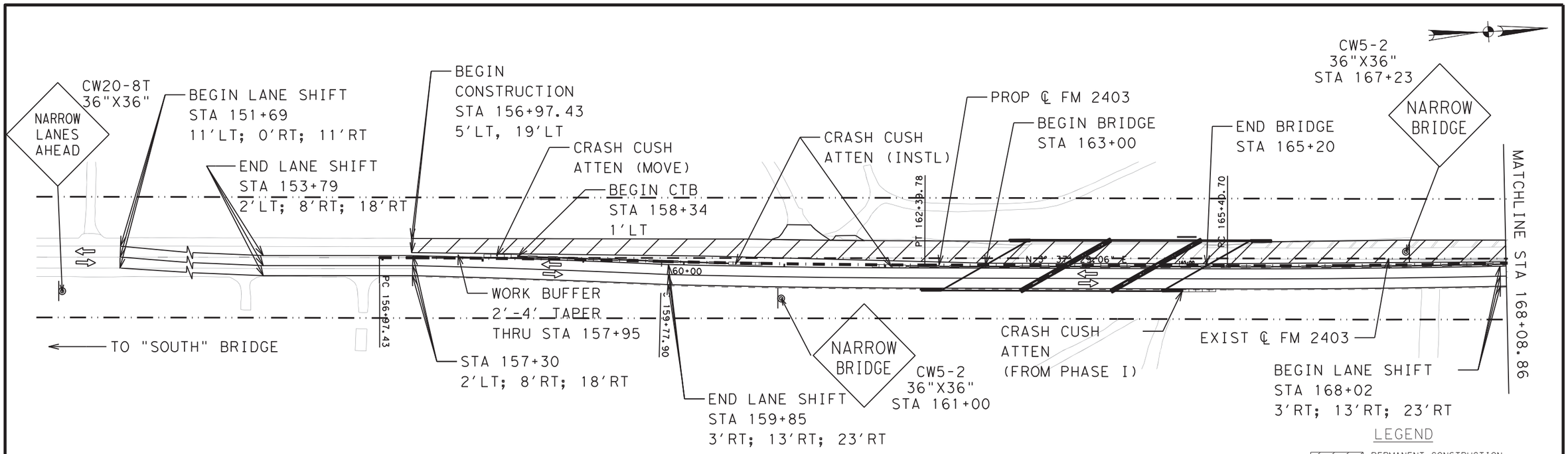
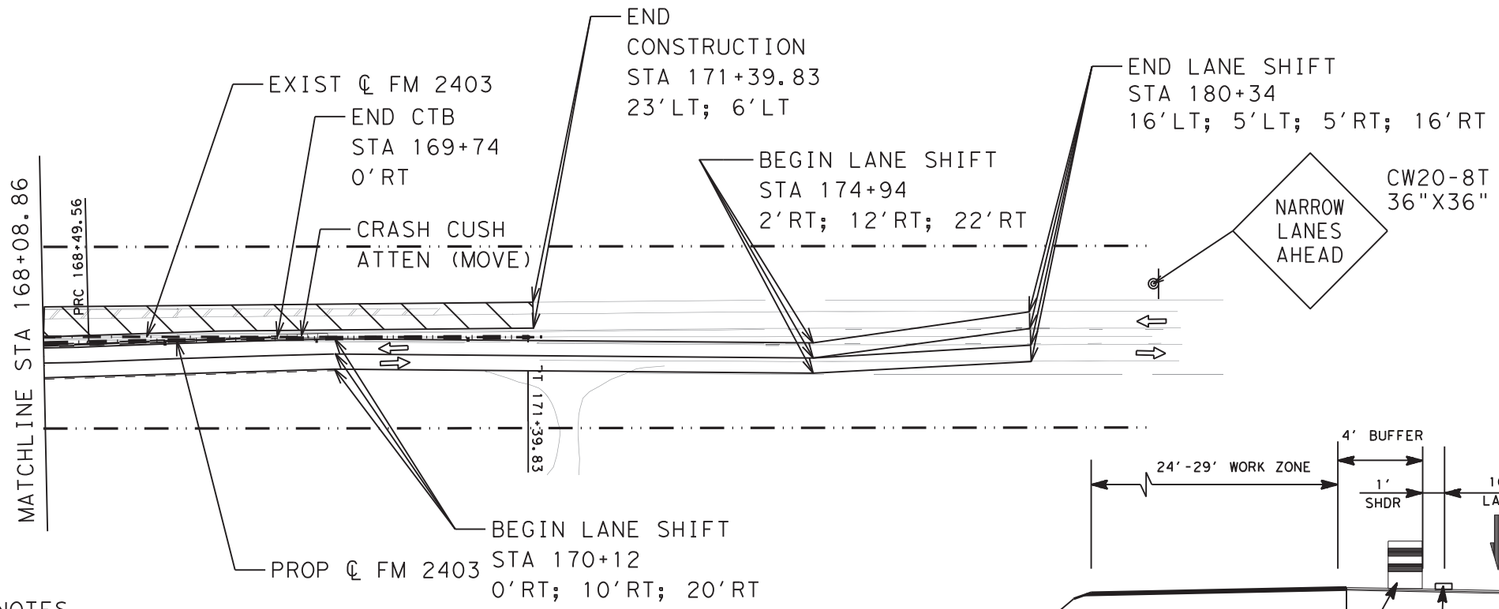
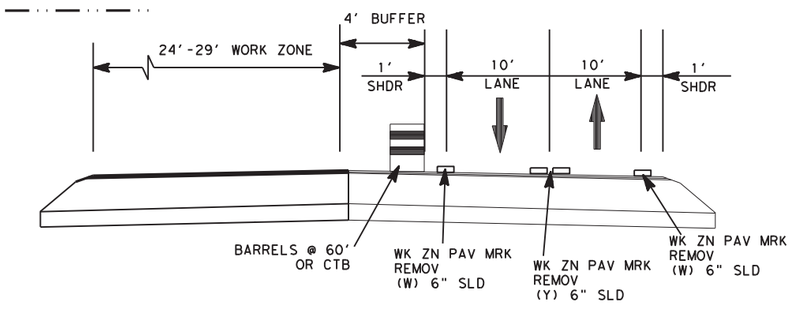




NOTES

1. USE DETOUR SHEET TO CLOSE NB LANE.
2. ALL STATIONS CALLOUTS ARE REFERRING TO PROPOSED ℄ STATIONS.
3. REFER TO TCP(2-3)-23 FOR SIGNS AND DETAILS NOT SHOWN.



TYPICAL SECTION
PHASE II

SCALE 1"=100'
SHEET 1 OF 1

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- DIRECTION OF TRAFFIC (PROP)
- PORT CTB
- CRASH CUSH ATTEN

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED
PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

FM 2403 "NORTH" TRAFFIC CONTROL PLAN PHASE 2

Texas Department of Transportation®

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		28

4/20/2023
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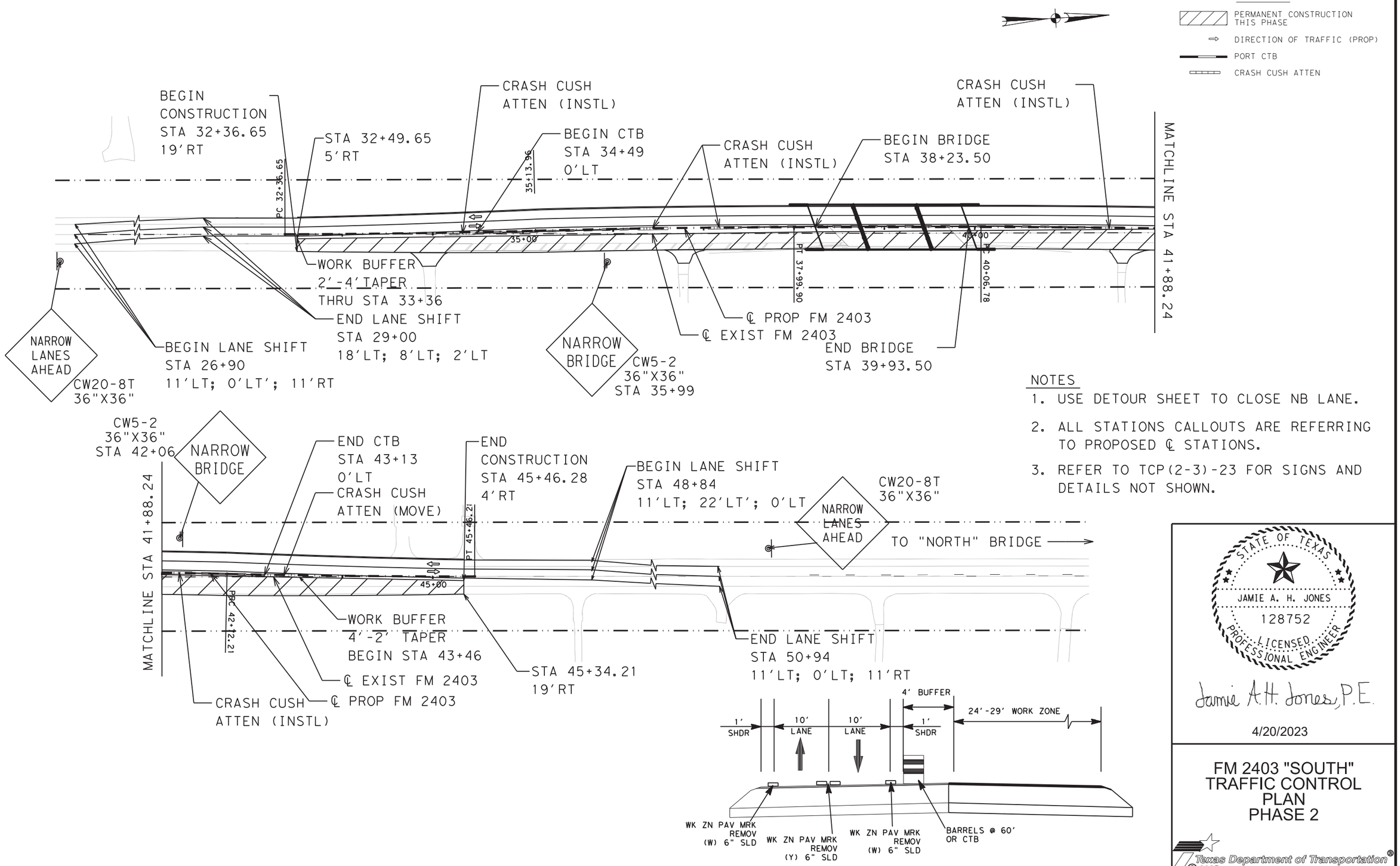

TYPICAL SECTION
PHASE II
N.T.S.

NOTES

1. USE DETOUR SHEET TO CLOSE NB LANE.
2. ALL STATIONS CALLOUTS ARE REFERRING TO PROPOSED ℄ STATIONS.
3. REFER TO TCP(2-3)-23 FOR SIGNS AND DETAILS NOT SHOWN.

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

FM 2403 "SOUTH" TRAFFIC CONTROL PLAN PHASE 2

Texas Department of Transportation®

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		29

SCALE 1"=100'
SHEET 1 OF 1

4/20/2023
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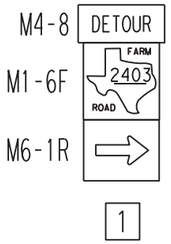
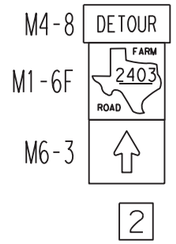
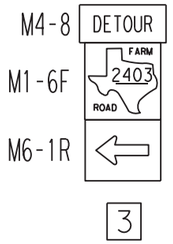
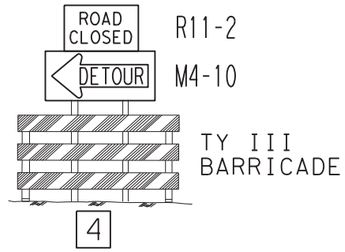








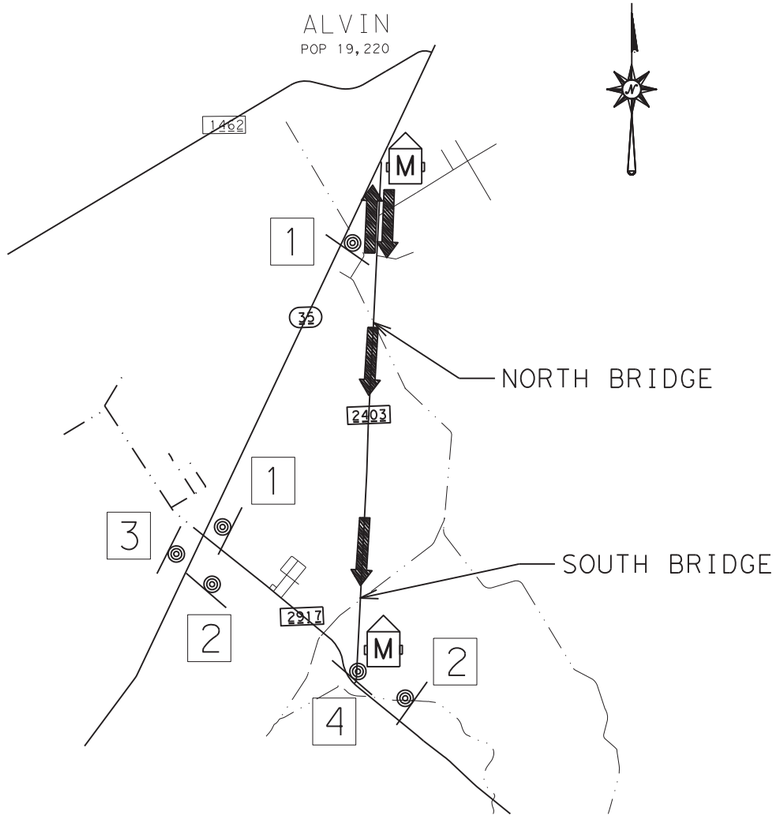
MESSAGE I

FM 2403
NORTHBOUND
TO BE CLOSED

MESSAGE II

BEGINS
MM DD

UTILIZE PCMS INSTALLED
A MINIMUM OF SEVEN CALENDAR DAYS
PRIOR TO NORTHBOUND CLOSURE



DETOUR

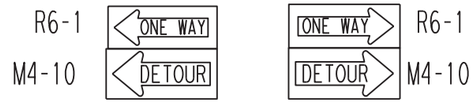
TO CLOSE NORTHBOUND TRAFFIC

NORTHBOUND TRAFFIC IS TO BE CLOSED FROM FM 2917 UNTIL NORTH BRIDGE.

1) INSTALL BARRELS ALONG CENTERLINE SPACED AT 100'.

2) INSTALL TY III EVERY 600' IN NORTHBOUND LANE, PAIRED WITH A "WRONG WAY" SIGN.

THIS DETOUR SHALL BE USED UNTIL PHASE 1 HAS BEEN COMPLETED FOR BOTH BRIDGE LOCATIONS. DO NOT REMOVE DETOUR UNTIL TRAFFIC HAS BEEN SWITCHED TO PHASE 2 FOR BOTH BRIDGE LOCATIONS.



PLACE AT EACH DRIVEWAY
AND INTERSECTION
ALONG NORTHBOUND LANE CLOSURE

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

DETOUR LAYOUT

Texas Department of Transportation
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CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		30

SHEET 1 OF 1

4/20/2023
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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

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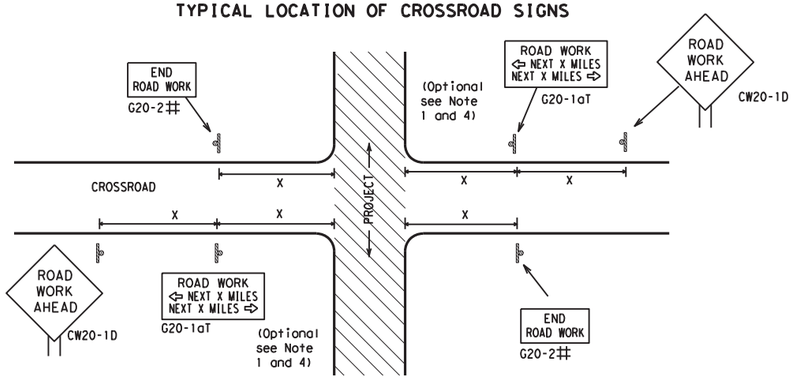
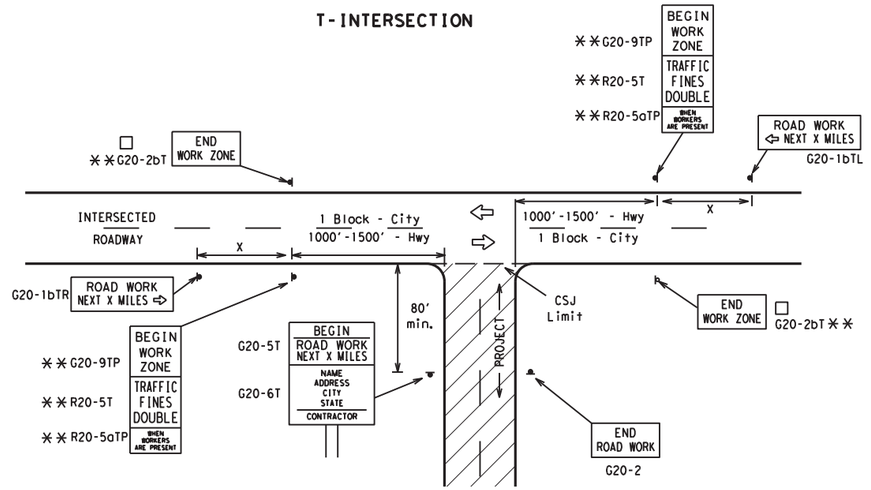
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

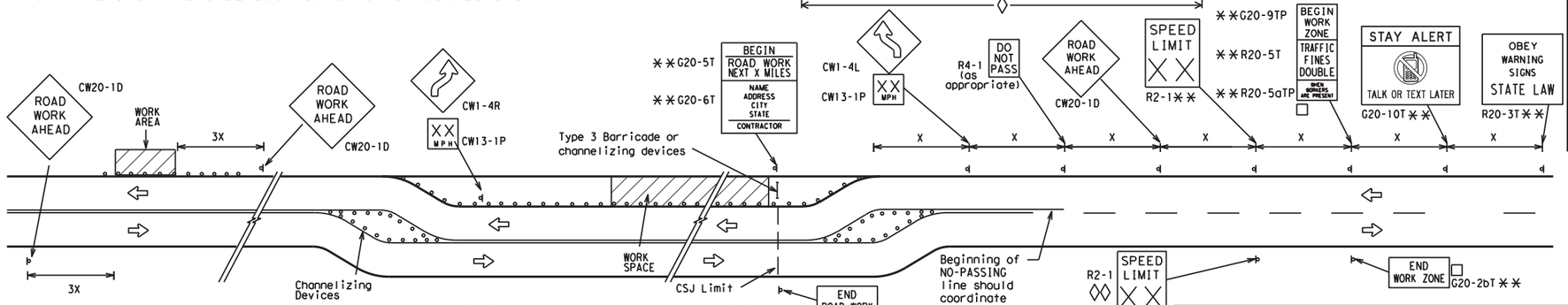
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

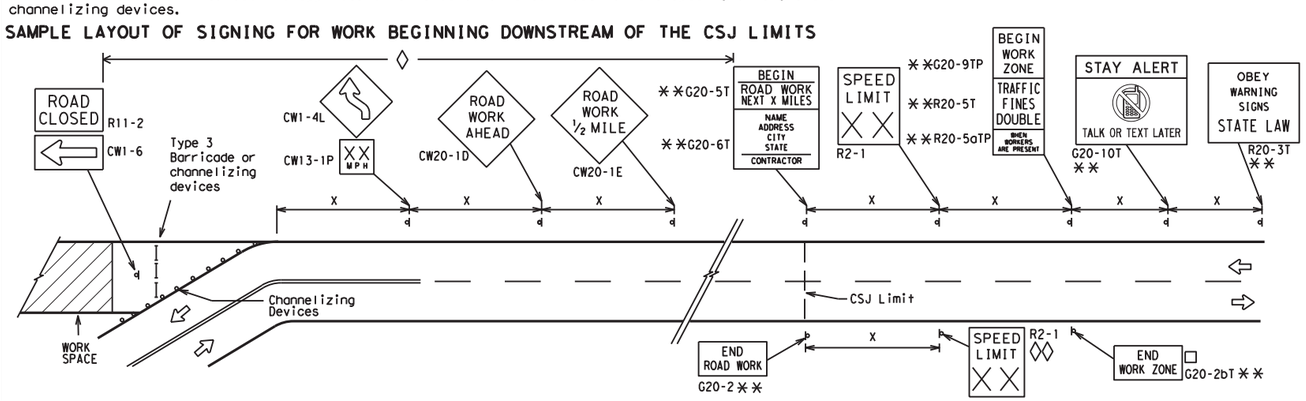
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

** 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.

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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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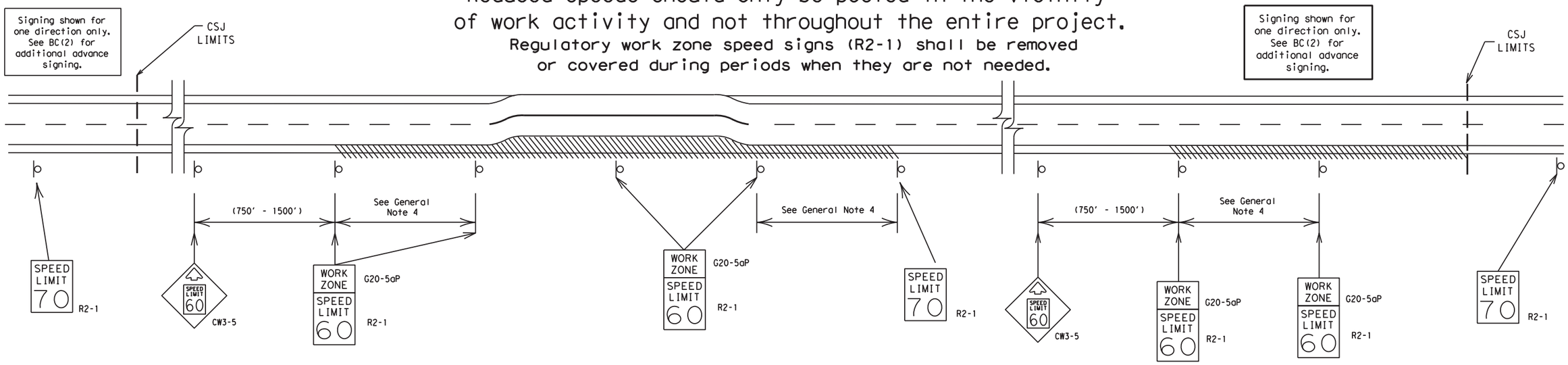
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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.

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Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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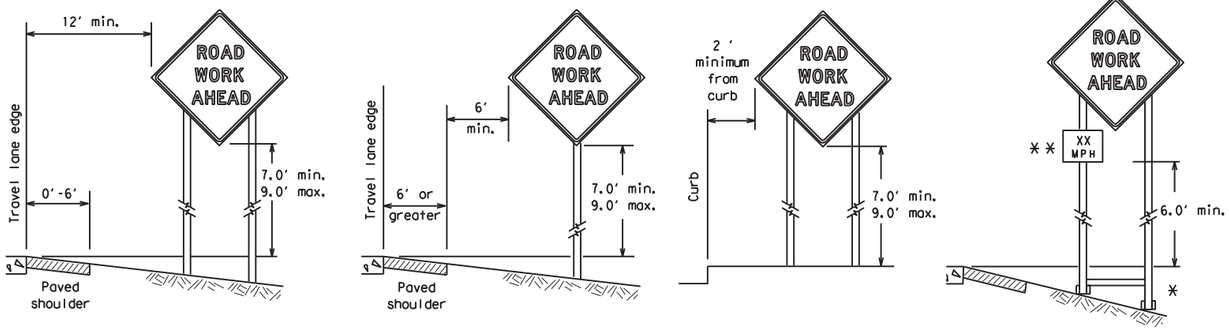
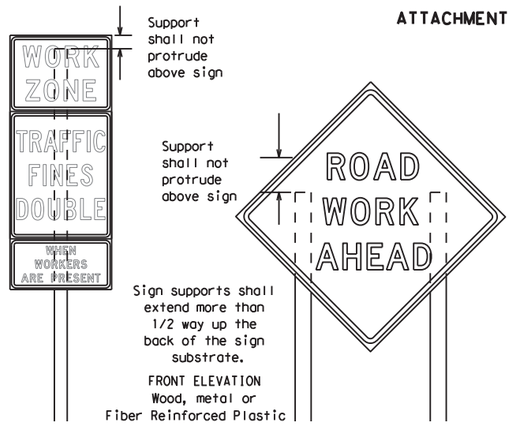
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



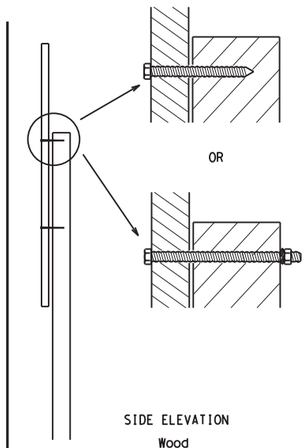
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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



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.

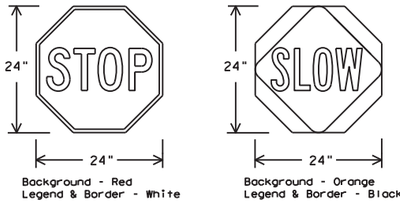


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.

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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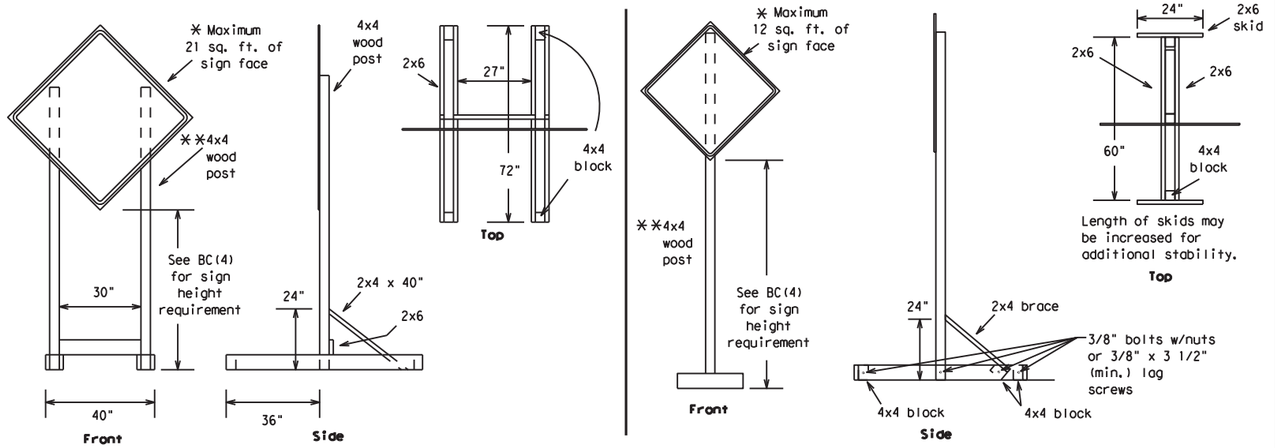
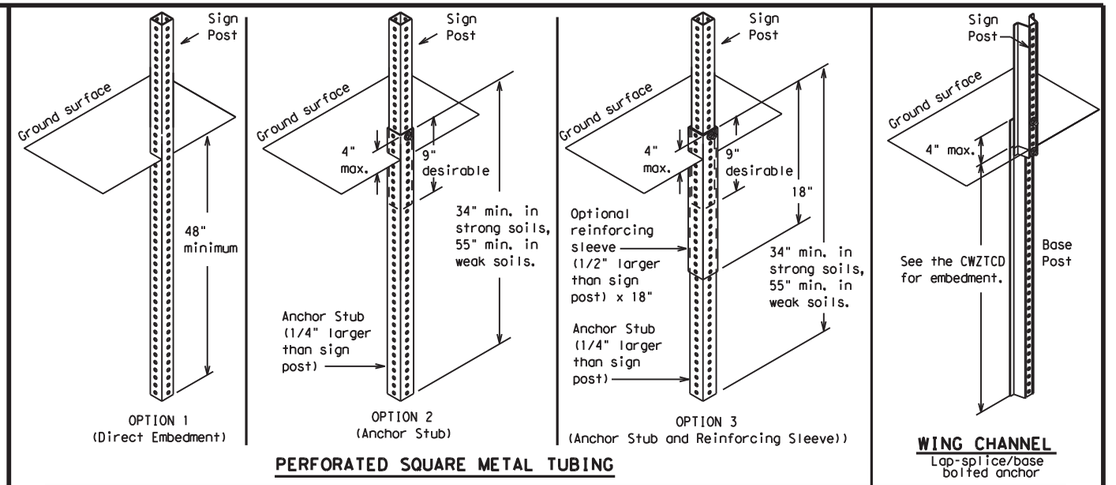


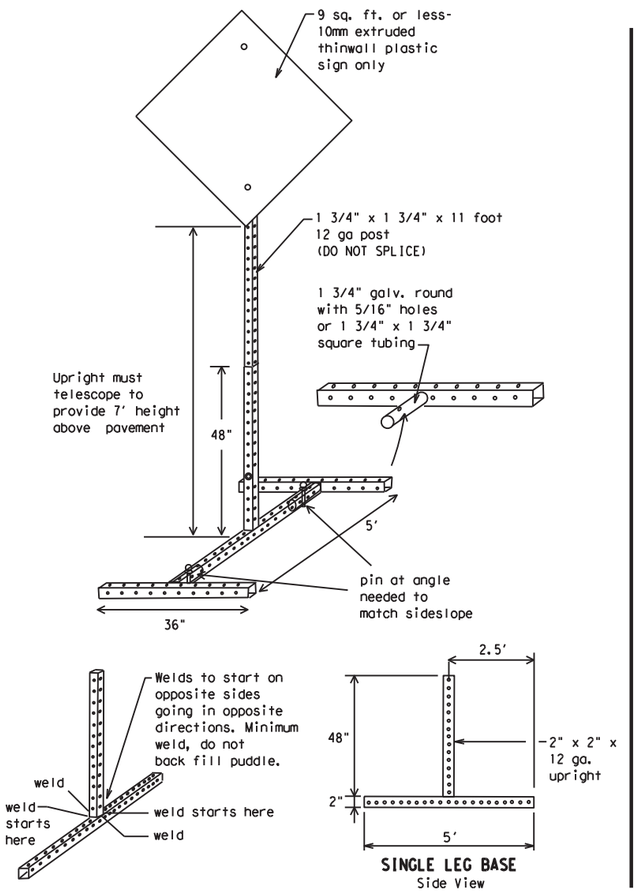
SKID MOUNTED WOOD SIGN SUPPORTS

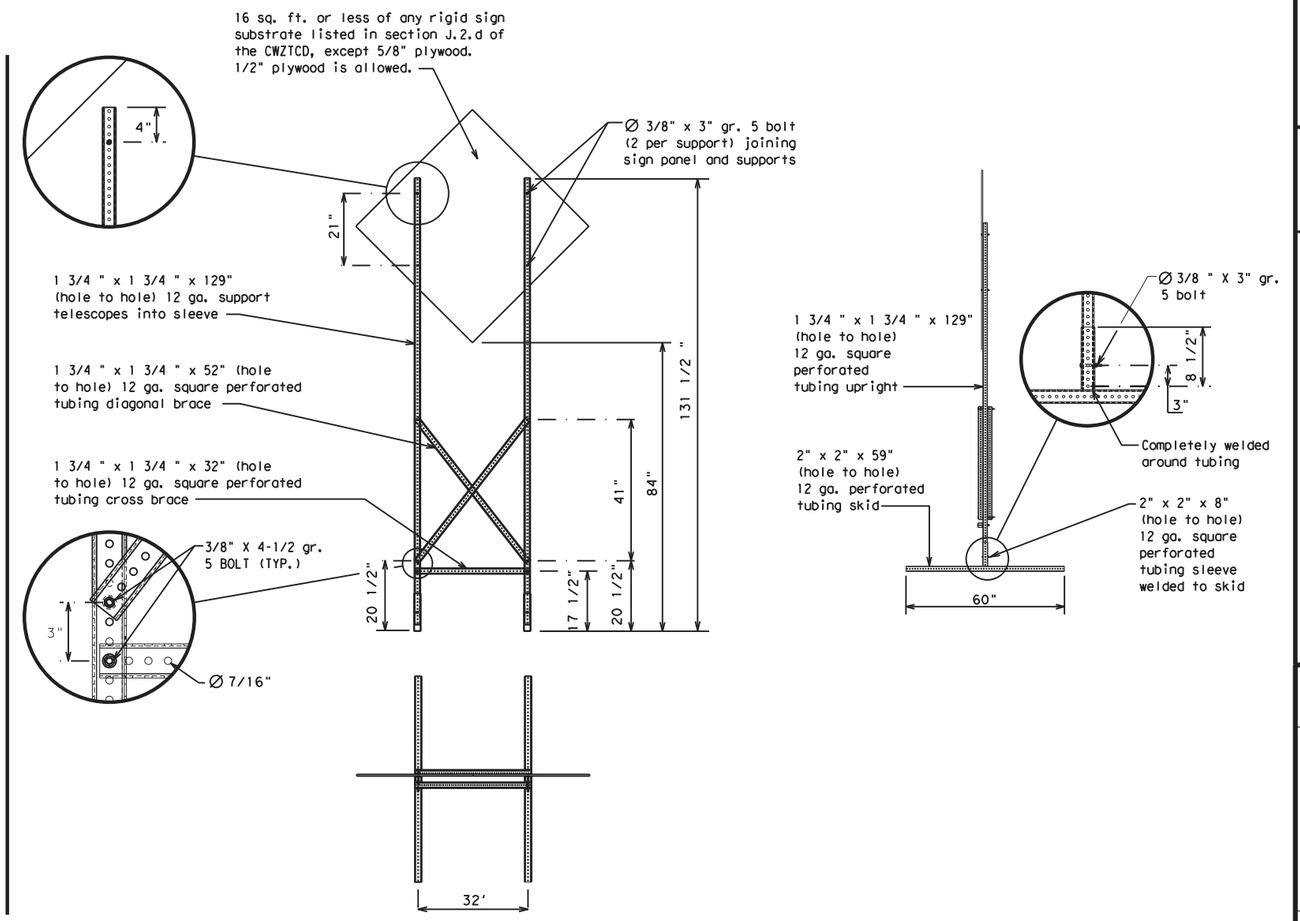
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS



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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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

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REVISIONS	2950	01	008, ETC	FM 2403
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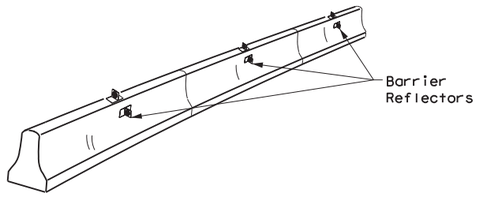
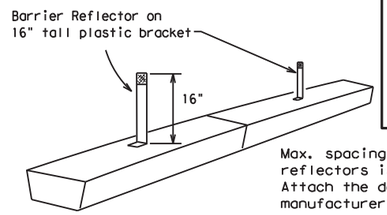
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



CONCRETE TRAFFIC BARRIER (CTB)

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

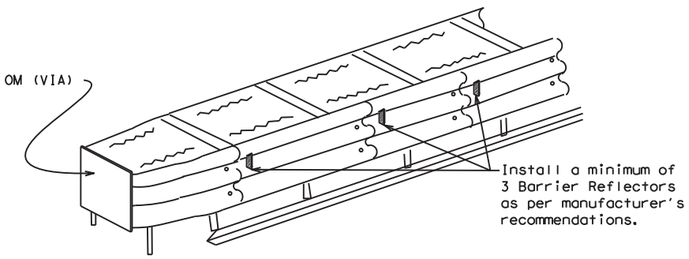


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) 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)

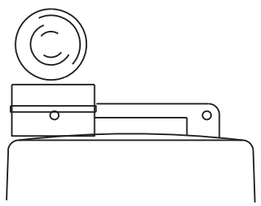


DELINEATION OF END TREATMENTS

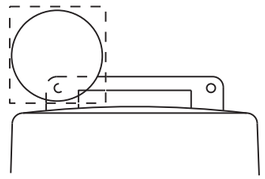
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

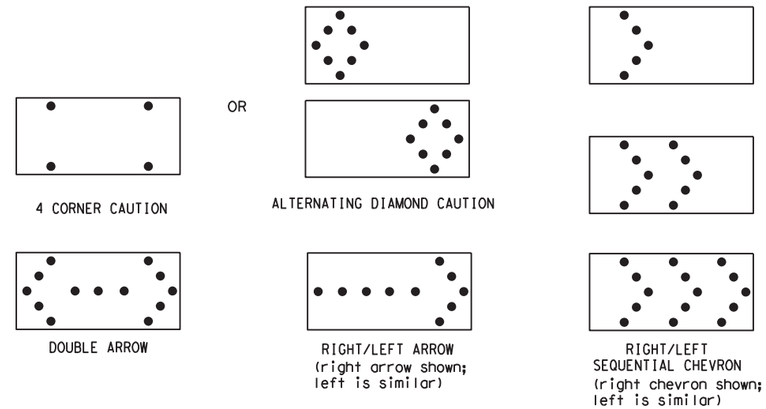
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

SHEET 7 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

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

BC(7)-21

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REVISIONS	2950	01	008, ETC	FM 2403
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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

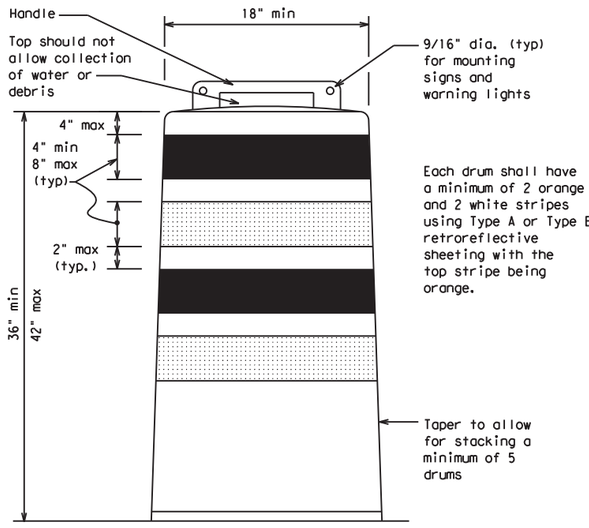
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

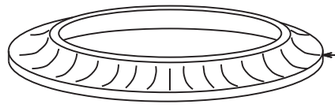
RETROREFLECTIVE SHEETING

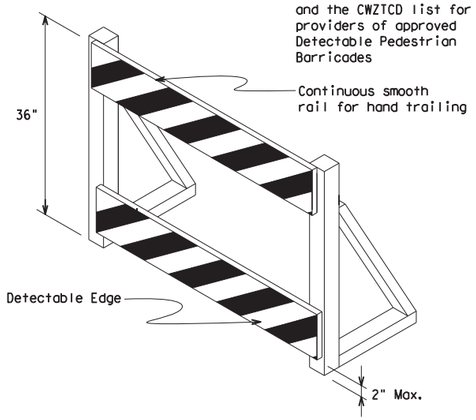
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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



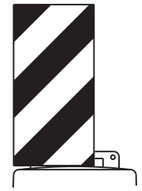




DETECTABLE PEDESTRIAN BARRICADES

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

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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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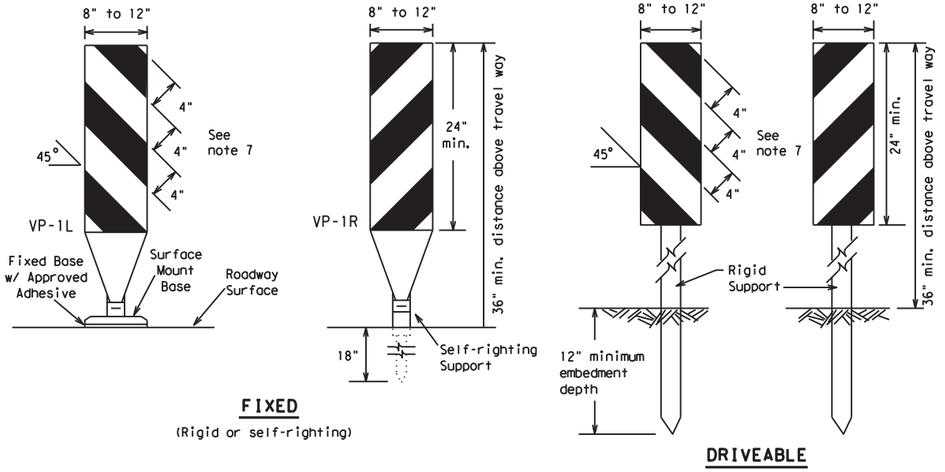
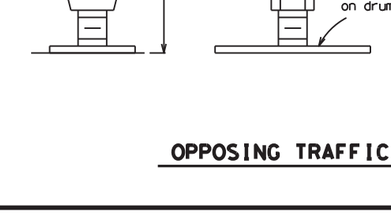


FIXED
(Rigid or self-righting)

DRIVEABLE

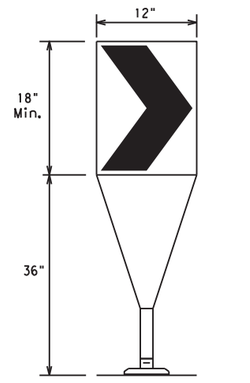


(Rigid or self-righting)

PORTABLE

VERTICAL PANELS (VPs)

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



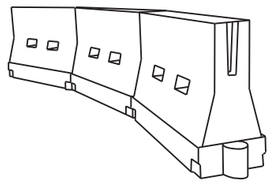
Fixed Base w/ Approved Adhesive
(Driveable Base, or Flexible Support can be used)

CHEVRONS

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.

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.

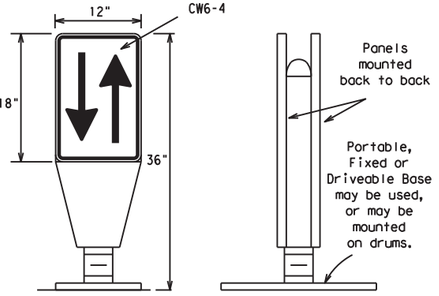
If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

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



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)

SHEET 9 OF 12

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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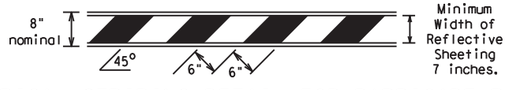
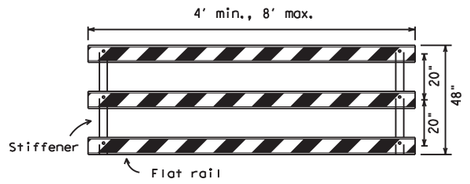
TYPE 3 BARRICADES

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.



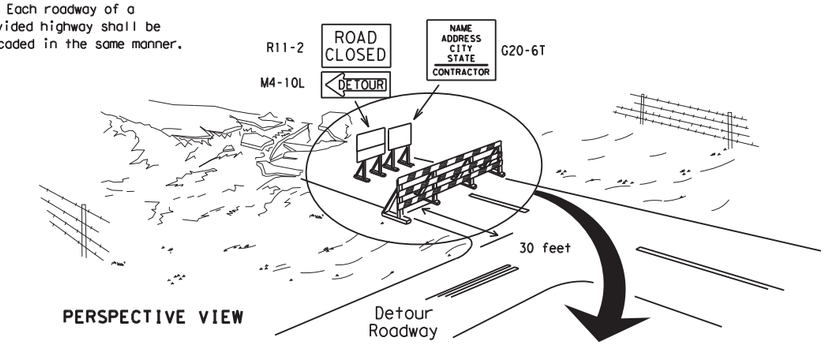
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

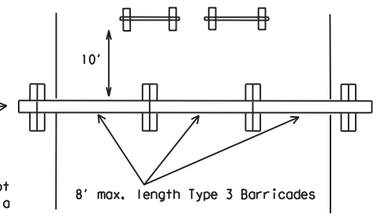
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

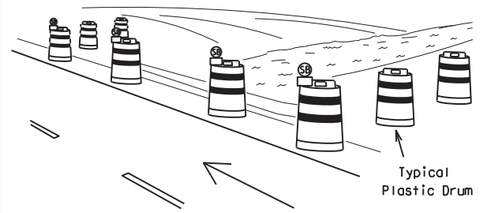
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

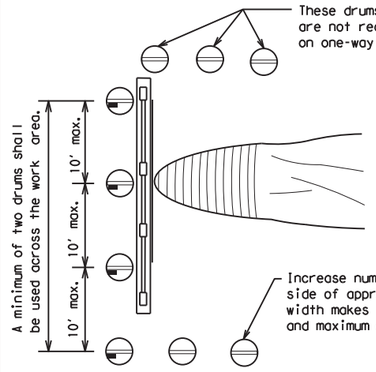
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

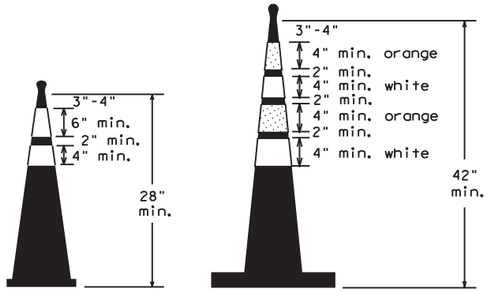
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



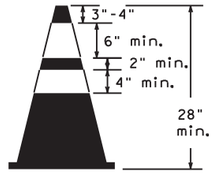
LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

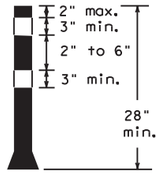
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

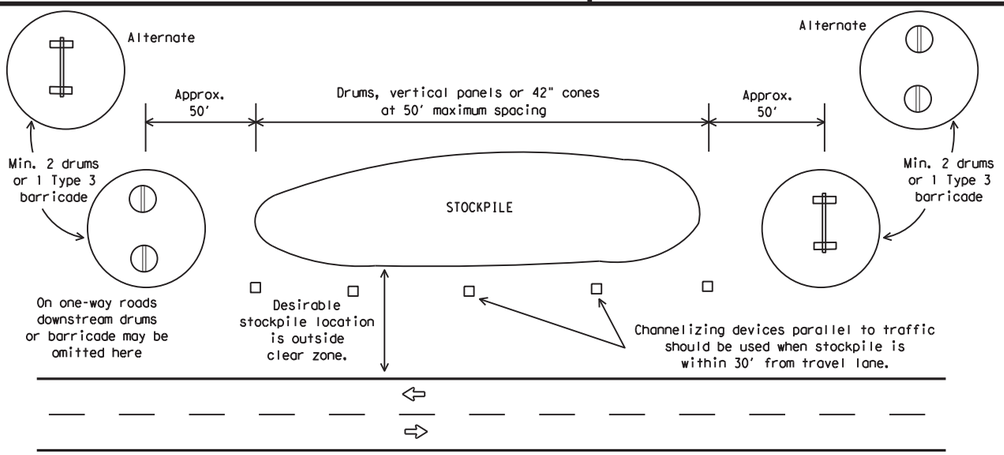


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

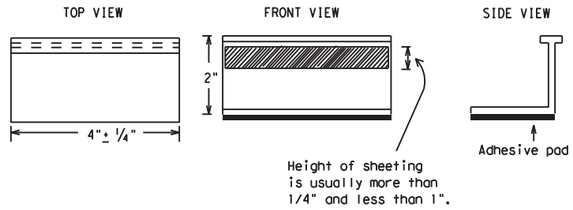
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	HOU	BRAZORIA		41
11-02 8-14				

105

DATE: 4/20/2023 4:55:59 PM
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DATE: 4/20/2023 4:56:00 PM
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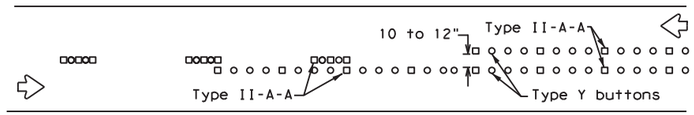
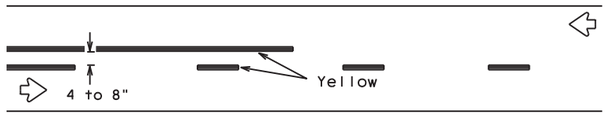
PAVEMENT MARKING PATTERNS

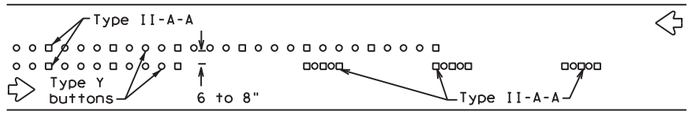
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



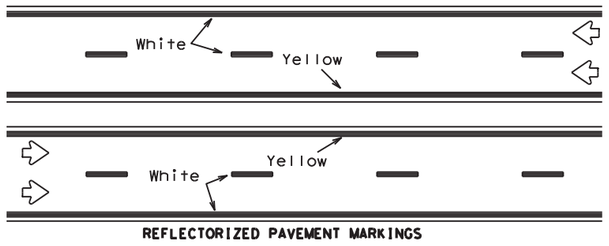
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



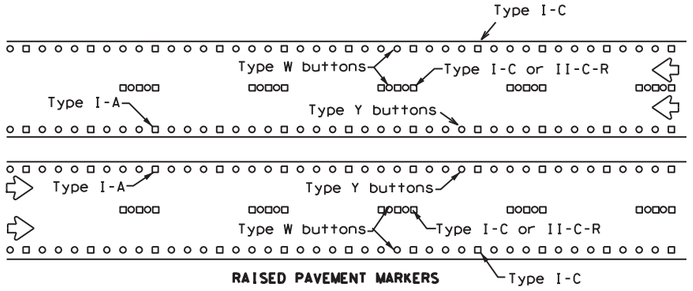
RAISED PAVEMENT MARKERS - PATTERN B

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



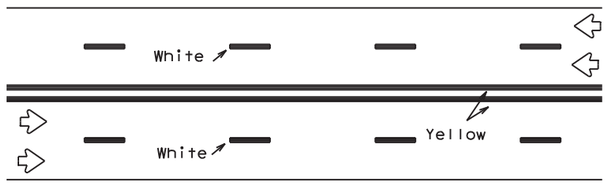
REFLECTORIZED PAVEMENT MARKINGS



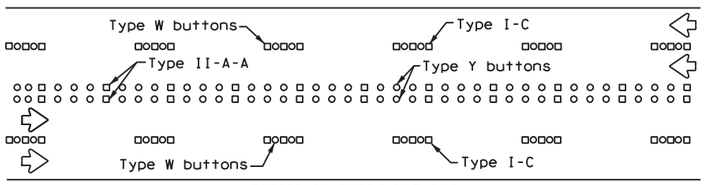
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



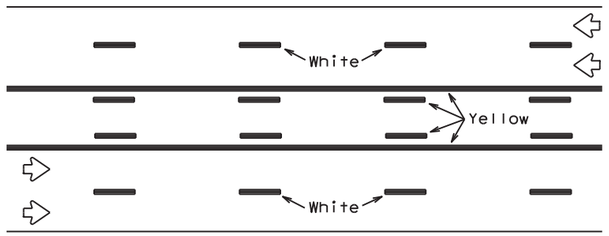
REFLECTORIZED PAVEMENT MARKINGS



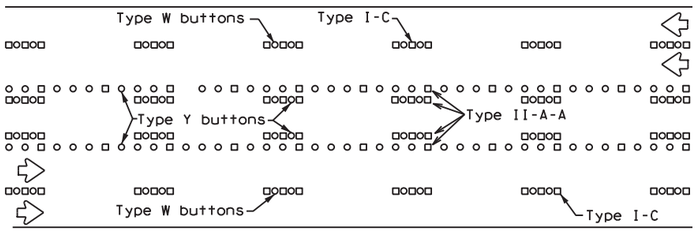
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

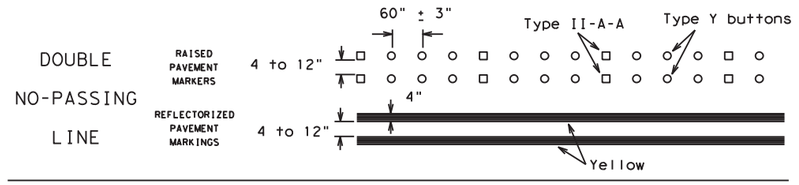
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

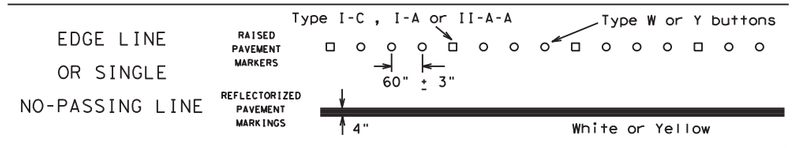
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

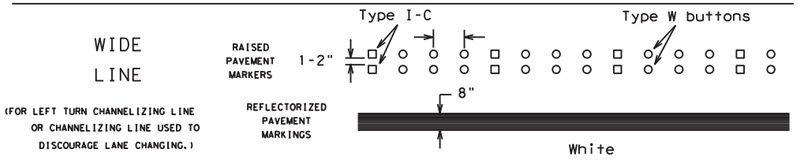


EDGE LINE OR SINGLE NO-PASSING LINE



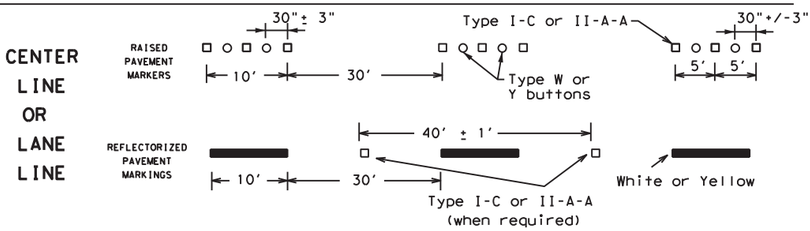
WIDE LINE

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

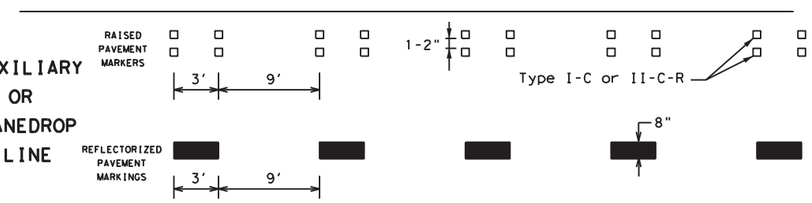


BROKEN LINES

CENTER LINE OR LANE LINE

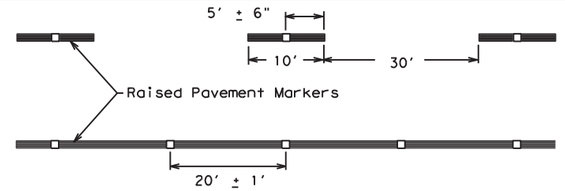


AUXILIARY OR LANEDROP LINE



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

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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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1-97 9-07 5-21	DIST	COUNTY		SHEET NO.
2-98 7-13	HOU	BRAZORIA		42
11-02 8-14				

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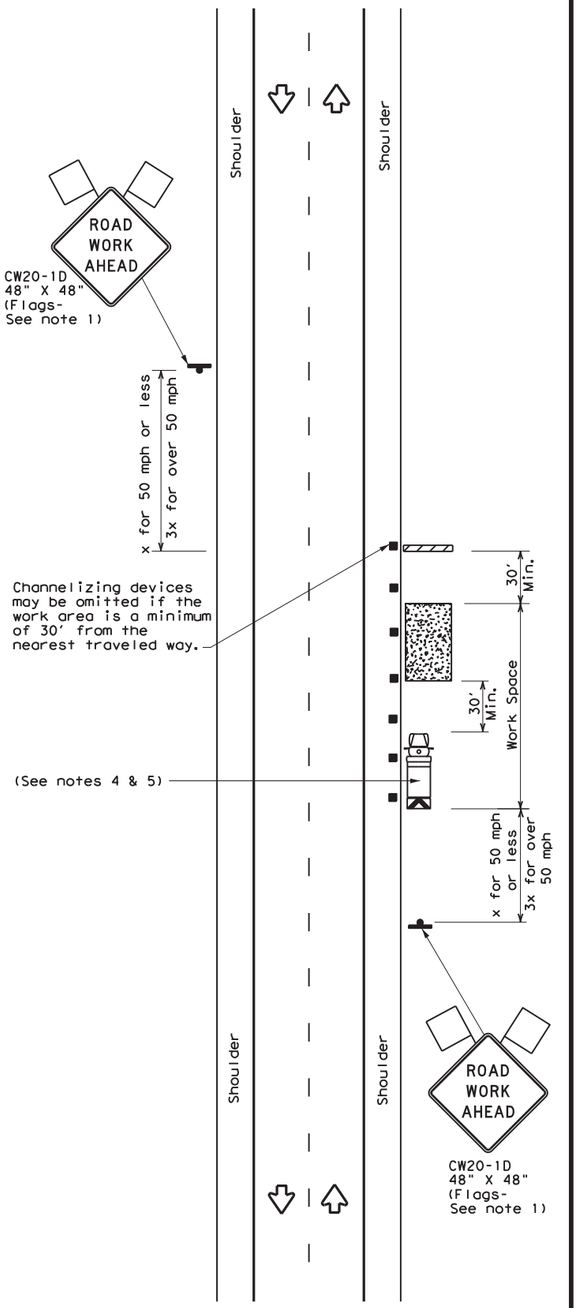
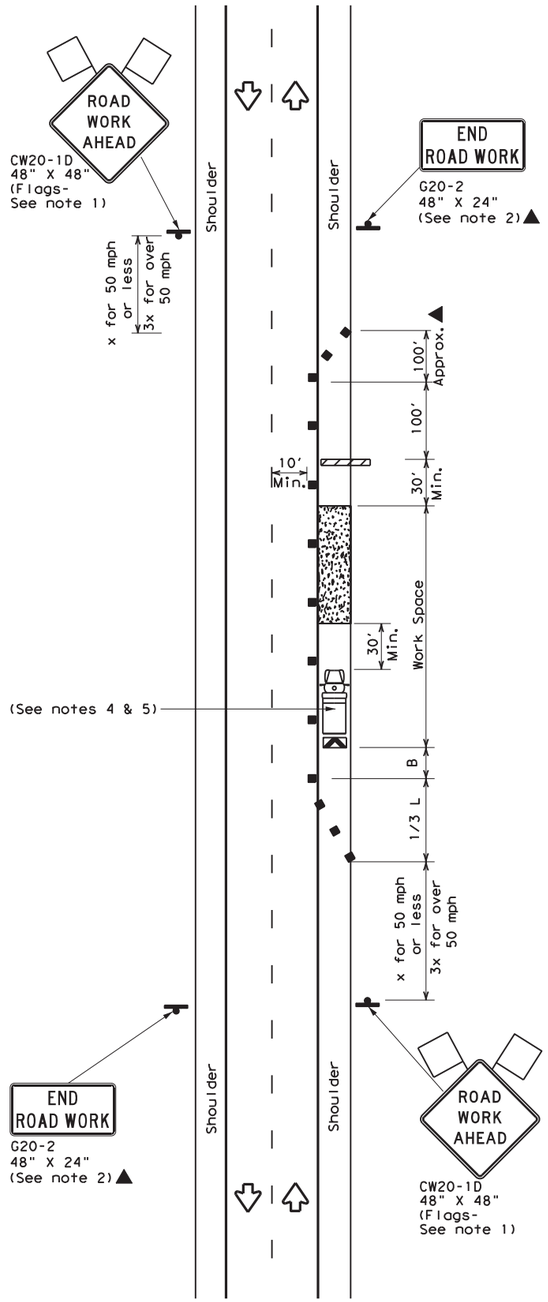


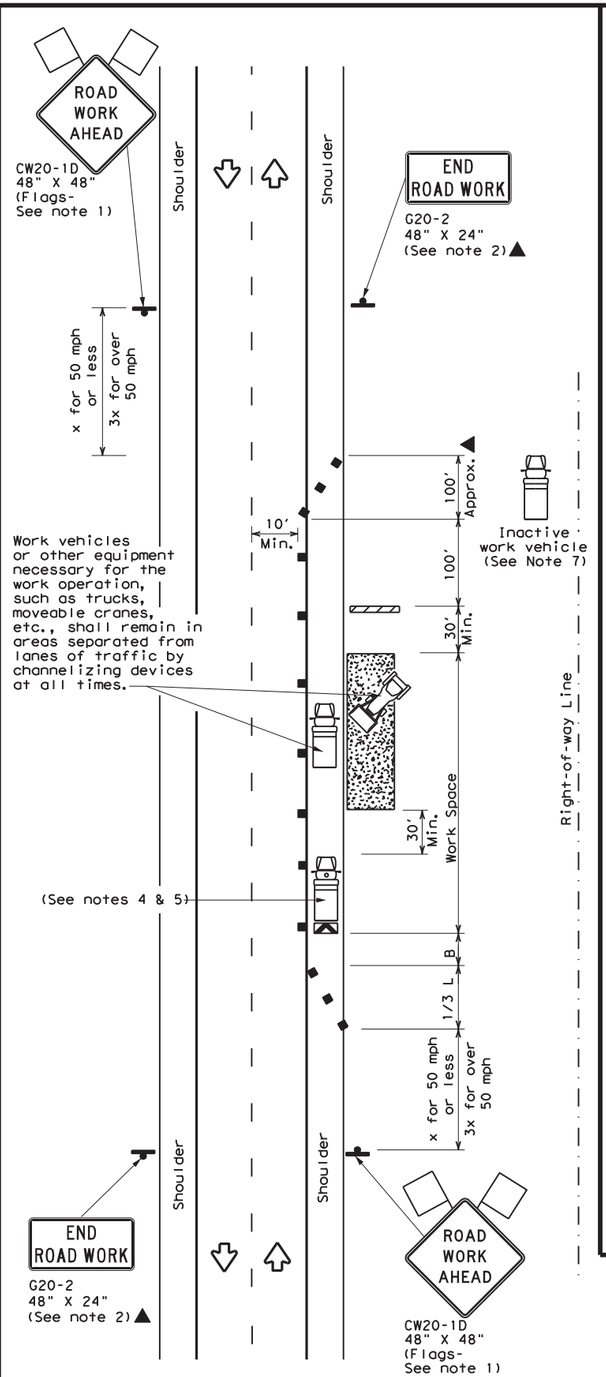
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	BRAZORIA		43
1-97 2-18				

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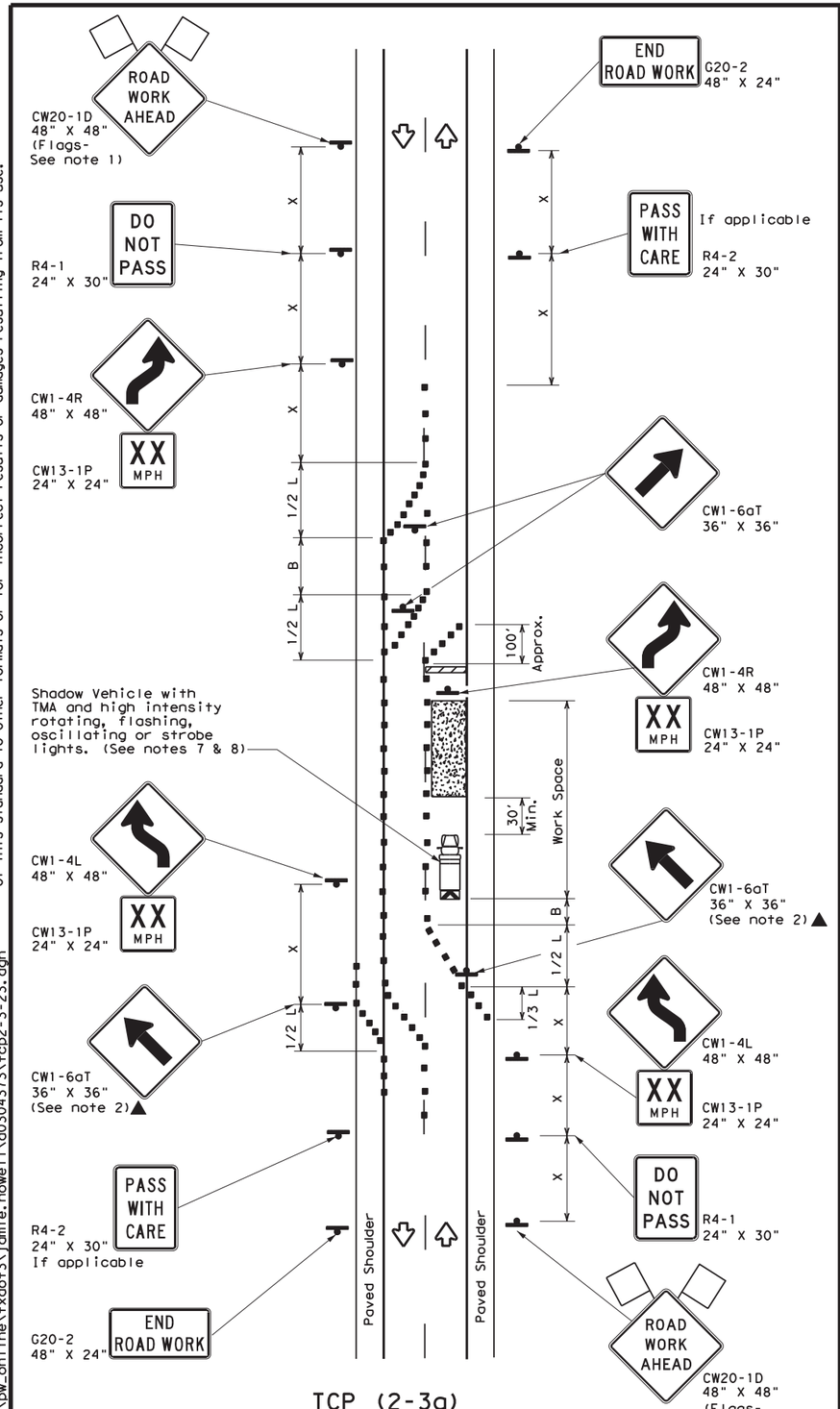
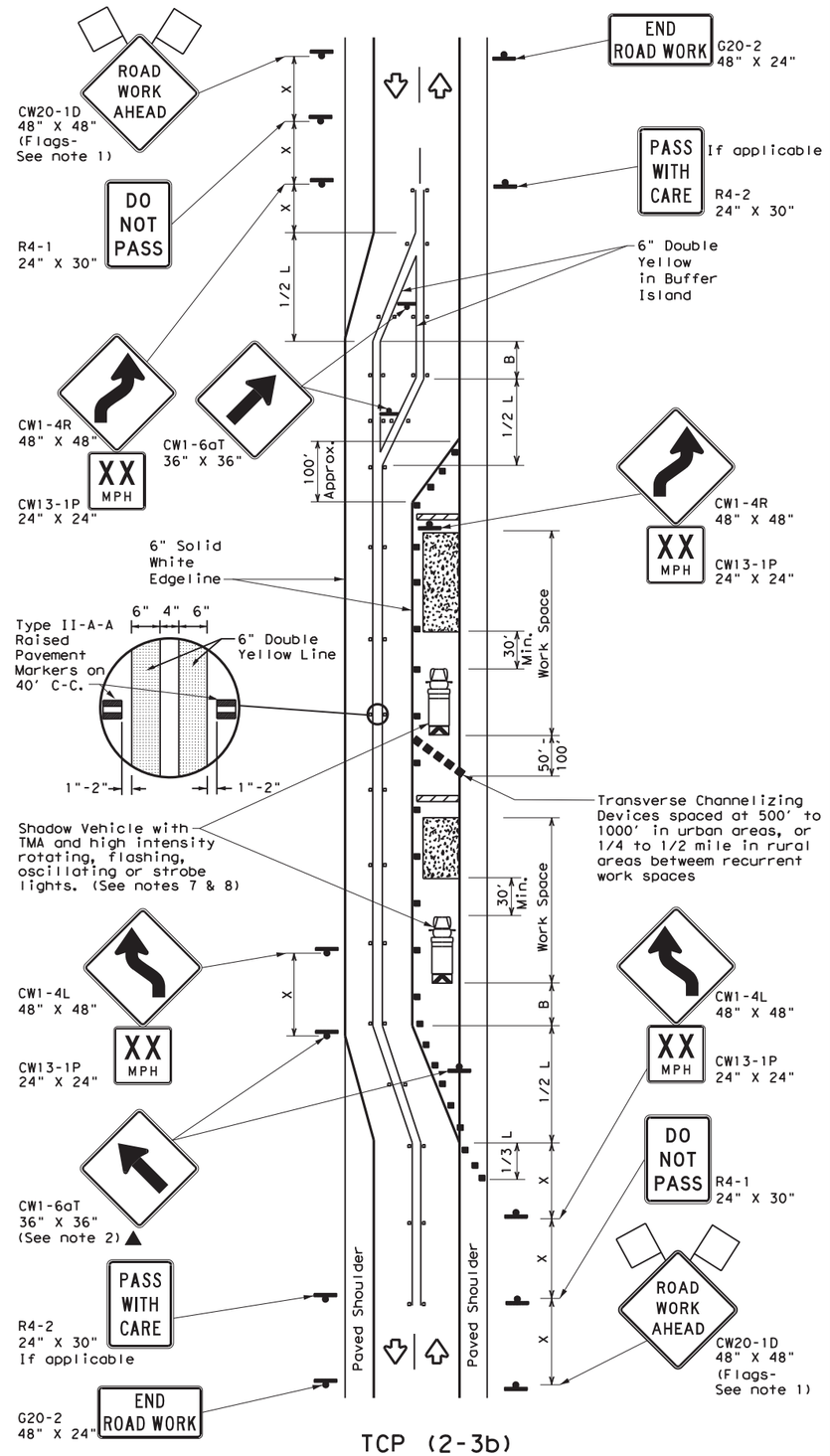


TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

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)-23

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© TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
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8-95 3-03 4-23	DIST	COUNTY		SHEET NO.
1-97 2-12	HOU	BRAZORIA		44

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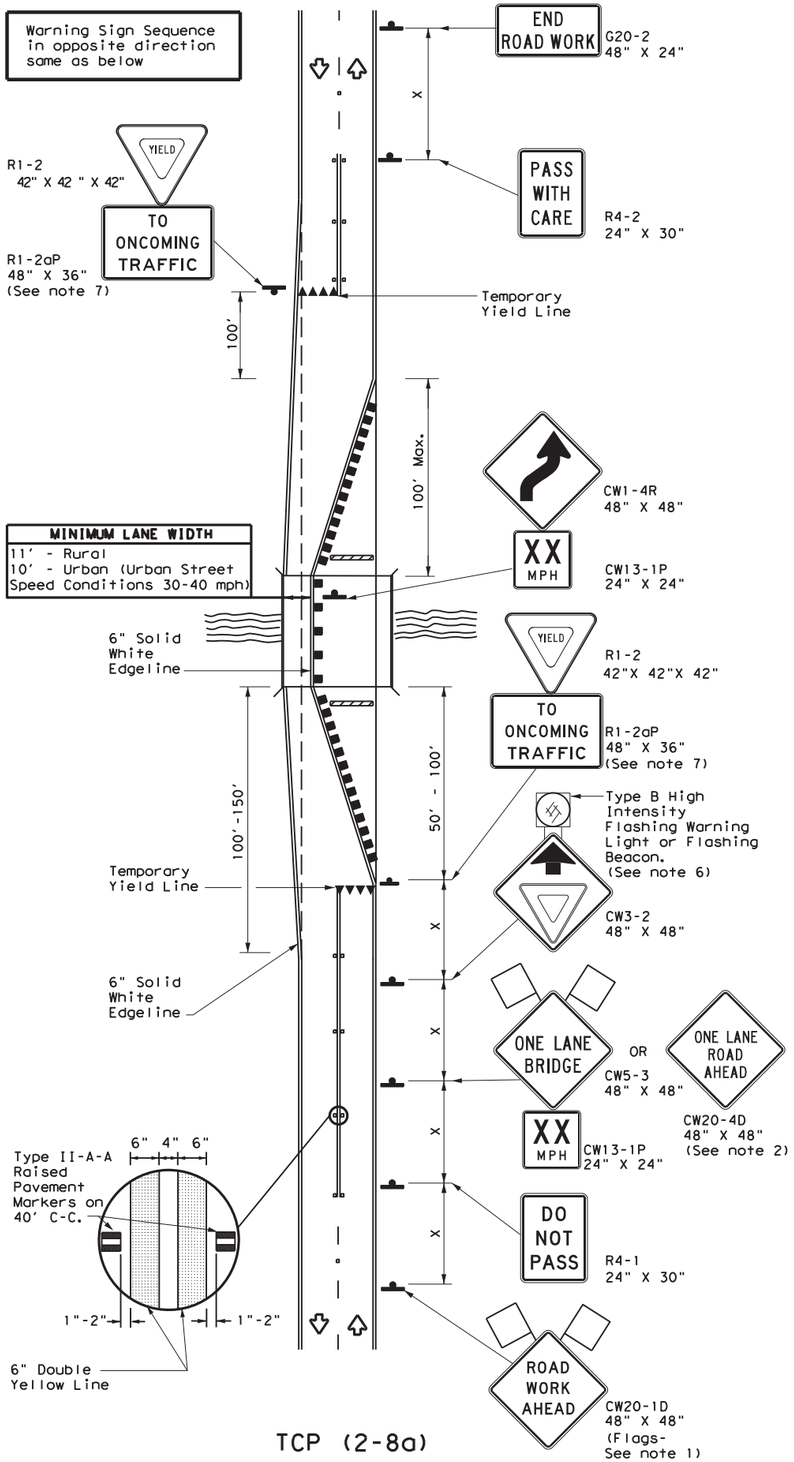
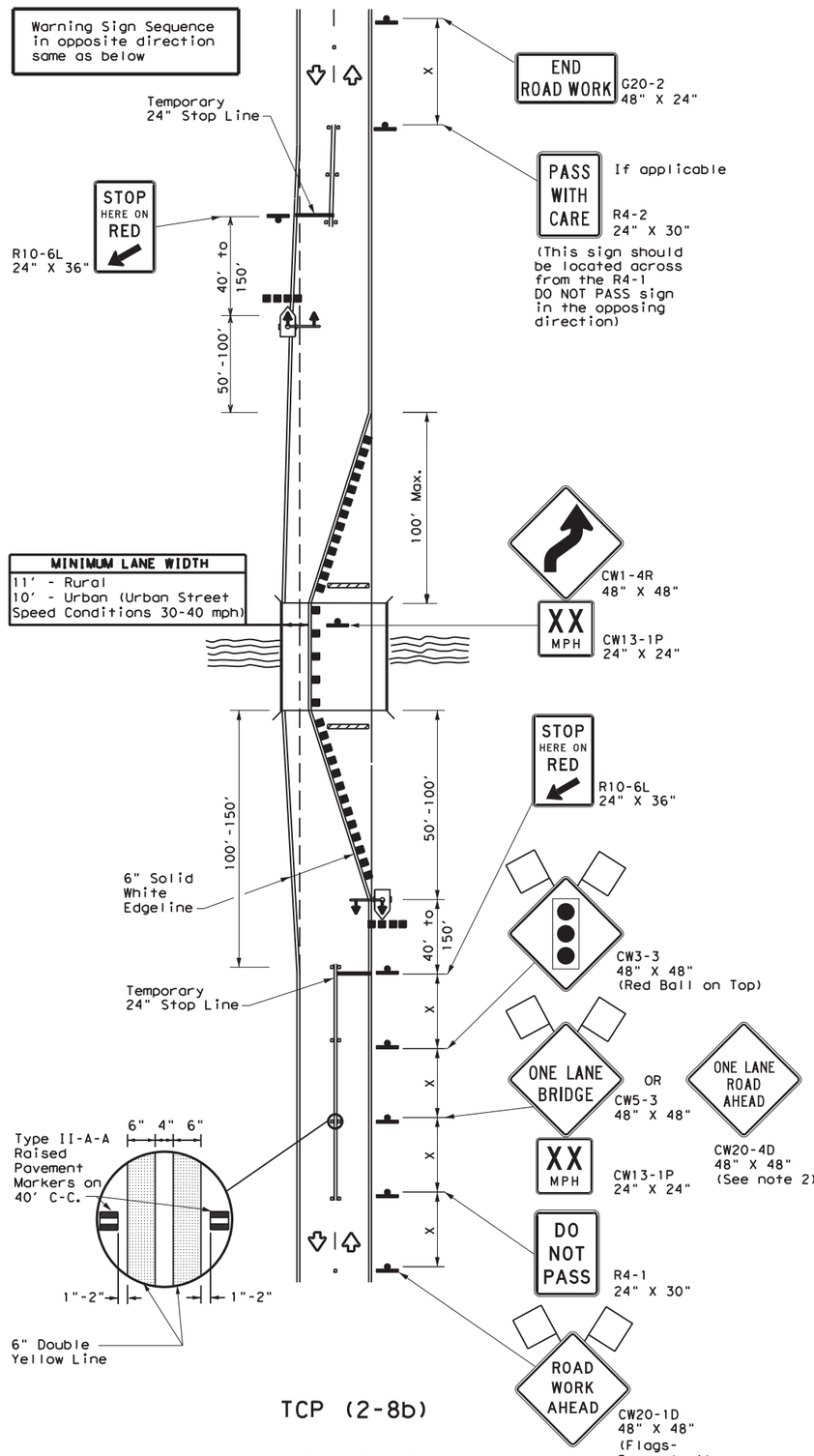


TCP (2-8a)

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



TCP (2-8b)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH TRAFFIC SIGNAL

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-8a)

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

TCP (2-8b)

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

Texas Department of Transportation — Traffic Safety Division Standard

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

TCP(2-8)-23

FILE: tcp2-8-23.dgn	DN:	CK:	DW:	CK:
© TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-85 4-98 2-18 8-95 3-03 4-23 1-97 2-12	2950	01	008, ETC	FM 2403
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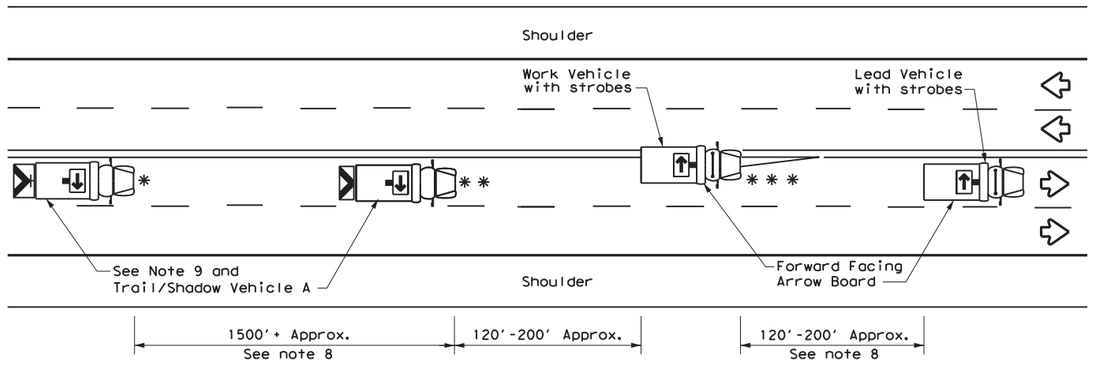
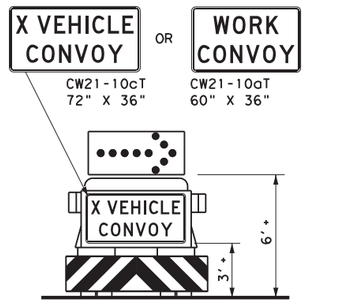
	HOU	BRAZORIA		45



TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

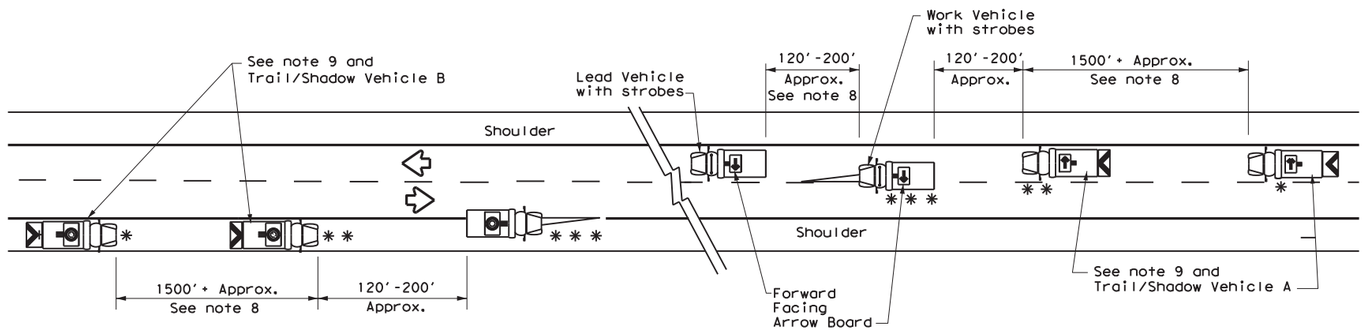
with RIGHT Directional display Flashing Arrow Board

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.

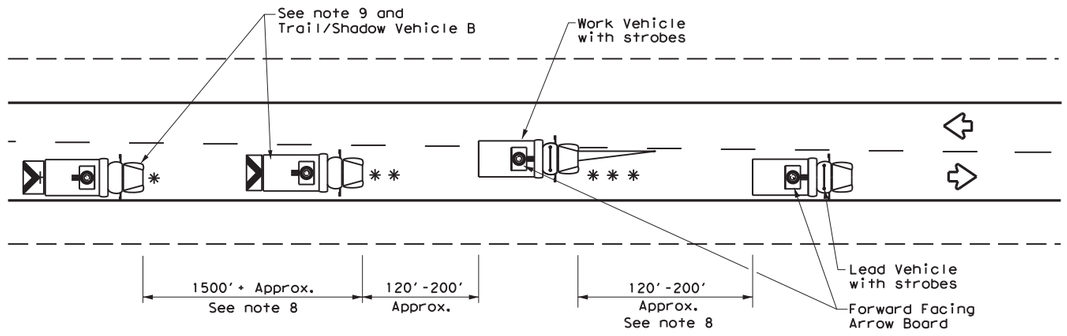


WORK ON SHOULDER

WORK ON TRAVEL LANE

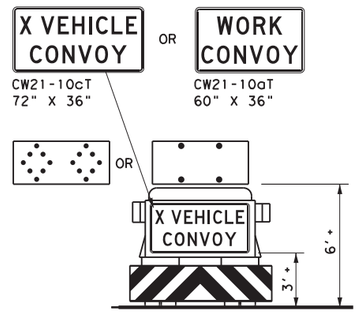
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



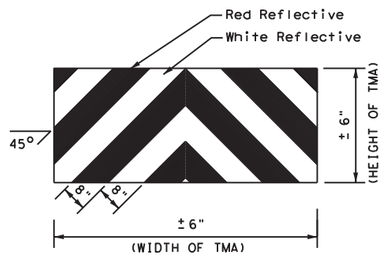
TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		46

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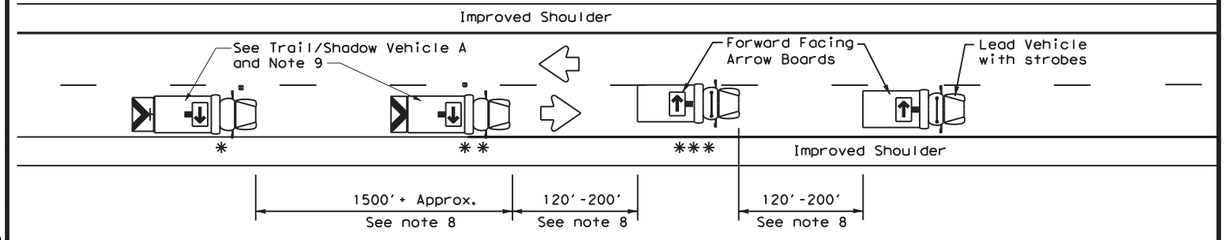
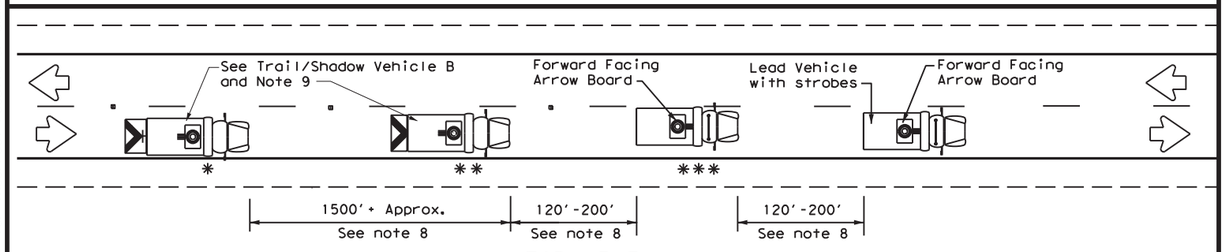


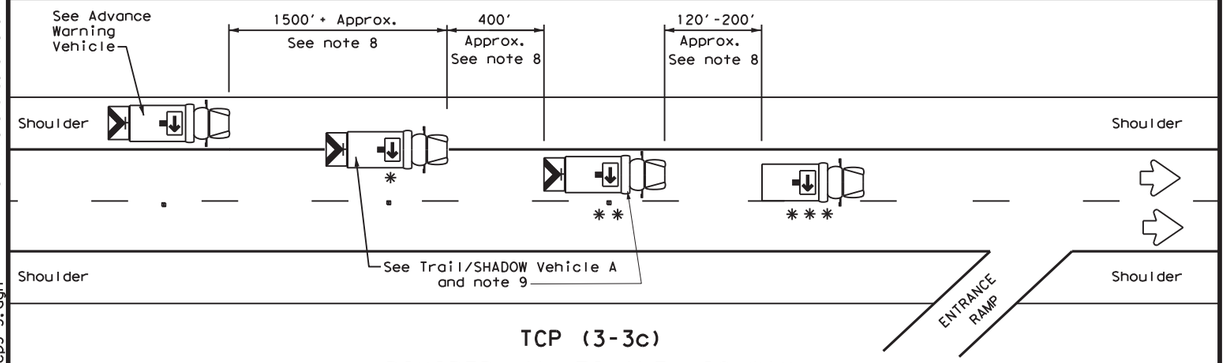
TCP (3-3a)

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



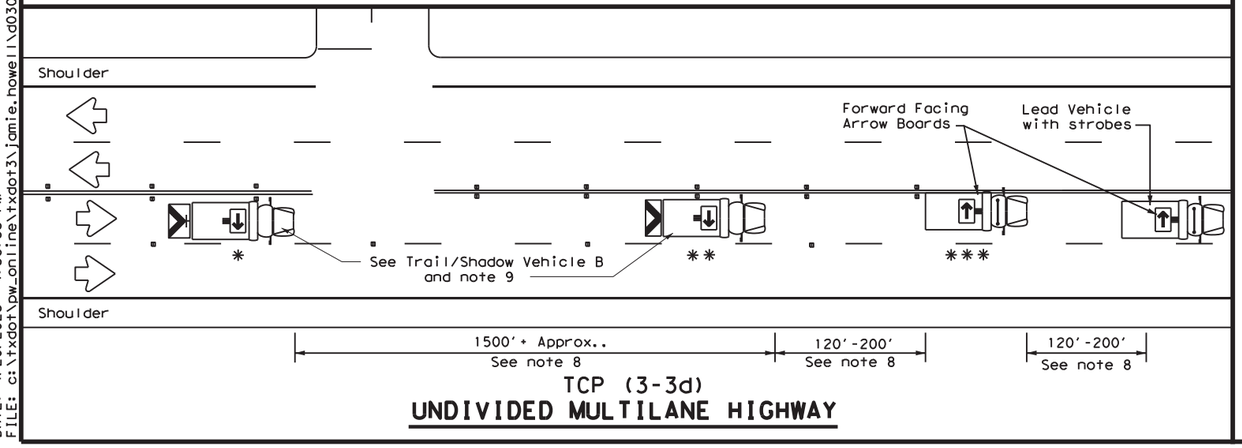
TCP (3-3b)

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



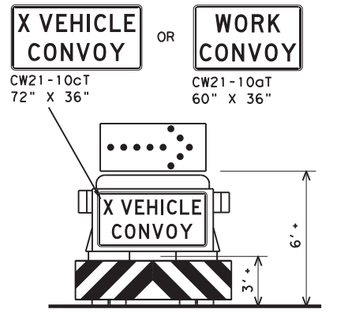
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



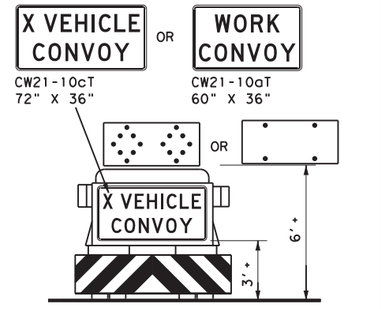
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



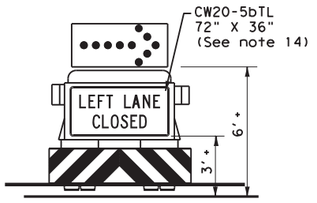
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

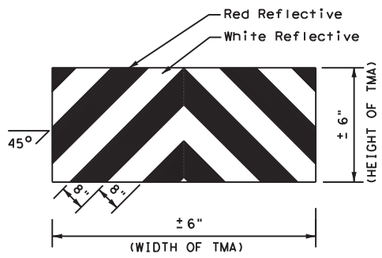


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

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

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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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8-95 7-13	HOU	BRAZORIA		47
1-97 7-14				

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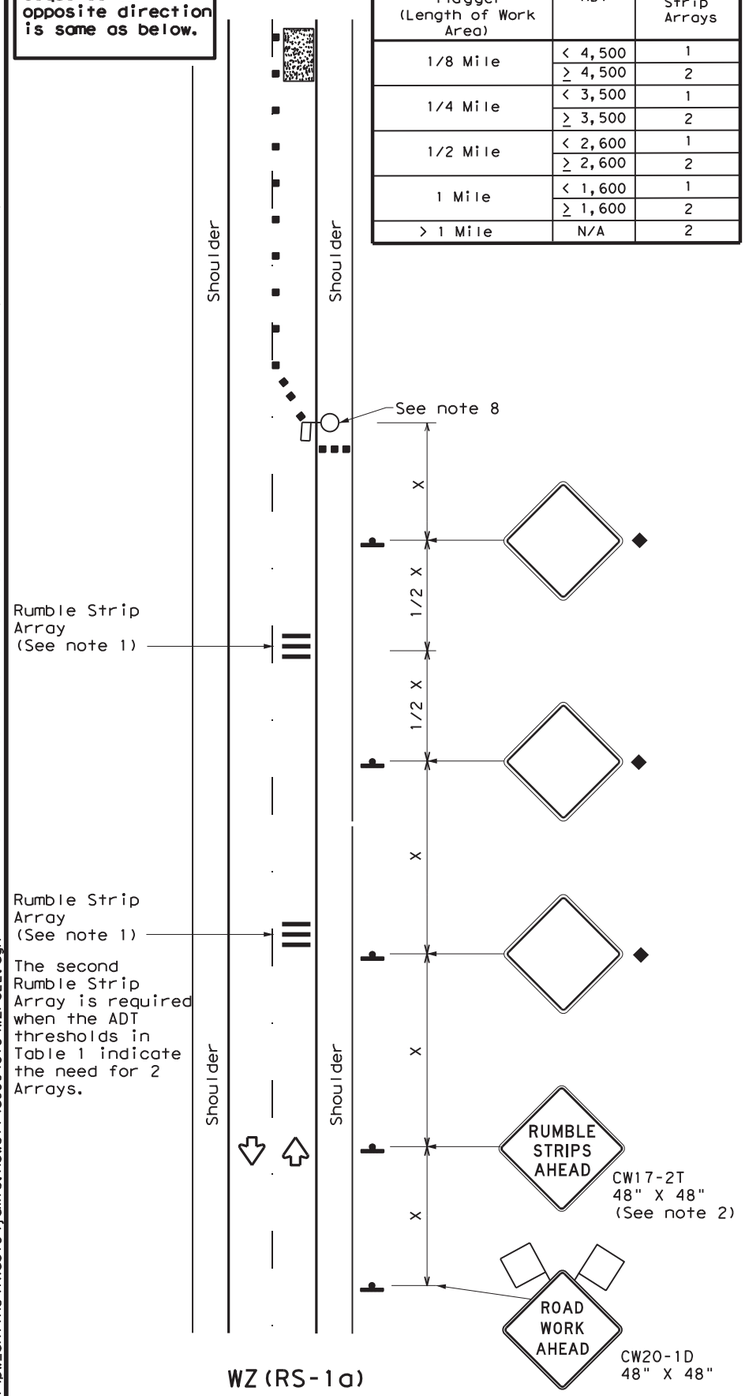
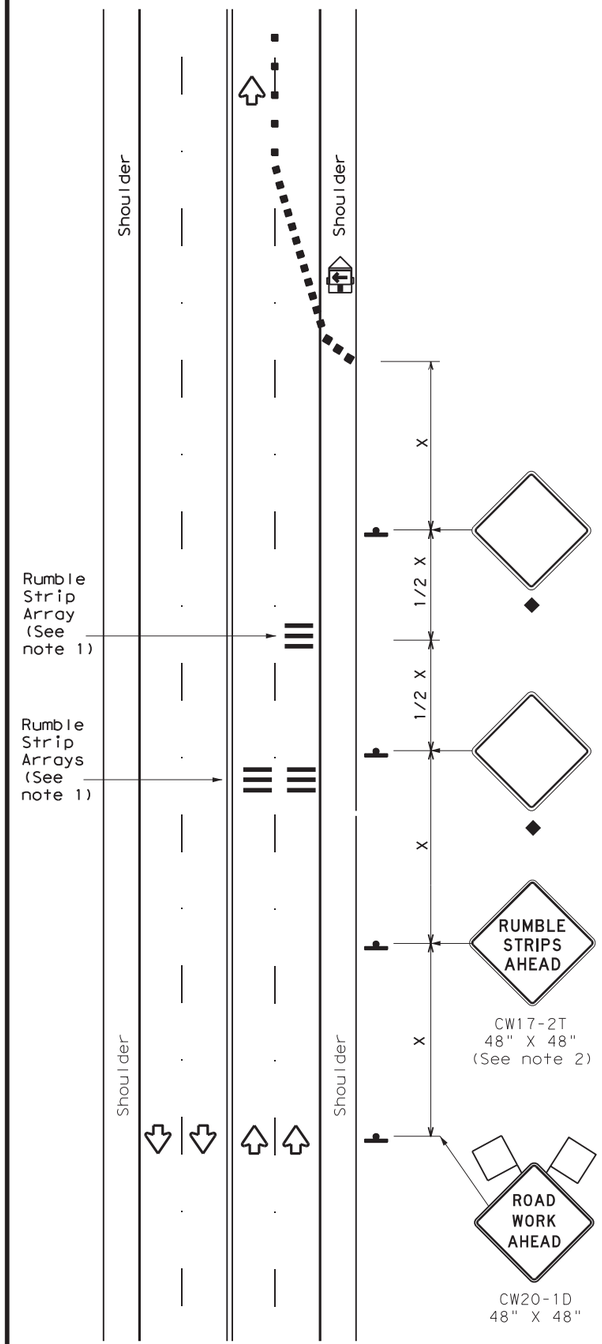
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation — Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		48

117

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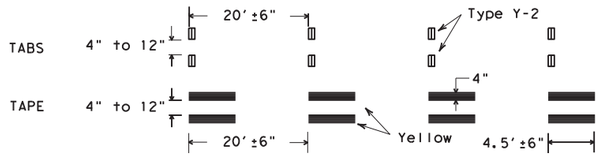
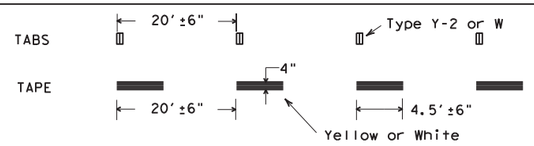
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

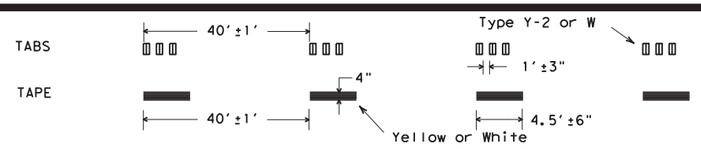


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



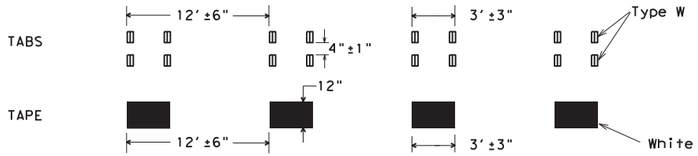
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

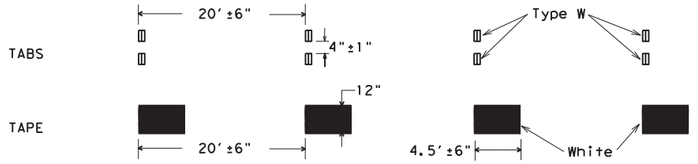


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



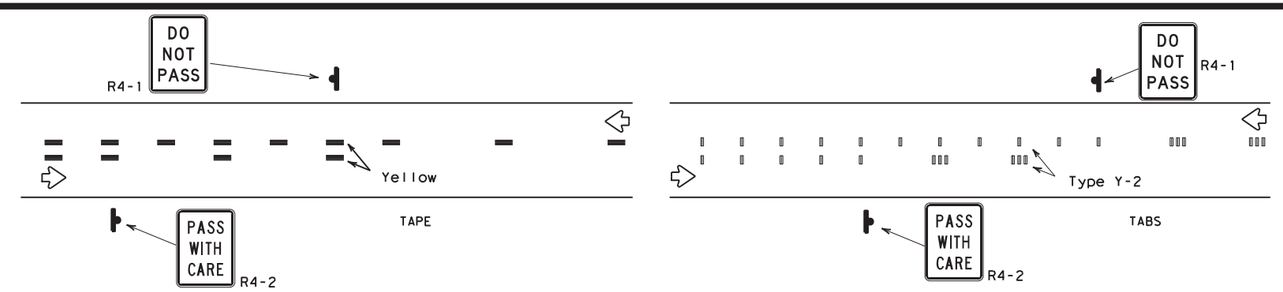
NOTES:

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

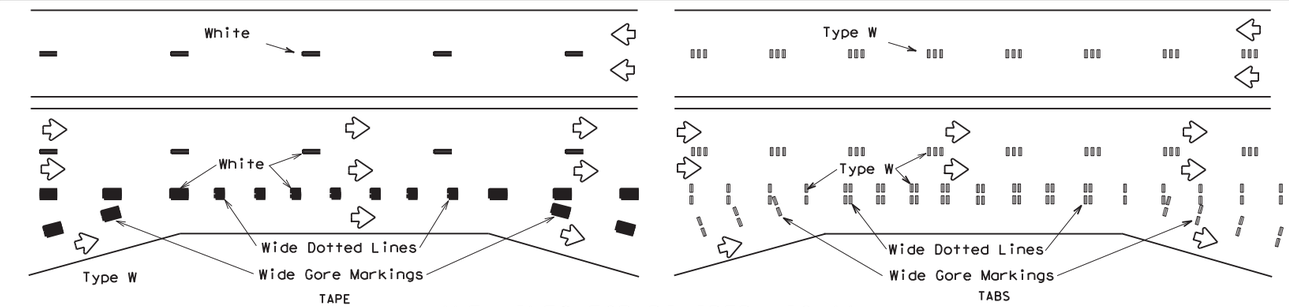
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

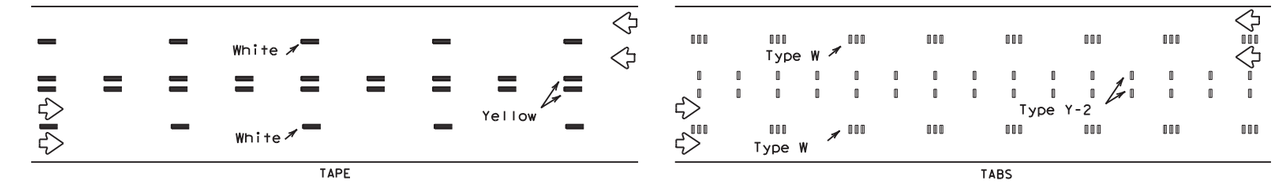
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



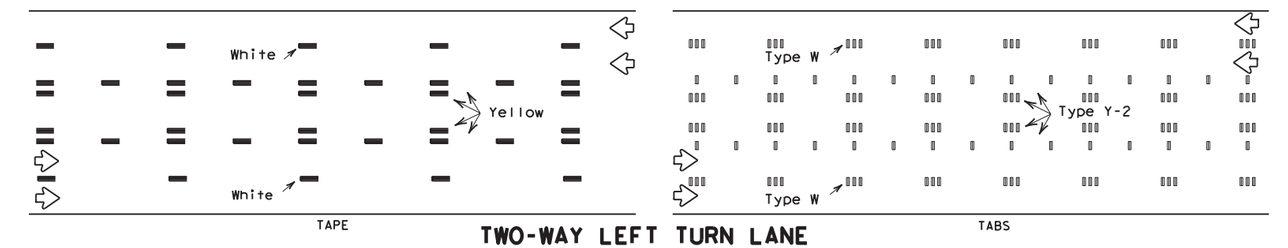
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



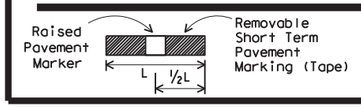
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

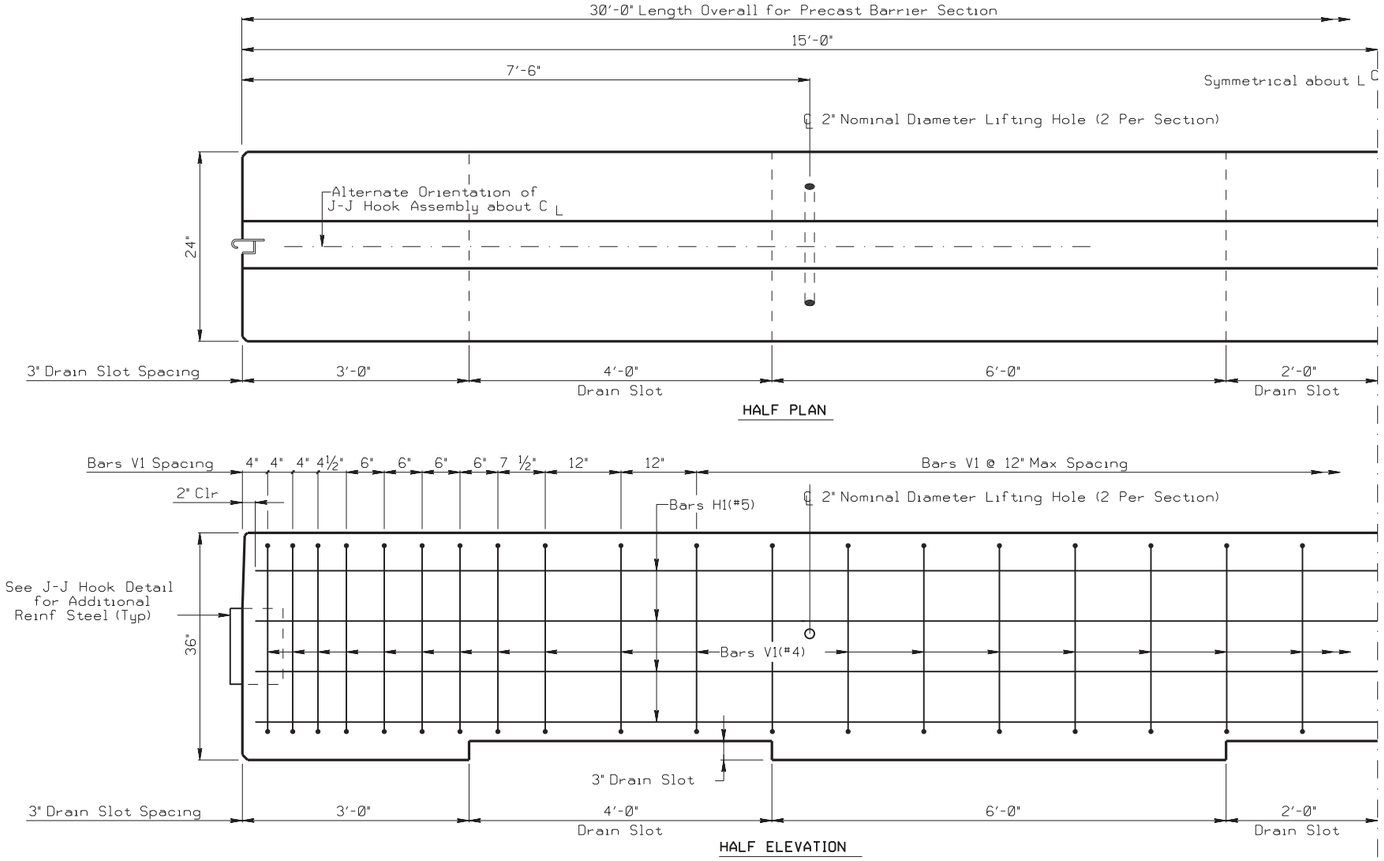
Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		2950	01	008, ETC	FM 2403
1-97		DIST	COUNTY		SHEET NO.
3-03		HOU	BRAZORIA		49
7-13					

111



PRECAST SINGLE SLOPE CONCRETE BARRIER

GENERAL NOTES:

1) Precast barrier length will be 30 feet(1 inch +/-) unless otherwise specified in the plans.

2) All concrete will be Class C.

3) All reinforcing steel will be Grade 60, unless otherwise specified. All welded rebar is ASTM A706.

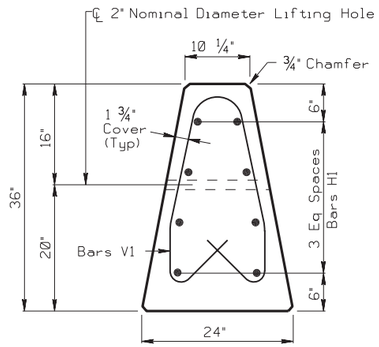
4) Chamfer all edges ¾inch.

5) The minimum bar splice length is 24 times the bar diameter.

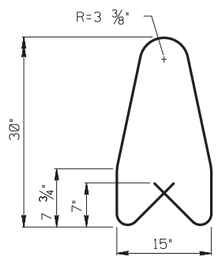
6) Welded wire fabric may be used as an option to conventional reinforcement. All wire is 60 ksi yield strength.

7) Transitions to barrier height,as needed,will be determined by the Engineer. Changes in barrier height should not normally exceed 2 inches per 30 feet. Vertical steel will be uniformly transitioned throughout the variation in barrier height as directed by the Engineer.

8) Installation of barrier anchorage is not paid for directly. Installation is incidental to barrier bid items.

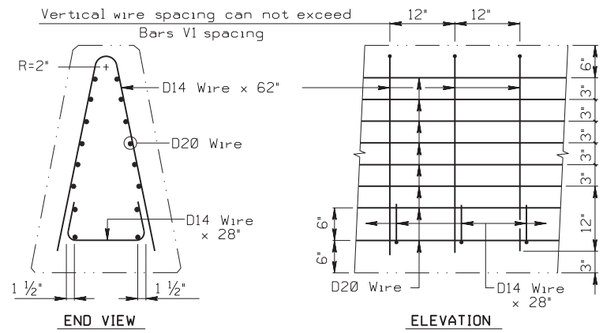


TYPICAL SECTION



BARS V1(#4)

WELDED WIRE FABRIC
36" BARRIER
3x12-D20xD14



WELDED WIRE FABRIC (OPTIONAL REINFORCING)

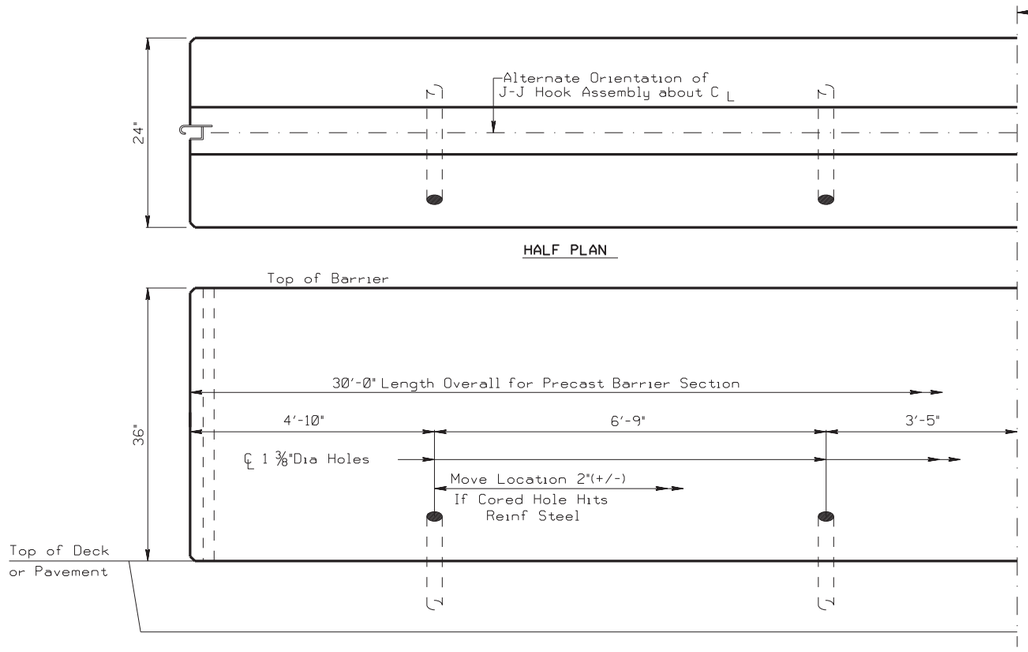
R = Radius
Dia = Diameter

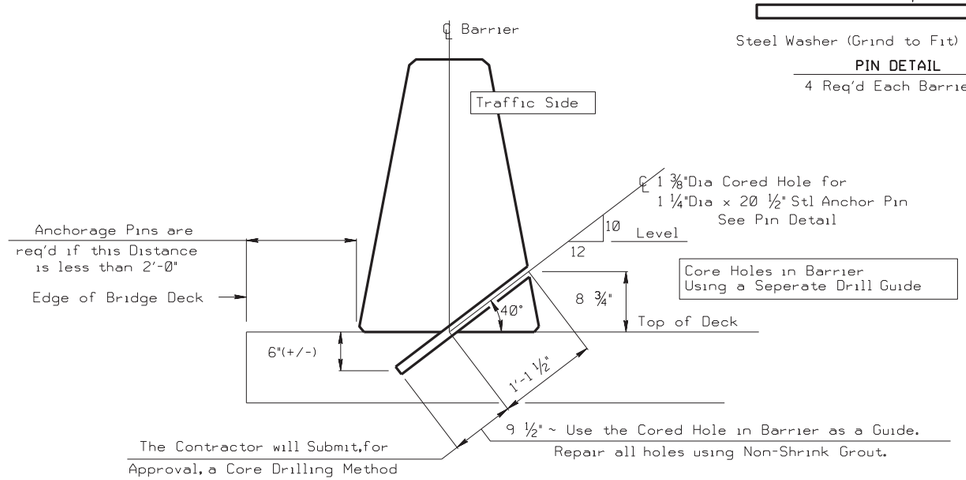
Texas Department of Transportation
Houston District (Roadway)

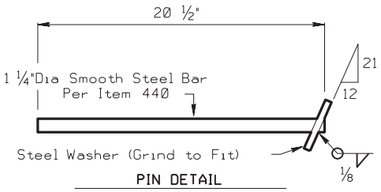
PRECAST SINGLE SLOPE CONCRETE BARRIER (J-J HOOK CONNECTION)

PSSCB-JJ

FILE: STDC3.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
©TxDOT JANUARY 2005	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6		50
12/2004	COUNTY		CONTROL SECT JOB	HIGHWAY
	BRAZORIA		2950 01	FM 2403

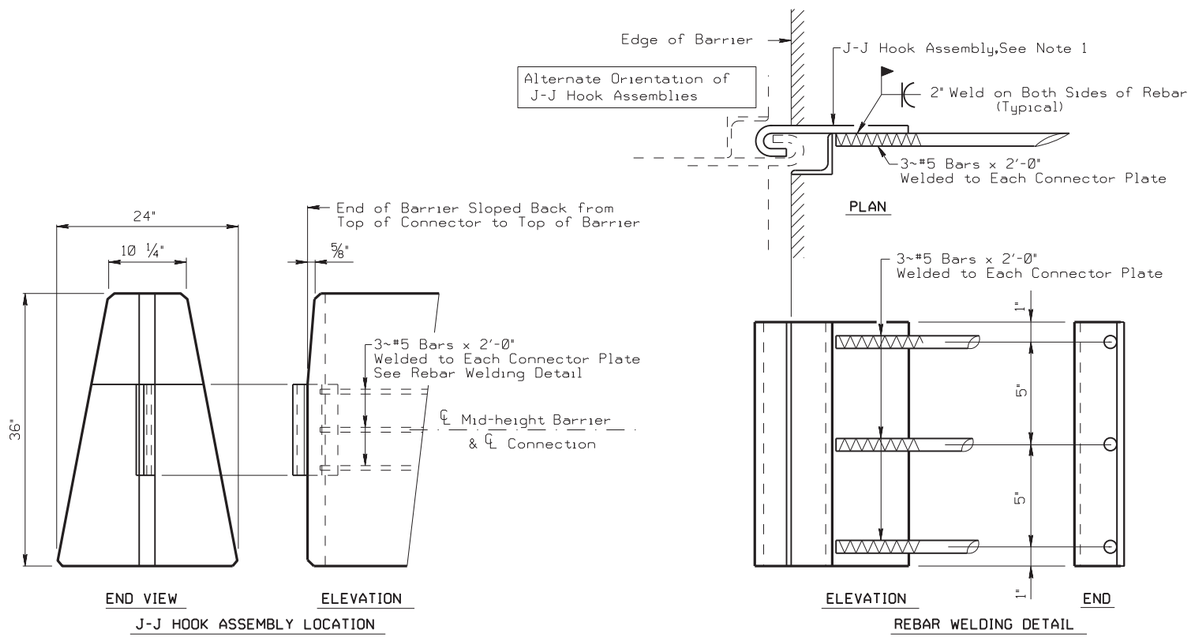






BARRIER ANCHORAGE DETAIL

For Barrier located on Bridge Deck with less than 2' clearance or transition to dissimilar Barrier



J-J HOOK DETAILS

CONNECTOR NOTES AND SPECIFICATIONS

1) J-J Hooks are a patented design as manufactured by EASI-SET Industries, phone 1-800-547-4045. All steel assemblies for joint shall be galvanized after fabrication in accordancewith item 445, "Galvanizing."

2) Reinforcing Steel:
ASTM A-36 (plain).

3) Welding:
All Welding to be in accordance with American Welding Society (AWS) Structural Welding Codes.
Use weldable rebar per Item 440.

4) Tolerances:
J-J Hook assembly tolerances as per manufacturer.
Installation and fabrication tolerances as follows:
Barrier length + 1/4"
Connector location +/- 1/16"

R = Radius
Dia = Diameter

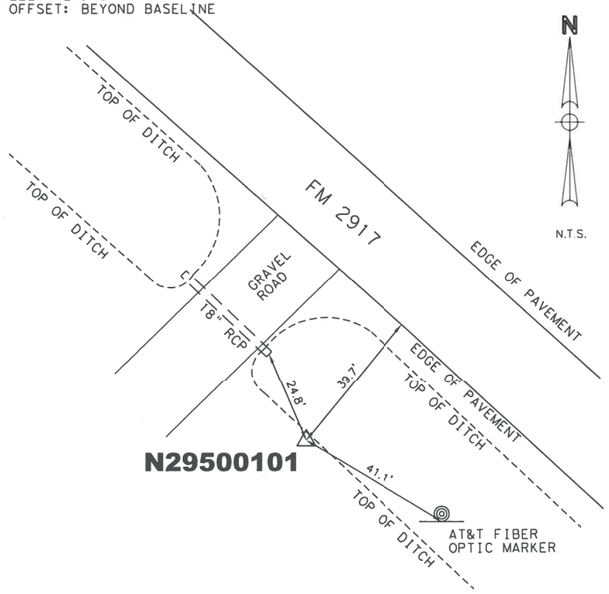
Texas Department of Transportation
Houston District (Roadway)

PRECAST SINGLE SLOPE CONCRETE BARRIER (J-J HOOK CONNECTION)

PSSCB-JJ

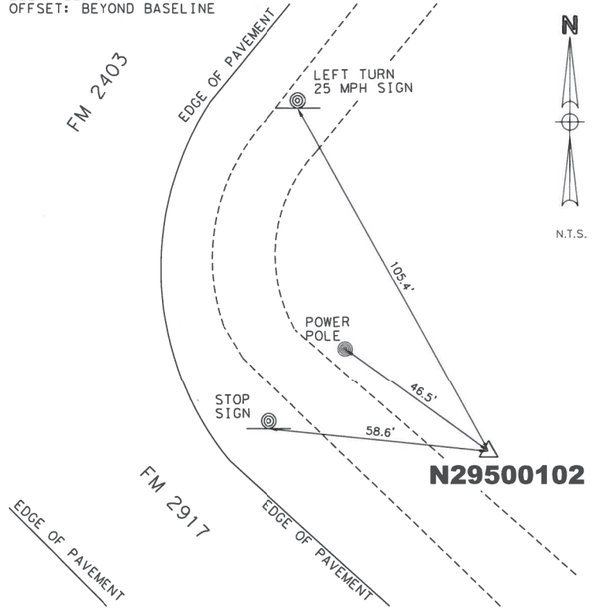
FILE: STDC3.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
©TxDOT JANUARY 2005	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 12/2004	HOUSTON	6		51
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	BRAZORIA	2950	01	008,ETC	FM 2403

N29500101
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP IN CONCRETE
N: 13,684,657.55
E: 3,161,602.69
ELEV: 21.40'
OFFSET: BEYOND BASELINE



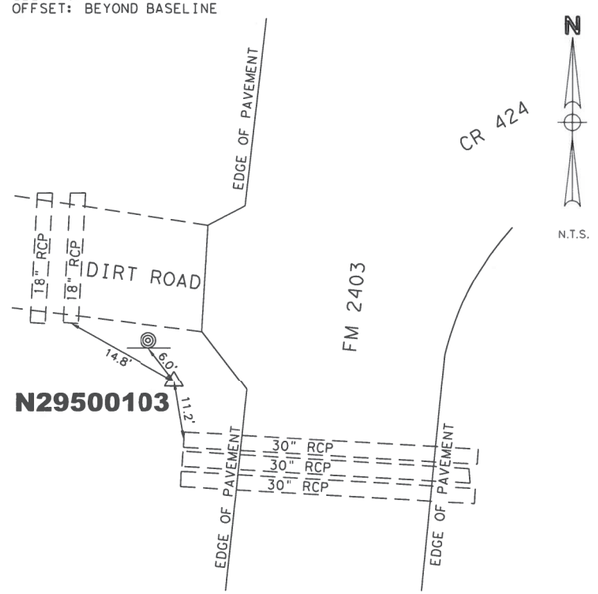
LOCATED 61' WEST OF FM 2917 CENTERLINE,
0.3 MILE SOUTH OF FM 2917 AND FM 2403 INTERSECTION.

N29500102
SET 5/8" IRON RON W/3-1/4"
TXDOT ALUMINUM CAP IN CONCRETE
N: 13,685,699.48
E: 3,160,547.48
ELEV: 22.30'
OFFSET: BEYOND BASELINE



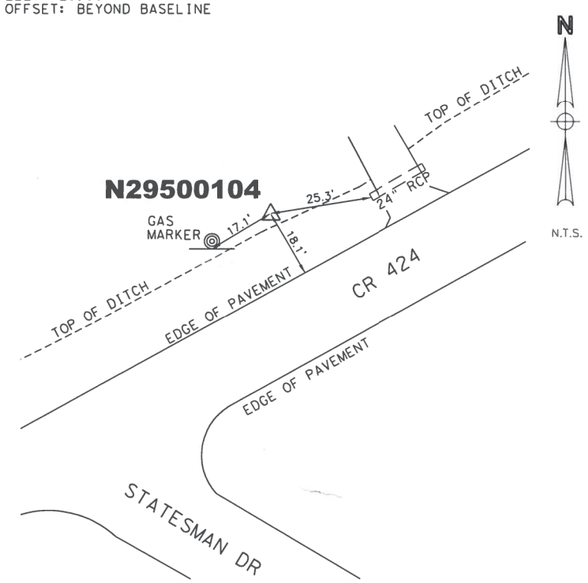
LOCATED ON THE NORTHEAST OF THE INTERSECTION OF
FM 2917 AND FM 2403.

N29500103
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP IN CONCRETE
N: 13,707,152.59
E: 3,161,773.03
ELEV: 30.66'
OFFSET: BEYOND BASELINE



LOCATED ON THE WEST OF THE INTERSECTION OF
FM 2403 AND CR 424 ON THE GRAVEL DRIVE.

N29500104
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP IN CONCRETE
N: 13,708,001.23
E: 3,163,139.37
ELEV: 29.55'
OFFSET: BEYOND BASELINE



LOCATED 29' NORTH OF CR 424 CENTERLINE,
0.3 MILE EAST OF FM 2403 AND CR 424 INTERSECTION.

1. ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204TXSC), NORTH AMERICAN DATUM OF 1983 (NAD83) (2011), EPOCH 2010.0000, ESTABLISHED USING STATIC GPS SESSIONS AND BASE STATION RTK METHOD BASED ON ADKS ADDICKS 1795 CORS ARP, HOU2 HOUSTON 2 COOP CORS ARP, DWI1 CLUTE COOP CORS ARP, LKHU LAKE HOUSTON CORS ARP, TXAG ANGELTON CORS ARP, ZHU1 HOUSTON WAAS 1 CORS ARP, TXLM LA MARQUE CORS ARP, TXGA GALVESTON CORS ARP. COORDINATES ARE SURFACE VALUES EXPRESSED IN US SURVEY FEET AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00013.

2. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) COMPUTED USING GEOID18, ESTABLISHED USING DIGITAL LEVELING METHODS AND BASED ON CONTROL POINT N29500103, HAVING AN ELEVATION OF 30.66'.

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

STATE OF TEXAS
REGISTERED
RICHARD R. DORR
4780
PROFESSIONAL
LAND SURVEYOR

10/06/2020

RICHARD R. DORR
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 4780 SURVEY DATE: 06/2020

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

TranSystems
2777 ALLEN PARKWAY
SUITE 500
HOUSTON, TX 77019
PHONE: 713-807-0600
TBPELS FIRM REG. NO. 100383-01

Texas Department of Transportation

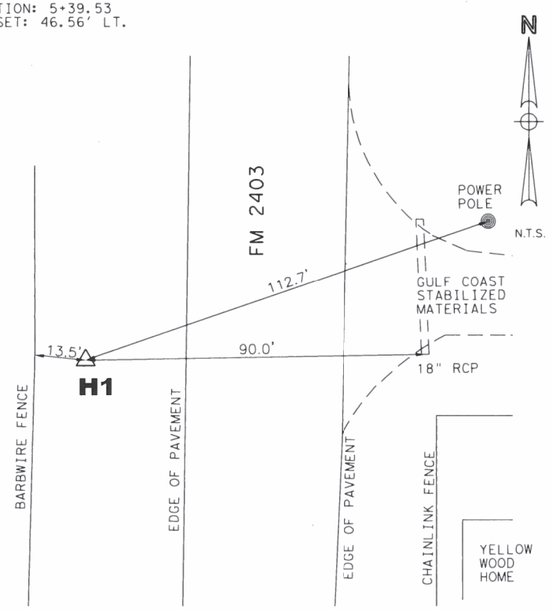
FM 2403
HORIZONTAL AND VERTICAL CONTROL SHEET

SHEET 1 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6			FM 2403
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	HOU	BRAZORIA	52
CHECK	CONTROL	SECTION	JOB	
	2950	01	008, ETC	

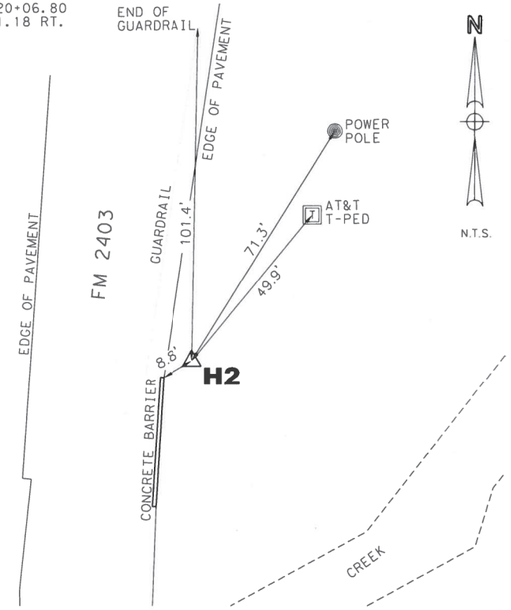
4/20/2023
c:\txdot\pw\online\txdot3\jamie.howell\d0304374\Survey Control.dgn

H1
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,688,174.73
E: 3,160,613.51
ELEV: 20.49'
STATION: 5+39.53
OFFSET: 46.56' LT.



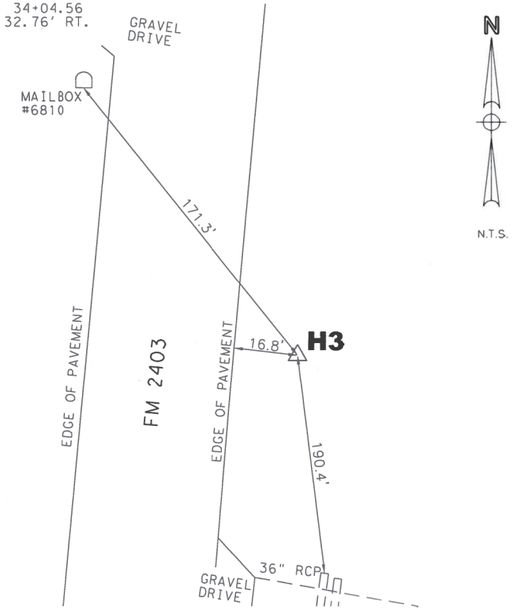
STATION IS LOCATED 46' WEST OF FM 2403 CENTERLINE, 0.5 MILE NORTH OF FM 2917 AND FM 2403 INTERSECTION.

H2
SET 5/8" IRON RON W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,689,635.35
E: 3,160,768.57
ELEV: 22.89'
STATION: 20+06.80
OFFSET: 21.18 RT.



STATION IS LOCATED 25' EAST OF FM 2403 CENTERLINE, 0.7 MILE NORTH OF FM 2917 AND FM 2403 INTERSECTION.

H3
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,691,029.94
E: 3,160,863.43
ELEV: 21.40'
STATION: 34+04.56
OFFSET: 32.76' RT.



STATION IS LOCATED 37' EAST OF FM 2403 CENTERLINE, 1.0 MILE NORTH OF FM 2917 AND FM 2403 INTERSECTION.

1. ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204TXSC), NORTH AMERICAN DATUM OF 1983 (NAD83) (2011), EPOCH 2010.0000, ESTABLISHED USING STATIC GPS SESSIONS AND BASE STATION RTK METHOD BASED ON ADKS ADDICKS 1795 CORS ARP, COH2 HOUSTON 2 COOP CORS ARP, DWI 1CLUTE COOP CORS ARP, LKHU LAKE HOUSTON, TXGA GALVESTON CORS ARP, CORS ARP, TXAG ANGELTON CORS ARP, ZHU1 HOUSTON WAAS 1 CORS ARP, TXLM LA MARQUE CORS ARP. COORDINATES ARE SURFACE VALUES EXPRESSED IN US SURVEY FEET AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00013.
2. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) COMPUTED USING GEOID18, ESTABLISHED USING DIGITAL LEVELING METHODS AND BASED ON CONTROL POINT N29500103, HAVING AN ELEVATION OF 30.66'.

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

STATE OF TEXAS
REGISTERED
RICHARD R. DORR
4780
PROFESSIONAL
LAND SURVEYOR

10/06/2020

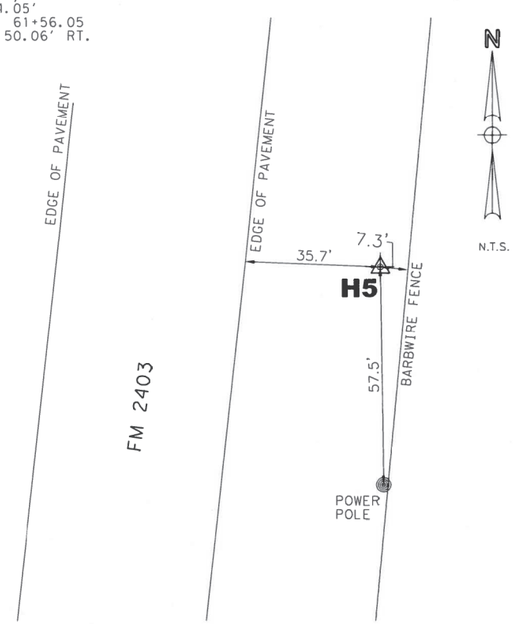
RICHARD R. DORR
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 4780 SURVEY DATE: 06/2020

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

H4
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,692,332.09
E: 3,160,865.93
ELEV: 23.89'
STATION: 47+04.55
OFFSET: 42.35' LT.

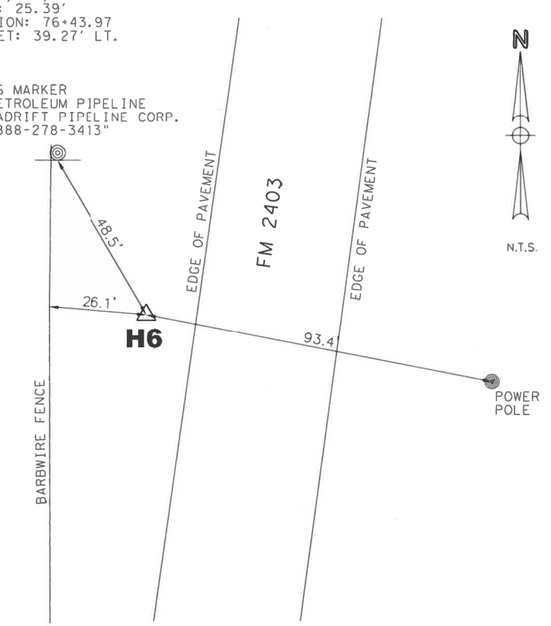
STATION IS LOCATED 37' WEST OF FM 2403 CENTERLINE, 1.3 MILES NORTH OF FM 2917 AND FM 2403 INTERSECTION.

H5
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,693,775.51
E: 3,161,044.67
ELEV: 24.05'
STATION: 61+56.05
OFFSET: 50.06' RT.



STATION IS LOCATED 54' EAST OF FM 2403 CENTERLINE, 1.5 MILES NORTH OF FM 2917 AND FM 2403 INTERSECTION.

H6
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,695,266.11
E: 3,161,044.17
ELEV: 25.39'
STATION: 76+43.97
OFFSET: 39.27' LT.



STATION IS LOCATED 34' EAST OF FM 2403 CENTERLINE, 1.8 MILES NORTH OF FM 2917 AND FM 2403 INTERSECTION.

TranSystems
2777 ALLEN PARKWAY
SUITE 500
HOUSTON, TX 77019
PHONE: 713-807-0600
TBPELS FIRM REG. NO. 100383-01

Texas Department of Transportation

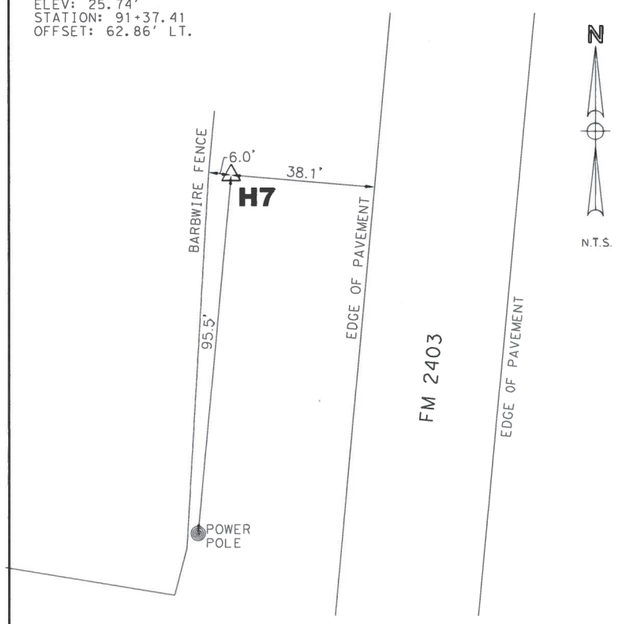
FM 2403
HORIZONTAL AND VERTICAL CONTROL SHEET

SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6			FM 2403
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	HOU	BRAZORIA	53
CHECK	CONTROL	SECTION	JOB	
	2950	01	008, EIC	

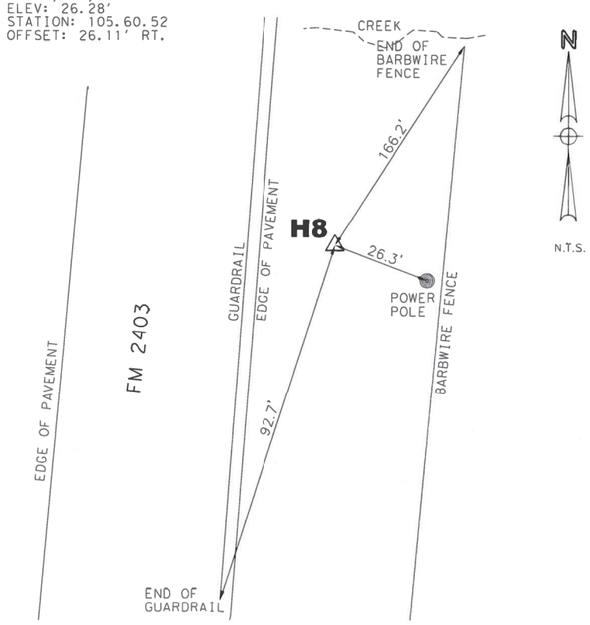
4/20/2023
c:\txdot\pw\online\txdot3\jamie.howell\d0304374\Survey Control.dgn

H7
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,696,758.29
E: 3,161,112.18
ELEV: 25.74'
STATION: 91+37.41
OFFSET: 62.86' LT.



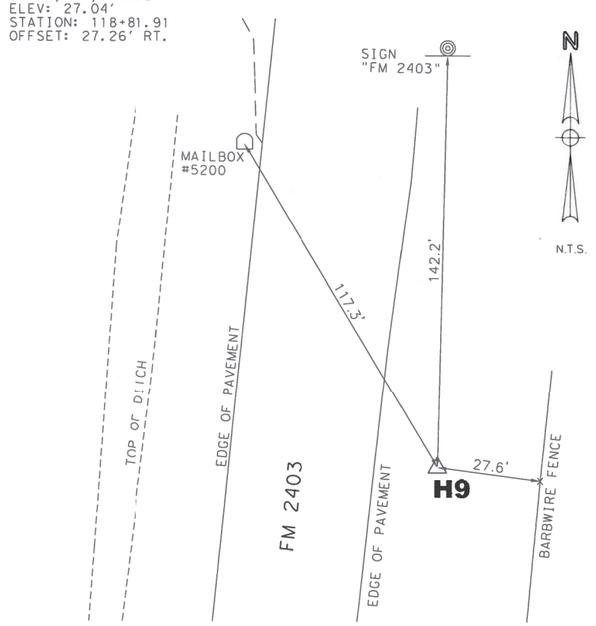
STATION IS LOCATED 57' WEST OF FM 2403 CENTERLINE, 2.1 MILES NORTH OF FM 2917 AND FM 2403 INTERSECTION.

H8
SET 5/8" IRON RON W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,698,173.19
E: 3,161,289.09
ELEV: 26.28'
STATION: 105.60.52
OFFSET: 26.11' RT.



STATION IS LOCATED 37' WEST OF FM 2403 CENTERLINE, 1.7 MILES SOUTH OF CR 424 AND FM 2403 INTERSECTION.

H9
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,699,492.07
E: 3,161,370.52
ELEV: 27.04'
STATION: 118+81.91
OFFSET: 27.26' RT.



STATION IS LOCATED 35' EAST OF FM 2403 CENTERLINE, 1.5 MILES SOUTH OF CR 424 AND FM 2403 INTERSECTION.

1. ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204TXSC), NORTH AMERICAN DATUM OF 1983 (NAD83) (2011), EPOCH 2010.0000, ESTABLISHED USING STATIC GPS SESSIONS AND BASE STATION RTK METHOD BASED ON ADKS ADDICKS 1795 CORS ARP, COH2 HOUSTON 2 COOP CORS ARP, DWI 1CLUTE COOP CORS ARP, LKHU LAKE HOUSTON, TXGA GALVESTON CORS ARP, CORS ARP, TXAG ANGELTON CORS ARP, ZHU1 HOUSTON WAAS 1 CORS ARP, TXLM LA MARQUE CORS ARP. COORDINATES ARE SURFACE VALUES EXPRESSED IN US SURVEY FEET AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00013.

2. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) COMPUTED USING GEOID18, ESTABLISHED USING DIGITAL LEVELING METHODS AND BASED ON CONTROL POINT N29500103, HAVING AN ELEVATION OF 30.66'.

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

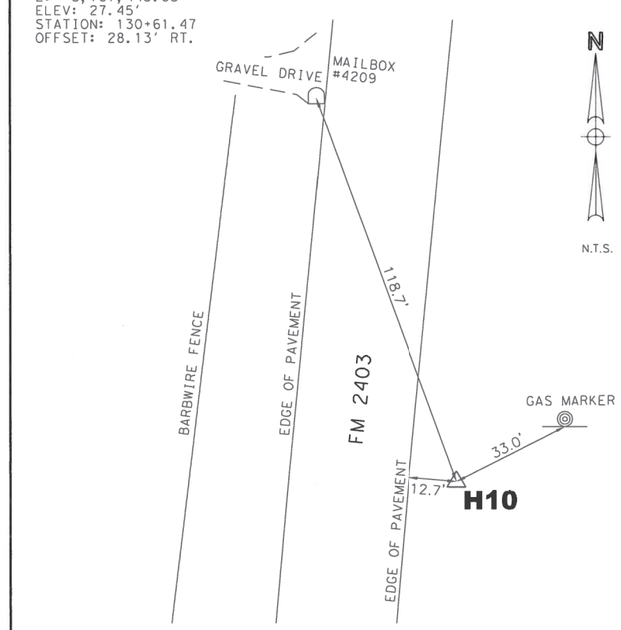
STATE OF TEXAS
REGISTERED
RICHARD R. DORR
4780
PROFESSIONAL
LAND SURVEYOR

10/06/2020

RICHARD R. DORR
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 4780 SURVEY DATE: 06/2020

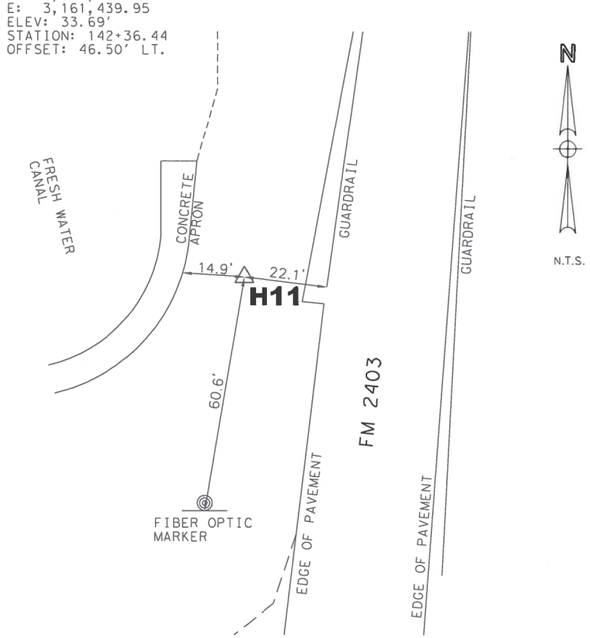
THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

H10
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,700,669.40
E: 3,161,443.05
ELEV: 27.45'
STATION: 130+61.47
OFFSET: 28.13' RT.



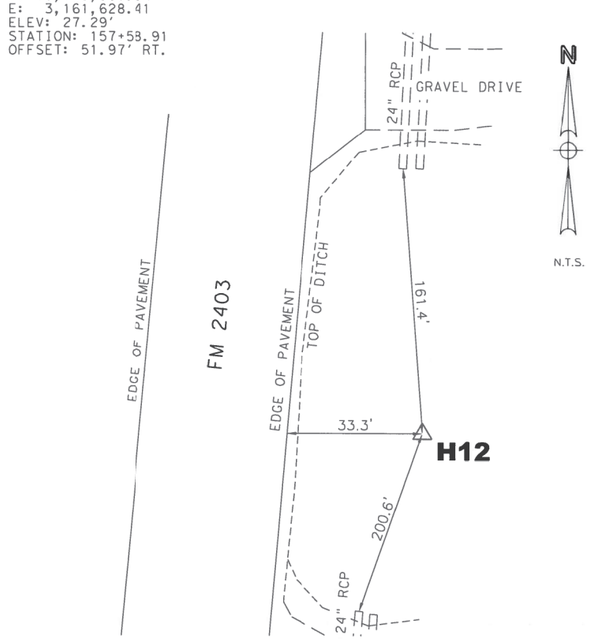
STATION IS LOCATED 33' EAST OF FM 2403 CENTERLINE, 1.2 MILES SOUTH OF CR 424 AND FM 2403 INTERSECTION.

H11
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,701,846.73
E: 3,161,439.95
ELEV: 33.69'
STATION: 142+36.44
OFFSET: 46.50' LT.



STATION IS LOCATED 42' WEST OF FM 2403 CENTERLINE, 1.0 MILE SOUTH OF CR 424 AND FM 2403 INTERSECTION.

H12
SET 5/8" IRON ROD W/3-1/4"
TXDOT ALUMINUM CAP
N: 13,703,360.64
E: 3,161,628.41
ELEV: 27.29'
STATION: 157+58.91
OFFSET: 51.97' RT.



STATION IS LOCATED 52' EAST OF FM 2403 CENTERLINE, 0.7 MILE SOUTH OF CR 424 AND FM 2403 INTERSECTION.

TranSystems
2777 ALLEN PARKWAY
SUITE 500
HOUSTON, TX 77019
PHONE: 713-807-0600
TBPELS FIRM REG. NO. 100383-01

Texas Department of Transportation

FM 2403
HORIZONTAL AND VERTICAL CONTROL SHEET

SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6			FM 2403
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
	TEXAS	HOU	BRAZORIA	54
CHECK	CONTROL	SECTION	JOB	
	2950	01	008, ETC	

4/20/2023
c:\txdot\pw*online1\txdot3\jamie.howell\d0304374\Survey Control.dgn

NORTH ALIGNMENT

Horizontal Alignment Review Report
Report Created: 1/27/2023
Time: 12:57pm
File Name: 3D Alignment.dgn
Last Revised: 1/27/2023 12:52:25
Note: All units in this report are in feet unless specified otherwise.

Alignment Name: N_Prop_CL
Alignment Description:
Alignment Style:

		Station	Northing	Easting
Element: Circular				
PC	( )	156+97.4339 R1	13701314.06	3161450.72
PI	( )	158+37.6749 R1	13701454.03	3161459.36
CC	( )		13700605.56	3172928.87
PRC	( )	159+77.9020 R1	13701593.75	3161471.41
Radius:		11500.0000		
Delta:		1°23'50.5"	Right	
Degree of Curvature (Arc):			0°29'53.6"	
Length:		280.4681		
Tangent:		140.2410		
Chord:		280.4612		
Middle Ordinate:		0.8550		
External:		0.8551		
Tangent Direction:		N 3°31'55.69" E		
Radial Direction:		S 86°28'04.31" E		
Chord Direction:		N 4°13'50.93" E		
Radial Direction:		S 85°04'13.82" E		
Tangent Direction:		N 4°55'46.18" E		
Element: Circular				
PRC	( )	159+77.9020 R1	13701593.75	3161471.41
PI	( )	161+08.8482 R1	13701724.22	3161482.66
CC	( )		13702581.95	3150013.95
PT	( )	162+39.7831 R1	13701854.90	3161490.94
Radius:		11500.0000		
Delta:		1°18'17.1"	Left	
Degree of Curvature (Arc):			0°29'53.6"	
Length:		261.8811		
Tangent:		130.9462		
Chord:		261.8754		
Middle Ordinate:		0.7454		
External:		0.7455		
Tangent Direction:		N 4°55'46.18" E		
Radial Direction:		S 85°04'13.82" E		
Chord Direction:		N 4°16'37.62" E		
Radial Direction:		S 86°22'30.94" E		
Tangent Direction:		N 3°37'29.06" E		
Element: Linear				
PT	( )	162+39.7831 R1	13701854.90	3161490.94
PC	( )	165+40.7043 R1	13702155.22	3161509.97
Tangential Direction:		N 3°37'29.06" E		
Tangential Length:		300.9212		
Element: Circular				
PC	( )	165+40.7043 R1	13702155.22	3161509.97
PI	( )	166+95.1416 R1	13702309.35	3161519.73
CC	( )		13702882.27	3150032.97
PRC	( )	168+49.5604 R1	13702463.68	3161525.35
Radius:		11500.0000		
Delta:		1°32'19.7"	Left	
Degree of Curvature (Arc):			0°29'53.6"	
Length:		308.8561		
Tangent:		154.4373		
Chord:		308.8468		
Middle Ordinate:		1.0369		
External:		1.0369		
Tangent Direction:		N 3°37'29.06" E		
Radial Direction:		S 86°22'30.94" E		
Chord Direction:		N 2°51'19.23" E		
Radial Direction:		S 87°54'50.60" E		
Tangent Direction:		N 2°05'09.40" E		
Element: Circular				
PRC	( )	168+49.5604 R1	13702463.68	3161525.35
PI	( )	169+94.7026 R1	13702608.73	3161530.63
CC	( )		13702045.10	3173017.73
PT	( )	171+39.8295 R1	13702753.59	3161539.58
Radius:		11500.0000		
Delta:		1°26'46.3"	Right	
Degree of Curvature (Arc):			0°29'53.6"	
Length:		290.2691		
Tangent:		145.1423		
Chord:		290.2614		
Middle Ordinate:		0.9158		
External:		0.9159		
Tangent Direction:		N 2°05'09.40" E		
Radial Direction:		S 87°54'50.60" E		
Chord Direction:		N 2°48'32.54" E		
Radial Direction:		S 86°28'04.31" E		
Tangent Direction:		N 3°31'55.69" E		

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

HORIZONTAL ALIGNMENT DATA

Texas Department of Transportation®
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CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		55

SCALE 1"=100'
SHEET 1 OF 2

4/20/2023
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SOUTH ALIGNMENT

Horizontal Alignment Review Report
Report Created: 1/27/2023
Time: 12:53pm
File Name: 3D Alignment.dgn
Last Revised: 1/27/2023 12:52:25
Note: All units in this report are in feet unless specified otherwise.

Alignment Name: S_Prop_CL
Alignment Description:
Alignment Style:

		Station	Northing	Easting
Element: Circular				
PC	( )	32+36.6469 R1	13688867.76	3160699.99
PI	( )	33+75.3078 R1	13689006.18	3160708.08
CC	( )		13689538.79	3149219.59
PRC	( )	35+13.9552 R1	13689144.76	3160712.83
Radius:		11500.0000		
Delta:		1°22'53.8"	Left	
Degree of Curvature (Arc):			0°29'53.6"	
Length:		277.3083		
Tangent:		138.6608		
Chord:		277.3015		
Middle Ordinate:		0.8359		
External:		0.8359		
Tangent Direction:		N 3°20'42.60" E		
Radial Direction:		S 86°39'17.40" E		
Chord Direction:		N 2°39'15.69" E		
Radial Direction:		S 88°02'11.22" E		
Tangent Direction:		N 1°57'48.78" E		
Element: Circular				
PRC	( )	35+13.9552 R1	13689144.76	3160712.83
PI	( )	36+56.9350 R1	13689287.66	3160717.73
CC	( )		13688750.73	3172206.08
PT	( )	37+99.9000 R1	13689430.39	3160726.18
Radius:		11500.0000		
Delta:		1°25'28.7"	Right	
Degree of Curvature (Arc):			0°29'53.6"	
Length:		285.9448		
Tangent:		142.9798		
Chord:		285.9374		
Middle Ordinate:		0.8887		
External:		0.8888		
Tangent Direction:		N 1°57'48.78" E		
Radial Direction:		S 88°02'11.22" E		
Chord Direction:		N 2°40'33.15" E		
Radial Direction:		S 86°36'42.49" E		
Tangent Direction:		N 3°23'17.51" E		
Linear				
PT	( )	37+99.9000 R1	13689430.39	3160726.18
PC	( )	40+06.7803 R1	13689636.90	3160738.41
Tangential Direction:		N 3°23'17.51" E		
Tangential Length:		206.8803		
Element: Circular				
PC	( )	40+06.7803 R1	13689636.90	3160738.41
PI	( )	41+39.5017 R1	13689769.39	3160746.25
CC	( )		13688957.25	3172218.31
PRC	( )	42+72.2112 R1	13689901.67	3160757.15
Radius:		11500.0000		
Delta:		1°19'20.8"	Right	
Degree of Curvature (Arc):			0°29'53.6"	
Length:		265.4309		
Tangent:		132.7213		
Chord:		265.4250		
Middle Ordinate:		0.7658		
External:		0.7658		
Tangent Direction:		N 3°23'17.51" E		
Radial Direction:		S 86°36'42.49" E		
Chord Direction:		N 4°02'57.90" E		
Radial Direction:		S 85°17'21.70" E		
Tangent Direction:		N 4°42'38.30" E		
Element: Circular				
PRC	( )	42+72.2112 R1	13689901.67	3160757.15
PI	( )	44+09.2514 R1	13690038.24	3160768.41
CC	( )		13690846.09	3149296.00
PT	( )	45+46.2787 R1	13690175.05	3160776.40
Radius:		11500.0000		
Delta:		1°21'55.7"	Left	
Degree of Curvature (Arc):			0°29'53.6"	
Length:		274.0675		
Tangent:		137.0402		
Chord:		274.0610		
Middle Ordinate:		0.8164		
External:		0.8165		
Tangent Direction:		N 4°42'38.30" E		
Radial Direction:		S 85°17'21.70" E		
Chord Direction:		N 4°01'40.45" E		
Radial Direction:		S 86°39'17.40" E		
Tangent Direction:		N 3°20'42.60" E		

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

HORIZONTAL ALIGNMENT DATA

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CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		56

SCALE 1"=100'
SHEET 2 OF 2

4/20/2023
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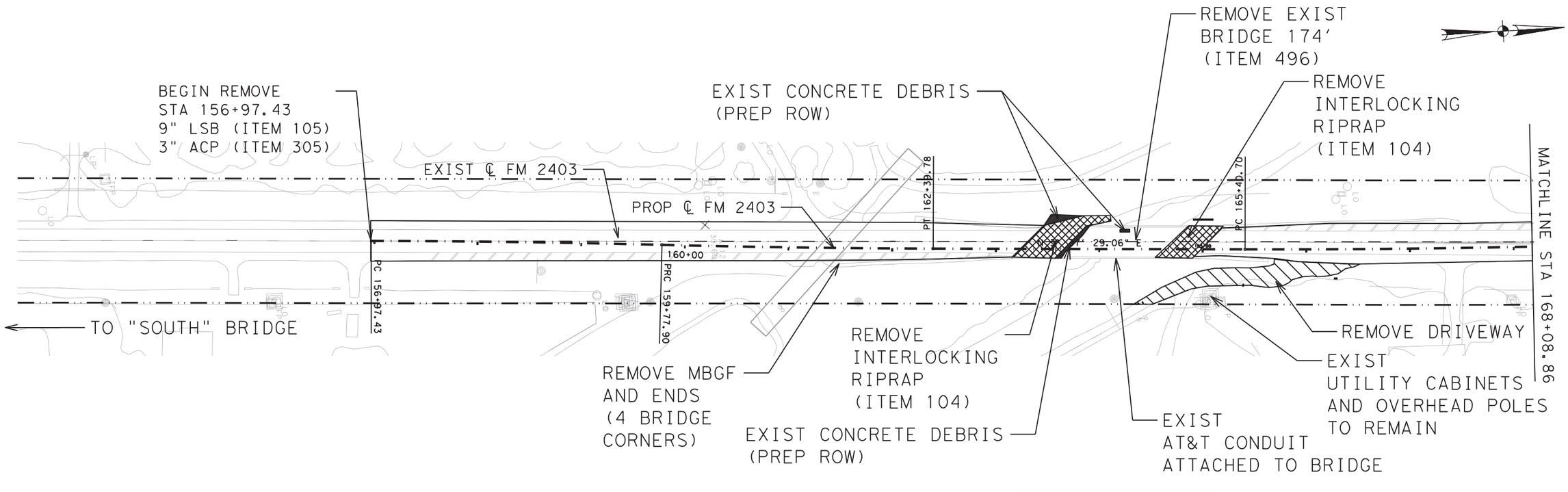
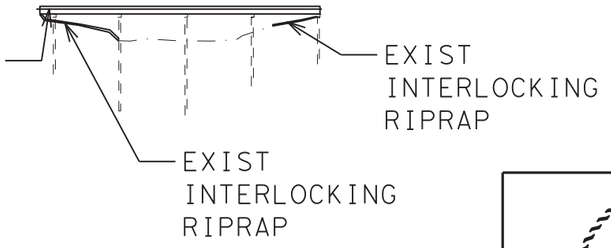
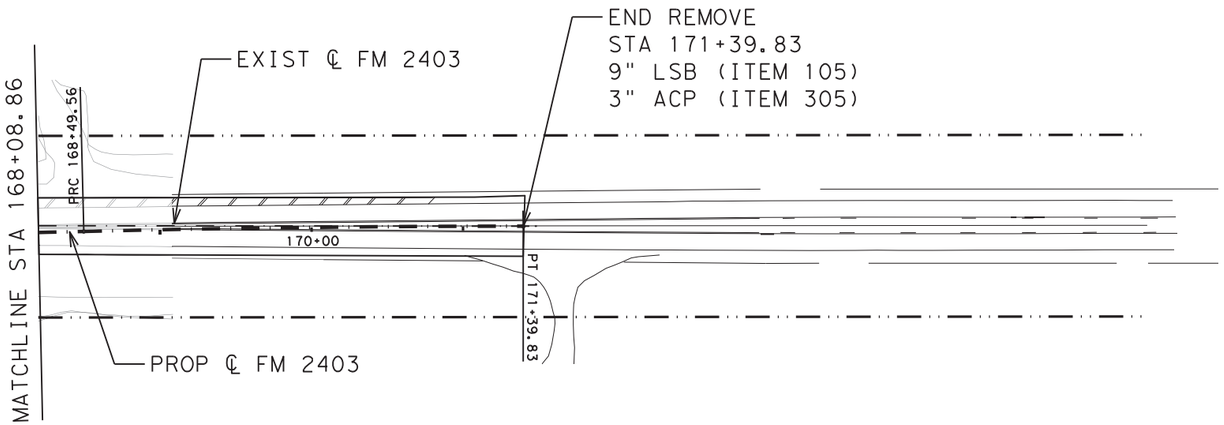


UTILITY CONDUIT WILL BE EMPTIED PRIOR TO CONSTRUCTION. CONFIRM BEFORE CUTTING.





STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

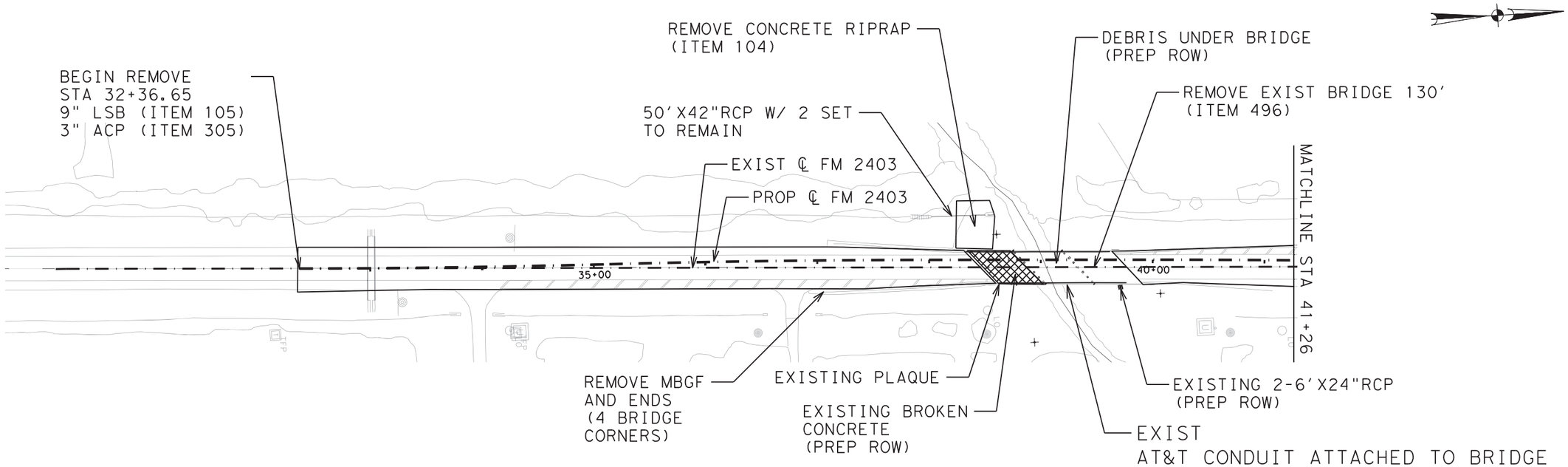
4/20/2023

NORTH REMOVAL LAYOUT

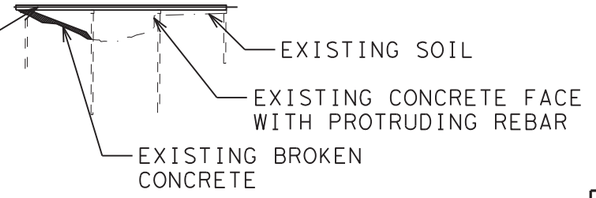
CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		57

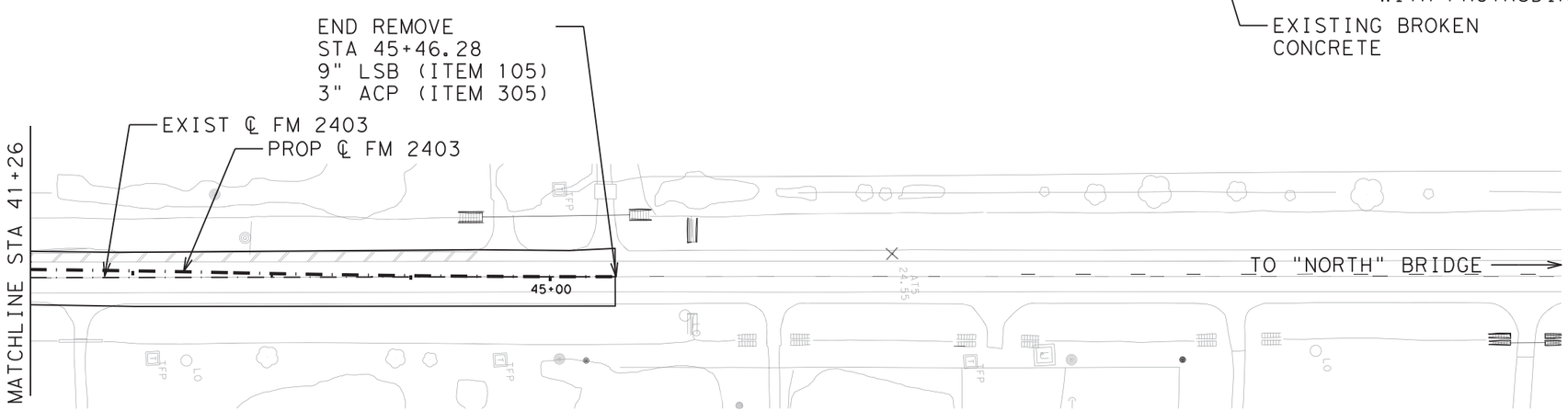
SCALE 1"=000'
SHEET 1 OF 1

4/20/2023
c:\txdot\pw*online\txdot3\jamie.howell\d0304374\Removal North.dgn



UTILITY CONDUIT WILL BE EMPTIED PRIOR TO CONSTRUCTION. CONFIRM BEFORE CUTTING.





STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

SOUTH REMOVAL LAYOUT

Texas Department of Transportation®

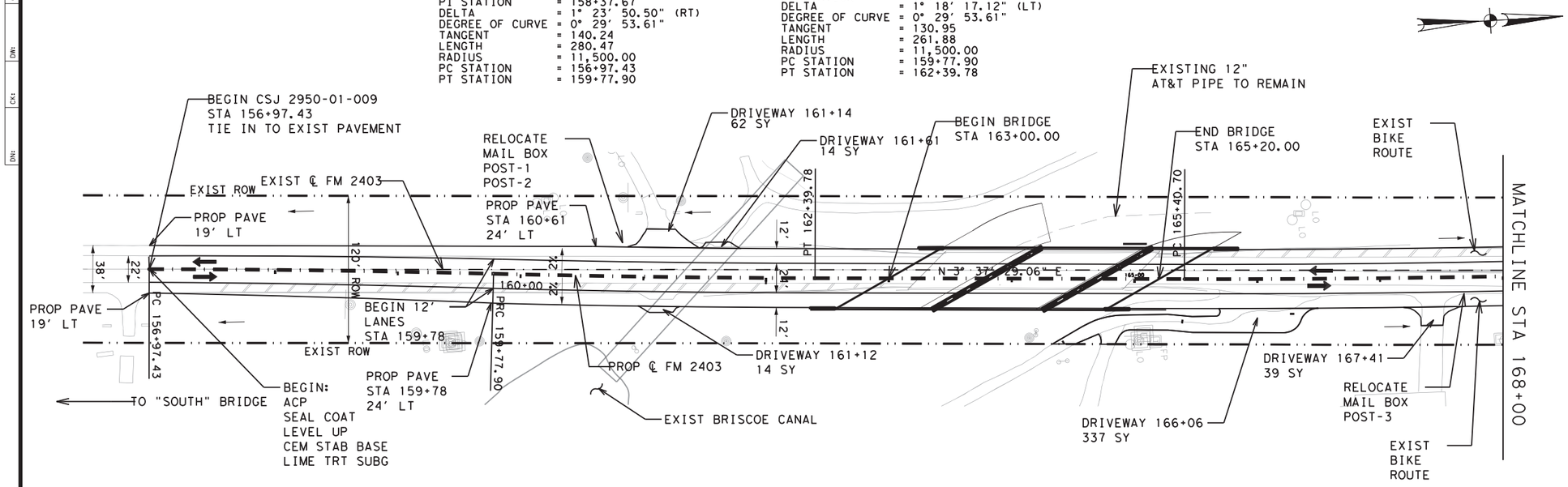
CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		58

SCALE 1"=100'
SHEET 1 OF 1

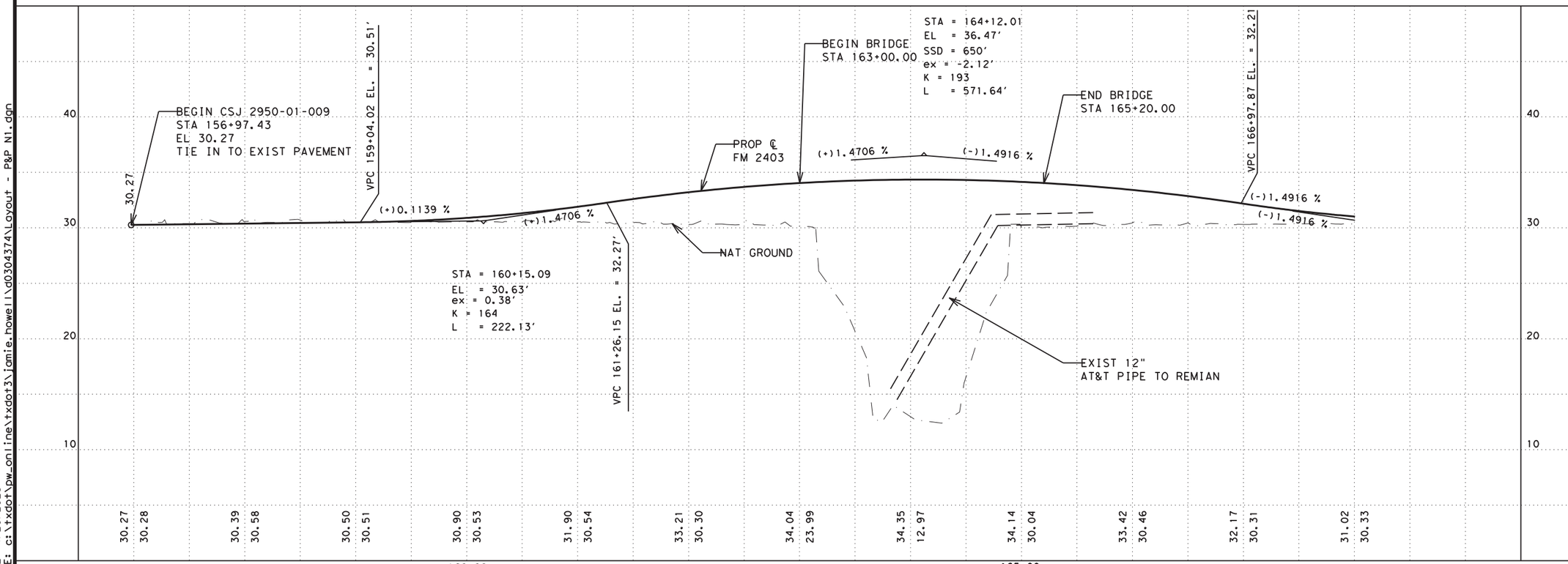
4/20/2023
c:\txdot\pw*online\txdot3\jamie.howell\d0304374\Removal South.dgn

PI STATION = 158+37.67
DELTA = 1° 23' 50.50" (RT)
DEGREE OF CURVE = 0° 29' 53.61"
TANGENT = 140.24
LENGTH = 280.47
RADIUS = 11,500.00
PC STATION = 156+97.43
PT STATION = 159+77.90

PI STATION = 161+08.85
DELTA = 1° 18' 17.12" (LT)
DEGREE OF CURVE = 0° 29' 53.61"
TANGENT = 130.95
LENGTH = 261.88
RADIUS = 11,500.00
PC STATION = 159+77.90
PT STATION = 162+39.78



PI STATION = 166+95.14
DELTA = 1° 32' 19.66" (LT)
DEGREE OF CURVE = 0° 29' 53.61"
TANGENT = 154.44
LENGTH = 308.86
RADIUS = 11,500.00
PC STATION = 165+40.70
PT STATION = 168+49.56



STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

FM 2403 NORTH PLAN & PROFILE

SHEET 1 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
2950	01	008, ETC	FM 2403
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		59

DATE: 4/20/2023 4:59:15 PM
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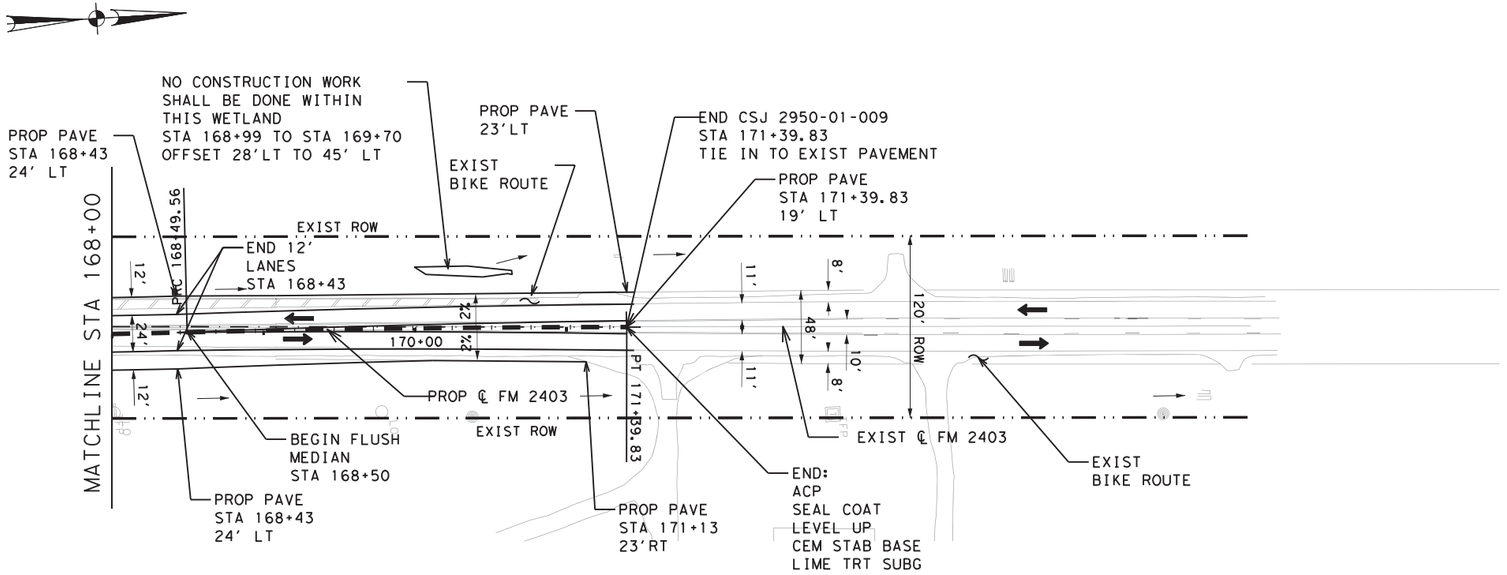
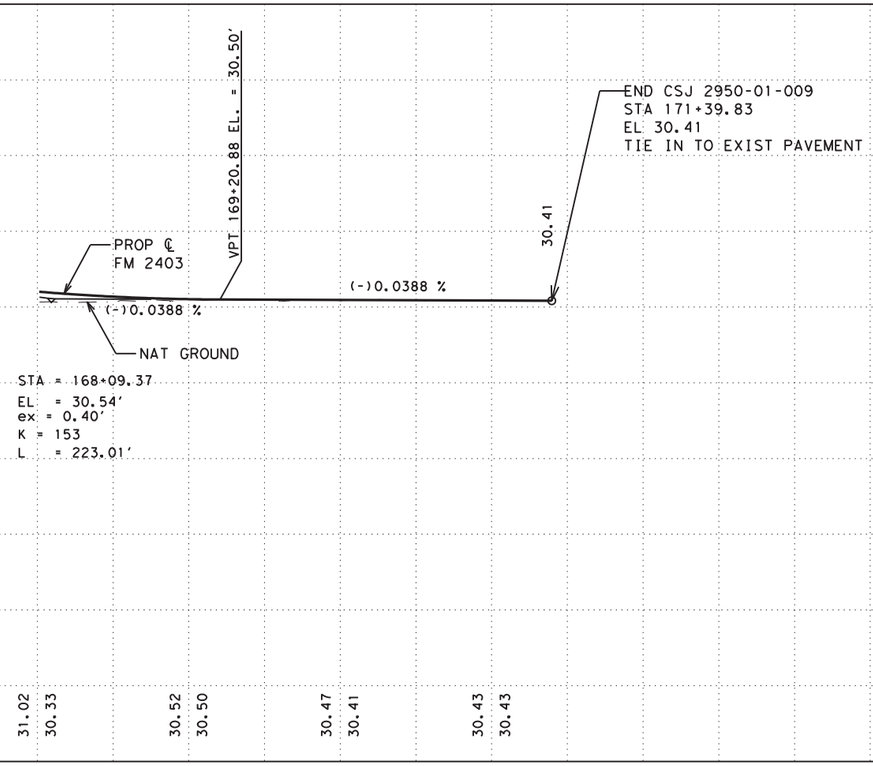


PI STATION = 169+94.70
DELTA = 1° 26' 46.29" (RT)
DEGREE OF CURVE = 0° 29' 53.61"
TANGENT = 145.14
LENGTH = 290.27
RADIUS = 11,500.00
PC STATION = 168+49.56
PT STATION = 171+39.83



JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

Jamie A.H. Jones, P.E.

5/19/2023

FM 2403 NORTH PLAN & PROFILE

SHEET 2 OF 2

Texas Department of Transportation

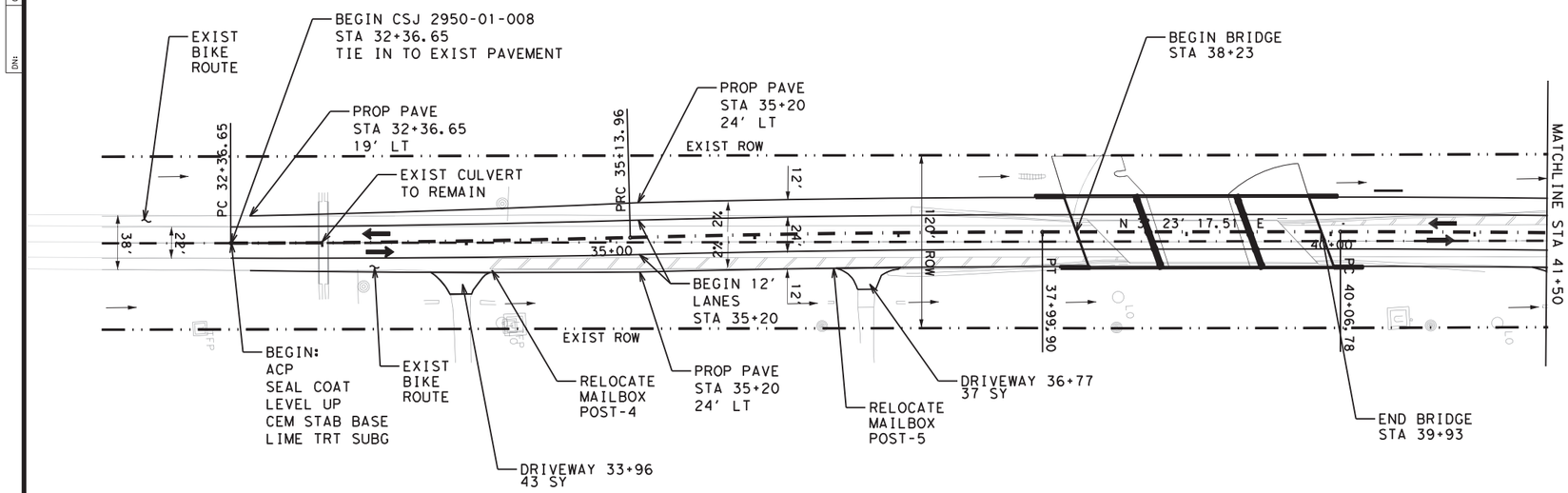
CONT	SECT	JOB	HIGHWAY
2950	01	008, ETC	FM 2403
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		60

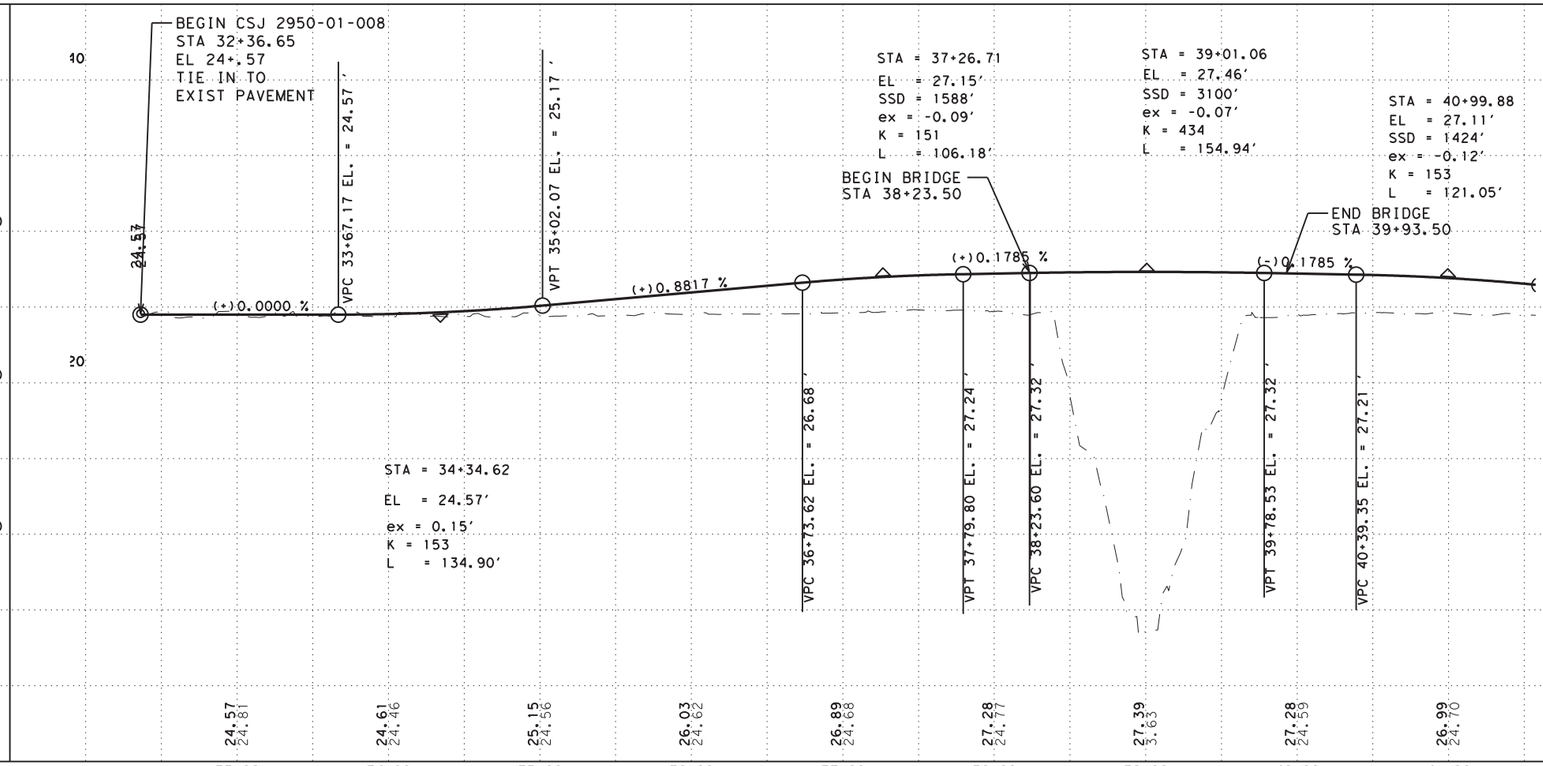
DATE: 5/5/2023 2:45:20 PM
FILE: c:\txdot\pw_online\txdot3\jamie.howell\d0304374\Layout - P&P N2.dgn

PI STATION = 33+75.31
DELTA = 1° 22' 53.82" (LT)
DEGREE OF CURVE = 0° 29' 53.61"
TANGENT = 138.66
LENGTH = 277.31
RADIUS = 11,500.00
PC STATION = 32+36.65
PT STATION = 35+13.96

PI STATION = 36+56.93
DELTA = 1° 25' 28.73" (RT)
DEGREE OF CURVE = 0° 29' 53.61"
TANGENT = 142.98
LENGTH = 285.94
RADIUS = 11,500.00
PC STATION = 35+13.96
PT STATION = 37+99.90

PI STATION = 41+39.50
DELTA = 1° 19' 20.79" (RT)
DEGREE OF CURVE = 0° 29' 53.61"
TANGENT = 132.72
LENGTH = 265.43
RADIUS = 11,500.00
PC STATION = 40+06.78
PT STATION = 42+72.21





STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/27/2023

FM 2403 SOUTH PLAN & PROFILE

SHEET 1 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
2950	01	008, ETC	FM 2403
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		61

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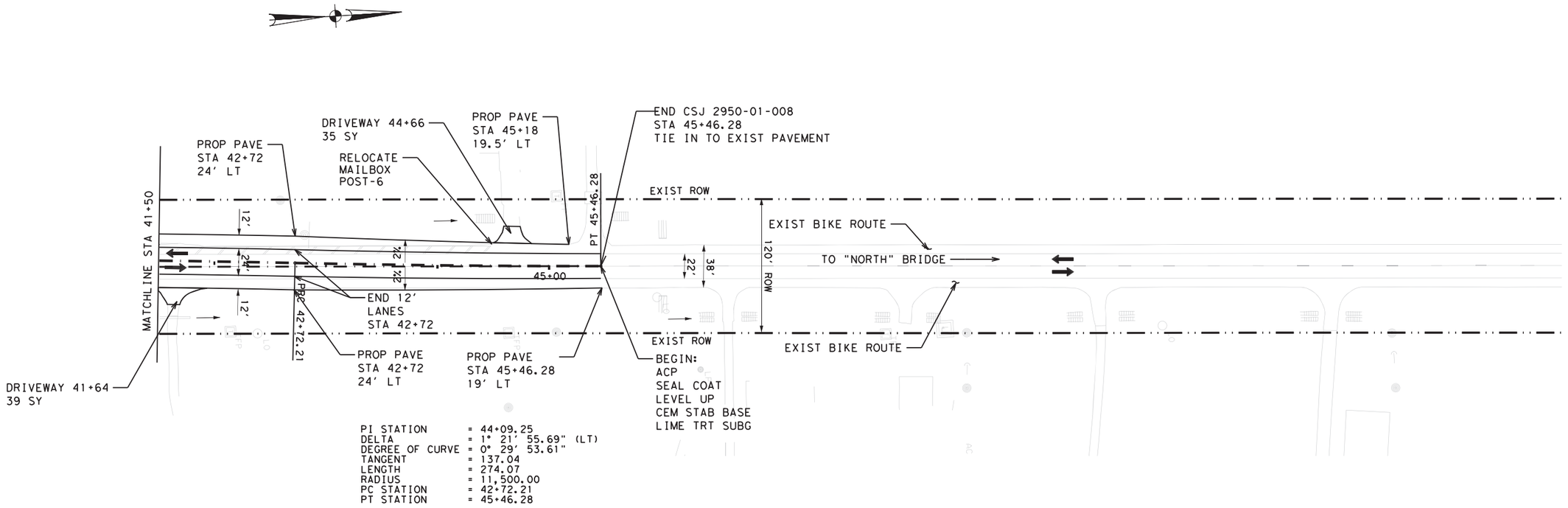

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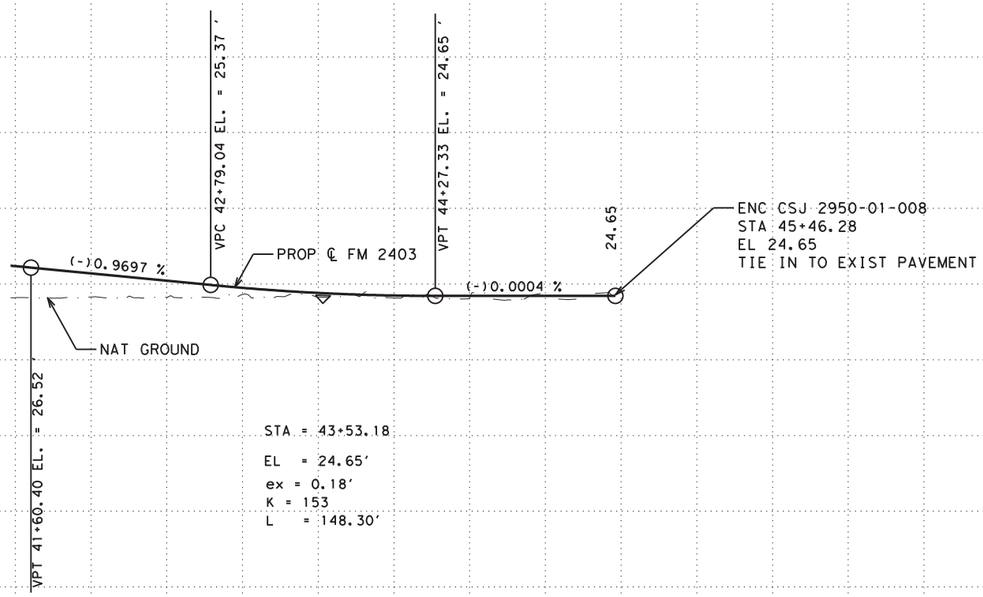

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED
PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/27/2023

FM 2403 SOUTH PLAN & PROFILE

SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
2950	01	008, ETC	FM 2403
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		62

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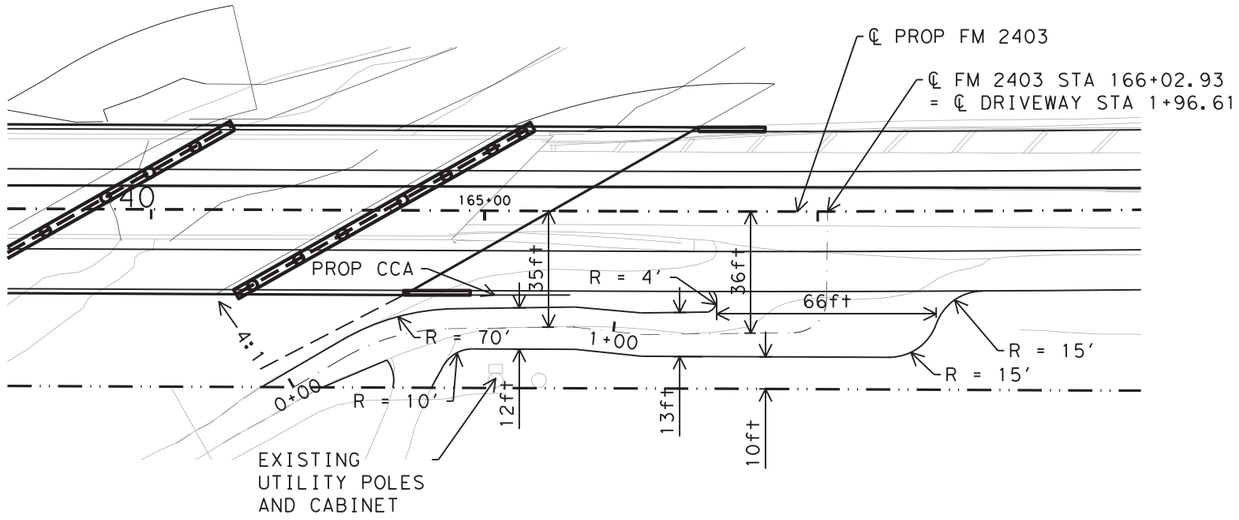
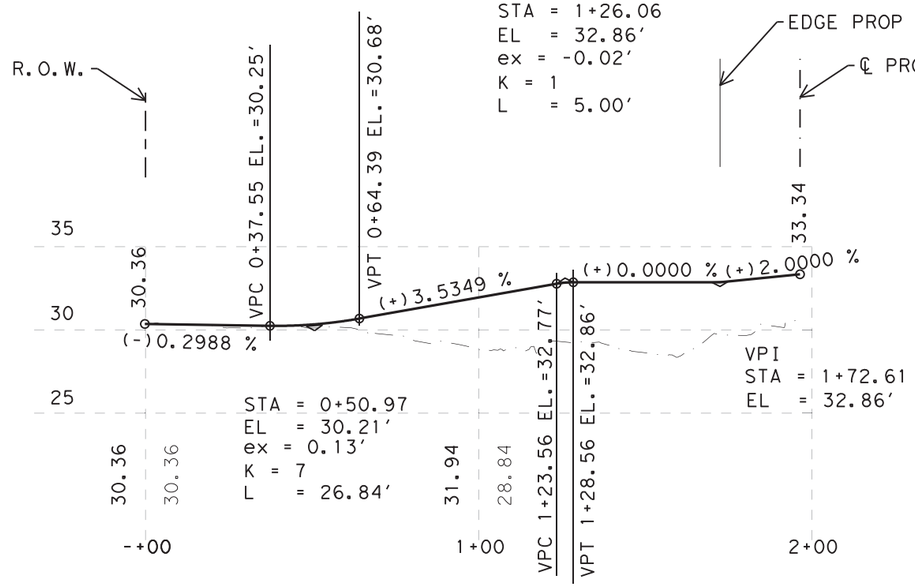


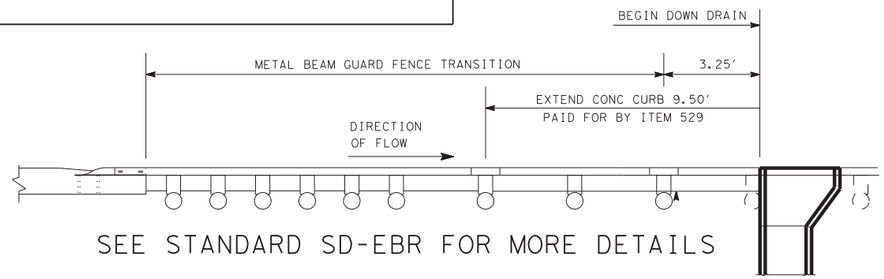


PROPOSED DRIVEWAY DETAILS
STA 166+03

EXISTING DEBRIS IN
NORTH DRAINAGE DITCH
TO BE REMOVED UNDER ITEM 100

DOWN DRAIN LOCATION DETAILS

STA	SIDE	432-6002 PROP RIPRAP CY	529-6002 PROP CONC CURB LF	104-6033 REMOVE CONC SY
37+93	RT	2	9.5	10
37+76	LT	2	9.5	8
40+41	RT	2	9.5	9
40+23	LT	1	9.5	6
		1	9.5	3
162+17	RT	2	9.5	11
163+05	LT	2	9.5	7
165+15	RT	2	9.5	9
166+03	LT	2	9.5	8



SEE STANDARD SD-EBR FOR MORE DETAILS

STATE OF TEXAS
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MISCELLANEOUS DETAILS

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CONT.	SECT.	JOB	HIGHWAY NO.
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SCALE N.T.S.
SHEET 1 OF 1

4/20/2023
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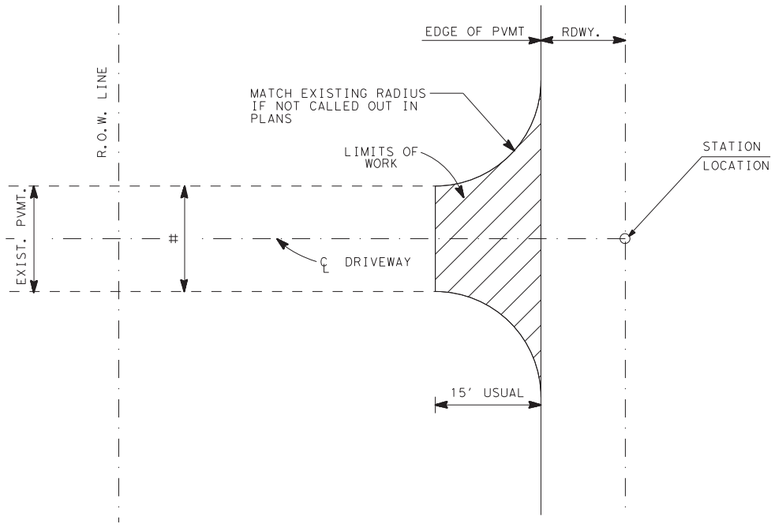
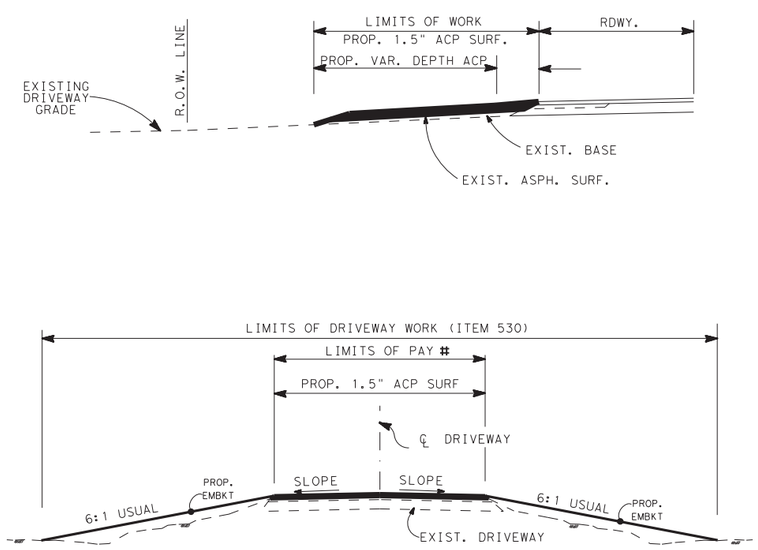


PLAN (TYPE II)

PRIVATE & COMMERCIAL DRIVEWAYS

NOTE:
1. EMBANKMENT, SCARIFYING OF BASE, PRIME, FLEX BASE, AND ASPH CONC PAV SHALL BE PLACED IN ACCORDANCE WITH ITEM 132, 247, 251, 310, 3076 AND SHALL BE INCIDENTAL TO ITEM 530.

MATCH WIDTH OF EXISTING DRIVEWAY.



PROFILE (TYPE II)

PRIVATE & COMMERCIAL DRIVEWAYS

SCALE N.T.S.
SHEET 1 OF 1

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

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DRIVEWAY DETAILS

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4/20/2023
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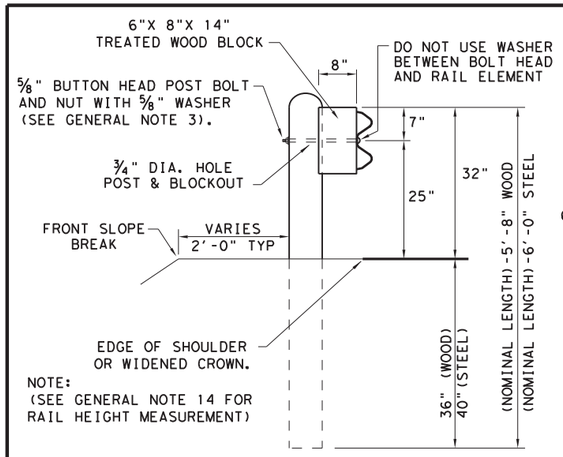
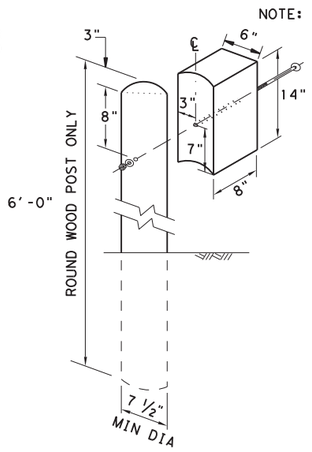
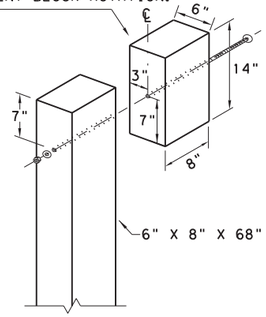


TYPICAL POST PLACEMENT

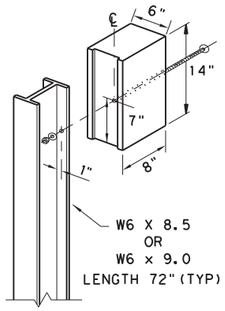


WOOD BLOCK TO ROUND WOOD POST

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

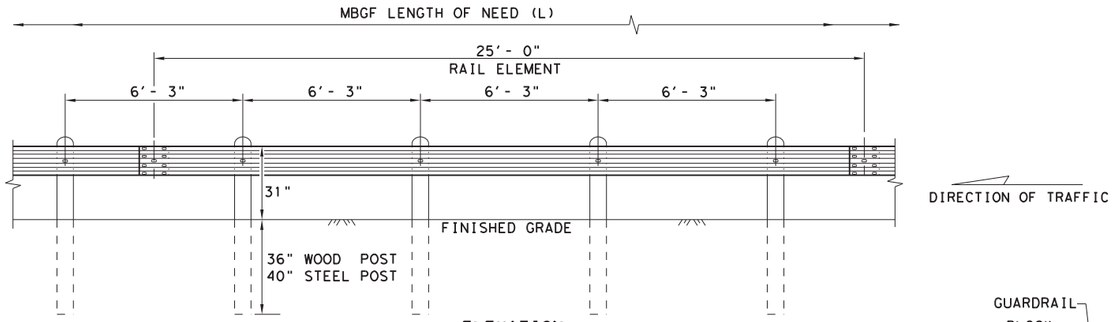


WOOD BLOCK TO RECTANGULAR WOOD POST



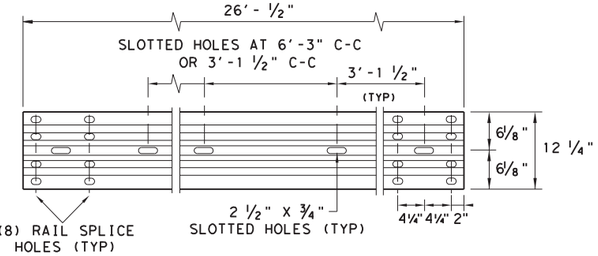
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



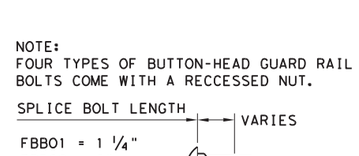
ELEVATION
MID-SPAN RAIL SPLICE

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



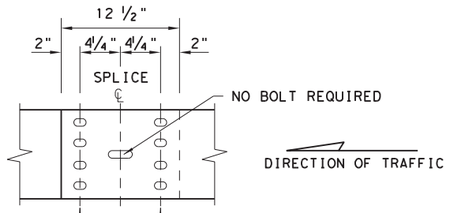
ELEVATION 25'- 0" (NOM.) W-BEAM SECTION

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



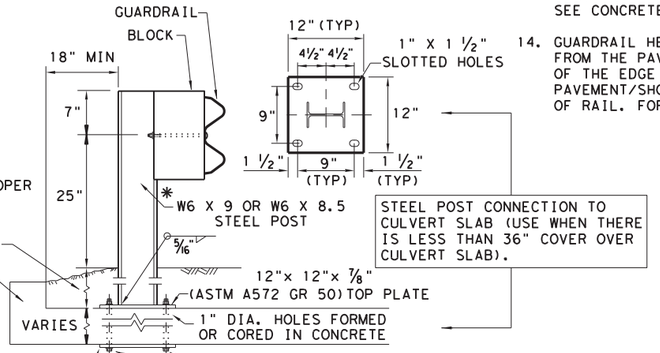
BUTTON HEAD BOLT

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.



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

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. ⅞" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 ¼" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE ⅞" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS ¼" MIN. BEYOND NUT.

NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

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
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		65

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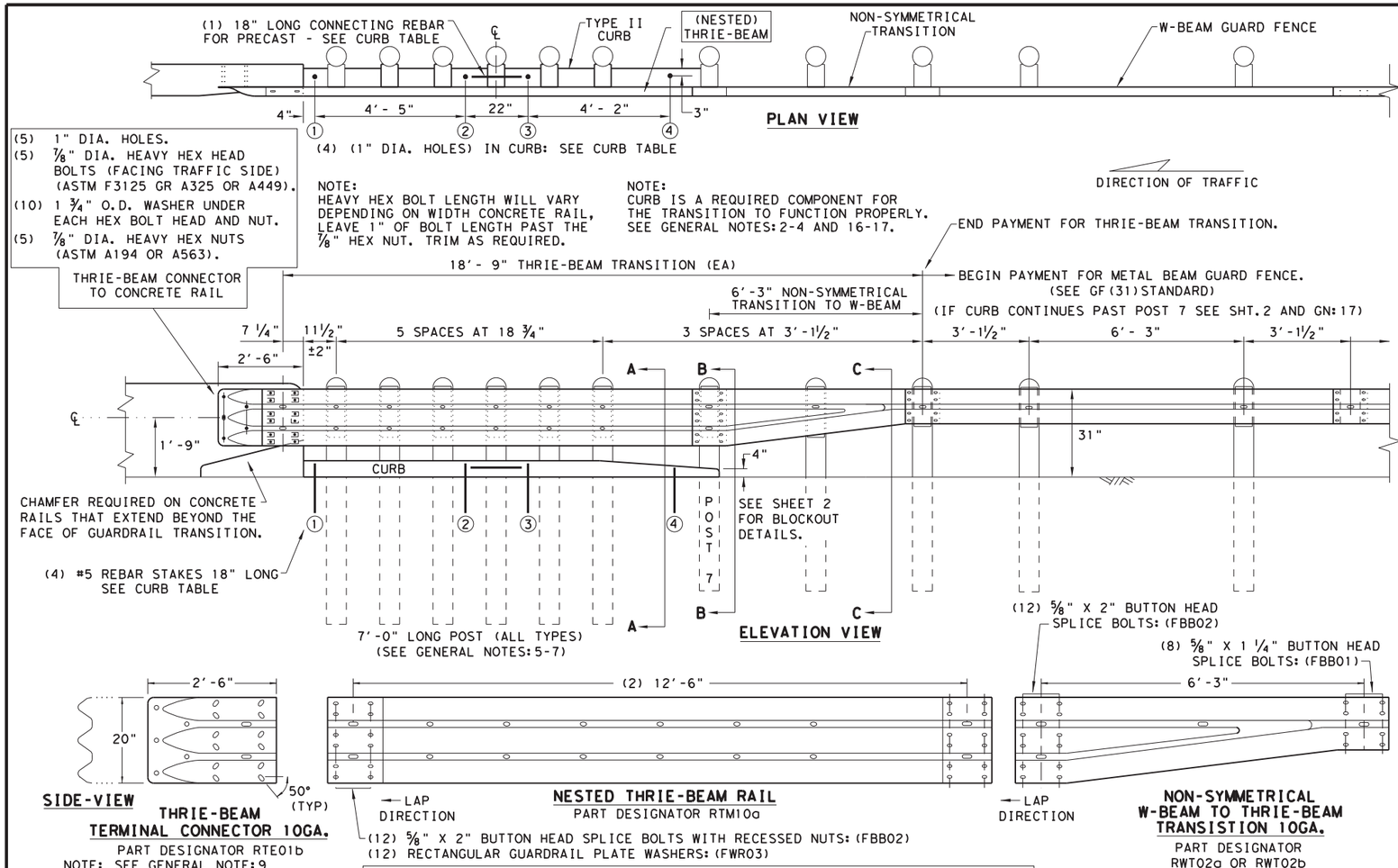


GENERAL NOTES

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

THRIE-BEAM TERMINAL - CURB TABLE

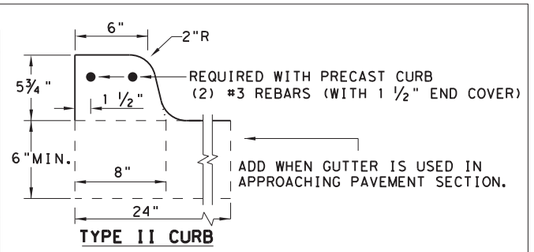
PRECAST CURB FULL LENGTH EQUALS 12'- 2"
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

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

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

SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *:
FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND 1/2" BELOW TOP OF CURB.
FILL HOLES WITH APPROVED GROUT MIXTURE.

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



TYPE II CURB

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31tr-tl320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
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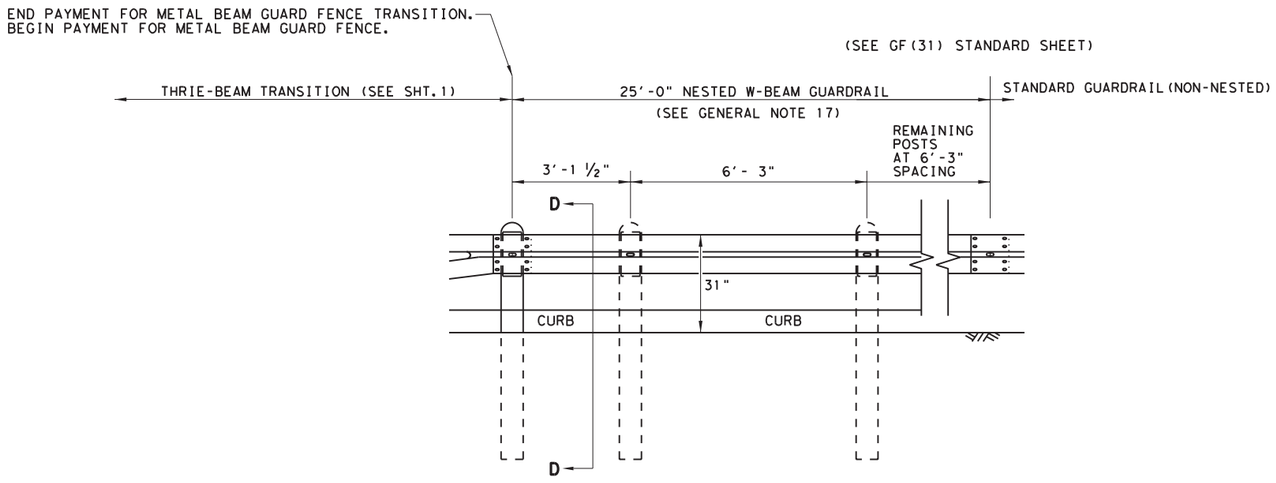
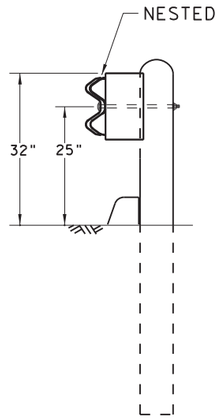
REVISIONS	2950	01	008, ETC	FM 2403	
	DIST	COUNTY		SHEET NO.	
	HOU	BRAZORIA		66	

DATE: 4/20/2023
FILE: c:\txdot\pw_online\txdot3\jamie.howell\d0547226\gf31trt1320.dgn

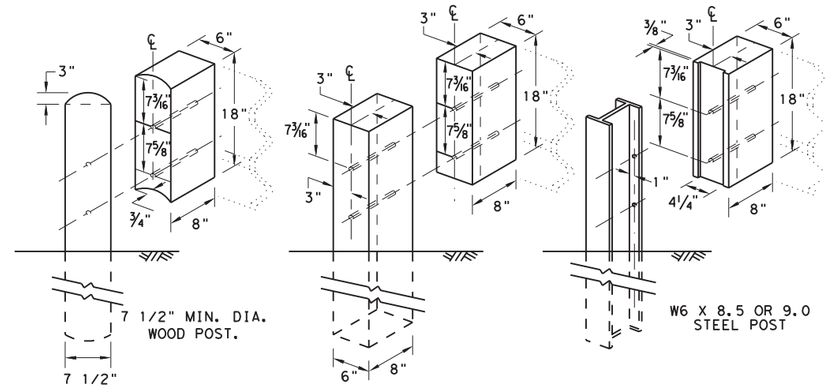
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		67

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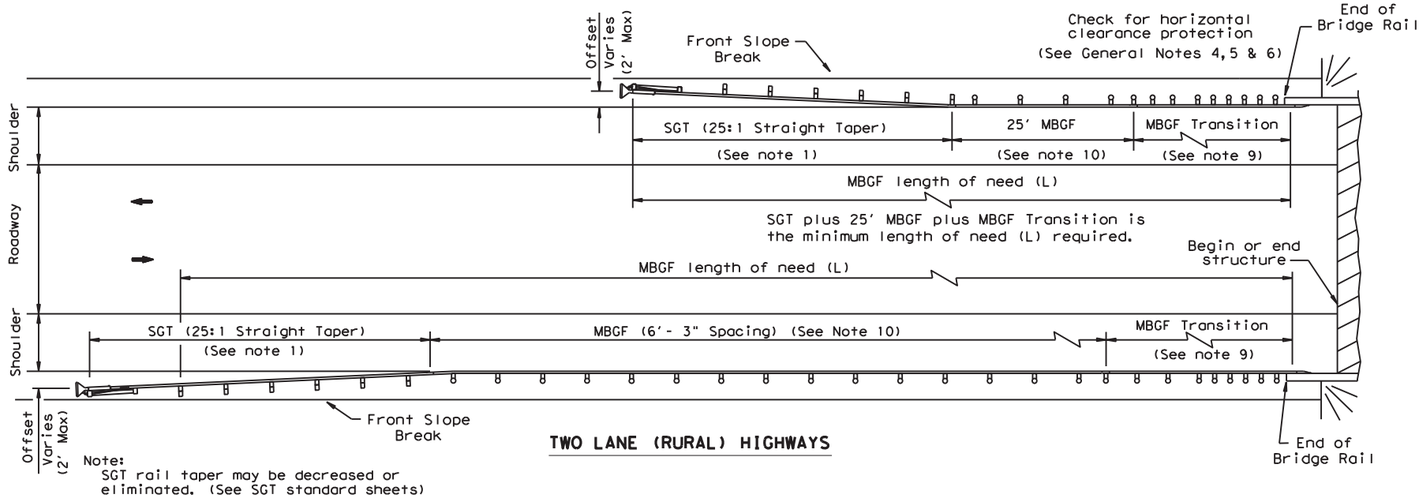
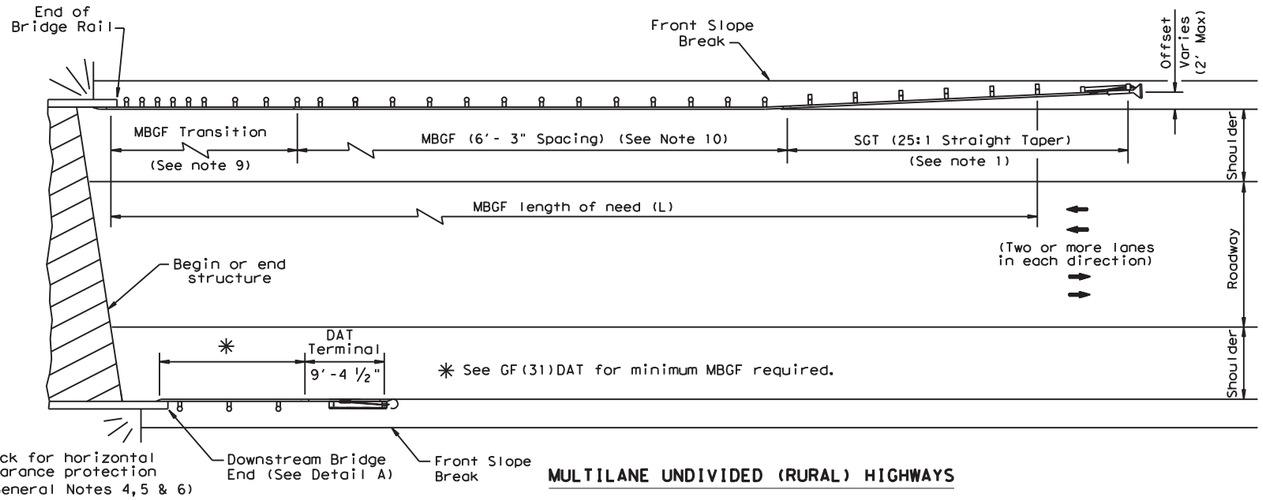
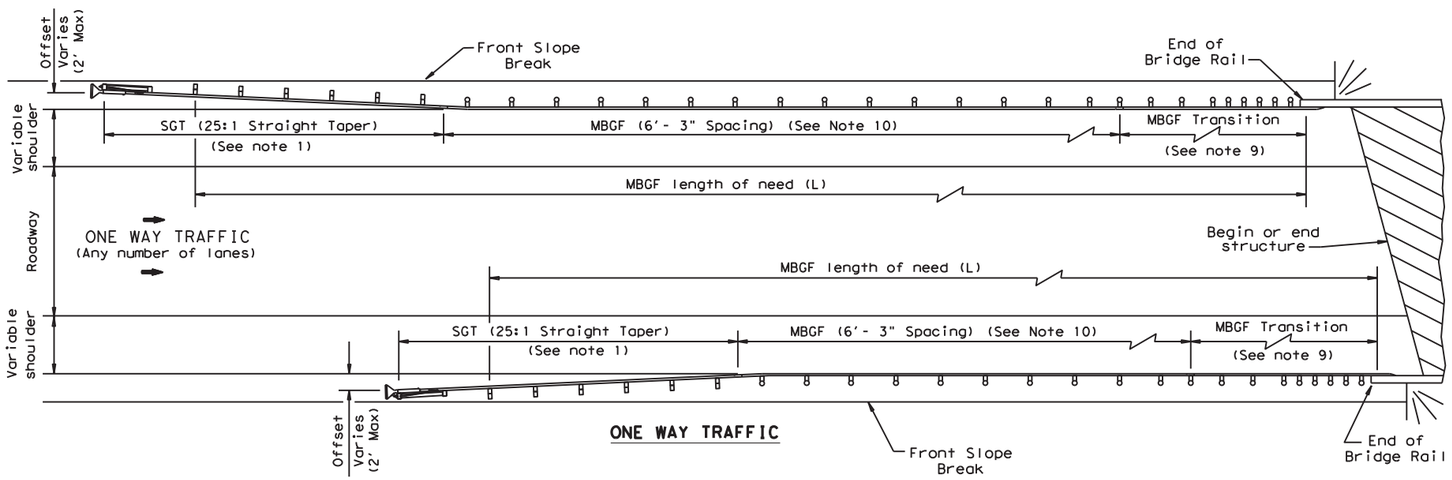


TWO LANE (RURAL) HIGHWAYS

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



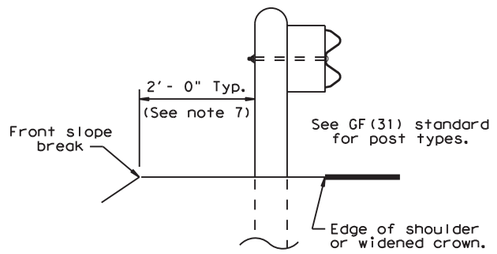
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



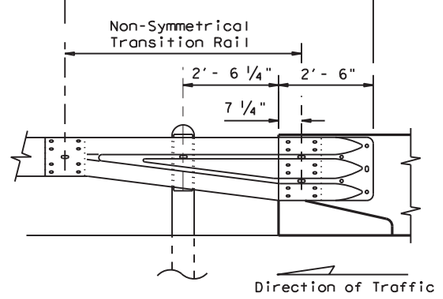
ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See GF(31), SGT( )31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'- 0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. For restrictive bridge widths: The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft."maximum" offset from the shoulder edge in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
10. A minimum 25' length of MBGF will be required.



TYPICAL CROSS SECTION AT MBGF



Note:
All rail elements shall be lapped in the direction of adjacent traffic.

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
©TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED APRIL 2014 SEE (MEMO 0414)	2950	01	008, ETC	FM 2403
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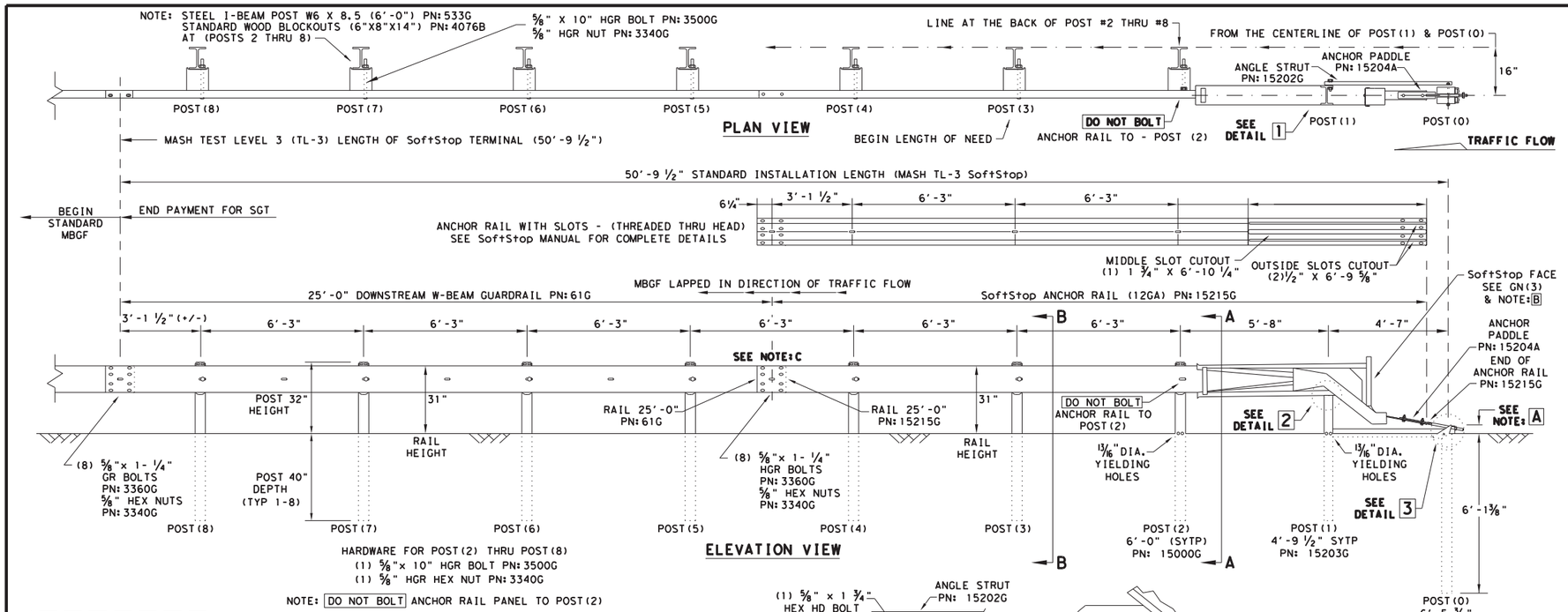

GENERAL NOTES

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	
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	HOU	BRAZORIA		69	

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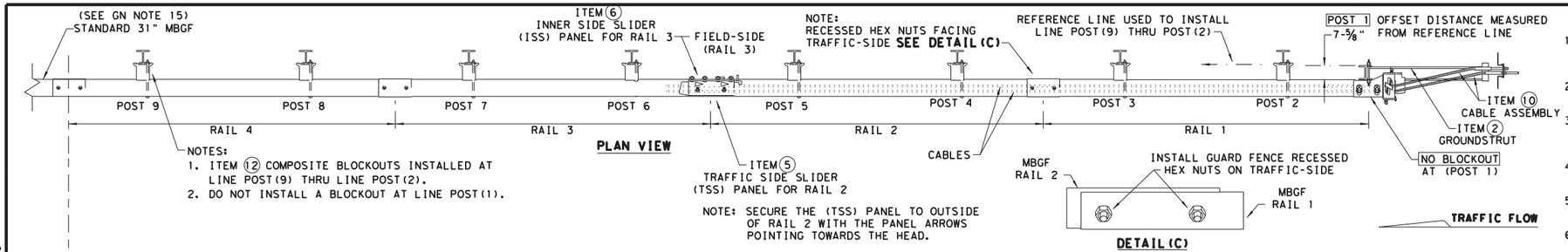

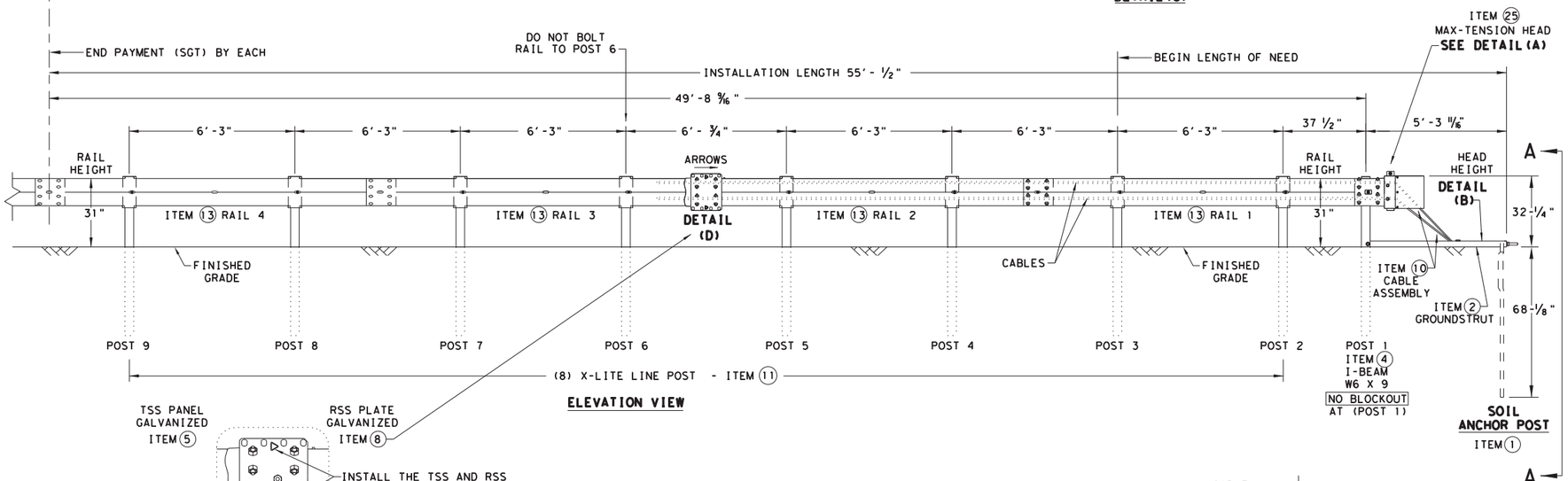

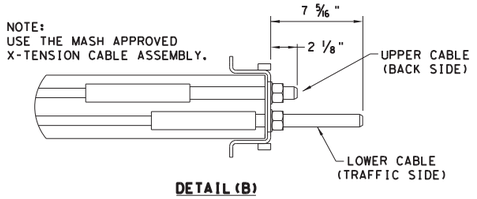

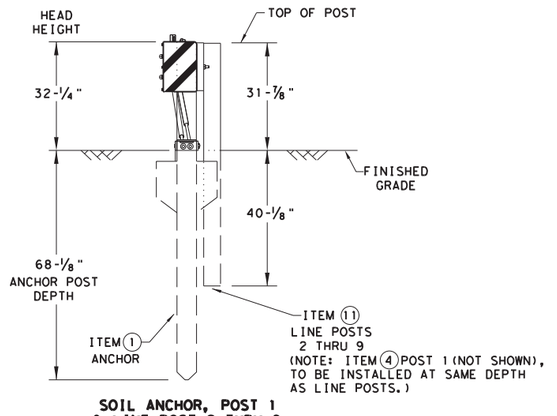

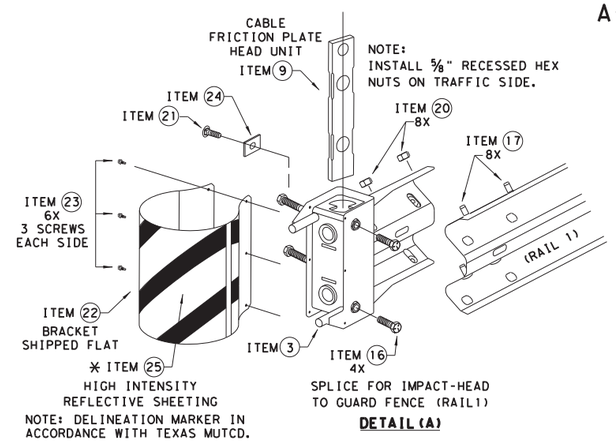

GENERAL NOTES

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

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	⅝" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	¾" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	⅝" X 1 ¼" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	⅝" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	⅝" WASHER F436 STRUCTURAL MGAL	2
20	4001116	⅝" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	⅝" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	¼" X ¾" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
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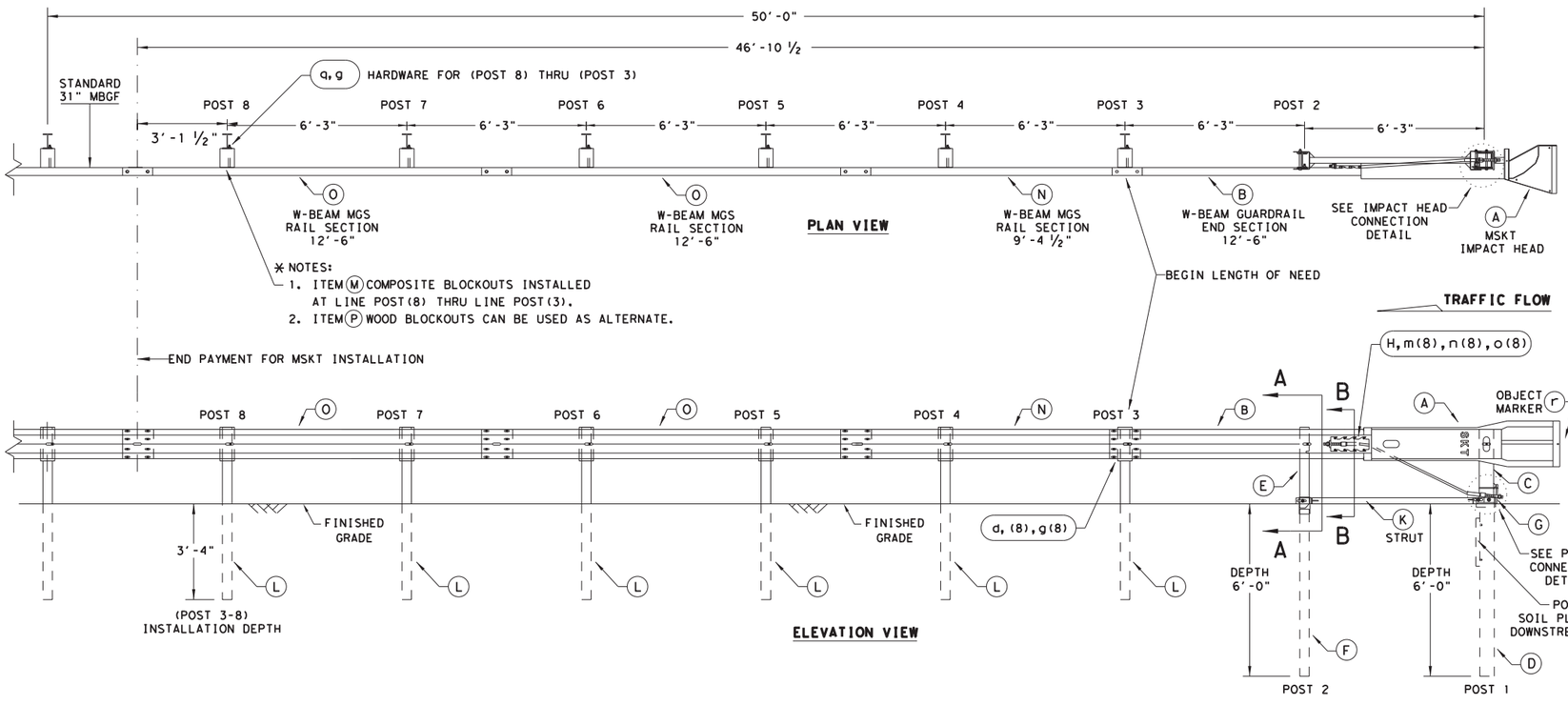
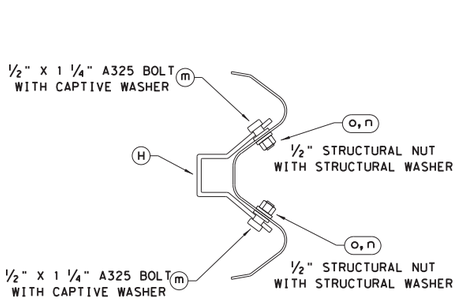
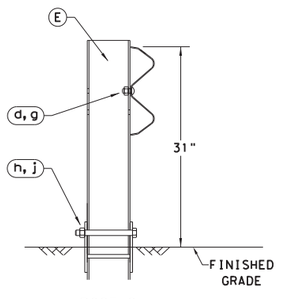


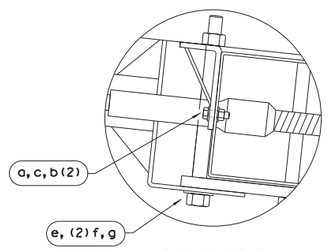
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



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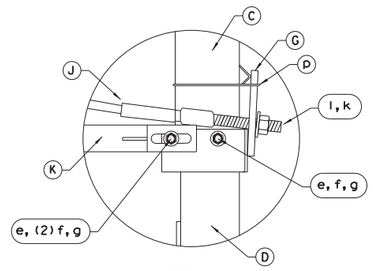
CONNECTION DETAIL



POST 1
CONNECTION DETAIL

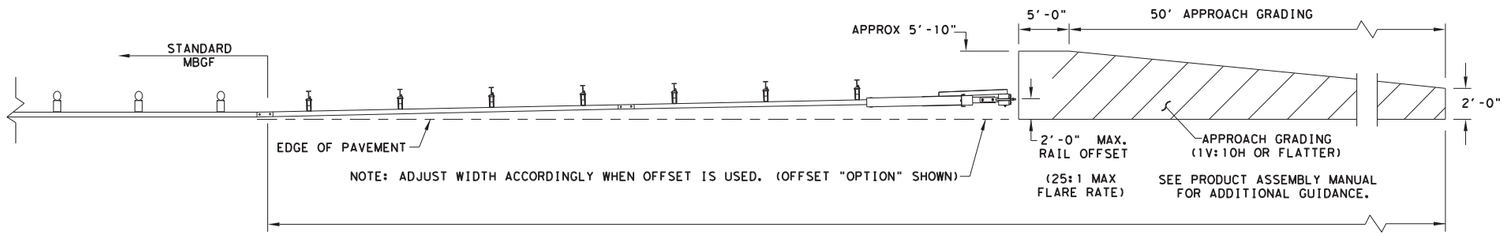
GENERAL NOTES

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 ⅜" 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.

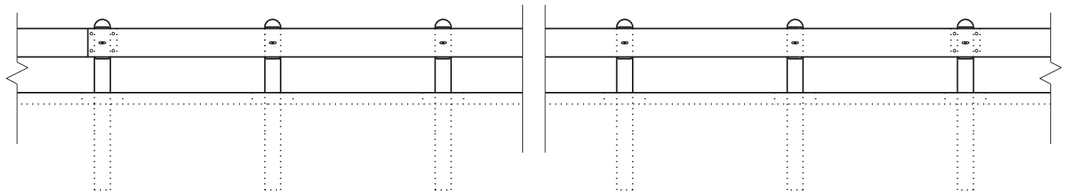
NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Texas Department of Transportation

Design Division Standard

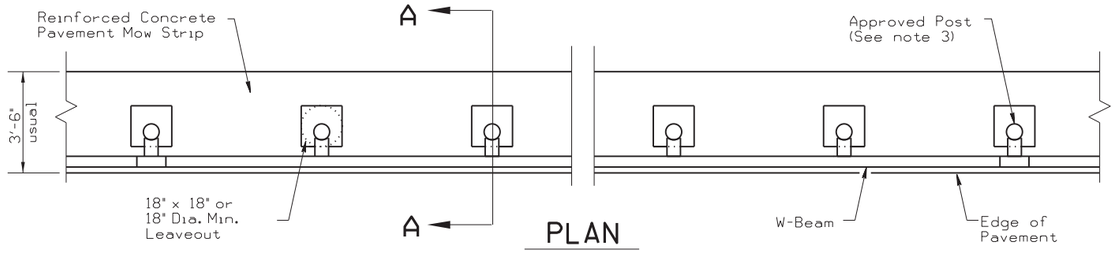
SINGLE GUARDRAIL TERMINAL
MSKT-MASH-TL-3
SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		71



ELEVATION

TRAFFIC



PLAN

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.

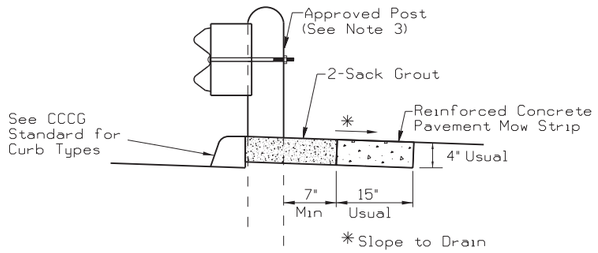
2. Provide a minimum of 7 in. leave out behind the post. Do not place concrete in the leave out.

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.

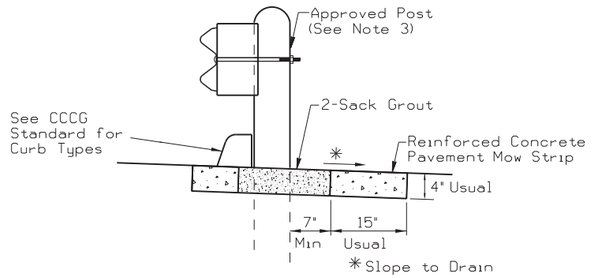
5. Fill the leave outs with no more than a 2-sack grout mixture and place in accordance with Section 421.2.7, ""Mortar and Grout." Payment for furnishing and placing the grout mixture is subsidiary to the Item 432, "RIPRAP."

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.



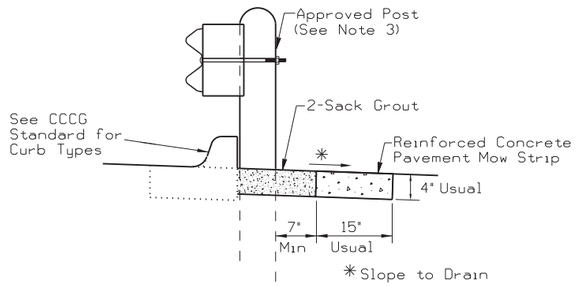
CURB OPTION (1)

Shown at Curbed Location

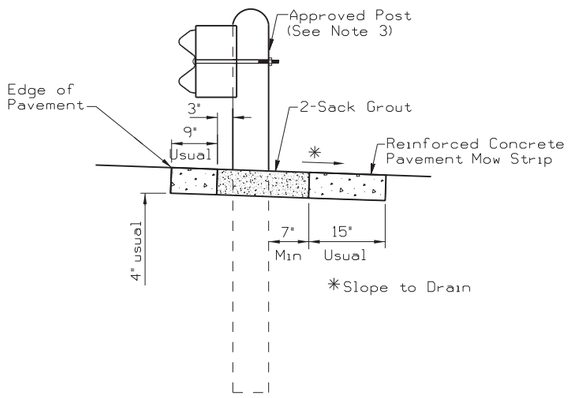


CURB OPTION (2)

Curb Shown on Top of Mow Strip

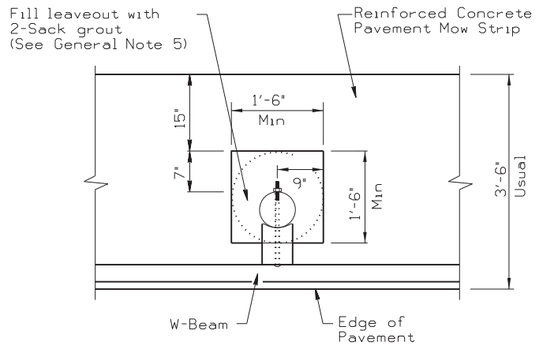


CURB OPTION (3)



SECTION A-A

Typical



MOW STRIP DETAIL

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

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			72
03/15 2014 SPECS	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	BRAZORIA		2950	01	ROAD, ETC FM 2403

STDE5.DGN

DATE: 4/20/2023
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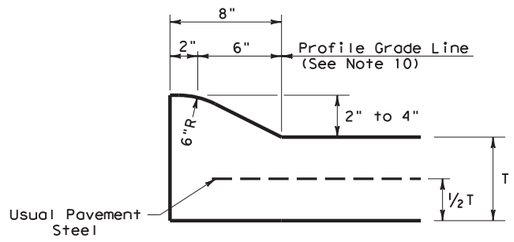
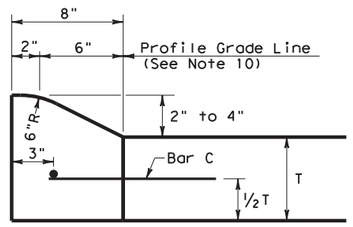


TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



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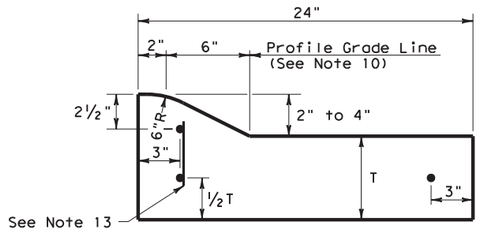
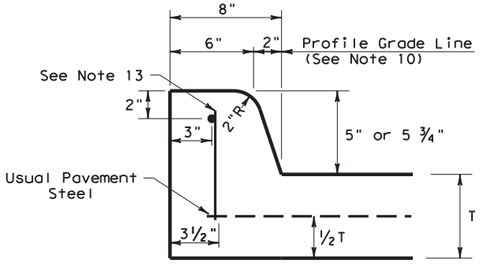
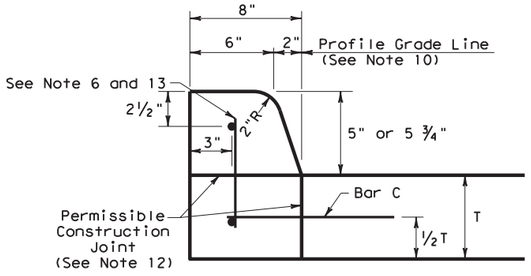


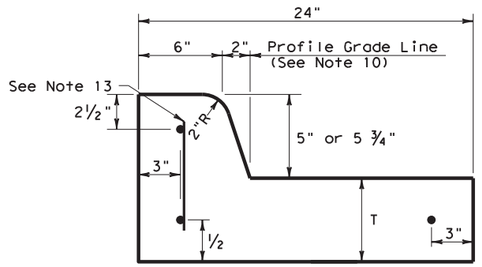
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



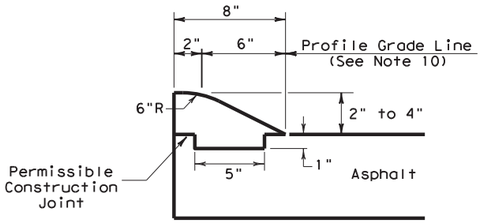
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



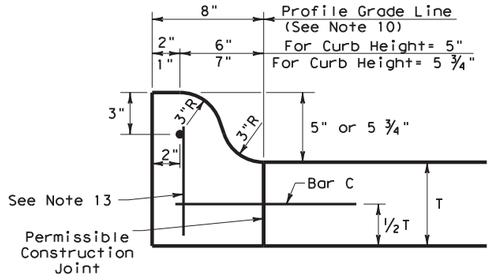
TYPE II CURB
5" - 5 ¾" HEIGHT



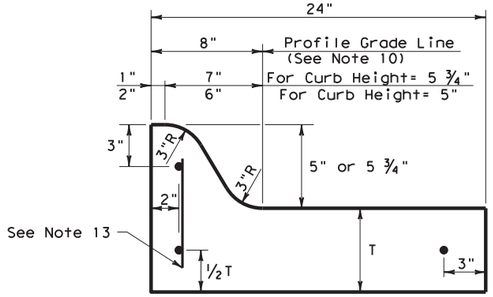
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



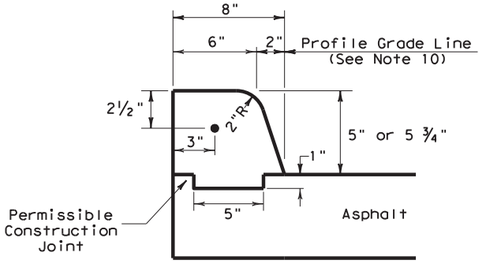
TYPE III CURB (KEYED)
2" - 4" HEIGHT



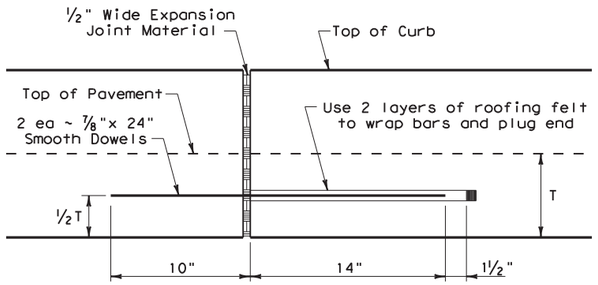
TYPE IIa CURB
5" - 5 ¾" HEIGHT



TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

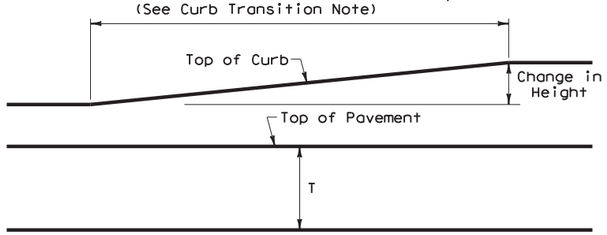


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.

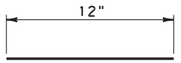


CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.

BAR B



BAR C

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-22

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: CS	CK: KM
© TxDOT: JUNE 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		73

DATE: 4/20/2023
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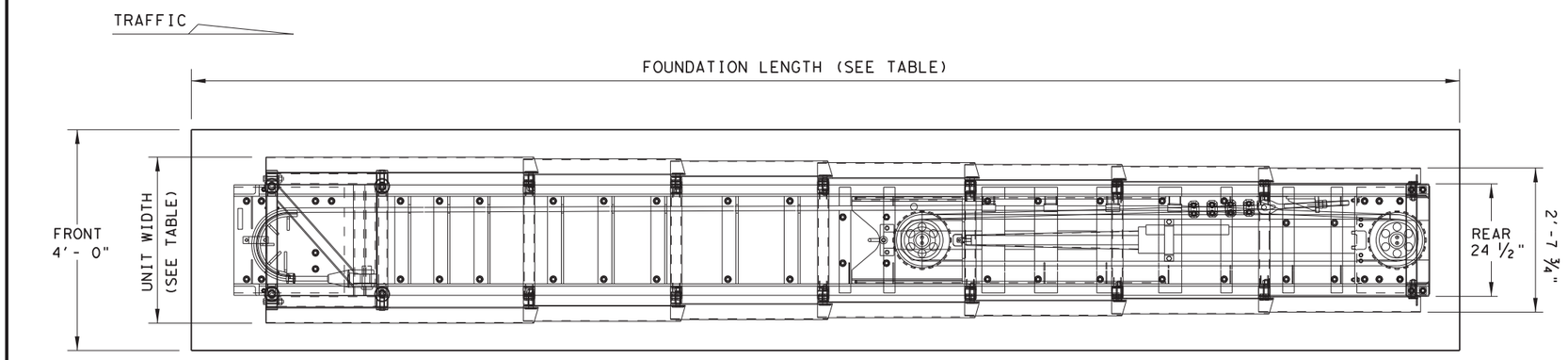
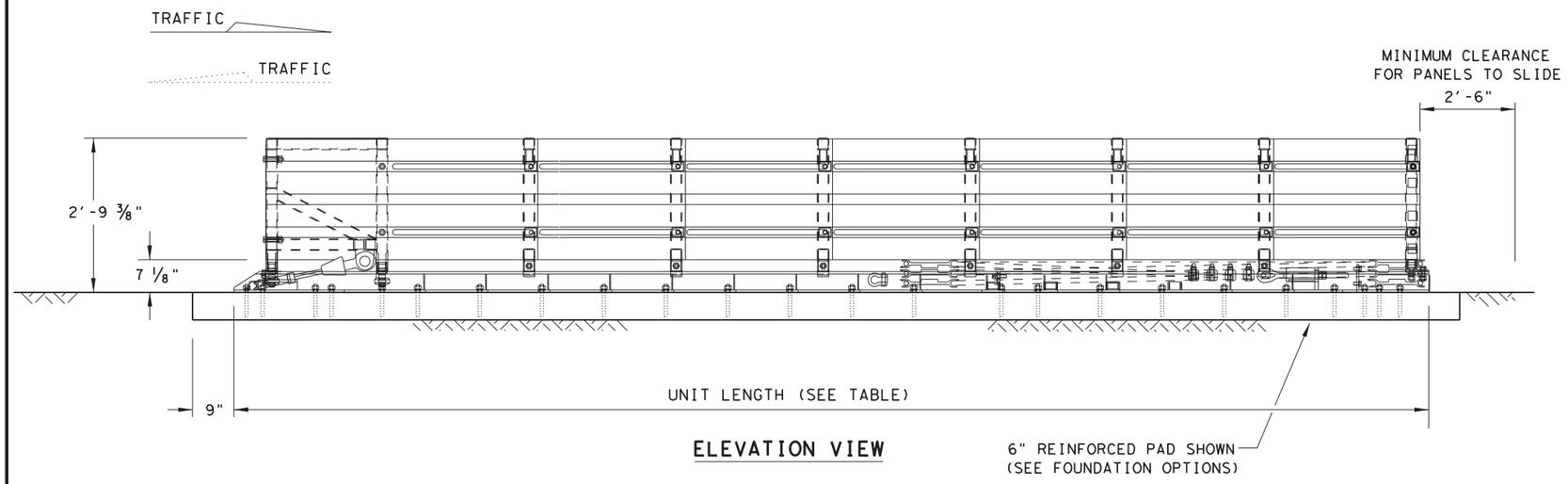


PLAN VIEW



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: smtcnl6.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
© TxDOT: February 2006	CONT	SECT	JOB	HIGHWAY
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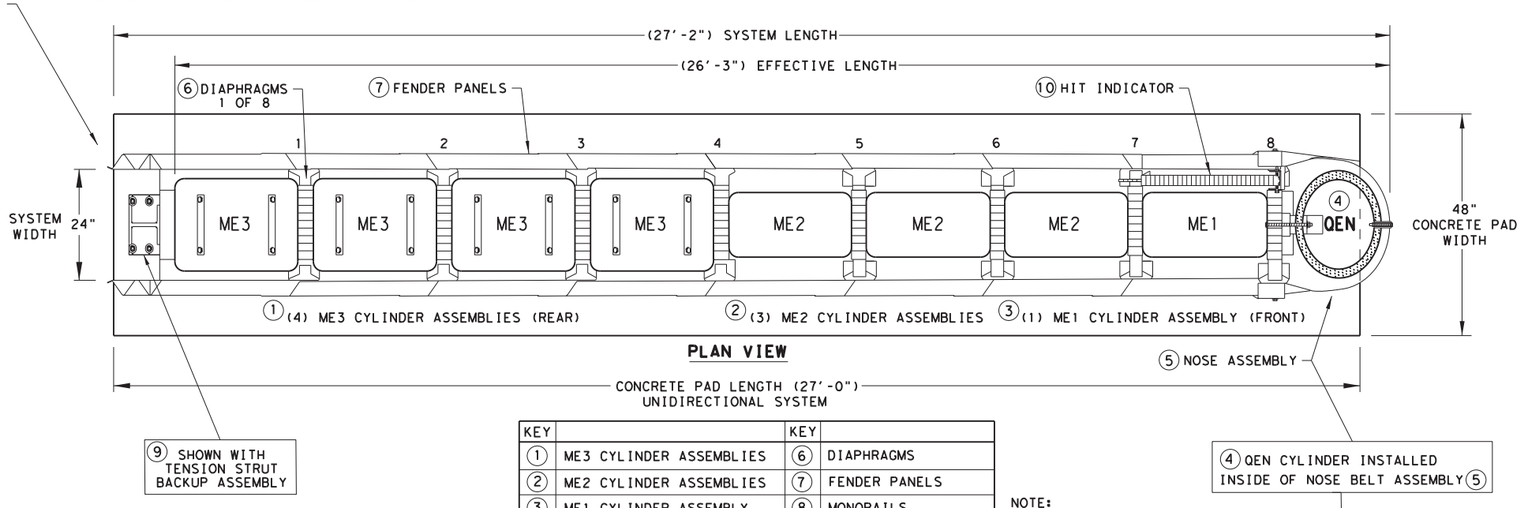
REVISED 06, 2013 (VP)	DIST	COUNTY		SHEET NO.
REVISED 03, 2016 (VP)	HOU	BRAZORIA		74

DATE: 4/20/2023
FILE: c:\txdot\pw_online\txdot3\jamie.howell\d0547226\qgelitem10n20.dgn

NOTE:
A TRANSITION MAY BE REQUIRED TO INSTALL THE QUADGUARD ELITE M10 TO THE OBJECT BEING SHIELDED.

QUADGUARD ELITE M10 24" WIDE (8 BAY) SYSTEM



PLAN VIEW

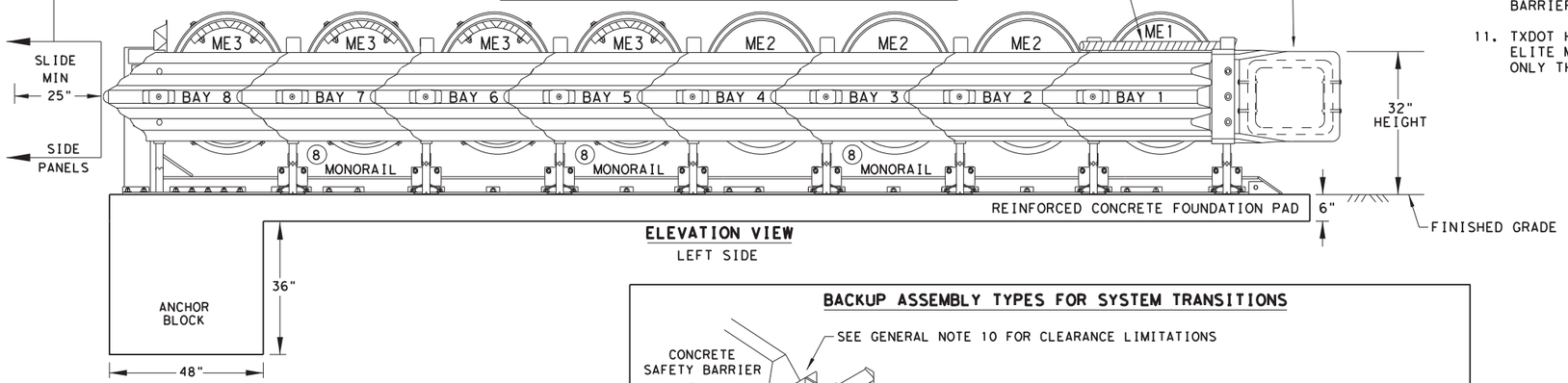
⑨ SHOWN WITH TENSION STRUT BACKUP ASSEMBLY

KEY		KEY	
①	ME3 CYLINDER ASSEMBLIES	⑥	DIAPHRAGMS
②	ME2 CYLINDER ASSEMBLIES	⑦	FENDER PANELS
③	ME1 CYLINDER ASSEMBLY	⑧	MONORAILS
④	QEN CYLINDER	⑨	TYPE OF BACKUP
⑤	NOSE BELT ASSEMBLY	⑩	HIT INDICATOR

④ QEN CYLINDER INSTALLED INSIDE OF NOSE BELT ASSEMBLY ⑤

NOTE:
HIT INDICATOR WILL RAISE UPON IMPACT.
⑩ HIT INDICATOR

NOTE:
PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 25" MIN.



ELEVATION VIEW
LEFT SIDE

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR CONCRETE PAD AND ANCHOR BLOCK INSTALLATION REQUIREMENTS.

A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD ELITE M10 FIELD INSTALATION AND INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY REQUIRED FOR THE TRANSITION WILL BE PROVIDED BY THE MANUFACTURER TO THE ENGINEER AND INSTALLER.

6" REINFORCED CONCRETE PAD REQUIRES THE INSTALLATION OF AN ANCHOR BLOCK AS SHOWN ON THE MANUFACTURER'S DRAWING PACKAGE.

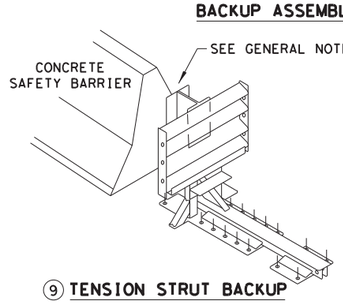
8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

CONCRETE PAD AND ANCHOR BLOCK COMBINATIONS SHALL BE CONFIRMED WITH THE MANUFACTURER BASED UPON SITE SPECIFIC DATA (SSD).

NOTE:
THE QUADGUARD ELITE M10 8-BAY, 24" WIDE - NARROW SYSTEM TESTED TO MASH TEST LEVEL 3.

TL-3 MODEL #	QM10024E	CYLINDER TYPES IN BAYS			
BAYS	8	TYPE-ME3	TYPE-ME2	TYPE-ME1	TYPE-QEN
DIAPHRAGMS	8	4	3	1	1
WIDTH	24"	REAR	FRONT		NOSE

BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS

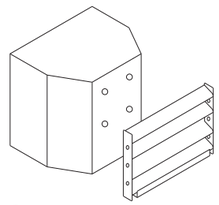


⑨ TENSION STRUT BACKUP

SYSTEM TRANSITIONS TYPES	
1	QUAD-BEAM TO CONCRETE SAFETY BARRIER
2	QUAD-BEAM TO CONCRETE BRIDGE RAIL
3	QUAD-BEAM TO CONCRETE END SHOE
4	QUAD-BEAM TO THRIE-BEAM RAIL
5	QUAD-BEAM TO W-BEAM RAIL

NOTE:
TRANSITION ASSEMBLIES FOR THE QUADGUARD ELITE M10 TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:

ALL POSTS W6X8.5/9 I-BEAMS (78" LONG).



⑨ CONCRETE BACKUP

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.

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD ELITE M10 SYSTEM AND 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: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 1(888)323-6374.
2. SEE THE RECENT QUADGUARD ELITE M10 PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE NARROW 24" SYSTEM BEFORE INSTALLING THE QUADGUARD ELITE M10 AT ANY GIVEN LOCATION.
3. FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD ELITE M10 IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD ELITE M10, THE QUADGUARD ELITE M10 SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD ELITE M10 AND OBSTACLE OR MUST ANGLE TOWARD FIELD SIDE OF THE BARRIER.
4. SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD ELITE M10 SYSTEM IS SHIELDING. SEE THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
5. COMPONENTS FOR THE QUADGUARD ELITE (M10) BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
6. CONCRETE PAD SHALL BE 6" MIN. REINFORCED 28MPa [4,000 PSI] (P.C.) OR 8" MIN. NON-REINFORCED 28MPa [4,000 PSI] CONCRETE ROADWAY MEASURING AT LEAST 12'-0" WIDE BY 50'-0" LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE, E.G. CONCRETE WALL.
7. 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%.
8. THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS,OR DEPRESSIONS.
9. THE QUADGUARD ELITE M10 SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
10. FOR THE TENSION STRUT BACKUP THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
11. TXDOT HAS ONLY APPROVED THE 24" WIDE QUADGUARD ELITE M10 SYSTEM. THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION AND ASSEMBLY MANUAL INCLUDES SYSTEM WIDTH OF 24". ONLY THE 24" SYSTEM IS ALLOWED TO BE INSTALLED ON TEXAS ROADWAYS.

FOUNDATION & ANCHORING REQUIREMENTS FOUNDATION TYPES: A, B, C, & D	
FOUNDATION TYPE: A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE

KEY:
ASPHALT CONCRETE (A.C.)
COMPACTED SUBBASE (C.S.)
PORTLAND CEMENT CONCRETE (P.C.C.)

NOTE: SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR THE APPROVED ADHESIVE.

IF THE UNIT IS ANCHORED TO ASPHALTIC CONCRETE, IT SHOULD BE RELOCATED TO FRESH, UNDISTURBED ASPHALT AND RE-ANCHORED AFTER EACH IMPACT TO ENSURE ADEQUATE FUTURE PERFORMANCE.

TENSION STRUT BACKUP MAY BE USED IN CONSTRUCTION ZONES ON ASPHALT CONCRETE (A.C.) FOR TEMPORARY USE ONLY.

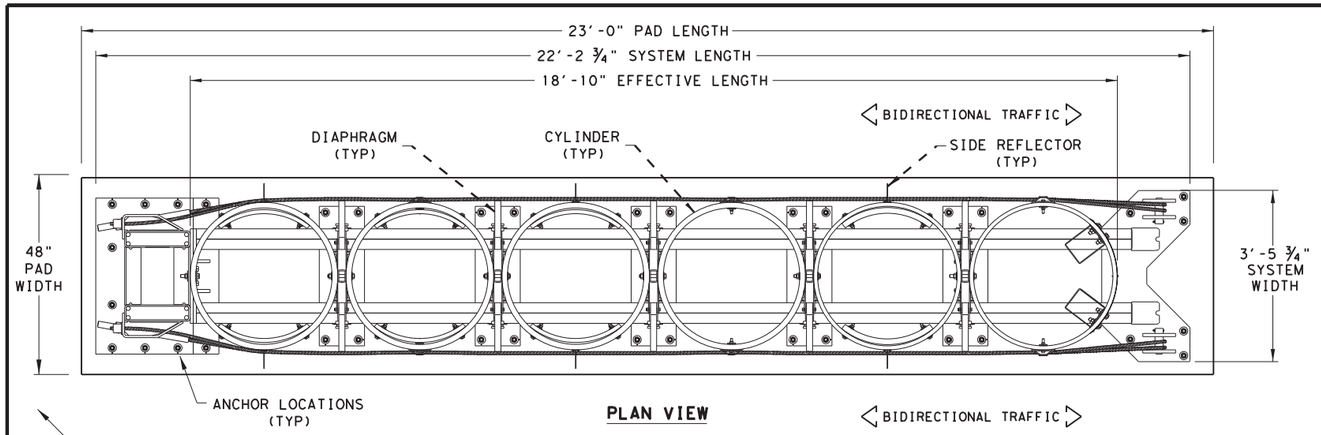
LOW MAINTENANCE

Texas Department of Transportation
Design Division Standard

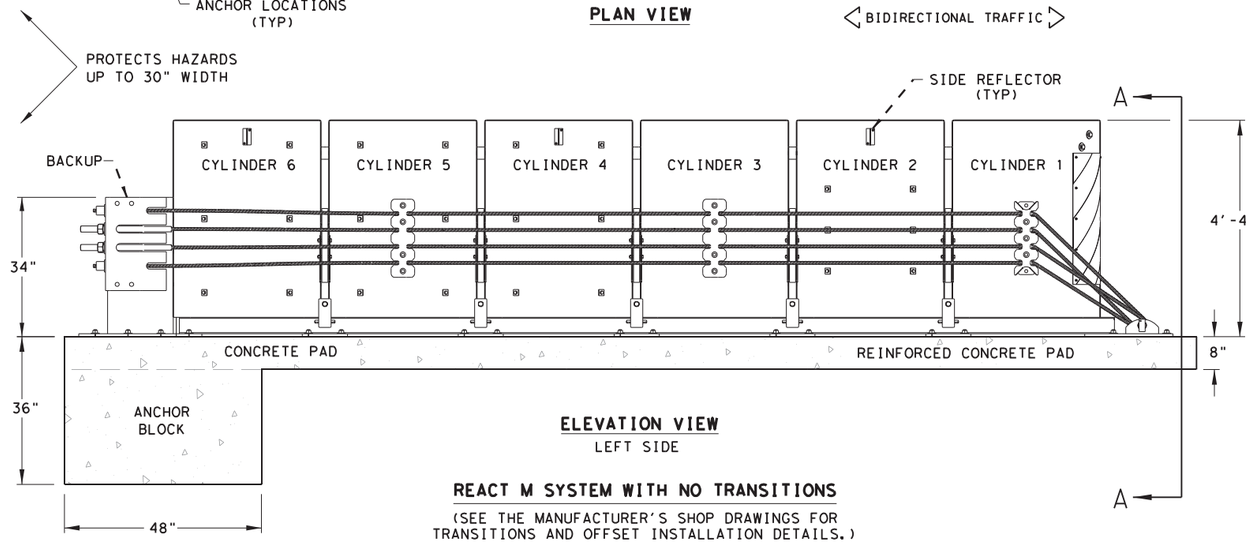
TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD ELITE M10 (MASH TL-3)

QGELITE(M10)(N)-20

FILE: qgelitem10n20.dgn	DN: TxDOT	CK: KM	DW: VP	CK: AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		75

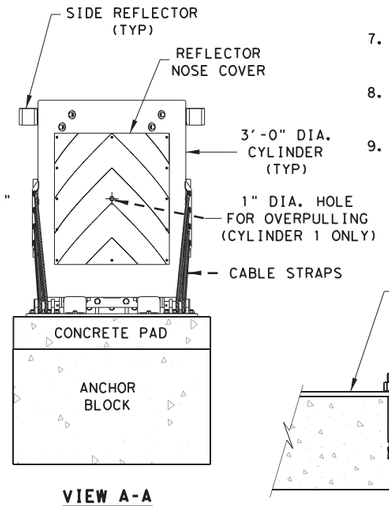


PLAN VIEW

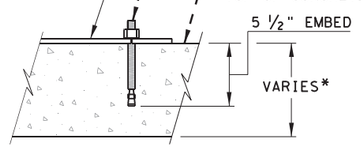


ELEVATION VIEW
LEFT SIDE

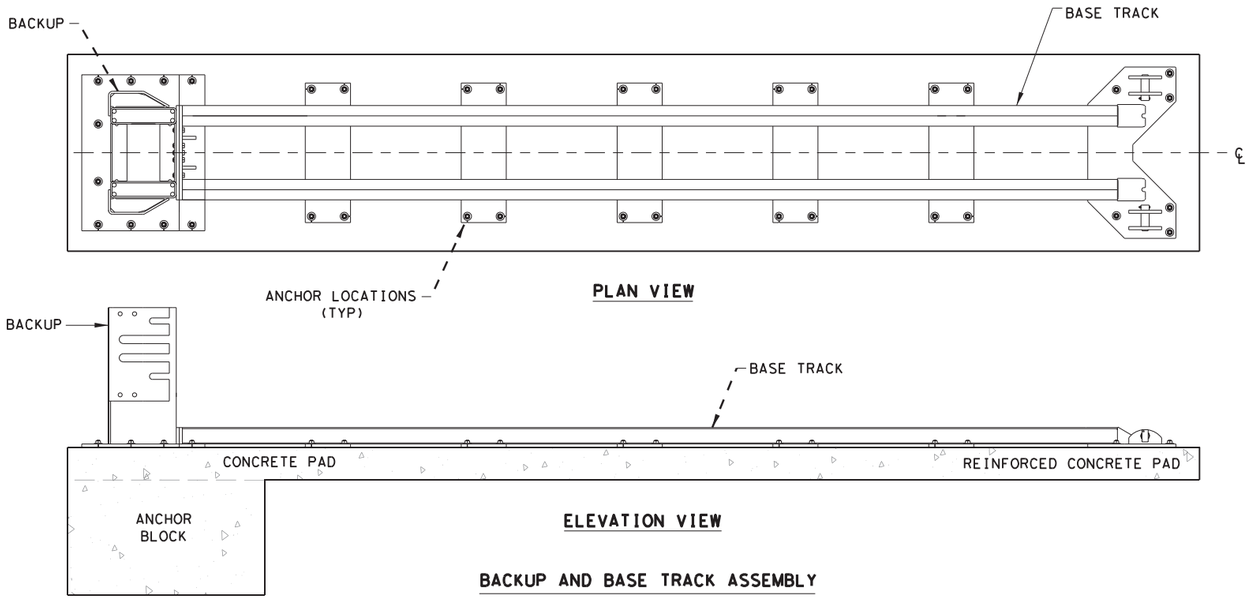
REACT M SYSTEM WITH NO TRANSITIONS
(SEE THE MANUFACTURER'S SHOP DRAWINGS FOR TRANSITIONS AND OFFSET INSTALLATION DETAILS.)



VIEW A-A



ANCHORING DETAIL
*SEE FOUNDATION TYPES TABLE



PLAN VIEW

ELEVATION VIEW

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

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

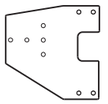
MINIMUM 8" REINFORCED PORTLAND CEMENT CONCRETE PAD (REQUIRED REINFORCING STEEL FOR CONCRETE PAD SHALL BE SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS.

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

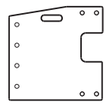
MINIMUM 7" CONCRETE DECK STRUCTURE, OR MINIMUM 6" REINFORCED CONCRETE ROADWAY

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

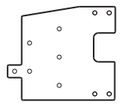
BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS



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

Texas Department of Transportation — Design Division Standard

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

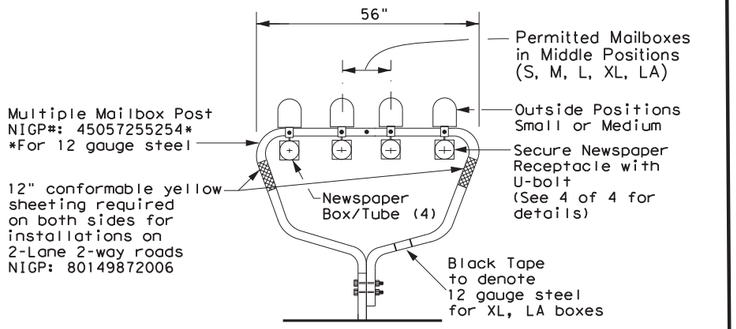
REACT(M)-21

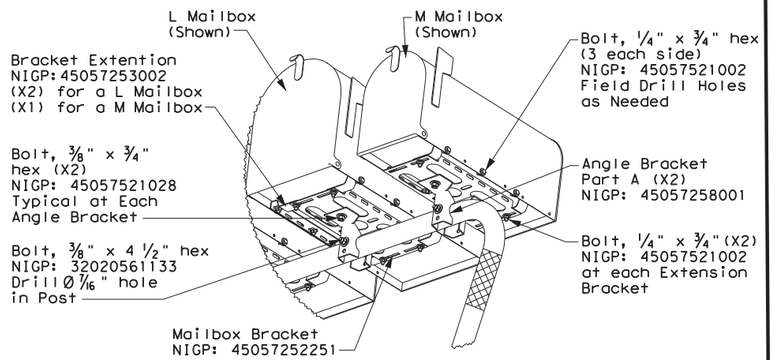
FILE: reactm21.dgn	DN: TXDOT	CK: KM	DW: SS	CK: CL
©TxDOT: JULY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		76

DATE: 4/20/2023
FILE: $FILE$

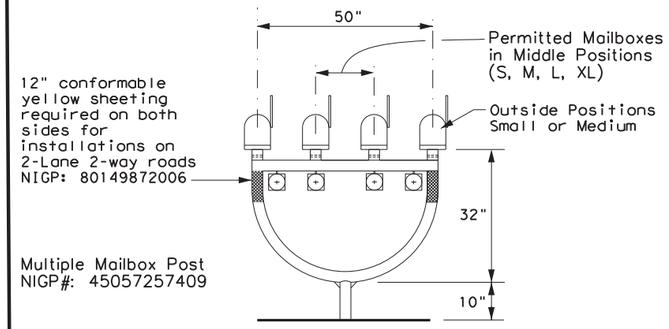
DATE:
FILE:

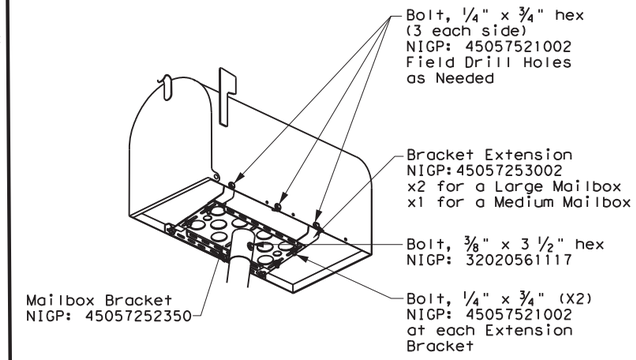
TYPE 1 - MULTIPLE





TYPE 4 - MULTIPLE





MAILBOX SIZES

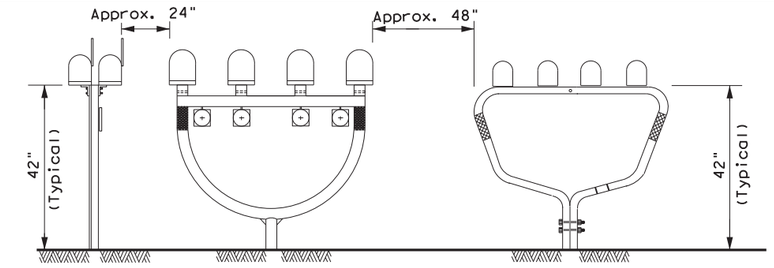
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX **
	LENGTH	WIDTH	HEIGHT	WEIGHT
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

* See Note 1.
** Excluding Molded Plastic on 4 X 4 Post

GENERAL NOTES:

1. Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
2. Mailboxes shall be made of light weight sheet metal or light weight plastic. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.

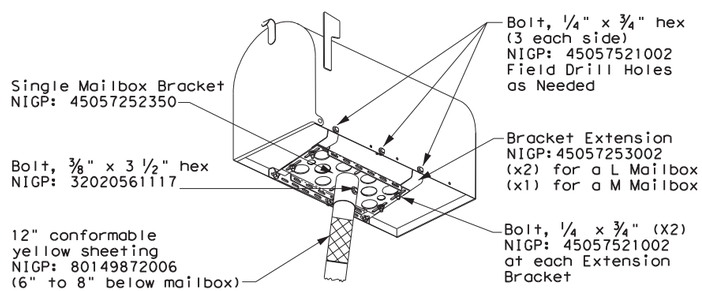
TYPICAL INSTALLATION MEASUREMENTS

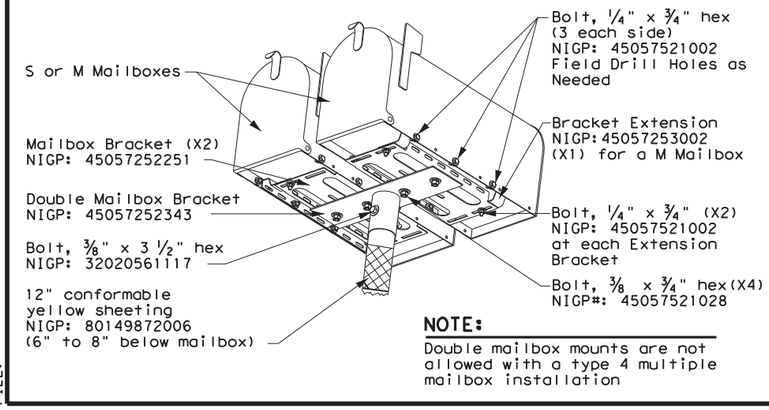


NOTE:

Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Design Standard sheets PED-Pedestrian Facilities Curb Ramps.

TYPE 2 and 4 - SINGLE/DOUBLE

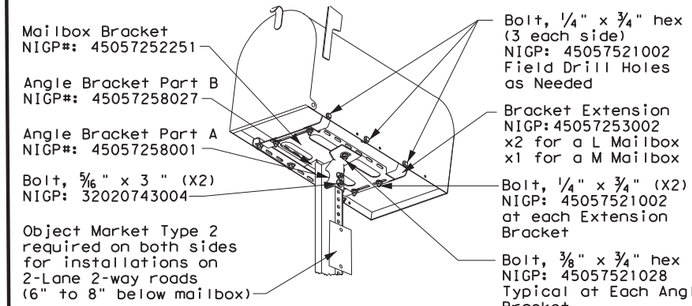


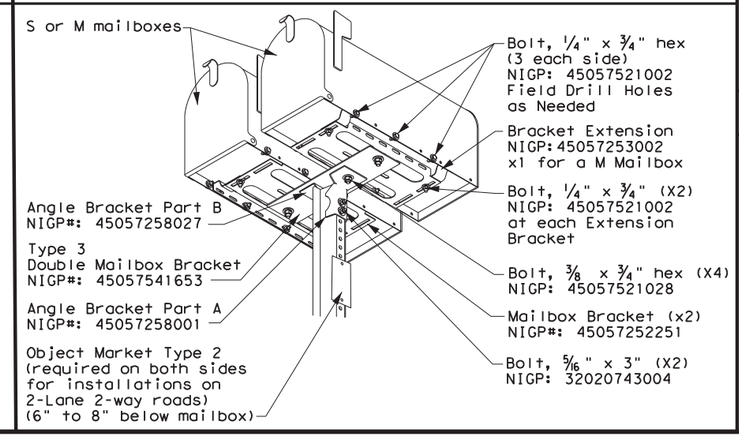


NOTE:

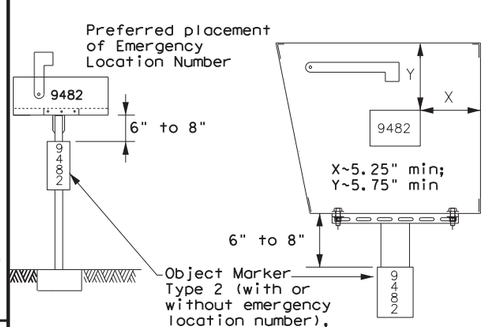
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

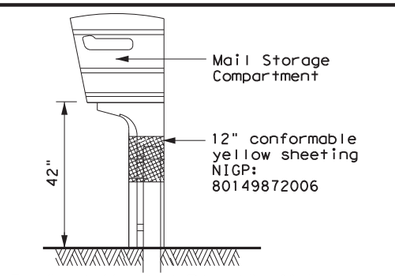


NOTES:

1. Location numbers are provided by homeowner. Minimum size 1" height.
2. Location number is typically placed on the mailbox in a contrasting color.
3. Black numbers may be placed on the Type 2 object marker if the numbers cannot be placed on the mailbox.
4. Alternatively, a green or blue plate with white numbers attached may be mounted below the object marker. Other contrasting color configuration, as approved, may be used.
5. See 3 of 4 for Foundation details.
6. See 4 of 4 for Hardware details.

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		77

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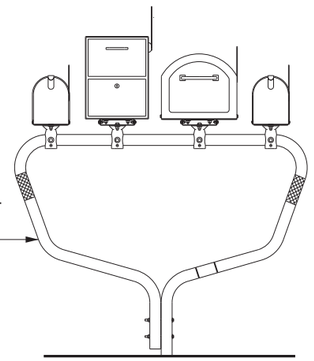
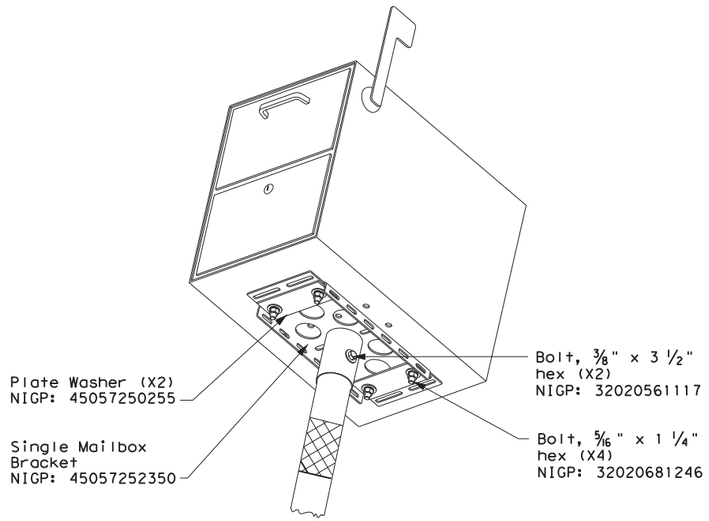
DATE:
FILE:

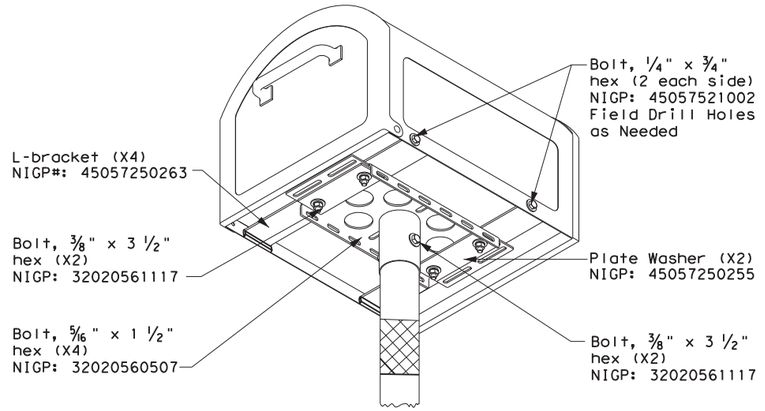
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

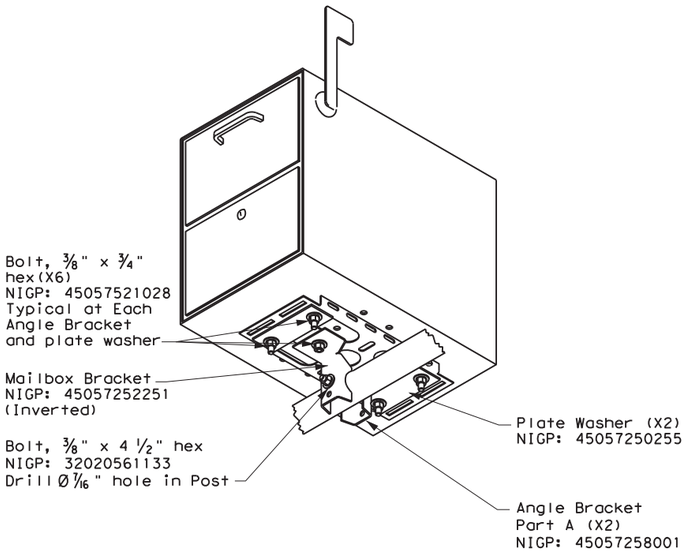


TYPE 2/4 - SINGLE XL MAILBOX

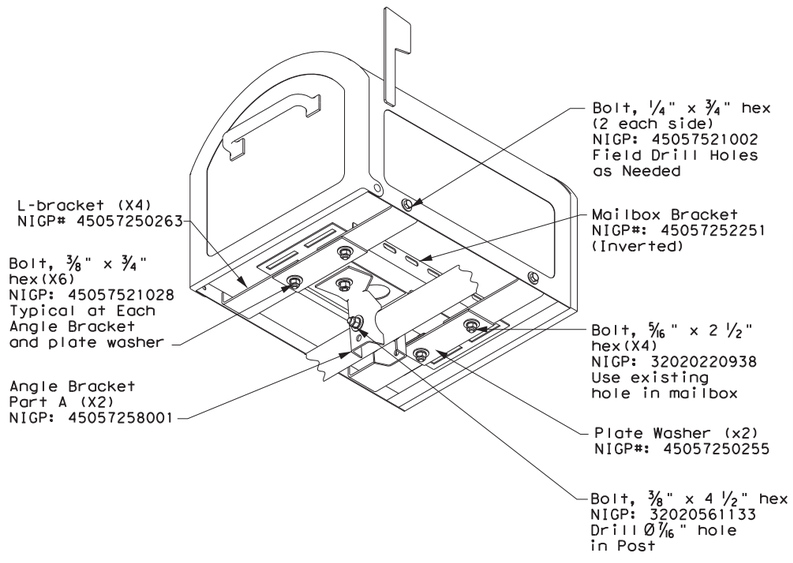


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

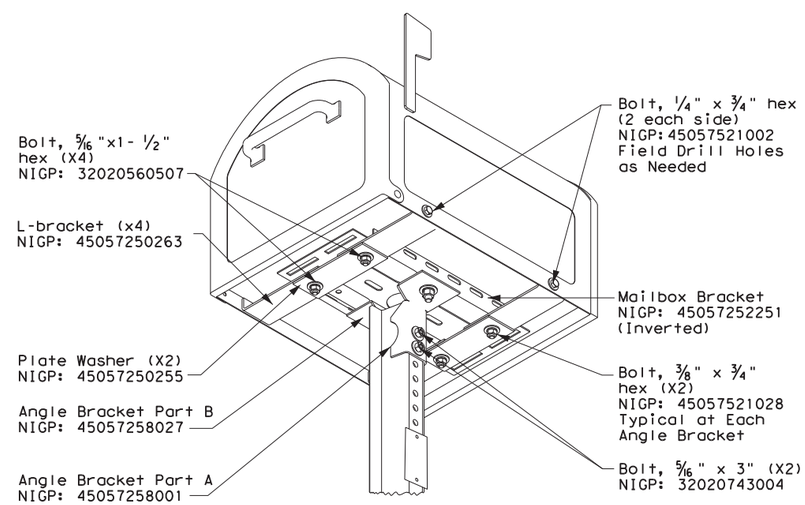
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



Texas Department of Transportation

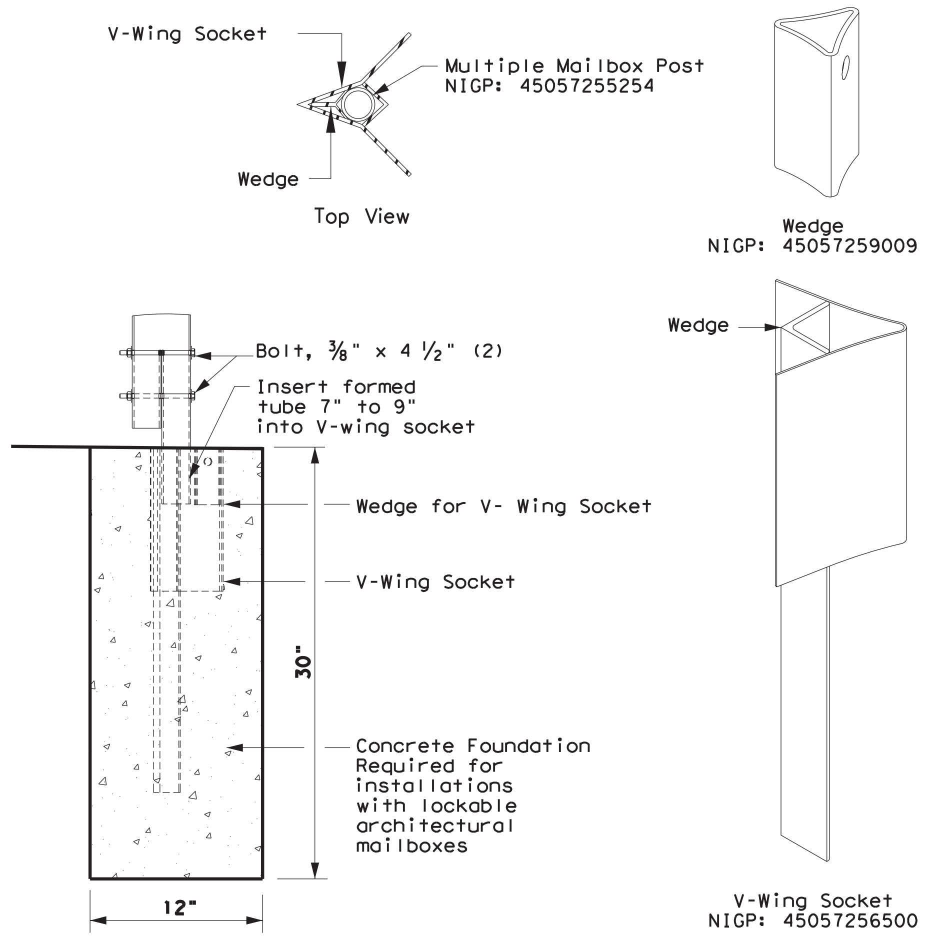
Maintenance Division Standard

XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

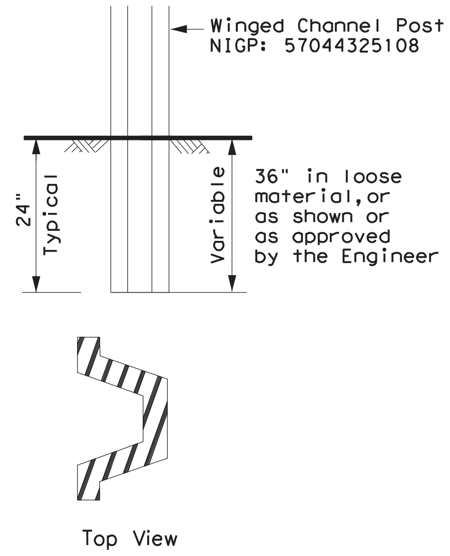
MB(2)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		78

TYPE 1 - SUPPORT/FOUNDATION
Thin Wall Tube w/ V-LOC Anchorage



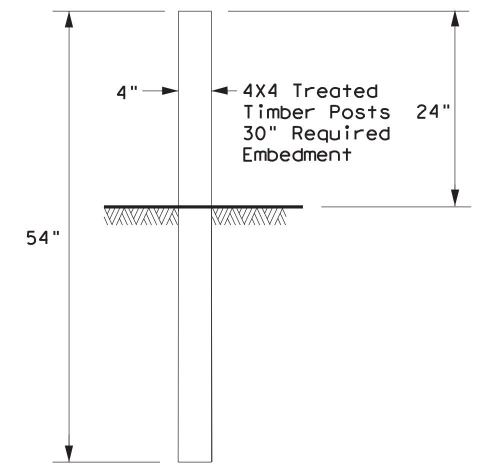
TYPE 3 - SUPPORT/FOUNDATION



NOTES:

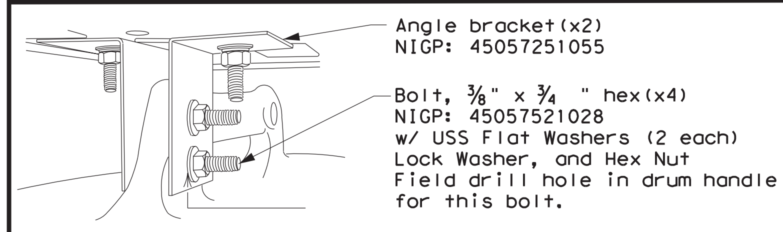
1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



Molded Plastic Mailboxes shall be installed on 4"x4" treated timber posts only. The use of steel pipe or structural tubing in place of timber post is prohibited.

TYPE 6 - TEMPORARY MAILBOX SUPPORT



Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

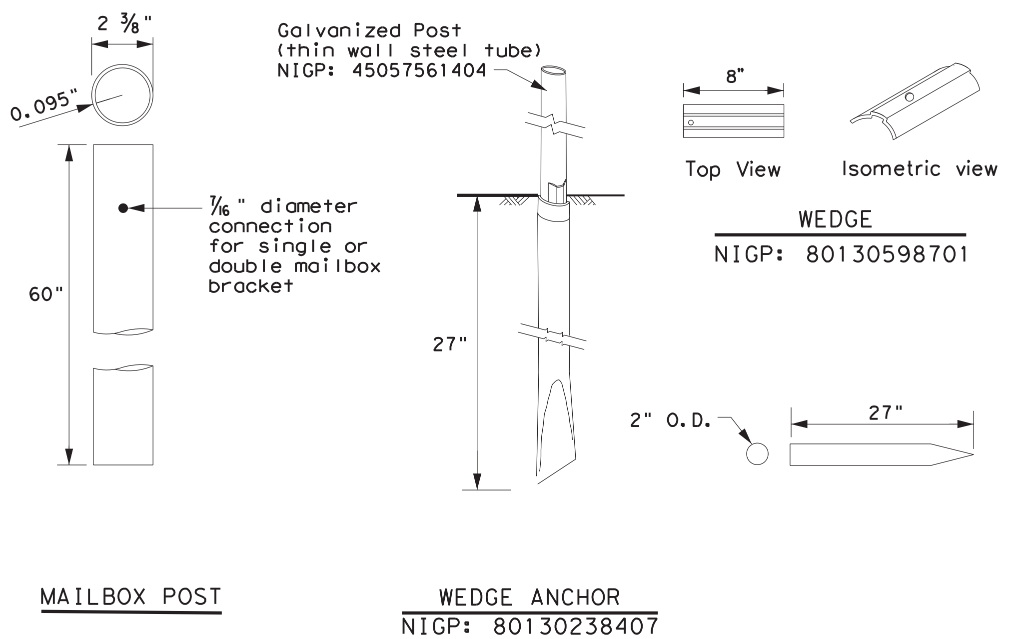
NOTES:

1. Place on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
2. Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

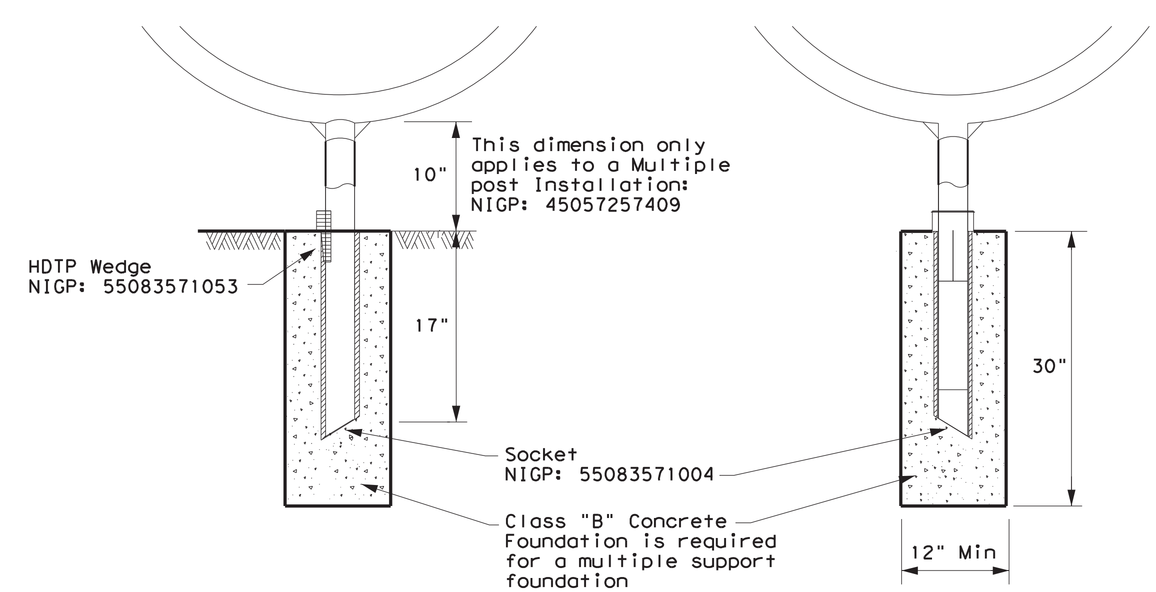
GENERAL NOTES:

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

TYPE 2 - SUPPORT/FOUNDATION
Thin Wall Steel Tube w/Wedge Anchor System



TYPE 4 - SUPPORT/FOUNDATION
Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



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Texas Department of Transportation — Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

FILE: MB-21.dgn	DN:	CK:	DW:	CK:
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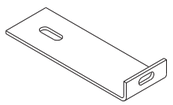
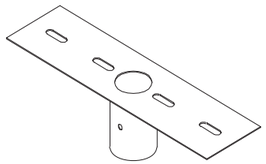
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2950	01	008, ETC	FM 2403
	DIST		COUNTY	SHEET NO.
	HOU		BRAZORIA	79

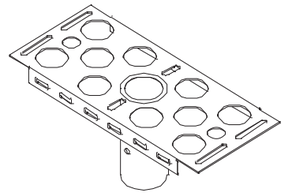
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL	Molded Plastic	S, or M
Mailbox Post NIGP #	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Gavanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)	4x4 Timber	Construction Barrel
Post and Mailbox Hardware NIGP #	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket forXL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	None	45057251055 Angle Bracket (x2)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete	None	None



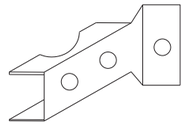
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



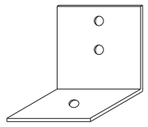
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



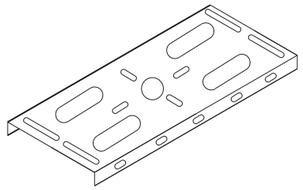
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



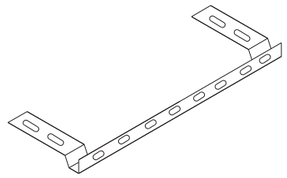
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



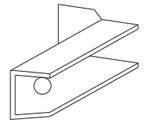
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



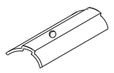
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



NIGP: 45057253002
Bracket Extension
Use 1 for a medium Mailbox
Use 2 for a Large Mailbox



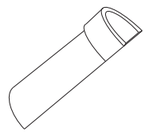
NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double



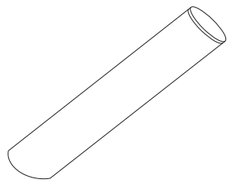
NIGP: 80130598701
Wedge for Type 2

NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes

NIGP: 45057541653
Type 3 double mailbox bracket

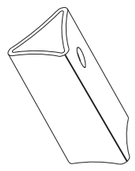


NIGP: 55083571053
Type 4 Mailbox Wedge

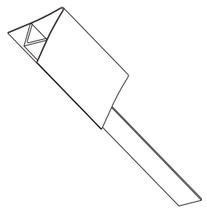


NIGP: 55083571004
Type 4 Mailbox Socket

NIGP: 80130238407
Type 2 Wedge Anchor



NIGP: 45057259009
Wedge for Type 1 V-wing Socket



NIGP: 45057256500
V-wing Socket for
Type 1 Foundation

NIGP #	OBJECT MARKERS AND CONFORMABLE SHEETING
55008311759	Type 2 OM 4"x4" (3 Needed) for Type 3 Wing Channel Post
55008312906	Type 2 OM 6"x12" (1 needed) for Type 3 Wing Channel Post
80149872006	12" Conformable Reflective Yellow Sheeting for Flexible Posts

NOTES:

1. Type 2 object marker in accordance with Traffic Engineering Standard Delineators & Object Markers.
2. A light weight receptacle for newspaper delivery can be attached to mailbox posts if the receptacle does not touch the mailbox, present a hazard to traffic or delivery of the mail, extend beyond the front of the mailbox, or display advertising, except the publication title.

BID CODES FOR CONTRACTS

MB-(X) ASSM TY (XXX) (X)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- MP = Molded Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

Texas Department of Transportation — Maintenance Division Standard

NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		80

DATE: 4/20/2023 5:01:58 PM
FILE: c:\txdot\pw_online\txdot3\jamie.howell\d0547226\mb-21(1).dgn

DATE: 4/20/2023 5:02:15 PM
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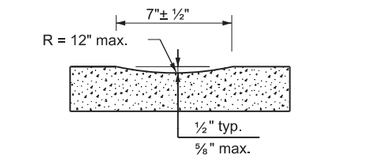
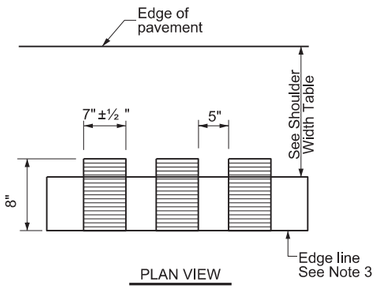
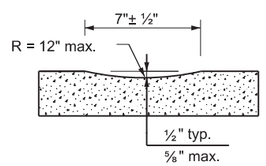


PROFILE VIEW
OPTION 1

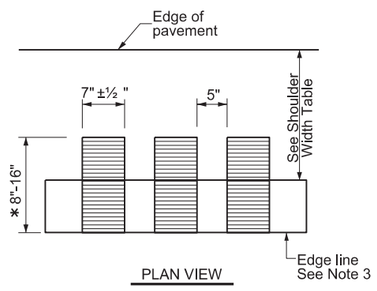


PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



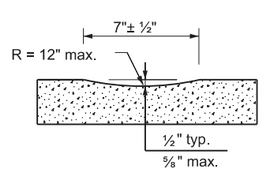
PROFILE VIEW
OPTION 2



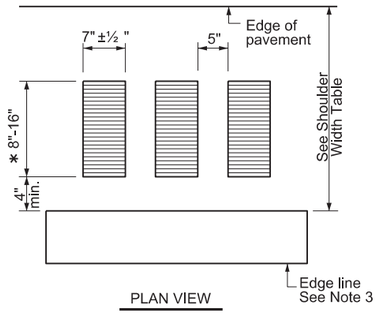
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



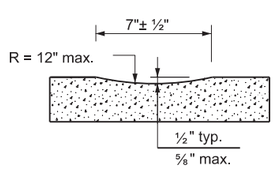
PROFILE VIEW
OPTION 3



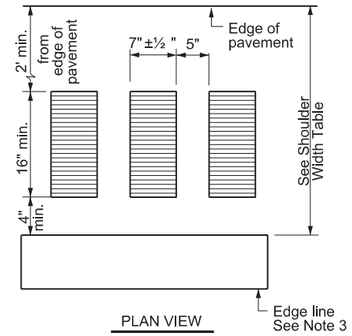
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

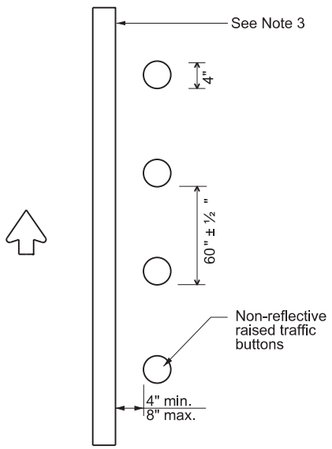


PROFILE VIEW
OPTION 4



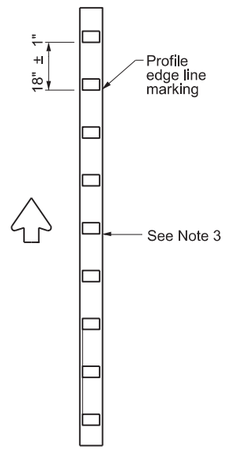
PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



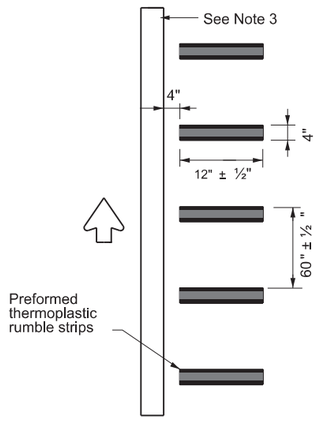
PLAN VIEW
OPTION 5

RAISED EDGE LINE (Rumble Strips)



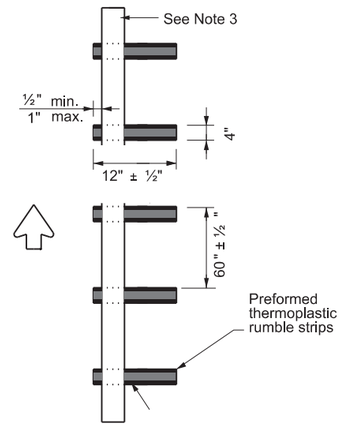
PLAN VIEW
OPTION 6

PROFILE EDGE LINE MARKINGS (Rumble Strips)



PLAN VIEW
OPTION 7

PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)



PLAN VIEW
OPTION 8

PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5, 6 or 8	Option 1, 2, 3 5, 6 or 7	Option 2, 4, 5 6 or 7

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
5. Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.
6. Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
7. Consideration should be given to noise levels when edgeline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

9. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
10. Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble strip.

WHEN INSTALLING RAISED OR PROFILE EDGE LINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
15. Raised profile thermoplastic markings used as edge lines may substitute for buttons.

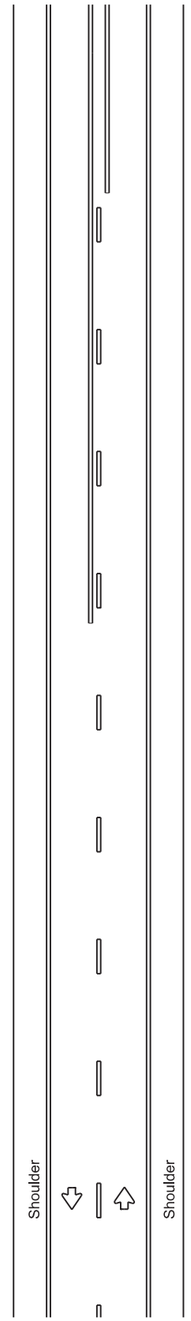
Texas Department of Transportation

Traffic Safety Division Standard

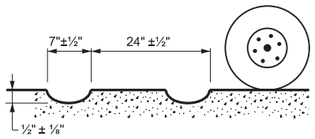
EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23

FILE: rs(2)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
10-13	DIST	COUNTY		SHEET NO.
1-23	HOU	BRAZORIA		81

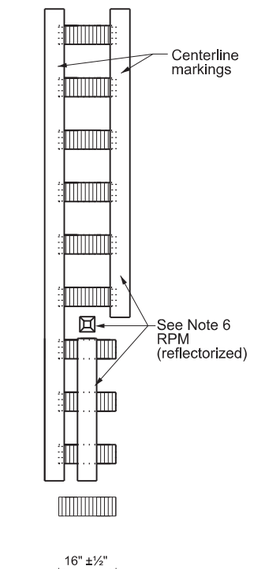
CENTERLINE RUMBLE STRIPS



TWO LANE TWO-WAY HIGHWAYS

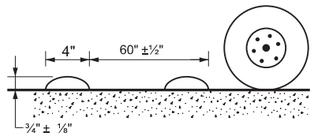


PROFILE VIEW

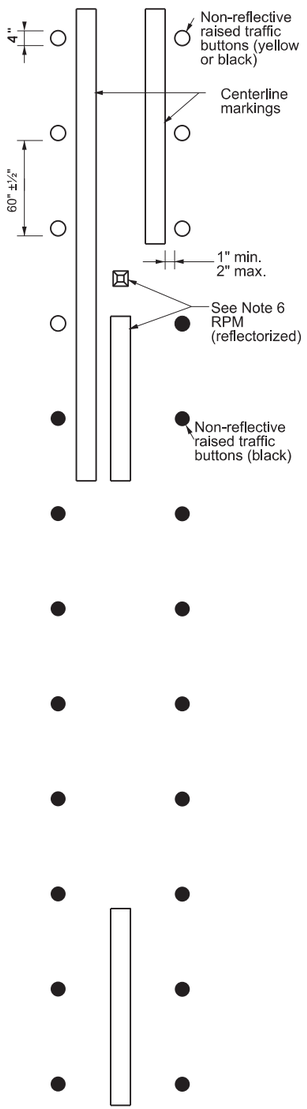


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

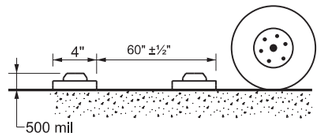


PROFILE VIEW

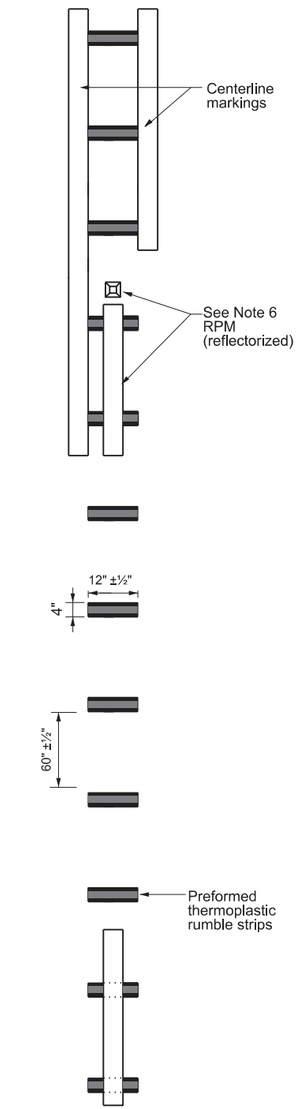


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

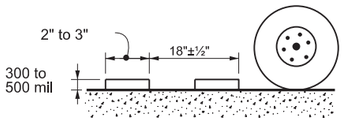


PROFILE VIEW

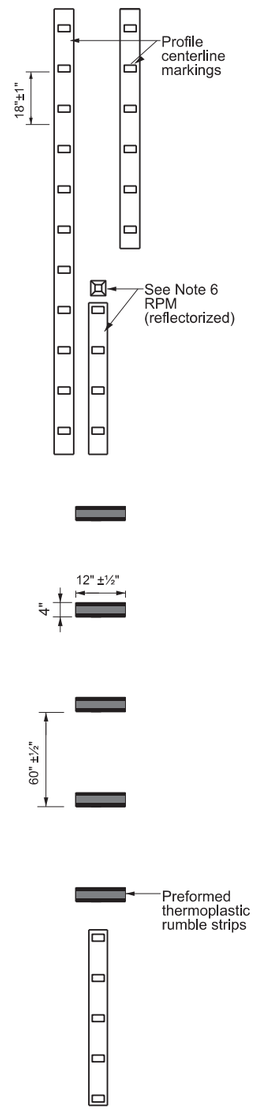


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC RUMBLE STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edge line rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections or driveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.
12. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING EDGE LINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

13. See standard sheet RS(2).

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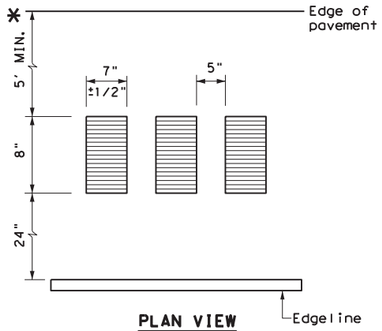
FILE: c:\txdot\pw_online\txdot3\jamie.howell\d0610203\rs(4)-23.dgn

Texas Department of Transportation

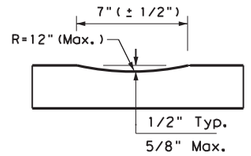
Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
10-13 1-23	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		82



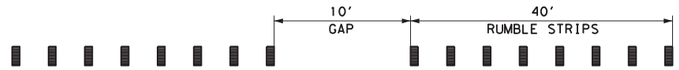
PLAN VIEW



PROFILE VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

* RESERVED FOR BICYCLES



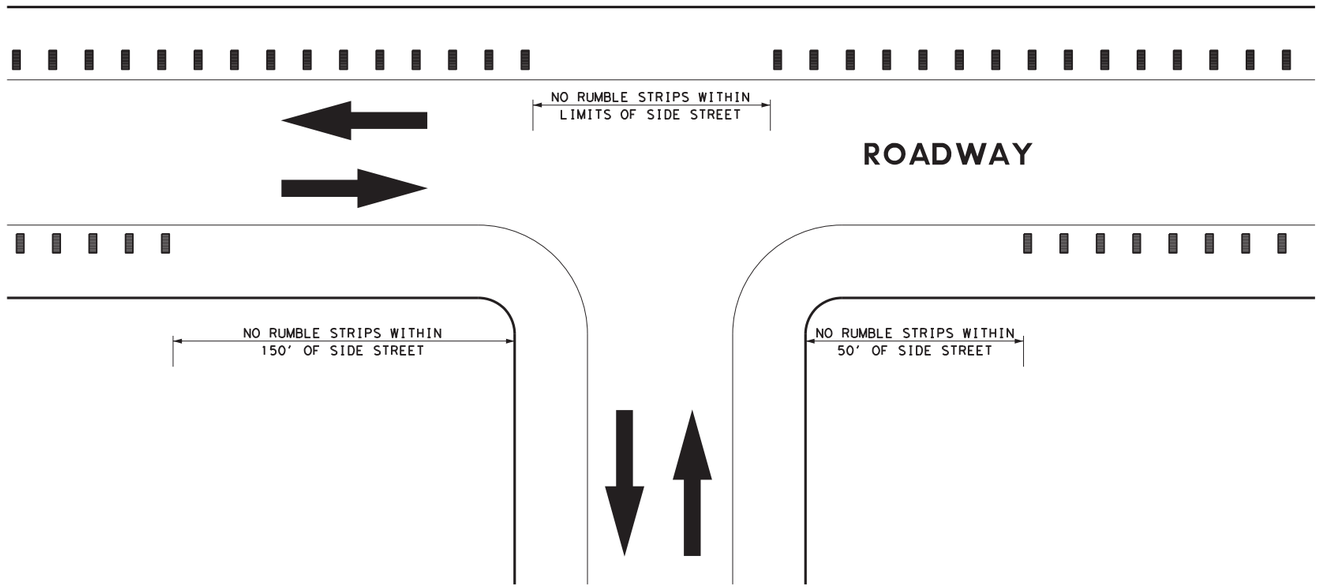
RUMBLE STRIP GAP DETAIL
N.T.S.

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

3. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
4. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
5. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
6. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.



INTERSECTION DETAIL

SCALE N.T.S.
SHEET 1 OF 1

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

4/20/2023

EDGELINE RUMBLE STRIPS DETAIL

Texas Department of Transportation®

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		83

4/20/2023
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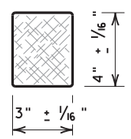
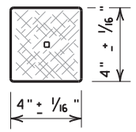
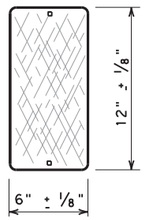
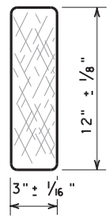
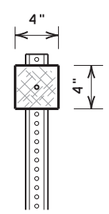
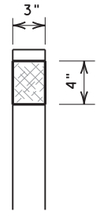
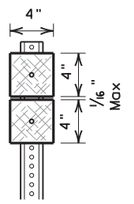
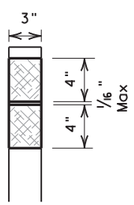
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE	 1-Size 2 reflector unit	 1-Size 1 reflector unit	 2-Size 2 reflector units	 2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

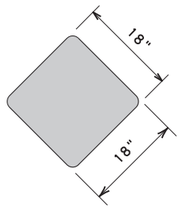
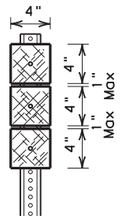
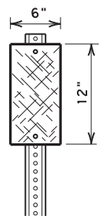
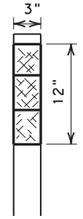
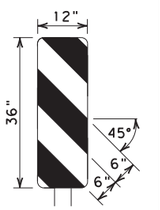
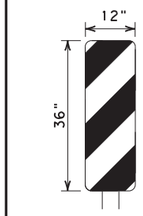
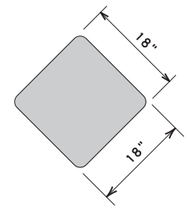
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

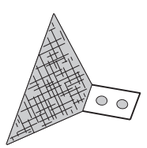
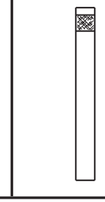
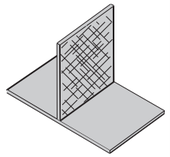
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

OBJECT MARKERS

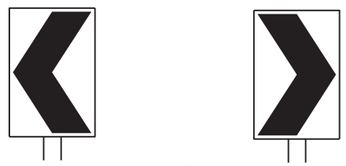
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		 3-Size 2 reflector units	 1-Size 3 reflector unit	 3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE



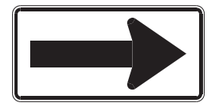
W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE



W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

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.

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

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	2950	01	008, ETC	FM 2403
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	HOU	BRAZORIA		84

20A

DATE: 4/20/2023 5:02:48 PM
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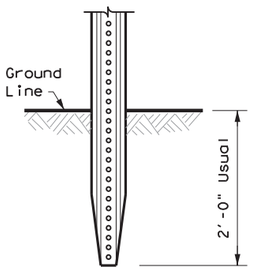
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

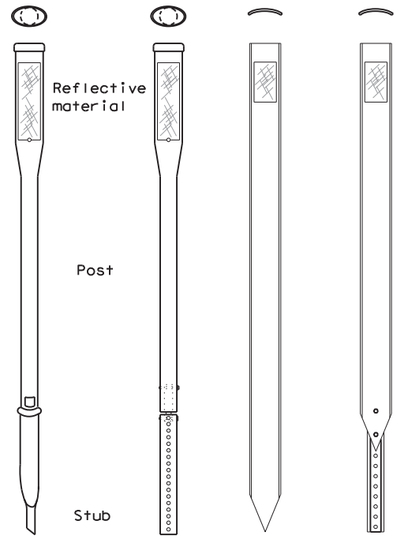


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

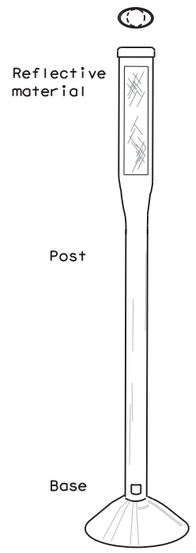
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



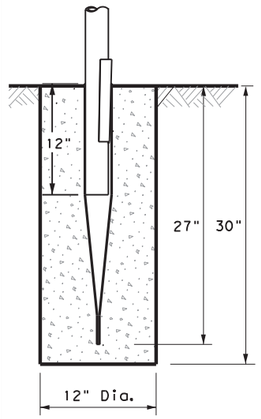
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

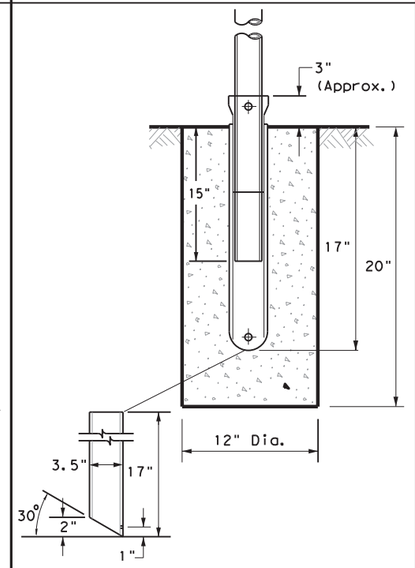
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

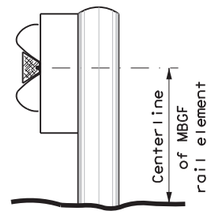
NOTE

1. Install per manufacturer's recommendations.

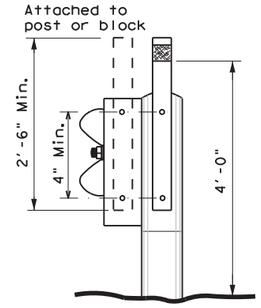
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

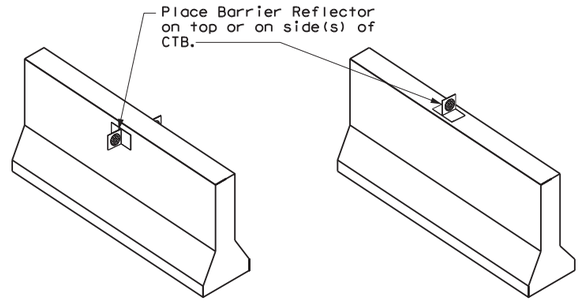
GF1



GF2



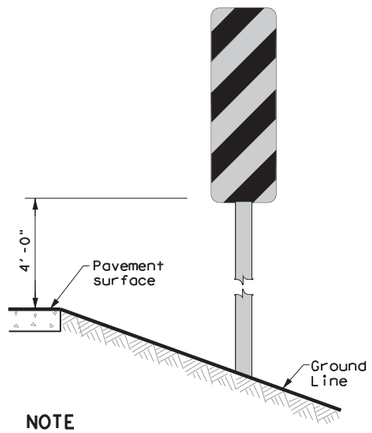
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

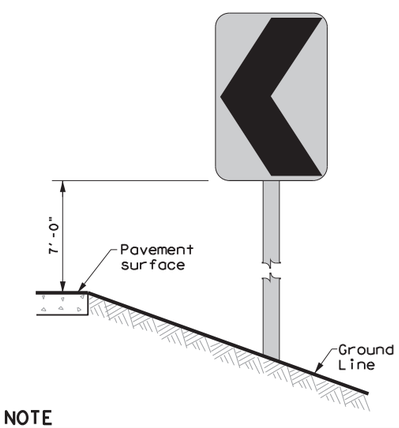
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

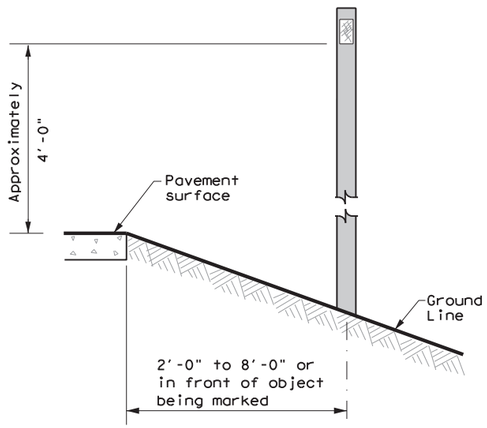
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	HOU	BRAZORIA		85

20B

DATE: 4/20/2023 5:02:55 PM
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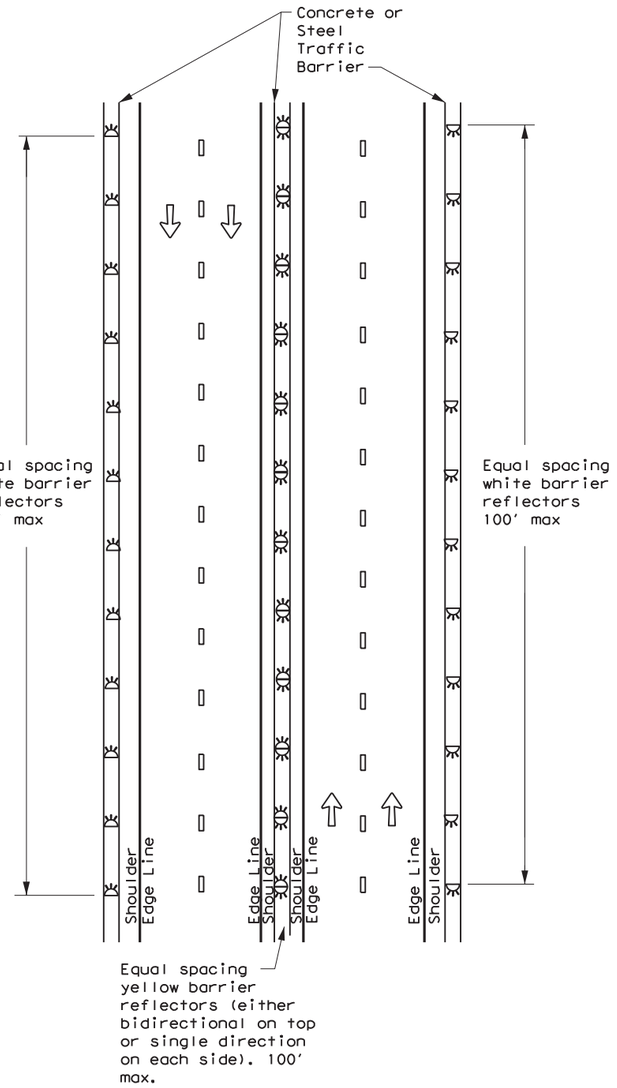
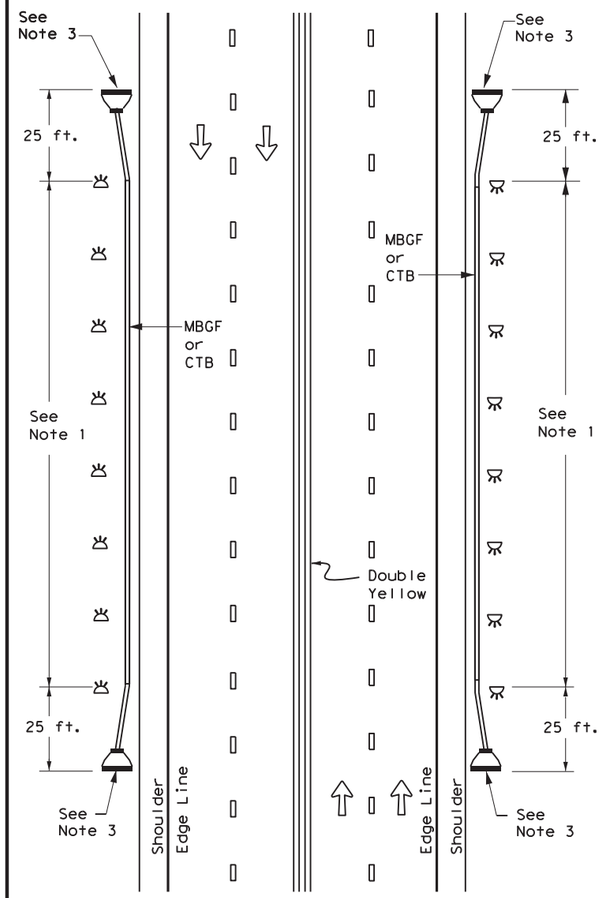
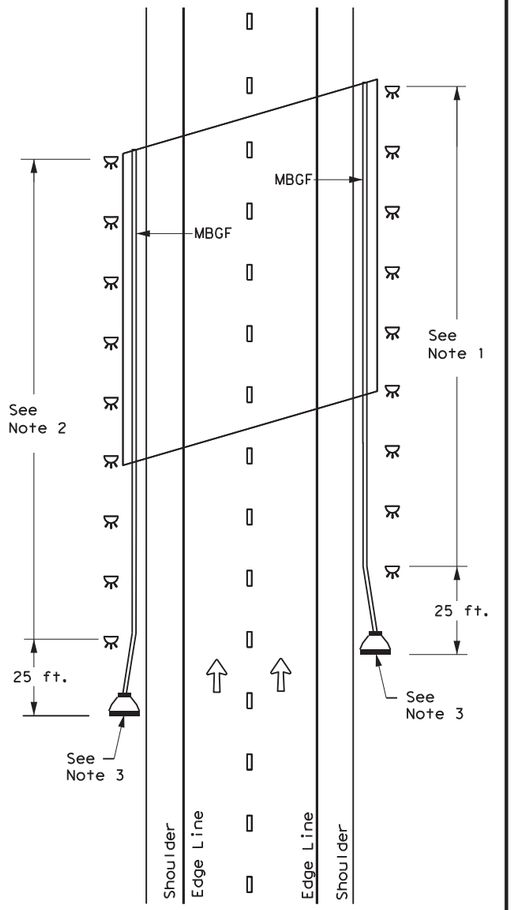
CONTINUOUS CONCRETE OR STEEL BARRIER



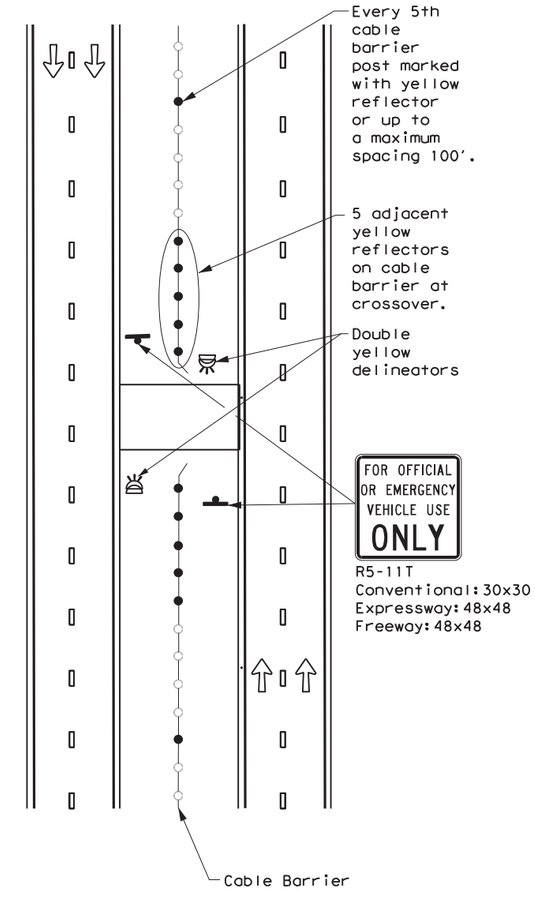
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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

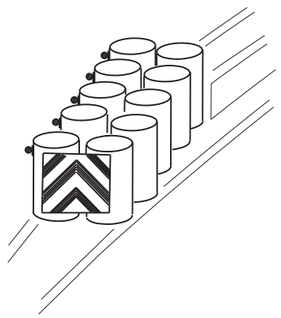
Texas Department of Transportation

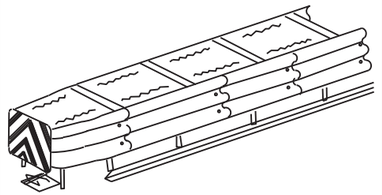
Traffic Safety Division Standard

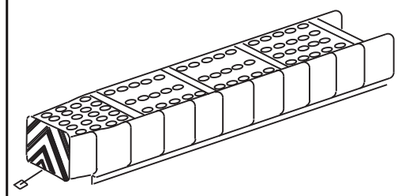
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

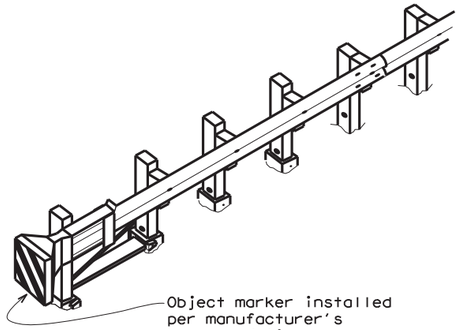
D & OM(6)-20

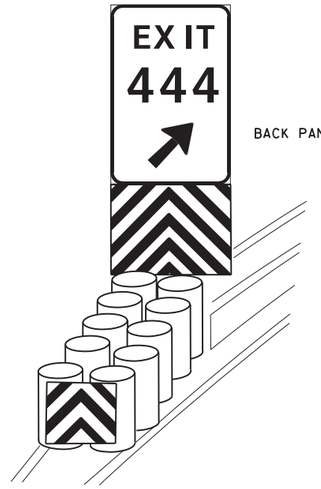
FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
7-20	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		86

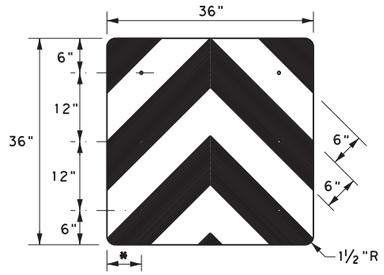


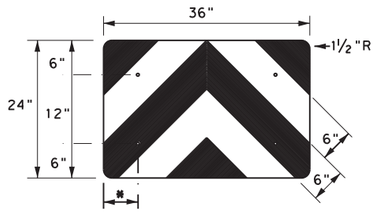




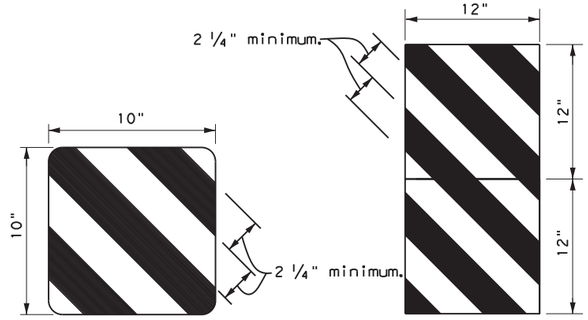




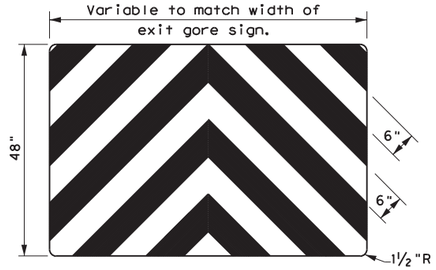


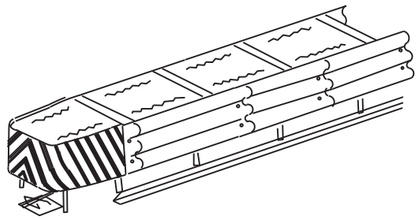


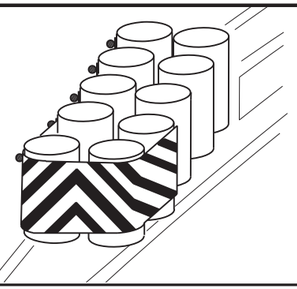
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

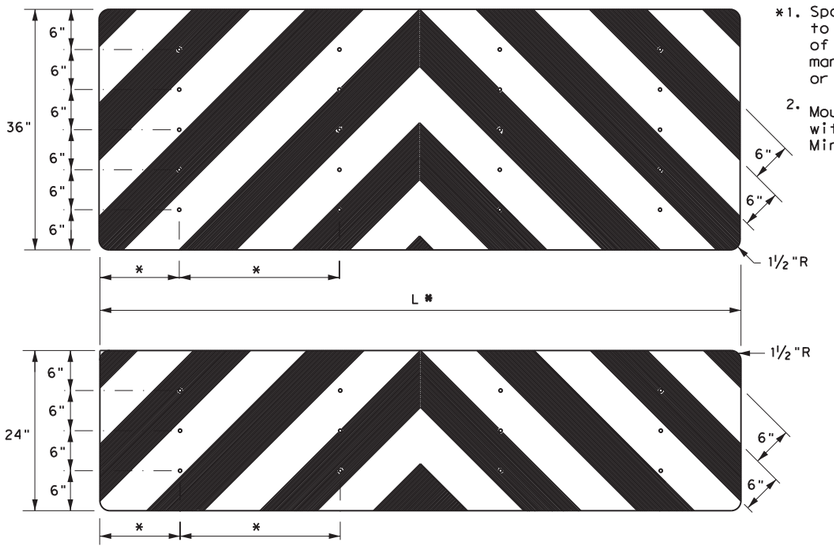


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

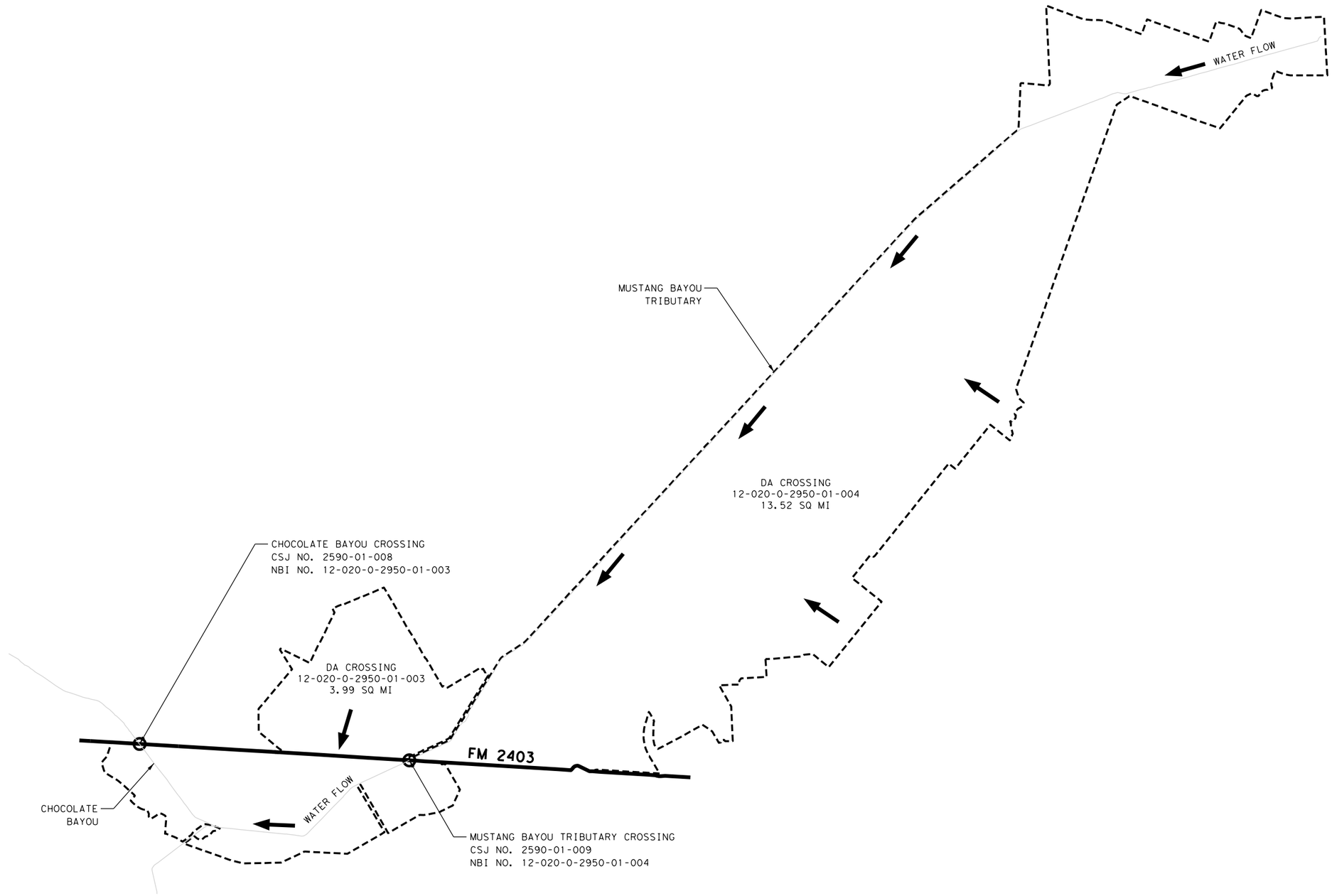
D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	HOU	BRAZORIA		87
4-98 7-20				

20G

DATE: 4/20/2023 5:03:09 PM
FILE: c:\txdot\pw_online\txdot3\jamie.howell\d0547226\domvia-20.dgn

BRIDGE NAME	CROSSING ID / BRIDGE NBI No	CROSSING STATION	STREAM NAME	EXISTING STRUCTURE	ASSOCIATED DRAINAGE AREA		DISCHARGE (CFS)							
					ACRES	SQ MILES	10-YEAR		25-YEAR		50-YEAR		100-YEAR	
							EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED
SOUTH BRIDGE	12-020-0-2950-01-003	39+00	CHOCOLATE BAYOU	BRIDGE	2553.60	3.99	1674.2	1675.6	2018.3	2020.1	2248.2	2250.4	2659.3	2669.3
NORTH BRIDGE	12-020-0-2950-01-004	164+00	MUSTANG BAYOU TRIBUTARY	BRIDGE	8650.24	13.52	1918.0	1920.0	2520.7	2528.4	3165.8	3164.1	3970.4	3950.0



LEGEND:

- FM 2403 CROSSING
- DRAINAGE AREA BOUNDARY
- STREAM
- FM 2403 ROADWAY
- FLOW ARROW

NOTE:

1. OVERALL DRAINAGE AREA BOUNDARIES FOR DRAINAGE CROSSINGS ARE SHOWN AS PROVIDED IN THE "DRAINAGE STUDY FOR FM 2403 BRIDGE REPLACEMENT PROJECT, BRAZORIA COUNTY, TEXAS "DATED MAY 2023, PREPARED BY CIVILTECH, A WOOLPERT COMPANY.

0 30000 60000
SCALE IN FEET

STATE OF TEXAS
SCOTT P. HUGHES
117276
LICENSED PROFESSIONAL ENGINEER
5-19-23

5/19/2023

CivilTech Engineering, Inc.
11821 Telge Road
Cypress, Texas 77429
PH: (281) 304-0200 • FX: (281) 304-0210
Firm Registration No. F-382

Texas Department of Transportation

FM 2403 OVERALL DRAINAGE AREA MAP

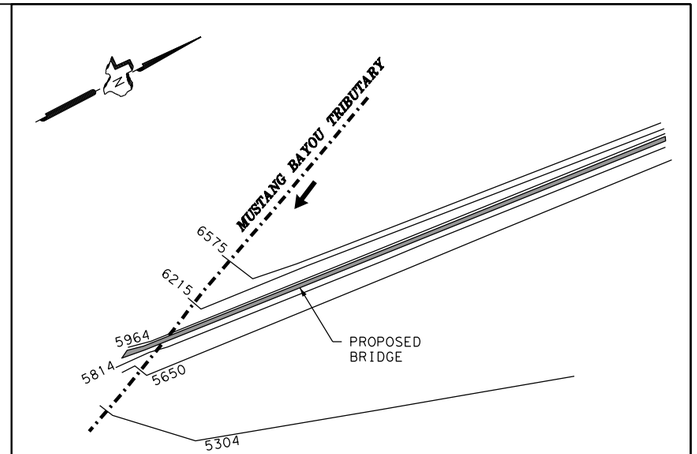
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2950	01	008, ETC	FM 2403
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		88

DATE: 5/19/2023
FILE: O:\2020405017\Drawings\FM2403\2403_DAM.dgn

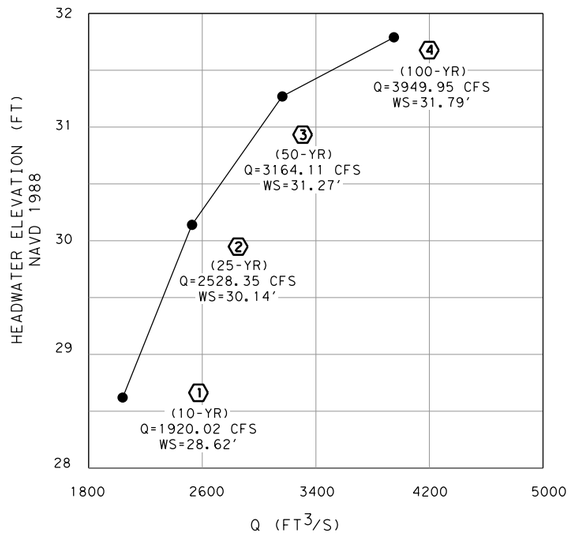
CK
DW
CK
DN

COMPARSION OF HEC-RAS MODEL RESULT FOR FM 2403 OVER MUSTANG BAYOU TRIBUTARY											
			FLOW (CFS)			WSE (FT)			VELOCITY (FT/S)		
XS	FREQ	FL (FT)	PROPOSED	EXISTING	DELTA	PROPOSED	EXISTING	DELTA	PROPOSED	EXISTING	DELTA
5964	10-YEAR	15.32	1920.02	1917.99	2.03	28.62	28.80	-0.18	1.22	1.44	-0.22
	25-YEAR	15.32	2528.35	2520.65	7.70	30.14	30.42	-0.28	1.34	1.55	-0.21
	50-YEAR	15.32	3164.11	3165.79	-1.68	31.27	31.52	-0.25	1.30	1.45	-0.15
	100-YEAR	15.32	3949.95	3970.35	-20.40	31.79	31.98	-0.19	1.42	1.55	-0.13
5946	BRIDGE										
5818	10-YEAR	15.17	1919.82	1916.97	2.85	28.59	28.59	0.00	1.24	2.07	-0.83
	25-YEAR	15.17	2526.68	2510.55	16.13	30.10	30.12	-0.02	1.35	2.18	-0.83
	50-YEAR	15.17	3163.84	3163.52	0.32	31.25	31.28	-0.03	1.31	2.02	-0.71
	100-YEAR	15.17	3959.12	3965.31	-6.19	31.76	31.80	-0.04	1.43	2.01	-0.58



HEC-RAS CROSS SECTIONS

* RATING CURVE AT STATION 5964
HEADWATER ELEVATION VS. FLOW



* RATING CURVE BASED ON HEC-RAS PROPOSED MODEL

HYDROLOGIC METHOD
FLOWS CALCULATED USING SCS METHOD.

HYDRAULIC METHOD
HEC-RAS MODEL WAS CREATED USING 2018 LIDAR FOR HYDRAULIC ANALYSIS.

1-DIMENSIONAL UNSTEADY MODEL WITH NORMAL DEPTH AS BOUNDARY CONDITION WAS CREATED TO ANALYZE THE BRIDGE.

WATER SURFACE ELEVATIONS (WSE) IS COMPUTED USING HEC-RAS MODEL "FM2403.PRJ".

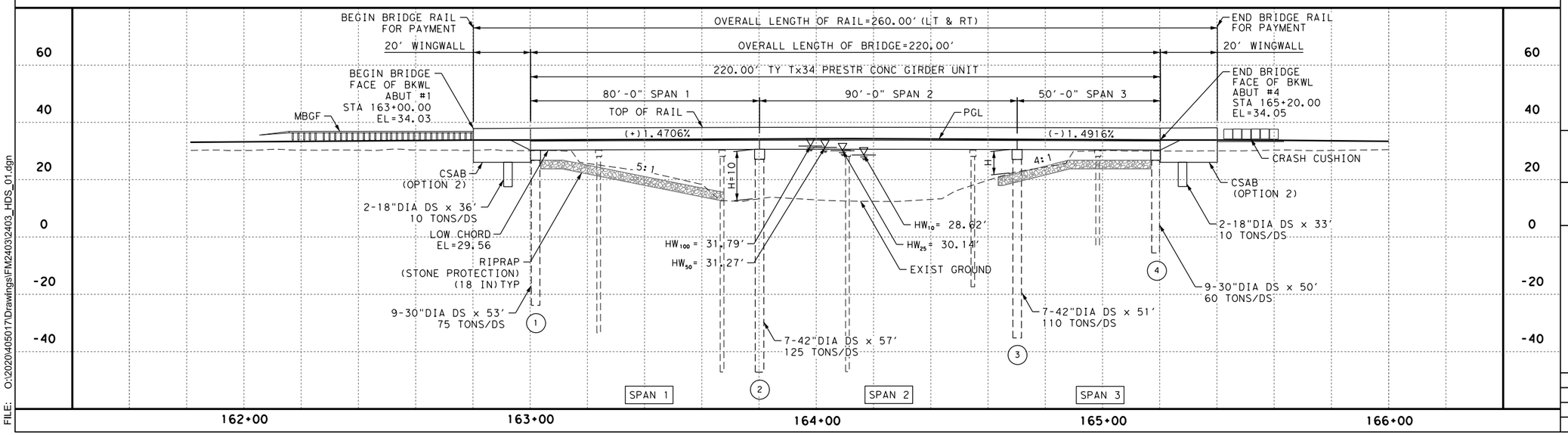
EXISTING CONDITION WATER SURFACE ELEVATIONS FROM HEC-RAS MODEL GEOMETRY NAMED "BR2950-01-009-GEO-Ex-XS_Extension".

PROPOSED CONDITION WATER SURFACE ELEVATIONS FROM HEC-RAS MODEL GEOMETRY NAMED "BR2950-01-009-GEO-Prop-XS_Extension".

NOTES:

1. NBI : 12-020-0-2950-01-004
2. DATA PRESENTED FROM DRAINAGE REPORT TITLED "DRAINAGE STUDY FOR FM 2403 BRIDGE REPLACEMENT PROJECT, BRAZORIA COUNTY, TEXAS" DATED MAY 2023, PREPARED BY CIVILTECH, A WOOLPERT COMPANY.
3. THE PROPOSED BRIDGE IS LOCATED AT HEC-RAS STATION 5946, BETWEEN STATIONS 5964 (UPSTREAM) AND 5818 (DOWNSTREAM). THE PROPOSED BRDIGE LENGTH IS 220 FT.
4. THE PROJECT DATA IS REFERENCED TO NAVD 1988.
5. THE PROJECT SITE LIES WITHIN ZONE AO WITH 3 FEET DEPTH OF THE FEMA REGULATORY FLOODPLAIN BASED ON FEMA FIRM PANEL NUMBER 48039C0258K DATED 12/30/2020.
6. HYDROLOGY WAS BASED ON NOAA'S ATLAS 14 RAINFALL.
7. HEC-RAS (VERSION 6.2.0) WAS USED FOR HYDRALUIC ANALYSIS AND DESIGN.

0 20 40 (H)
0 20 40 (V)



5/19/2023

CivilTech Engineering, Inc.
11821 Telge Road
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Firm Registration No. F-382

Texas Department of Transportation

FM 2403
HYDRAULIC DATA SHEET
NORTH BRIDGE

SHEET 1 OF 2

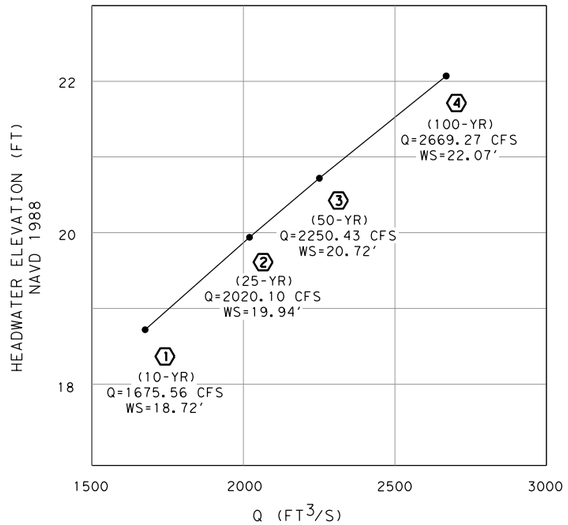
CONT	SECT	JOB	HIGHWAY
2950	01	008, ETC	FM 2403
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		89

DATE: 5/19/2023
FILE: O:\2020\4050017\Drawings\FM2403\2403_HDS_01.dgn

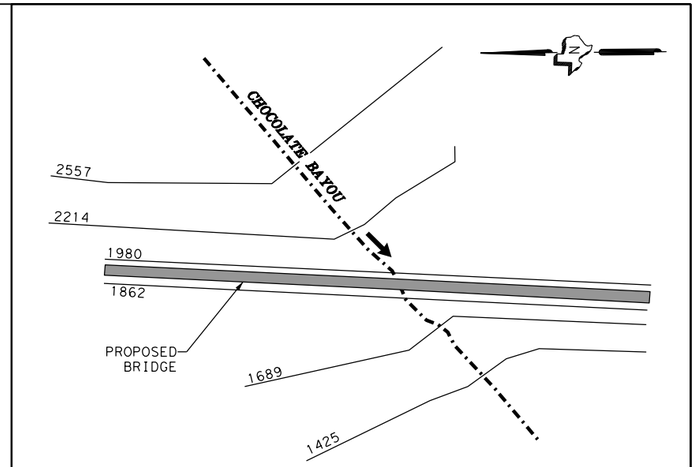
CK:
DW:
CK:
DN:

COMPARSION OF HEC-RAS MODEL RESULT FOR FM 2403 OVER CHOCOLATE BAYOU											
			FLOW (CFS)			WSE (FT)			VELOCITY (FT/S)		
XS	FREQ	FL (FT)	PROPOSED	EXISTING	DELTA	PROPOSED	EXISTING	DELTA	PROPOSED	EXISTING	DELTA
1980	10-YEAR	5.62	1675.56	1674.23	1.33	18.72	18.75	-0.03	2.71	2.70	0.01
	25-YEAR	5.62	2020.10	2018.32	1.78	19.94	19.98	-0.04	2.84	2.83	0.01
	50-YEAR	5.62	2250.43	2248.19	2.24	20.72	20.75	-0.03	2.89	2.87	0.02
	100-YEAR	5.62	2669.27	2659.27	10.00	22.07	22.14	-0.07	2.92	2.88	0.04
1923.5	BRIDGE										
1862	10-YEAR	4.73	1675.55	1674.22	1.33	18.67	18.67	0.00	2.63	2.63	0.00
	25-YEAR	4.73	2020.09	2018.31	1.78	19.90	19.89	0.01	2.73	2.75	-0.02
	50-YEAR	4.73	2250.42	2248.19	2.23	20.68	20.67	0.01	2.76	2.81	-0.05
	100-YEAR	4.73	2669.28	2659.27	10.01	22.04	22.00	0.04	2.75	2.83	-0.08

* RATING CURVE AT STATION 1980
HEADWATER ELEVATION VS. FLOW



* RATING CURVE BASED ON HEC-RAS PROPOSED MODEL



HEC-RAS CROSS SECTIONS

HYDROLOGIC METHOD
FLOWS CALCULATED USING SCS METHOD.

HYDRAULIC METHOD
HEC-RAS MODEL WAS CREATED USING 2018 LIDAR FOR HYDRAULIC ANALYSIS.

1-DIMENSIONAL UNSTEADY MODEL WITH NORMAL DEPTH AS BOUNDARY CONDITION WAS CREATED TO ANALYZE THE BRIDGE.

WATER SURFACE ELEVATIONS (WSE) IS COMPUTED USING HEC-RAS MODEL "BR_2950-01-008.PRJ".

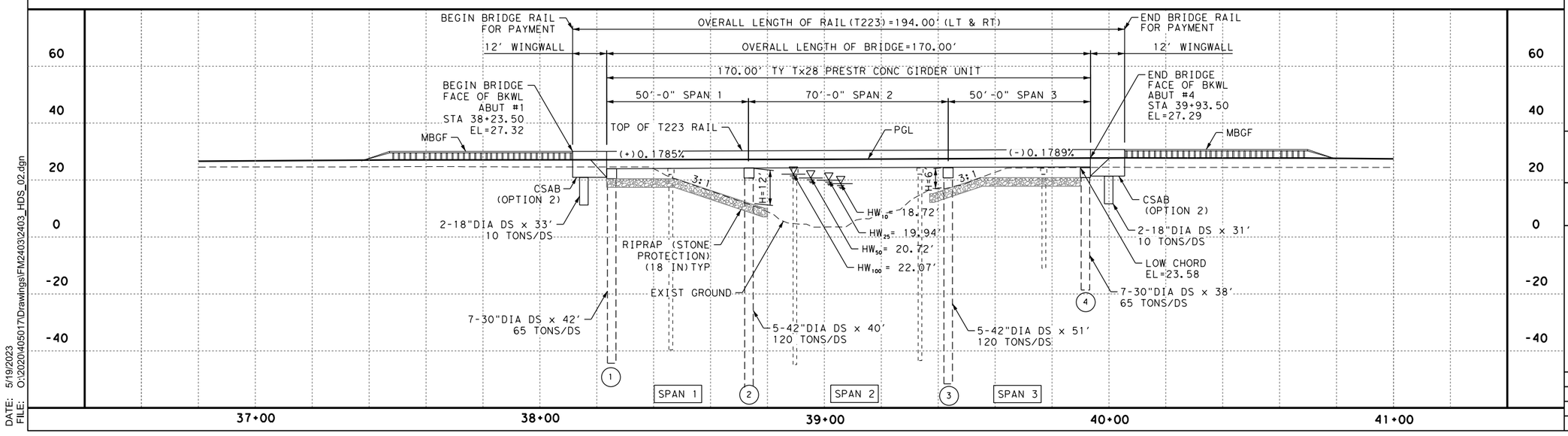
EXISTING CONDITION WATER SURFACE ELEVATIONS FROM HEC-RAS MODEL GEOMETRY NAMED "FM2403_EX".

PROPOSED CONDITION WATER SURFACE ELEVATIONS FROM HEC-RAS MODEL GEOMETRY NAMED "FM2403_PROP".

NOTES:

1. NBI : 12-020-0-2950-01-003
2. DATA PRESENTED FROM DRAINAGE REPORT TITLED "DRAINAGE STUDY FOR FM 2403 BRIDGE REPLACEMENT PROJECT, BRAZORIA COUNTY, TEXAS" DATED MAY 2023, PREPARED BY CIVILTECH, A WOOLPERT COMPANY.
3. THE PROPOSED BRIDGE IS LOCATED AT HEC-RAS STATION 1923.5, BETWEEN STATIONS 1980 (UPSTREAM) AND 1862 (DOWNSTREAM). THE PROPOSED BRDIGE LENGTH IS 170 FT.
4. THE PROJECT DATA IS REFERENCED TO NAVD 1988.
5. THE PROJECT SITE IS NOT WITHIN THE FEMA REGULATORY FLOODWAY.
6. HYDROLOGY WAS BASED ON NOAA'S ATLAS 14 RAINFALL.
7. HEC-RAS (VERSION 6.2.0) WAS USED FOR HYDRALUIC ANALYSIS AND DESIGN.

0 20 40 (H)
0 20 40 (V)



DATE: 5/19/2023
FILE: O:\2020\405017\Drawings\FM2403\2403_HDS_02.dgn

STATE OF TEXAS
SCOTT P. HUGHES
117276
LICENSED PROFESSIONAL ENGINEER
5-19-23

5/19/2023

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Cypress, Texas 77429
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Firm Registration No. F-382

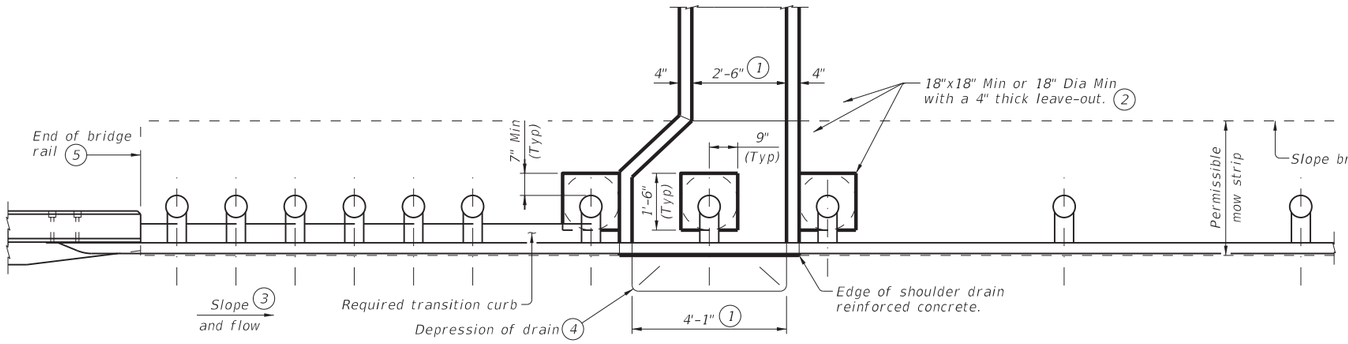
Texas Department of Transportation

FM 2403
HYDRAULIC DATA SHEET
SOUTH BRIDGE

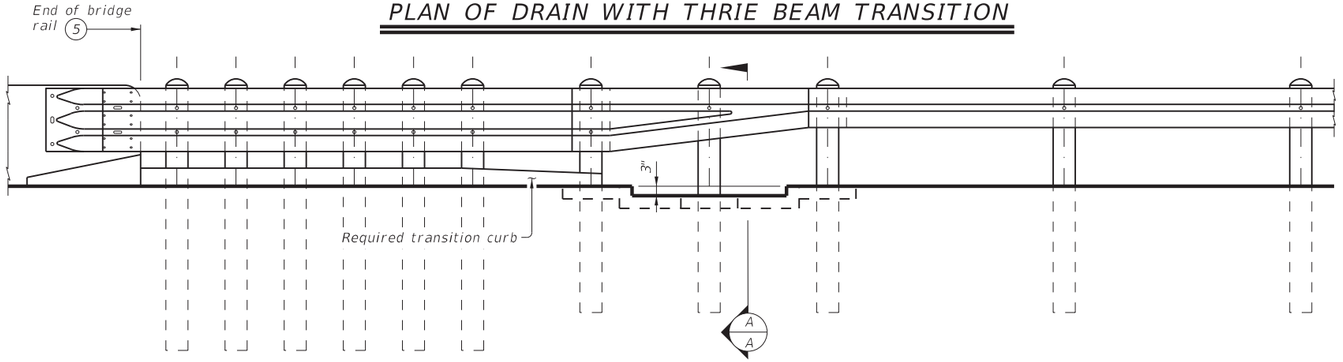
SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2950	01	008, ETC	FM 2403 N
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		90

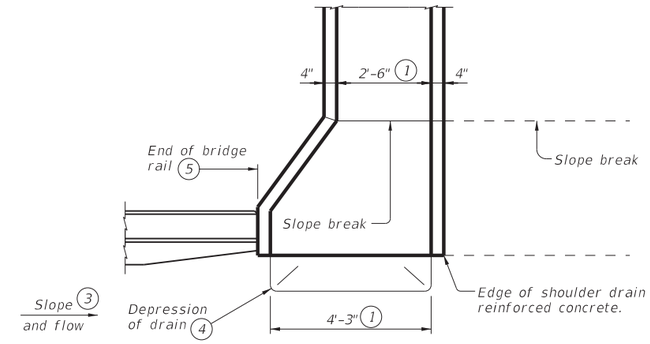
DATE: 4/20/2023 5:03:27 PM
FILE: c:\txdot\pw_online\txdot3\jamie.howell\d0304376\sdebr001-19.dgn



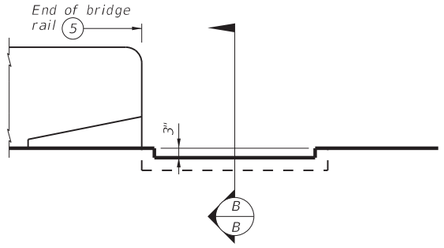
PLAN OF DRAIN WITH THRIE BEAM TRANSITION



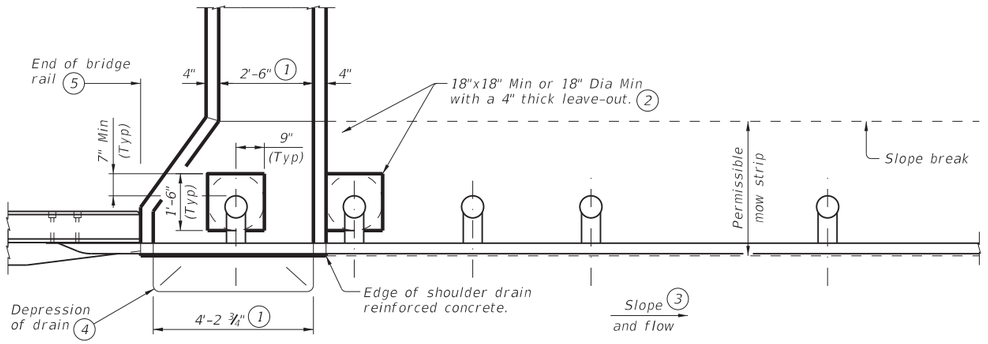
ROADWAY ELEVATION OF DRAIN WITH THRIE BEAM TRANSITION



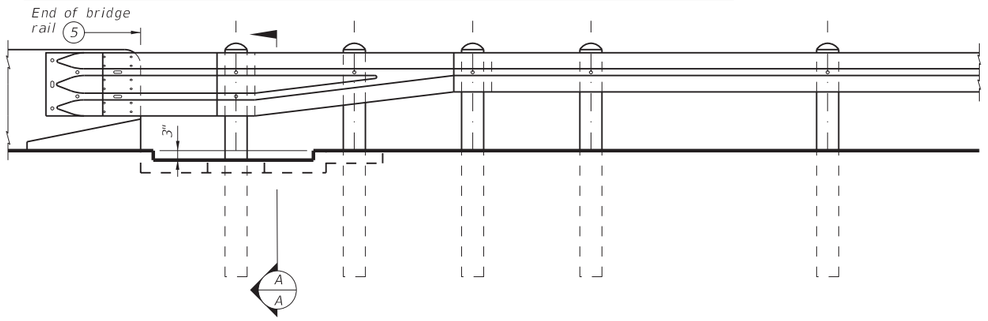
PLAN OF DRAIN WITHOUT MBGF TRANSITION



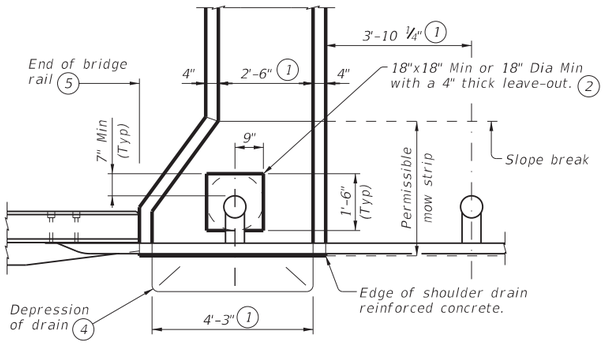
ROADWAY ELEVATION OF DRAIN WITHOUT MBGF TRANSITION



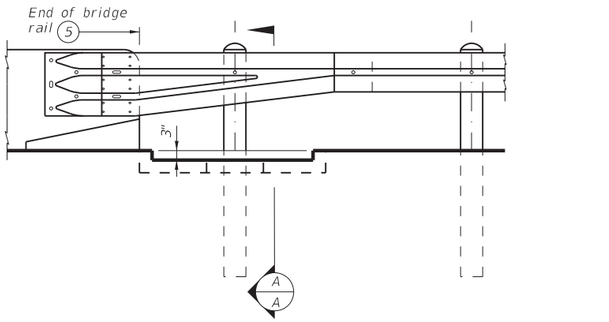
PLAN OF DRAIN WITH TL-2 (LOW SPEED) TRANSITION



ROADWAY ELEVATION OF DRAIN WITH TL-2 (LOW SPEED) TRANSITION



PLAN OF DRAIN WITH DOWNSTREAM ANCHOR TERMINAL



ROADWAY ELEVATION OF DRAIN WITH DOWNSTREAM ANCHOR TERMINAL

(1) Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer. Location of shoulder drain must consider limitation imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.

(2) Fill leave-outs with no more than a 2-sack grout mixture (1 part cement, 5 parts water, and 14 parts sand by volume) with a 28-day compressive strength of approximately 120 psi or less. Provide grout of a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (20" Max leave-out).

(3) For other slope and flow directions drain configuration may be mirrored wider or tapered wider if shown elsewhere in the plans or directed by the Engineer.

(4) Form depression into concrete, asphalt pavement, or approach slab.

(5) See Bridge Layout for rail type.

Texas Department of Transportation

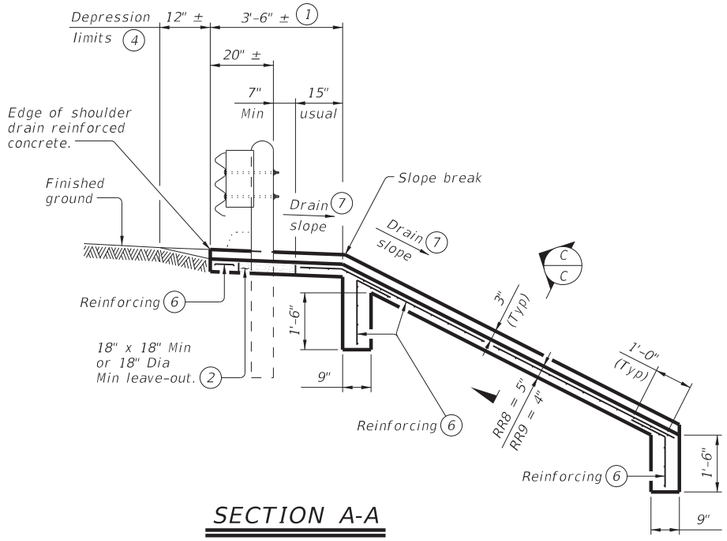
Bridge Division Standard

SHOULDER DRAIN AT END OF BRIDGE RAIL

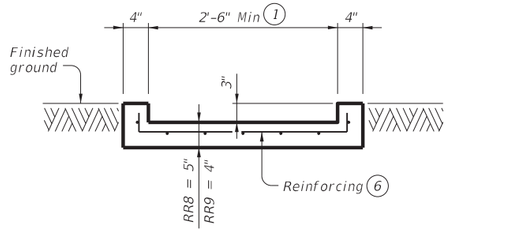
SD-EBR

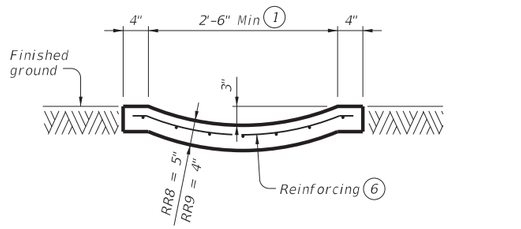
FILE: sdebr001-19.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		92

DATE: 4/20/2023 5:03:30 PM
FILE: c:\txdot\pw_online\txdot3\jamie.howell\d0304376\sdebr001-19.dgn



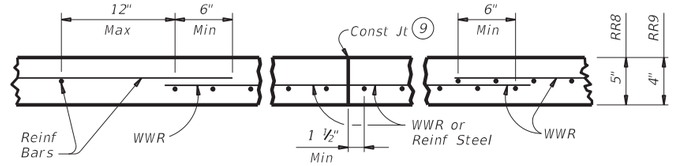
SECTION A-A





SECTION C-C

Sections shown without integrated riprap.



REINFORCEMENT DETAILS (6)

See General Notes for optional synthetic fiber reinforcement.

(1) Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer. Location of shoulder drain must consider limitation imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.

(2) Fill leave-outs with no more than a 2-sack grout mixture (1 part cement, 5 parts water, and 14 parts sand by volume) with a 28-day compressive strength of approximately 120 psi or less. Provide grout of a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (20" Max leave-out).

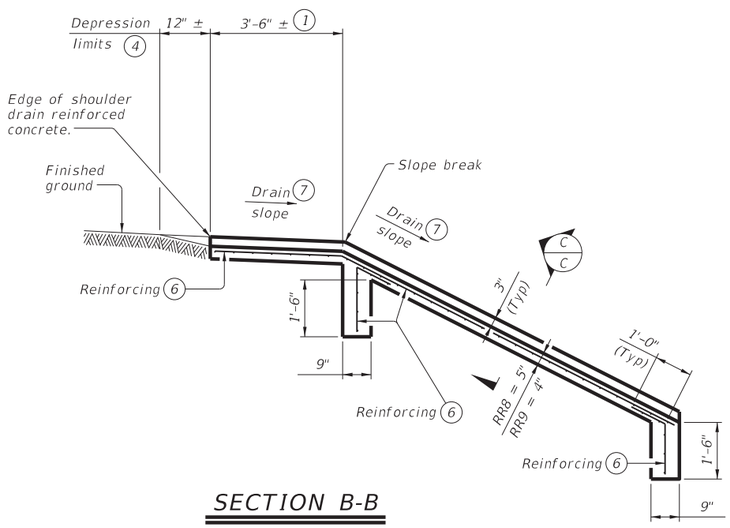
(4) Form depression into concrete, asphalt pavement, or approach slab.

(6) Provide (#3) reinforcing bar at 18" spacing c-c or welded wire reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars, unless shown otherwise.

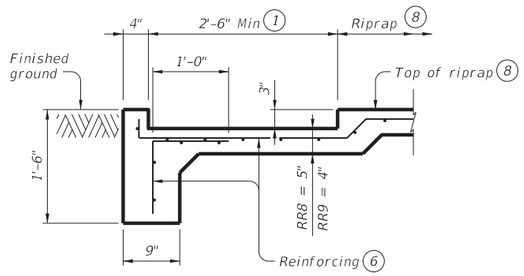
(7) See elsewhere in plans or as directed by the Engineer.

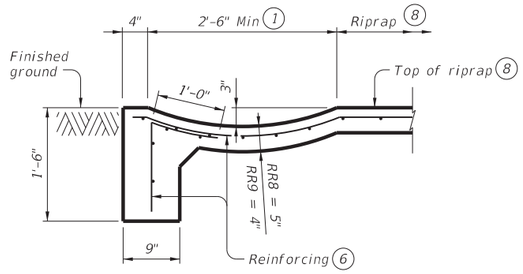
(8) See CRR standard for details and notes not shown.

(9) WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic fiber is utilized.



SECTION B-B





SECTION C-C

Sections shown with integrated riprap.

GENERAL NOTES:

Provide Class "B" concrete with a minimum compressive strength of 2,000 psi unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

See Metal Beam Guard Fence (Mow Strip) standard for details and notes not shown.

Payment for furnishing and placing 2-sack grout mixture will be subsidiary to shoulder drain.

Payment for shoulder drain will be as per Item 420, "Cl B Conc (Flume)". All details shown herein are subsidiary to shoulder drain.

See Layout for limits of shoulder drain.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

SHOULDER DRAIN AT END OF BRIDGE RAIL

SD-EBR

FILE: sdebr001-19.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		93

DRILLING LOG

WinCore Version 3.3

County	Brazoria	Hole	DD-1	District	Houston
Highway	FM 2403	Structure	Bridge	Date	10/24/2019
CSJ	2950-01-008	Station	38+20	Grnd. Elev.	21.87 ft
		Offset	34.1 RT	GW Elev.	3.87 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
18.9			CLAY, sandy, dark grey (CH)			24	51			
						18	52	36		
15.9	5	6 (6) 7 (6)	CLAY, sandy, soft, tan little grey (CH)	0	39.6	19	53		135	
			CLAY, sandy, soft, tan and grey (CL)	0	11.8	12	20	5	134	
10.9	10	9 (6) 10 (6)				8	36	22		% Passing No.200 Sieve = 20.61
			SAND, loose, tan							
5.9	15	6 (6) 11 (6)				9				
			SAND, very loose, tan							
.9	20	3 (6) 4 (6)				5				
			SAND, compact, tan							
-4.1	25	22 (6) 22 (6)				22				
			SAND, dense, tan							
-9.1	30	45 (6) 50 (5)				22				
			SAND, slightly compact, tan							
-14.1	35	15 (6) 16 (6)				24				
			SAND, compact, tan w/ little clay							
	40	30 (6) 32 (6)				23				
-20.1			SAND, slightly compact, tan							
	45	9 (6) 12 (6)				23				
-25.1			SAND, compact, tan							
	50	27 (6) 28 (6)				25				
-30.1			SAND, slightly compact, grey and tan w/ little clay and rock							
	55	16 (6) 18 (6)				20				
-35.1			SAND, dense, grey w/ little clay							
	60					19				

Remarks: X=3160774.3507, Y=13689480.7905; Water level encountered at 20 ft depth on 10/23/2019.

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: Dempsey Gearen Logger: Linda Hall Organization: TxDOT

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DRILLING LOG

WinCore Version 3.3

County	Brazoria	Hole	DD-1	District	Houston
Highway	FM 2403	Structure	Bridge	Date	10/24/2019
CSJ	2950-01-008	Station	38+20	Grnd. Elev.	21.87 ft
		Offset	34.1 RT	GW Elev.	3.87 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
		46 (6) 48 (6)	SAND, dense, grey w/ little clay							
-40.1			SAND, slightly compact, grey							
	65					19				
-45.1			CLAY, sandy, stiff, grey and tan w/ ferrous nodules (CL)							
	70	11 (6) 13 (6)				25	43	17	130.1	
-50.1			CLAY, sandy, stiff, tan little grey w/ ferrous nodules (CH)							
	75	13 (6) 16 (6)				21	57			
-55.1			CLAY, sandy, very stiff, grey and tan (CL)							
	80	27 (6) 50 (6)				19	48	29		
-60.1			CLAY, sandy, stiff, grey and tan (CL)							
	85	17 (6) 15 (6)				24	43	23		
	90	17 (6) 19 (6)				18	25			
-70.1			SILT, compact, tan little grey							
	95	35 (6) 35 (6)				24	25	4		% Passing No.200 Sieve = 23.68
-75.1			CLAY, sandy, very stiff, tan little grey (CL)							
	100	12 (6) 30 (6)				22	31			
	105					22	39	22		
-85.1			CLAY, very stiff, reddish tan little grey w/ calcareous (CH)							
-88.1	110	33 (6) 33 (6)				26	60			
	115									
	120									

Remarks: X=3160774.3507, Y=13689480.7905; Water level encountered at 20 ft depth on 10/23/2019.

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: Dempsey Gearen Logger: Linda Hall Organization: TxDOT

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STATE OF TEXAS
CHEN-HUA CHUNG
89236
LICENSED
PROFESSIONAL ENGINEER

4/7/2023

SOUTH BRIDGE
BORING LOGS

Texas Department of Transportation

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		94

SHEET 1 OF 2

4/7/2023
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DRILLING LOG

WinCore Version 3.3

County	Brazoria	Hole	DD-2	District	Houston
Highway	FM 2403	Structure	Bridge	Date	10/23/2019
CSJ	2950-01-008	Station	39+58	Grnd. Elev.	21.79 ft
		Offset	27.1 RT	GW Elev.	N/A

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
			CLAY, sandy, soft, dark grey and tan w/ rock (CL)			18	38			
						3	33	16		
5		7 (6) 8 (6)				5	39			
15.8			SAND, silty, loose, tan							
						18				
10		8 (6) 7 (6)								
10.8			SAND, loose, tan							
						6				
15		5 (6) 5 (6)								
						25				
20		8 (6) 12 (6)								
.8			SAND, compact, tan							
						24				
25		24 (6) 25 (6)								
-4.2			SAND, slightly compact, tan							
						25				
30		19 (6) 17 (6)								
-9.2			SAND, dense, tan							
						24				
35		33 (6) 50 (6)								
-14.2			SAND, compact, tan							
						20				
40		23 (6) 22 (6)								
-19.2			SAND, slightly compact, greyish tan							
						24				
45		9 (6) 14 (6)								
-25.2			CLAY, sandy, very stiff, brown (CH)	50	9.3	30	50	29	131.8	
50		30 (6) 45 (6)								
-30.2			SAND, dense, grey							
						21				
55		41 (6) 50 (5.5)								
-35.2			SAND, loose, grey							
						19				
60										

Remarks: X=3160775.4567, Y=13689619.4505; Water level encountered at 16 ft depth on 10/22/2019.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen Logger: Linda Hall Organization: TxDOT

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DRILLING LOG

WinCore Version 3.3

County	Brazoria	Hole	DD-2	District	Houston
Highway	FM 2403	Structure	Bridge	Date	10/23/2019
CSJ	2950-01-008	Station	39+58	Grnd. Elev.	21.79 ft
		Offset	27.1 RT	GW Elev.	N/A

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
		9 (6) 9 (6)	SAND, loose, grey							
-40.2			CLAY, sandy, stiff, grey (CL)							
65		11 (6) 12 (6)				24	44	25		
70		10 (6) 11 (6)		0	26.9	12	46		135	
-50.2			CLAY, sandy, stiff, tan and grey w/ ferrous nodules (CH)							
75		14 (6) 20 (6)				11	69	43		
80		15 (6) 19 (6)				87	57			
85		10 (6) 10 (6)				35	52	31		% Passing No.200 Sieve = 87.65
-65.2			CLAY, sandy, stiff, tan little grey (CL)							
90		15 (6) 22 (6)				22	48	29		
-70.2			CLAY, sandy, soft, tan little grey (CL)							
95		10 (6) 8 (6)				23	39	21		% Passing No.200 Sieve = 40.69
-75.2			CLAY, sandy, stiff, brown and tan little grey (CL)							
100		10 (6) 20 (6)				22	30			
-80.2			CLAY, sandy, very stiff, brown and tan little grey w/ calcareous (CH)							
105		22 (6) 22 (6)				30	67	40		
-85.2			CLAY, sandy, stiff, brown, tan, and grey (CL)							
-88.2 110		13 (6) 16 (6)				20	37			
115										
120										

Remarks: X=3160775.4567, Y=13689619.4505; Water level encountered at 16 ft depth on 10/22/2019.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen Logger: Linda Hall Organization: TxDOT

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STATE OF TEXAS
CHEN-HUA CHUNG
89236
LICENSED PROFESSIONAL ENGINEER

4/7/2023

SOUTH BRIDGE
BORING LOGS

Texas Department of Transportation

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		95

SHEET 2 OF 2

4/7/2023
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DRILLING LOG

WinCore Version 3.3

County	Brazoria	Hole	BC-1	District	Houston
Highway	FM 2403	Structure	Bridge	Date	10/18/2019
CSJ	2950-01-008	Station	162+83	Grnd. Elev.	29.80 ft
		Offset	29.6 LT	GW Elev.	N/A

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
			CLAY, sandy, grey with rock (CL)			23	46			
26.8						26	47	24		
	5	2 (6) 3 (6)	CLAY, sandy, very soft, dark grey (CH)	0	6.2	36	70		121	pp=0.5
21.8						34	69	40		
	10	4 (6) 4 (6)	CLAY, sandy, soft, grey and tan w/ rock and calcareous (CL)	0	7.9	17	40		126	pp=3
18.8			CLAY, sandy, grey and tan w/ calcareous (CH)			26	60	36		
15.8	15	5 (6) 6 (6)	CLAY, sandy, soft, grey and tan (CL)	0	5.3	24	34		119	
11.8			SAND, dense, tan			37				
	20	50 (6) 50 (4)				21				
8.8			SAND, slightly compact, brown and tan							
	25	17 (6) 18 (6)				20				
3.8			SAND, compact, tan							
	30	19 (6) 30 (6)				23				
	35	34 (6) 14 (6)				23				
-6.2			CLAY, sandy, soft, brown and grey (CL)	38	23.8	24	47	22	121.9	
	40	6 (6) 8 (6)				18	39			
-12.2			CLAY, sandy, stiff, grey (CL)							
	45	12 (6) 15 (6)				23	47	23		
	50	13 (6) 16 (6)				19	42			
-22.2			CLAY, sandy, stiff, tan little grey w/ calcareous (CL)							
	55	14 (6) 16 (6)				19	25	7		
-27.2			CLAY, sandy, soft, tan and grey (CH)			19	69			
	60									

Remarks: X=3161463.6557, Y=13701925.0504;

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen Logger: Linda Hall Organization: TxDOT

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DRILLING LOG

WinCore Version 3.3

County	Brazoria	Hole	BC-1	District	Houston
Highway	FM 2403	Structure	Bridge	Date	10/18/2019
CSJ	2950-01-008	Station	162+83	Grnd. Elev.	29.80 ft
		Offset	29.6 LT	GW Elev.	N/A

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
		9 (6) 9 (6)	CLAY, sandy, soft, tan and grey (CH)							
-32.2			CLAY, sandy, stiff, tan (CL)							
	65	10 (6) 26 (6)				26	37	5		
-37.2			CLAY, sandy, soft, tan (CL)							
	70	8 (6) 10 (6)				27	31			
-42.2			CLAY, sandy, stiff, grey and tan (CH)							
	75	10 (6) 12 (6)				25	55	31		
	80	10 (6) 14 (6)				25	57			
-52.2			CLAY, sandy, very stiff, grey and tan (CH)							
	85	20 (6) 21 (6)				23	62	42		
	90	33 (6) 34 (6)				17	50			
-62.2			CLAY, sandy, stiff, tan and grey (CL)							
	95	19 (6) 16 (6)				18	36	18		
	100	12 (6) 12 (6)				21	27	8		% Passing No.200 Sieve = 24.1
	105	12 (6) 17 (6)				24	43			
-77.2			CLAY, sandy, soft, tan and grey (CL)							
-80.2	110	7 (6) 7 (6)				28	45	26		
	115									
	120									

Remarks: X=3161463.6557, Y=13701925.0504;

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen Logger: Linda Hall Organization: TxDOT

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STATE OF TEXAS
CHEN-HUA CHUNG
89236
LICENSED PROFESSIONAL ENGINEER

Chen-Hua Chung

4/7/2023

NORTH BRIDGE BORING LOGS

Texas Department of Transportation®

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		96

SHEET 1 OF 2

4/7/2023
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DRILLING LOG

WinCore Version 3.3

County	Brazoria	Hole	BC-2	District	Houston
Highway	FM 2403	Structure	Bridge	Date	10/17/2019
CSJ	2950-01-008	Station	164+78	Grnd. Elev.	30.03 ft
		Offset	20.5 RT	GW Elev.	15.61 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
29.			CLAY, sandy, grey br w/shell (CH)			17	50			
			CLAY, sandy, soft, grey (CH)			31	73	42		
	5	3 (6) 5 (6)		0	17.7	32	77		117	
24.			CLAY, sandy, tan little grey w/ calcareous (CL)			24	48	29		
22.			CLAY, sandy, soft, tan little grey w/ calcareous (CH)							
	10	6 (6) 6 (6)		0	33.4	24	54		126	
17.			CLAY, sandy, very stiff, tan (CL)			27	57	32		
	15	18 (6) 34 (6)		0	24.6	24	33		126	
14.			SAND, slightly compact, tan							
	20	12 (6) 12 (6)				19				
	25	14 (6) 18 (6)				17				
4.			SAND, compact, tan w/ some shell							
	30	20 (6) 21 (6)				18				
-1.			SAND, slightly compact, tan							
	35	18 (6) 13 (6)				21				
-6.			CLAY, sandy, brown (CH)			24	52	34		
-8.			CLAY, sandy, soft, grey (CL)							
	40	6 (6) 7 (6)				21	28			
-12.			CLAY, sandy, stiff, grey and tan w/ calcareous and ferrous nodules (CL)							
	45	16 (6) 17 (6)				16	35	17		
-17.			CLAY, sandy, stiff, grey and tan w/ calcareous (CH)							
	50	11 (6) 12 (6)				21	53			
-22.			CLAY, sandy, stiff, tan and grey (CL)							
	55	12 (6) 12 (6)				23	24	13		% Passing No.200 Sieve = 53
-27.			CLAY, sandy, soft, brown and tan (CL)							
	60					22	27	14		% Passing No.200 Sieve = 90

Remarks: X=3161525.6117, Y=13702116.2505; Water level encountered at 15.16 ft depth on 10/15/2019.

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: Dempsey Gearen Logger: Linda Hall Organization: TxDOT

H:\Lab2\FM 2403 at Briscoe Canal & Drainage Ditch_2950-01-008_CC\WinCORE\FM 2403_at Briscoe Canal and Drainage Ditch_2950-01-008.CLG

DRILLING LOG

WinCore Version 3.3

County	Brazoria	Hole	BC-2	District	Houston
Highway	FM 2403	Structure	Bridge	Date	10/17/2019
CSJ	2950-01-008	Station	164+78	Grnd. Elev.	30.03 ft
		Offset	20.5 RT	GW Elev.	15.61 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
		9 (6) 10 (6)	CLAY, sandy, soft, brown and tan (CL)							
-32.			CLAY, sandy, stiff, grey and tan (CL)							
	65	11 (6) 16 (6)				27	29	14		
-37.			CLAY, sandy, soft, grey (CH)							
	70	6 (6) 7 (6)				33	64			
-43.			CLAY, sandy, stiff, grey (CH)							
	75	10 (6) 11 (6)				29	57	27		
-47.			CLAY, sandy, stiff, grey and tan (CL)							
	80	13 (6) 15 (6)				18	40			
-52.			CLAY, sandy, very stiff, grey and tan (CL)							
	85	20 (6) 22 (6)				18	48	29		
-57.			SAND, very dense, tan							
	90	50 (2) 50 (1)				22				
-62.			CLAY, sandy, stiff, tan and grey (CL)							
	95	13 (6) 11 (6)				22	29	12		% Passing No.200 Sieve = 49
	100	15 (6) 18 (6)				20	33			
-72.			CLAY, sandy, soft, grey (CL)							
	105	8 (6) 8 (6)				34	49	33		
-77.			CLAY, sandy, stiff, grey (CL)							
-80.	110	23 (6) 13 (6)				24	32			
	115									
	120									

Remarks: X=3161525.6117, Y=13702116.2505; Water level encountered at 15.16 ft depth on 10/15/2019.

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: Dempsey Gearen Logger: Linda Hall Organization: TxDOT

H:\Lab2\FM 2403 at Briscoe Canal & Drainage Ditch_2950-01-008_CC\WinCORE\FM 2403_at Briscoe Canal and Drainage Ditch_2950-01-008.CLG

STATE OF TEXAS
CHEN-HUA CHUNG
89236
LICENSED PROFESSIONAL ENGINEER

4/7/2023

NORTH BRIDGE
BORING LOGS

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		97

SHEET 2 OF 2

4/7/2023
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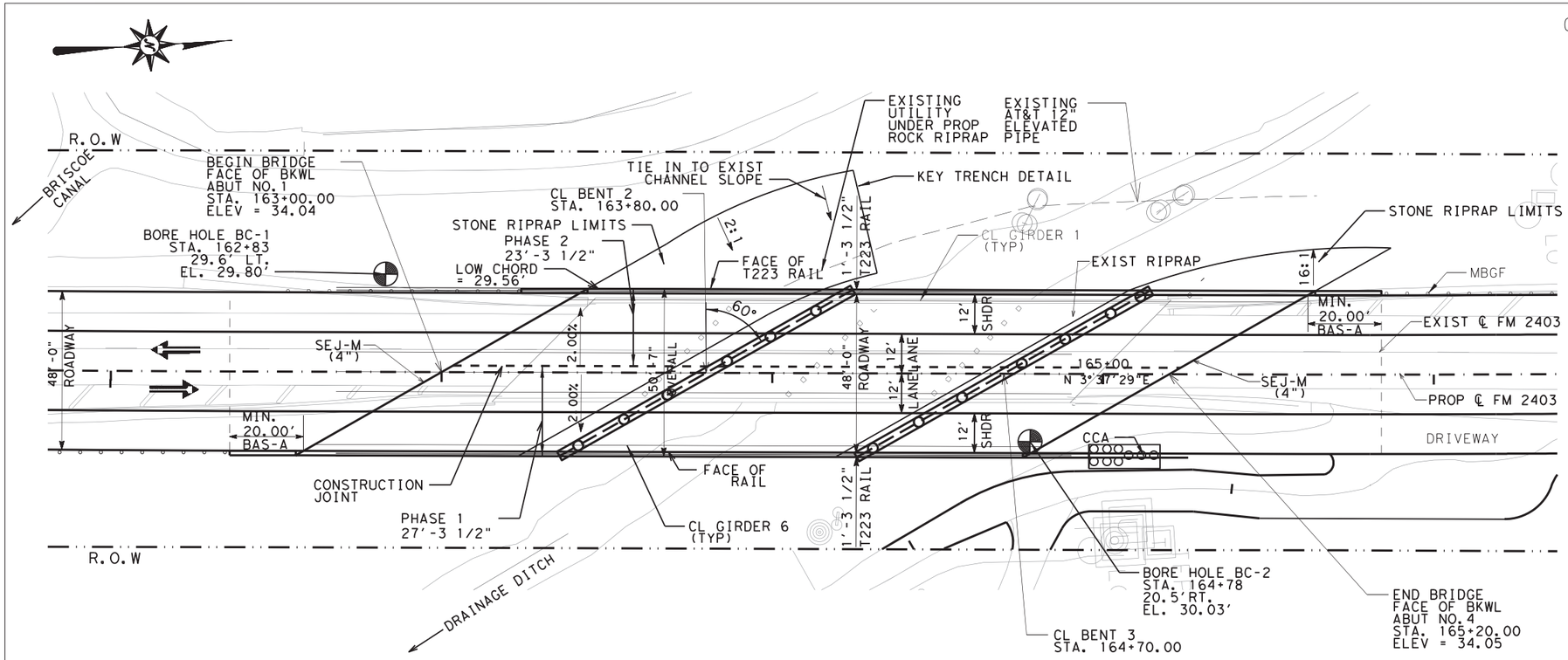


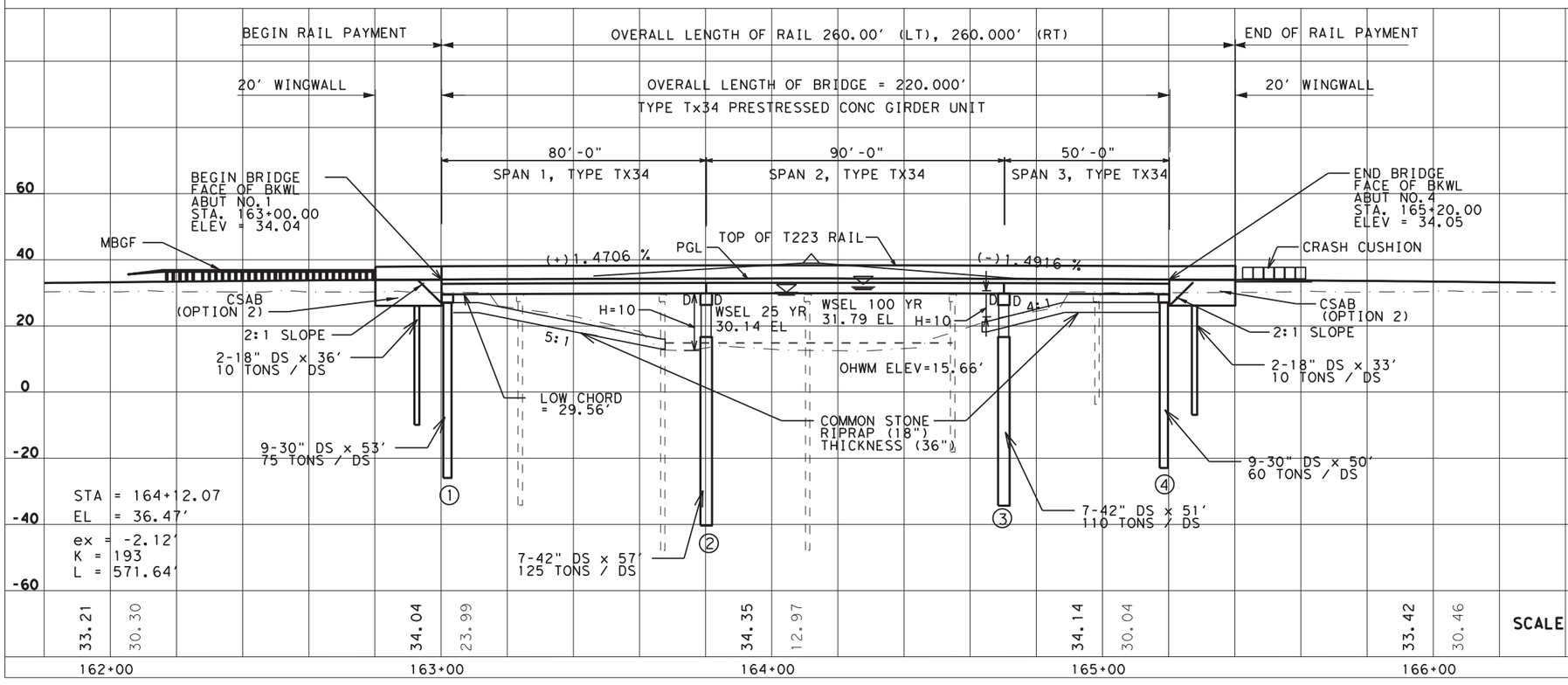
GENERAL NOTES:

1. DESIGN ACCORDING TO AASHTO 2020 LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION.
2. SEE BORING LOG SHEETS FOR TEST HOLE DATA.
3. SEE TYPICAL SECTION SHEETS FOR TYPICAL SECTIONS AND PHASING DETAILS.
4. EXISTING 4 SPAN PAN GIRDER BRIDGE WTIH PRESTRESSED CONCRETE PILES (175 FT LONG BY 43 FT WIDTH) SHALL BE REMOVED. SEE TYPICAL SECTIONS/PHASING SHEETS FOR THE DETAILS.
5. CONTRACTOR SHALL VERIFY THE LOCATION DEPTH OF ALL UTILITIES PRIOR TO CONSTRUCTION OR FABRICATION. THE COST OF RELOCATION UTILITIES WILL BE PAID FOR UNDER SEPARATE CONTRACT.
6. FOR RIPRAP DETAILS, SEE TXDOT STANDARD "STONE RIPRAP" (SRR) SHEET.
7. ALL BENTS AND ABUTMENTS ON BEARING S 26°22'31" E

EXIST NBI # 12-020-2950-01-001

PROP NBI # 12-020-2950-01-004

FUNCTIONAL CLASS = MAJOR COLLECTOR
DESIGN SPEED = 60 MPH
ADT = 7,200 (2023)
ADT = 10,200 (2043)



STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED
PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

5/19/2023

FM 2403
NORTH DRAINAGE DITCH
BRIDGE LAYOUT

SHEET 1 OF 1

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		98

5/5/2023
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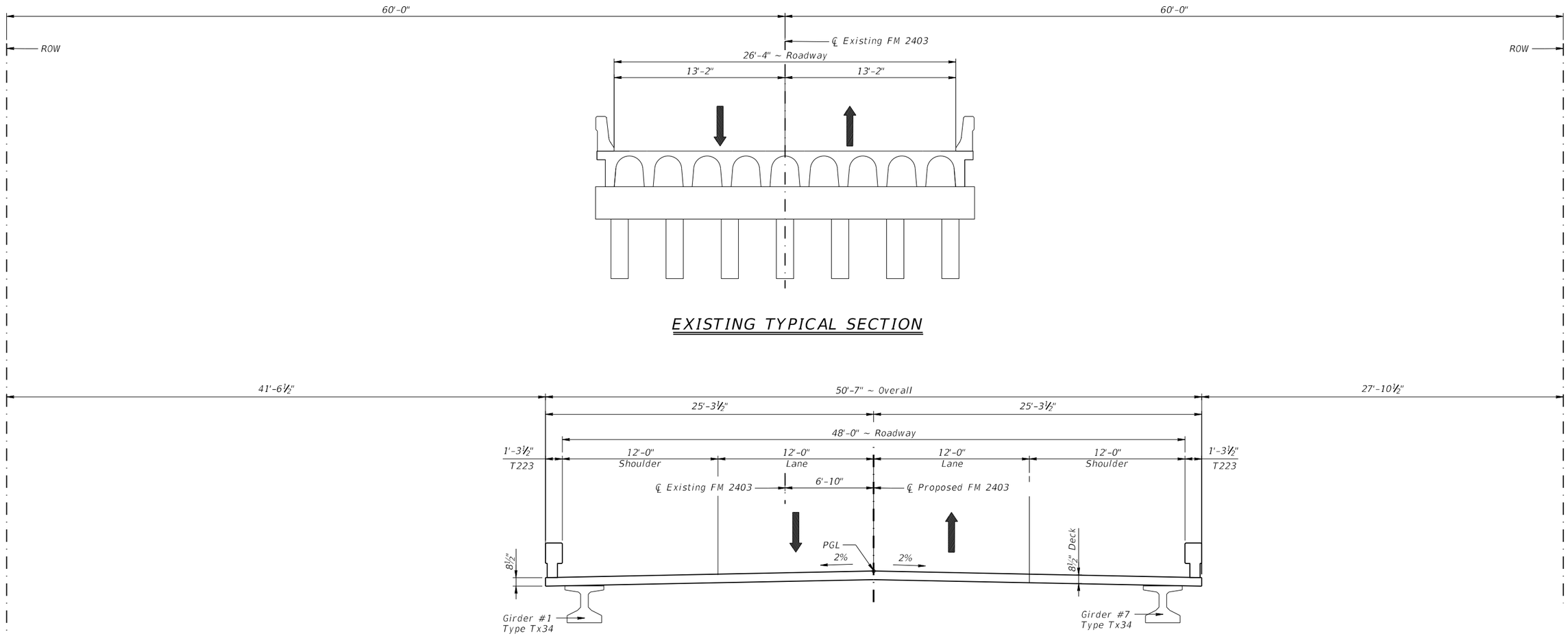

EXISTING TYPICAL SECTION

PROPOSED TYPICAL SECTION ~ FINAL

SHEET 1 OF 1

STATE OF TEXAS
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111317
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05/11/2023

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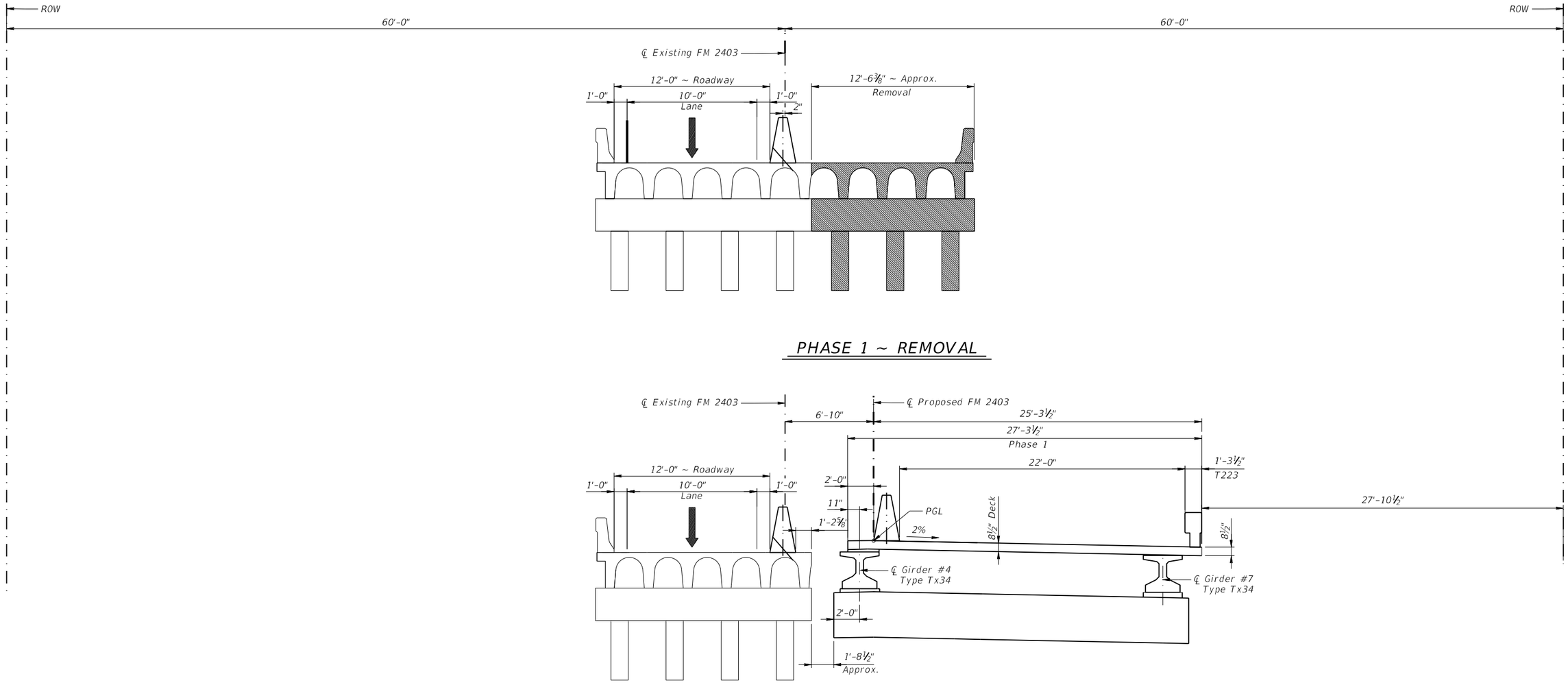
Houston District (Bridge)

TYPICAL SECTION

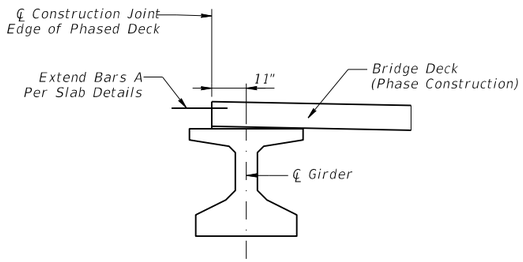
FM 2403
NORTH DRAINAGE DITCH

FILE: TypSec_Bridge.dgn		DN: MEC	CK: JH	DW: MEC	CK: TF	
©TxDOT 5/11/2023	CONT	SECT	JOB	HIGHWAY		
REVISIONS	2950	01	008, ETC	FM 2403		
	DIST	COUNTY		SHEET NO.		
	HOU	BRAZORIA		99		



PHASE 1 ~ REMOVAL

PHASE 1 ~ CONSTRUCTION



PHASE DETAIL

Area to be removed

SHEET 1 OF 2

Texas Department of Transportation

Houston District (Bridge)

BRIDGE CONSTRUCTION SEQUENCE

FM 2403
NORTH DRAINAGE DITCH

FILE: TypSec_Bridge.dgn	DN: MEC	CK: JH	DW: MEC	CK: TF
©TxDOT 5/11/2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		100

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MICHAEL E. CARLSON
111317
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05/11/2023

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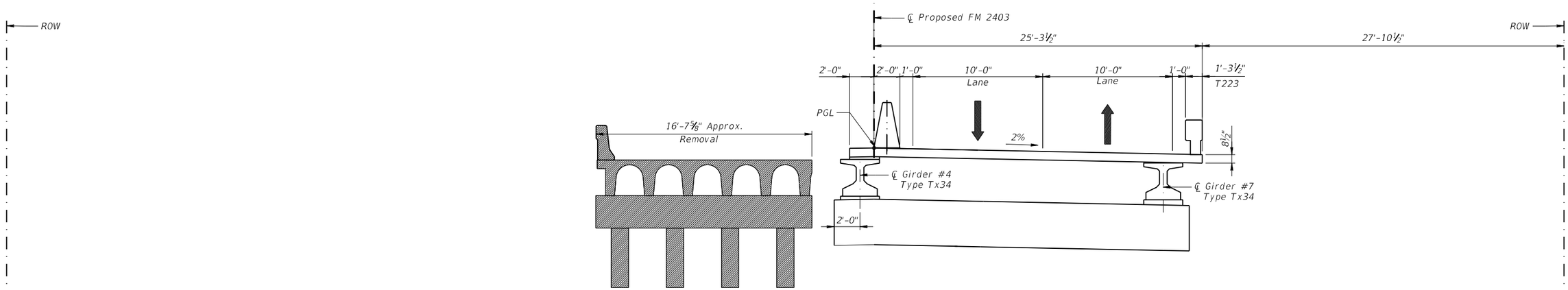

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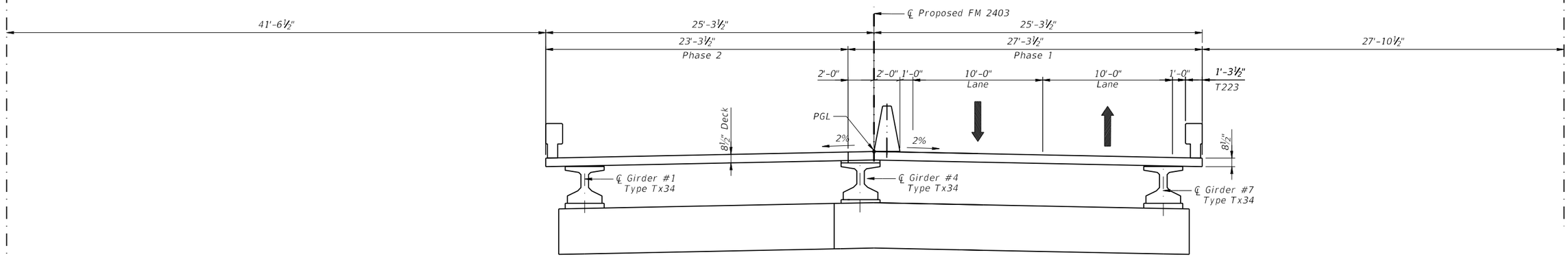

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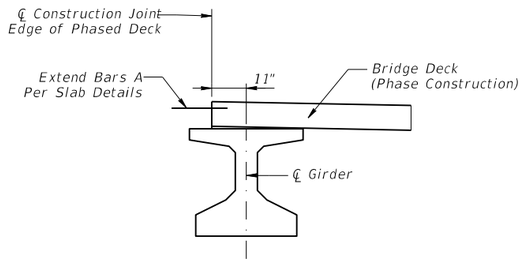

PHASE DETAIL

Area to be removed

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MICHAEL E. CARLSON
111317
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05/11/2023

SHEET 2 OF 2

Texas Department of Transportation

Houston District (Bridge)

BRIDGE CONSTRUCTION SEQUENCE

FM 2403
NORTH DRAINAGE DITCH

FILE: TypSec_Bridge.dgn		DN: MEC	CK: JH	DW: MEC	CK: TF		
©TxDOT 5/11/2023		CONT	SECT	JOB	HIGHWAY		
REVISIONS		2950	01	008, ETC	FM 2403		
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		HOU	BRAZORIA		101		

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ESTIMATED QUANTITIES

ITEM NO.	416-6001	416-6003	416-6005	420-6013	420-6029	420-6037	422-6001	425-6036	432-6026	450-6006	454-6018
ITEM	DRILL SHAFT (18 IN)	DRILL SHAFT (30 IN)	DRILL SHAFT (42 IN)	CL C CONC (ABUT)	CL C CONC (CAP)	CL C CONC (COLUMN)	REINF CONC SLAB	PRESTR CONC GIRDER (TX34)	RIPRAP (STONE COMMON) (DRY)(18 IN)	RAIL (TY T223)	SEALED EXPANSION JOINT (4 IN) (SEJ - M)
UNIT	LF	LF	LF	CY	CY	CY	SF	LF	CY	LF	LF
QUANTITY	138	927	756	109.1	90.0	35.8	11,128.5	1,630	674.9	520	204

BEARING SEAT ELEVATIONS

	BEAM 1	BEAM 2	BEAM 3	BEAM 4	BEAM 5	BEAM 6	BEAM 7	BEAM 8
ABUT 1 (FWD)	29.802	29.896	29.982	30.060	29.928	29.671	29.370	
BENT 2 (BK)	29.926	30.068	30.203	30.329	30.238	30.039	29.802	
(FWD)	29.883	30.027	30.162	30.291	30.200	30.061	29.917	29.767
BENT 3 (BK)	29.639	29.838	30.030	30.214	30.170	30.077	29.978	29.875
(FWD)	29.712	29.913	30.106	30.291	30.247	30.099	29.956	
ABUT 4 (BK)	29.413	29.643	29.866	30.081	30.062	29.953	29.844	

HL93 LOADING

SHEET 0F

STATE OF TEXAS
ZHANFEI FAN
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05.17.2023

Texas Department of Transportation

Houston District (Bridge)

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE:	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT	CONT.	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST.	COUNTY		SHEET NO.
	HOU	BRAZORIA		102

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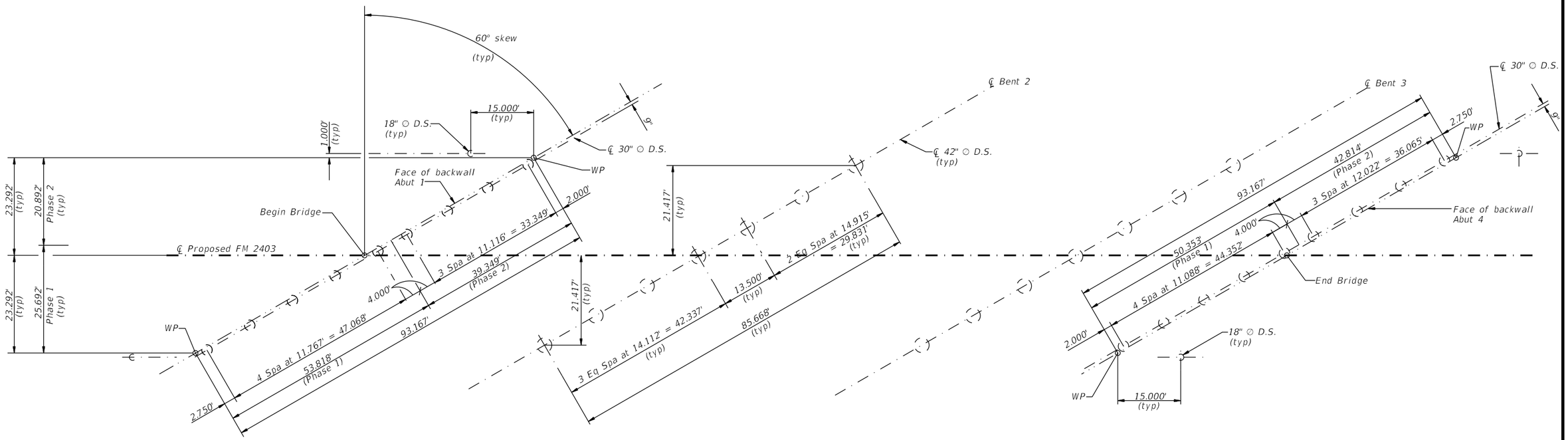

GENERAL NOTES:

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 & PILE 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.

TABLE OF DRILLED SHAFT (DS) & COLUMN INFORMATION

	Abut 1, 30" DS	Abut 1, 18" DS*	Bent 2, 42" DS	Bent 3, 42" DS	Abut 4, 30" DS	Abut 4, 18" DS*
Foundation Load (Tons/DS)	75	10	125	110	60	10
# of Column/DS	9	2	7	7	9	2
H for Column Above (ft)	0	0	10	10	0	0
DS Length (ft)	53	36	57	51	50	33
H + DS Length (ft)	53	36	67	61	50	33

** 18" DS are for abutment wingwalls*

STATE OF TEXAS
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Zhanfei Fan, P.E.

05.17.2023

HL93 LOADING *SHEET OF*

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FOUNDATION LAYOUT

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE: $FILE$	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT $DATE$ REVISIONS	CONT.	SECT	JOB	HIGHWAY
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	HOU	BRAZORIA		103

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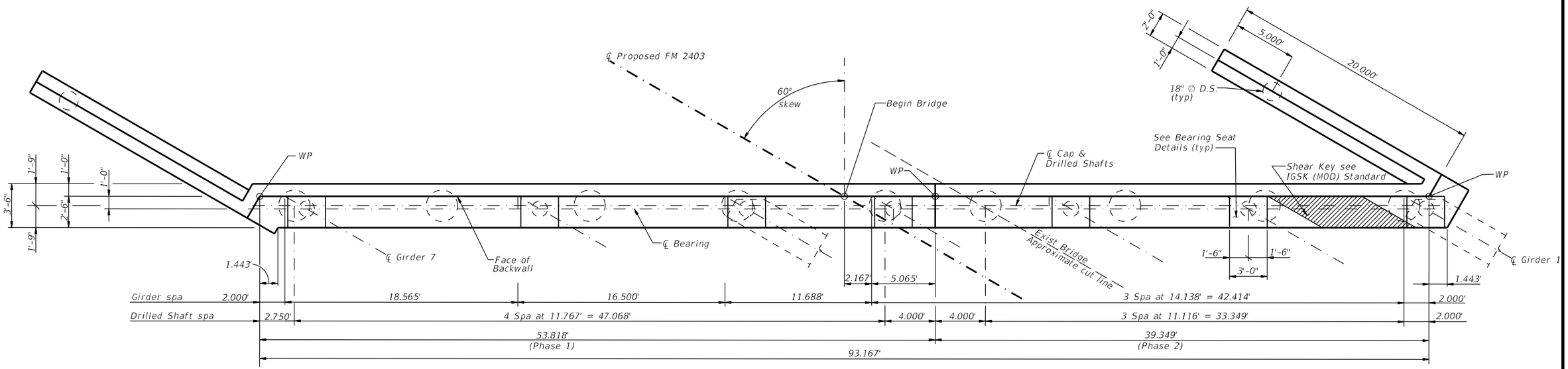
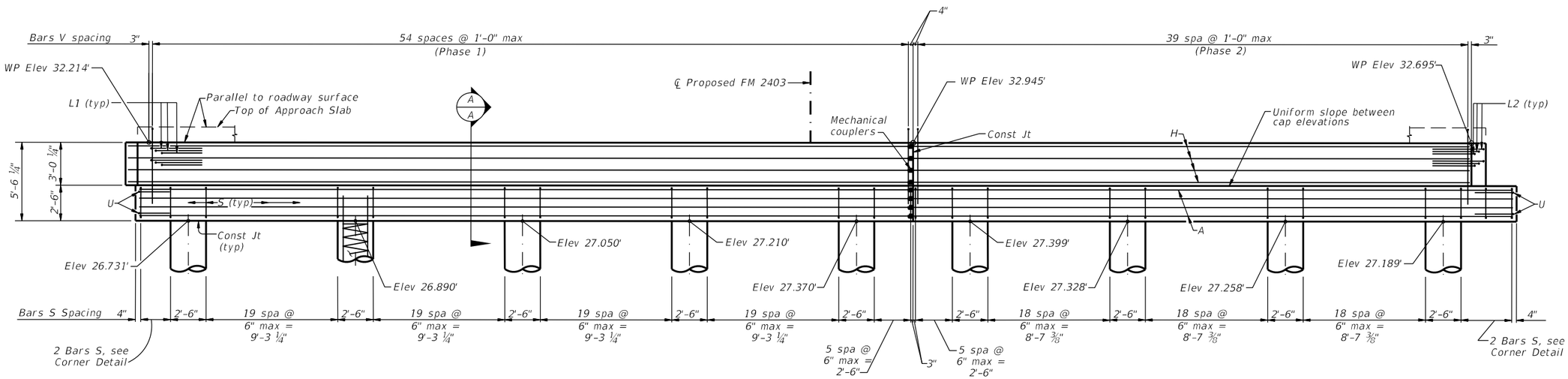


PLAN



ELEVATION

(Looking back station)

HL93 LOADING

SHEET 1 OF 2

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

Texas Department of Transportation

Houston District (Bridge)

ABUTMENT 1

FM 2403
NORTH DRAINAGE DITCH BRIDGE

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©TxDOT $DATES REVISIONS	CONT	SECT	JOB	HIGHWAY
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	HOU	BRAZORIA		104

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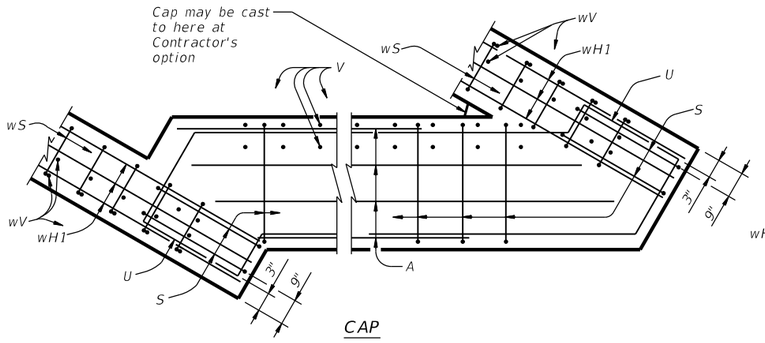

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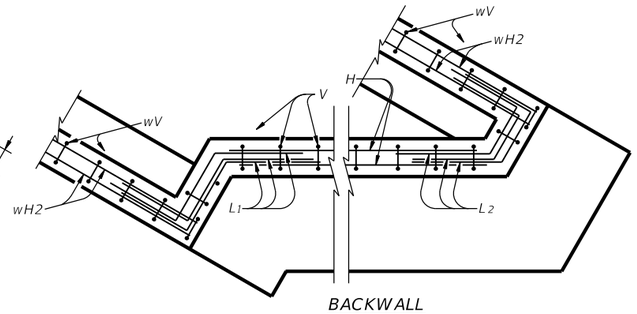
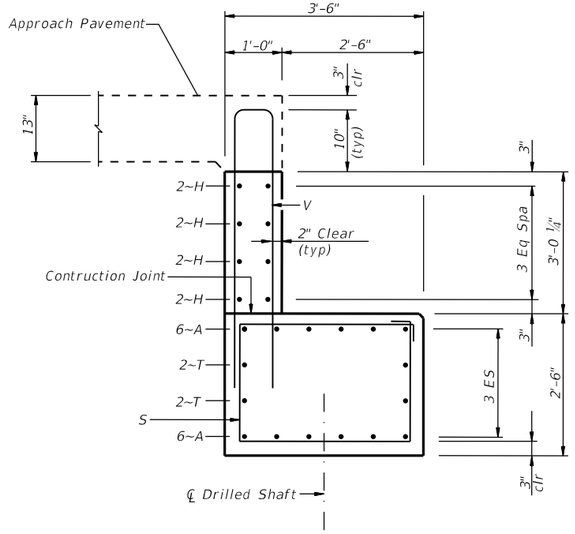
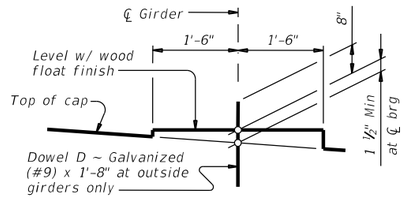


BACKWALL

CORNER DETAILS

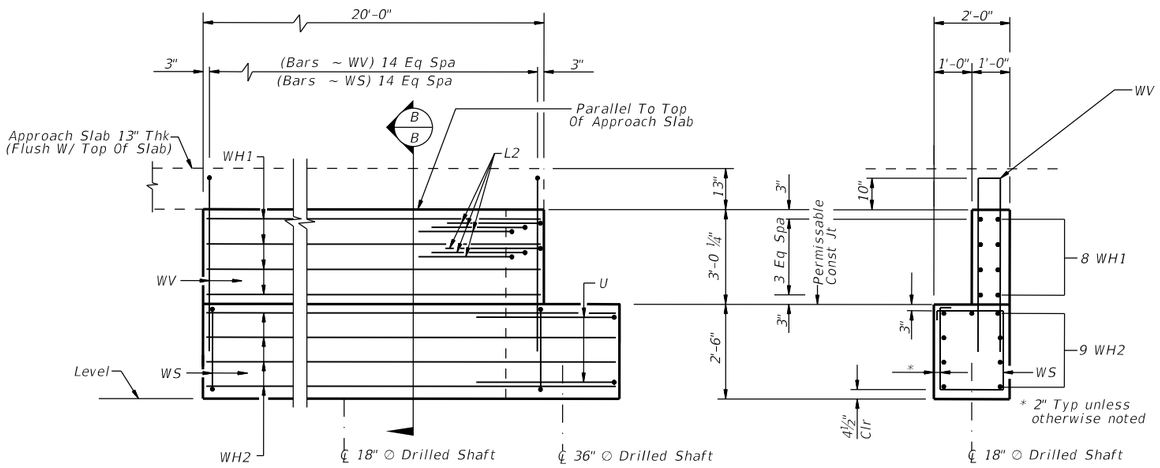


SECTION A-A



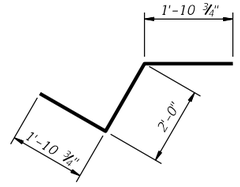
BEARING SEAT DETAIL

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



WINGWALL ELEVATION

SECTION B-B



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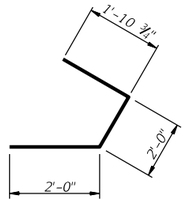

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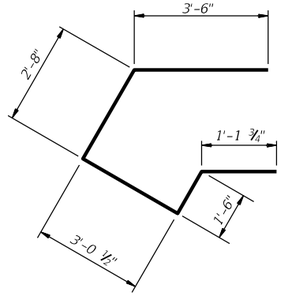

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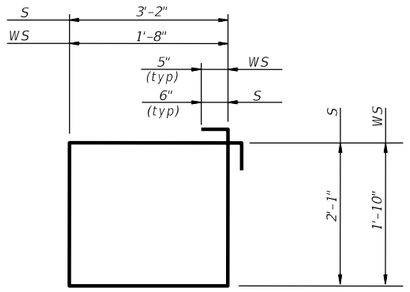
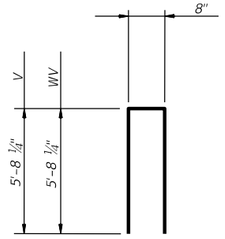


BARS S & wS



BARS V & wV

TABLE OF ESTIMATED QUANTITIES (PHASE 2)				
BAR	NO.	SIZE	LENGTH	WEIGHT
A	12	# 11	39'-4"	2,385
H	8	# 6	39'-5"	474
L2	6	# 6	5'-11"	54
S	65	# 5	11'-6"	781
T	4	# 6	39'-4"	237
U	2	# 6	11'-11"	36
V	40	# 5	12'-1"	505
wH1	8	# 6	19'-8"	237
wH2	9	# 6	24'-8"	334
WS	43	# 4	7'-10"	225
WV	40	# 5	12'-1"	505
ITEM			UNIT	QUANTITY
Reinforcing Steel			LBS	5,773
Class "C" Conc (Abut)			CY	24.6

TABLE OF ESTIMATED QUANTITIES (PHASE 1)				
BAR	NO.	SIZE	LENGTH	WEIGHT
A	12	# 11	53'-9"	3,258
H	8	# 6	53'-10"	648
L1	6	# 6	5'-10"	53
S	88	# 5	11'-6"	1,057
T	4	# 6	53'-9"	324
U	2	# 6	11'-11"	36
V	55	# 5	12'-1"	694
wH1	8	# 6	19'-8"	237
wH2	9	# 6	24'-8"	334
WS	43	# 4	7'-10"	225
WV	40	# 5	12'-1"	505
ITEM			UNIT	QUANTITY
Reinforcing Steel			LBS	7,371
Class "C" Conc (Abut)			CY	30.0

(1) Bars A, T, H, wH1, wH2, shall be extended beyond Construction Joint with a lap splice included or mechanical couplers at Contractor's option
Lap splices in Phase 1:
#11 Bars (A, B) = 5'-3"
#6 Bars (H, wH1, wH2) = 2'-10"
#5 Bars (T) = 1'-10"

GENERAL NOTES:

- Designed According to AASHTO LRFD Bridge Design Specifications.
- Reinforcing Steel Quantity is for Contractor's information Only.
- See Standard Bridge Drilled Shaft Details Houston District (HOU-BDS-22).
- See Table of Estimated Foundation Quantities for Foundation loads and Drilled Shaft lengths.
- Chamfer All Exposed Edges 3/4".
- See Bridge Approach Slab Concrete Pavement Houston District (BAS-C).
- 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 Grade 60 reinforcing steel.

HL93 LOADING

SHEET 2 OF 2

STATE OF TEXAS
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05.17.2023

Texas Department of Transportation

Houston District (Bridge)

ABUTMENT 1

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE: $FILE$	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT $DATE$ REVISIONS	CONT.	SECT	JOB	HIGHWAY
	2950	01	008, ETC	FM 2403
	DIST.	COUNTY		SHEET NO.
	HOU	BRAZORIA		105

DATE: $DATE$
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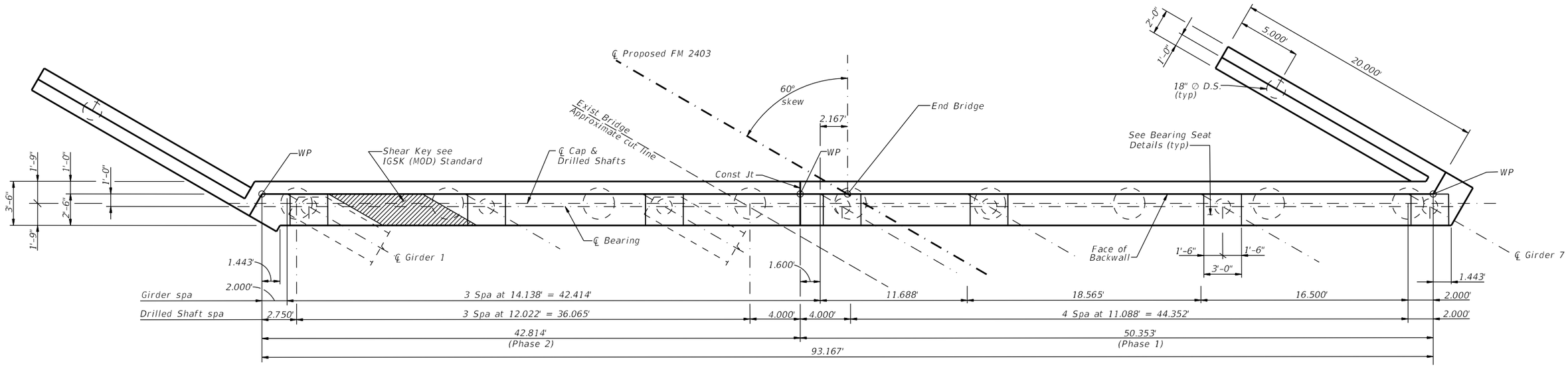

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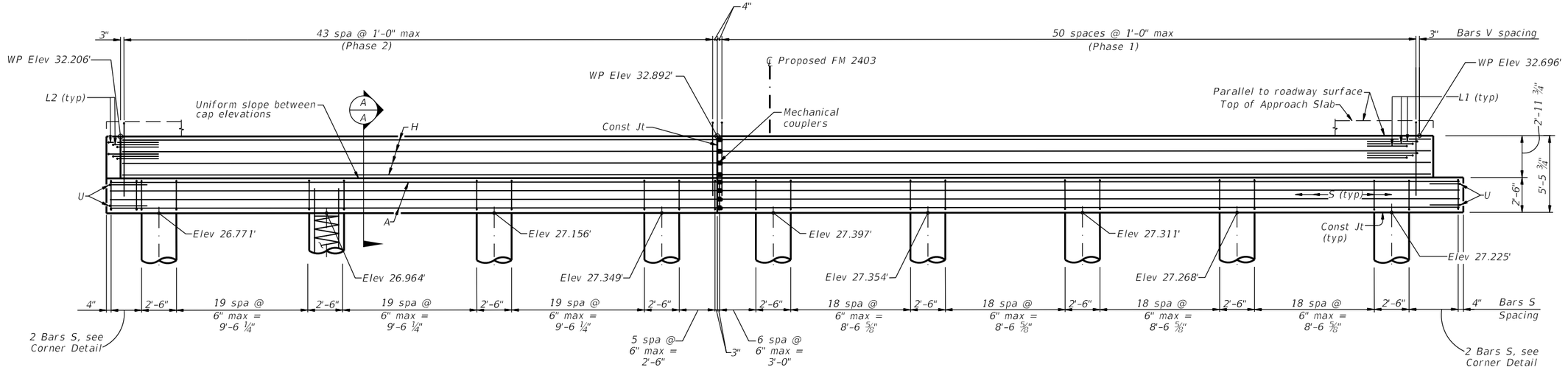

ELEVATION

(Looking forward station)

HL93 LOADING

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

Texas Department of Transportation ®2018

Houston District (Bridge)

ABUTMENT 4

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE: $FILES$	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT $DATE$ REVISIONS	CONT.	SECT	JOB	HIGHWAY
	2950	01	008, ETC	FM 2403
	DIST.	COUNTY		SHEET NO.
	HOU	BRAZORIA		106

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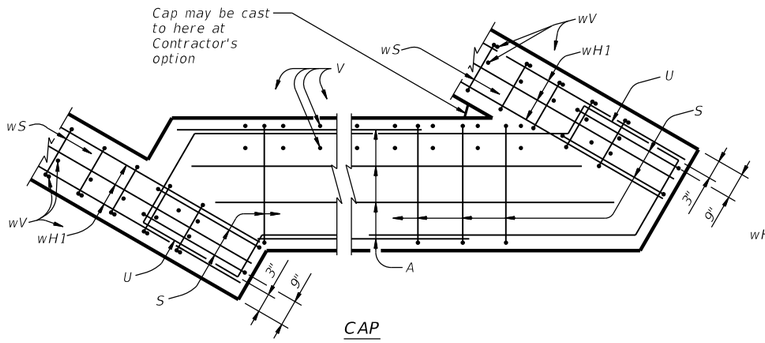

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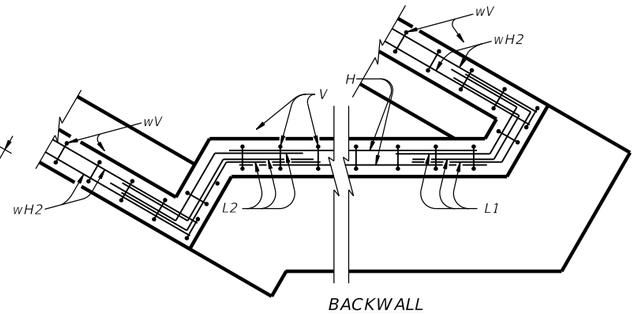


BACKWALL

TABLE OF ESTIMATED QUANTITIES (PHASE 2)

BAR	NO.	SIZE	LENGTH	WEIGHT
A	12	# 11	42'-9"	2,592
H	8	# 6	42'-9"	514
L2	6	# 6	5'-11"	54
S	68	# 5	11'-6"	817
T	4	# 6	42'-9"	257
U	2	# 6	11'-11"	36
V	44	# 5	12'-0"	552
wH1	8	# 6	19'-8"	237
wH2	9	# 6	24'-8"	334
WS	43	# 4	7'-10"	225
WV	40	# 5	12'-0"	501

ITEM	UNIT	QUANTITY
Reinforcing Steel	LBS	6,119
Class "C" Conc (Abut)	CY	25.7

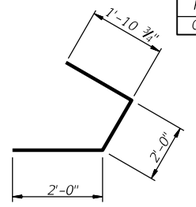
TABLE OF ESTIMATED QUANTITIES (PHASE 1)

BAR	NO.	SIZE	LENGTH	WEIGHT
A	12	# 11	50'-4"	3,051
H	8	# 6	50'-5"	607
L1	6	# 6	5'-10"	53
S	85	# 5	11'-6"	1,021
T	4	# 6	50'-4"	303
U	2	# 6	11'-11"	36
V	51	# 5	12'-0"	639
wH1	8	# 6	19'-8"	237
wH2	9	# 6	24'-8"	334
WS	43	# 4	7'-10"	225
WV	40	# 5	12'-0"	501

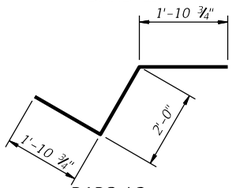
ITEM	UNIT	QUANTITY
Reinforcing Steel	LBS	7,007
Class "C" Conc (Abut)	CY	28.9

(1) Bars A, T, H, wH1, wH2, shall be extended beyond Construction Joint with a lap splice included or mechanical couplers at Contractor's option
Lap splices in Phase 1:
#11 Bars (A, B) = 5'-3"
#6 Bars (H, wH1, wH2) = 2'-10"
#5 Bars (T) = 1'-10"

CORNER DETAILS



BARS L1



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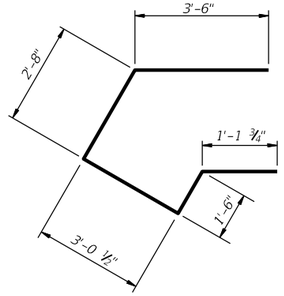
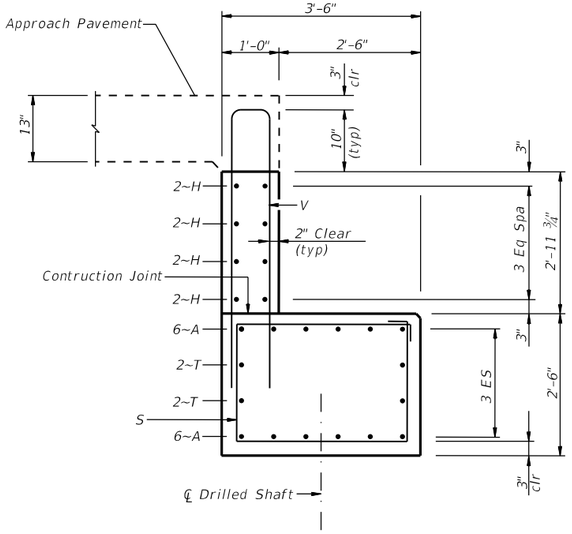
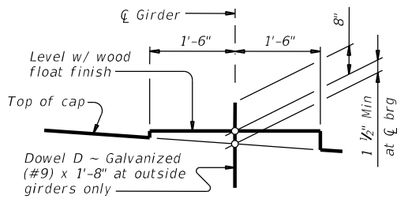


BARS U

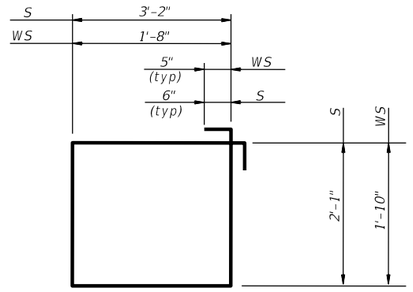


SECTION A-A

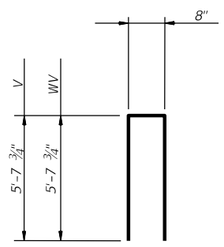


BEARING SEAT DETAIL

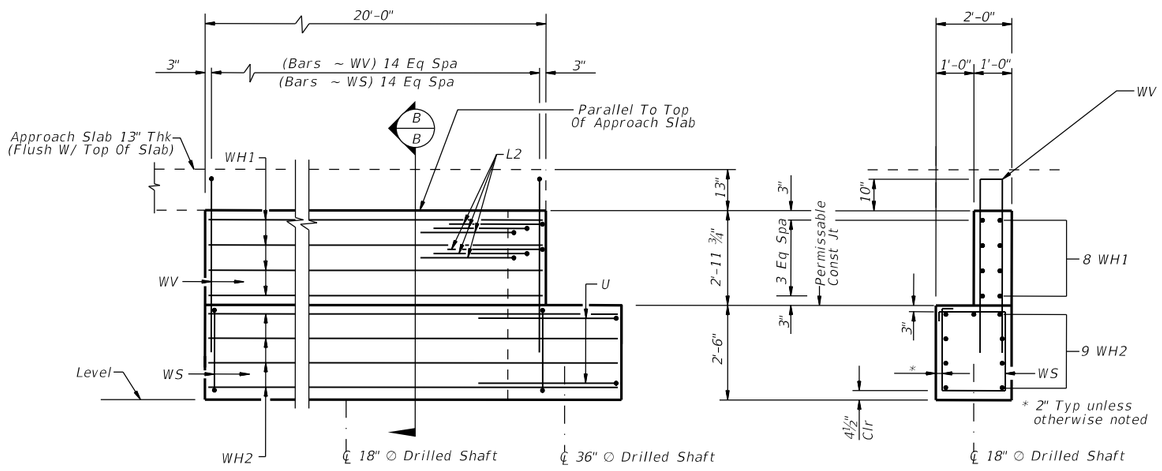
(Bearing surface must be clean and free of all loose material before placing bearing pad.)



BARS S & wS



BARS V & wV



WINGWALL ELEVATION

SECTION B-B

GENERAL NOTES:

- Designed According to AASHTO LRFD Bridge Design Specifications.
- Reinforcing Steel Quantity is for Contractor's information Only.
- See Standard Bridge Drilled Shaft Details Houston District (HOU-BDS-22).
- See Table of Estimated Foundation Quantities for Foundation loads and Drilled Shaft lengths.
- Chamfer All Exposed Edges ¾".
- See Bridge Approach Slab Concrete Pavement Houston District (BAS-C).
- 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 Grade 60 reinforcing steel.

HL93 LOADING

STATE OF TEXAS
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05.17.2023

Texas Department of Transportation

Houston District (Bridge)

ABUTMENT 4

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE: $FILES	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
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	HOU	BRAZORIA		107

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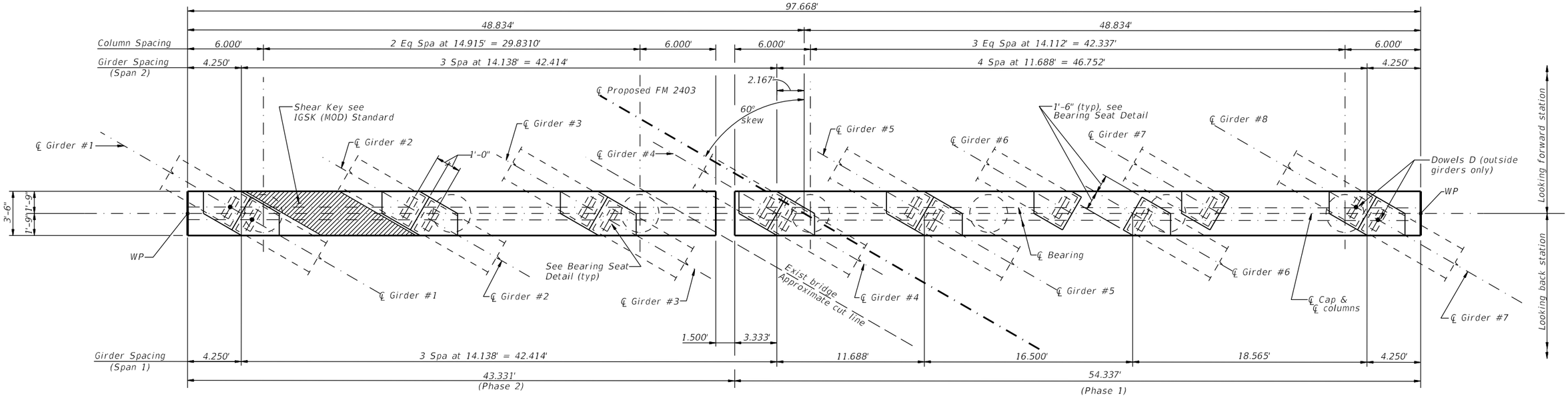

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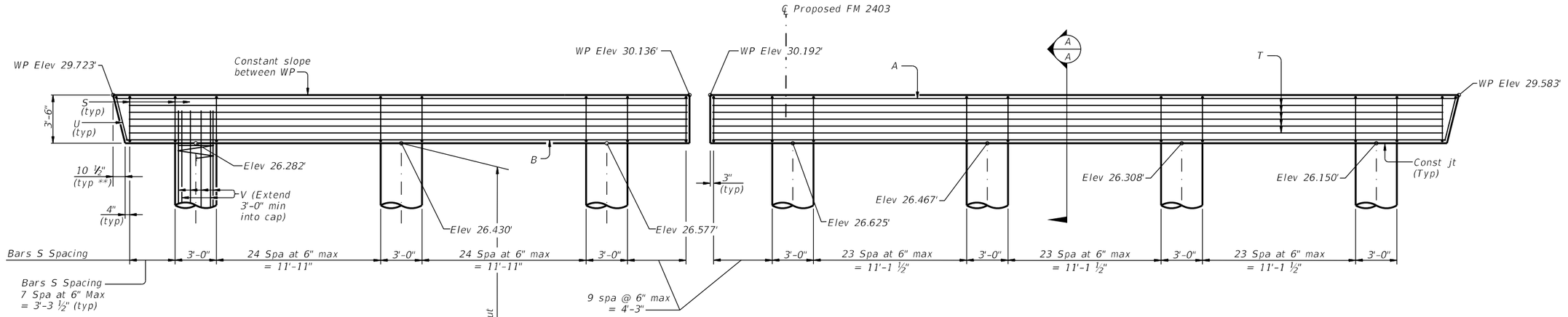
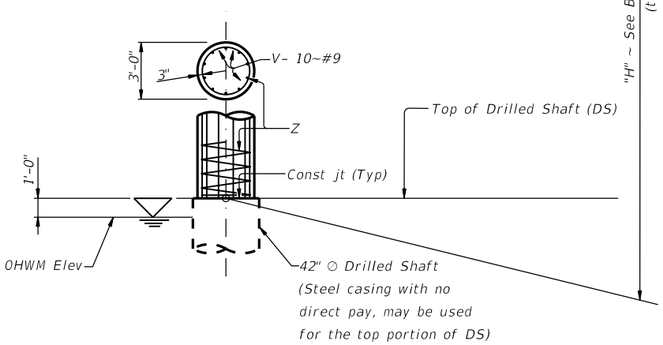


** Measured parallel to top of cap cross slope.



ELEVATION

Note to Contractor:
Determine Top of Drilled Shaft Elevations using the criteria defined and the approximate "H" values provided in Bridge Layout. Field adjustment of Top of DS Elevations and "H" may be necessary. Maintain the Tip of DS Elevations.

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05.17.2023

2018 Texas Department of Transportation

Houston District (Bridge)

BENT 2

FM 2403
NORTH DRAINAGE DITCH BRIDGE

FILE: $FILES	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT $DATE$ REVISIONS	CONT.	SECT	JOB	HIGHWAY
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	HOU	BRAZORIA		108

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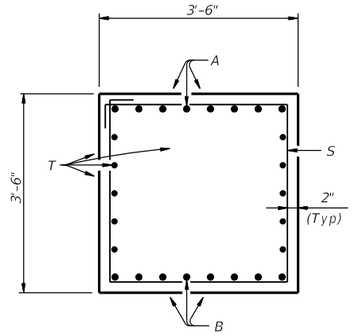

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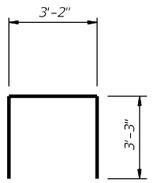

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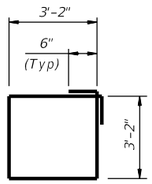

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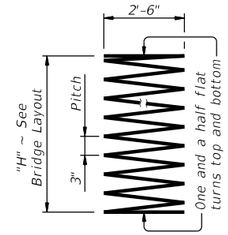

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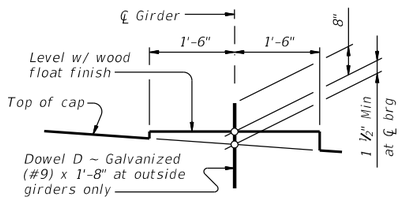

BEARING SEAT DETAIL

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

TABLE OF ESTIMATED QUANTITIES (PHASE 2)

Bar	No.	Size	Length	Weight
A	8	#11	41'-6"	1,677
B	8	#11	40'-9"	1,647
D	2	#9	1'-8"	12
S	68	#5	13'-8"	970
T	10	#5	40'-8"	426
U	1	#5	9'-8"	11
V	30	#9	12'-9" Avg	1,294
Z	3	#4	330'-1"	662
Reinforcing Steel			Lbs	6,699
Class "C" Concrete (Cap)			CY	20.0
Class "C" Concrete (Col)			CY	7.7

TABLE OF ESTIMATED QUANTITIES (PHASE 1)

Bar	No.	Size	Length	Weight
A	8	#11	54'-0"	2,183
B	8	#11	53'-3"	2,152
D	2	#9	1'-8"	12
S	90	#5	13'-8"	1,284
T	10	#5	53'-2"	556
U	1	#5	9'-8"	11
V	40	#9	12'-9" Avg	1,725
Z	4	#4	330'-1"	882
Reinforcing Steel			Lbs	8,805
Class "C" Concrete (Cap)			CY	24.9
Class "C" Concrete (Col)			CY	10.2

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Standard Bridge Drilled Shaft Details Houston District (HOU-BDS-22) standard sheet for all foundation details and notes.

See Shear Key (IGSK) (MOD) standard sheet for all shear key details and notes, if applicable. Shear key is included in cap quantities.

See Table of Foundation Quantities sheet for Loads and Lengths of Drilled Shafts.

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.

Galvanize dowel bars D.

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ZHANFEI FAN
92259
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P.E.

05.17.2023

HL93 LOADING

SHEET 2 OF 2

Texas Department of Transportation

Houston District (Bridge)

BENT 2

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE: $FILE$	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT $DATE$	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
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	HOU	BRAZORIA		109

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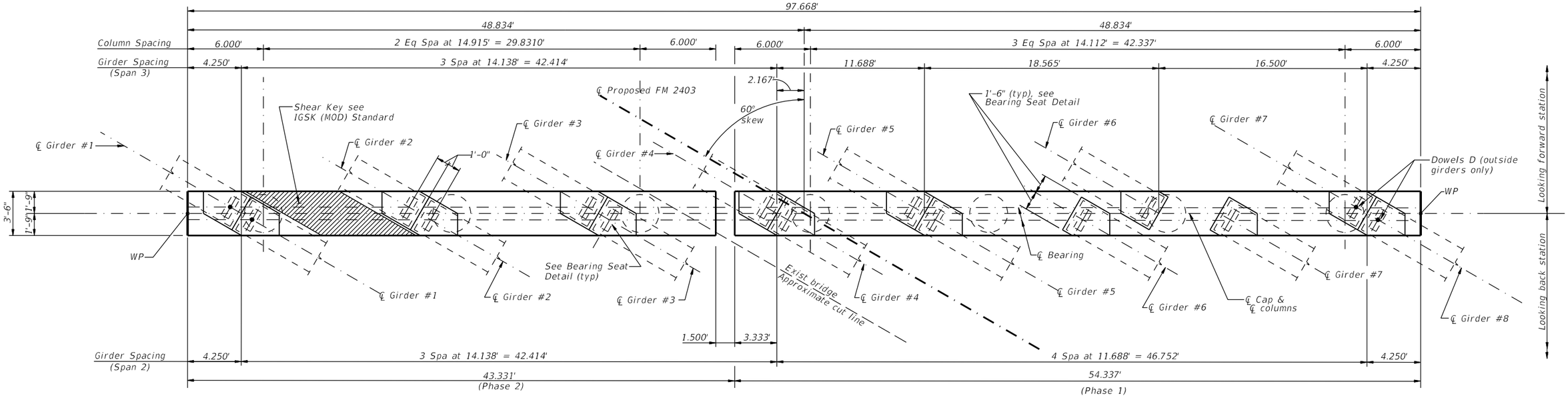

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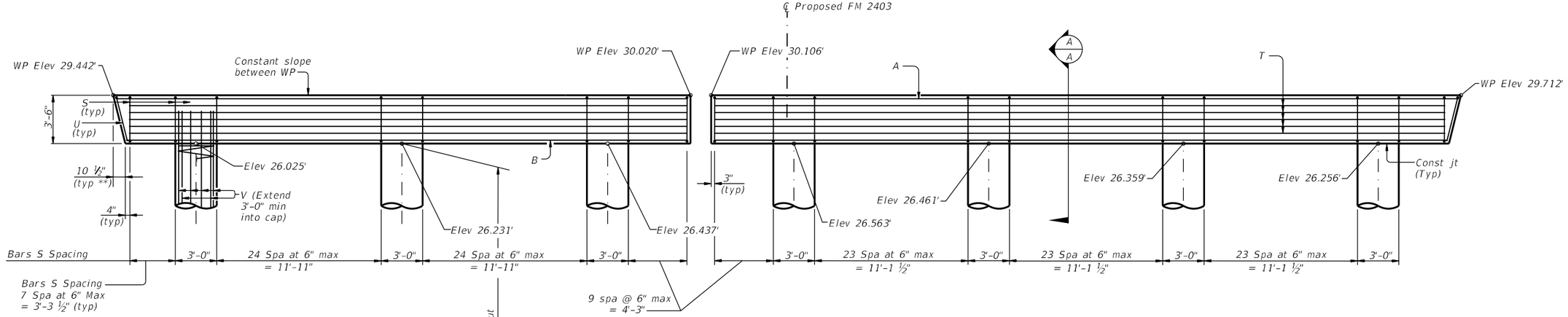
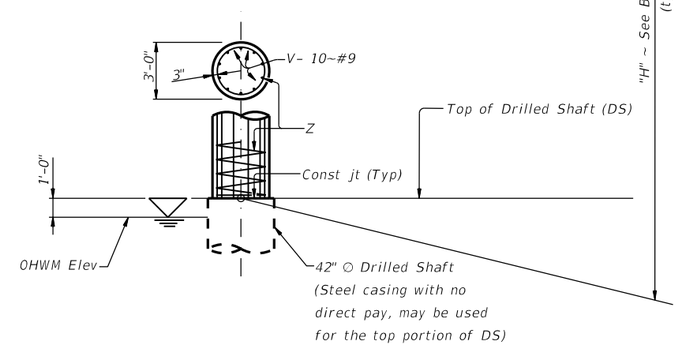


** Measured parallel to top of cap cross slope.



ELEVATION

Note to Contractor:
Determine Top of Drilled Shaft Elevations using the criteria defined and the approximate "H" values provided in Bridge Layout. Field adjustment of Top of DS Elevations and "H" may be necessary. Maintain the Tip of DS Elevations.

HL93 LOADING

SHEET 1 OF 2

STATE OF TEXAS
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05.17.2023

Texas Department of Transportation 2018

Houston District (Bridge)

BENT 3

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE: $FILES		DN: AI	CK: TF	DW: GB	CK: AI	
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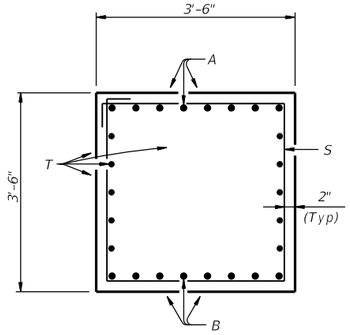

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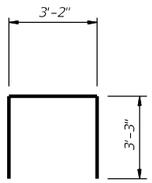

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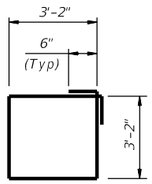

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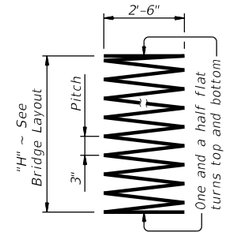

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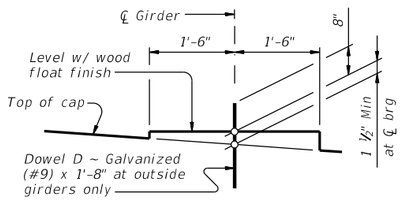

BEARING SEAT DETAIL

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

TABLE OF ESTIMATED QUANTITIES (PHASE 2)

Bar	No.	Size	Length	Weight
A	8	#11	41'-6"	1,677
B	8	#11	40'-9"	1,647
D	2	#9	1'-8"	12
S	68	#5	13'-8"	970
T	10	#5	40'-8"	426
U	1	#5	9'-8"	11
V	30	#9	12'-9" Avg	1,294
Z	3	#4	330'-1"	662
Reinforcing Steel			Lbs	6,699
Class "C" Concrete (Cap)			CY	20.0
Class "C" Concrete (Col)			CY	7.7

TABLE OF ESTIMATED QUANTITIES (PHASE 1)

Bar	No.	Size	Length	Weight
A	8	#11	54'-0"	2,183
B	8	#11	53'-3"	2,152
D	2	#9	1'-8"	12
S	90	#5	13'-8"	1,284
T	10	#5	53'-2"	556
U	1	#5	9'-8"	11
V	40	#9	12'-9" Avg	1,725
Z	4	#4	330'-1"	882
Reinforcing Steel			Lbs	8,805
Class "C" Concrete (Cap)			CY	24.9
Class "C" Concrete (Col)			CY	10.2

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Standard Bridge Drilled Shaft Details Houston District (HOU-BDS-22) standard sheet for all foundation details and notes.

See Shear Key (IGSK) (MOD) standard sheet for all shear key details and notes, if applicable. Shear key is included in cap quantities.

See Table of Foundation Quantities sheet for Loads and Lengths of Drilled Shafts.

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.

Galvanize dowel bars D.

STATE OF TEXAS
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05.17.2023

HL93 LOADING

SHEET 2 OF 2

Texas Department of Transportation

Houston District (Bridge)

BENT 3

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE: $FILE$	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT $DATE$	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
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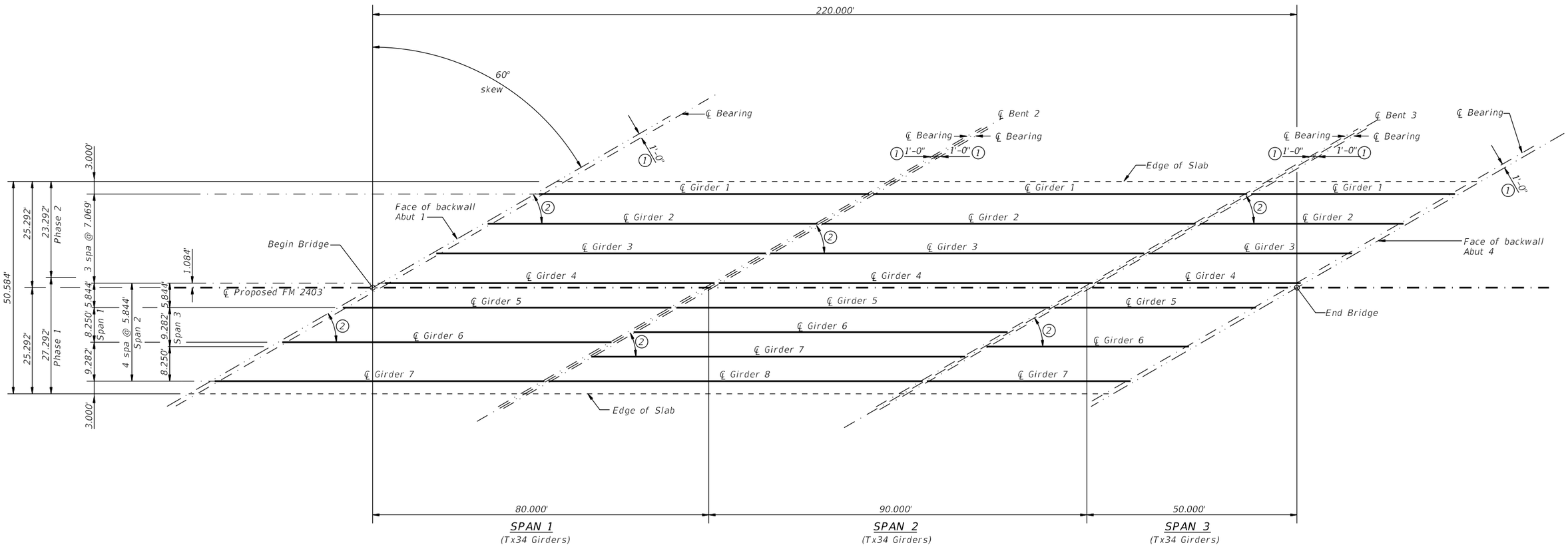

PLAN

NOTES:

1. See Standard IGEB for orientation of dimension.
2. Girder angle (Typ.), See bent report.

HL93 LOADING

SHEET 1 OF 2

TABLE OF ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY			
		Phase	SPAN 1	SPAN 2	SPAN 3
Prestressed Concrete Girder (Tx34)	LF	Phase 1	320	450	200
		Phase 2	240	270	150

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05.17.2023

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Houston District (Bridge)

FRAMING PLAN

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE: $FILES	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT $DATE$	CONT.	SECT.	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST.	COUNTY		SHEET NO.
	HOU	BRAZORIA		112

DATE:
FILE: pw:\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\295001008\4 - Design\Bridge\FM2403\FM2403 Bri Frame.dgn

BENT REPORT

ABUT NO. 1 (S 26 22 31.00 E)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 44.584 L

		BEAM SPAC. (C.L. BENT)	BEAM ANGLE D M S
SPAN 1	BEAM 1	0.000	30 0 0
	BEAM 2	14.138	30 0 0
	BEAM 3	14.138	30 0 0
	BEAM 4	14.138	30 0 0
	BEAM 5	11.688	30 0 0
	BEAM 6	16.500	30 0 0
	BEAM 7	18.564	30 0 0
	TOTAL	89.166	

BENT NO. 2 (S 26 22 31.00 E)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 44.584 L

		BEAM SPAC. (C.L. BENT)	BEAM ANGLE D M S
SPAN 1	BEAM 1	0.000	30 0 0
	BEAM 2	14.138	30 0 0
	BEAM 3	14.138	30 0 0
	BEAM 4	14.138	30 0 0
	BEAM 5	11.688	30 0 0
	BEAM 6	16.500	30 0 0
	BEAM 7	18.564	30 0 0
	TOTAL	89.166	

BENT REPORT

BENT NO. 2 (S 26 22 31.00 E)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 44.584 L

		BEAM SPAC. (C.L. BENT)	BEAM ANGLE D M S
SPAN 2	BEAM 1	0.000	30 0 0
	BEAM 2	14.138	30 0 0
	BEAM 3	14.138	30 0 0
	BEAM 4	14.138	30 0 0
	BEAM 5	11.688	30 0 0
	BEAM 6	11.688	30 0 0
	BEAM 7	11.688	30 0 0
	BEAM 8	11.688	30 0 0
	TOTAL	89.166	

BENT NO. 3 (S 26 22 31.00 E)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 44.584 L

		BEAM SPAC. (C.L. BENT)	BEAM ANGLE D M S
SPAN 2	BEAM 1	0.000	30 0 0
	BEAM 2	14.138	30 0 0
	BEAM 3	14.138	30 0 0
	BEAM 4	14.138	30 0 0
	BEAM 5	11.688	30 0 0
	BEAM 6	11.688	30 0 0
	BEAM 7	11.688	30 0 0
	BEAM 8	11.688	30 0 0
	TOTAL	89.166	

BENT REPORT

BENT NO. 3 (S 26 22 31.00 E)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 44.584 L

		BEAM SPAC. (C.L. BENT)	BEAM ANGLE D M S
SPAN 3	BEAM 1	0.000	30 0 0
	BEAM 2	14.138	30 0 0
	BEAM 3	14.138	30 0 0
	BEAM 4	14.138	30 0 0
	BEAM 5	11.688	30 0 0
	BEAM 6	18.564	30 0 0
	BEAM 7	16.500	30 0 0
	TOTAL	89.166	

ABUT NO. 4 (S 26 22 31.00 E)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 44.584 L

		BEAM SPAC. (C.L. BENT)	BEAM ANGLE D M S
SPAN 3	BEAM 1	0.000	30 0 0
	BEAM 2	14.138	30 0 0
	BEAM 3	14.138	30 0 0
	BEAM 4	14.138	30 0 0
	BEAM 5	11.688	30 0 0
	BEAM 6	18.564	30 0 0
	BEAM 7	16.500	30 0 0
	TOTAL	89.166	

BEAM REPORT

BEAM REPORT, SPAN 1

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.	BEAM SLOPE
BEAM 1	80.000	77.000	79.25	0.0016
BEAM 2	80.000	77.000	79.25	0.0022
BEAM 3	80.000	77.000	79.25	0.0029
BEAM 4	80.000	77.000	79.25	0.0035
BEAM 5	80.000	77.000	79.25	0.0040
BEAM 6	80.000	77.000	79.25	0.0048
BEAM 7	80.000	77.000	79.25	0.0056

BEAM REPORT

BEAM REPORT, SPAN 2

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.	BEAM SLOPE
BEAM 1	90.000	88.000	89.50	-0.0028
BEAM 2	90.000	88.000	89.50	-0.0021
BEAM 3	90.000	88.000	89.50	-0.0015
BEAM 4	90.000	88.000	89.50	-0.0009
BEAM 5	90.000	88.000	89.50	-0.0003
BEAM 6	90.000	88.000	89.50	0.0002
BEAM 7	90.000	88.000	89.50	0.0007
BEAM 8	90.000	88.000	89.50	0.0012

BEAM REPORT

BEAM REPORT, SPAN 3

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.	BEAM SLOPE
BEAM 1	50.000	47.000	49.25	-0.0064
BEAM 2	50.000	47.000	49.25	-0.0057
BEAM 3	50.000	47.000	49.25	-0.0051
BEAM 4	50.000	47.000	49.25	-0.0045
BEAM 5	50.000	47.000	49.25	-0.0039
BEAM 6	50.000	47.000	49.25	-0.0031
BEAM 7	50.000	47.000	49.25	-0.0024

HL93 LOADING

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED
PROFESSIONAL ENGINEER

Zhanfei Fan, P.E.
05.17.2023

Texas Department of Transportation
Houston District (Bridge)

FRAMING PLAN

FM 2403
NORTH DRAINAGE DITCH BRIDGE

FILE: $FILES	DN: AI	CK: TF	DW: GB	CK: AI	
©TxDOT $DATES	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2950	01	008, ETC	FM 2403	
	DIST	COUNTY		SHEET NO.	
	HOU	BRAZORIA		113	

DATE:
FILE:

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS		
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS						NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)								Moment	Shear	Inv	Opr	Inv
FM 2403 North Bridge	1	1-5	Tx34		24	0.6	270	12.18	7.84	4	30.5	4.300	6.200	3.142	-3.457	3211	0.485	1.035	1.19	1.54	1.00
	1	6-7	Tx34		28	0.6	270	12.01	8.30	4	30.5	5.100	7.300	3.443	-3.851	3616	0.553	1.200	1.09	1.52	1.01
	2	1-3	Tx34		32	0.6	270	11.64	7.14	6	30.5	5.500	6.800	4.008	-4.332	3932	0.478	1.045	1.30	1.73	1.02
	2	4-8	Tx34		30	0.6	270	11.81	7.41	6	28.5	5.200	6.000	3.834	-4.009	3606	0.452	0.921	1.45	1.92	1.09
	3	1-5	Tx34		14	0.6	270	13.01	13.01	2	12.5	4.000	5.000	1.252	-1.475	1480	0.525	0.996	1.06	1.37	1.28
	3	6-7	Tx34		16	0.6	270	13.01	13.01	4	12.5	4.000	5.000	1.329	-1.586	1666	0.570	1.155	1.02	1.33	1.26

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

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

Compression = 0.65 f'ci

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

Optional designs must likewise conform.

(2) Portion of full HL93.

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications. Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.

Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

Use low relaxation strands, each pretensioned to 75 percent of fpu.

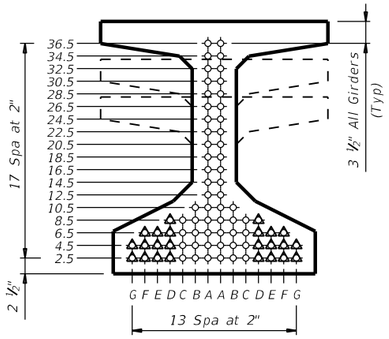
Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked △. Double wrap full-length debonded strands in outer most position of each row.

When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

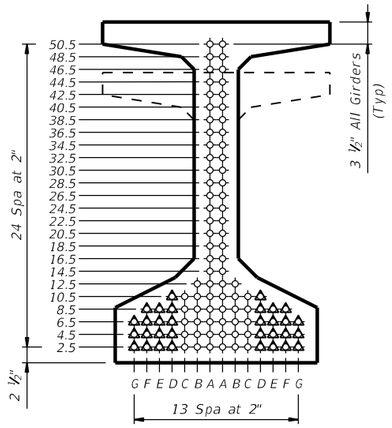
Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

DEPRESSED STRAND DESIGNS:

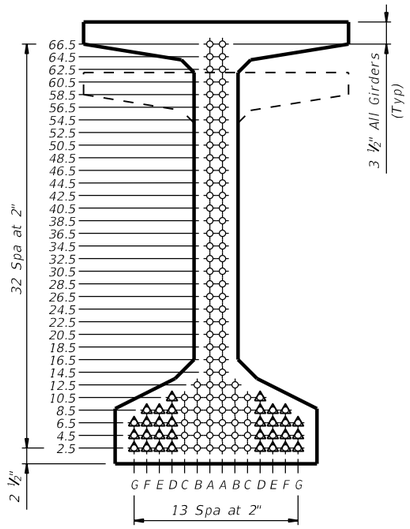
Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.



TYPE Tx28, Tx34 & Tx40



TYPE Tx46 & Tx54



TYPE Tx62 & Tx70

HL93 LOADING

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

Zhanfei Fan, P.E.

05.17.2023

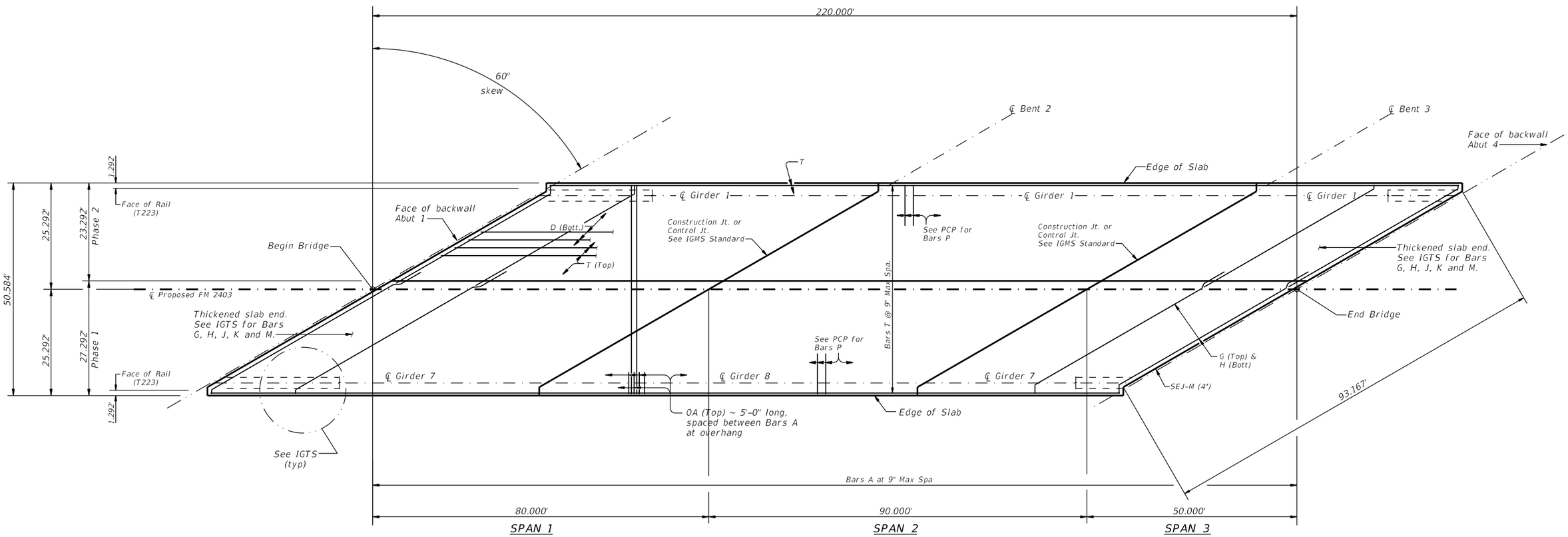
Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DESIGNS (NON-STANDARD SPANS)

IGND

FILE: igndsts1-22.dgn	DN: TxDOT	CK: TxDOT	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Modified for depressed strands only. 3-22: Added Load Rating.	2950	01	088, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		114



NOTES:

1. See IGTS Standard for Bars AA, G, H, J, K and M. See PCP Standards for other details.
2. See IGCS(MOD) Standard For continuous slab details. See PCP Standard for other details.
3. Bars 0A (Top) ~ 5'-0" long, spaced between Bars A at overhang. See PCP Standard for Bars P (Bottom).
4. Provided bar laps, where requried, as follows:
   Uncoated ~ #4 = 1'-7"
   ~ #5 = 2'-0"
5. For phase construction, a construction joint shall be allowed at the location shown. All transverse bars (A, G & H) shall be terminated beyond the construction joint for a lap length.

HL93 LOADING

SHEET OF

STATE OF TEXAS
ZHANFEI FAN
92259
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05.17.2023

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Houston District (Bridge)

SLAB PLAN

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE: $FILE$	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT $DATE$ REVISIONS	CONT.	SECT	JOB	HIGHWAY
	2950	01	008, ETC	FM 2403
	DIST.	COUNTY		SHEET NO.
	HOU	BRAZORIA		115

DATE:
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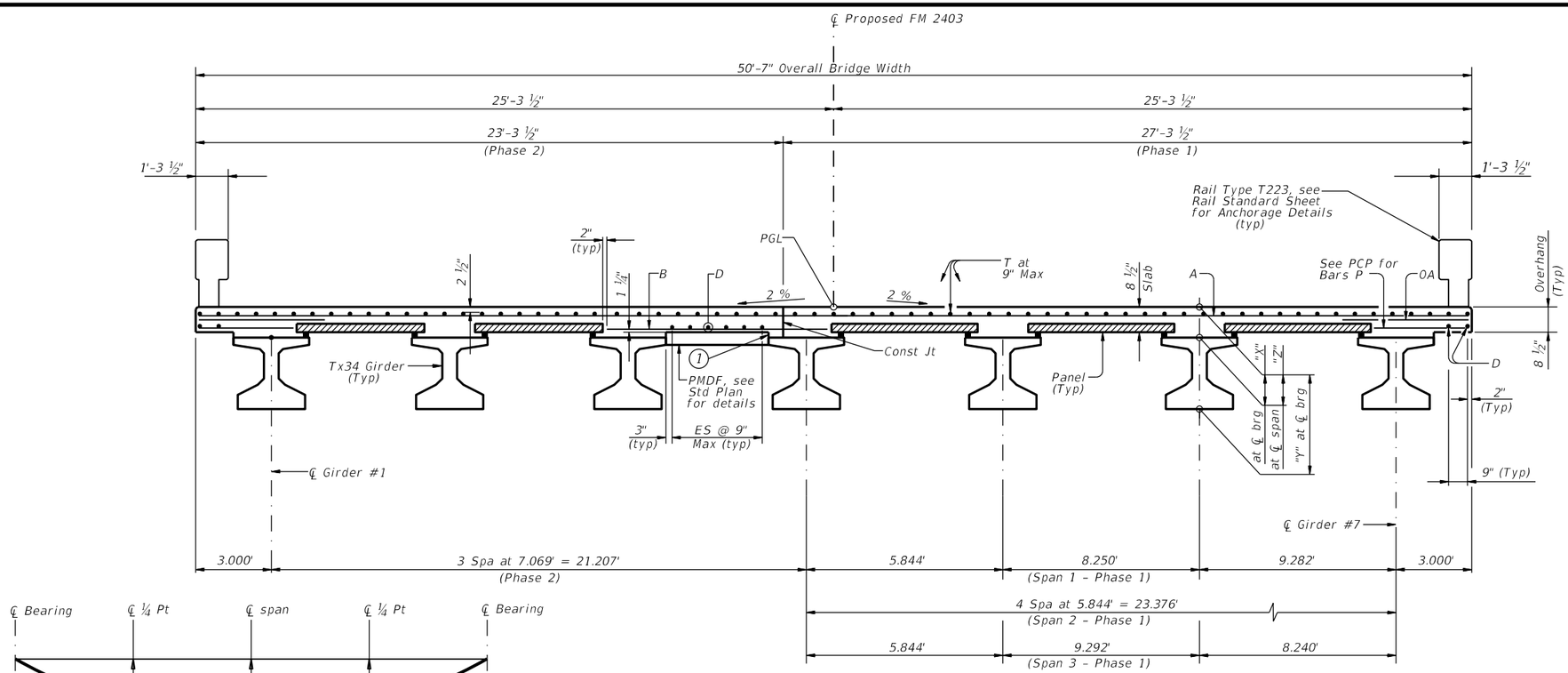
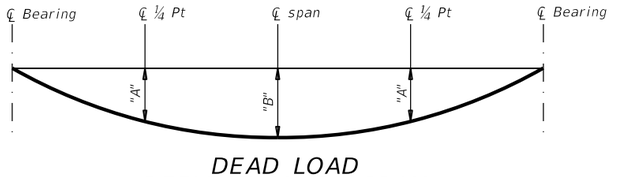


TYPICAL TRANSVERSE SECTION

(Showing girder type Tx34)



DEAD LOAD DEFLECTION DIAGRAM

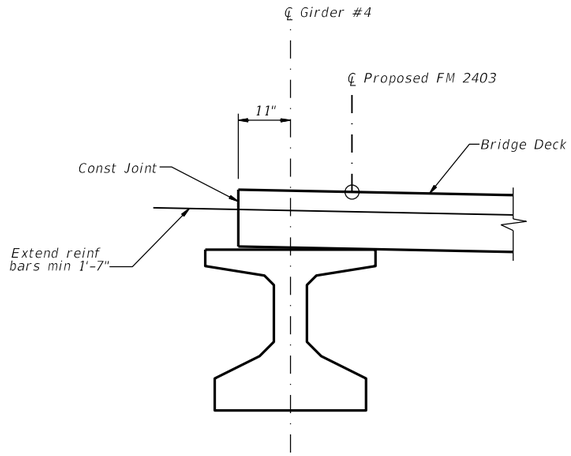
Calculated deflections shown are due to the concrete slab on interior girders only (Ec = 5000 ksi). Adjust values as required for exterior girders and if optional slab forming is used. These values may require field verification.

TABLE OF SECTION DEPTHS

SPAN NO.	GIRDER NO.	Section Depths X"	Y"	Z"
1	1	11 "	3'-9 "	9 ¾"
1	2	11 "	3'-9 "	9 ⅞"
1	3	11 "	3'-9 "	9 ⅞"
1	4	11 "	3'-9 "	9 ¾"
1	5	11 "	3'-9 "	9 ⅞"
1	6	11 "	3'-9 "	9 ⅝"
1	7	11 "	3'-9 "	9 ½"
2	1	11 ½"	3'-9 ½"	10 ⅛"
2	2	11 ½"	3'-9 ½"	10 ¼"
2	3	11 ½"	3'-9 ½"	10 ¼"
2	4	11 ½"	3'-9 ½"	10 ¼"
2	5	11 ½"	3'-9 ½"	10 ⅛"
2	6	11 ½"	3'-9 ½"	10 ⅛"
2	7	11 ½"	3'-9 ½"	10 ⅛"
2	8	11 ½"	3'-9 ½"	10 ⅛"
3	1	10 ½"	3'-8 ½"	9 ⅞"
3	2	10 ½"	3'-8 ½"	9 ⅞"
3	3	10 ½"	3'-8 ½"	9 ⅞"
3	4	10 ½"	3'-8 ½"	9 ⅞"
3	5	10 ½"	3'-8 ½"	9 ⅞"
3	6	10 ½"	3'-8 ½"	9 ¾"
3	7	10 ½"	3'-8 ½"	9 ¾"

TABLE OF DEAD LOAD DEFLECTIONS

SPAN NO.	GIRDER NO.	"A" (Feet)	"B" (Feet)
1	1	0.077	0.109
1	2-3, 5	0.083	0.118
1	4	0.076	0.108
1	6	0.103	0.146
1	7	0.090	0.128
2	1	0.124	0.177
2	2-3	0.134	0.191
2	4	0.123	0.175
2	5-7	0.111	0.158
2	8	0.113	0.160
3	1	0.011	0.016
3	2-3, 7	0.012	0.017
3	4	0.011	0.015
3	5	0.013	0.018
3	6	0.015	0.021



PHASE DETAIL

TABLE OF ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY		
		PHASE 1	PHASE 2	TOTAL
Reinf Conc Slab	SF			
Reinf Steel	LB			

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
0A	#5
P	#4
T	#4

1 Contractor to ensure min clearances are met for PCP panels prior to pouring Phase 2. If min clearances can't be met use PMDF in this bay. Refer to PCP Standard for more information.

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, 0A, P Or T Unless Noted Otherwise. Provide The Same Laps As Required For Reinforcing Bars.

HL93 LOADING

SHEET OF

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

Texas Department of Transportation

Houston District (Bridge)

SLAB DETAILS

FM 2403

NORTH DRAINAGE DITCH BRIDGE

FILE: $FILE$	DN: AI	CK: TF	DW: GB	CK: AI
©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		116

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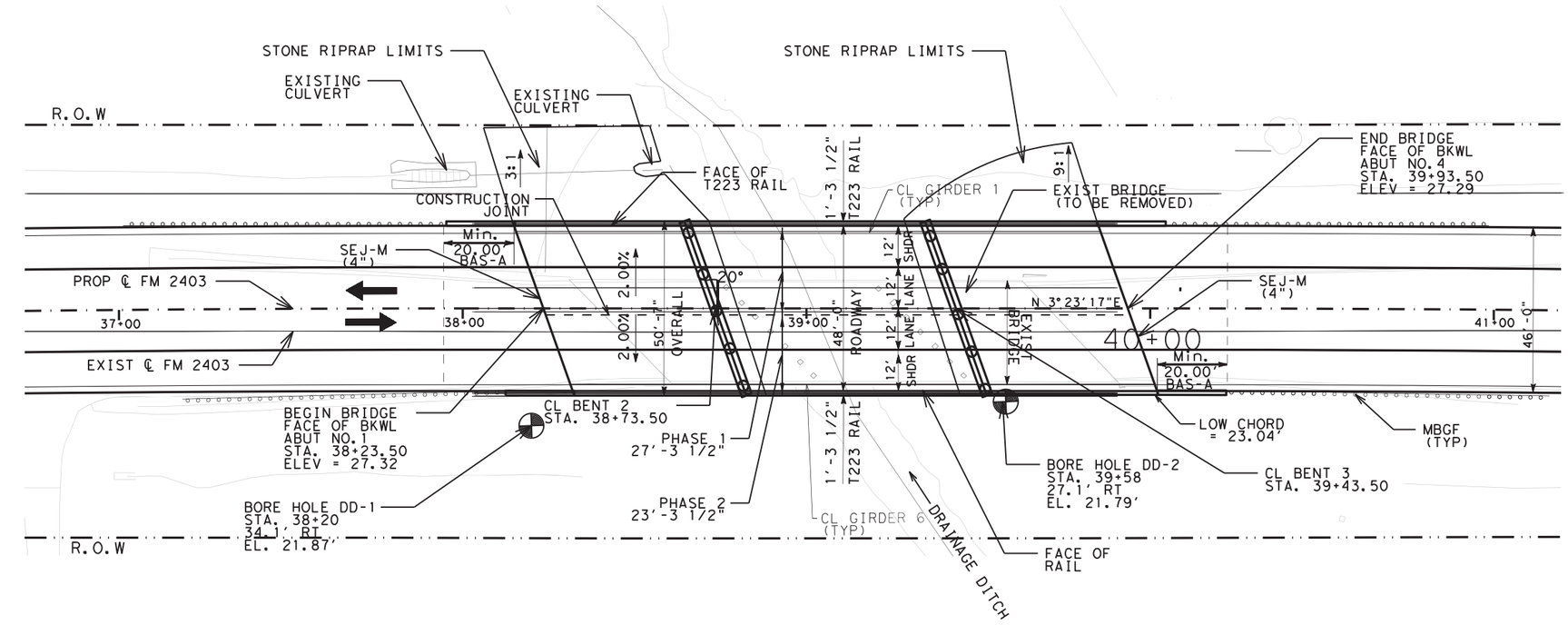


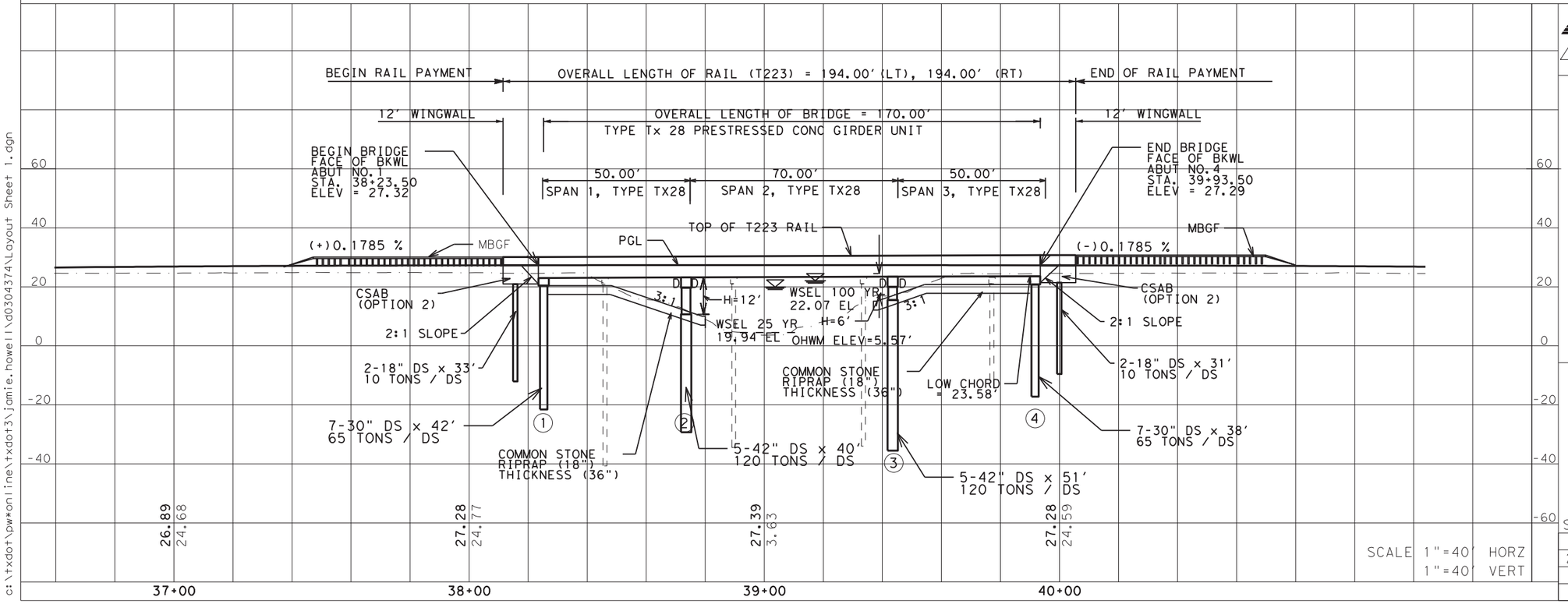
GENERAL NOTES:

1. DESIGN ACCORDING TO AASHTO 2020 LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION.
2. SEE BORING LOG SHEETS FOR TEST HOLE DATA.
3. SEE TYPICAL SECTION SHEETS FOR TYPICAL SECTIONS AND PHASING DETAILS.
4. EXISTING 3 SPAN PAN GIRDER BRIDGE WITH PRESTRESSED CONCRETE PILES (132 FT LONG X 42 FT WIDTH) SHALL BE REMOVED. SEE TYPICAL SECTIONS/ PHASING SHEETS FOR THE DETAILS.
5. CONTRACTOR SHALL VERIFY THE LOCATION DEPTH OF ALL UTILITIES PRIOR TO CONSTRUCTION OR FABRICATION. THE COST OF RELOCATION UTILITIES WILL BE PAID FOR UNDER SEPARATE CONTRACT.
6. FOR RIPRAP DETAILS, SEE TXDOT STANDARD "STONE RIPRAP" (SRR) SHEET.
7. ALL BENTS AND ABUTMENTS ON BEARING N 73°23'17" E

EXIST NBI # 12-020-2950-01-002

PROP NBI # 12-020-2950-01-003

FUNCTIONAL CLASS = MAJOR COLLECTOR
DESIGN SPEED = 60 MPH
ADT = 7,200 (2023)
ADT = 10,200 (2043)



STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

5/19/2023

FM 2403 SOUTH DRAINAGE DITCH BRIDGE LAYOUT

SHEET 1 OF 1

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		117

5/5/2023
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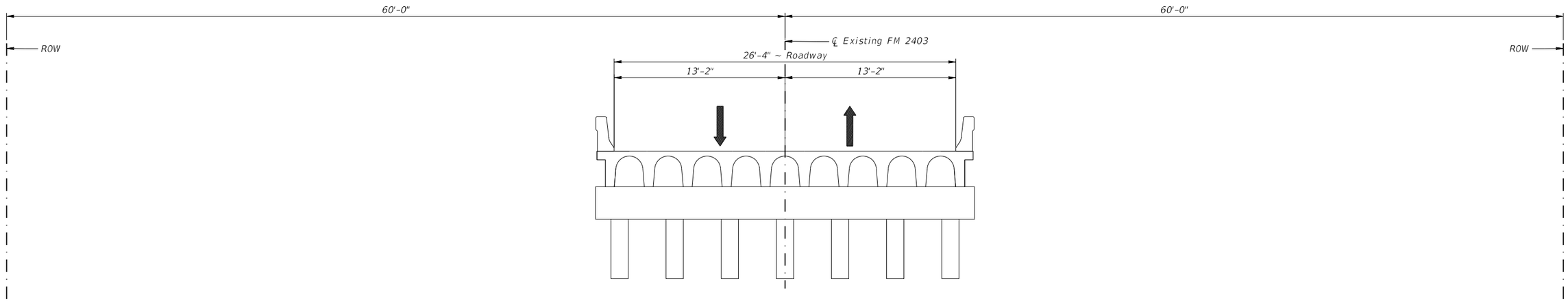
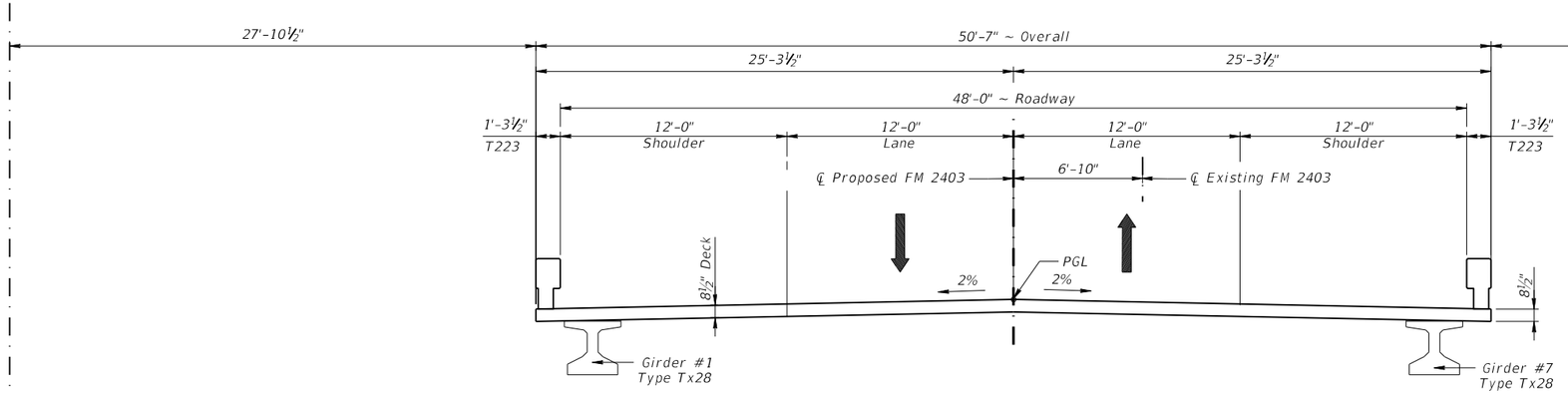


EXISTING TYPICAL SECTION



PROPOSED TYPICAL SECTION ~ FINAL

SHEET 1 OF 1

STATE OF TEXAS
MICHAEL E. CARLSON
111317
LICENSED
PROFESSIONAL ENGINEER

05/11/2023

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Houston District (Bridge)

TYPICAL SECTION

FM 2403
SOUTH DRAINAGE DITCH

FILE: TypSec_Bridge.dgn		DN: MEC	CK: JH	DW: MEC	CK: TF		
©TxDOT 5/11/2023	CONT	SECT	JOB		HIGHWAY		
REVISIONS	2950	01	008, ETC		FM 2403		
	DIST	COUNTY			SHEET NO.		
	HOU	BRAZORIA			118		

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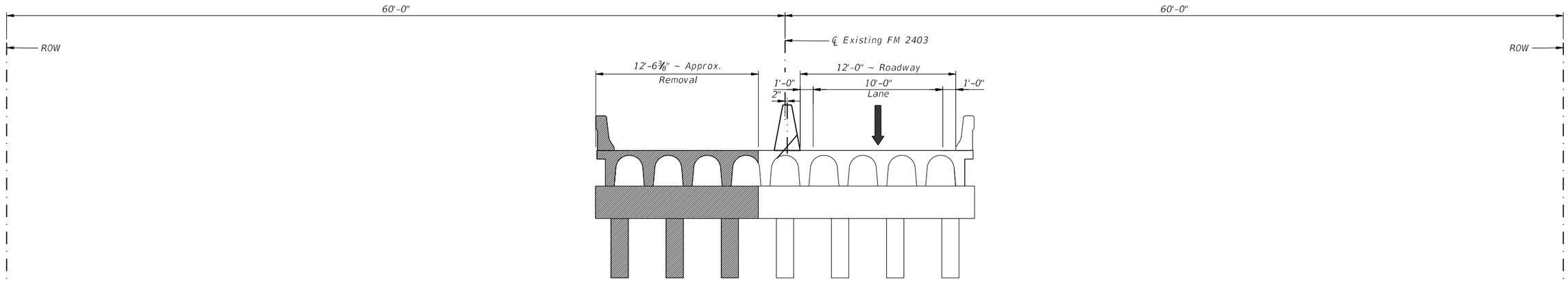
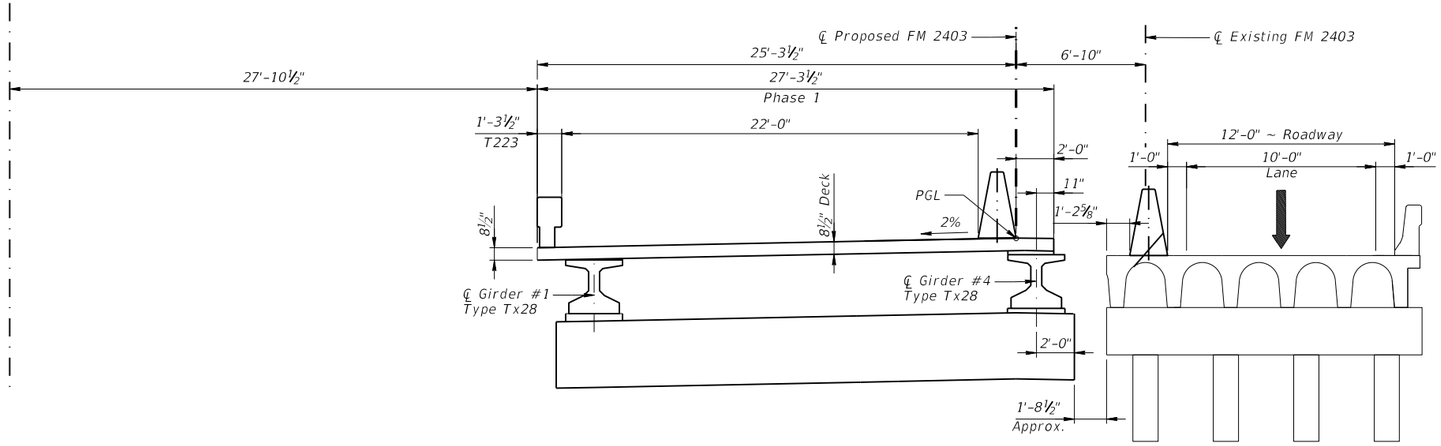
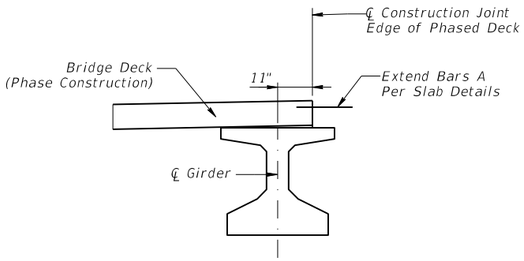


PHASE 1 ~ REMOVAL



PHASE 1 ~ CONSTRUCTION



PHASE DETAIL

Area to be removed

05/11/2023

SHEET 1 OF 2

Texas Department of Transportation

Houston District (Bridge)

BRIDGE CONSTRUCTION SEQUENCE

FM 2403
SOUTH DRAINAGE DITCH

FILE: TypSec_Bridge.dgn	DN: MEC	CK: JH	DW: MEC	CK: TF			
©TxDOT 5/11/2023	CONT	SECT	JOB	HIGHWAY			
REVISIONS	2950	01	008, ETC	FM 2403			
	DIST	COUNTY		SHEET NO.			
	HOU	BRAZORIA		119			

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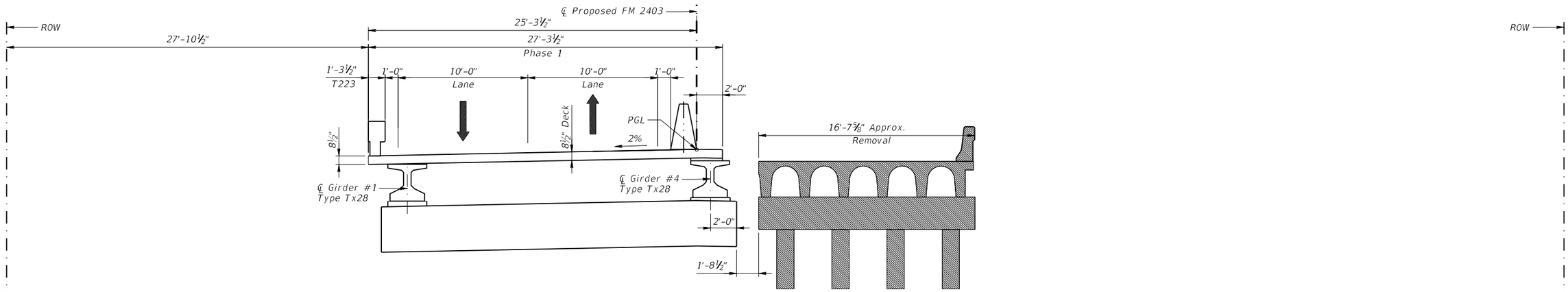
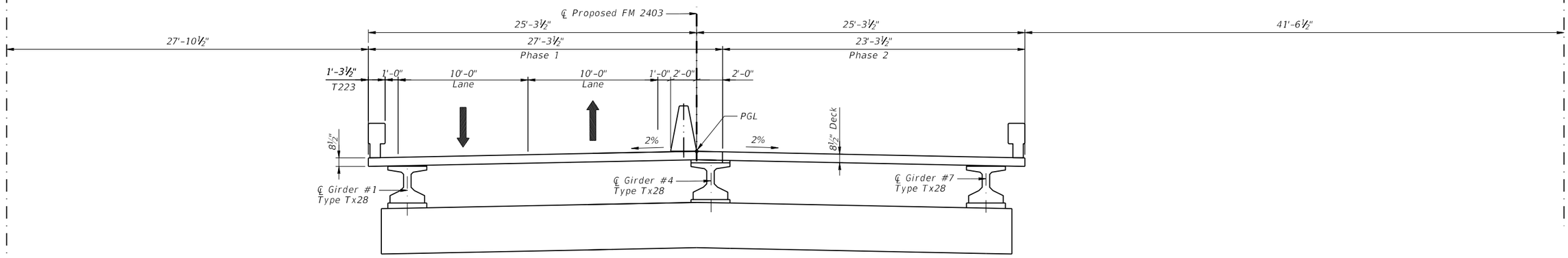
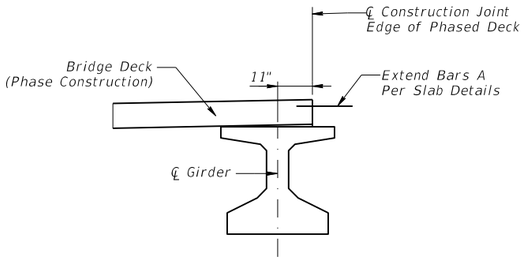


PHASE 2 ~ REMOVAL



PHASE 2 ~ CONSTRUCTION



PHASE DETAIL

Area to be removed

STATE OF TEXAS
MICHAEL E. CARLSON
111317
LICENSED
PROFESSIONAL ENGINEER

05/11/2023

SHEET 2 OF 2

Texas Department of Transportation

Houston District (Bridge)

BRIDGE CONSTRUCTION SEQUENCE

FM 2403
SOUTH DRAINAGE DITCH

FILE: TypSec_Bridge.dgn	DN: MEC	CK: JH	DW: MEC	CK: TF
©TxDOT 5/11/2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		120

DATE: 03/28/2023 04:33 PM
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ESTIMATED QUANTITIES

ITEM NO.	416-6001	416-6003	416-6005	420-6013	420-6029	420-6037	422-6001	425-6035	432-6026	450-6006	454-6018
ITEM	DRILL SHAFT (18 IN)	DRILL SHAFT (30 IN)	DRILL SHAFT (42 IN)	CL C CONC (ABUT)	CL C CONC (CAP)	CL C CONC (COLUMN)	REINF CONC SLAB	PRESTR CONC GIRDER (TX28)	RIPRAP (STONE COMMON) (DRY)(18 IN)	RAIL (TY T223)	SEALED EXPANSION JOINT (4 IN) (SEJ - M)
UNIT	LF	LF	LF	CY	CY	CY	SF	LF	CY	LF	LF
QUANTITY	128	560	455	58.6	47.2	23.5	8,599.5	1,179.5	674.9	388	108

BEARING SEAT ELEVATIONS

		BEAM 1	BEAM 2	BEAM 3	BEAM 4	BEAM 5	BEAM 6	BEAM 7
ABUT	1 (FWD)	23.384	23.545	23.705	23.823	23.686	23.549	23.412
BENT	2 (BK)	23.450	23.608	23.766	23.881	23.741	23.601	23.461
	(FWD)	23.368	23.526	23.684	23.799	23.659	23.519	23.378
BENT	3 (BK)	23.370	23.523	23.677	23.786	23.643	23.498	23.354
	(FWD)	23.451	23.605	23.758	23.868	23.724	23.580	23.435
ABUT	4 (BK)	23.386	23.537	23.688	23.795	23.649	23.503	23.357

HL93 LOADING

SHEET 0F

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED
PROFESSIONAL ENGINEER

05.17.2023

Texas Department of Transportation

Houston District (Bridge)

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

FM 2403

SOUTH DRAINAGE DITCH BRIDGE

FILE:	DN: DB	CK: TF	DW: GB	CK: DB
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
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	HOU	BRAZORIA		121

DATE: $DATE$
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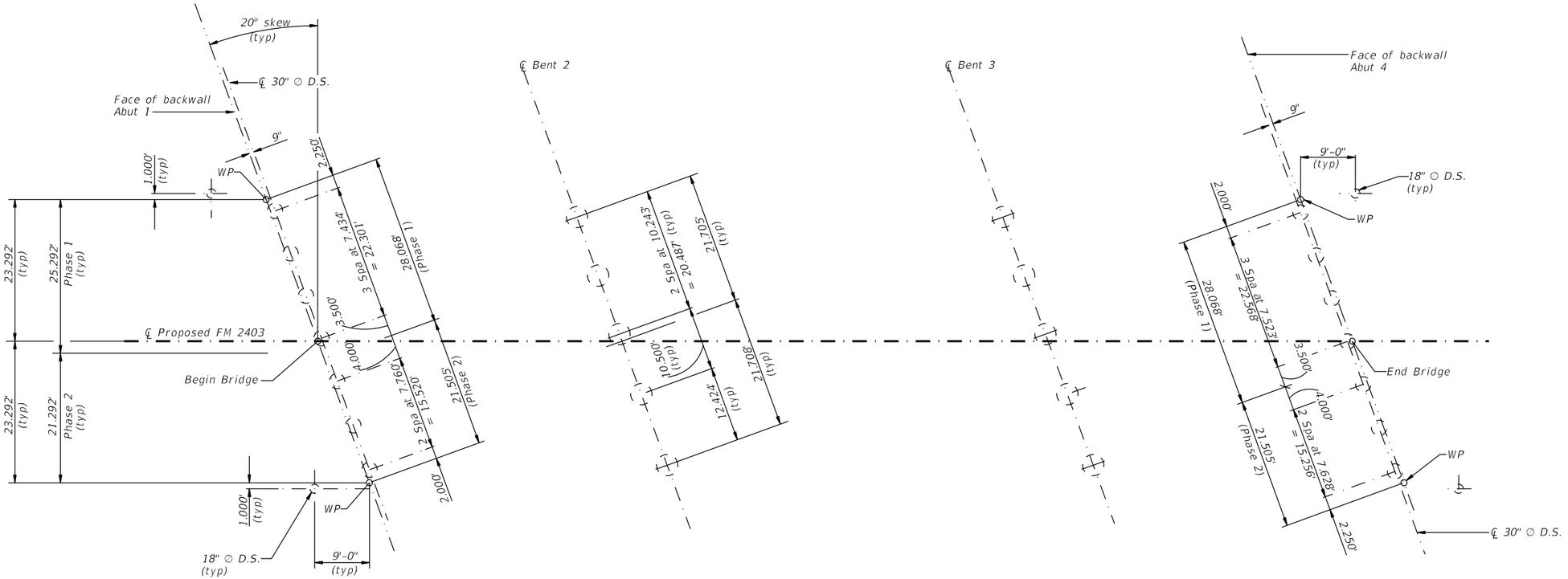

GENERAL NOTES:

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 & PILE 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.

TABLE OF DRILLED SHAFT (DS) & COLUMN INFORMATION

	Abut 1, 30" DS	Abut 1, 18" DS*	Bent 2, 42" DS	Bent 3, 42" DS	Abut 4, 30" DS	Abut 4, 18" DS*
Foundation Load (Tons/DS)	65	10	120	120	65	10
# of Column/DS	7	2	5	5	7	2
H for Column Above (ft)	0	0	12	6	0	0
DS Length (ft)	42	33	40	51	38	31
H + DS Length (ft)	42	33	52	57	38	31

* 18" DS are for abutment wingwalls

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

HL93 LOADING SHEET OF

Texas Department of Transportation ®2018

Houston District (Bridge)

FOUNDATION LAYOUT

FM 2403
SOUTH DRAINAGE DITCH BRIDGE

FILE: $FILE$	DN: DB	CK: TF	DW: GB	CK: DB
©TxDOT $DATE$	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		122

DATE: $DATE$
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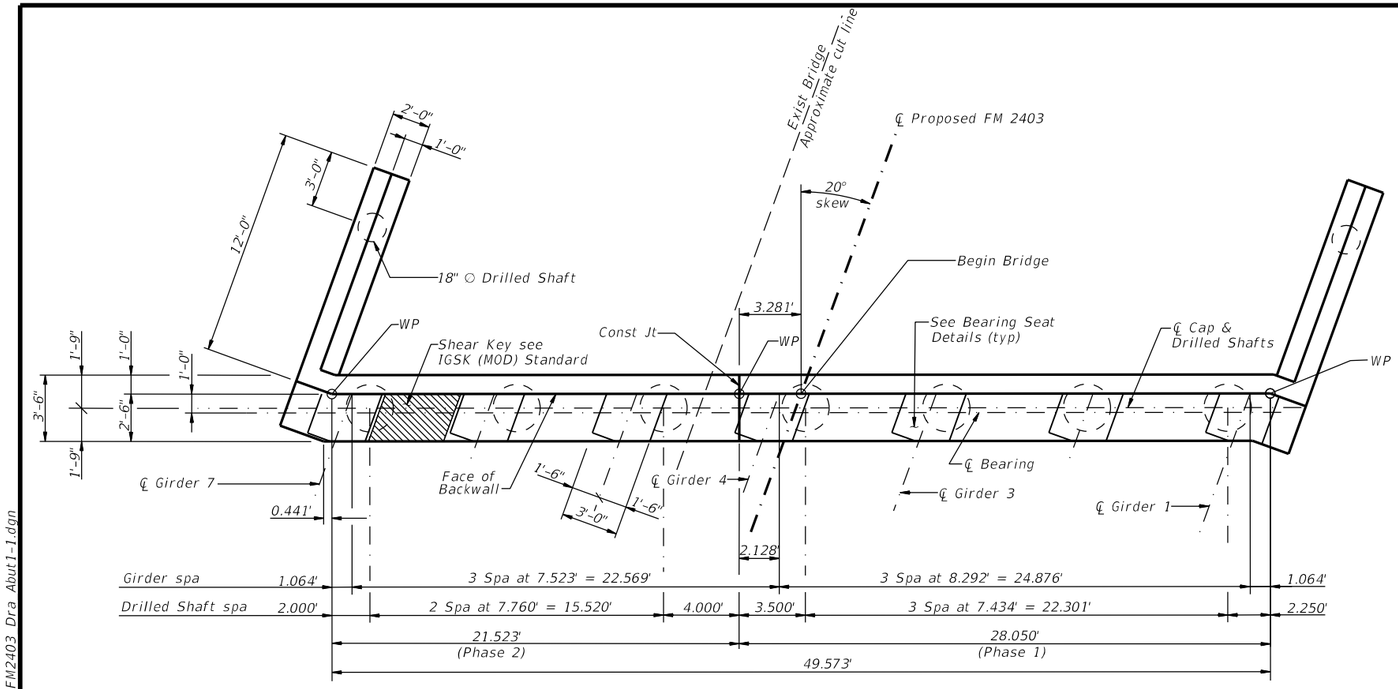
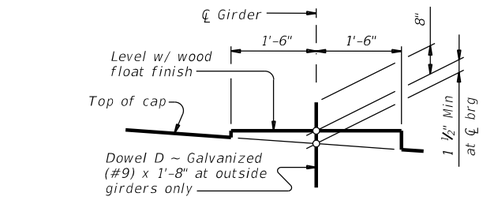
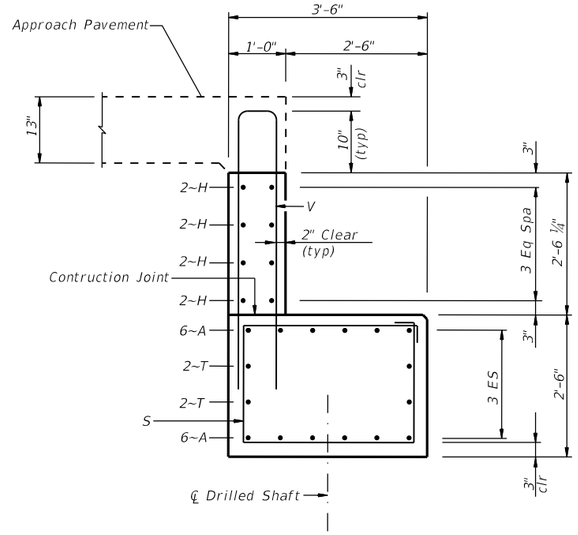


PLAN

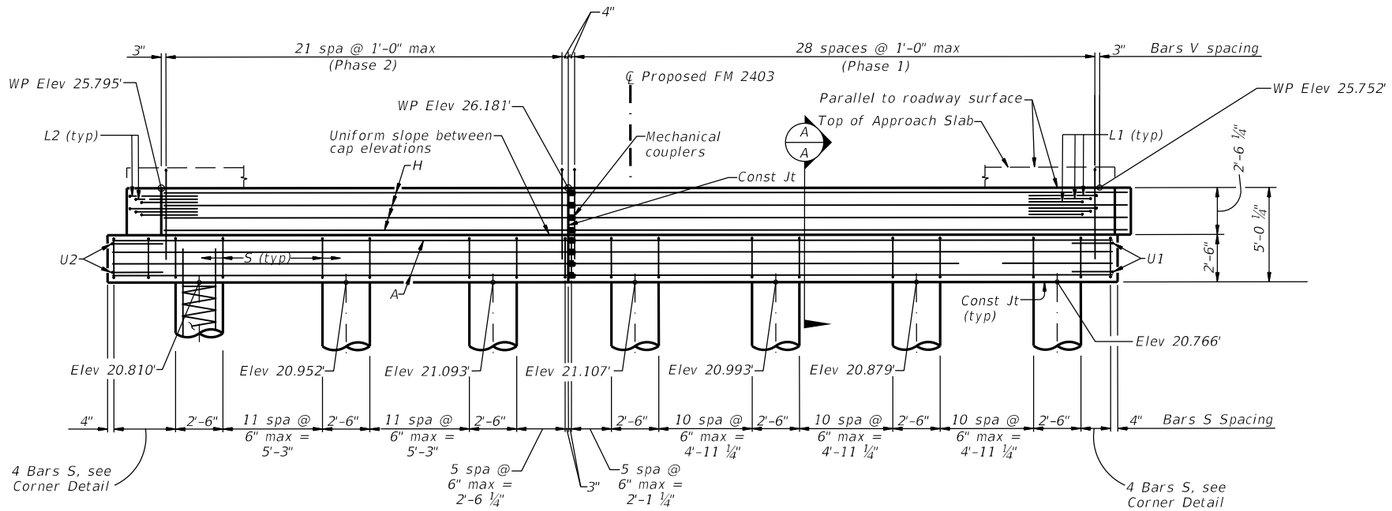


BEARING SEAT DETAIL

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



SECTION A-A



ELEVATION

(Looking back station)

HL93 LOADING

SHEET 1 OF 2

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED
PROFESSIONAL ENGINEER

05.17.2023

Texas Department of Transportation

Houston District (Bridge)

ABUTMENT 1

FM 2403

SOUTH DRAINAGE DITCH BRIDGE

FILE: $FILE$	DN: DB	CK: TF	DW: GB	CK: DB	
©TxDOT $DATE$	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2950	01	008, ETC	FM 2403	
	DIST	COUNTY		SHEET NO.	
	HOU	BRAZORIA		123	

DATE: $DATE$
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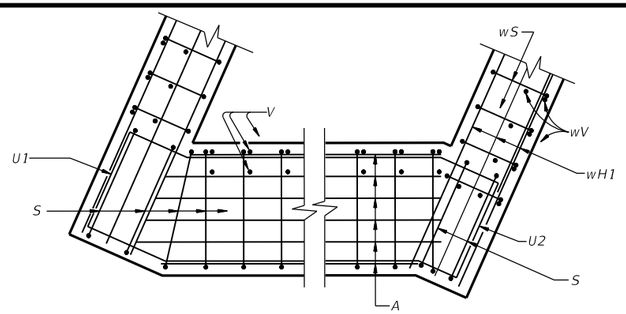

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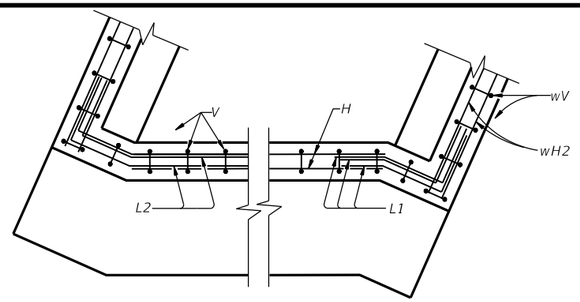
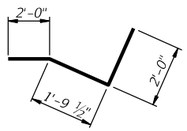
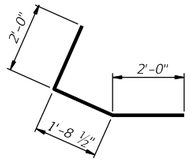


BACKWALL

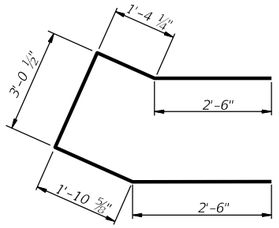
CORNER DETAILS



BARS L1



BARS L2



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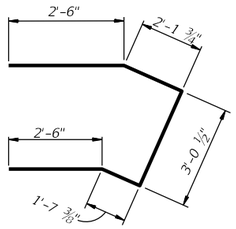

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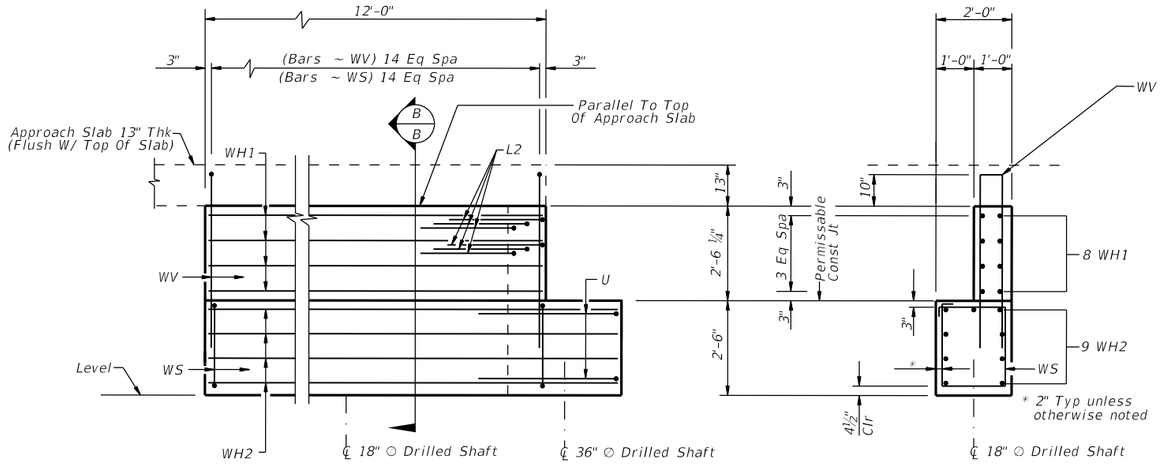
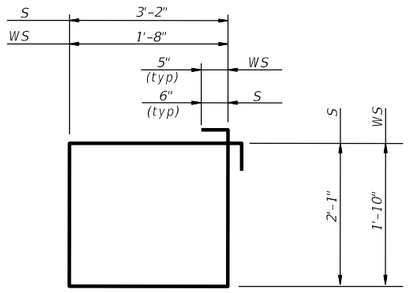
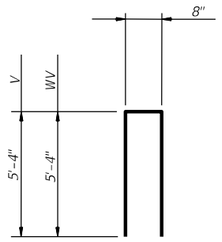


WINGWALL ELEVATION

SECTION B-B



BARS S & wS



BARS V & wV

TABLE OF ESTIMATED QUANTITIES (PHASE 2)

BAR	NO.	SIZE	LENGTH	WEIGHT
A	12	# 11	21'-9"	1,387
H	8	# 6	21'-5"	257
L2	6	# 6	5'-9"	52
S	34	# 5	11'-6"	408
T	4	# 6	21'-9"	131
U2	2	# 6	11'-10"	36
V	24	# 5	11'-4"	284
wH1	8	# 6	11'-8"	140
wH2	9	# 6	11'-8"	158
WS	12	# 4	7'-10"	63
WV	12	# 5	11'-4"	142

ITEM	UNIT	QUANTITY
Reinforcing Steel	LBS	3,056
Class "C" Conc (Abut)	CY	13.4

TABLE OF ESTIMATED QUANTITIES (PHASE 1)

BAR	NO.	SIZE	LENGTH	WEIGHT
A	12	# 11	27'-7"	1,759
H	8	# 6	27'-11"	335
L1	6	# 6	5'-10"	53
S	43	# 5	11'-6"	516
T	4	# 6	27'-7"	166
U1	2	# 6	11'-4"	34
V	30	# 5	11'-4"	355
wH1	8	# 6	11'-8"	140
wH2	9	# 6	11'-8"	158
WS	12	# 4	7'-10"	63
WV	12	# 5	11'-4"	142

ITEM	UNIT	QUANTITY
Reinforcing Steel	LBS	3,719
Class "C" Conc (Abut)	CY	15.8

(1) Bars A, T, H, wH1, wH2, shall be extended beyond Construction Joint with a lap splice included or mechanical couplers at Contractor's option

Lap splices in Phase 1:
#11 Bars (A, B) = 5'-3"
#6 Bars (H, wH1, wH2) = 2'-10"
#5 Bars (T) = 1'-10"

GENERAL NOTES:

- Designed According to AASHTO LRFD Bridge Design Specifications.
- Reinforcing Steel Quantity is for Contractor's information Only.
- See Standard Bridge Drilled Shaft Details Houston District (HOU-BDS-22).
- See Table of Estimated Foundation Quantities for Foundation loads and Drilled Shaft lengths.
- Chamfer All Exposed Edges 3/4".
- See Bridge Approach Slab Concrete Pavement Houston District (BAS-C).
- 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 Grade 60 reinforcing steel.

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

HL93 LOADING

Texas Department of Transportation

Houston District (Bridge)

ABUTMENT 1

FM 2403

SOUTH DRAINAGE DITCH BRIDGE

FILE: $FILES		DN: DB	CK: TF	DW: GB	CK: DB
©TxDOT $DATES	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2950	01	008, ETC	FM 2403	
	DIST	COUNTY		SHEET NO.	
	HOU	BRAZORIA		124	

DATE: $DATES
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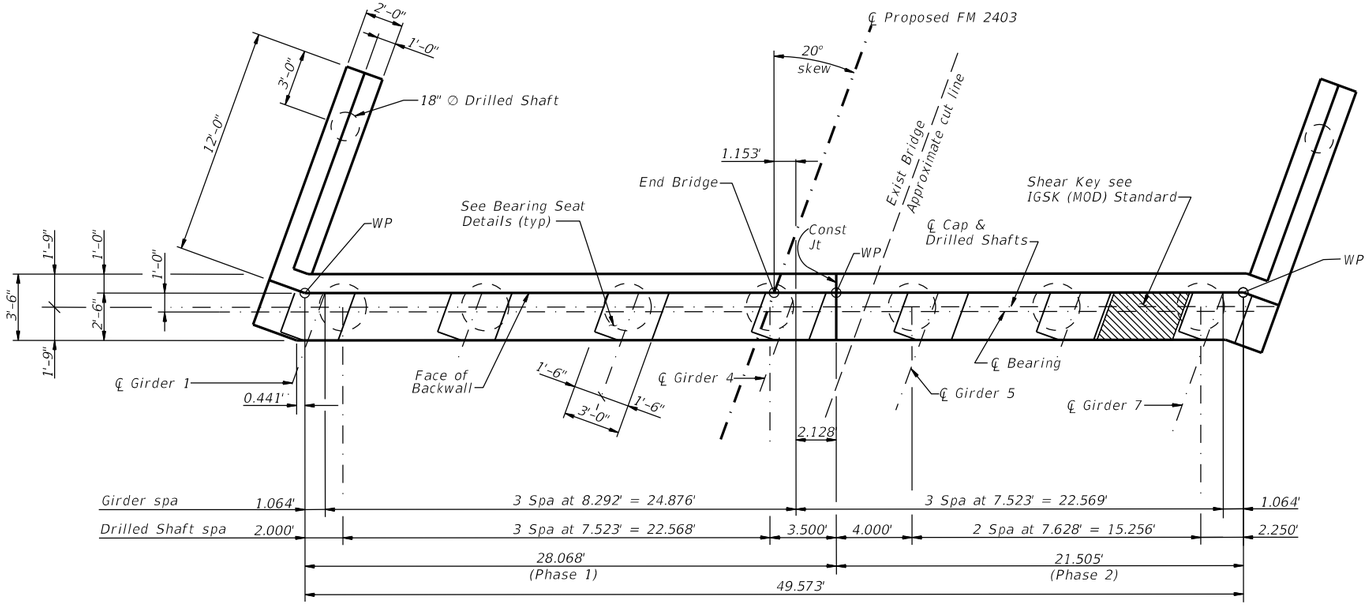

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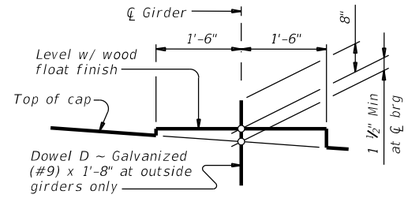
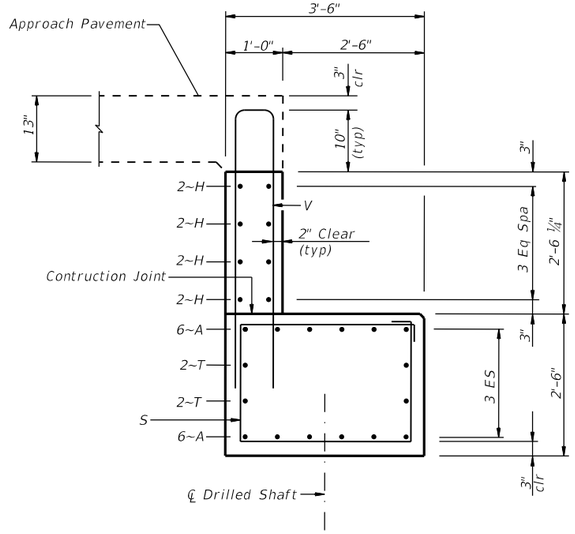
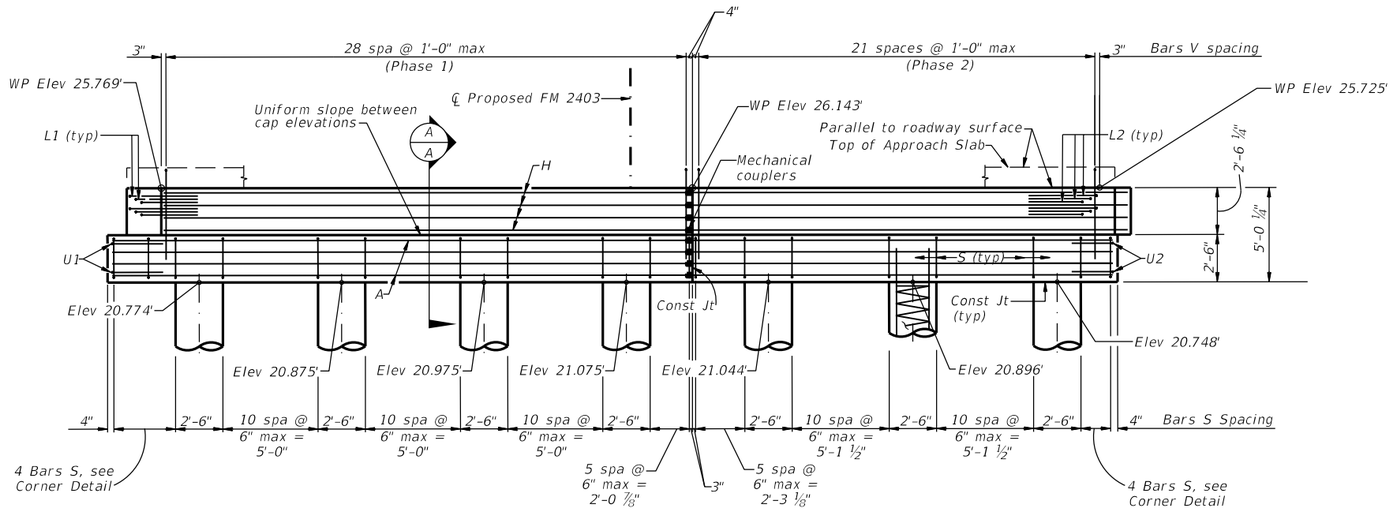


BEARING SEAT DETAIL

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



SECTION A-A



ELEVATION

(Looking forward station)

HL93 LOADING

SHEET 1 OF 2

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

Texas Department of Transportation ®2018

Houston District (Bridge)

ABUTMENT 4

FM 2403

SOUTH DRAINAGE DITCH BRIDGE

FILE: $FILES$	DN: DB	CK: TF	DW: GB	CK: DB	
©TxDOT $DATES$ REVISIONS	CONT	SECT	JOB	HIGHWAY	
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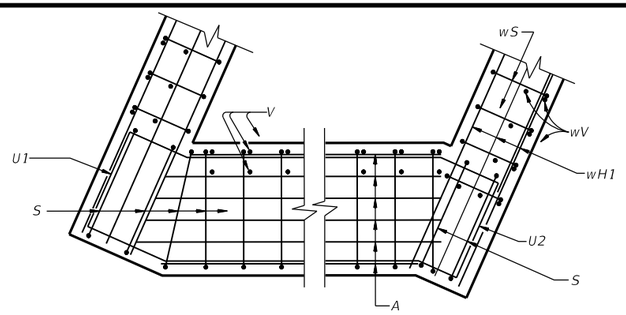

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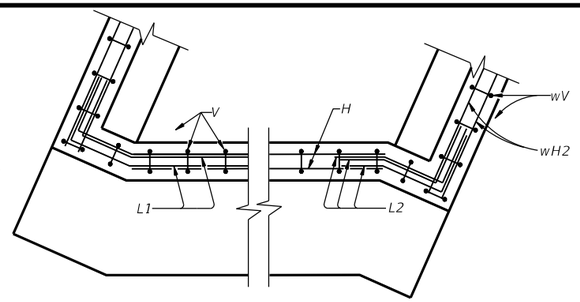
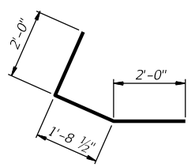
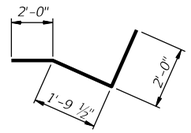


BACKWALL

CORNER DETAILS



BARS L1



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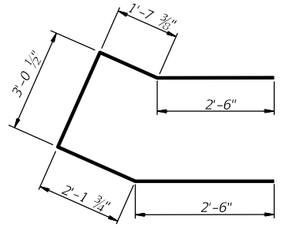

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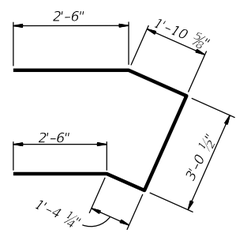

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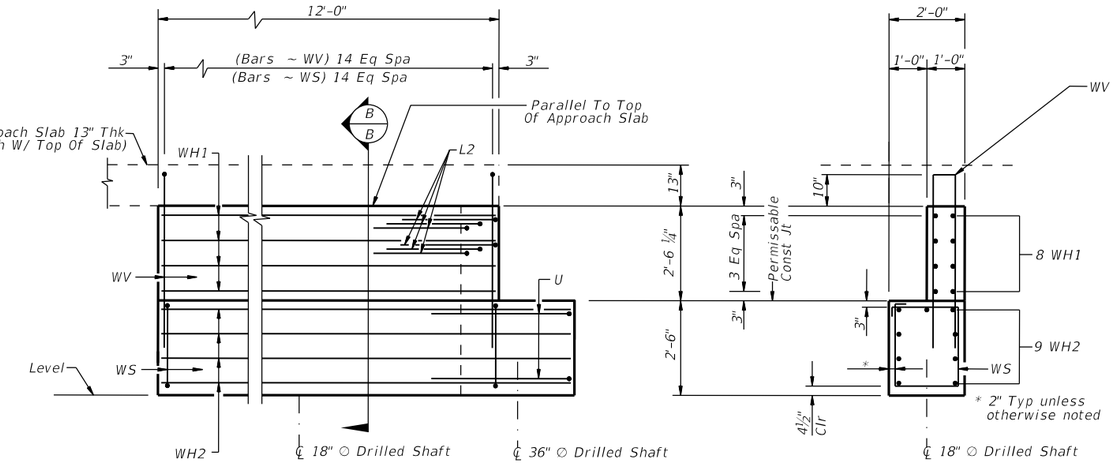
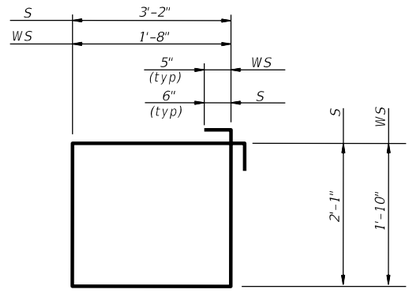
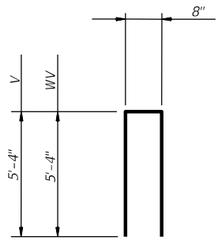


WINGWALL ELEVATION

SECTION B-B



BARS S & wS



BARS V & wV

TABLE OF ESTIMATED QUANTITIES (PHASE 2)

BAR	NO.	SIZE	LENGTH	WEIGHT
A	12	# 11	21'-0"	1,339
H	8	# 6	21'-4"	256
L2	6	# 6	5'-10"	53
S	32	# 5	11'-6"	384
T	4	# 6	21'-0"	126
U2	2	# 6	11'-4"	34
V	24	# 5	11'-4"	284
wH1	8	# 6	11'-8"	140
wH2	9	# 6	11'-8"	158
WS	12	# 4	7'-10"	63
WV	12	# 5	11'-4"	142

ITEM	UNIT	QUANTITY
Reinforcing Steel	LBS	2,978
Class "C" Conc (Abut)	CY	13.4

TABLE OF ESTIMATED QUANTITIES (PHASE 1)

BAR	NO.	SIZE	LENGTH	WEIGHT
A	12	# 11	28'-4"	1,806
H	8	# 6	27'-11"	335
L1	6	# 6	5'-9"	52
S	43	# 5	11'-6"	516
T	4	# 6	28'-4"	170
U1	2	# 6	11'-10"	36
V	30	# 5	11'-4"	355
wH1	8	# 6	11'-8"	140
wH2	9	# 6	11'-8"	158
WS	12	# 4	7'-10"	63
WV	12	# 5	11'-4"	142

ITEM	UNIT	QUANTITY
Reinforcing Steel	LBS	3,772
Class "C" Conc (Abut)	CY	15.8

(1) Bars A, T, H, wH1, wH2, shall be extended beyond Construction Joint with a lap splice included or mechanical couplers at Contractor's option

Lap splices in Phase 1:
#11 Bars (A, B) = 5'-3"
#6 Bars (H, wH1, wH2) = 2'-10"
#5 Bars (T) = 1'-10"

GENERAL NOTES:

- Designed According to AASHTO LRFD Bridge Design Specifications.
- Reinforcing Steel Quantity is for Contractor's information Only.
- See Standard Bridge Drilled Shaft Details Houston District (HOU-BDS-22).
- See Table of Estimated Foundation Quantities for Foundation loads and Drilled Shaft lengths.
- Chamfer All Exposed Edges ¾".
- See Bridge Approach Slab Concrete Pavement Houston District (BAS-C).
- 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 Grade 60 reinforcing steel.

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

HL93 LOADING

Texas Department of Transportation

Houston District (Bridge)

ABUTMENT 4

FM 2403
SOUTH DRAINAGE DITCH BRIDGE

FILE: $FILES	DN: DB	CK: TF	DW: GB	CK: DB
©TxDOT $DATES	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		126

DATE: $DATE$
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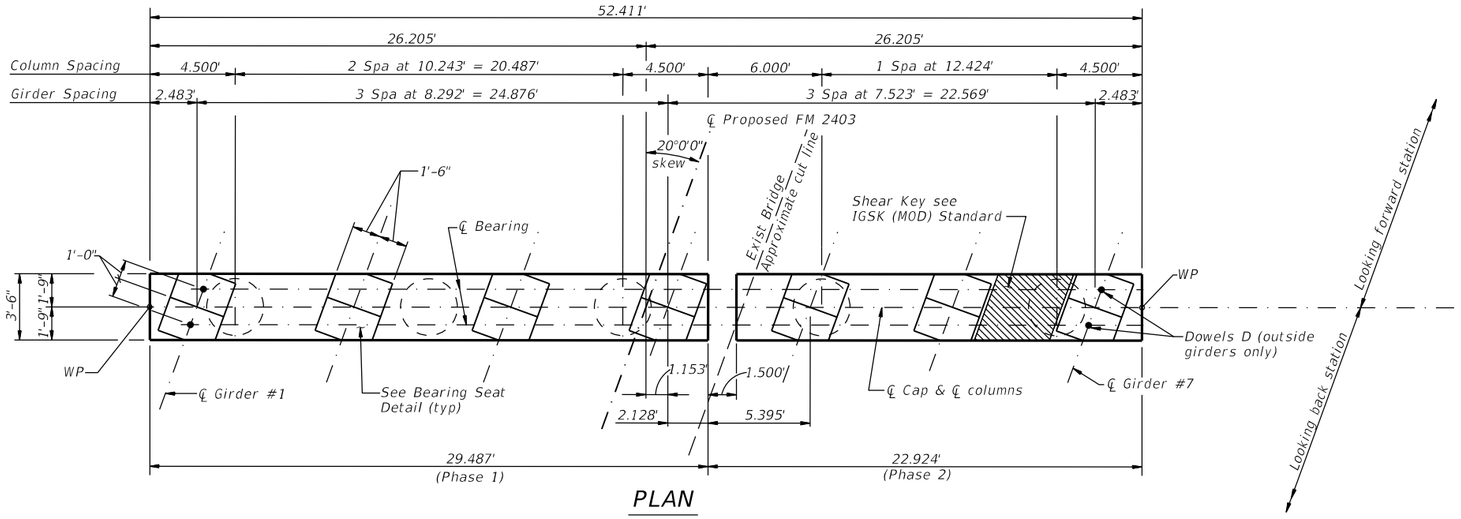
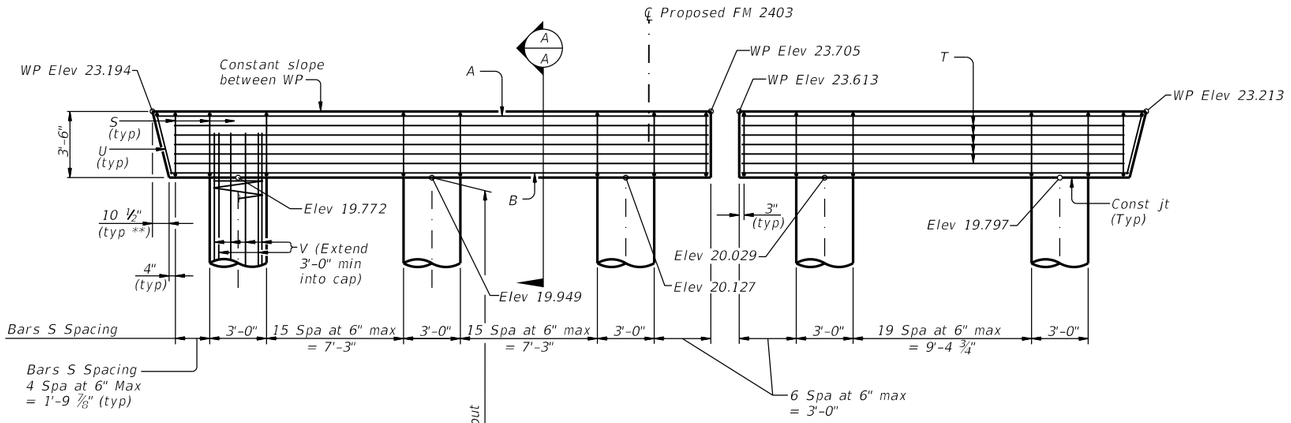
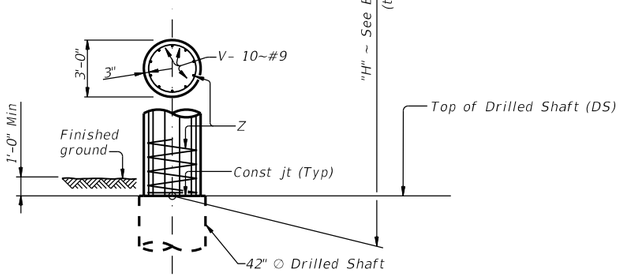


PLAN

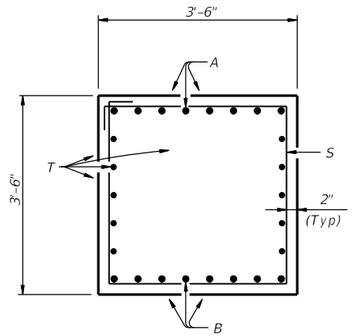


ELEVATION

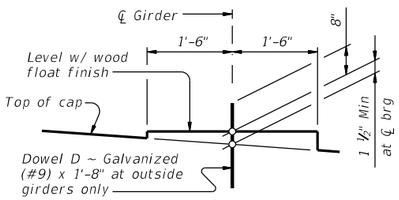
** Measured parallel to top of cap cross slope.



Note to Contractor:
Determine Top of Drilled Shaft Elevations using the criteria defined and the approximate "H" values provided in Bridge Layout. Field adjustment of Top of DS Elevations and "H" may be necessary. Maintain the Tip of DS Elevations.



SECTION A-A



BEARING SEAT DETAIL

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

TABLE OF ESTIMATED QUANTITIES (PHASE 2)

Bar	No.	Size	Length	Weight
A	8	#11	21'-1"	896
B	8	#11	20'-4"	864
D	2	#9	1'-8"	11
S	32	#5	13'-8"	456
T	10	#5	20'-4"	212
U	1	#5	9'-8"	10
V	20	#9	14'-6"	986
Z	2	#4	384'-1"	513
Reinforcing Steel			Lbs	3,949
Class "C" Concrete (Cap)			CY	10.2
Class "C" Concrete (Col)			CY	6.3

TABLE OF ESTIMATED QUANTITIES (PHASE 1)

Bar	No.	Size	Length	Weight
A	8	#11	29'-2"	1,240
B	8	#11	28'-5"	1,208
D	2	#9	1'-8"	11
S	44	#5	13'-8"	627
T	10	#5	28'-5"	296
U	1	#5	9'-8"	10
V	30	#9	14'-6"	1,479
Z	3	#4	384'-1"	770
Reinforcing Steel			Lbs	5,641
Class "C" Concrete (Cap)			CY	13.4
Class "C" Concrete (Col)			CY	9.5

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Standard Bridge Drilled Shaft Details Houston District (HOU-BDS-22) standard sheet for all foundation details and notes.

See Shear Key (IGSK) (MOD) standard sheet for all shear key details and notes, if applicable. Shear key is included in cap quantities.

See Table of Foundation Quantities sheet for Loads and Lengths of Drilled Shafts.

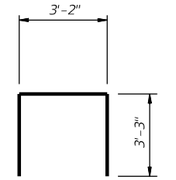
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.

MATERIAL NOTES:

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

Provide Grade 60 reinforcing steel.

Galvanize dowel bars D.



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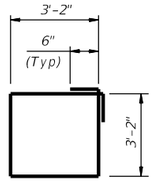

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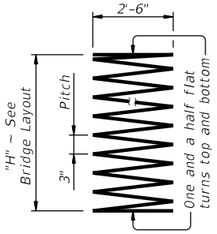

BARS Z

HL93 LOADING

SHEET 1 OF 2

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED
PROFESSIONAL ENGINEER

05.17.2023

Texas Department of Transportation

Houston District (Bridge)

BENT 2

FM 2403

SOUTH DRAINAGE DITCH BRIDGE

FILE: $FILE$	DN: DB	CK: TF	DW: GB	CK: DB
©TxDOT $DATE$ REVISIONS	CONT.	SECT	JOB	HIGHWAY
	2950	01	008, ETC	FM 2403
	DIST.	COUNTY		SHEET NO.
	HOU	BRAZORIA		127

DATE: $DATE$
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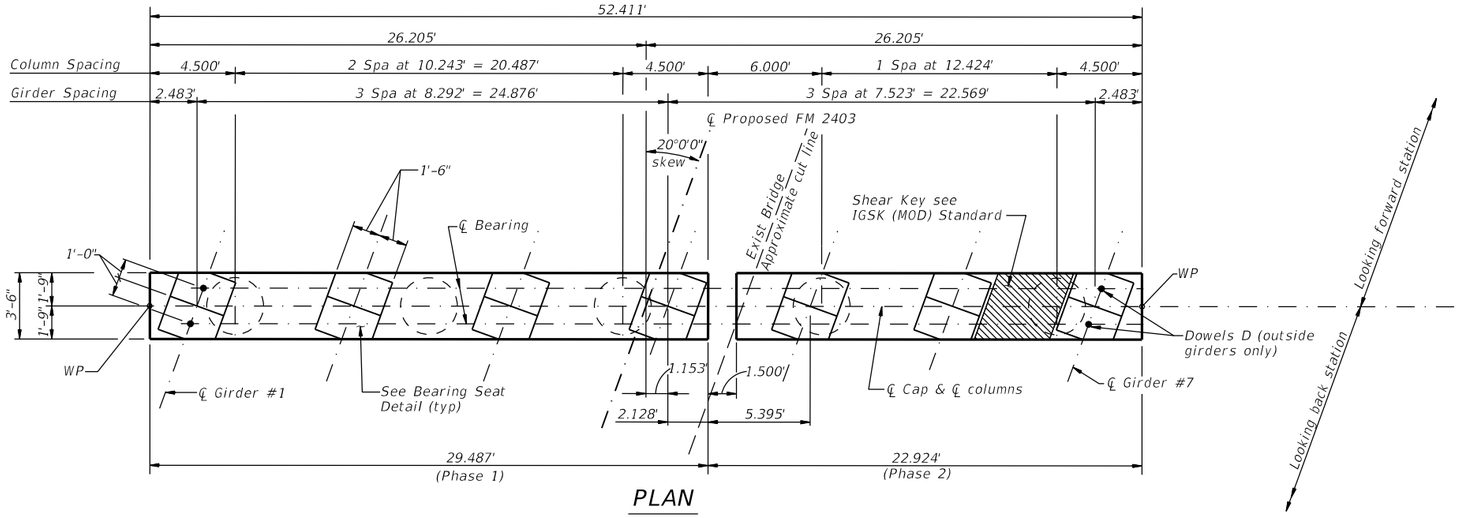
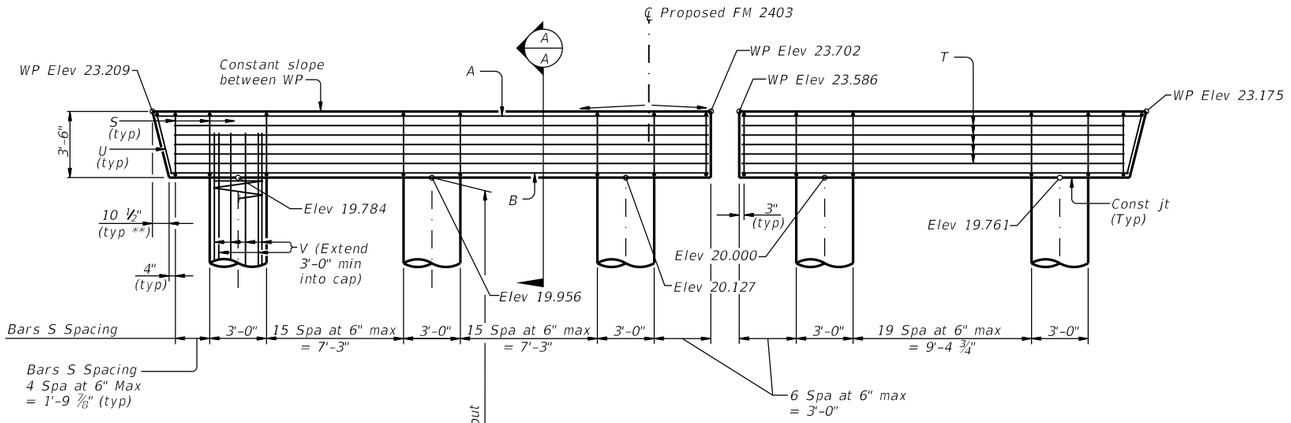
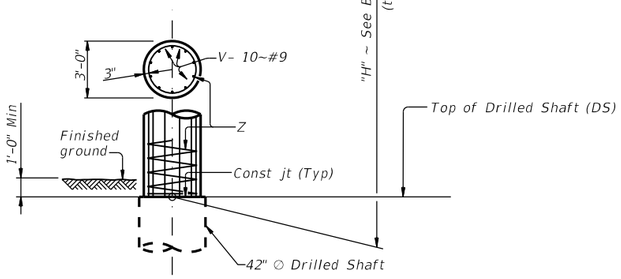


PLAN



ELEVATION

** Measured parallel to top of cap cross slope.



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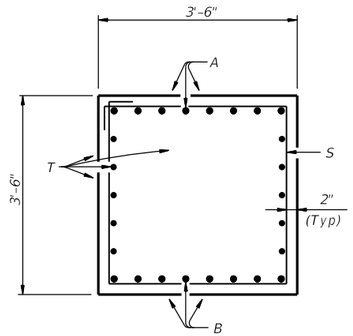
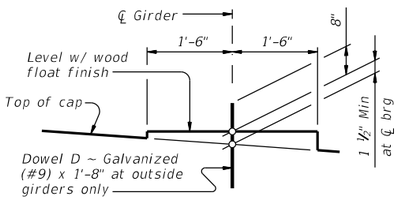


SECTION A-A



BEARING SEAT DETAIL

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

TABLE OF ESTIMATED QUANTITIES (PHASE 2)

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B	8	#11	20'-4"	864
D	2	#9	1'-8"	11
S	32	#5	13'-8"	456
T	10	#5	20'-4"	212
U	1	#5	9'-8"	10
V	20	#9	8'-6"	578
Z	2	#4	195'-7"	261
Reinforcing Steel		Lbs		3,289
Class "C" Concrete (Cap)		CY		10.2
Class "C" Concrete (Col)		CY		3.2

TABLE OF ESTIMATED QUANTITIES (PHASE 1)

Bar	No.	Size	Length	Weight
A	8	#11	29'-2"	1,240
B	8	#11	28'-5"	1,208
D	2	#9	1'-8"	11
S	44	#5	13'-8"	627
T	10	#5	28'-5"	296
U	1	#5	9'-8"	10
V	30	#9	8'-6"	867
Z	3	#4	195'-7"	392
Reinforcing Steel		Lbs		4,651
Class "C" Concrete (Cap)		CY		13.4
Class "C" Concrete (Col)		CY		4.7

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Standard Bridge Drilled Shaft Details Houston District (HOU-BDS-22) standard sheet for all foundation details and notes.

See Shear Key (IGSK) (MOD) standard sheet for all shear key details and notes, if applicable. Shear key is included in cap quantities.

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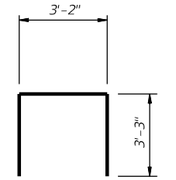
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.

MATERIAL NOTES:

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

Provide Grade 60 reinforcing steel.

Galvanize dowel bars D.



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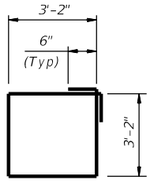

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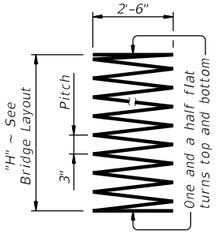
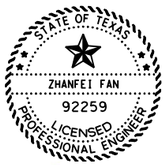


BARS Z

HL93 LOADING

SHEET 1 OF 2



05.17.2023

Texas Department of Transportation

Houston District (Bridge)

BENT 3

FM 2403

SOUTH DRAINAGE DITCH BRIDGE

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©TxDOT $DATE$ REVISIONS	CONT.	SECT	JOB	HIGHWAY
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	DIST.	COUNTY		SHEET NO.
	HOU	BRAZORIA		128

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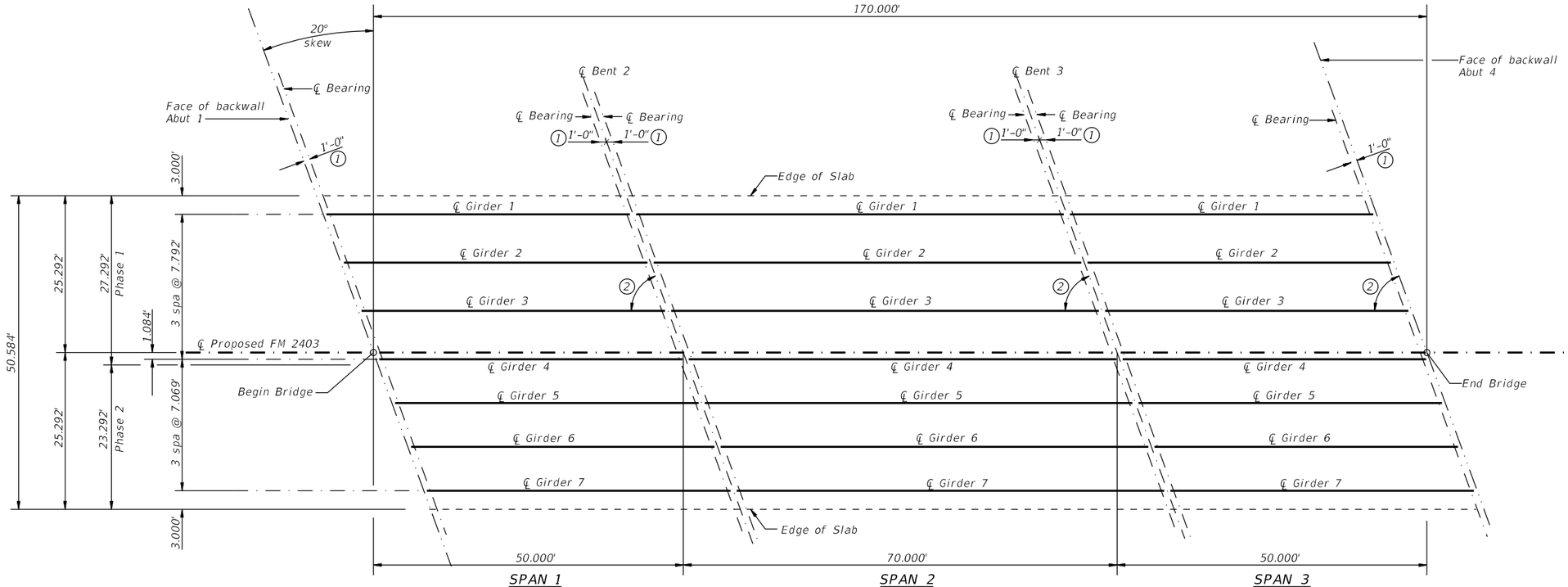

PLAN

BENT REPORT

BENT NO. 1 (N 73 23 17.00 E)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 23.723 L

			BEAM SPAC. (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 1	BEAM	1	0.000	70	0	0
	BEAM	2	8.292	70	0	0
	BEAM	3	8.292	70	0	0
	BEAM	4	8.292	70	0	0
	BEAM	5	7.523	70	0	0
	BEAM	6	7.523	70	0	0
	BEAM	7	7.523	70	0	0
	TOTAL		47.444			

BENT NO. 2 (N 73 23 17.00 E)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 23.723 L

			BEAM SPAC. (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 1	BEAM	1	0.000	70	0	0
	BEAM	2	8.292	70	0	0
	BEAM	3	8.292	70	0	0
	BEAM	4	8.292	70	0	0
	BEAM	5	7.523	70	0	0
	BEAM	6	7.523	70	0	0
	BEAM	7	7.523	70	0	0
	TOTAL		47.444			
SPAN 2	BEAM	1	0.000	70	0	0
	BEAM	2	8.292	70	0	0
	BEAM	3	8.292	70	0	0
	BEAM	4	8.292	70	0	0
	BEAM	5	7.523	70	0	0
	BEAM	6	7.523	70	0	0
	BEAM	7	7.523	70	0	0
	TOTAL		47.444			

BENT REPORT

BENT NO. 3 (N 73 23 17.00 E)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 23.723 L

			BEAM SPAC. (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 2	BEAM	1	0.000	70	0	0
	BEAM	2	8.292	70	0	0
	BEAM	3	8.292	70	0	0
	BEAM	4	8.292	70	0	0
	BEAM	5	7.523	70	0	0
	BEAM	6	7.523	70	0	0
	BEAM	7	7.523	70	0	0
	TOTAL		47.444			
SPAN 3	BEAM	1	0.000	70	0	0
	BEAM	2	8.292	70	0	0
	BEAM	3	8.292	70	0	0
	BEAM	4	8.292	70	0	0
	BEAM	5	7.523	70	0	0
	BEAM	6	7.523	70	0	0
	BEAM	7	7.523	70	0	0
	TOTAL		47.444			

BENT NO. 4 (N 73 23 17.00 E)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 23.723 L

			BEAM SPAC. (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 3	BEAM	1	0.000	70	0	0
	BEAM	2	8.292	70	0	0
	BEAM	3	8.292	70	0	0
	BEAM	4	8.292	70	0	0
	BEAM	5	7.523	70	0	0
	BEAM	6	7.523	70	0	0
	BEAM	7	7.523	70	0	0
	TOTAL		47.444			

BEAM REPORT

BEAM REPORT, SPAN 1

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.	BEAM SLOPE
BEAM 1	50.000	47.936	49.48	0.0014
BEAM 2	50.000	47.936	49.48	0.0013
BEAM 3	50.000	47.936	49.48	0.0013
BEAM 4	50.000	47.936	49.48	0.0012
BEAM 5	50.000	47.936	49.48	0.0011
BEAM 6	50.000	47.936	49.48	0.0011
BEAM 7	50.000	47.936	49.48	0.0010

BEAM REPORT, SPAN 2

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.	BEAM SLOPE
BEAM 1	70.000	68.000	69.50	0.0000
BEAM 2	70.000	68.000	69.50	-0.0000
BEAM 3	70.000	68.000	69.50	-0.0001
BEAM 4	70.000	68.000	69.50	-0.0002
BEAM 5	70.000	68.000	69.50	-0.0002
BEAM 6	70.000	68.000	69.50	-0.0003
BEAM 7	70.000	68.000	69.50	-0.0004

BEAM REPORT, SPAN 3

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.	BEAM SLOPE
BEAM 1	50.000	47.936	49.48	-0.0014
BEAM 2	50.000	47.936	49.48	-0.0014
BEAM 3	50.000	47.936	49.48	-0.0015
BEAM 4	50.000	47.936	49.48	-0.0015
BEAM 5	50.000	47.936	49.48	-0.0016
BEAM 6	50.000	47.936	49.48	-0.0016
BEAM 7	50.000	47.936	49.48	-0.0016

NOTES:

1. See Standard IGEB for orientation of dimension.
2. Girder angle (Typ.), See bent report.

TABLE OF ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY			
		Phase	SPAN 1	SPAN 2	SPAN 3
Prestressed Concrete Girder (Tx28)	LF	Phase 1	197.9	278.0	197.9
		Phase 2	148.4	208.5	148.4

HL93 LOADING

SHEET OF

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

Texas Department of Transportation

Houston District (Bridge)

FRAMING PLAN

FM 2403

SOUTH DRAINAGE DITCH BRIDGE

FILE: $FILES$	DN: DB	CK: TF	DW: GB	CK: DB
©TxDOT $DATE$ REVISIONS	CONT.	SECT	JOB	HIGHWAY
	2950	01	008, ETC	FM 2403
	DIST.	COUNTY		SHEET NO.
	HOU	BRAZORIA		129

DATE: $DATE$
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STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS		
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS						NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)								Moment	Shear	Inv	Opr	Inv
FM 2403 South Bridge	1,3	1-7	Tx28		14	0.6	270	10.48	9.62	2	8.5	4.000	5.000	1.957	-2.354	1804	0.676	0.863	1.01	1.80	1.23
	2	1-7	Tx28		30	0.6	270	9.28	6.08	6	22.5	5.800	7.000	3.874	-4.368	3106	0.616	0.870	1.23	1.63	1.02

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

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

Compression = 0.65 f'ci

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

Optional designs must likewise conform.

(2) Portion of full HL93.

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications. Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.

Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

Use low relaxation strands, each pretensioned to 75 percent of fpu.

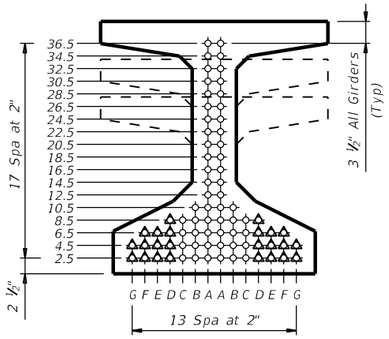
Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked △. Double wrap full-length debonded strands in outer most position of each row.

When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

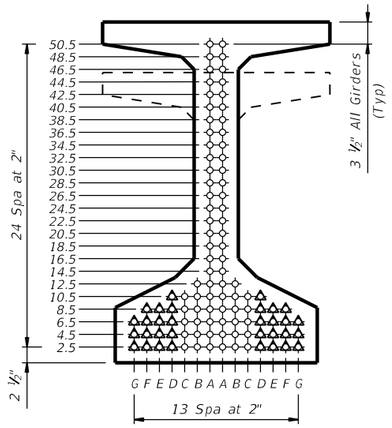
Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

DEPRESSED STRAND DESIGNS:

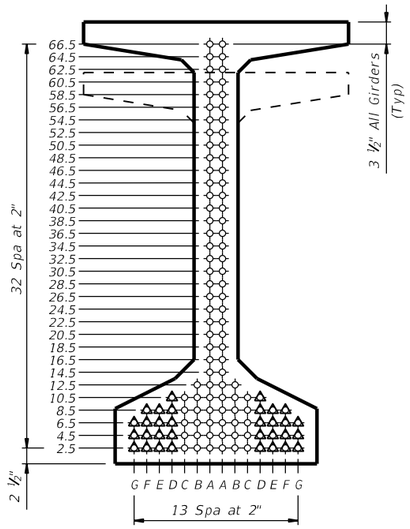
Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.



TYPE Tx28, Tx34 & Tx40



TYPE Tx46 & Tx54



TYPE Tx62 & Tx70

HL93 LOADING

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

Texas Department of Transportation

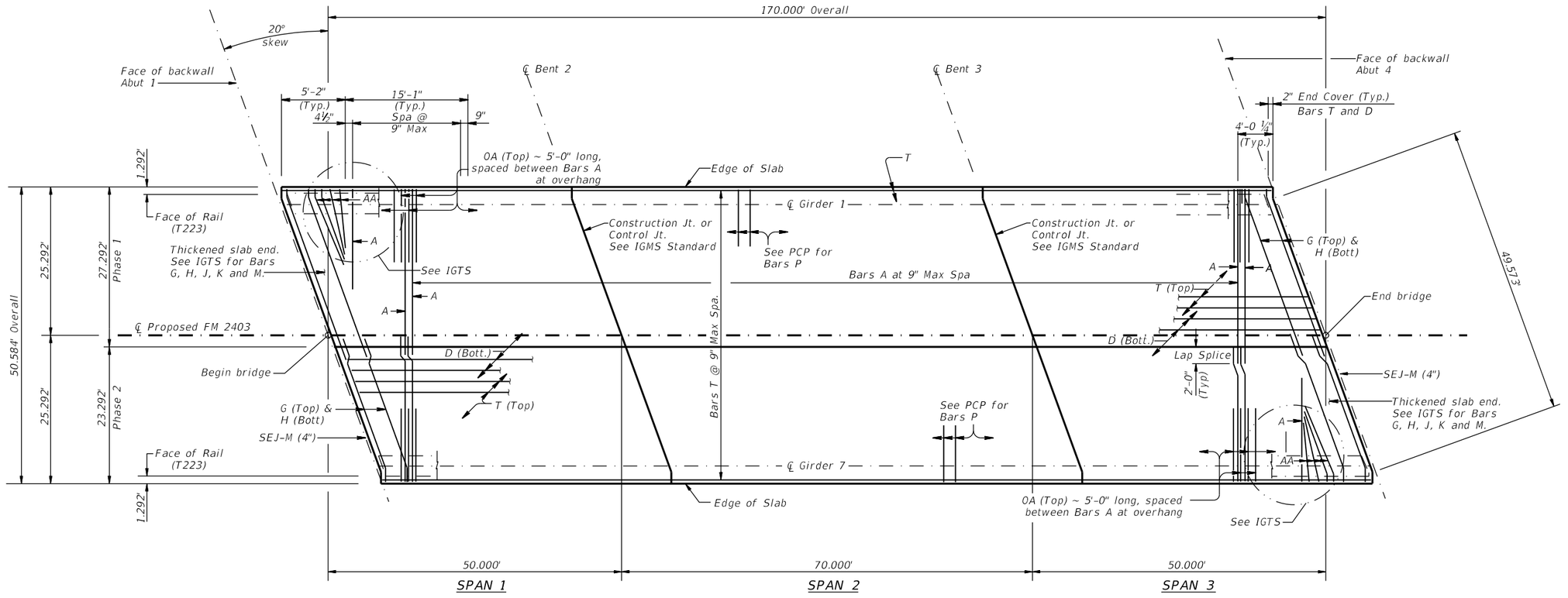
Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DESIGNS (NON-STANDARD SPANS)

IGND

FILE: igndsts1-22.dgn	DN: TxDOT	CK: TxDOT	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Modified for depressed strands only. 3-22: Added Load Rating.	2950	01	088, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		130

DATE:
FILE:



PLAN

NOTES:

1. See IGTS Standard for Bars AA, G, H, J, K and M. See PCP Standards for other details.
2. See IGCS(MOD) Standard For continuous slab details. See PCP Standard for other details.
3. Bars 0A (Top) ~ 5'-0" long, spaced between Bars A at overhang. See PCP Standard for Bars P (Bottom).
4. Provided bar laps, where requried, as follows:
   Uncoated ~ #4 = 1'-7"
   ~ #5 = 2'-0"
5. For phase construction, a construction joint shall be allowed at the location shown. All transverse bars (A, G & H) shall be terminated beyond the construction joint for a lap length.

HL93 LOADING

SHEET OF

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

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Houston District (Bridge)

SLAB PLAN

FM 2403

SOUTH DRAINAGE DITCH BRIDGE

FILE: $FILES	DN: DB	CK: TF	DW: GB	CK: DB
©TxDOT $DATES REVISIONS	CONT.	SECT	JOB	HIGHWAY
	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		131

DATE: $DATE$
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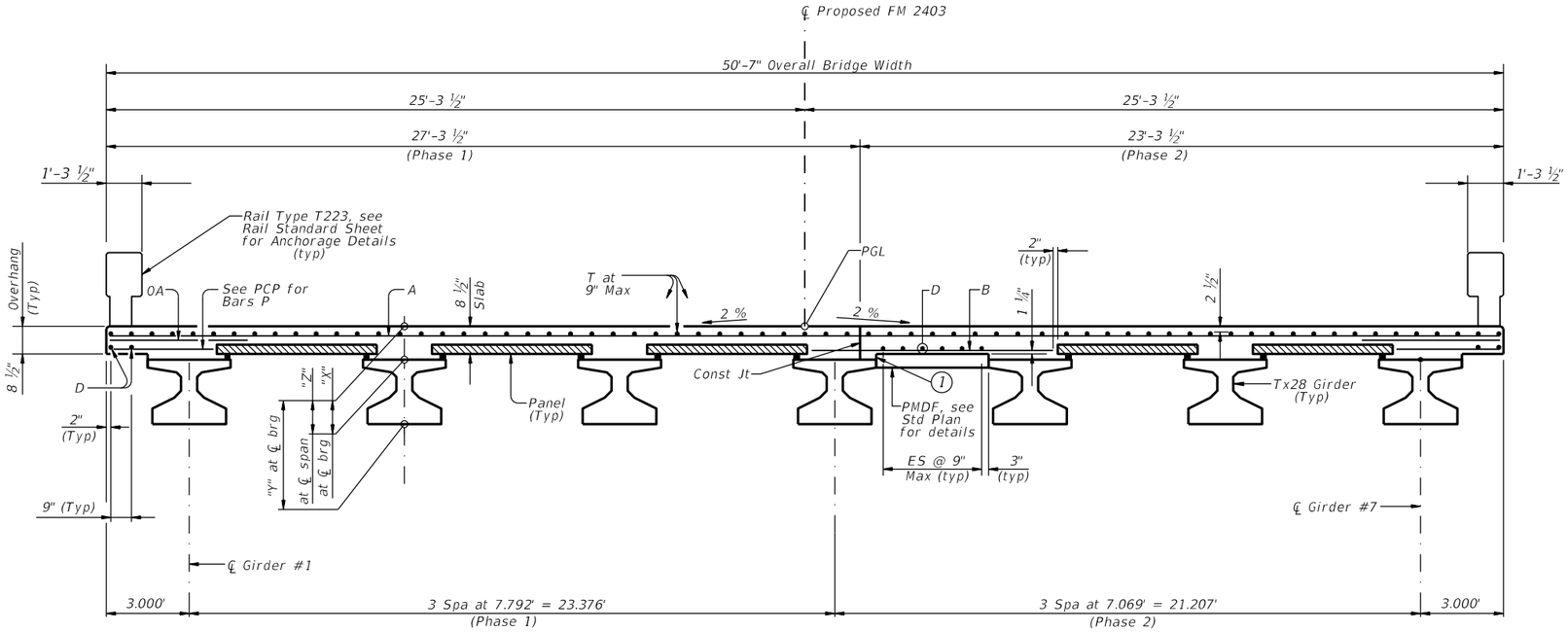


TYPICAL TRANSVERSE SECTION

(Showing girder type Tx28)

TABLE OF ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Reinf Conc Slab	SF	
Reinf Steel	LB	

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

1 Contractor to ensure min clearances are met for PCP panels prior to pouring Phase 2. If min clearances can't be met use PMDF in this bay. Refer to PCP Standard for more information.

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.

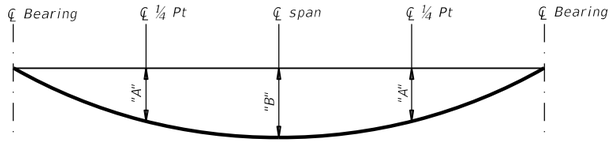
MATERIAL NOTES:

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.

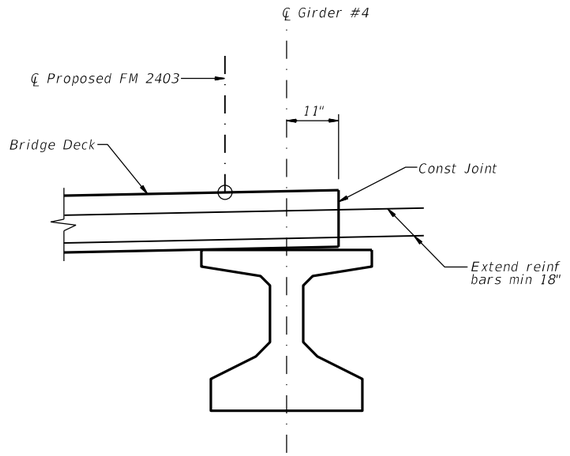


DEAD LOAD DEFLECTION DIAGRAM

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 DEAD LOAD DEFLECTIONS			
SPAN NO.	GIRDER NO.	"A" (Feet)	"B" (Feet)
1,3	1	0.019	0.027
1,3	2,3	0.022	0.031
1,3	4	0.021	0.030
1,3	5,6	0.020	0.028
1,3	7	0.018	0.026
2	1	0.078	0.111
2	2,3	0.088	0.126
2	4	0.084	0.120
2	5,6	0.080	0.114
2	7	0.074	0.106

TABLE OF SECTION DEPTHS				
SPAN NO.	GIRDER NO.	Section Depths X"	Y"	Z"
1,3	1,6,7	11"	3'-3"	10"
1	2,3,5	11"	3'-3"	10 1/8"
1	4	11"	3'-3"	10 1/4"
3	2,3,4,5	11"	3'-3"	10 1/8"
2	1,6	1'-0"	3'-4"	9 7/8"
2	2	1'-0"	3'-4"	10"
2	3	1'-0"	3'-4"	10 1/4"
2	4	1'-0"	3'-4"	10 3/8"
2	5	1'-0"	3'-4"	10 1/8"
2	7	1'-0"	3'-4"	9 3/4"



PHASE DETAIL

HL93 LOADING

STATE OF TEXAS
ZHANFEI FAN
92259
LICENSED PROFESSIONAL ENGINEER

05.17.2023

Texas Department of Transportation

Houston District (Bridge)

SLAB DETAILS

FM 2403

SOUTH DRAINAGE DITCH BRIDGE

FILE: $FILE$	DN: DB	CK: TF	DW: GB	CK: DB
©TxDOT $DATE$ REVISIONS	CONT	SECT	JOB	HIGHWAY
	2950	01	008, ETC	FM 2403
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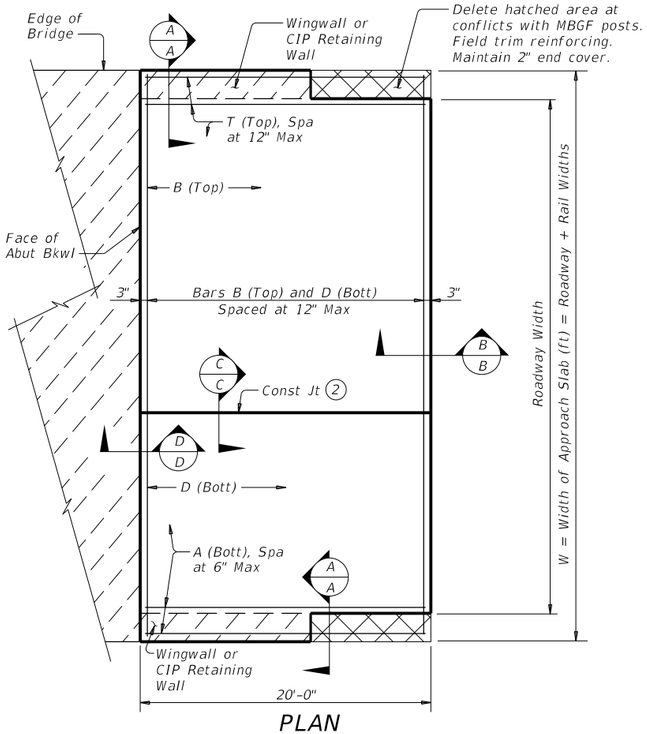
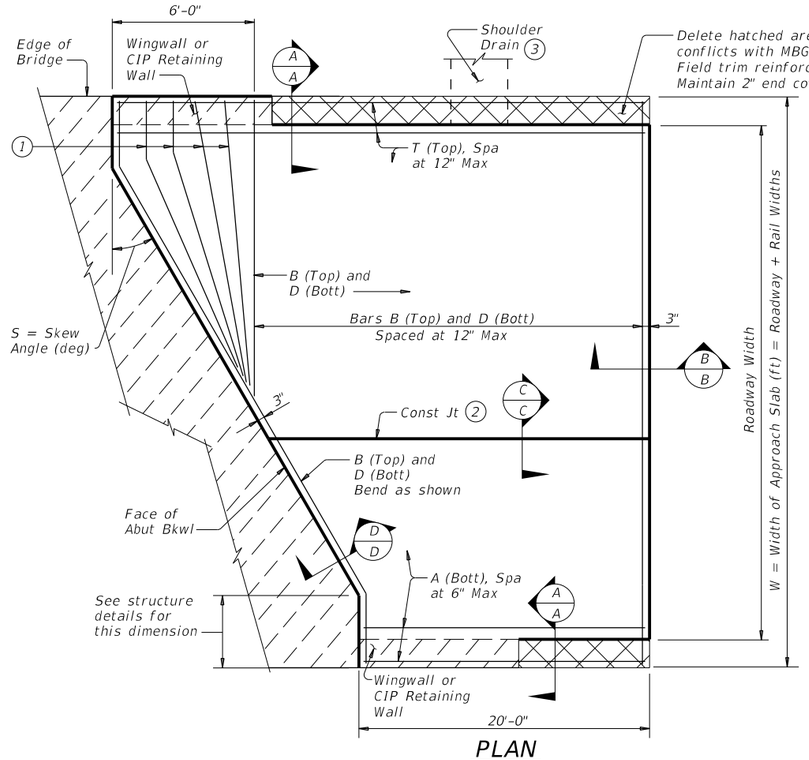


PLAN

(Showing Non-Skewed Approach Slab)



PLAN

(Showing Skewed Approach Slab)

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

Vol of Appr Slab Conc (CY) = $0.802W + 0.02W^2 \tan S$
(Includes Support Slab)

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.

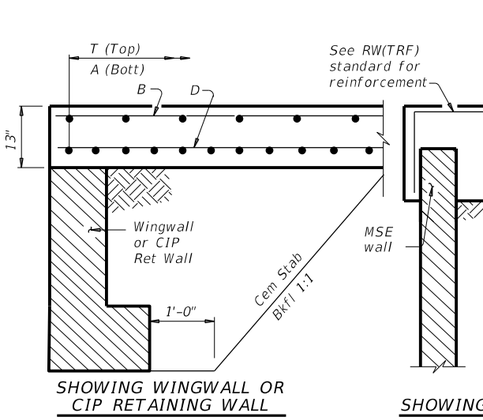
(3) See details elsewhere in plans for shoulder drain location and details.

(4) For Contractor's information only. Quantities 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.

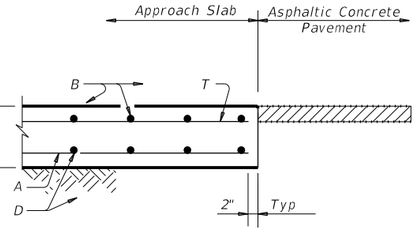
(7) Place in accordance with Item 438.



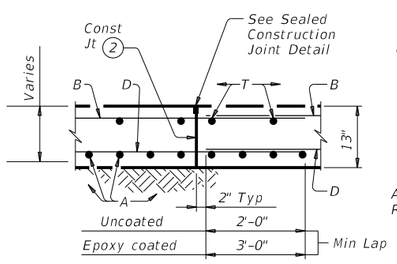
SHOWING WINGWALL OR CIP RETAINING WALL

SHOWING MSE WALL

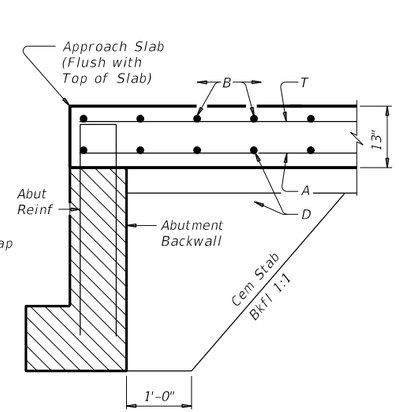
SECTION A-A



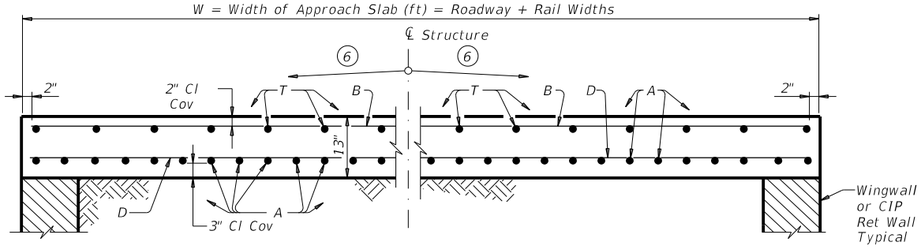
SECTION B-B



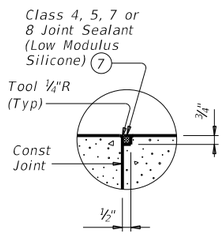
SECTION C-C (5)



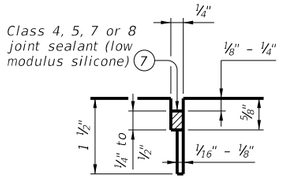
SECTION D-D



TRANSVERSE SECTION



SEALED CONSTRUCTION JOINT DETAIL



LONGITUDINAL SAW CUT JOINT DETAIL

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

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

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 1#2" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 1#2" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

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.

STATE OF TEXAS
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05/11/2023

Texas Department of Transportation

Houston District Standard

BRIDGE APPROACH SLAB
ASPHALTIC CONCRETE PAVEMENT

BAS-A (HOU)

FILE: STDB10A.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS 02-20 Removed stress relieving pad.	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		133

DATE: 03/31/2023 04:20 PM
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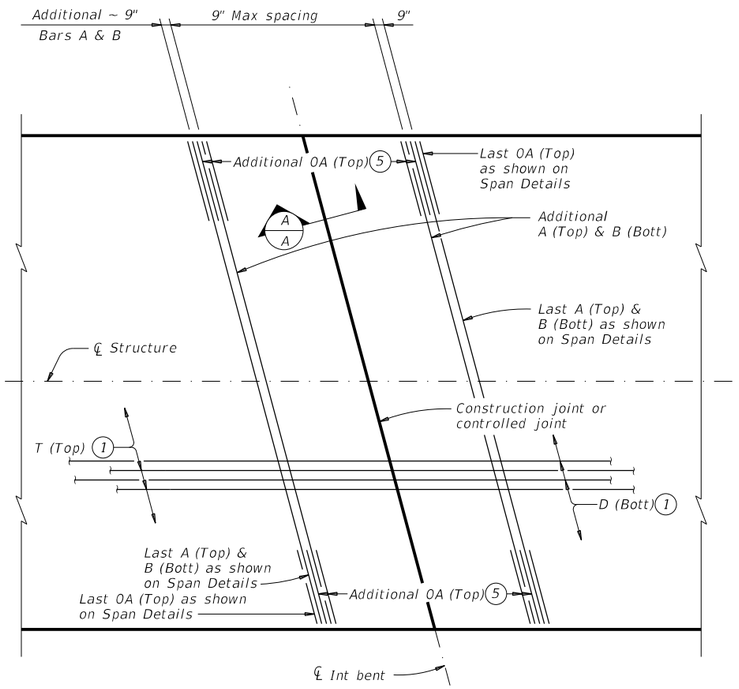
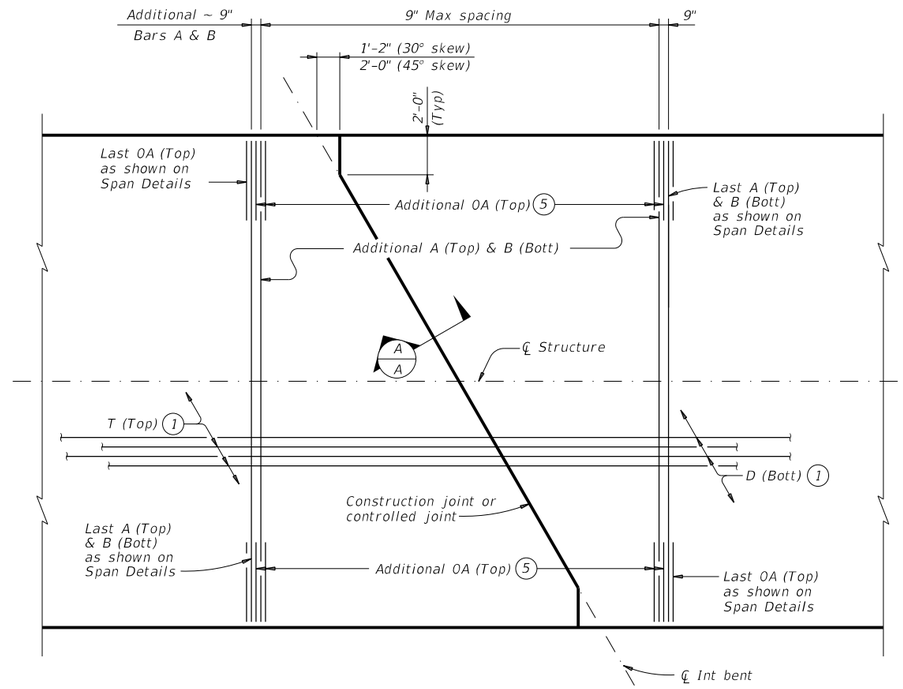


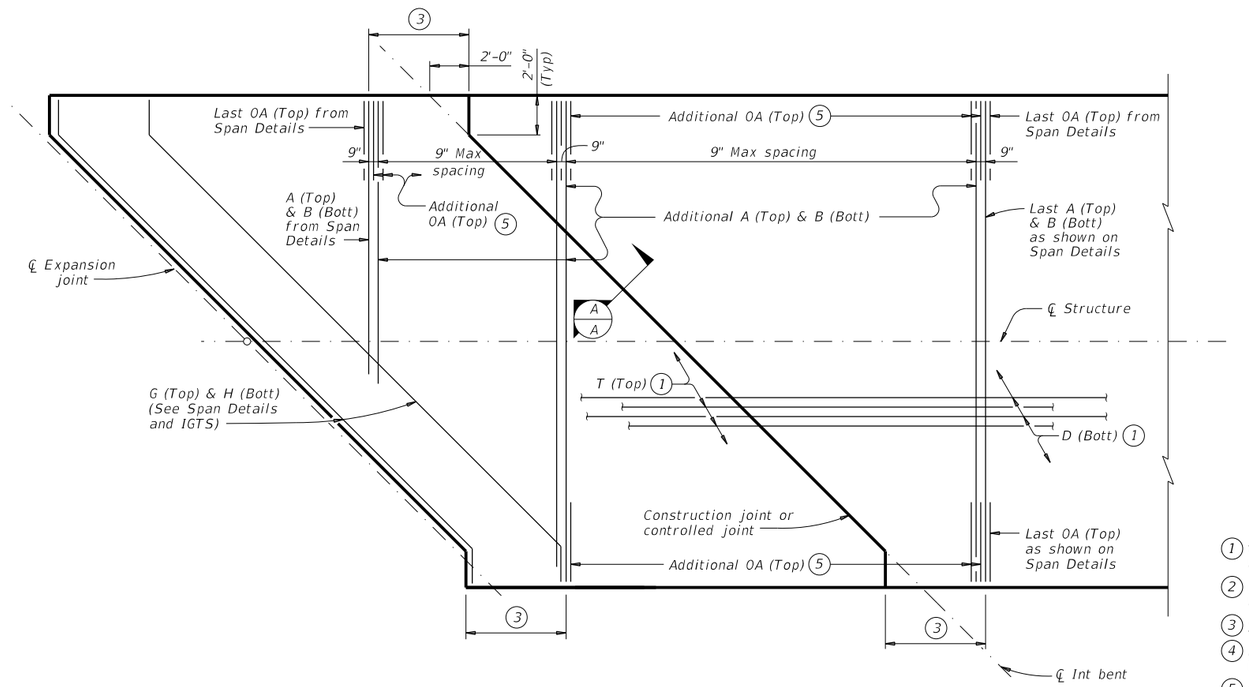
PLAN FOR 0° OR 15° SKEW

(Showing 15° skew)



PLAN FOR 30° OR 45° SKEW

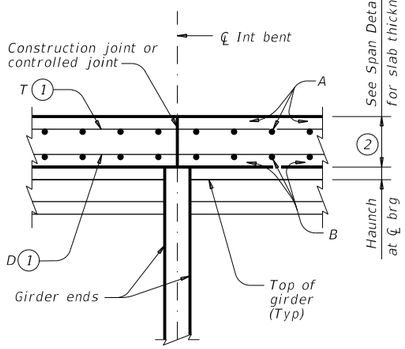
(Showing 30° skew)



PLAN FOR 45° SKEW 4

(Showing short span condition.)

BARS OA (#5)



SECTION A-A

Bars 0A (Top) not shown for clarity.

1. Top and bottom mats must be continuous through joint.
2. Maintain a constant slab thickness over the bent.
3. 5'-4" as shown on Span Details.
4. Use these details when no full slab width bars A and B are shown on Span Details.
5. Bars 0A (Top) at 9" Max spacing between Bars A (Top).

BAR TABLE	
BAR	SIZE
A	#4
B	#4
D	#4
T	#4
0A	#5

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
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05/11/2023

Texas Department of Transportation

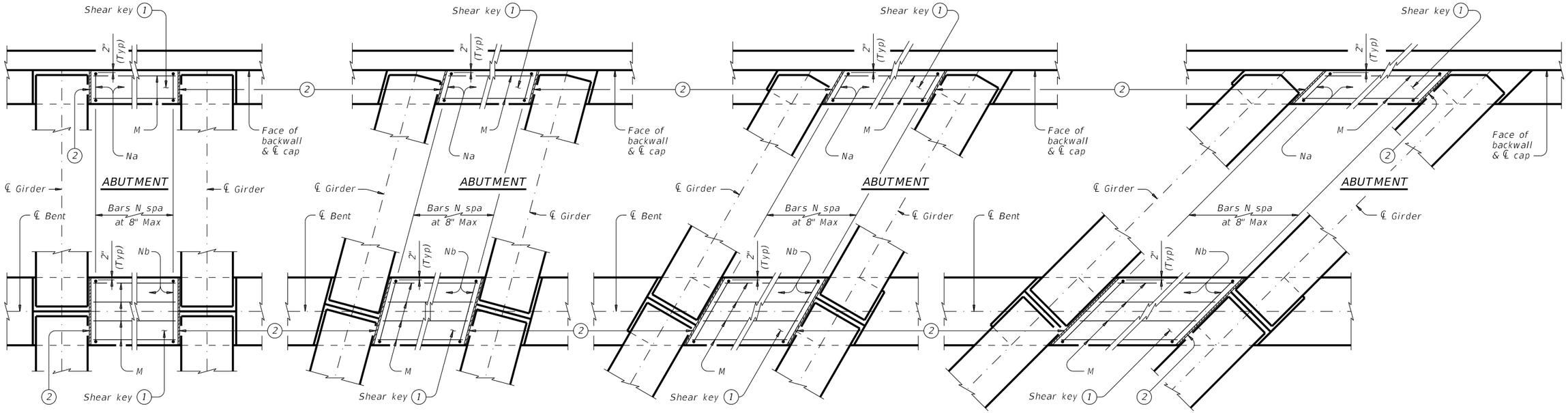
Bridge Division Standard

CONTINUOUS SLAB DETAILS

PRESTR CONC I-GIRDER SPANS

IGCS(MOD)

FILE: IG-IGCS-23.dgn	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
10-19: Added bubble note 6.	DIST	COUNTY		SHEET NO.
01-23: Added 34' Rdwy.	HOU	BRAZORIA		134



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° & 60° 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.

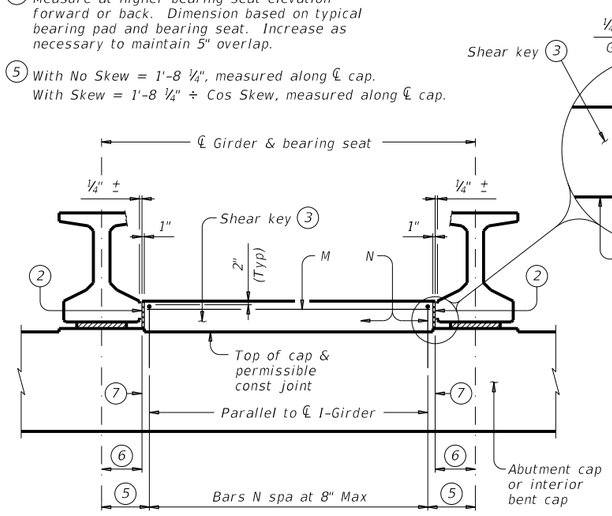
(5) With No Skew = 1'-8 ¼", measured along ℄ cap.
With Skew = 1'-8 ¼" ÷ Cos Skew, measured along ℄ cap.

(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.

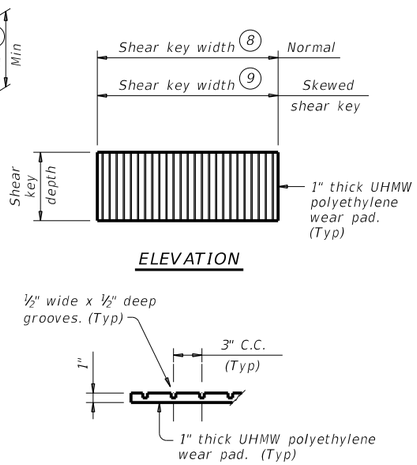
(8) Abutments = Cap width – Backwall Width.
Interior bents = Cap width.

(9) Abutments = (Cap width – Backwall Width) ÷ Cos Skew.
Interior bents = Cap width ÷ Cos Skew.

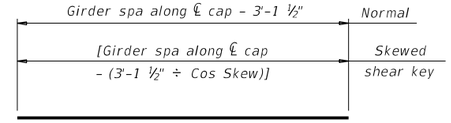


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

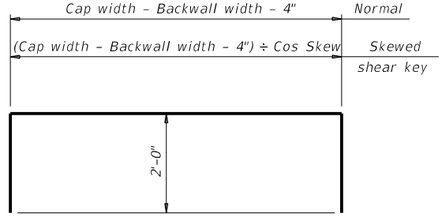
Showing shear key with girder Type Tx46. Other I-Girder types similar.



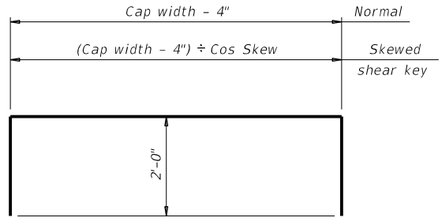
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



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
MICHAEL E. CARLSON
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05/11/2023

Texas Department of Transportation

Bridge Division Standard

SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

IGSK(MOD)

FILE: igskstds-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
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	HOU	BRAZORIA		135

DATE:
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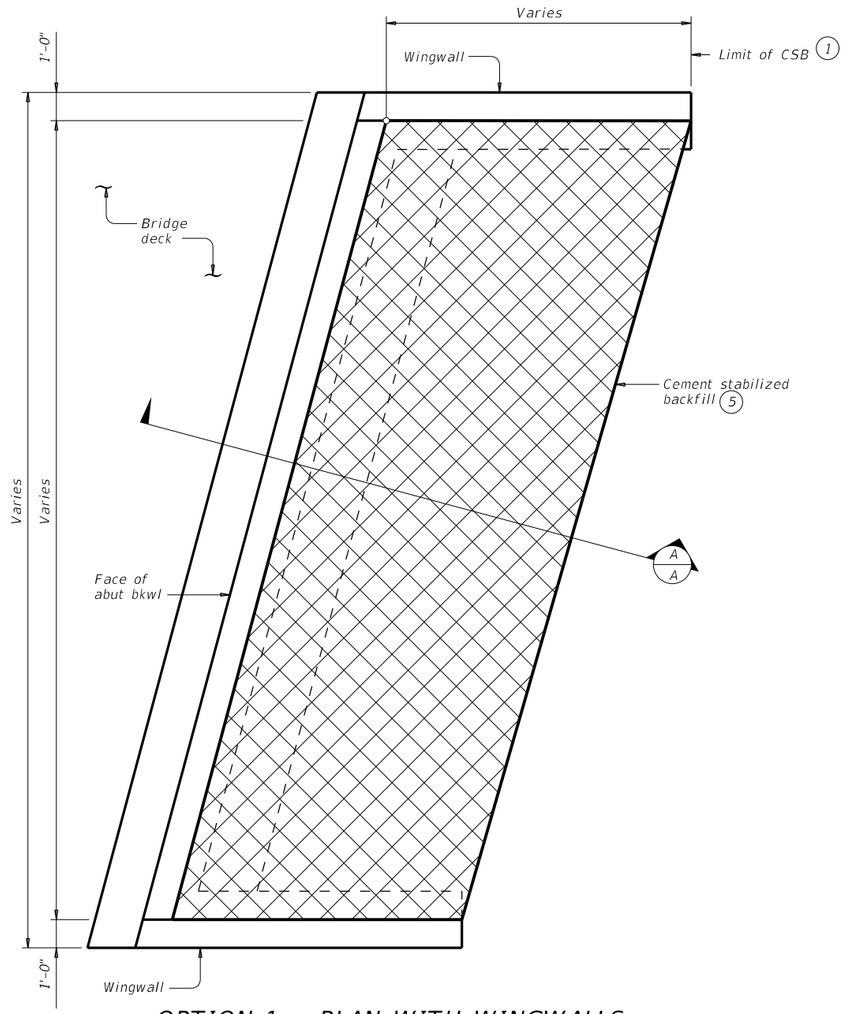
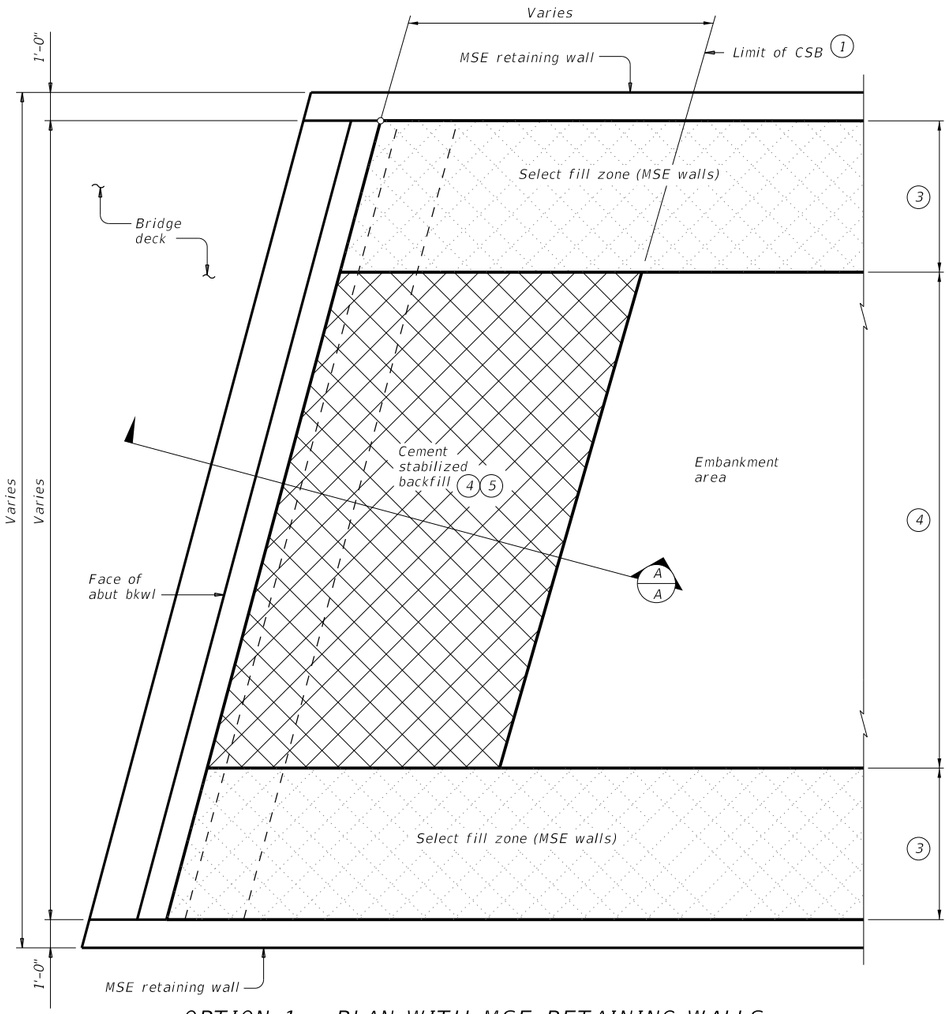


OPTION 1 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 1 ~ PLAN WITH MSE RETAINING WALLS

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

GENERAL NOTES:

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

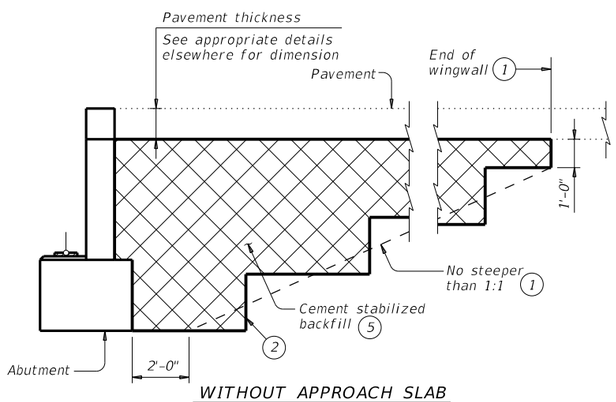
Construct abutment backfill in accordance with Item 400, "Excavation and Backfill for Structures".

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

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

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

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



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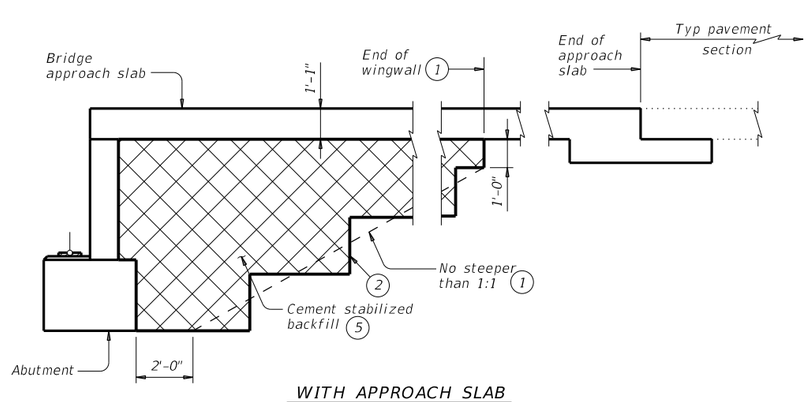

WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION A-A

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		136

DATE: 5/11/2023 2:09:30 PM
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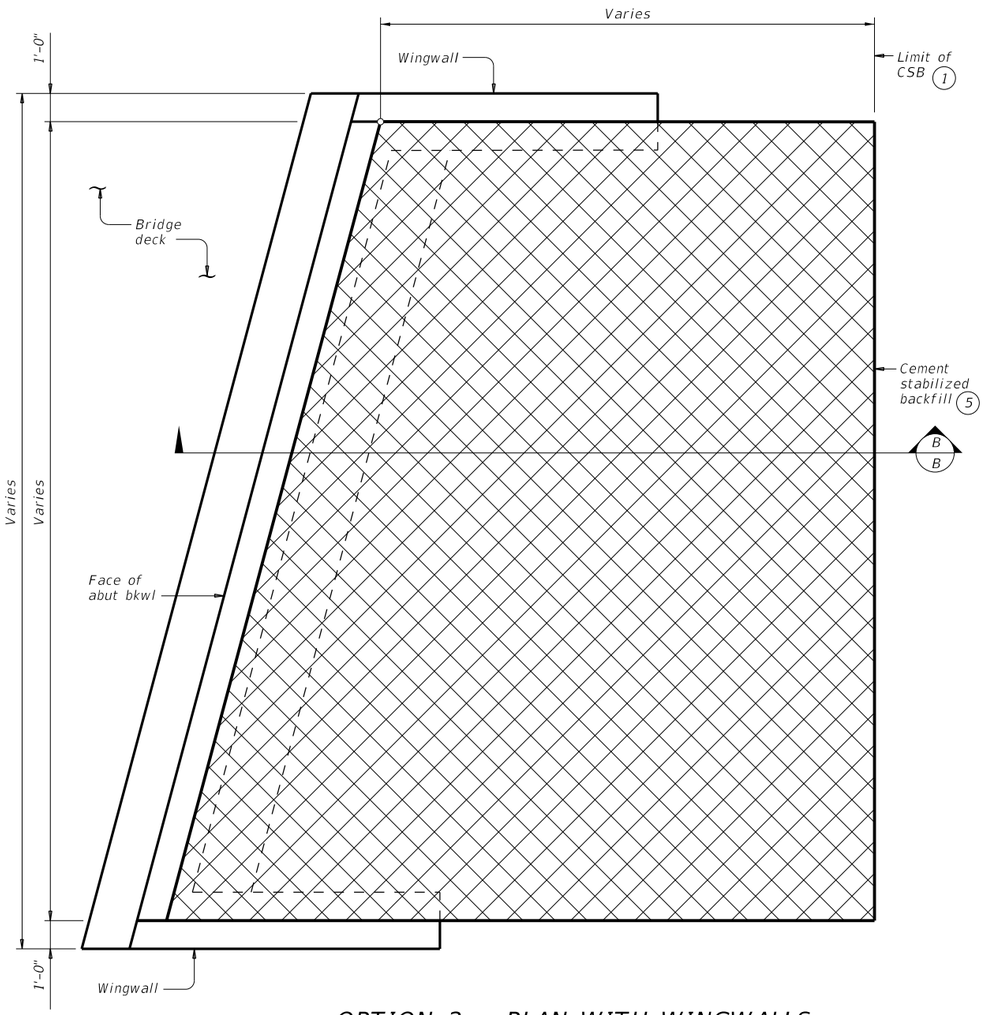
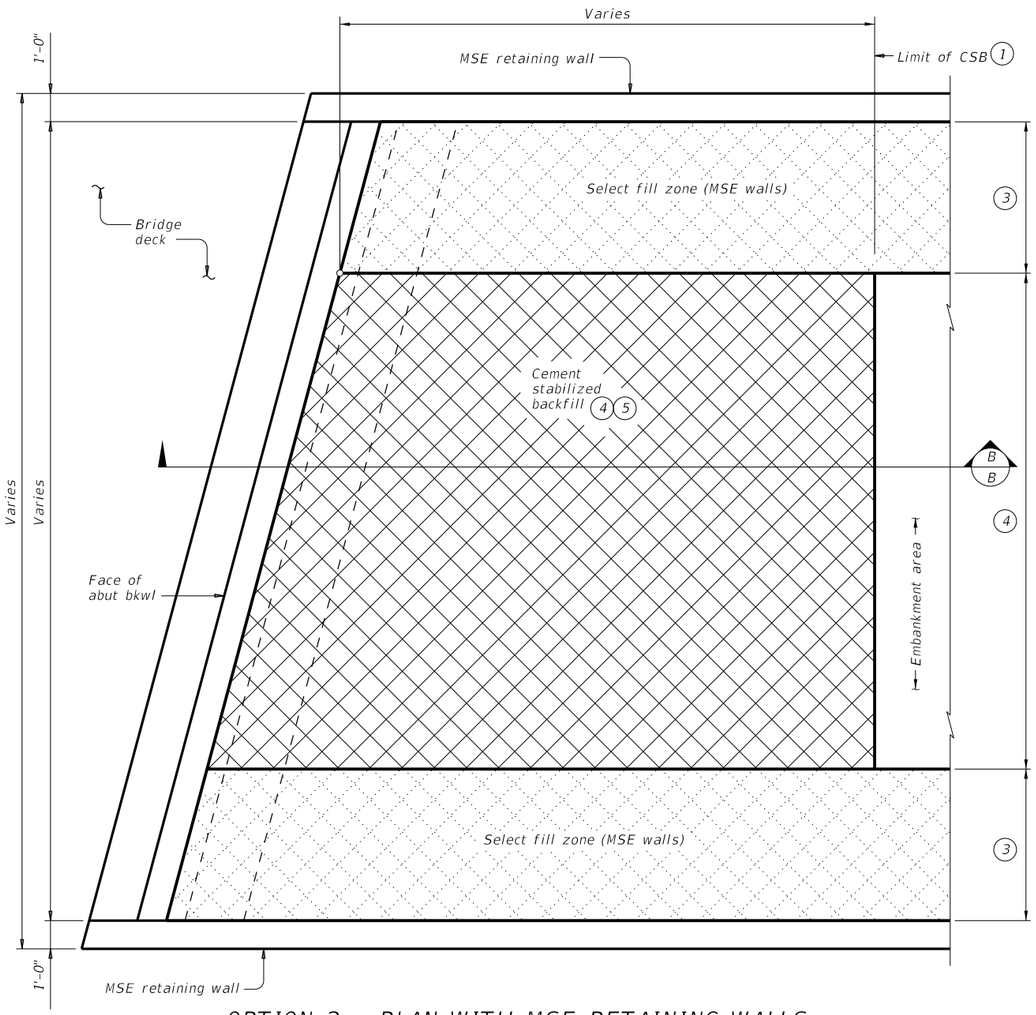


OPTION 2 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 2 ~ PLAN WITH MSE RETAINING WALLS

(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

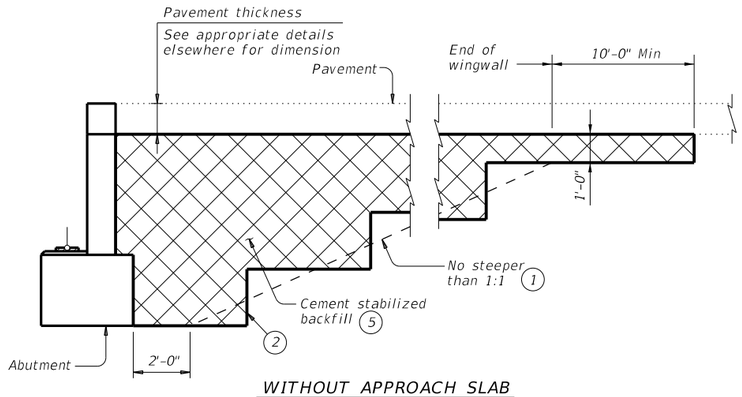
(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans, flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill, then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height. Place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

(6) 1'-0" for BAS-A
1'-10" for BAS-C



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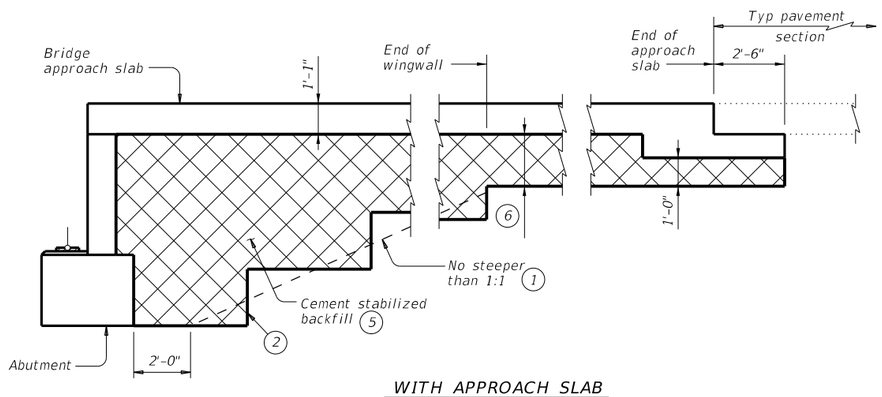


WITH APPROACH SLAB
(Showing BAS-C, BAS-A similar.)

SECTION B-B

SHEET 2 OF 2

Texas Department of Transportation

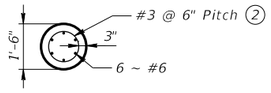
Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

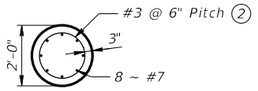
FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		137



SECTION

18" DRILLED SHAFT

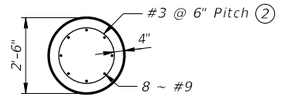
Located at bridge abutment wingwalls.



SECTION

24" DRILLED SHAFT

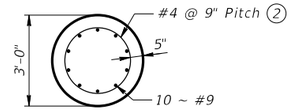
Located at prestressed concrete slab beam bridges.



SECTION

30" DRILLED SHAFT

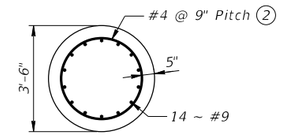
Located at bridge abutments or prestressed concrete slab beam bridges.



SECTION

36" DRILLED SHAFT

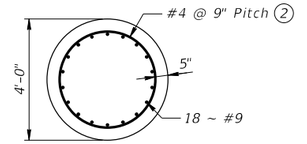
Located at bridge abutments and select bridge bents.



SECTION

42" DRILLED SHAFT

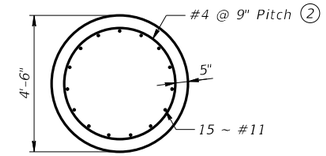
Located at bridge bents.



SECTION

48" DRILLED SHAFT

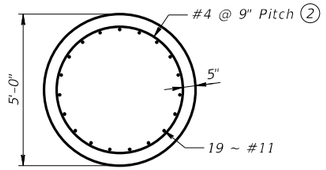
Located at bridge bents.



SECTION

54" DRILLED SHAFT

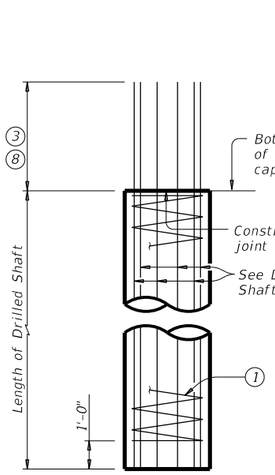
Located at bridge bents.



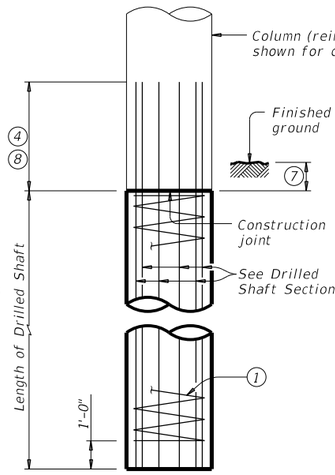
SECTION

60" DRILLED SHAFT

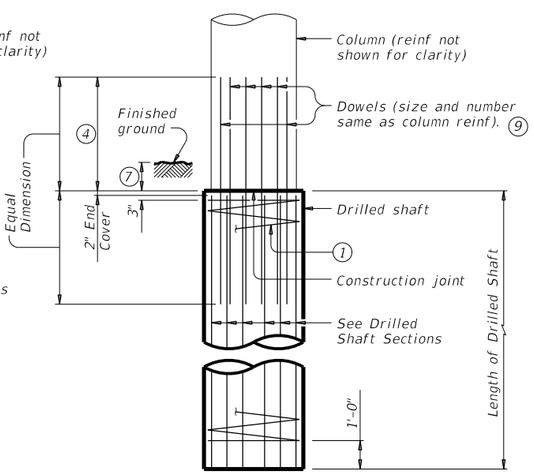
Located at bridge bents.



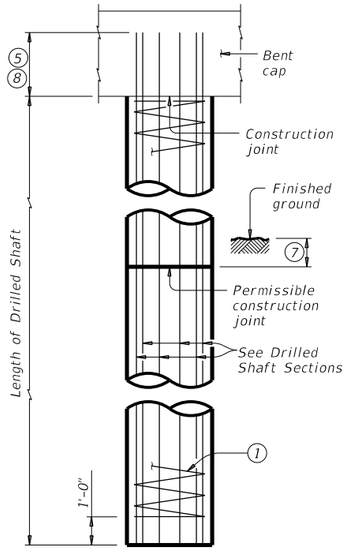
ABUTMENTS & WINGWALLS



INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



SHORT INTERIOR BENT (6) DRILLED SHAFT DETAIL

DRILLED SHAFT ELEVATION DETAILS

CONSTRUCTION NOTES:

See Bridge Layout and "Foundation Notes" or "Table of Foundation Quantities", if provided, for drilled shaft size, design load, and length required.

Use these drilled shaft details unless shown otherwise on bridge plans.

Refer to bridge details for anticipated locations of drilled shaft casing.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

These details have been modifed for the Houston District to facilitate slurry displacement method of drilled shaft installation.

The details shown on this sheet are only applicable for multi-column or multi-drilled shaft bridge abutments and bents. These details are not applicable for retaining walls, sound walls, and sign structures. Drilled shaft details shown on this sheet maybe referenced by engineer for footings on drilled shafts. Refer elsewhere in plans for footing details.

Drilled shaft details for drilled shafts exceeding 60" diameter are shown elsewhere in plans. Drilled shafts exceeding 30" diameter shall have a minimum of 5" clear cover and 1% minimum vertical reinforcing steel.

MATERIAL NOTES:

Provide Class SS Concrete (f'c = 3,600 psi), unless shown otherwise.
Provide Grade 60 reinforcing steel, unless shown otherwise.
Galvanize reinforcing if shown elsewhere in the plans.
Provide bar laps for drilled shaft reinforcing, where required, as follows:
Uncoated or galvanized (#6) ~ 2'-10"
Uncoated or galvanized (#7) ~ 3'-3"
Uncoated or galvanized (#9) ~ 4'-3"
Uncoated or galvanized (#11) ~ 5'-3"

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

(1) Refer to drilled shaft section for spiral size and pitch.

(2) Provide one and half flat turns top and bottom.

(3) Min extensions into support element
#6 Bars = 1'-11"
#7 Bars = 2'-0"
#9 Bars = 2'-3"

(4) Min lap with column reinforcement
#7 Bars = 3'-3"
#9 Bars = 4'-3"
#11 Bars = 5'-3"

(5) Min extensions into support element
#6 Bars = 1'-11"
#7 Bars = 2'-3"
#9 Bars = 2'-9"

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

(7) 1'-0" Min, unless shown otherwise on plans.
2'-0" Min at water crossings, unless shown otherwise on plans.

(8) Projecting reinforcing is to be included in unit price bid for drilled shafts.

(9) Dowels are to be included in unit price bid for drilled shafts.

HL93 LOADING

Texas Department of Transportation

Houston District (Bridge)

STANDARD BRIDGE DRILLED SHAFT DETAILS HOUSTON DISTRICT

HOU-BDS-22

FILE: STDJ14.dgn	DN: MEC	CK: YL	DW: MEC	CK: YL
©TxDOT JAN. 27, 2022	CONT.	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST.	COUNTY		SHEET NO.
	HOU	BRAZORIA		138

DATE:
FILE:

DATE: 5/11/2023 2:09:42 PM
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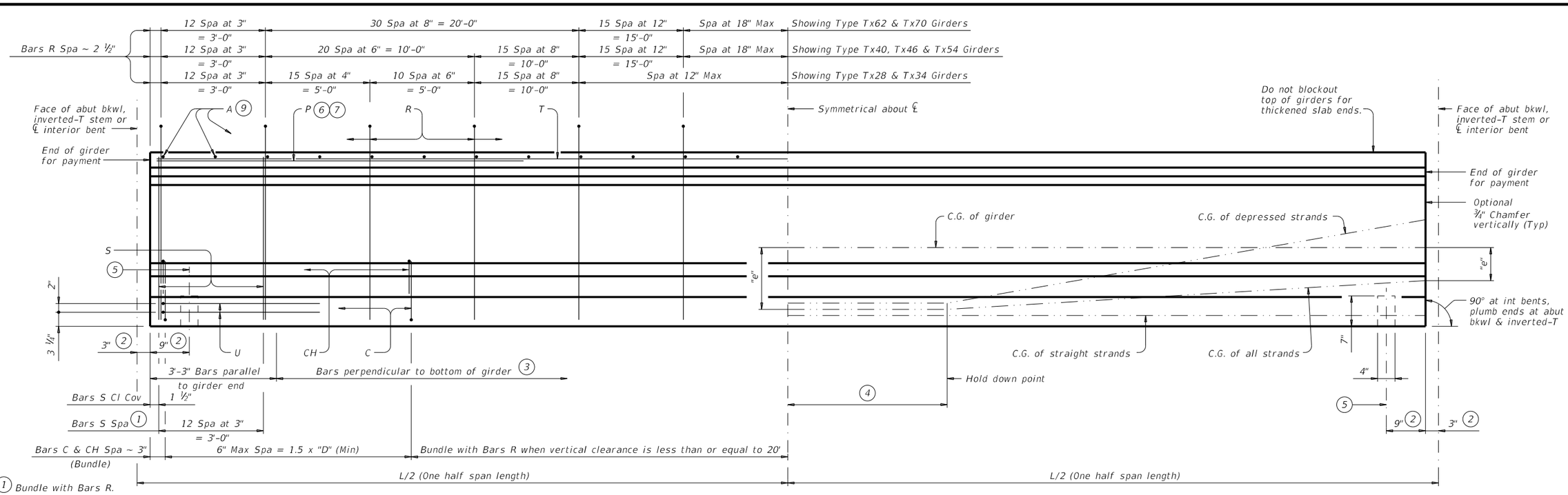


(1) Bundle with Bars R.

(2) Measured along ℄ Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.

(3) The average of the top and bottom spacing of Bars R cannot exceed the required spacing.

(4) L/20, but not less than 5'-0" (-0,+2').

(5) ℄ 4" x 1 ½" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

GIRDER ELEVATION

(6) Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

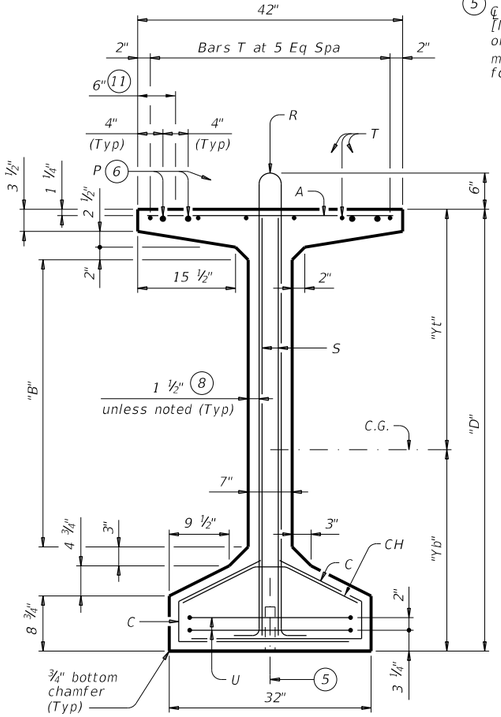
(7) Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

(8) 1 ⅜" Clear Cover to Bars S.

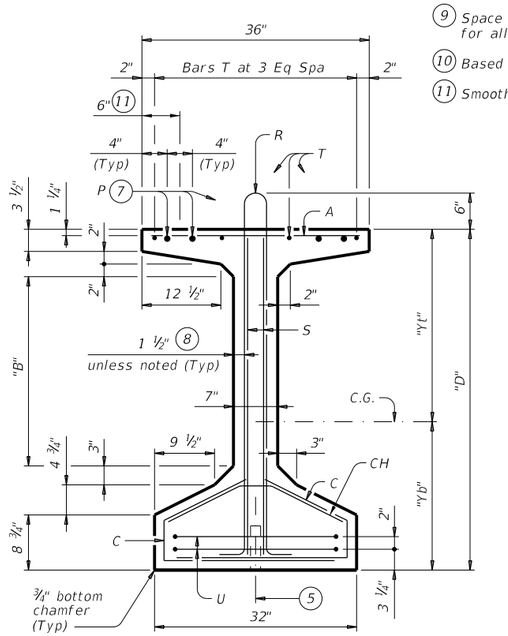
(9) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

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

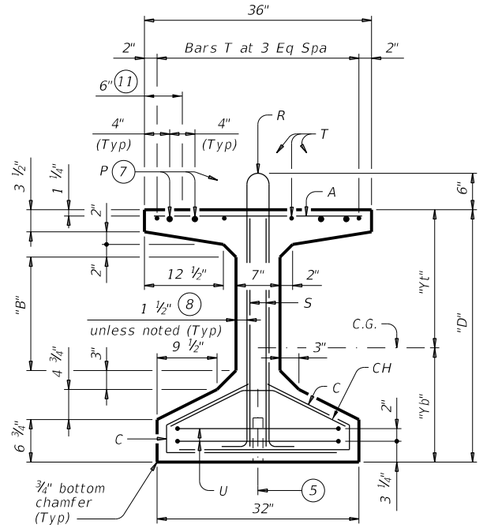
(11) Smooth trowel finish on the slab overhang side of exterior girder.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GIRDER DIMENSIONS AND SECTION PROPERTIES

Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.²)	"Ix" (in.⁴)	"Iy" (in.⁴)	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 ½"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 ½"	38.09	31.91	966	628,747	57,579	1,040

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Provide Class H concrete.
Provide Grade 60 reinforcing steel.
An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted.
It is permissible for bars or strands to come in contact with materials used in forming anchor holes.
When vertical clearance of the span is less than or equal to 20', provide additional Bars C and CH in every girder of that span.

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

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: IG-IGD-23.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added Bars C and CH full length for VC<= 20' 3-23: Clarified C and CH requirement	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		139

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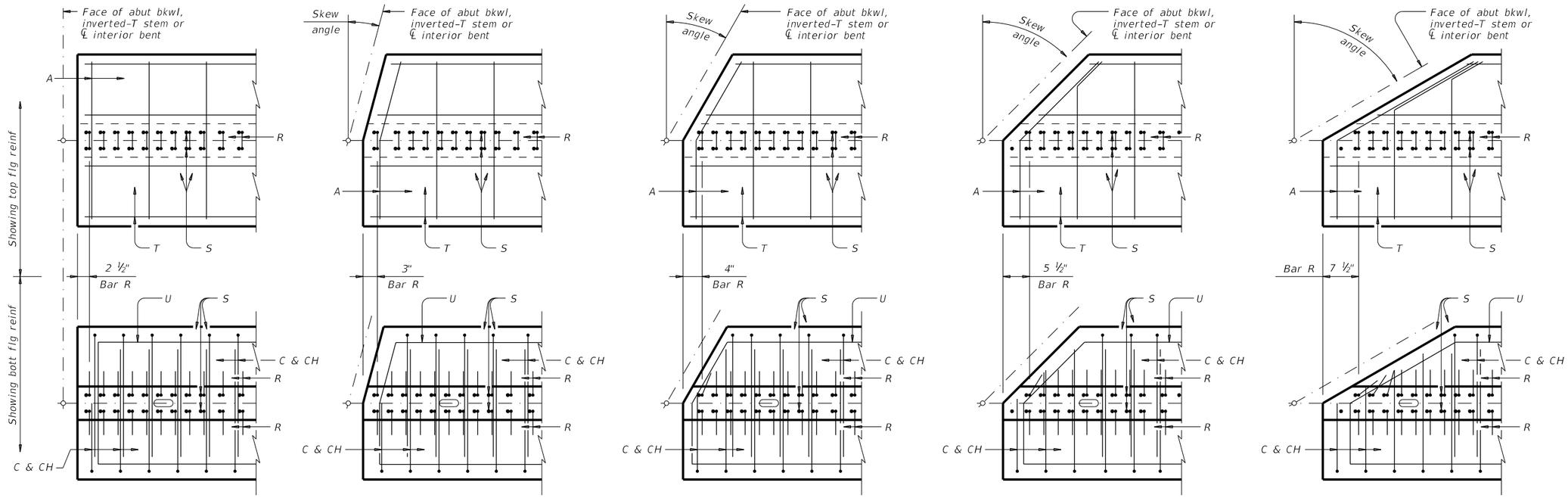
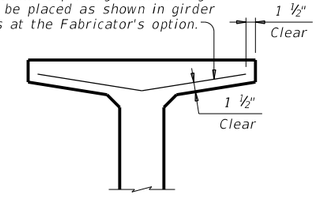
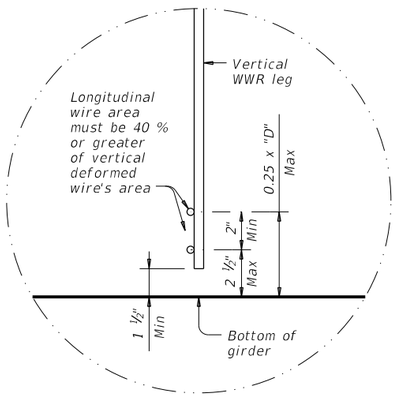


PLAN OF GIRDER ENDS (12)

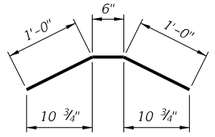
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



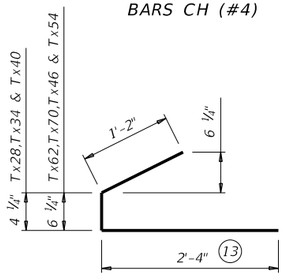
OPTIONAL TOP FLANGE REINFORCING DETAIL



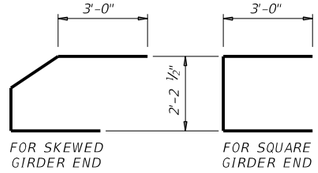
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



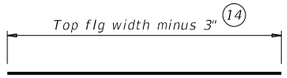
BARS CH (#4)



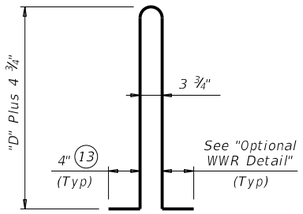
BARS C (#4)



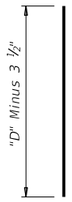
BARS U (#5)



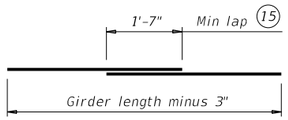
BARS A (#3)



BARS R (#4) (16)



BARS S (#6)



BARS T (#4)

(12) Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.

(13) Bars may be cut or bent at skewed end as required.

(14) Increase as necessary for bars at skewed end.

(15) No portion of bar less than 10 ft.

(16) For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: IG-IGD-23.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added Bars C and CH full length for VC<= 20' 3-23: Clarified C and CH requirement	2950	01	008, ETC	FM 2403
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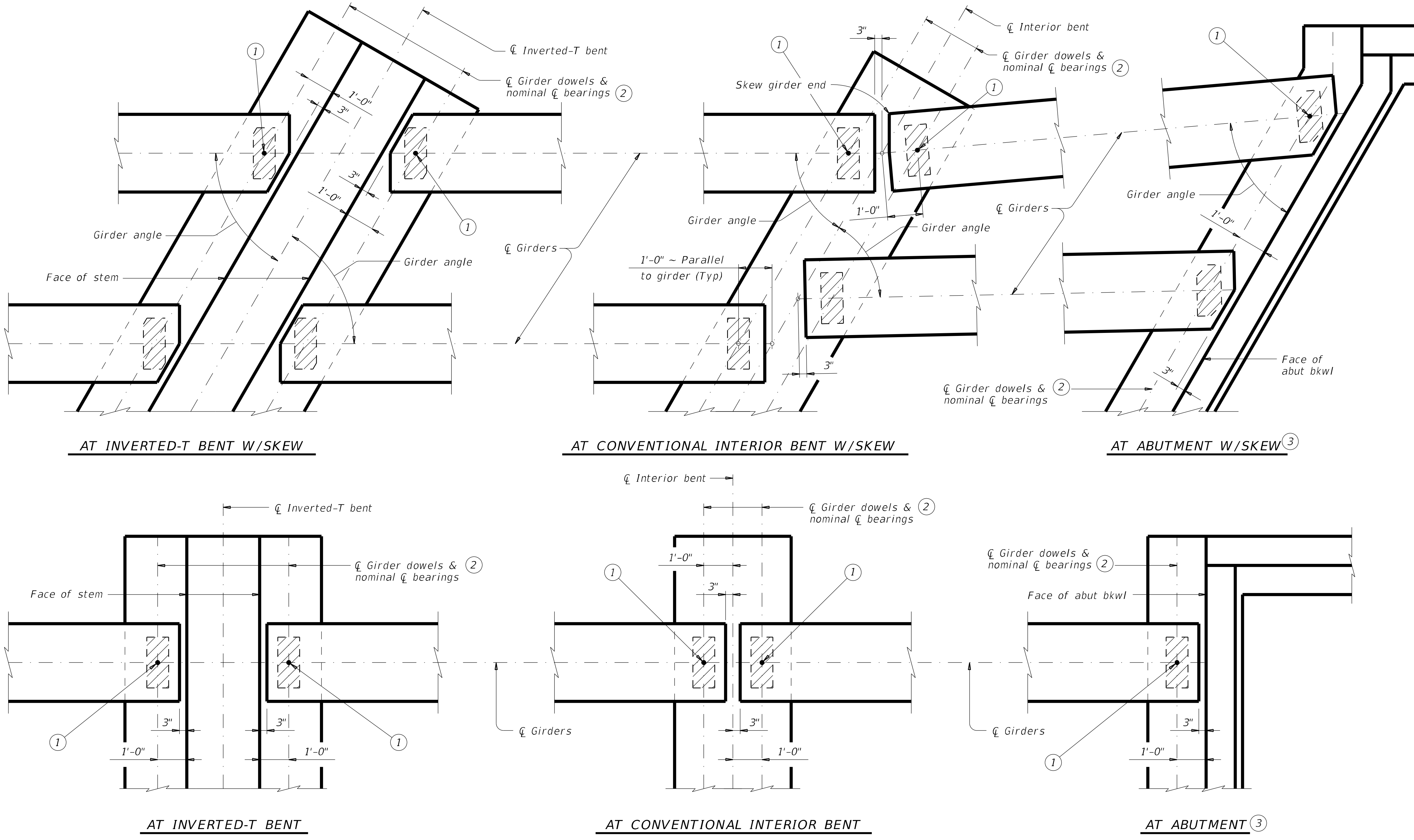
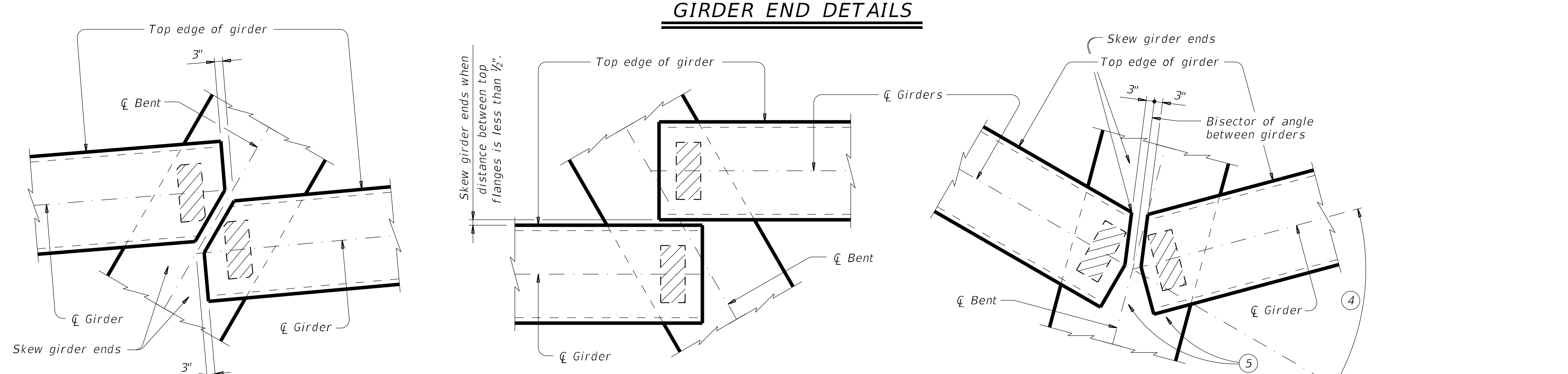
	HOU	BRAZORIA		140



GIRDER END DETAILS



GIRDER CONFLICT DETAILS

(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.

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

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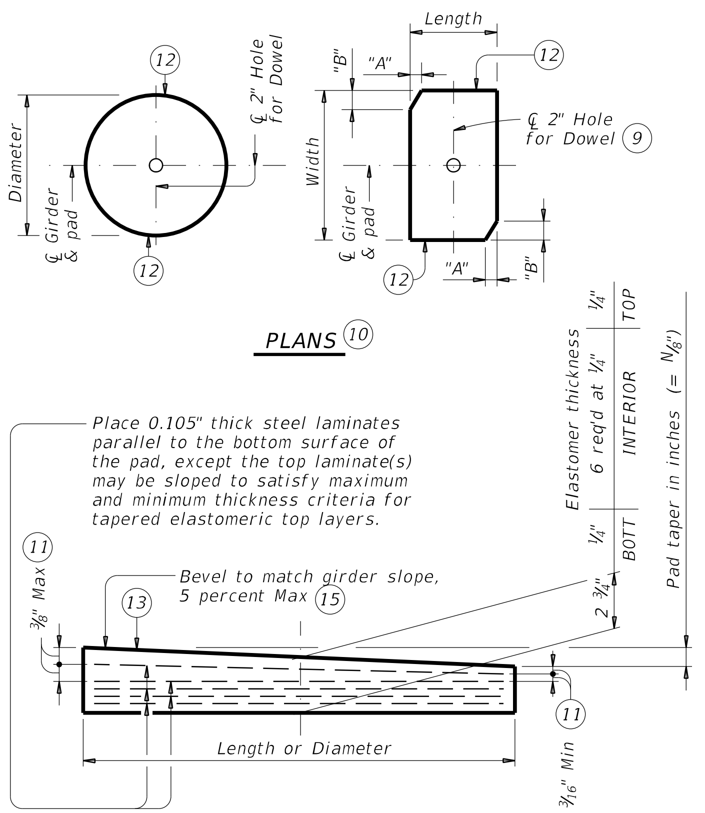
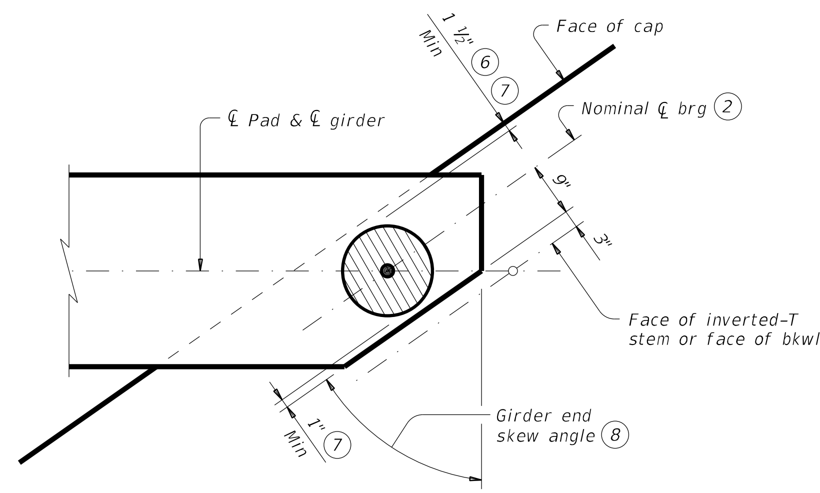
TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)			
Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 ½"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 ½"

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"	"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"

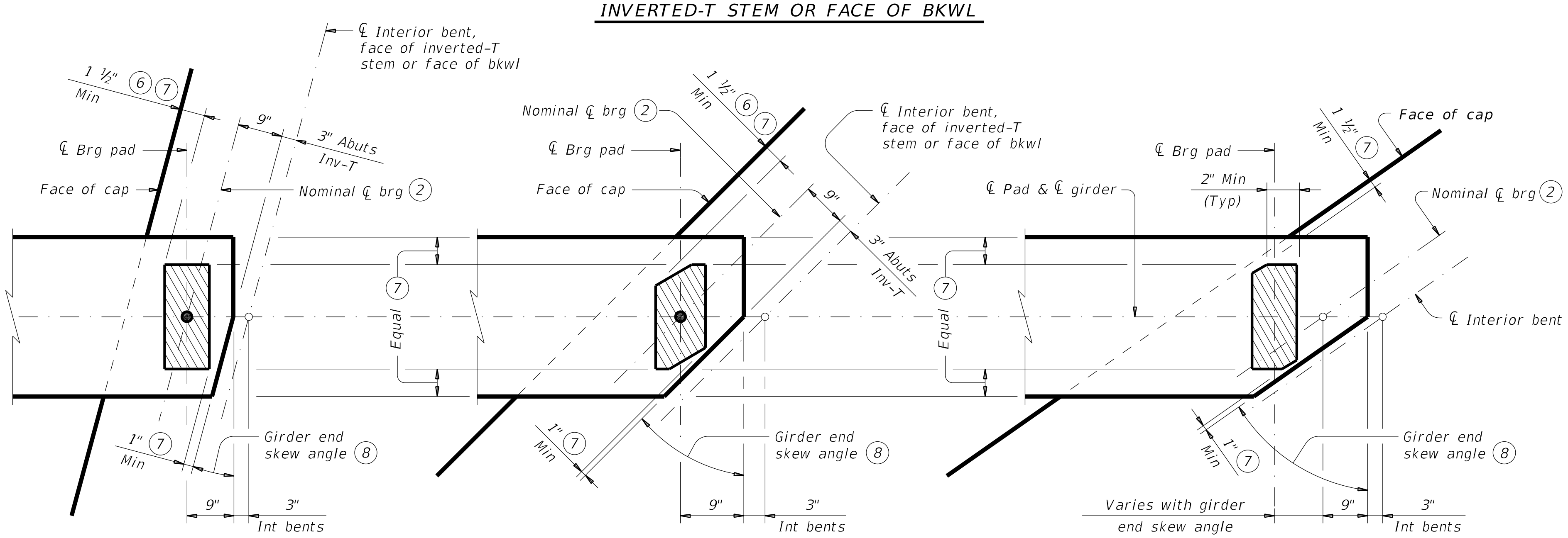


LAMINATED ELASTOMERIC BEARING PAD

(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

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(6) 3" for inverted-T.

(7) Place centerline pad as near nominal centerline bearing as possible between limits shown.

(8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.

(9) Provide 2" dia hole only at locations required. See Substructure details for location.

(10) See Table of Bearing Pad Dimensions for dimensions.

(11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(12) Locate Permanent Mark here.

(13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in 1/8" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for 1/8" taper)
N=2, (for ¼" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.0625"}{\text{Length or Dia}}\right)$ IN/IN.

(14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.

(15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.

(16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

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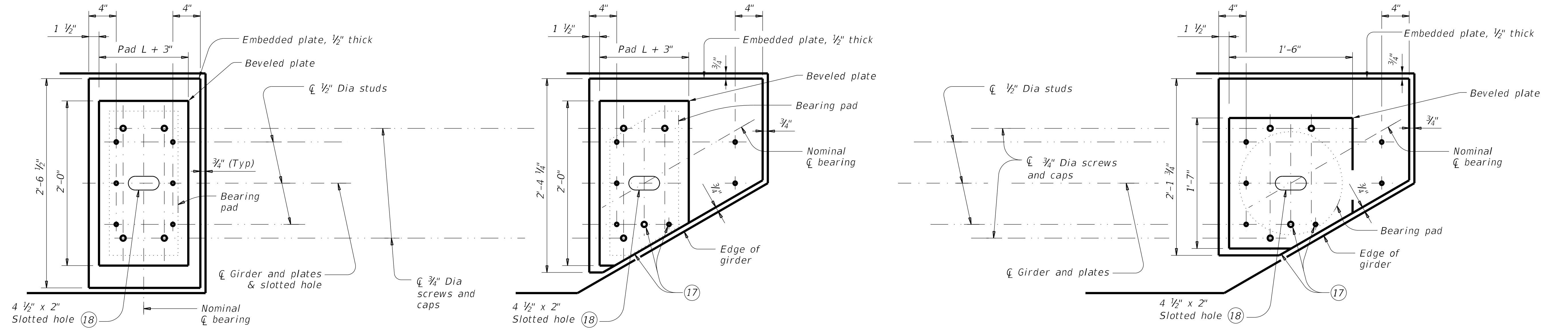
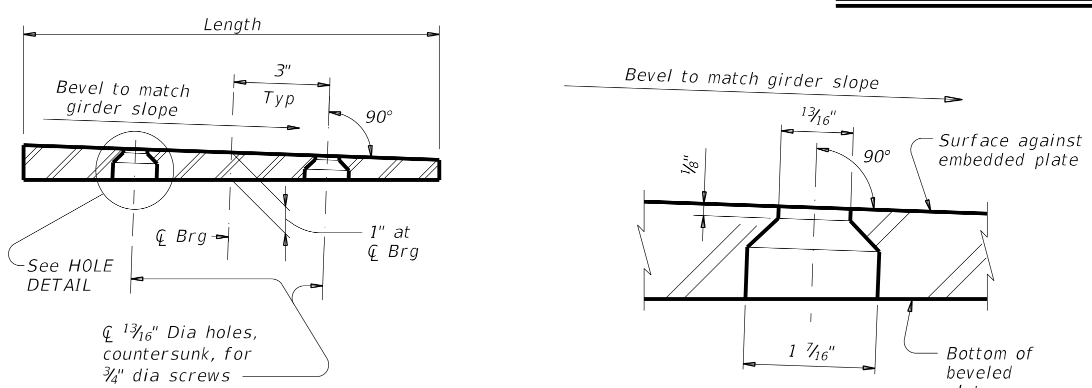


NORMAL GIRDER END
RECTANGULAR BEARING PAD

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

(17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.

(18) Slotted hole is required at doweled girder end locations.

SOLE PLATE NOTES:

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

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

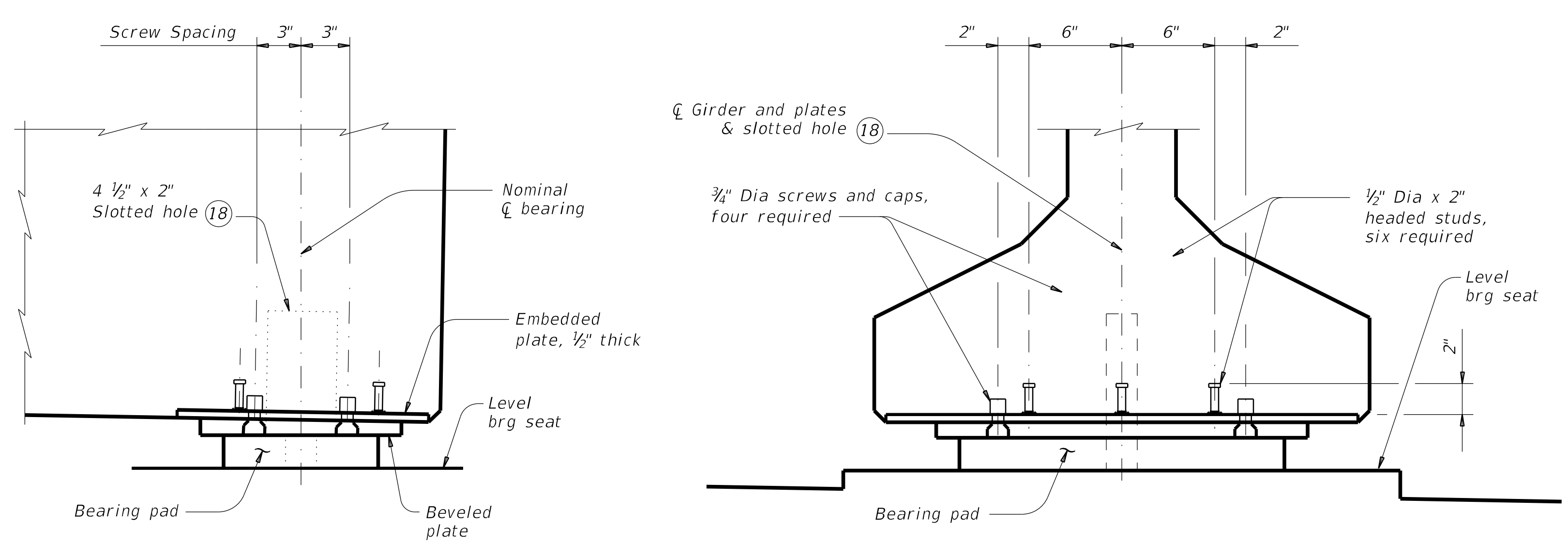
Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

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

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

¾" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a ¾" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than ½" deep or deeper than 1".

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



SIDE ELEVATION

END ELEVATION
Showing normal girder end.

GIRDER DETAILS

HL93 LOADING — SHEET 3 OF 3

Texas Department of Transportation — Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

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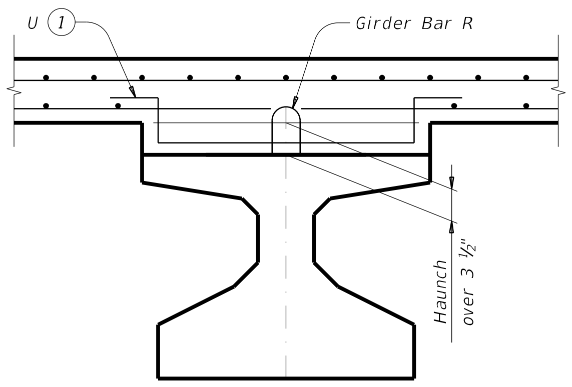
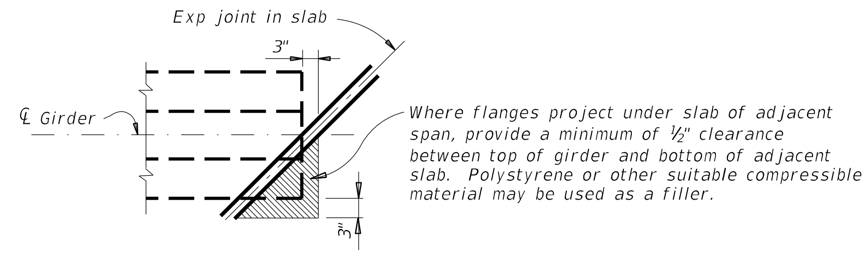
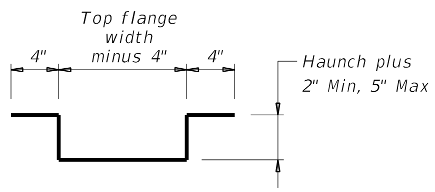


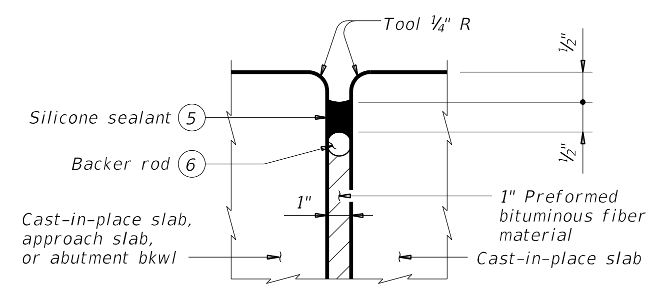
HAUNCH REINFORCING DETAIL



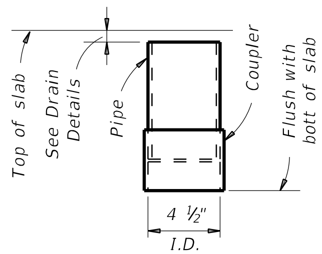
TREATMENT AT GIRDER END FOR SKEWED SPANS



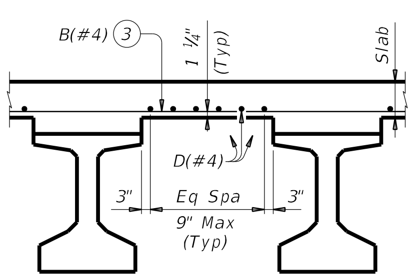
BARS U (#4)



TYPE A JOINT DETAIL ⑦

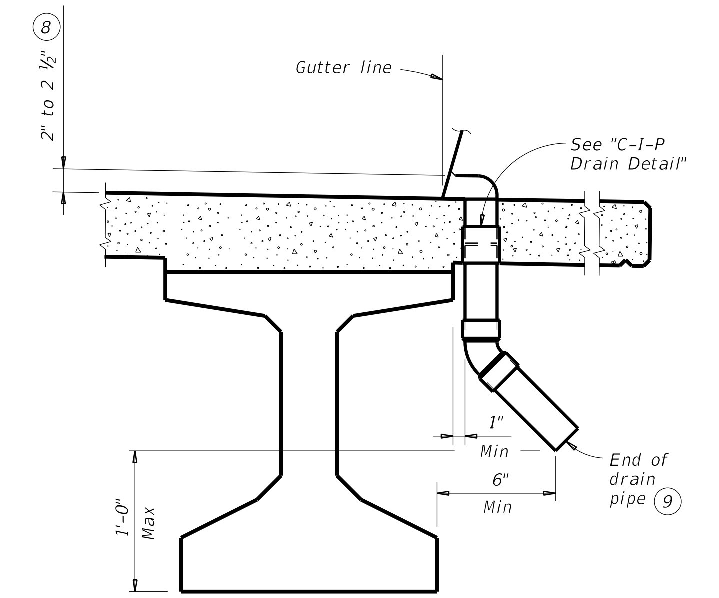


C-I-P DRAIN DETAIL ②



TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP ④

Top reinforcing steel not shown for clarity.



DRAIN DETAIL ⑩

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.

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.

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.

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Texas Department of Transportation — Bridge Division Standard

MISCELLANEOUS SLAB DETAILS
PRESTR CONCRETE I-GIRDERS

IGMS

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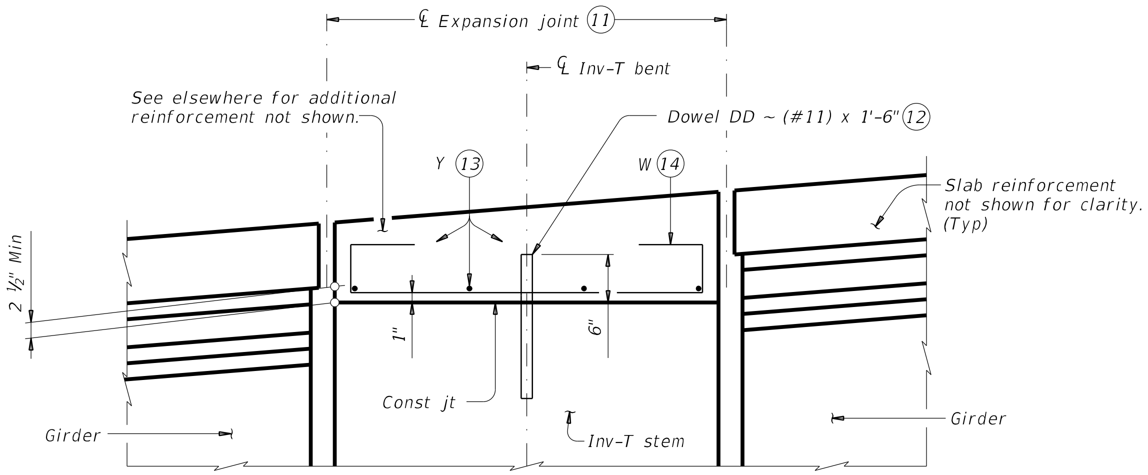
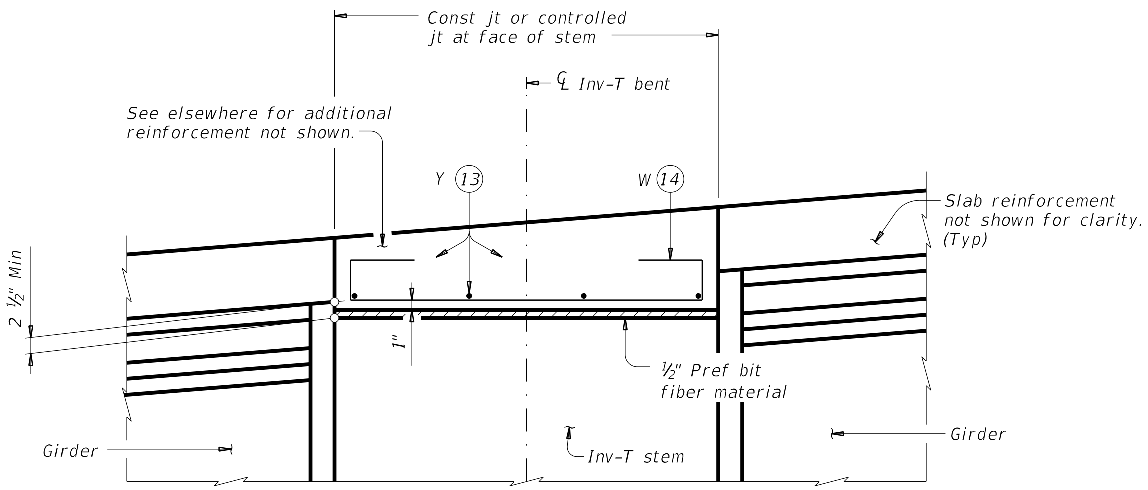
	HOU		BRAZORIA	144

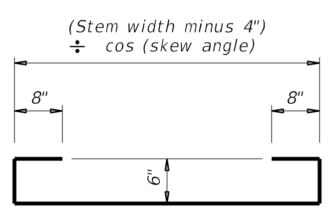


SHOWING EXPANSION JOINTS

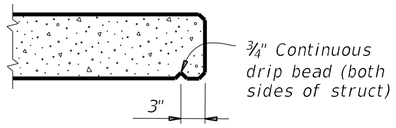


SHOWING CONST JTS OR CONTROLLED JTS

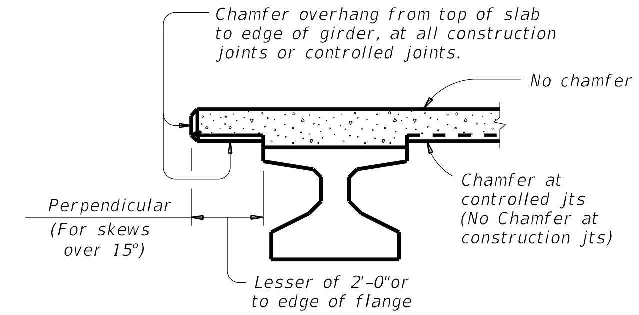
REINFORCEMENT OVER INV-T BENTS



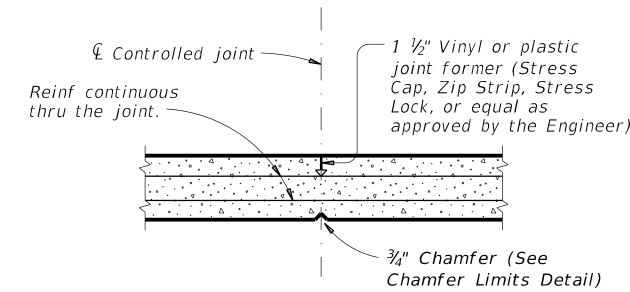
BARS W (#4)



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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Texas Department of Transportation — Bridge Division Standard

MISCELLANEOUS SLAB DETAILS
PRESTR CONCRETE I-GIRDERS

IGMS

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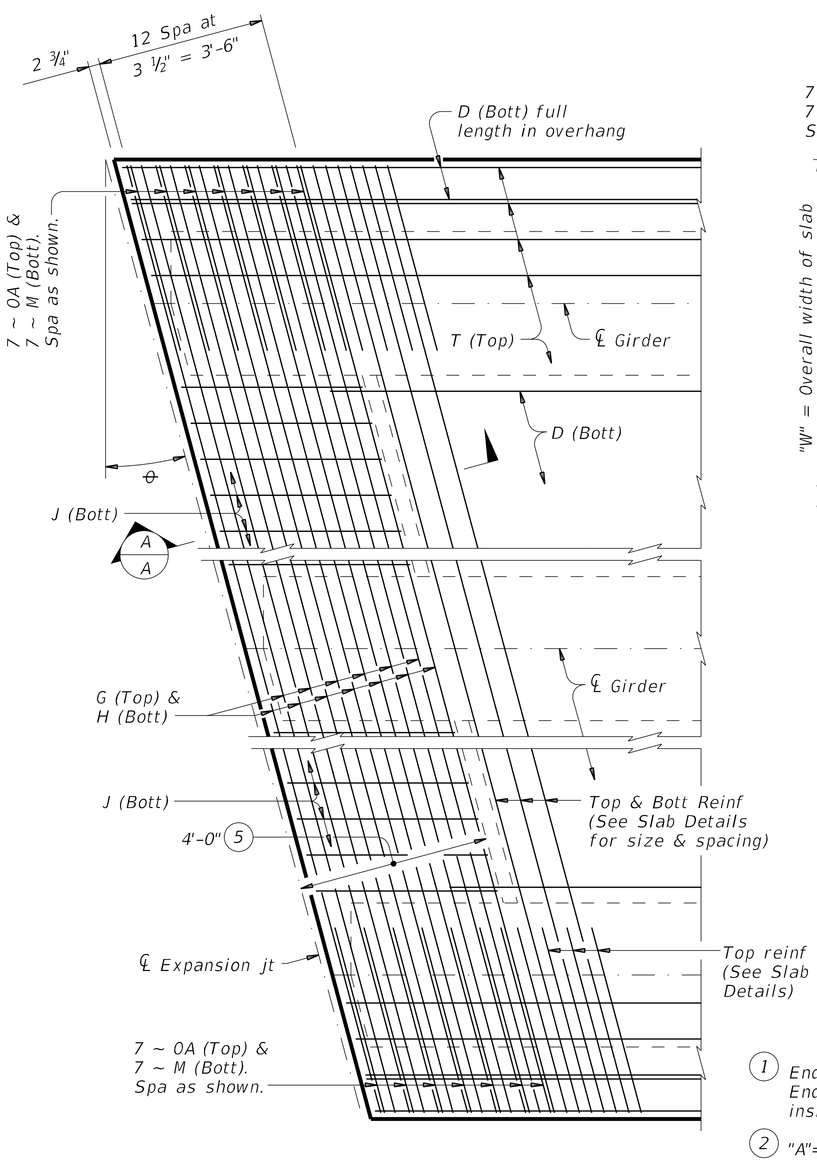
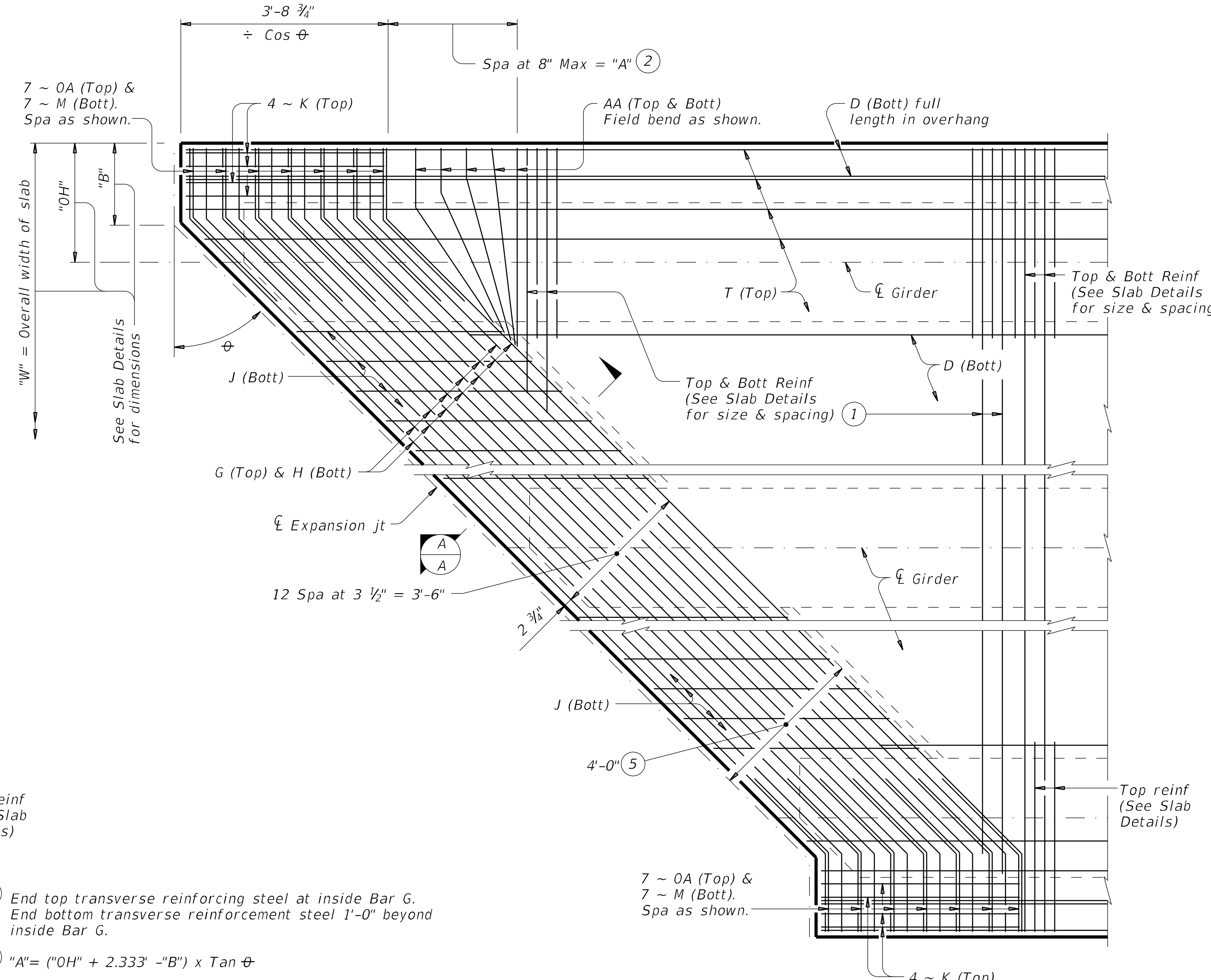
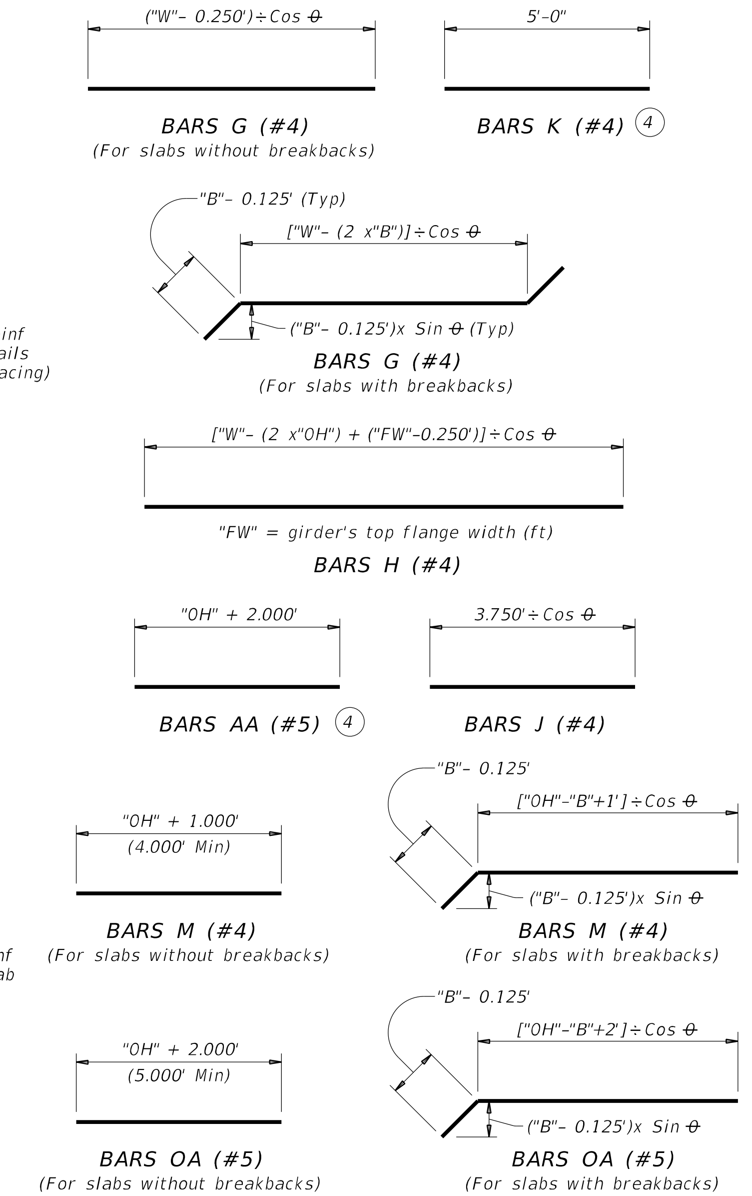


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



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 θ
3. Provide clear cover as indicated unless otherwise shown on Span Details.
4. Only required on slabs with breakbacks.
5. Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



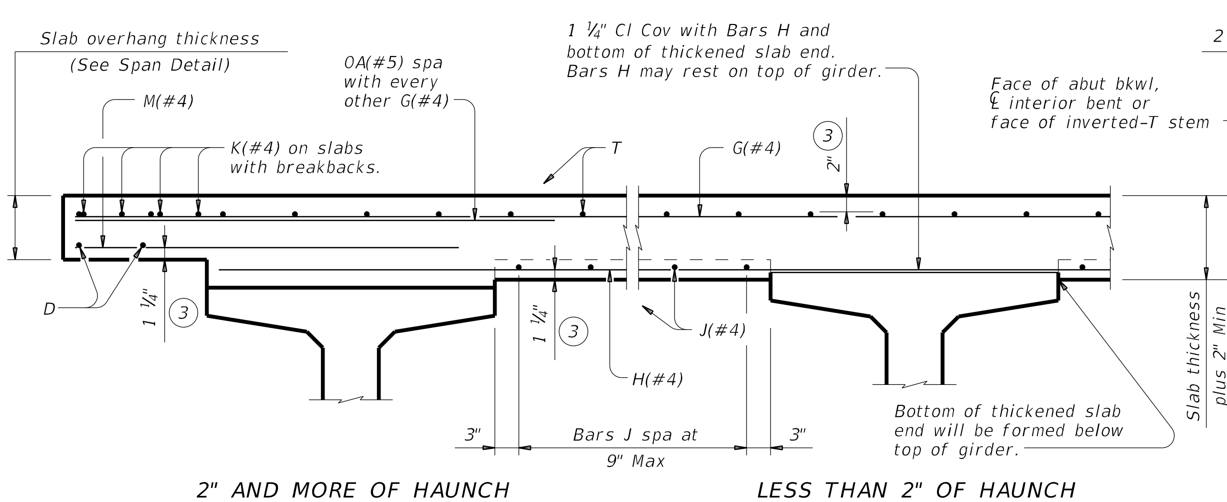
GENERAL NOTES:

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

MATERIAL NOTES:

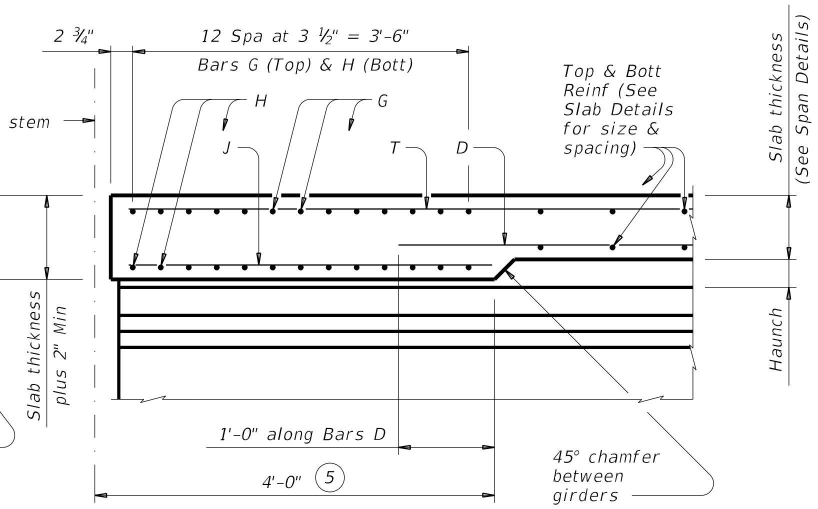
Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

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



TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at ℄ Brg)



SECTION A-A

(Showing with 2" and more of haunch)

HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

IGTS

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	HOU		BRAZORIA	146

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.

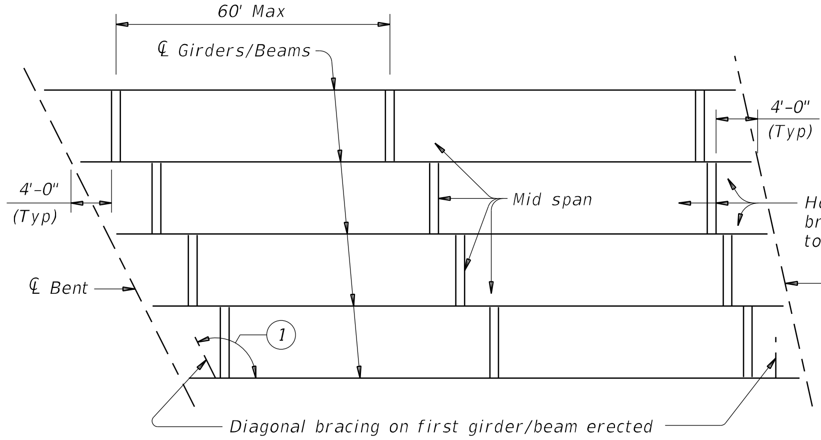
ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

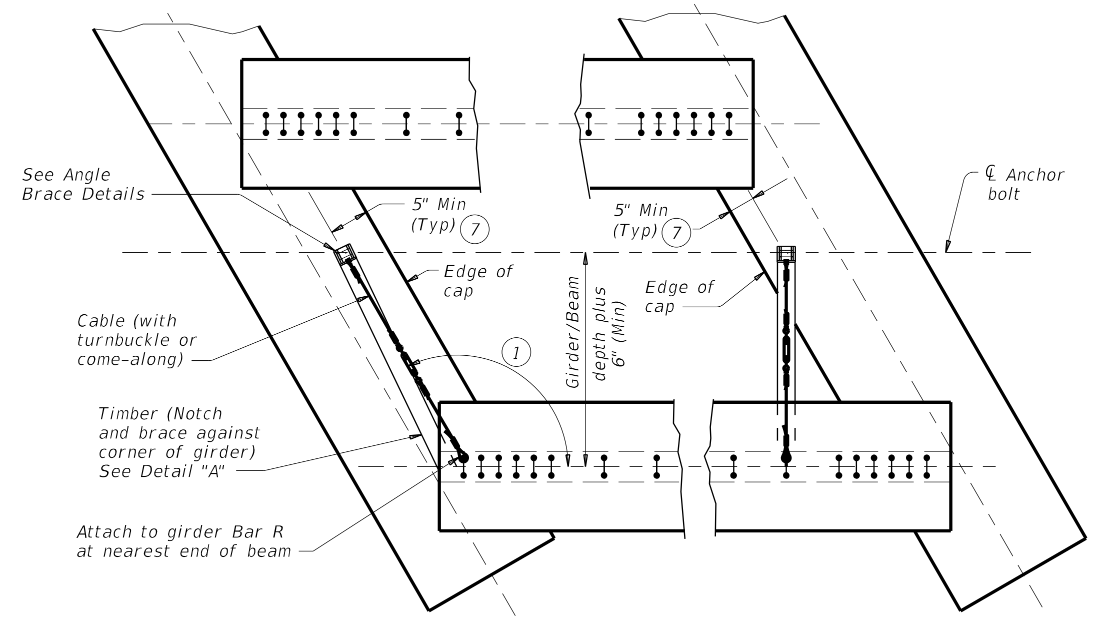
Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

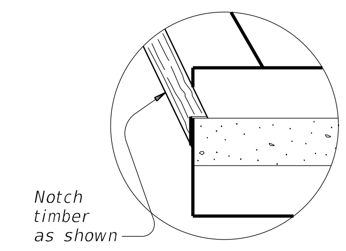
Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top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



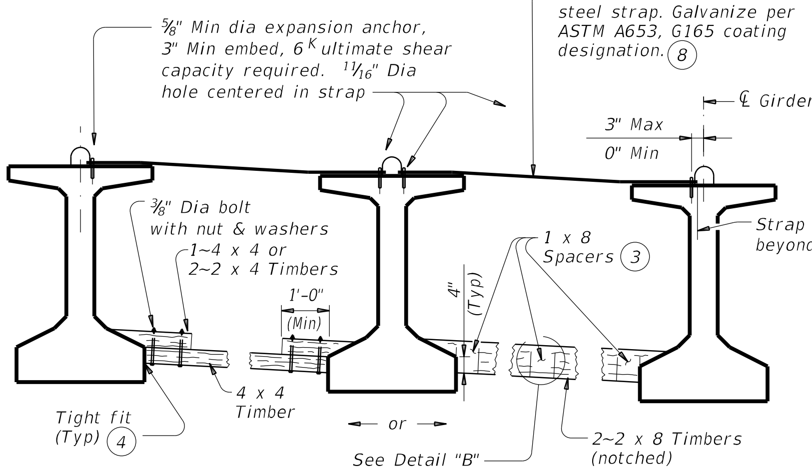
ERECTION BRACING



PLAN

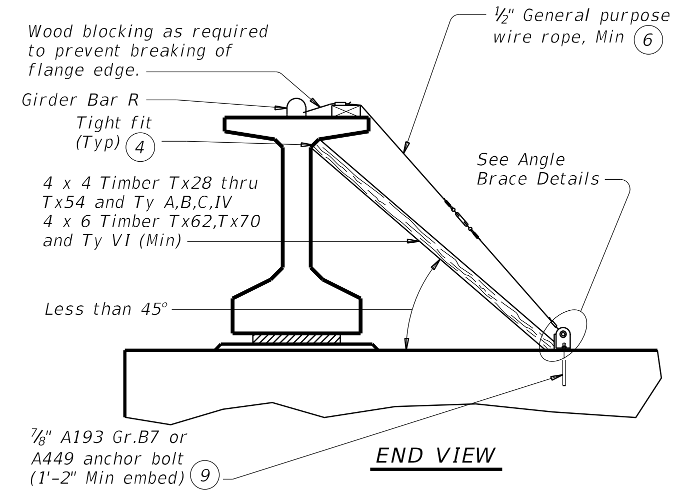


DETAIL "A"



FOR ERECTION BRACING, OPTION 1

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



DIAGONAL BRACING DETAILS 5

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

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.

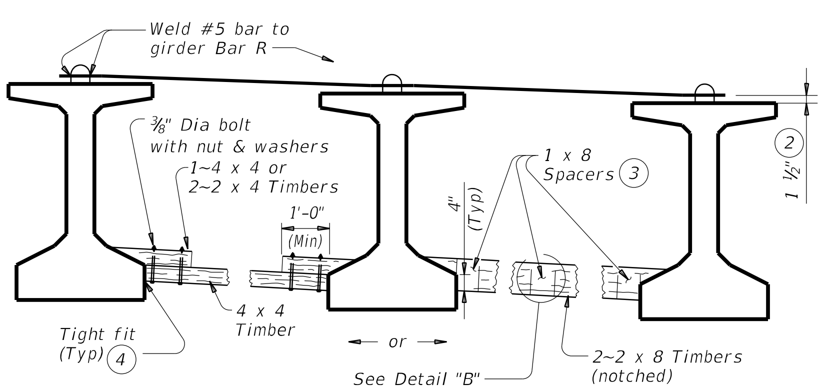
5 Pressure treated landscape timbers can not be used.

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 agginst the dead end.

7 It is acceptable to tie anchor bolts to cap reinforcement.

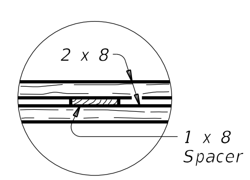
8 Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

9 Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.



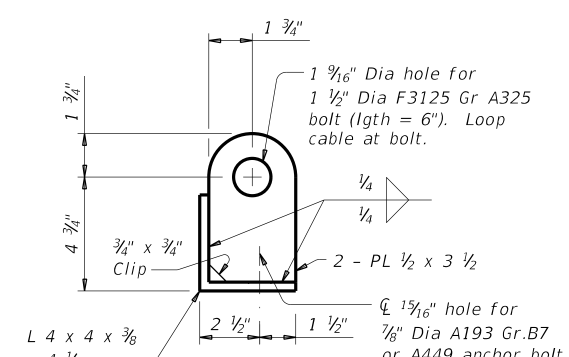
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS 5



PLAN

DETAIL "B"



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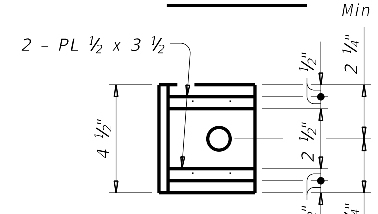

PLAN

ANGLE BRACE DETAILS

SHEET 1 OF 2

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
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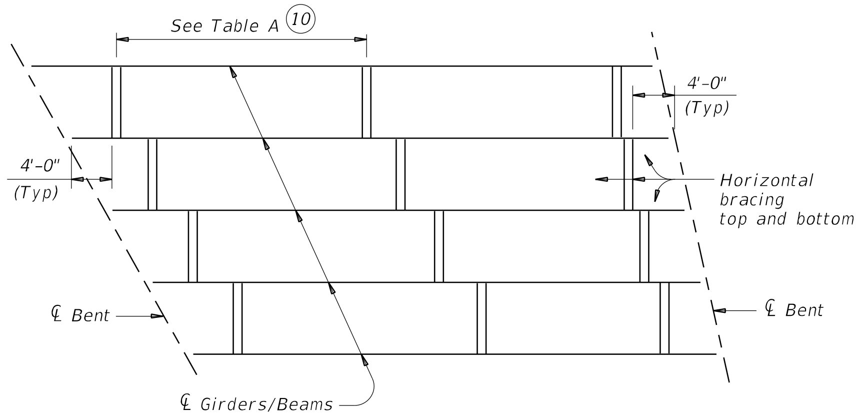
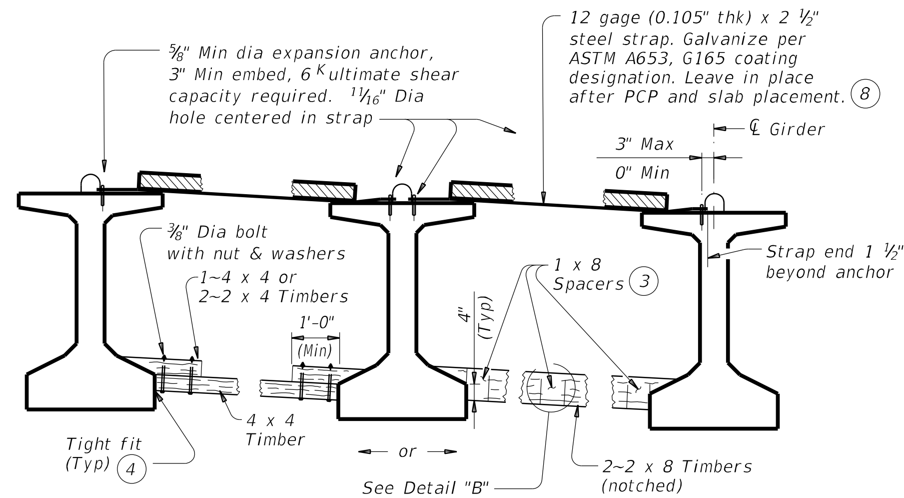


SLAB PLACEMENT BRACING

TABLE A

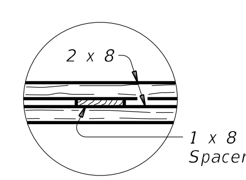
OPTION 1-RIGID BRACING (STEEL STRAP)		
Girder or Beam Type	Maximum Bracing Spacing: Slab Overhang less than 4'-0" (11)	Maximum Bracing Spacing: Slab Overhang 4'-0" and greater (11)
Tx28	1/4 points	1/4 points
Tx34	1/4 points	1/4 points
Tx40	1/4 points	1/8 points
Tx46	1/4 points	1/8 points
Tx54	1/4 points	1/8 points
Tx62	1/4 points	1/8 points
Tx70	1/4 points	1/8 points
A	1/8 points	1/8 points
B	1/8 points	1/8 points
C	1/8 points	1/8 points
IV	1/4 points	1/8 points
VI	1/4 points	1/8 points

OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)		
Girder or Beam Type	Maximum Bracing Spacing: Slab Overhang less than 4'-0" (11)	Maximum Bracing Spacing: Slab Overhang 4'-0" and greater (11)
Tx28	1/4 points	1/8 points
Tx34	1/4 points	1/8 points
Tx40	1/4 points	1/8 points
Tx46	1/4 points	1/8 points
Tx54	1/4 points	1/8 points
Tx62	1/4 points	1/8 points
Tx70	1/4 points	1/8 points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	1/4 points	4.0 ft
VI	1/4 points	4.0 ft



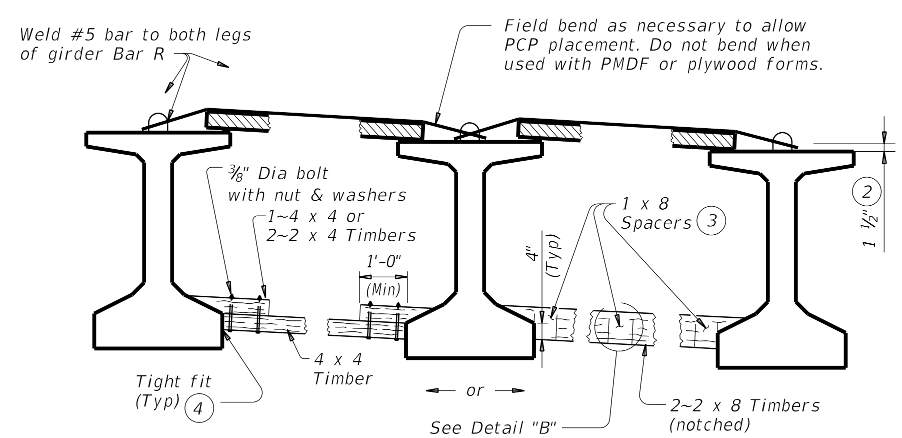
FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

(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 (1/4 and 1/8 points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425.

Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Removal of bracing for short periods of time to align girders and beams is permissible.

All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown.

Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation | Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS
PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

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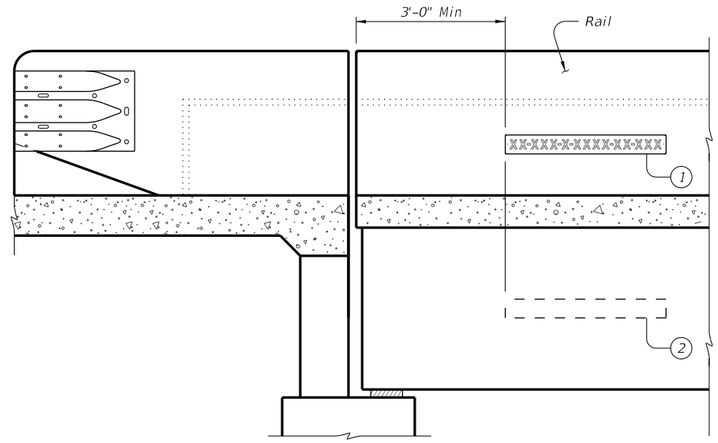

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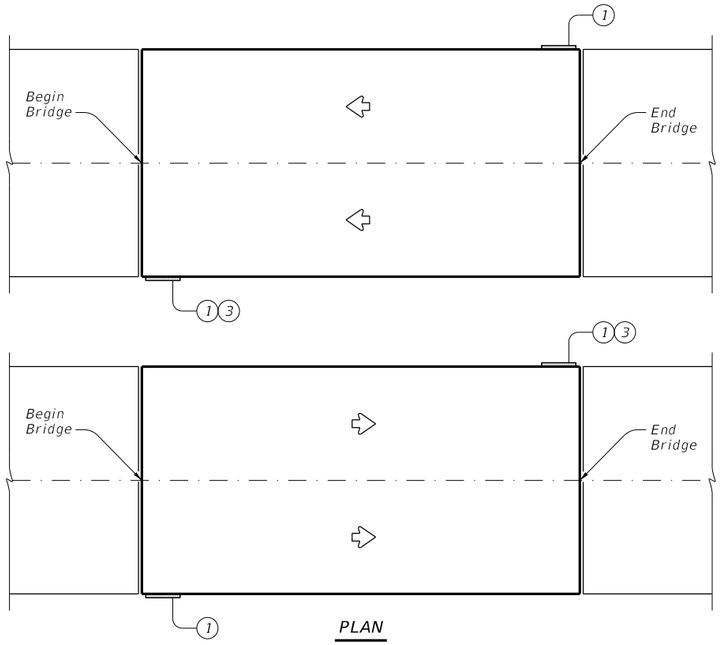
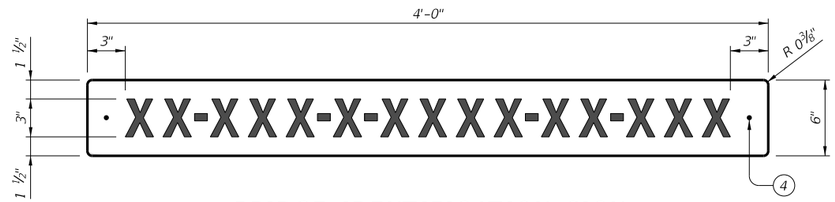
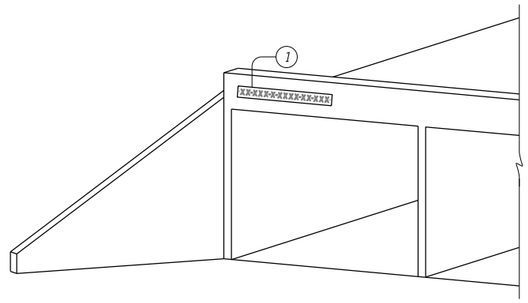


PLAN

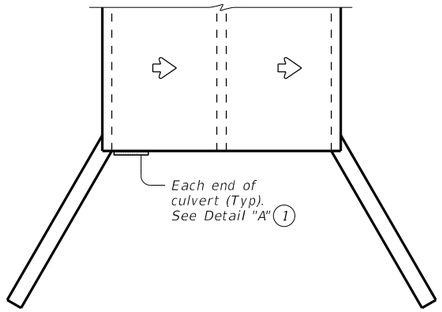
BRIDGE SIGN LOCATIONS



BRIDGE IDENTIFICATION SIGN

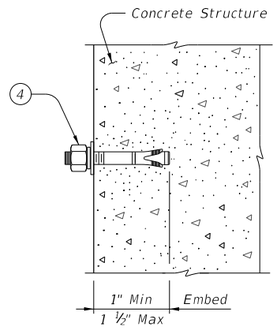


DETAIL "A"



PLAN

BRIDGE CLASS CULVERT SIGN PLACEMENT



ANCHOR DETAIL

SHEETING REQUIREMENTS

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

(1) Bridge identification sign location

(2) Alternate sign placement location for exterior concrete beams.

(3) If adjacent bridges are less than 2 feet apart, these signs may be omitted.

(4) ¼" Diameter stainless steel expansion anchor with hex nut, washer, and spring-lock washer.

SIGN NOTES:

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

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

MATERIAL NOTES:

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

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

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

Provide ¼" diameter stainless steel expansion anchors with one hex head nut, one flat washer, and one helical spring-lock washer each.

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

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

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

GENERAL NOTES:

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

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

Do not install anchors sections of members under tension.

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

Texas Department of Transportation

Bridge Division Standard

NBI BRIDGE IDENTIFICATION SIGN STANDARD

NBIS

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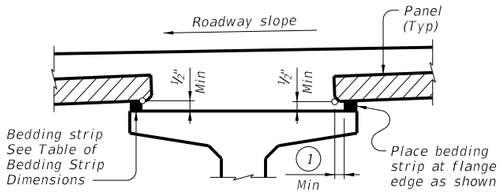
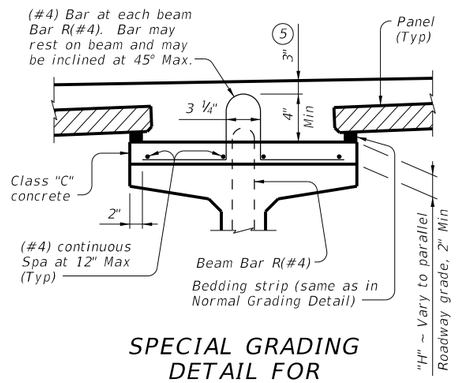


NORMAL GRADING DETAIL (3)

Showing prestressed concrete I-girders.
(Other beam types similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

Showing prestressed concrete I-girders.
(Other beam types similar)

TABLE OF BEDDING STRIP DIMENSIONS		
WIDTH	HEIGHT (4)	
	Min	Max
1" (Min)	½"	2"
1 ¼"	½"	2 ½"
1 ½"	½"	3"
1 ¾"	½"	3 ½"
2"	½"	4"
2 ¼"	½"	4 ½" (2)
2 ½"	½"	5" (2)
2 ¾"	½"	5 ½" (2)
3" (Max)	½"	6" (2)

(1) 2" Min for I-girders, 1 ½" Min for all other beam types.

(2) Allowed for prestressed concrete I-girders, not allowed on other beam types.

(3) To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in ¼" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is ¼". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.

(4) Height must not exceed twice the width.

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(7) Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 ½" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.

(8) Do not locate construction joints on top of a panel.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges.

Placing panels to minimize joint openings is recommended.

If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction.

Bars U, shown on PCP-FAB, may be bent over or cut off if necessary.

Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 ½" under the panels as the slab concrete is placed.

To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least ½". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required.

For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated.

Provide bar Laps, where required, as follows:

Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees.

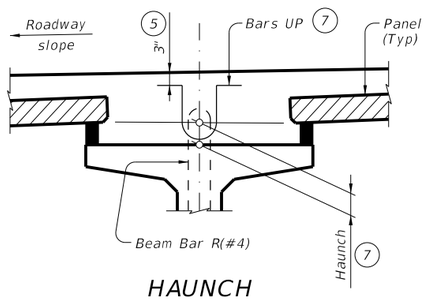
Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.

These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer.

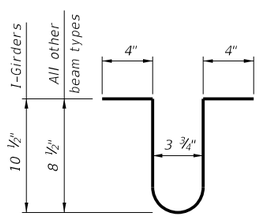
Any additional reinforcement or concrete required on this standard is considered subsidiary to the bid Item "Reinforced Concrete Slab".

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

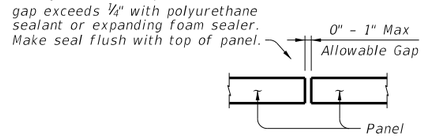


HAUNCH REINFORCING DETAIL

Showing prestressed concrete I-girders.
(Other beam types similar)

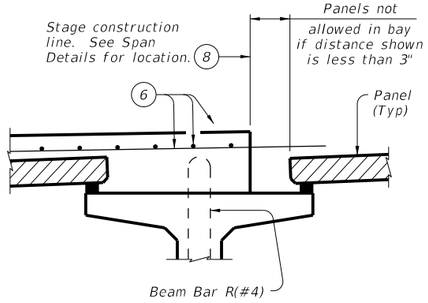


BARS UP (#4) (7)

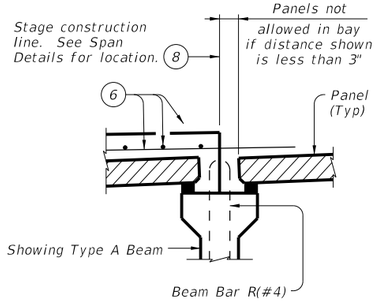


PANEL JOINTS

(Panel reinforcing not shown for clarity.
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



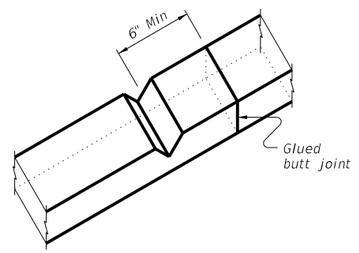
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL (9)

HL93 LOADING SHEET 1 OF 4

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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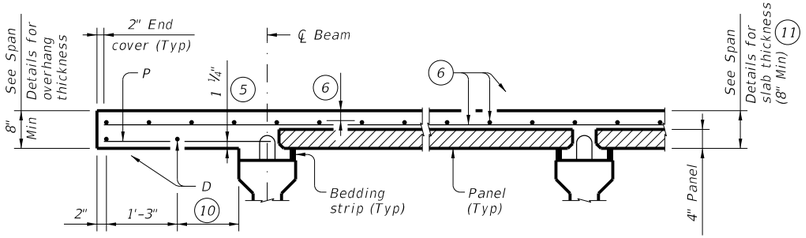

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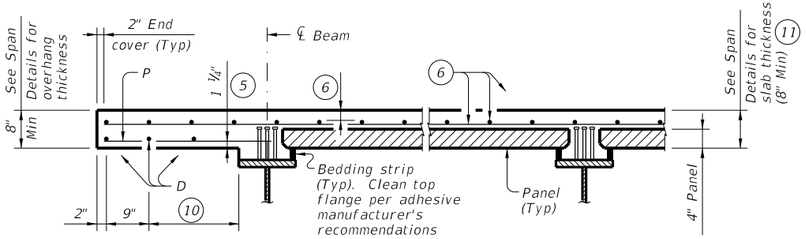
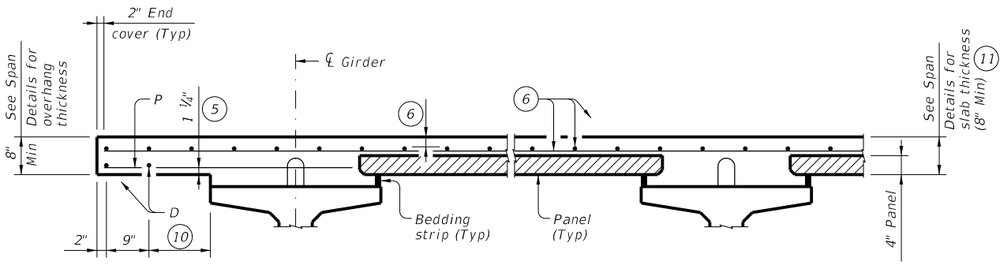
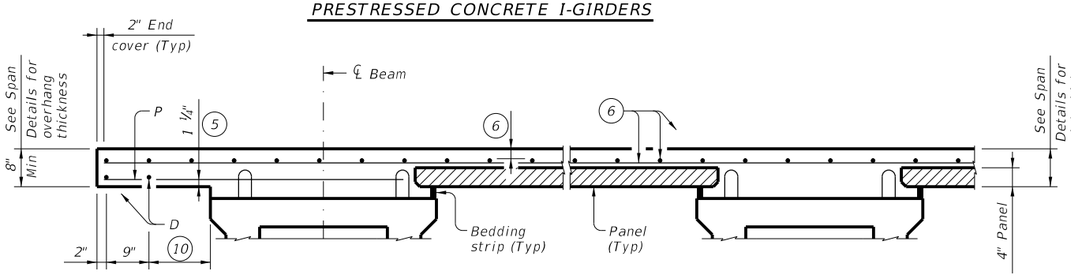


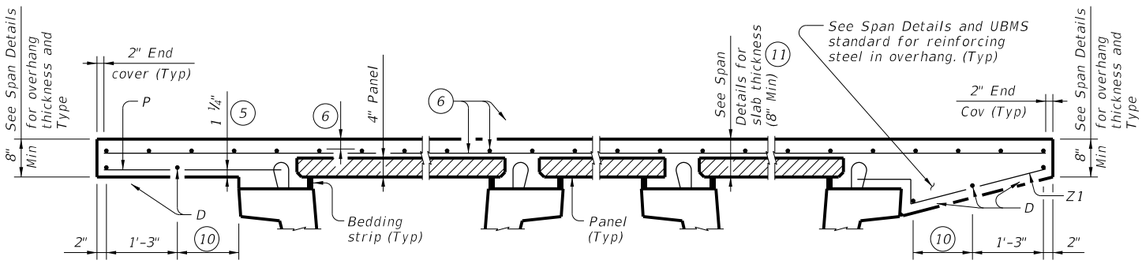
STEEL BEAMS (13)



PRESTRESSED CONCRETE I-GIRDERS



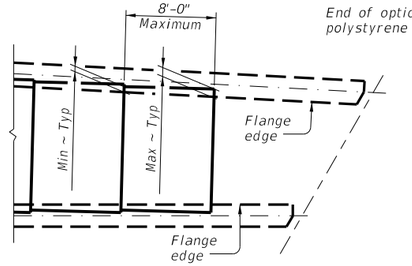
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

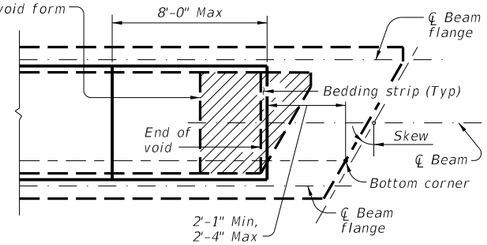
SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS



AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



OVER CONC U-BEAMS

PART PLANS OF PANEL PLACEMENT

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

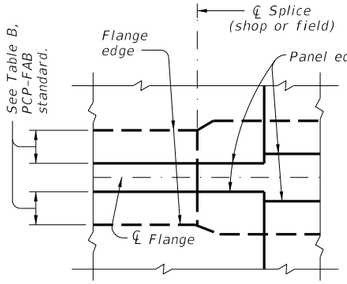
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(10) Equally space additional bar if more than 1'-3" Max.

(11) The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.

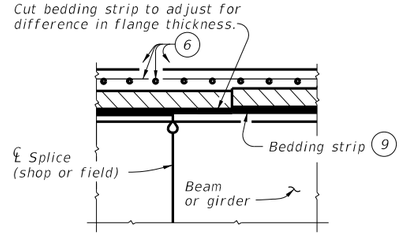
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Panels are allowed over top tension flanges, as approved by the Engineer. See Span Details for additional top mat reinforcement required in tension zones. Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



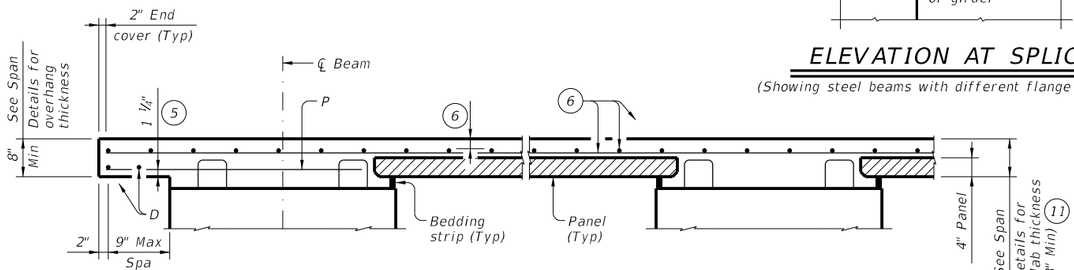
PLAN AT SPLICE

(Showing steel beams with flange width transition)



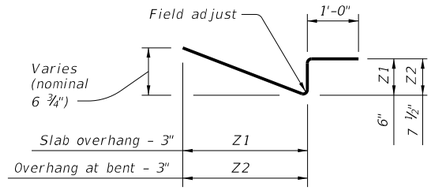
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



BARS Z (#4) (12)

HL93 LOADING SHEET 2 OF 4

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP

FILE: MS-PCP-23.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
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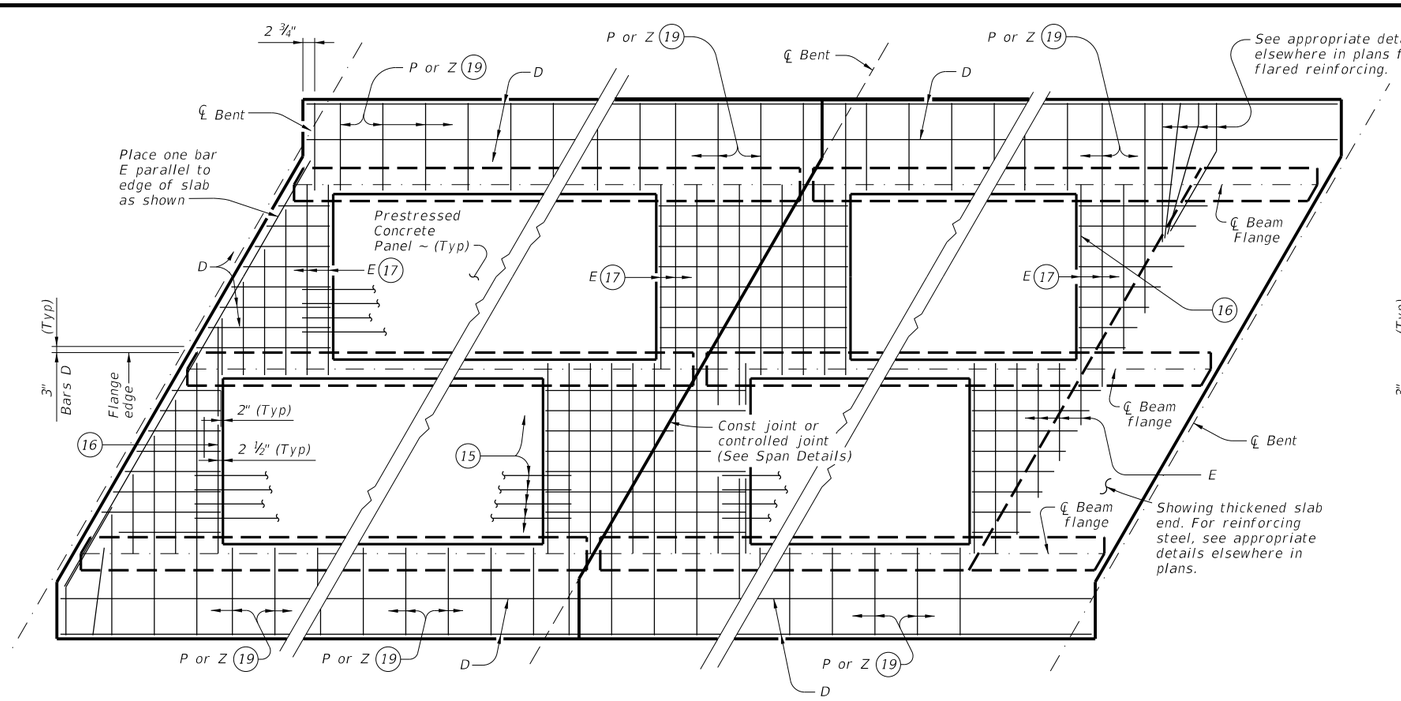
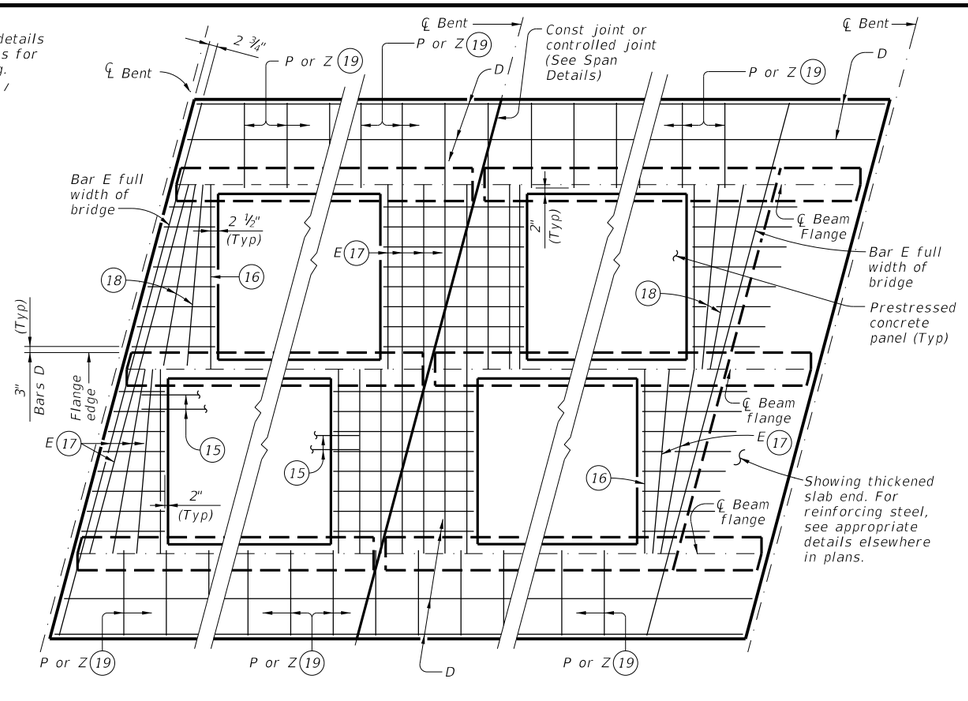


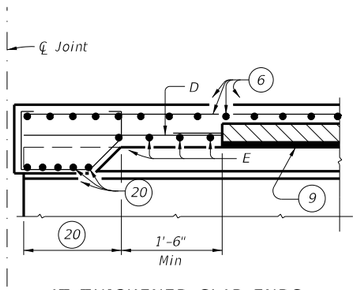
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

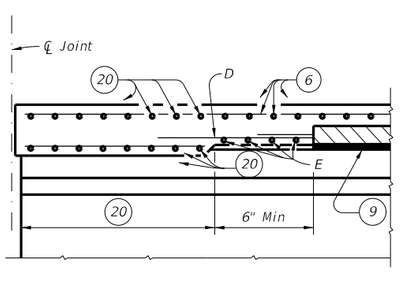


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

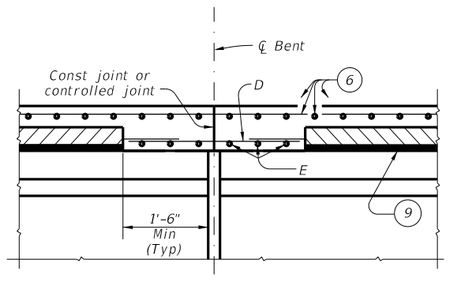
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



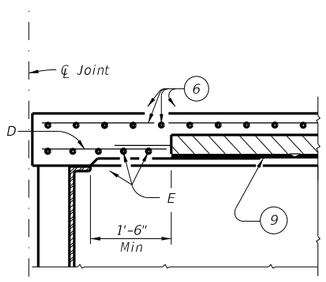
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



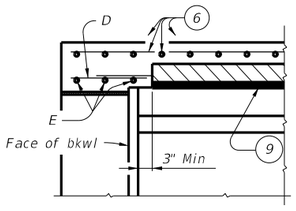
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



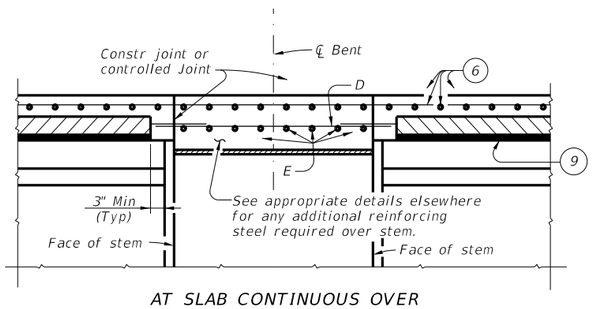
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(14) Max Spacing as listed unless otherwise shown.

(15) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(16) Maintain one Bar E(#4) parallel to panel ends (Typ).

(17) Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.

(18) Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.

(19) Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(20) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

HL93 LOADING

SHEET 3 OF 4

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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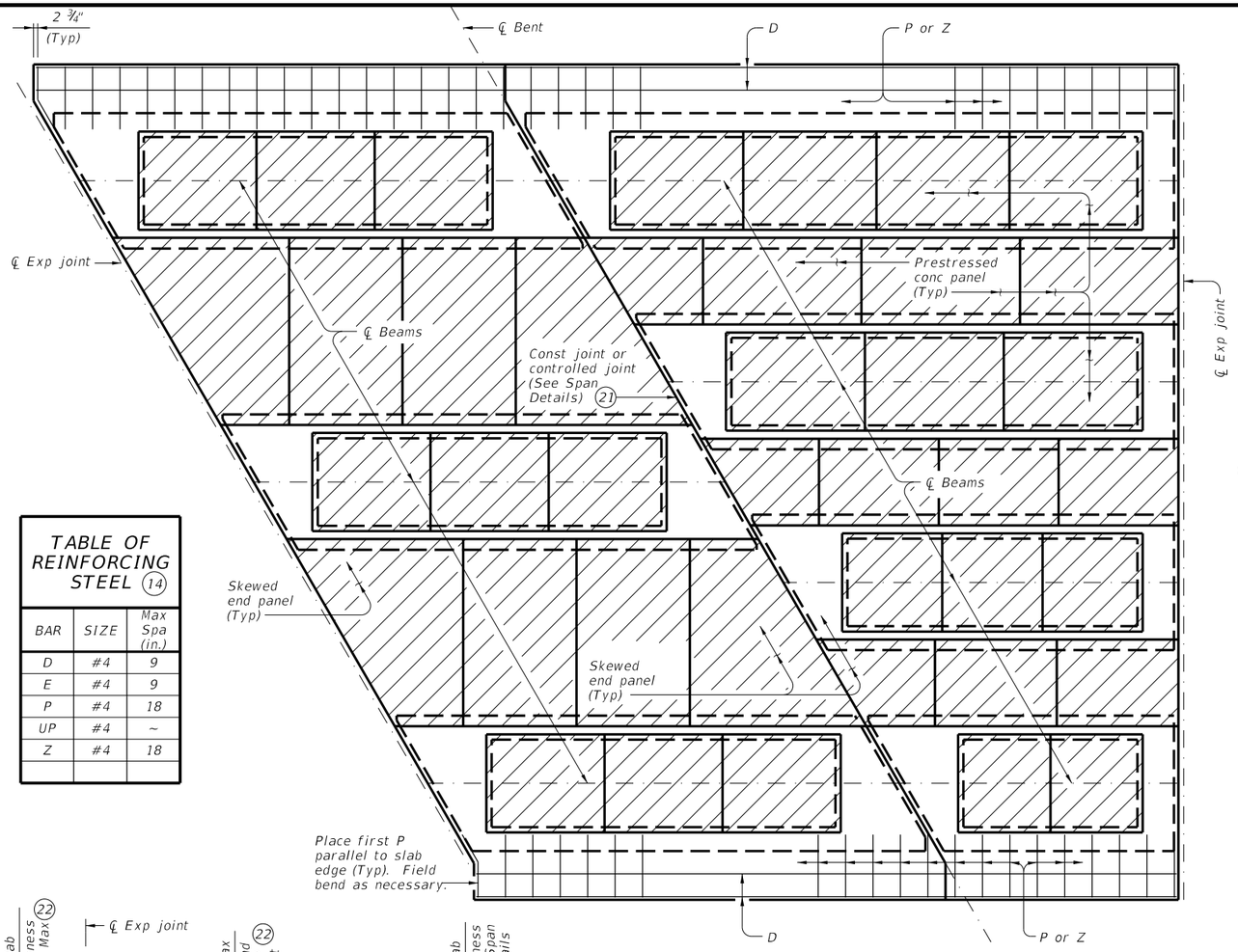
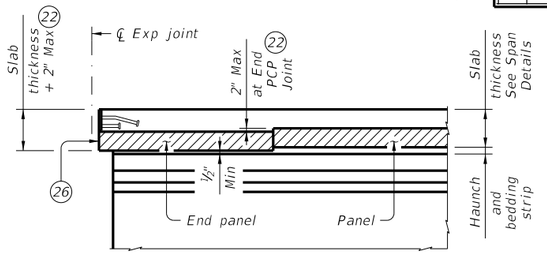


TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

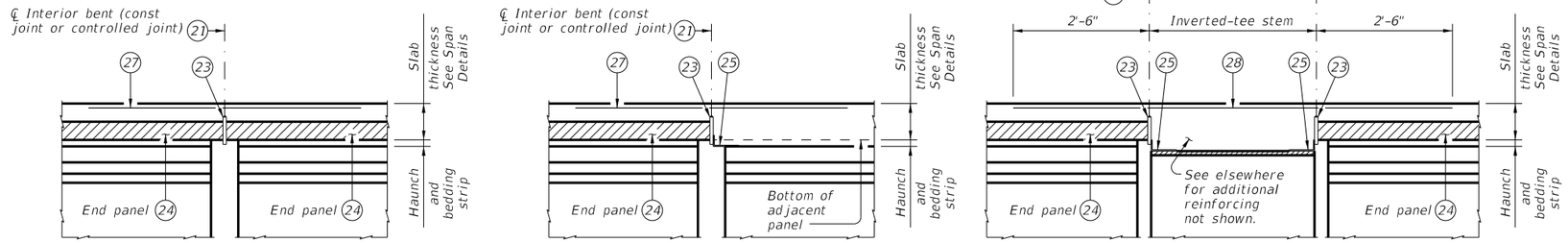
OPTION 2 ~ PLAN OF SLAB

(Showing U-Beams; other beams similar)



JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-B, SEJ-M, SEJ-S(0), AJ, and Type A expansion joints only.



CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.

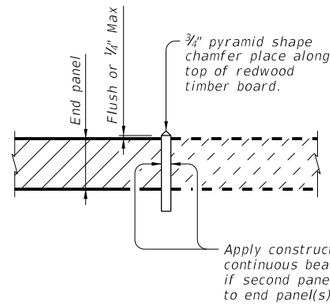
CONVENTIONAL INTERIOR BENT

Panel against beam/girder end in adjacent span.

INVERTED-T BENT

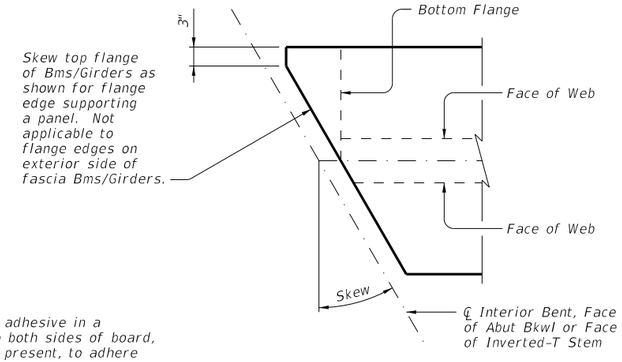
Panels against inverted-tee stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)



ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".



OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Beam/I-Girder, U-Beams and Steel Beams similar.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(14) Max Spacing as listed unless otherwise shown.

(21) 1 ½" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

(22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than ½" thick.

(23) ¾" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within ¼" Max above panel. Place ¾" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within ¼" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.

(24) Place panel within ½" of ¾" thick board.

(25) Permanent galvanized steel sheet form. Removable formwork is acceptable.

(26) Place end panel within ½" of expansion joint opening. End panel cannot encroach on required expansion joint opening.

(27) Place additional (#4) bar 5'-0" in length between every slab Bars T. Center (#4) bar on Joint.

(28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

SPECIAL OPTION 2 CONSTRUCTION NOTES:

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 ½".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-B, SEJ-M, and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and 0A from standard IGTS in the slab.

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Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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3/2023: Removed top flange tension limit.	DIST	COUNTY		SHEET NO.
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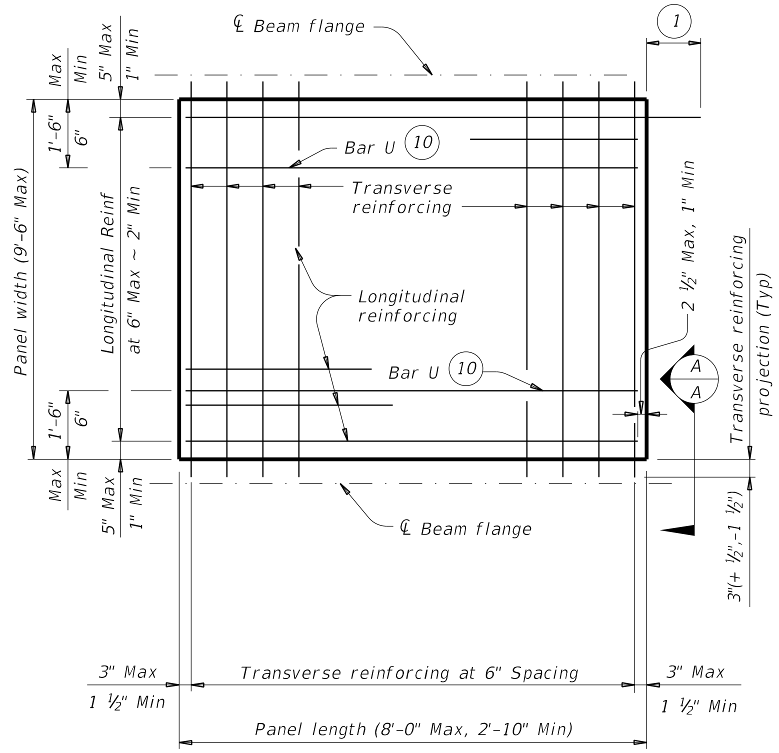
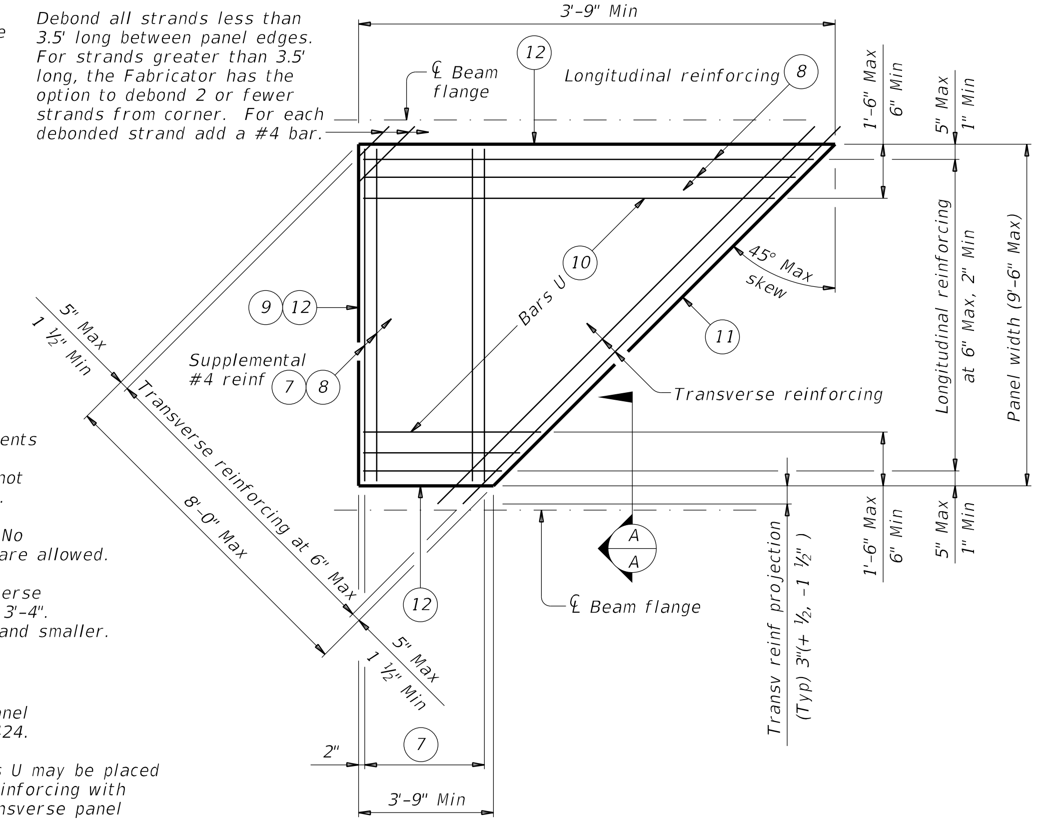


TYPICAL NON-SKEWED PANEL PLAN



TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

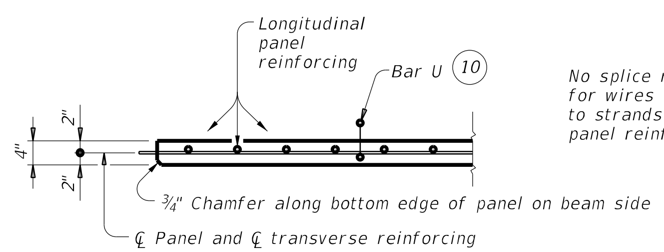
1. At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2",-0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
2. Four loops required per panel.
3. Four loops required per panel. ⅜" or ½" strands may be used.
4. Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
5. See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
6. One Splice allowed per panel. No more than two sheets of WWR are allowed.
7. Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
8. End Cover 2 ½" Max, 1" Min.
9. Recess strands on indicated panel edge in accordance with Item 424.
10. At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
11. Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
12. Timber form work permissible this edge.

TABLE A (4) (5)

Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3	4 ½
IV	6	4	7 ½
VI	6 ½	4 ½"	8 ½
U40 - 54	5 ½	5 ½	7
Tx28-70	6	5	7 ½
XB20 - 40	4	3	4 ½
XSB12 - 15	4	3	4 ½

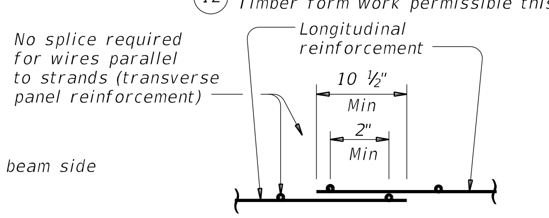
TABLE B (4) (5)

Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3	3 ¼
Over 15" to 18"	4	3	4 ¾
Over 18"	5	3 ½	6 ¼

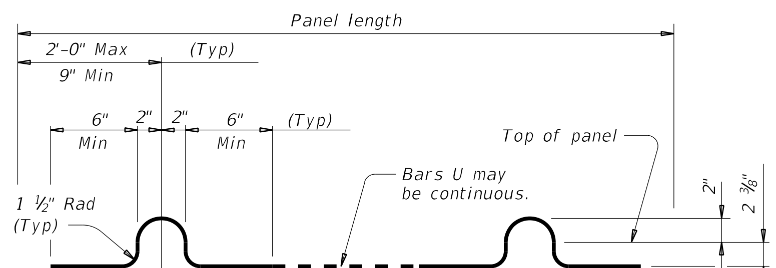


SECTION A-A

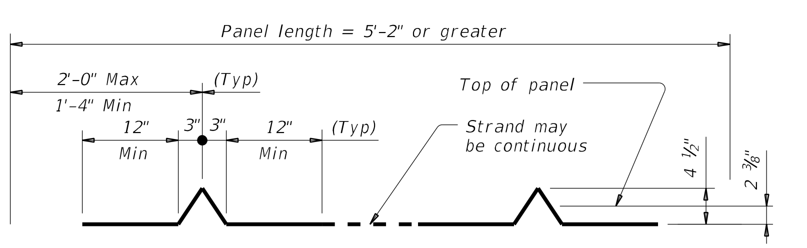
(Not showing supplemental #4 bars for skewed end panels.)



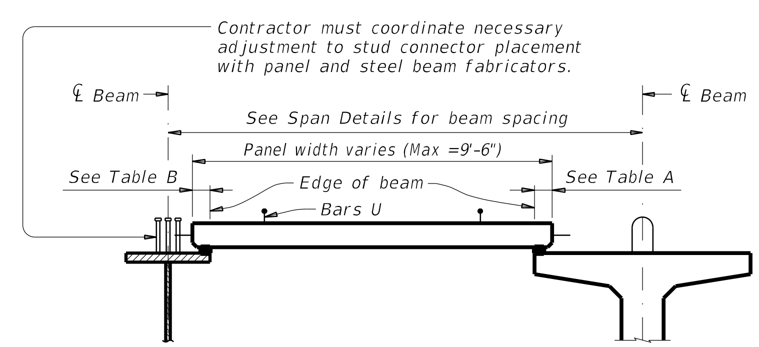
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



BARS U (#3) (2)



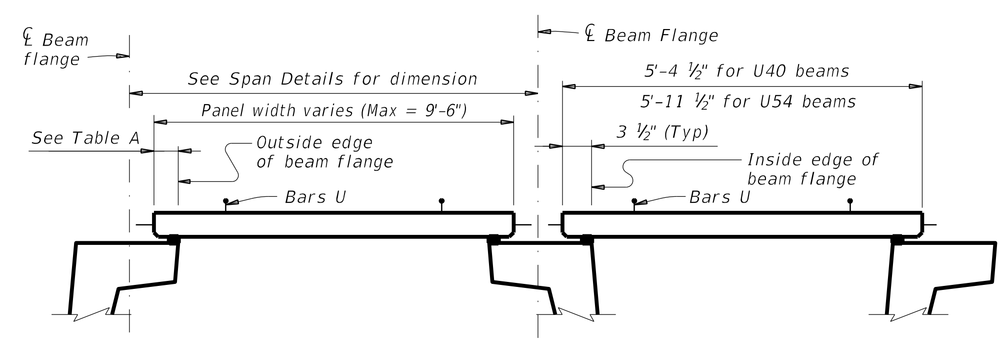
OPTIONAL STRAND FOR BARS U (3)



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3,500 psi. Minimum 28 day strength f'c=5,000 psi.
Provide ¾" chamfer along bottom edge of panel on beam side.
Do not use epoxy-coated reinforcing steel bar or strand in panels.
Remove laitance from top panel surface.
Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).
Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.
A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.
For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.
For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).
Place transverse panel reinforcement at panel centroid and space at 6" Max.

LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:
1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.
No combination of longitudinal reinforcement options in a panel is allowed.
Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

FILE: pcpstde2-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
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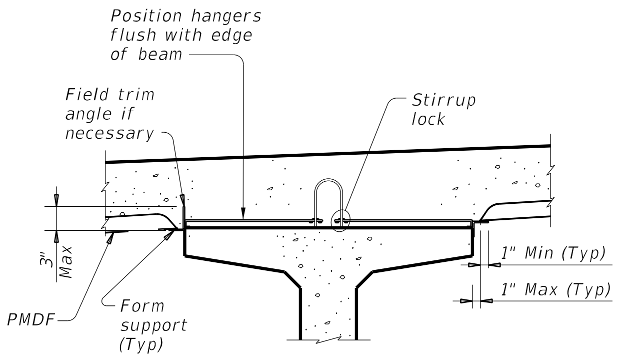
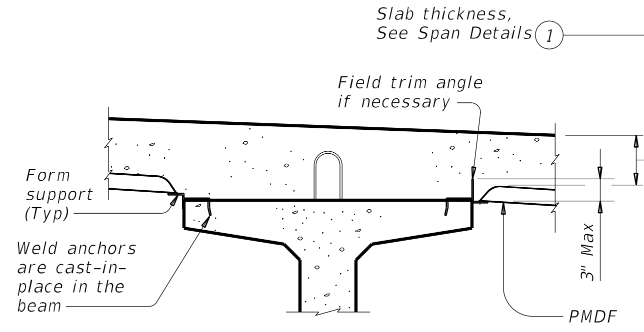
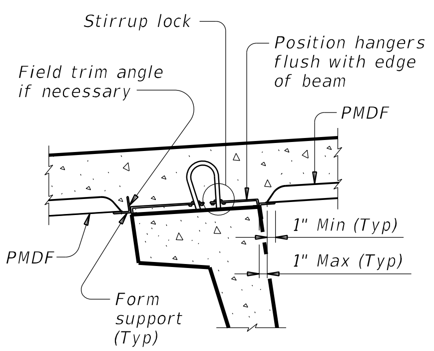


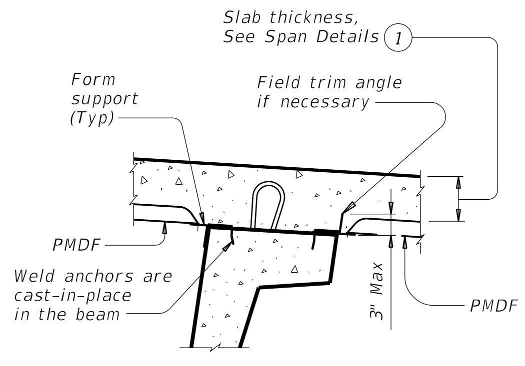
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



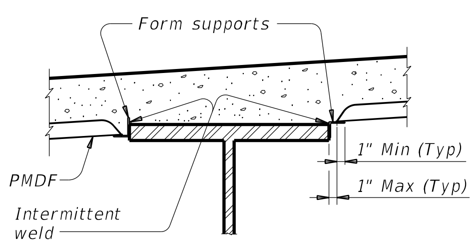
PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS



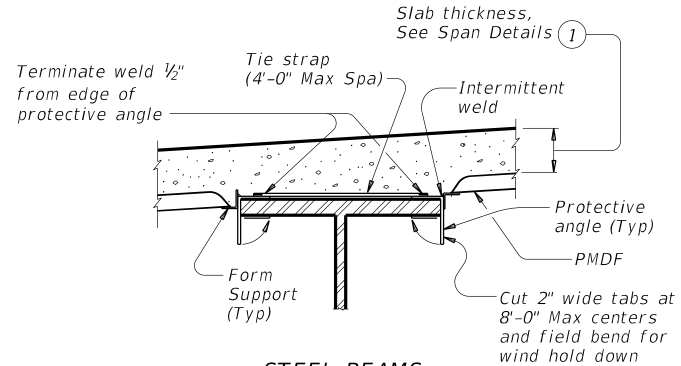
U-BEAMS WITH STIRRUP LOCKS



U-BEAMS WITH WELD ANCHORS

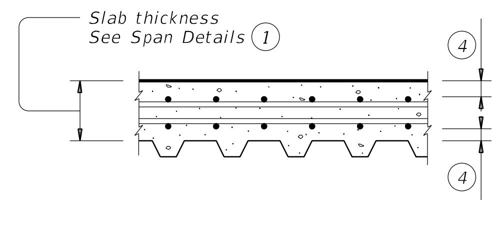


STEEL BEAMS AT COMPRESSION FLANGES

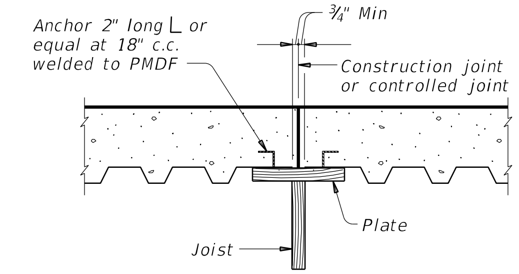


STEEL BEAMS AT TENSION FLANGES 2

TYPICAL TRANSVERSE SECTIONS



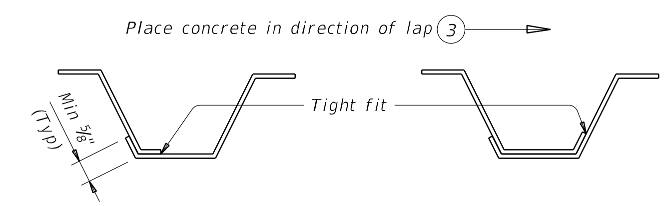
TYP LONGITUDINAL SLAB SECTION



Note: In spans where PMD forms are used, timber forms must be used at construction joints.
Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

SECTION THRU CONSTRUCTION JOINT

FOR PRESTR CONC U-BEAM AND STEEL GIRDER BRIDGES:
Unless shown elsewhere in the plans, size, spacing, and orientation of bottom mat of slab reinforcement must match the top mat of reinforcing shown on the span details except all bottom mat bars are to be #5. Bottom mat reinforcement and additional concrete is subsidiary to Item 422 "Concrete Superstructures."
FOR PRESTR CONC TX-GIRDER BRIDGES:
See Miscellaneous Slab Details, Prestr Concrete I-Girders (IGMS) standard sheet for bottom mat reinforcing.



SIDE LAP DETAILS

1 Slab thickness minus ⅝" if corrugations match reinforcing bars.

2 Welding of form supports to tension flanges will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension flange zones will be considered. At least one layer of sheet metal must be provided between the flange and the weld joint.

3 The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.

4 See Span details for cover requirements.

DESIGN NOTES:

As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi.

Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.

1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.

1/240 of the form design span, but not more than 0.75", for all design spans of railroad overpass bridge spans fully or partially over railroad right-of-way, and for all bridge spans of railroad underpass structures.

The form design span must not be less than the clear distance between beam flanges, measured parallel to the form flutes, minus 2".

CONSTRUCTION NOTES:

Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

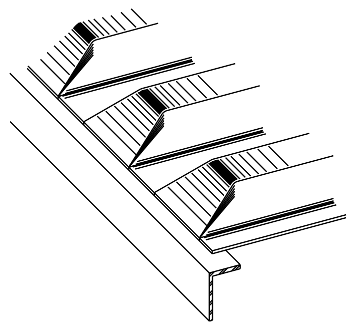
Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.



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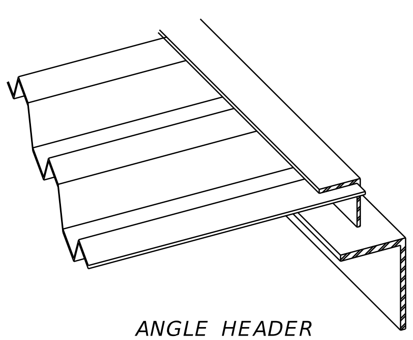

ANGLE HEADER

NOTE: This type is to be used for skewed ends only.

TYPES OF END CLOSURES

GENERAL NOTES:

Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, structural steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage.

Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension flanges for steel beams and provisions for protecting the tension flanges from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans.

The details and notes shown on this standard are to be used as a guide in preparation of the forming plans.

All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Concrete Superstructures".

Texas Department of Transportation | Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfste1-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
02-20: Modified box note by adding steel beams/girders and subsidiary. 12-21: Updated max deflection for RR.	DIST		COUNTY	SHEET NO.
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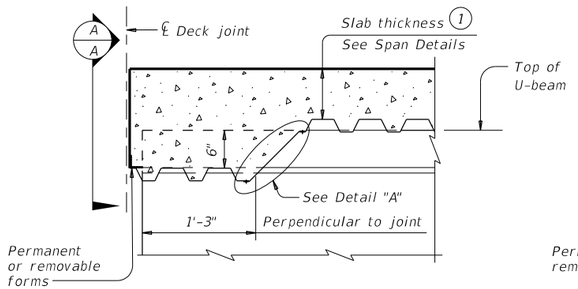
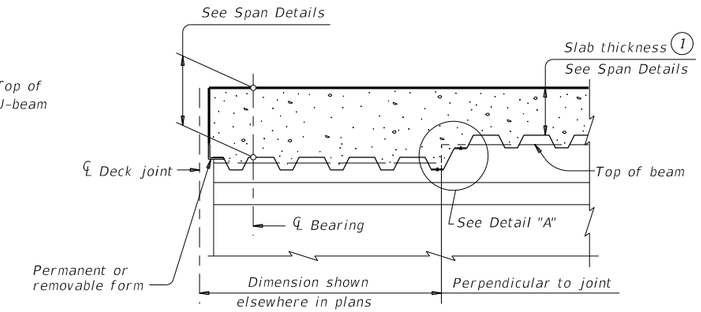
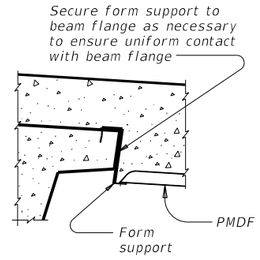


AT THICKENED SLAB END FOR U-BEAMS

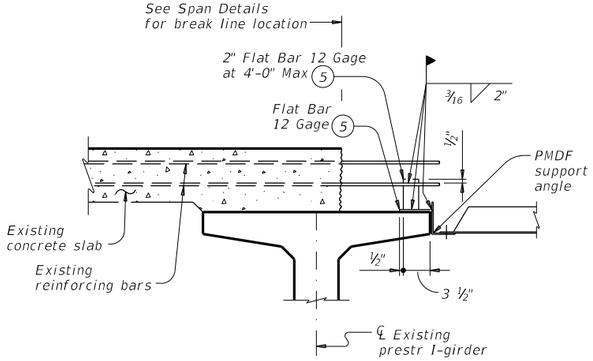


AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS

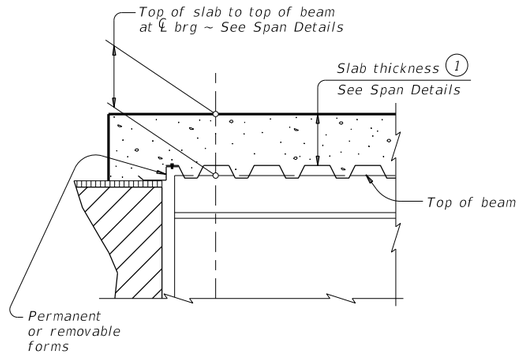
Showing I-beam block-out. No block-out for I-girders or steel beams.



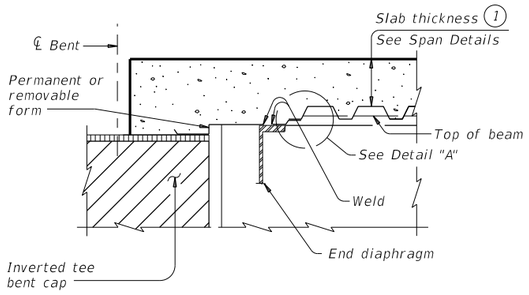
SECTION A-A



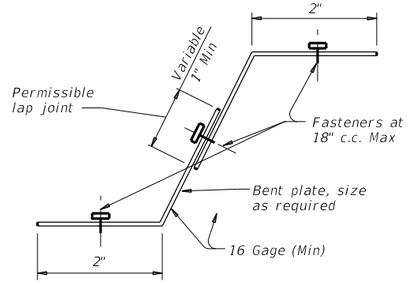
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



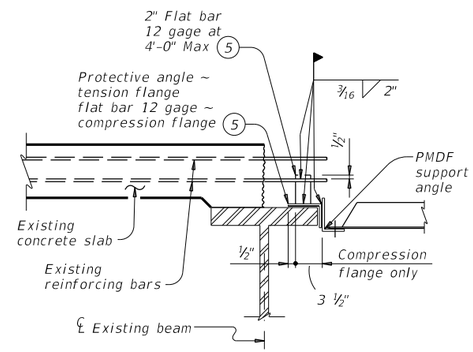
AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END



AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END

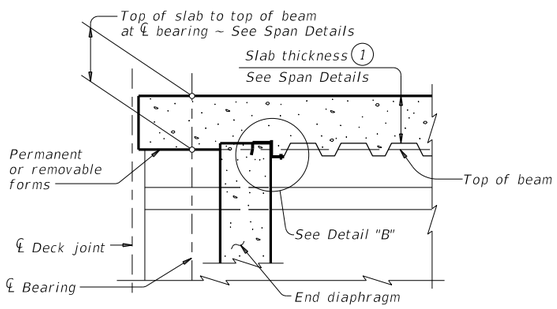


DETAIL "A"

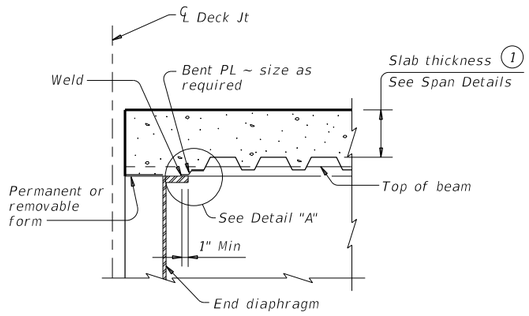


SHOWING STEEL BEAMS

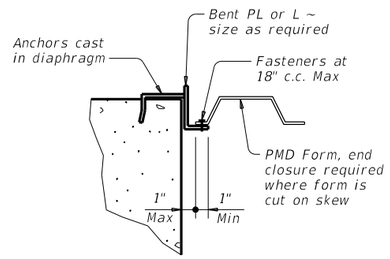
WIDENING DETAILS



AT CONC END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS



AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END



DETAIL "B"

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars

(5) Minimum yield stress of 12 gage bars shall be 40 ksi

DETAILS AT ENDS OF BEAMS

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

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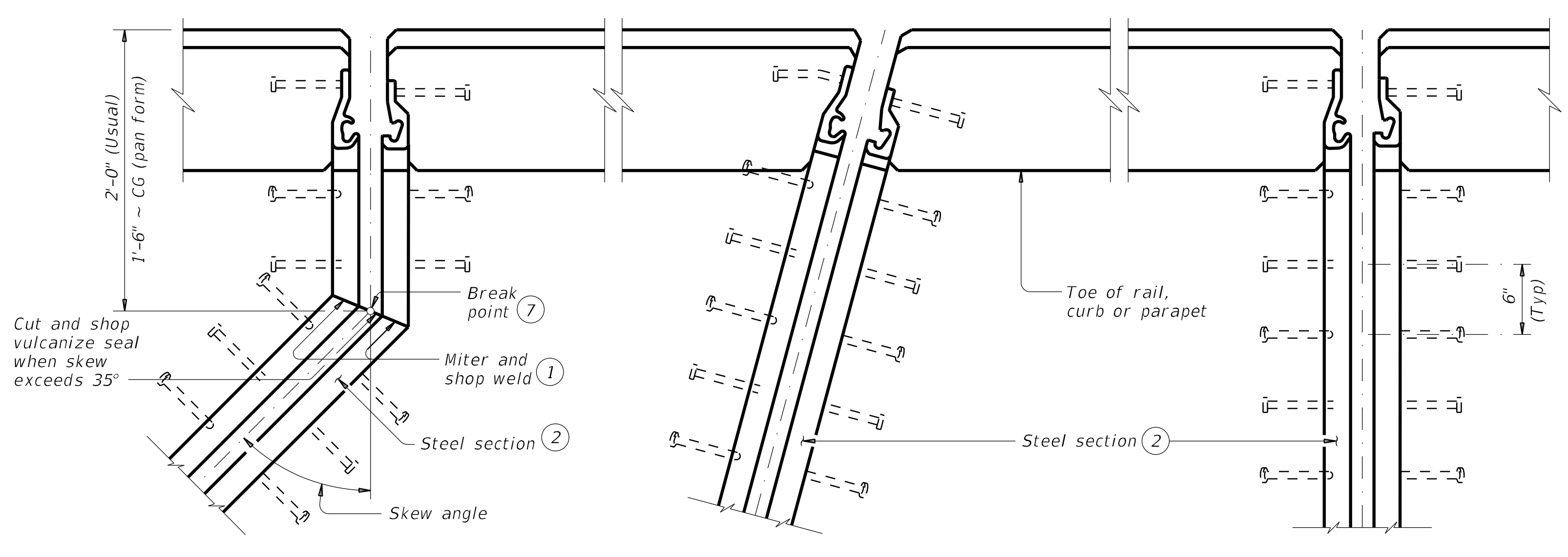
12-21: Updated max deflection for RR.	HOU	BRAZORIA		156

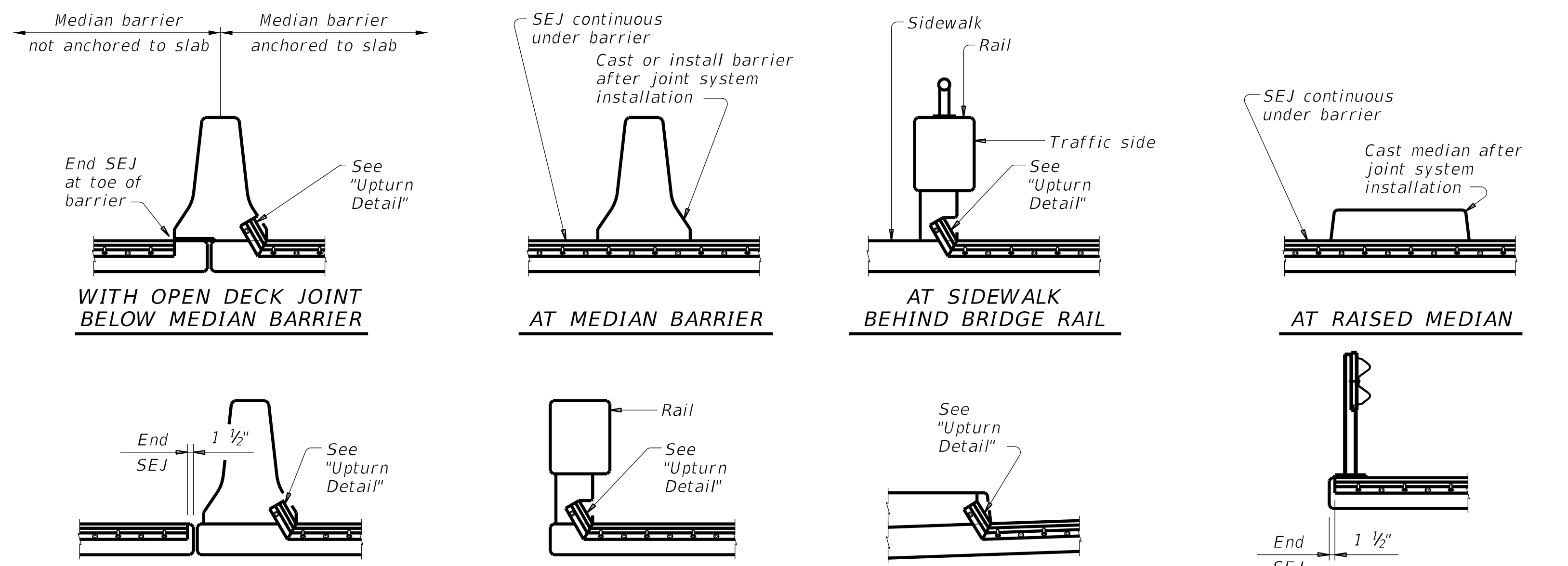


SHOWING SKEWS WITH SLAB BREAKBACKS

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

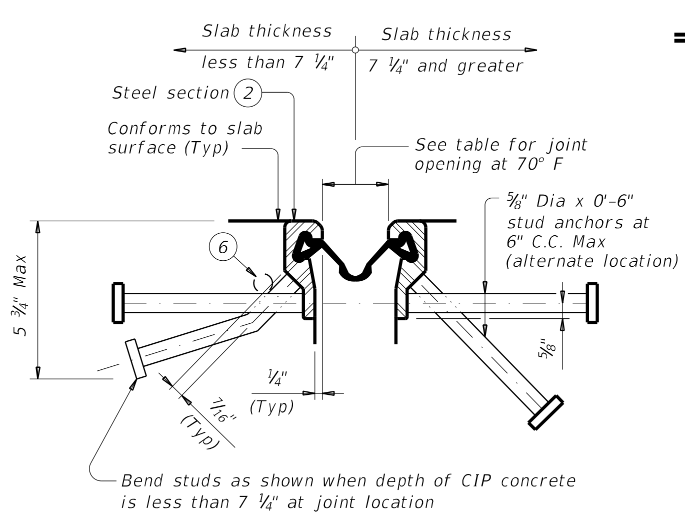
WITH OPEN DECK JOINT ADJACENT TO MEDIAN BARRIER

AT CONCRETE BRIDGE RAIL

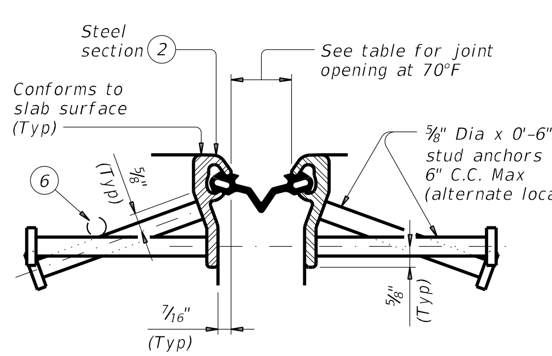
AT SIDEWALK

AT STEEL POST BRIDGE RAIL

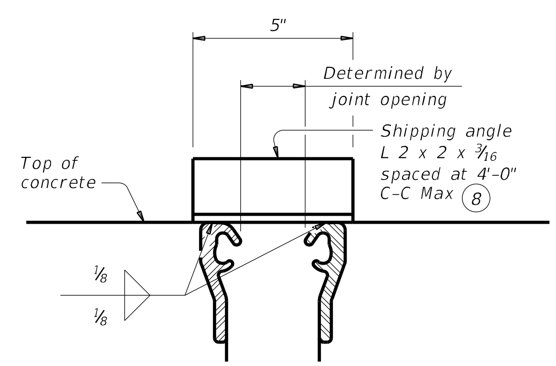
TYPICAL SECTIONS 5



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"

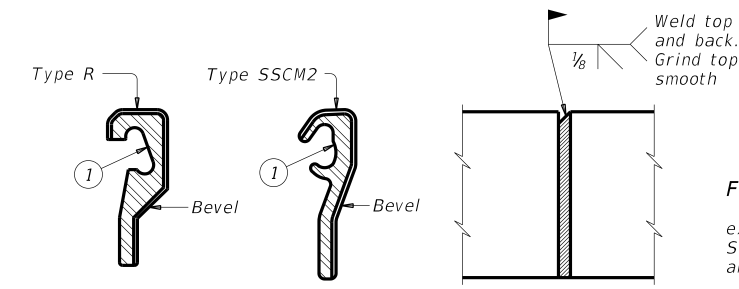
REDUCED LONGITUDINAL MOVEMENT RANGE

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.

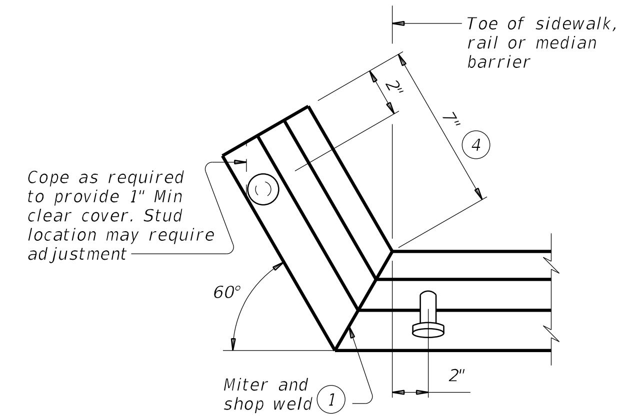


WELD LIMITS

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, "Field 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

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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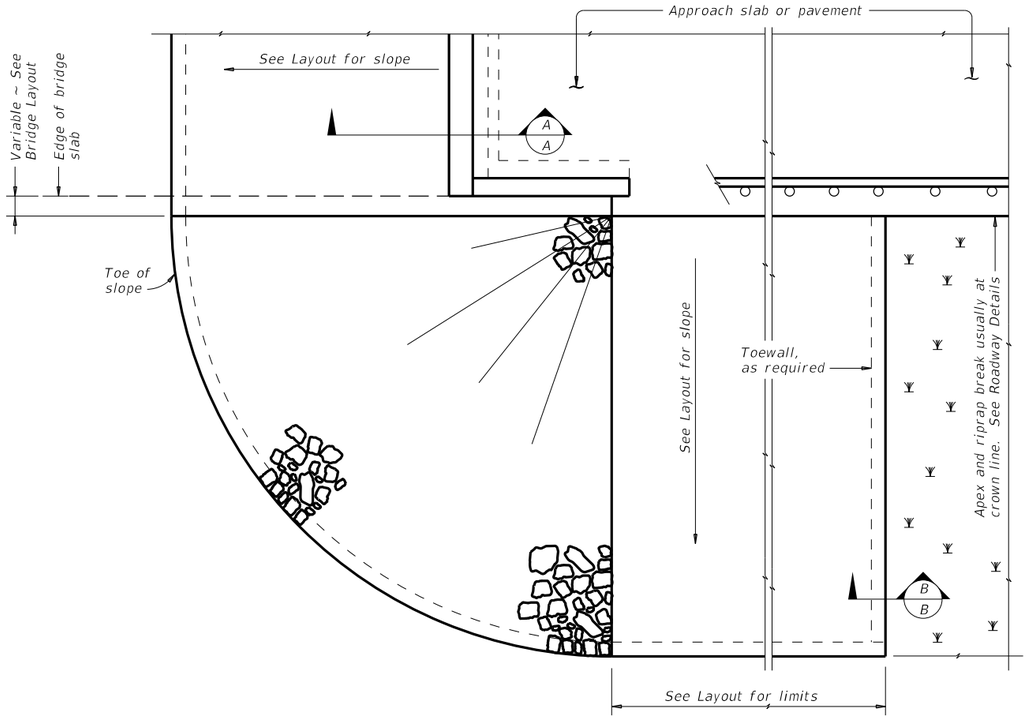
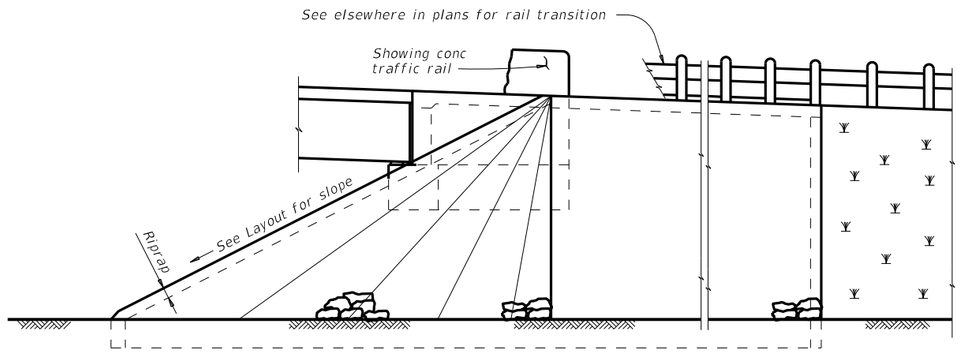
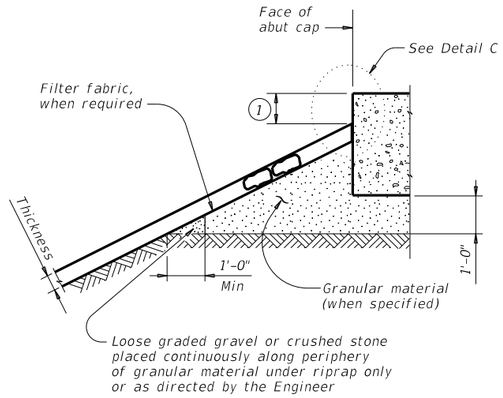


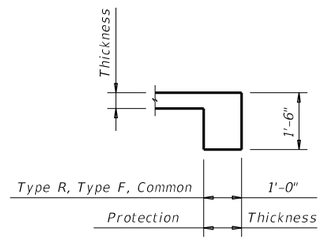
PLAN



ELEVATION

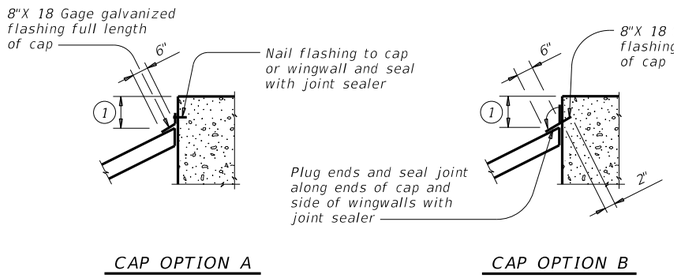


SECTION A-A AT CAP



SECTION B-B

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



CAP OPTION A

CAP OPTION B

DETAIL C

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

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

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

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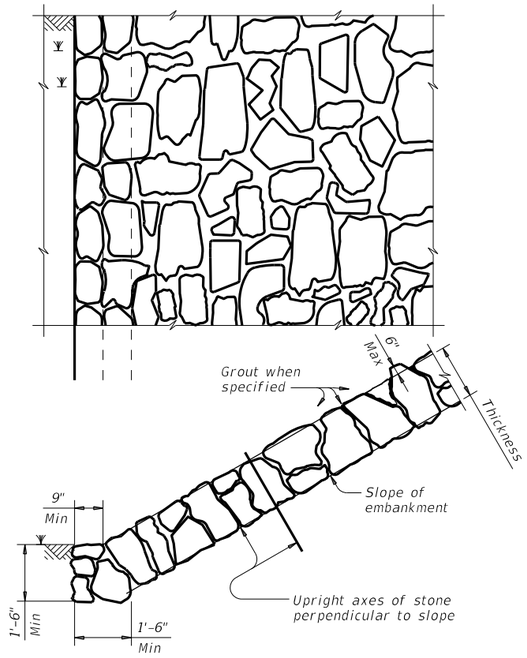


FIGURE 1 ~ TYPE R STONE RIPRAP
dry or grouted

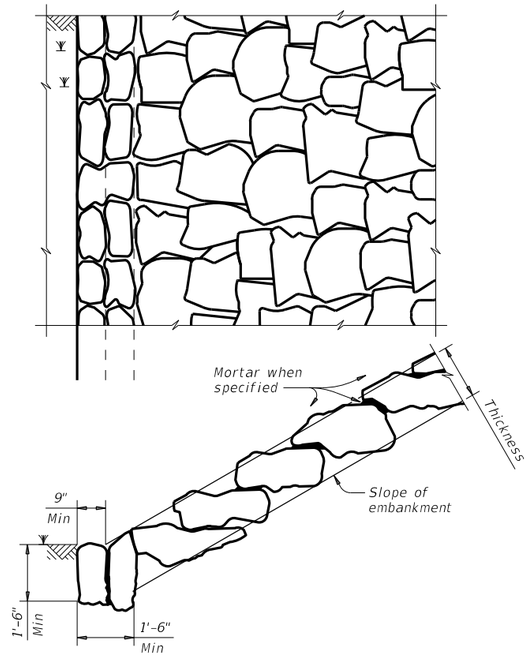


FIGURE 2 ~ TYPE F STONE RIPRAP
dry or mortared

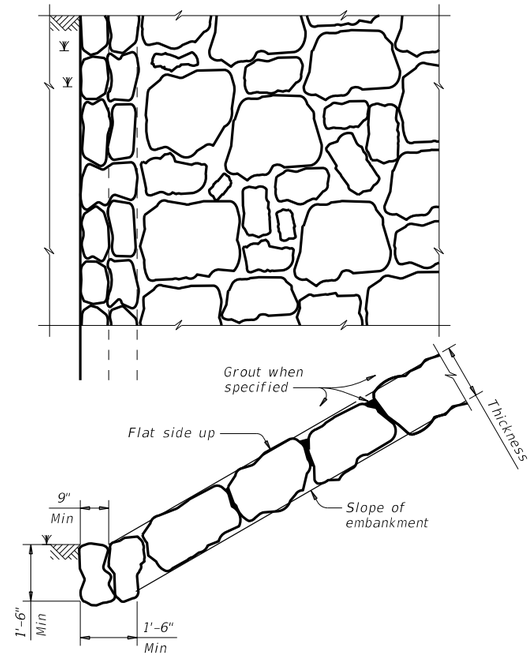


FIGURE 3 ~ TYPE F STONE RIPRAP
grouted

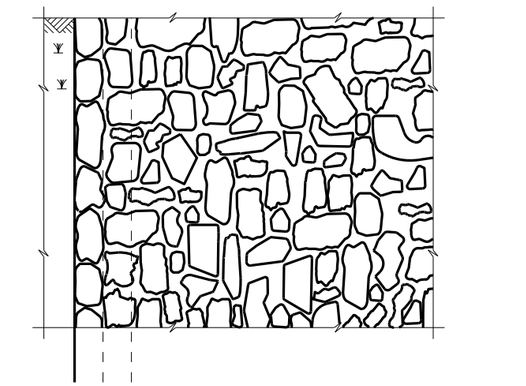


FIGURE 4 ~ COMMON STONE RIPRAP
dry or grouted

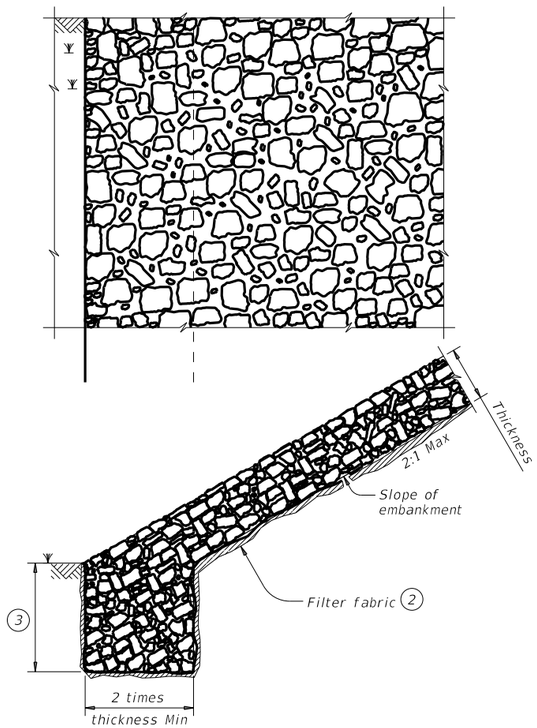


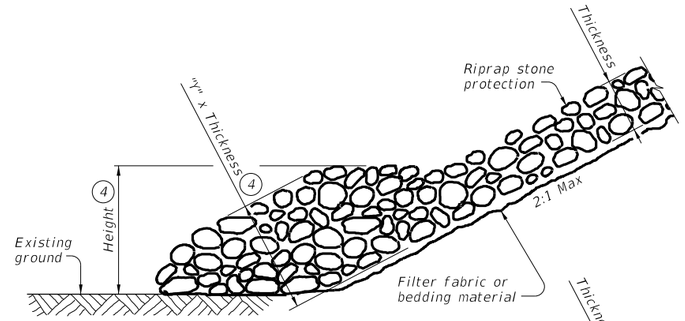
FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

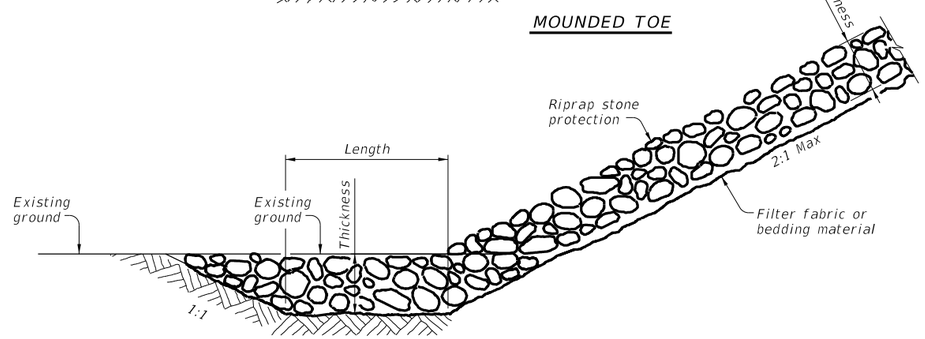
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(4) "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

(5) List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

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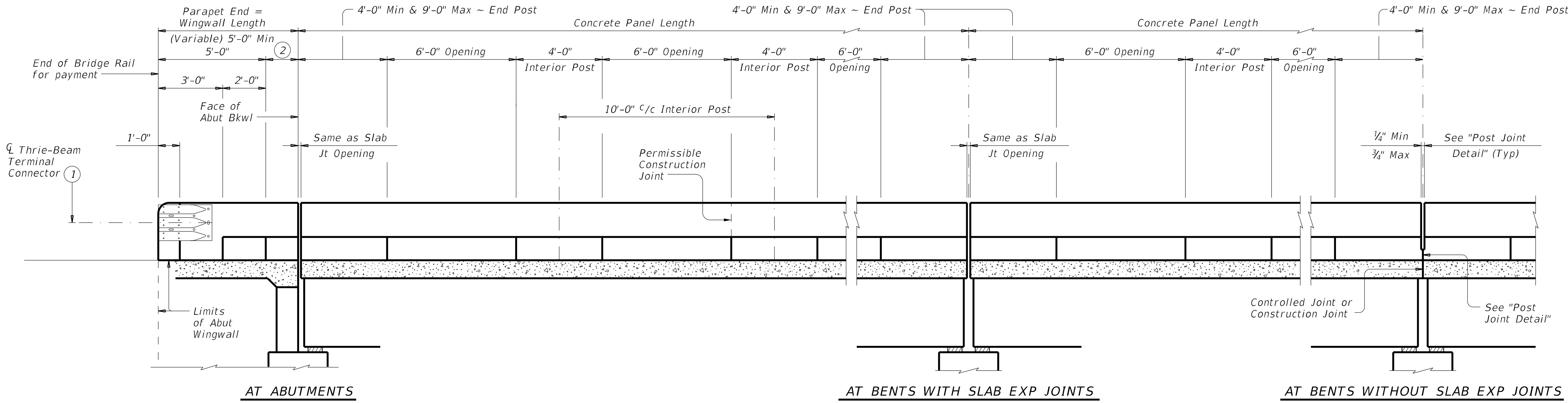
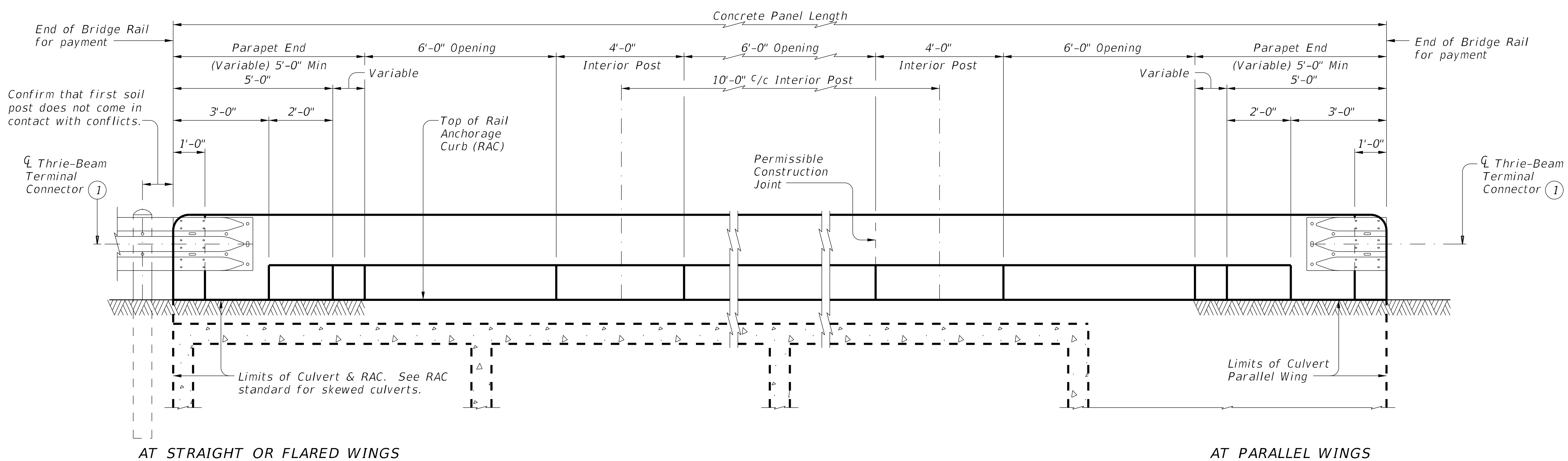


ROADWAY ELEVATION OF RAIL ON BRIDGE



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)

DATE: 5/11/2023 2:10:57 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\295001008\4 Design\Bridge\Bridge Standards\rlstd005-19.dgn

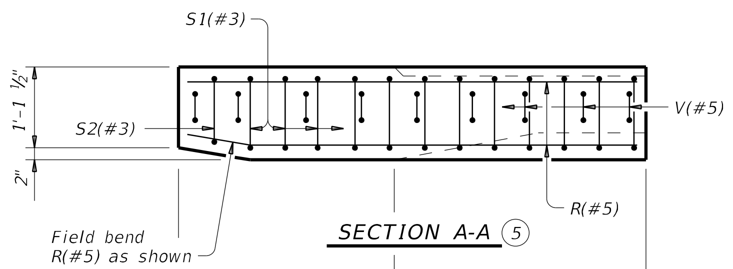
SHEET 1 OF 3

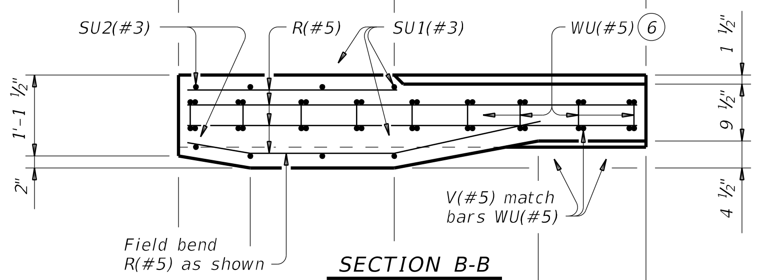
Texas Department of Transportation | Bridge Division Standard

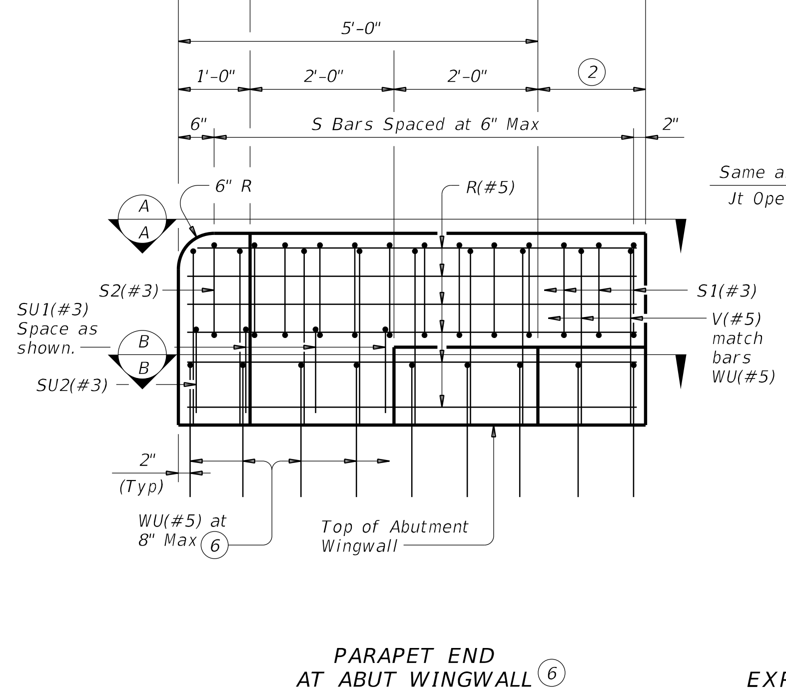
TRAFFIC RAIL

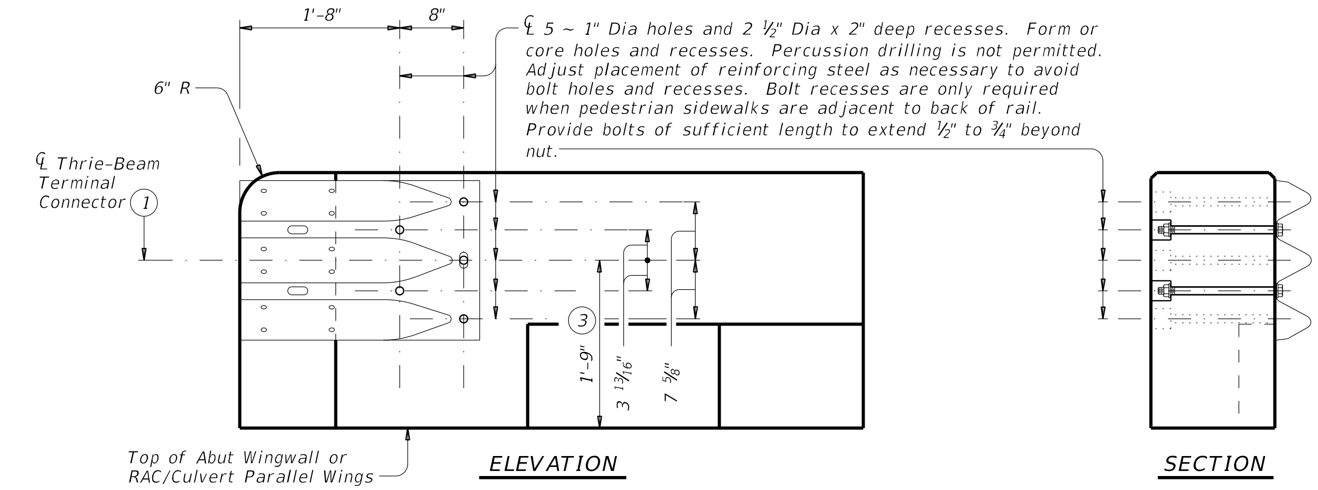
TYPE T223

FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST		COUNTY	SHEET NO.
	HOU		BRAZORIA	160

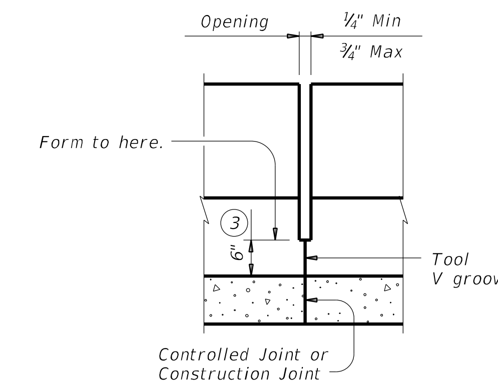






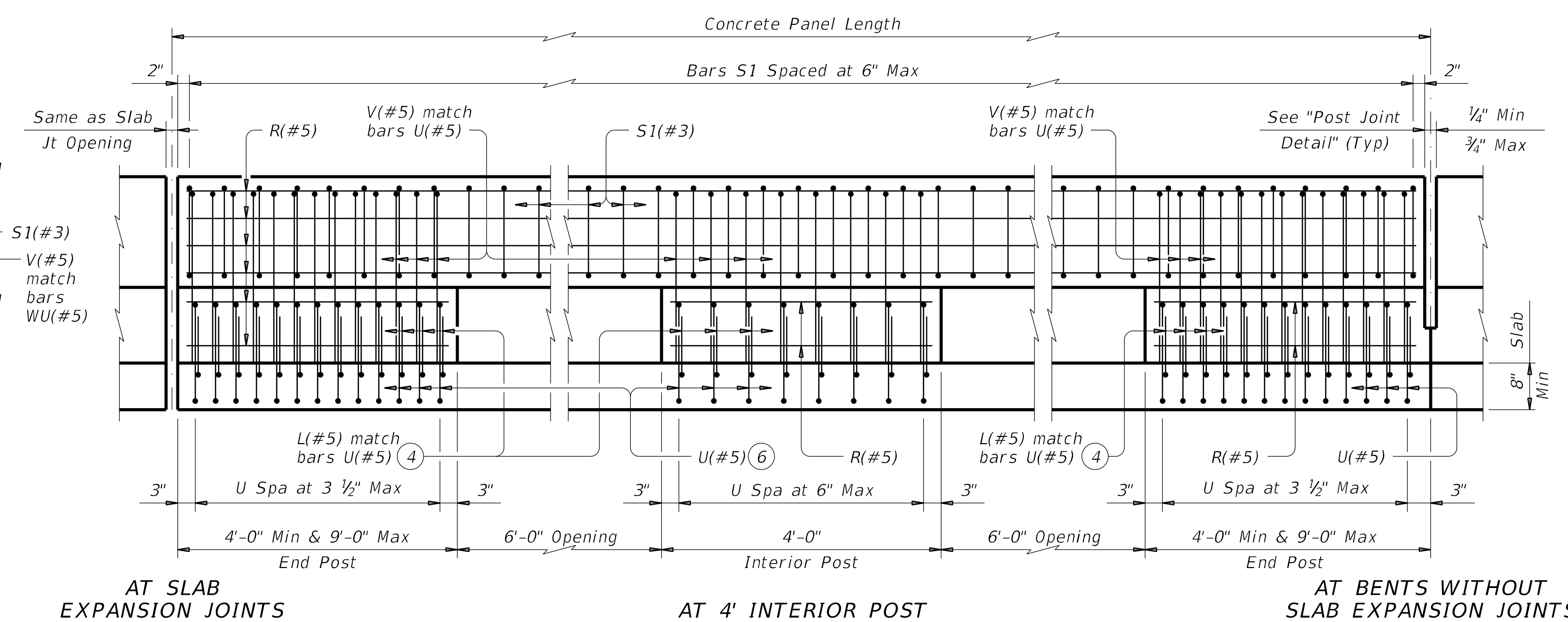


TERMINAL CONNECTION DETAILS



POST JOINT DETAIL

Provide at all interior bents without slab expansion joints.



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab. Rail on box culvert similar.

(1) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.

(2) Wingwall Length minus 5'-0" (Varies)

(3) Increase 2" for structures with overlay.

(4) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(5) Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.

(6) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on achorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

DATE: 5/11/2023 2:10:58 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\29500108\4 ... rlstd005-19.dgn

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T223

FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST		COUNTY	SHEET NO.
	HOU		BRAZORIA	161

DATE: 5/11/2023 2:10:59 PM
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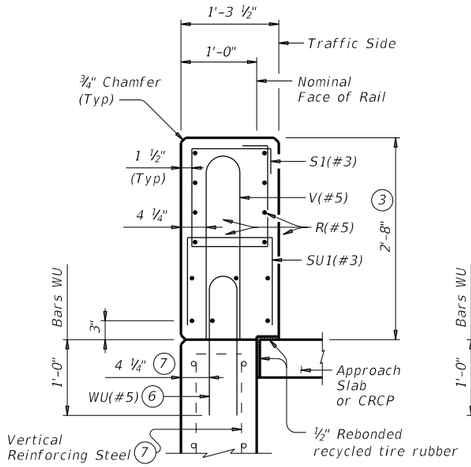
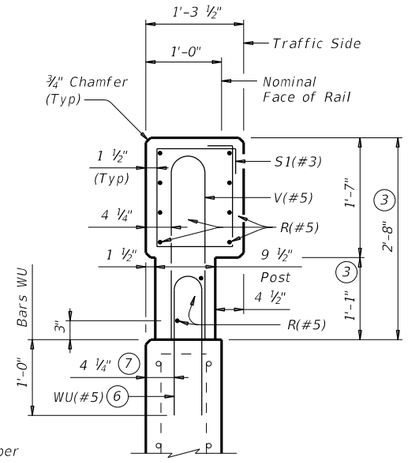
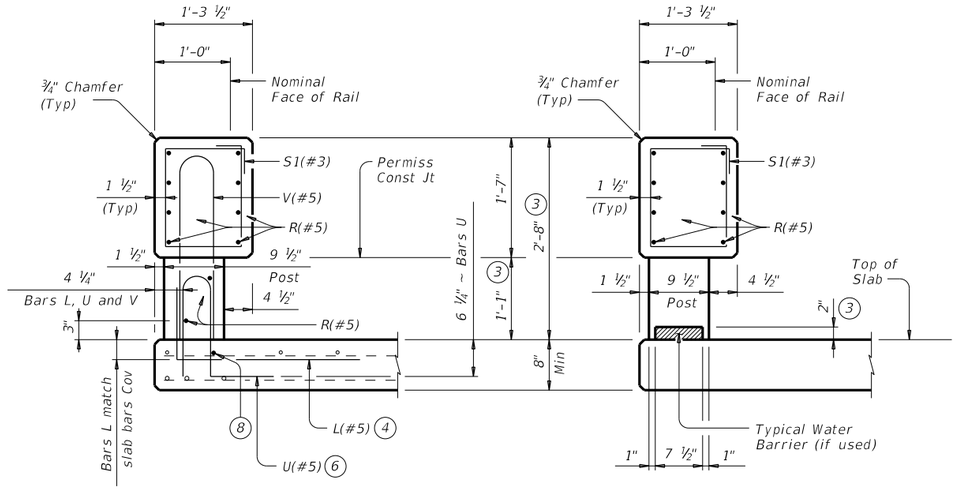


SECTION C-C
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

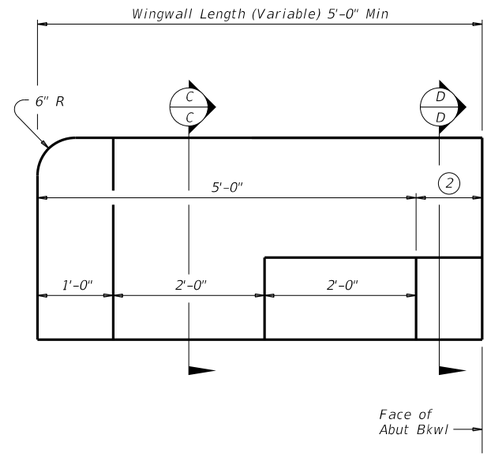


AT POST
ON BRIDGE SLAB

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.*

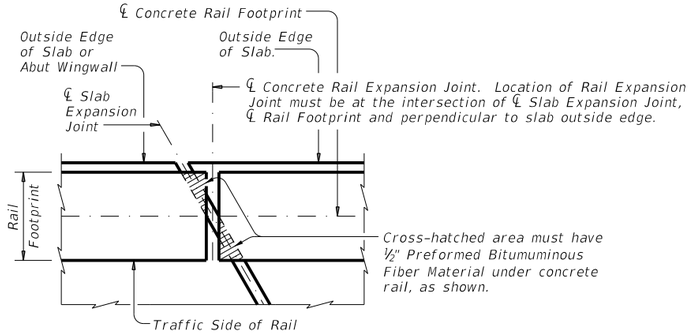
(4) *Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.*

(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.

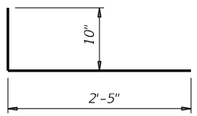
Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

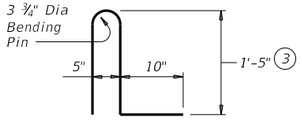
Shop drawings are not required for this rail.

Average weight of railing with no overlay is 358 plf.

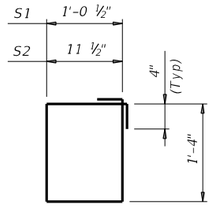
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



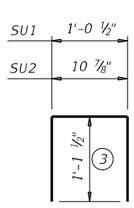
BARS L (#5)



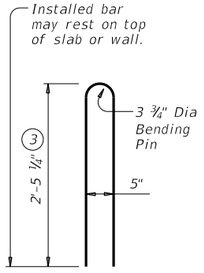
BARS U (#5) (9)



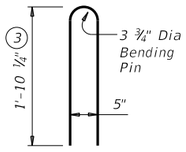
BARS S (#3)



BARS SU (#3)



BARS V (#5) (9)



BARS WU (#5)

SHEET 3 OF 3

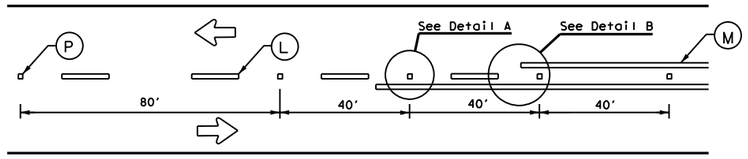
Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T223

FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, ETC	FM 2403
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		162



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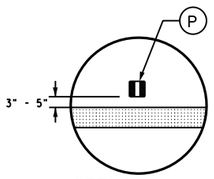

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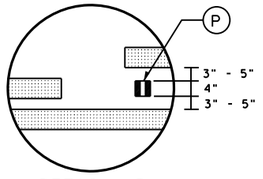

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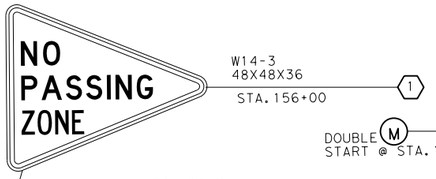


W14-3
48X48X36
STA. 156+00
1

DOUBLE
START @ STA. 160+40
M

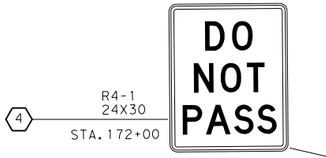
MATCH WITH
EXISTING PAVEMENT MARKING
AT STA. 156+97.43

DETAIL "C"

W8-13aT
36X36
STA. 169+50
X5 2

W11-1
36X36

W16-1P
24X30
STA. 171+00
X4 3



R4-1
24X30
STA. 172+00
4

MATCH WITH
EXISTING PAVEMENT MARKING
AT STA. 171+39.83

TOTAL 3432'
M

@40'
P

1446'
N

PT 162+38.78

PC 165+40.70

PRC 168+49.56

PT 171+39.83

N 3° 37' 29.06" E

160+00

170+00

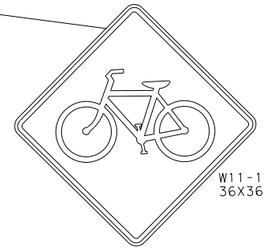
PC 156+97.43

PRC 159+77.90

M START ON THE RIGHT @FM 2403
@ STA. 156+97.43

W5-2
36X36
STA. 155+25
X1

R4-1
24X30
STA. 156+00
5



W11-1
36X36

W16-1P
24X30
STA. 157+50
6 X2

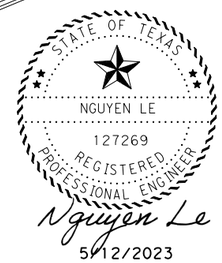
N
1441'

W8-13aT
36X36
STA. 159+00
7 X3

W14-3
48X48X36
STA. 172+00
8

LEGEND:

- (L) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)
- (M) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)
- (N) REF PROF PAV MRK TY I (W)(6")(SLD)(090MIL)
- (P) REFL PAV MRKR TY-II-A-A
- DIRECTION OF TRAVEL
- PROPOSED SMALL SIGN
- (X-) REMOVED SMALL SIGN



TEXAS DEPARTMENT OF TRANSPORTATION

SIGNING & PAVEMENT MARKING LAYOUT FM 2403

SCALE: 1" : 100'

SHEET 2 OF 2

ORIGINAL DRAWING DATE: MARCH, 2023	STATE DISTRICT	FEDERAL REGION	PROJECT NO			SHEET
REVISIONS	HOU	6				163
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY
	BRAZORIA		2950	01	008 etc	FM 2403

DATE: 3/31/2023
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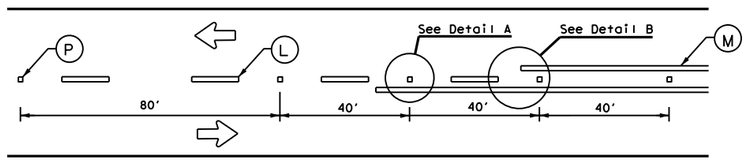

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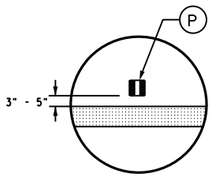

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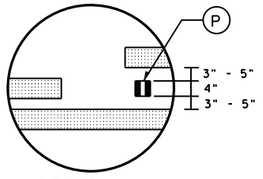

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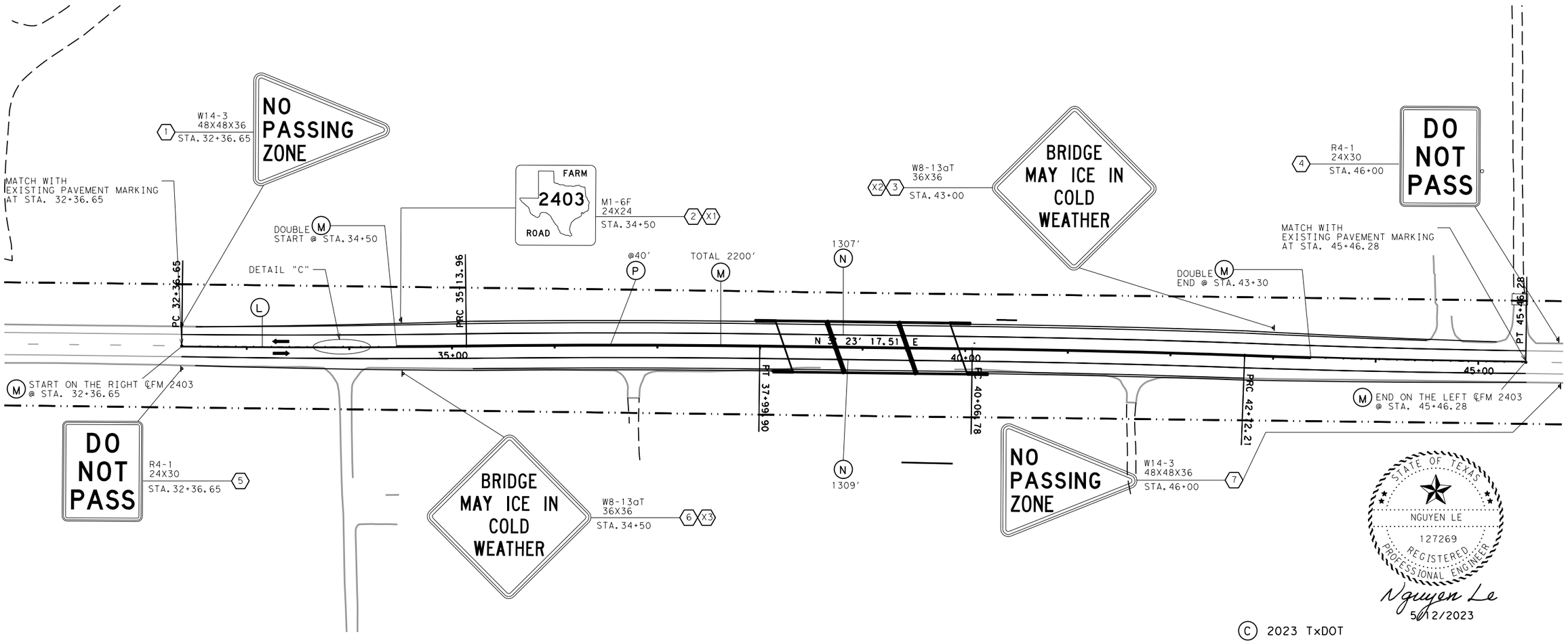

LEGEND:

- (L) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)
- (M) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)
- (N) REF PROF PAV MRK TY I (W)(6")(SLD)(090MIL)
- (P) REFL PAV MRKR TY-II-A-A
- DIRECTION OF TRAVEL
- PROPOSED SMALL SIGN
- (X-) REMOVED SMALL SIGN

STATE OF TEXAS
NGUYEN LE
127269
REGISTERED PROFESSIONAL ENGINEER
Nguyen Le
5/12/2023

TEXAS DEPARTMENT OF TRANSPORTATION

SIGNING & PAVEMENT MARKING LAYOUT FM 2403

SCALE: 1" : 100'

SHEET 1 OF 2

ORIGINAL DRAWING DATE: MARCH, 2023	STATE DISTRICT	FEDERAL REGION	PROJECT NO	SHEET
DN.: - REVISIONS	HOU	6		164
CK.: -	COUNTY	CONTROL	SECTION	JOB	HIGHWAY
DR.: -	BRAZORIA	2950	01	008 etc	FM 2403
CK.: -					

DATE: 3/31/2023
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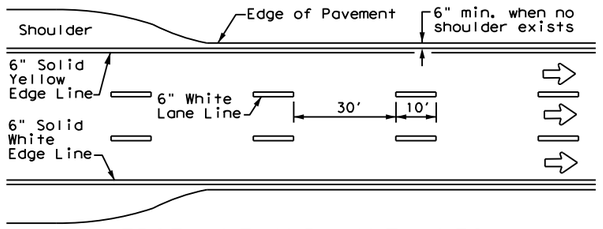
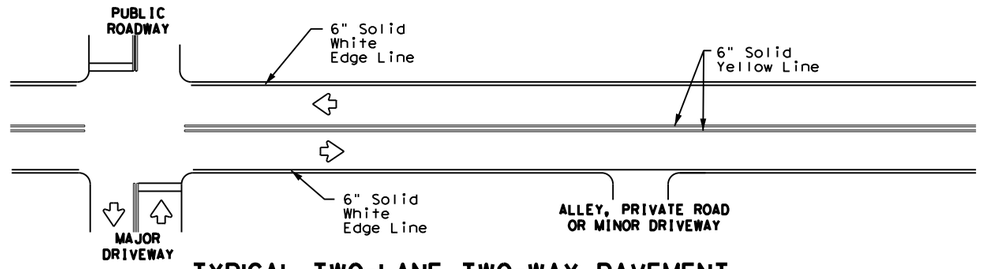
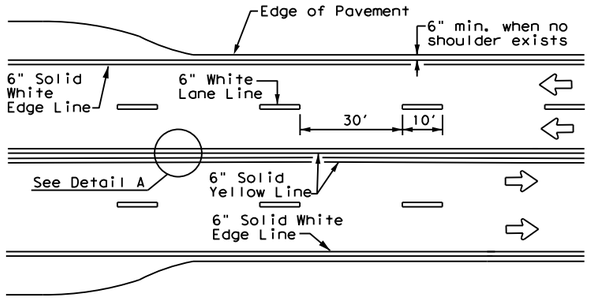
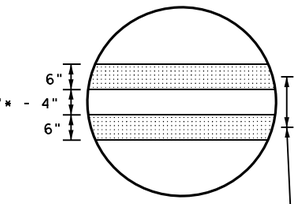


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

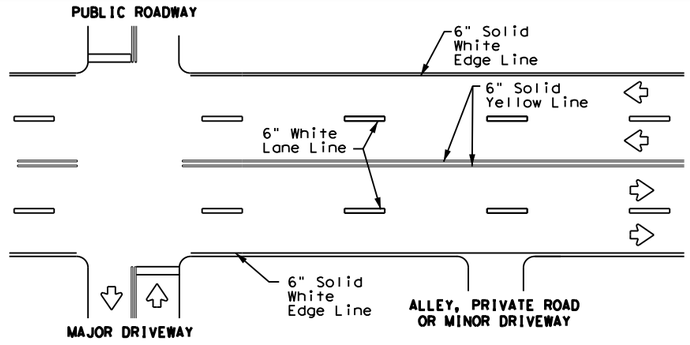




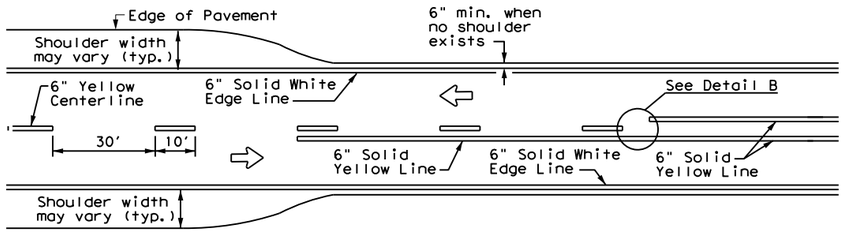
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.

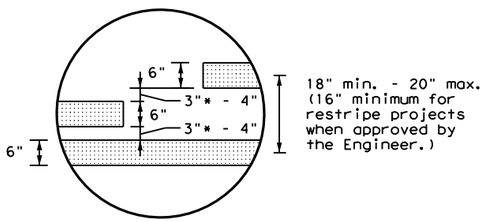
** 8" minimum for restripe projects when approved by the Engineer.



TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

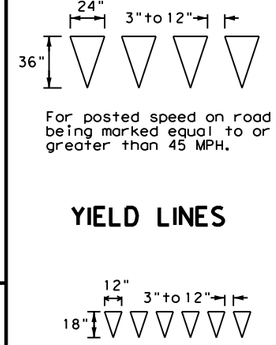


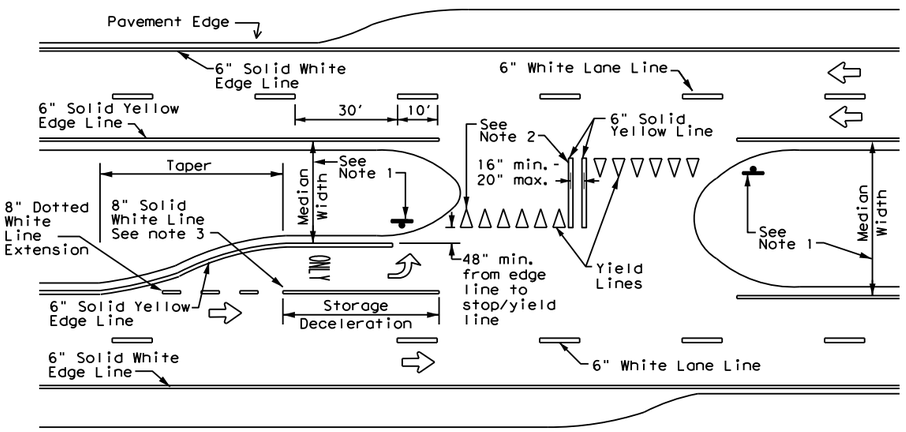
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.





FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections.
   Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
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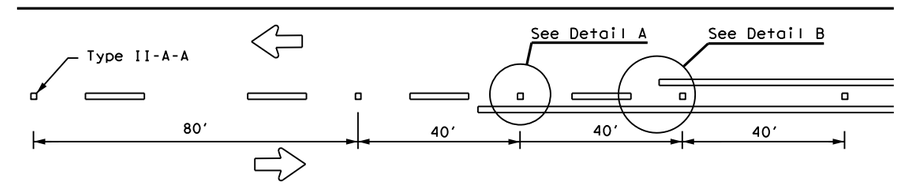
REVISIONS 11-78 8-00 6-20	2950	01	008, ect	FM 2403
8-95 3-03 12-22	DIST	COUNTY		SHEET NO.
5-00 2-12	HOU	BRAZORIA		165

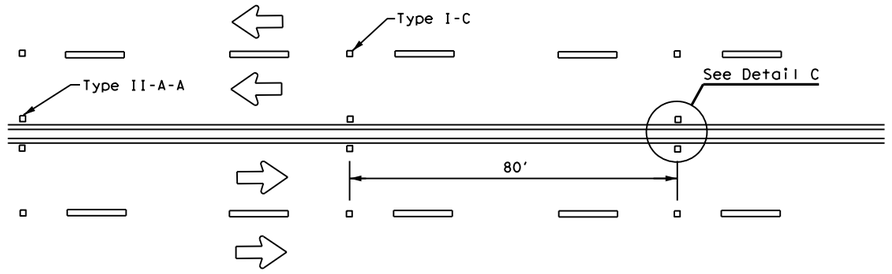
22A

DATE:
FILE:

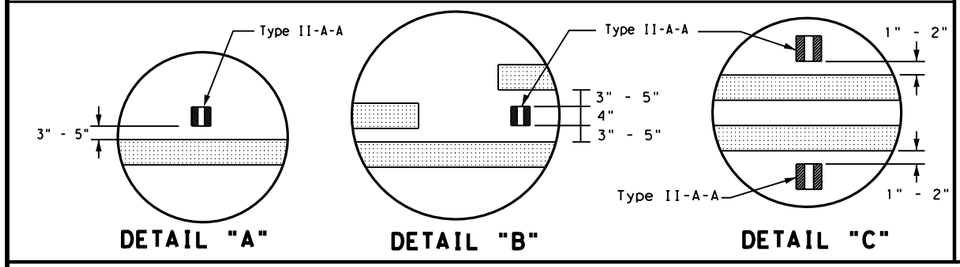
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

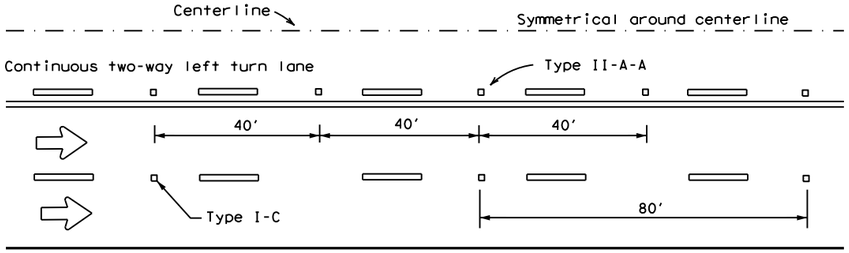


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

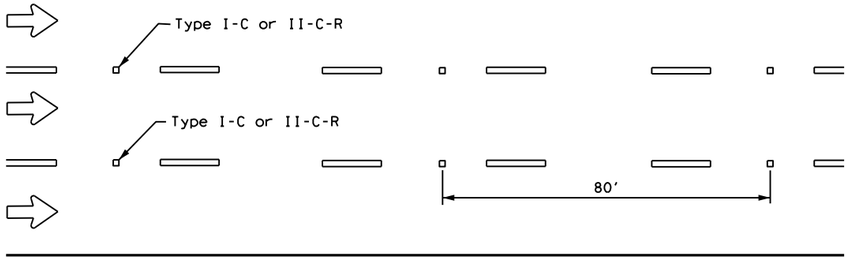


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





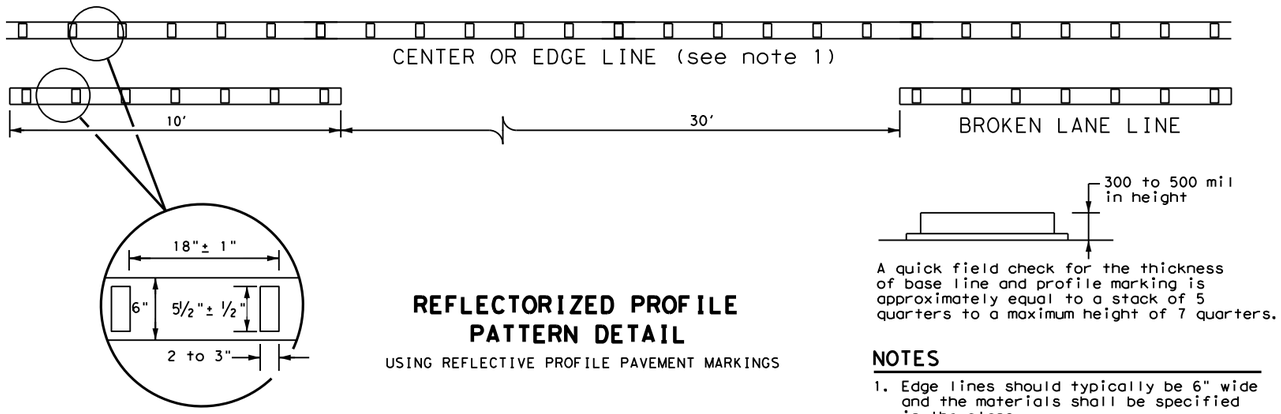
CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

See Note 3.



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

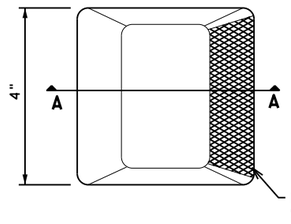
1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

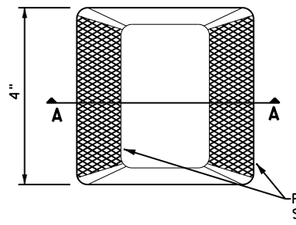
1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

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

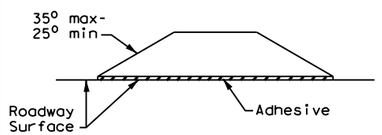
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



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)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
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REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	2950	01	008, ect	FM 2403
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	HOU	BRAZORIA		166

22B

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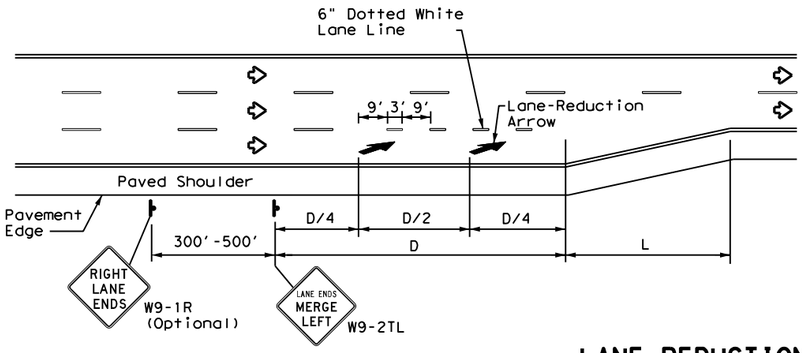
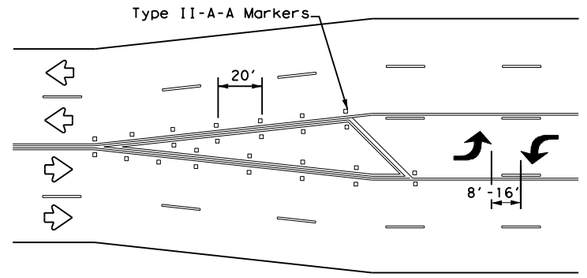


LANE REDUCTION

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 RIGHT LANE ENDS (W9-1R) 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.

ADVANCED WARNING SIGN DISTANCE (D)		
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	



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.

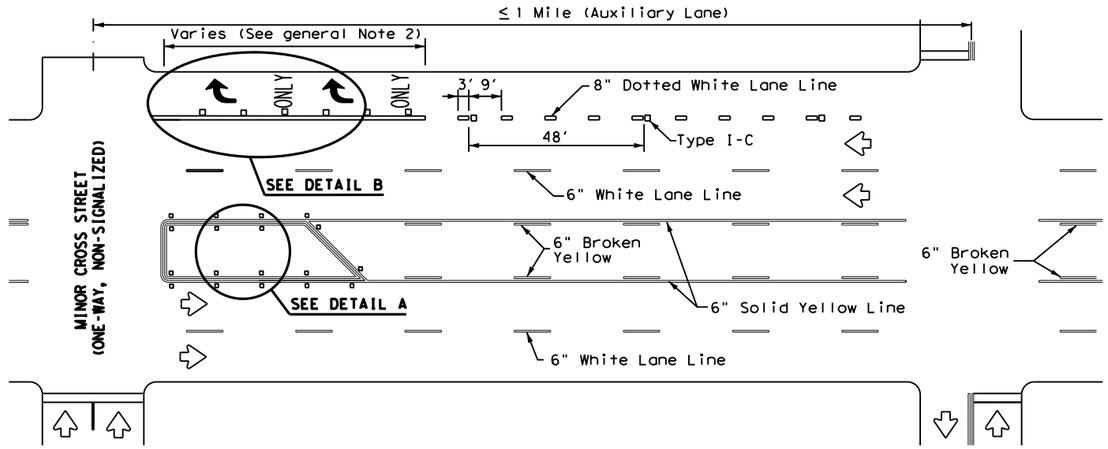
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

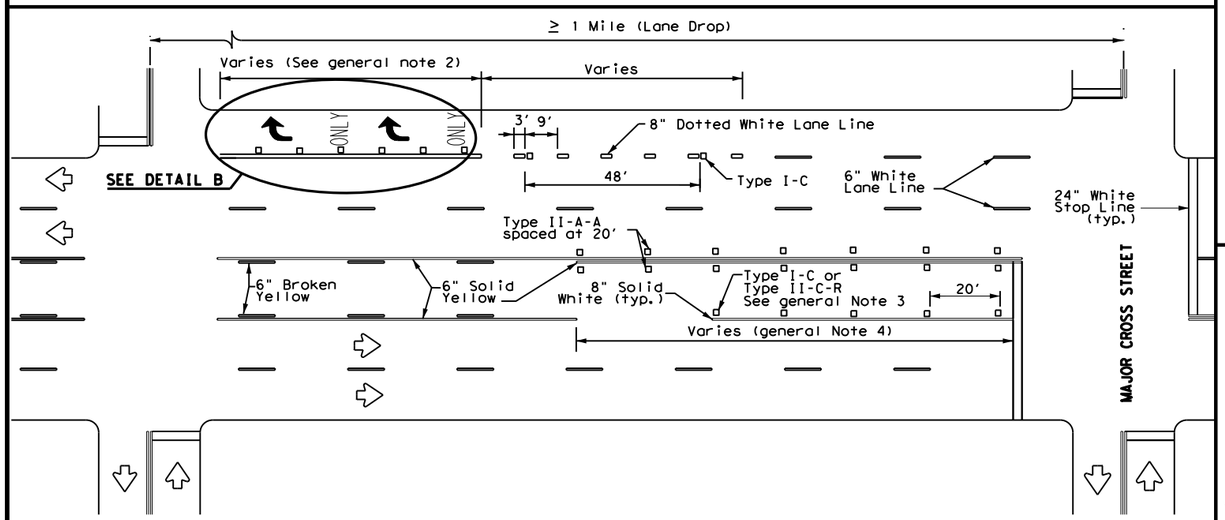
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn 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. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

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

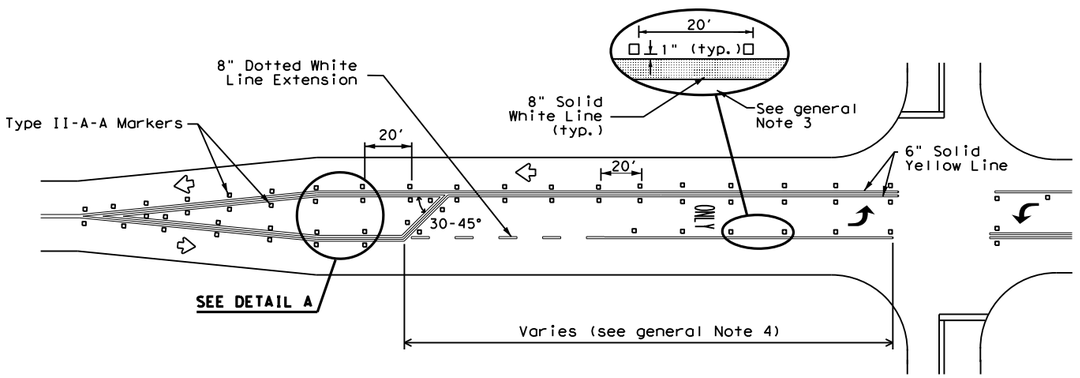
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



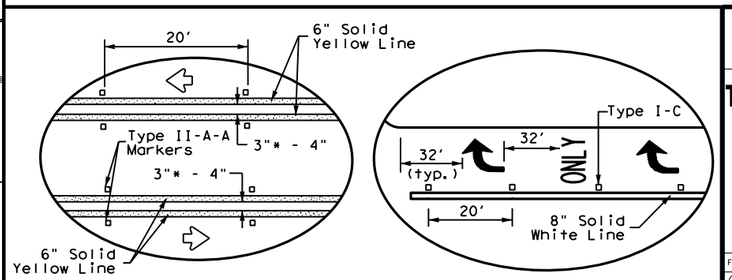
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-22

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
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REVISIONS 4-98 3-03 6-20 5-00 2-10 12-22 8-00 2-12	2950	01	008, etc	FM 2403
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	HOU	BRAZORIA		167

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

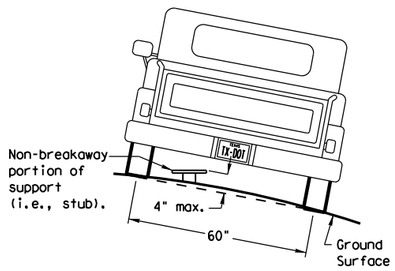
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

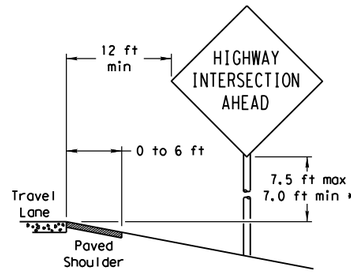
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

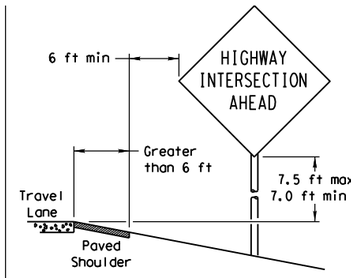
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

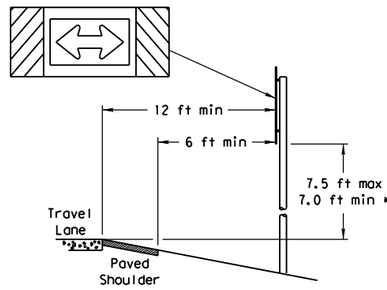
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



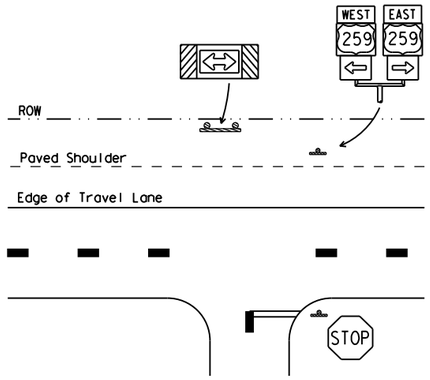
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

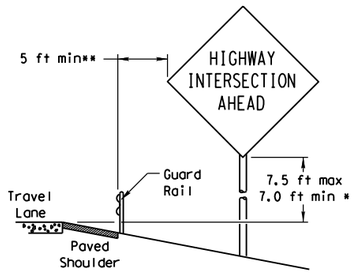
T-INTERSECTION



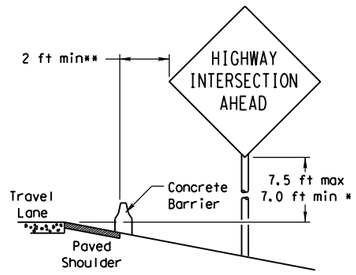
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

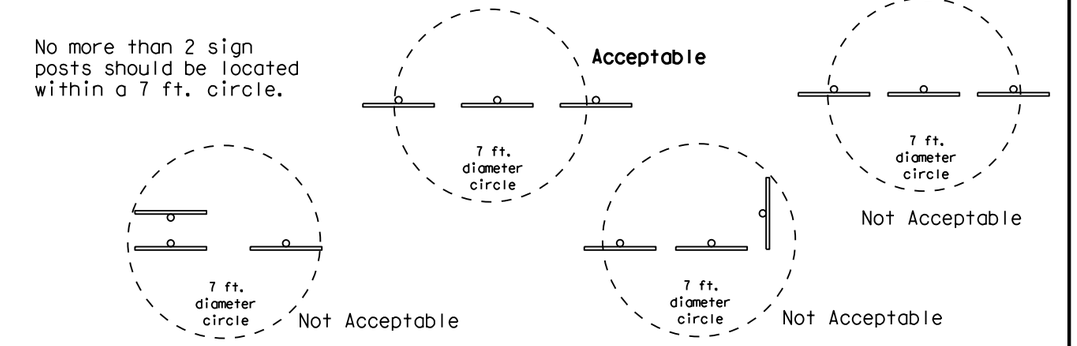
(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

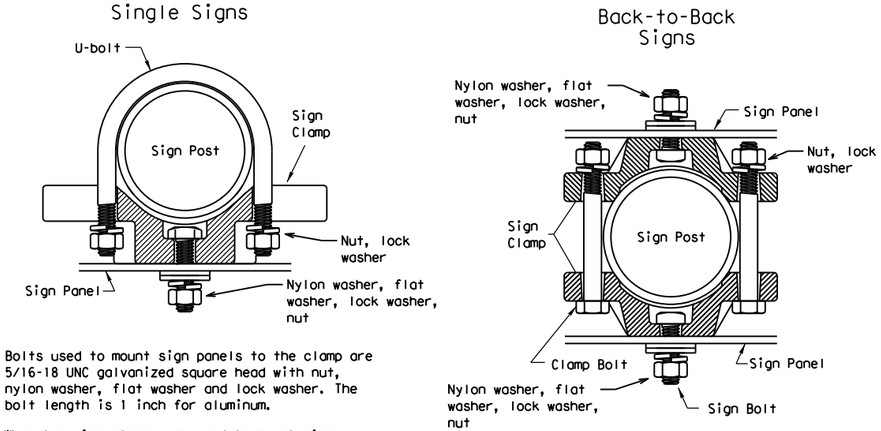
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm



TYPICAL SIGN ATTACHMENT DETAIL



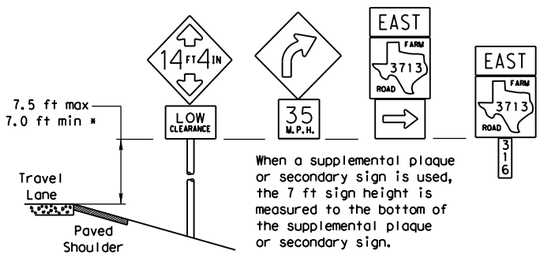
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

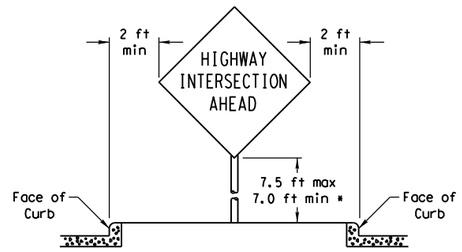
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



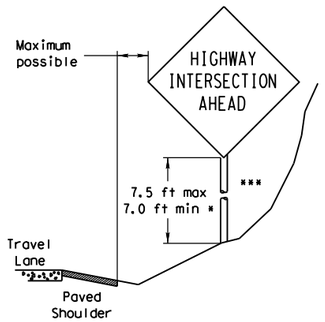
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		168

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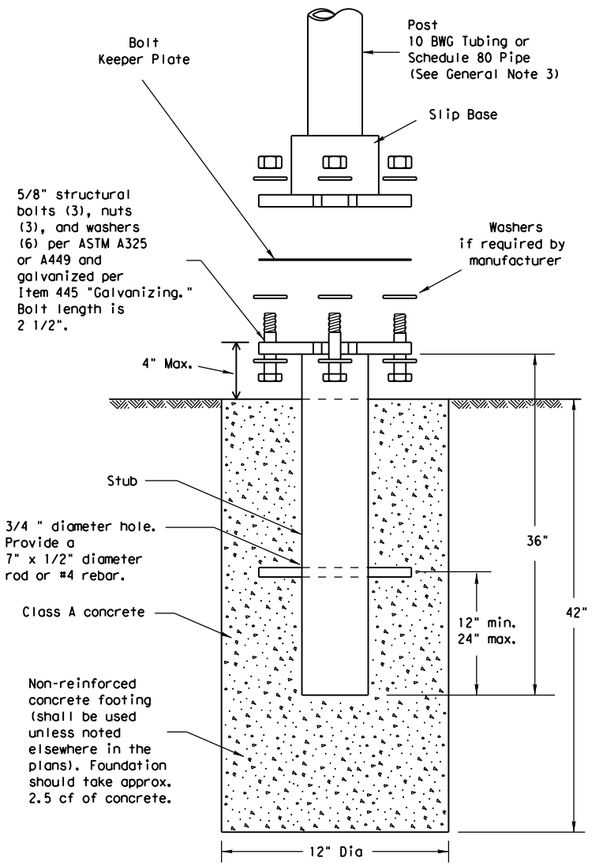
FILE:

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.

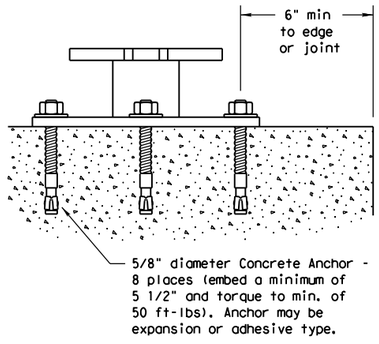
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

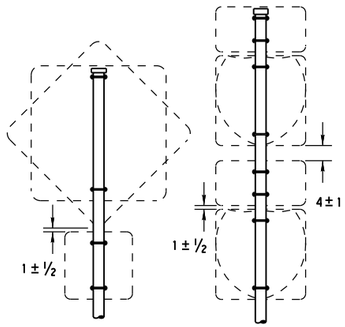
SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS 9-08			

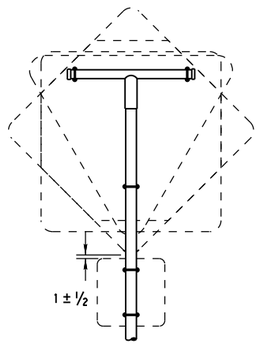
CONT	SECT	JOB	HIGHWAY
2950	01	008, etc	FM 2403
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		169

DATE:
FILE:

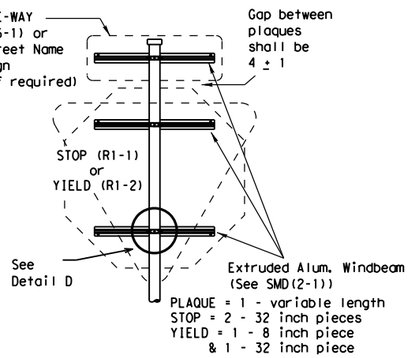
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



SM RD SGN ASSM TY XXXXX(1)XX(P)

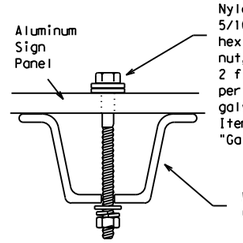


SM RD SGN ASSM TY XXXXX(1)XX(T)



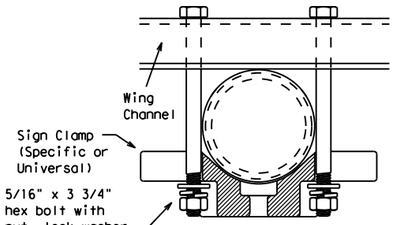
PLAQUE = 1 - variable length
STOP = 2 - 32 inch pieces
YIELD = 1 - 8 inch piece
& 1 - 32 inch piece

SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



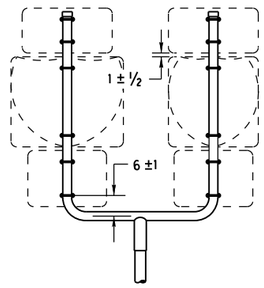
Top View

Detail A

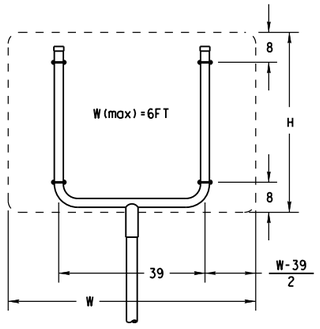


Top View

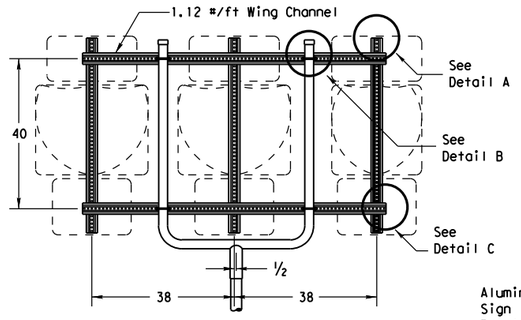
Detail B



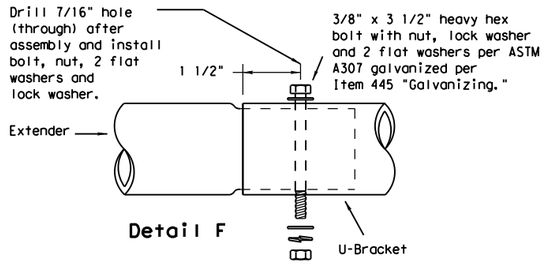
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

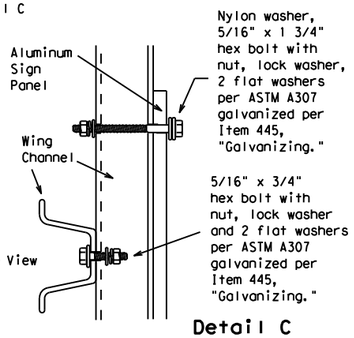


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

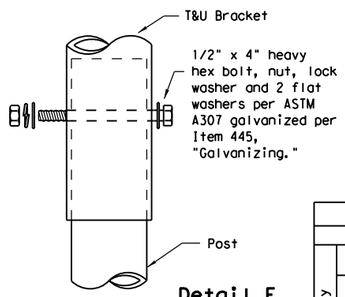


Detail F

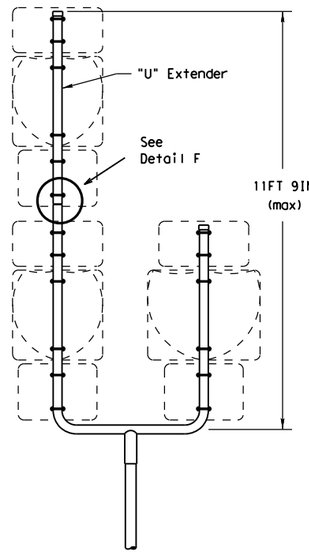
Splices shall only be allowed behind the sign substrate.



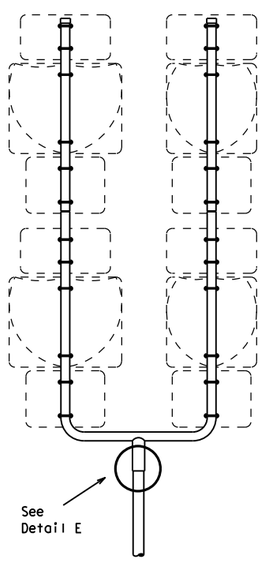
Detail C



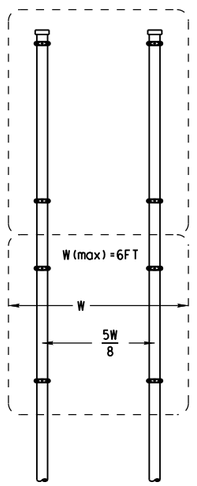
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

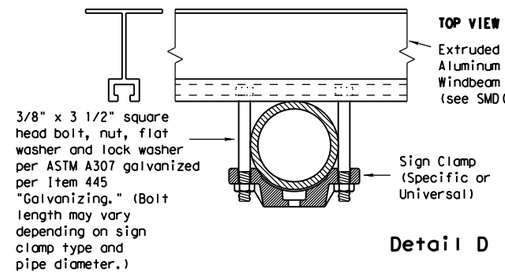


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

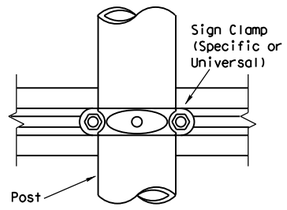


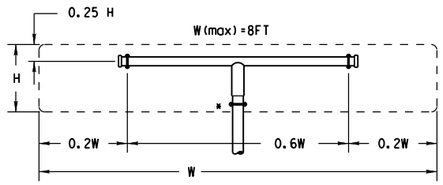
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

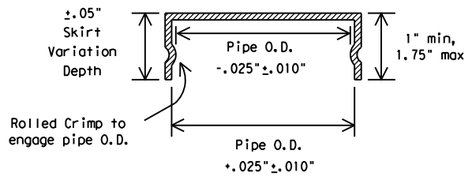




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

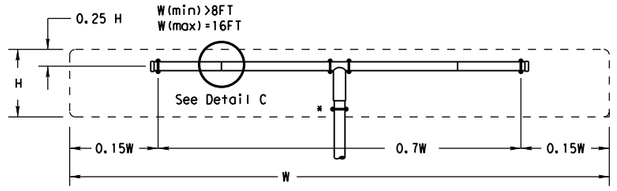
CONT	SECT	JOB	HIGHWAY
2950	01	008, etc	FM 2403

DIST	COUNTY	SHEET NO.
HOU	BRAZORIA	170

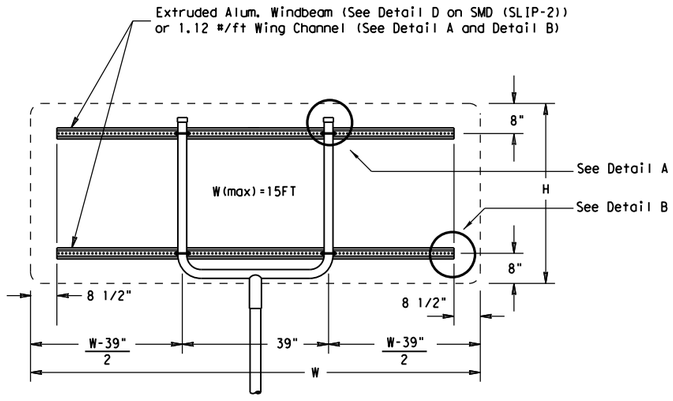
9-08 REVISIONS

DATE:
FILE:

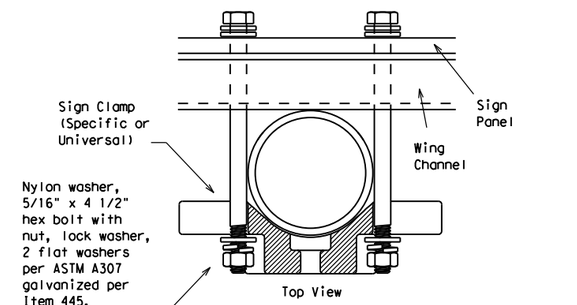
DATE:
FILE:



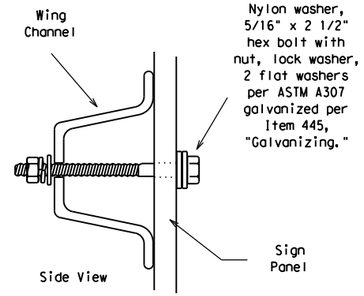
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



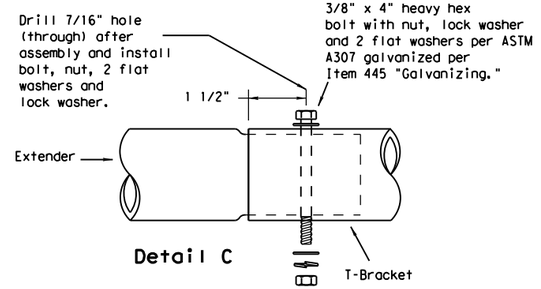
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Detail A

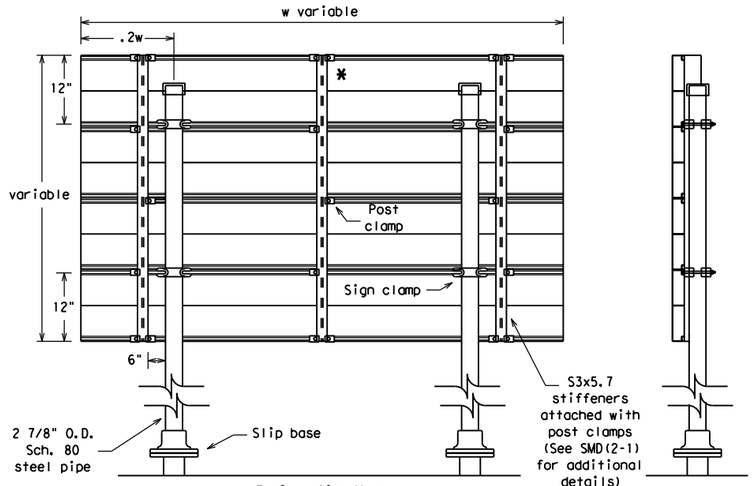


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

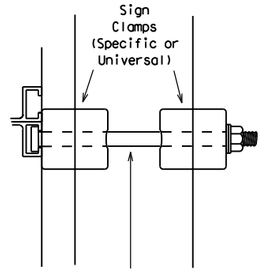


Typical Sign Mount

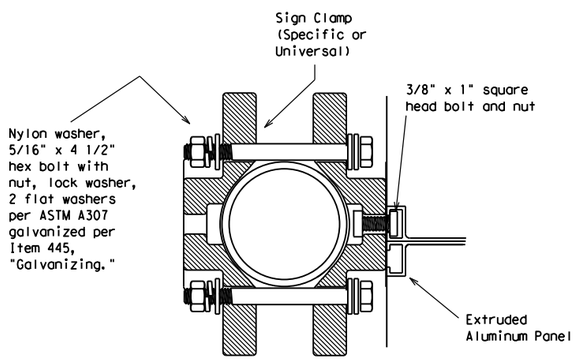
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

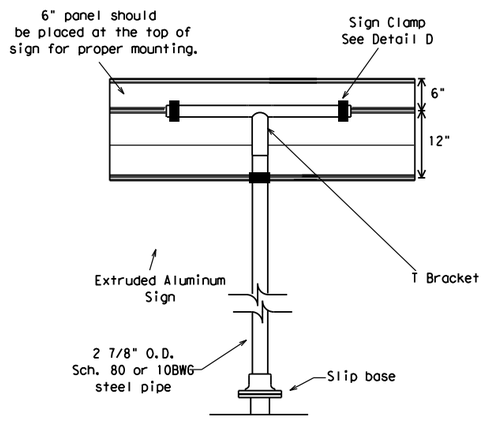
See Detail E
for clamp installation



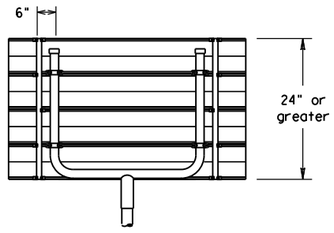
Detail E



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

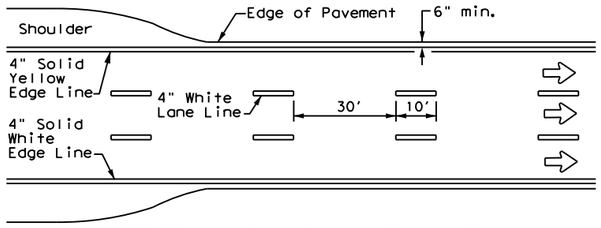
SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

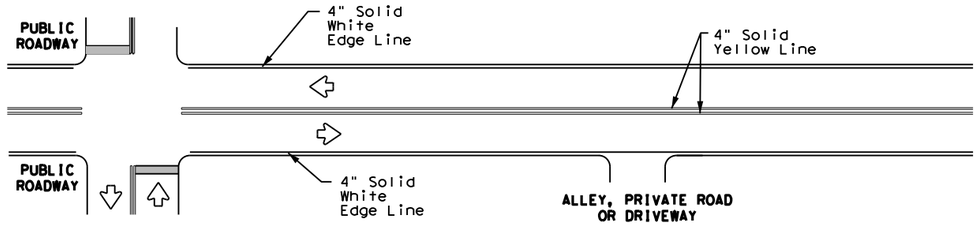
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

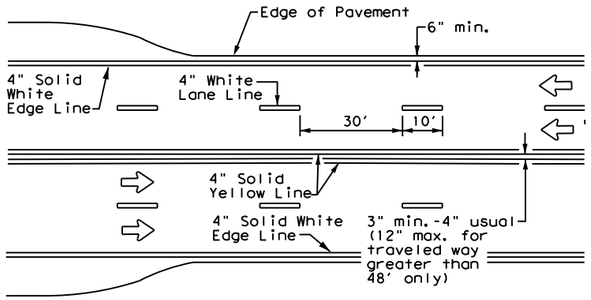
CONT	SECT	JOB	HIGHWAY
2950	01	008, etc	FM 2403
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		171



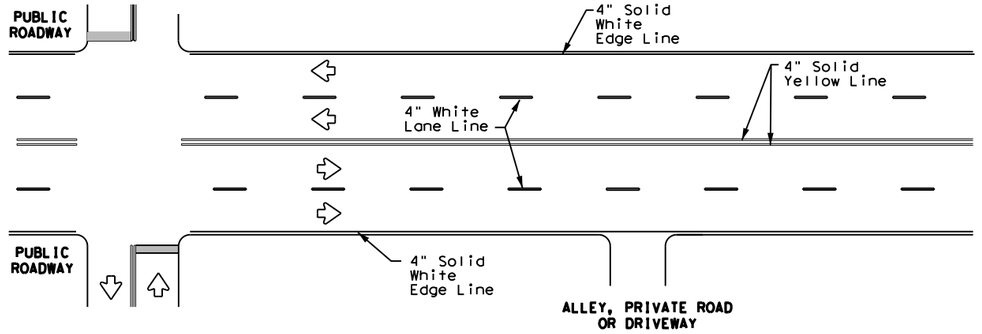
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



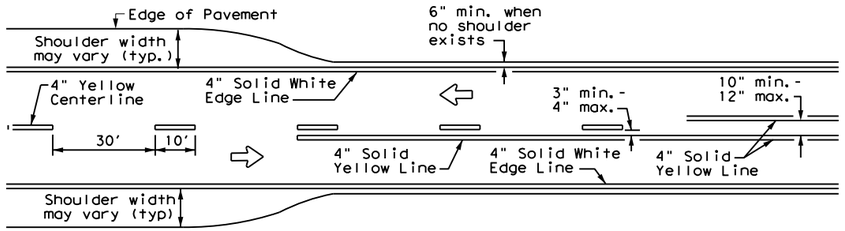
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



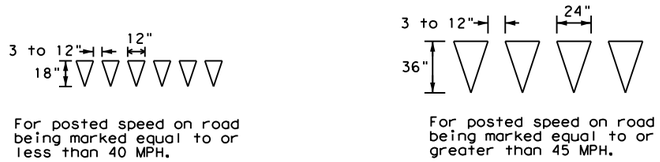
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



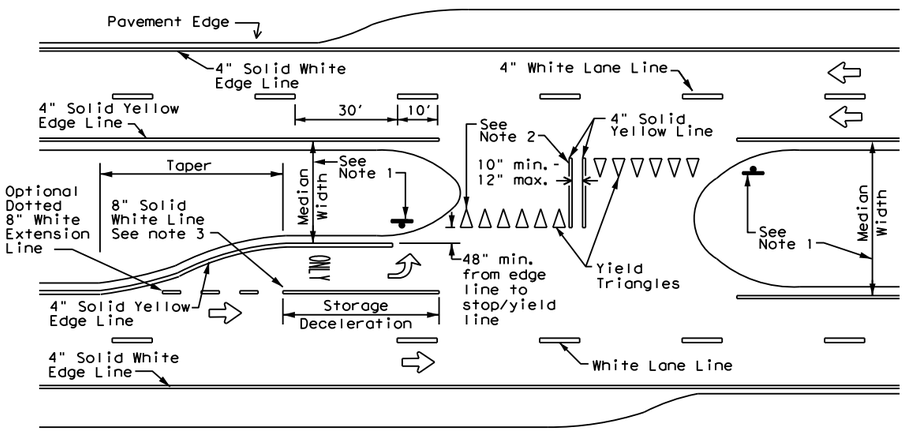
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTE:

Irrespective of shoulder, use 6in width lines (edge lines).

Use 4 in. width lines (edge and lane lines) when lane width is 10 ft. or less; and 6 in. width lines when lane width is greater than 10 ft.

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.

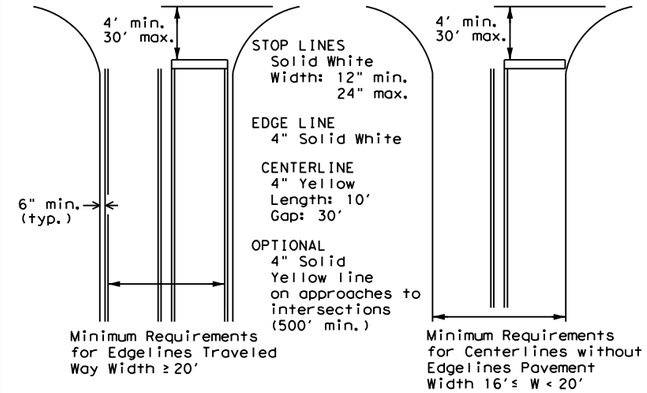
GENERAL NOTES

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
HOUSTON DISTRICT STANDARD

TYPICAL STANDARD PAVEMENT MARKINGS

PM-20

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
8-95 2-12
5-00 8-16
8-00 7-20
3-03

CONT	SECT	JOB	HIGHWAY
2950	01	008, etc	FM 2403
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		172

DATE:
FILE:

STD N-5a

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
2950-01-008, ETC

1.2 PROJECT LIMITS:
From: AT DRAINAGE DITCH

To:

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 29°19'59.6"N ,(Long) 95°15'30.8"W

END: (Lat) ,(Long)

1.4 TOTAL PROJECT AREA (Acres): 7.66

1.5 TOTAL AREA TO BE DISTURBED (Acres): 2.57

1.6 NATURE OF CONSTRUCTION ACTIVITY:
REPLACE BRIDGES AND APPROACHES

1.7 MAJOR SOIL TYPES:

Soil Type	Description
BERNARD CLAY	LOAMY, LOW SLOPE
LAKE CHARLES	CLAY

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

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

Type	Sheet #s

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

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

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

1.10 POTENTIAL POLLUTANTS AND SOURCES:

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

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

Tributaries	Classified Waterbody
CHOCOLATE BAYOU ABOVE TIDAL	SEGMENT #1108

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

1.12 ROLES AND RESPONSIBILITIES: TxDOT

- ☒ Development of plans and specifications
- ☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- ☒ Post Construction Site Notice
- ☒ Submit NOI/CSN to local MS4
- ☒ Perform SWP3 inspections
- ☒ Maintain SWP3 records and update to reflect daily operations
- ☒ Complete and submit Notice of Termination to TCEQ
- ☒ Maintain SWP3 records for 3 years
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- ☒ Day To Day Operational Control
- ☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- ☒ Post Construction Site Notice
- ☒ Submit NOI/CSN to local MS4
- ☒ Maintain schedule of major construction activities
- ☒ Install, maintain and modify BMPs
- ☒ Complete and submit Notice of Termination to TCEQ
- ☒ Maintain SWP3 records for 3 years
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

5/19/2023

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			173
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	BRAZORIA	
CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008,ETC	FM 2403

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

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

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

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

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

2.2 SEDIMENT CONTROL BMPs:

T / P

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

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

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

T / P

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

2.3 PERMANENT CONTROLS:

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

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

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

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

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

2.5 POLLUTION PREVENTION MEASURES:

- ☐ Chemical Management
- ☐ Concrete and Materials Waste Management
- ☐ Debris and Trash Management
- ☐ Dust Control
- ☐ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

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

Type	Stationing	
	From	To

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

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

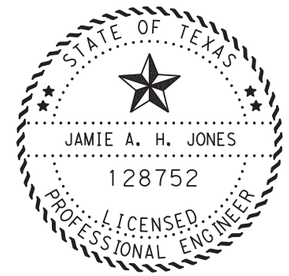
- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges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

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

2.9 MAINTENANCE:

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



Jamie A.H. Jones, P.E.

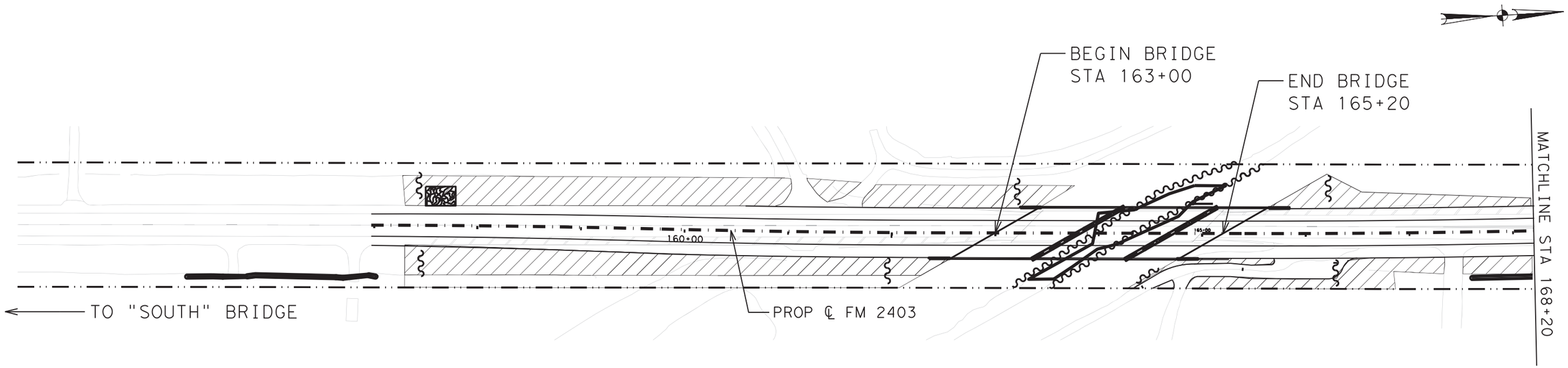
5/19/2023

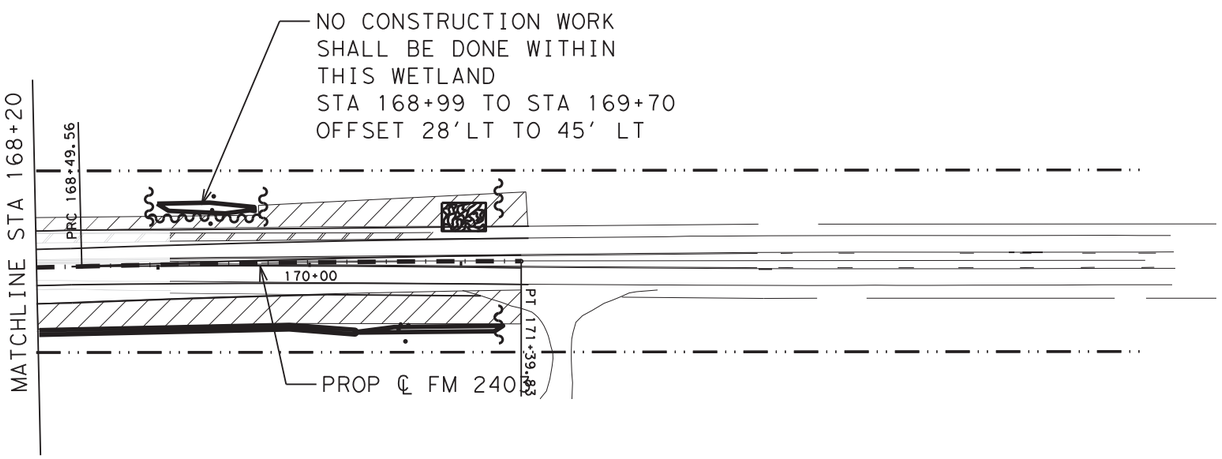
STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			174
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	BRAZORIA	
CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008,ETC	FM 2403





LEGEND

- SILT FENCE (25')
- CONSTRUCTION (36 X 150) EXIT
- PERMANENT SEEDING
- DELINEATED WATER FEATURE

SCALE 1"=000'
SHEET 1 OF 1

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

5/19/2023

SWP3 LAYOUT NORTH

Texas Department of Transportation®

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		175

5/5/2023
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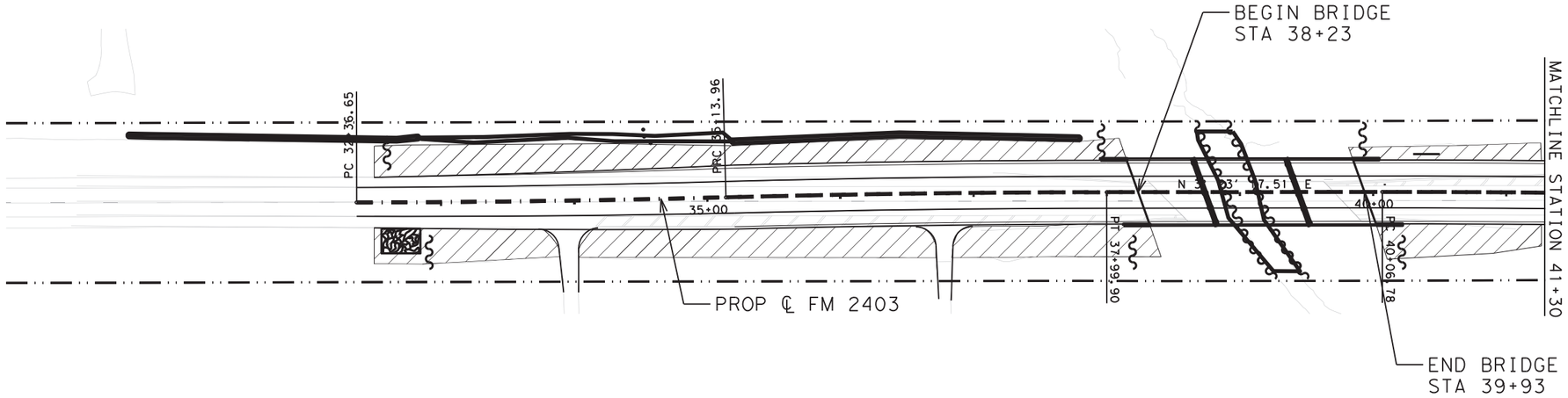

LEGEND

- SILT FENCE (25')
- CONSTRUCTION (36 X 150) EXIT
- PERMANENT SEEDING
- DELINEATED WATER FEATURE

SCALE 1"=100'
SHEET 1 OF 1

STATE OF TEXAS
JAMIE A. H. JONES
128752
LICENSED PROFESSIONAL ENGINEER

Jamie A.H. Jones, P.E.

5/19/2023

SWP3 LAYOUT SOUTH

Texas Department of Transportation®

CONT.	SECT.	JOB	HIGHWAY NO.
2950	01	008, ETC	FM 2403
DIST.	COUNTY		SHEET NO.
HOU	BRAZORIA		176

5/18/2023
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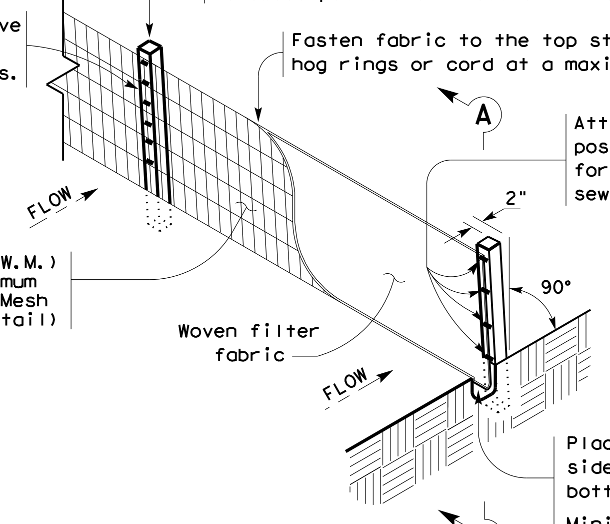
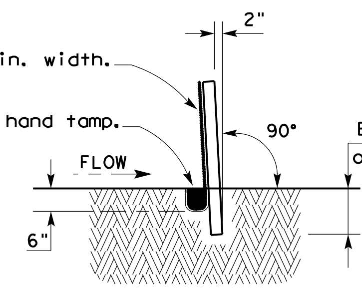
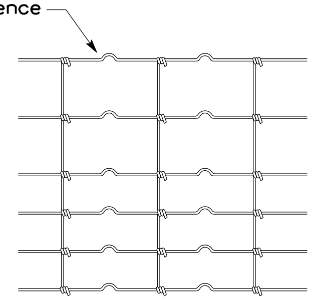


TEMPORARY SEDIMENT CONTROL FENCE

SCF



SECTION A-A



HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

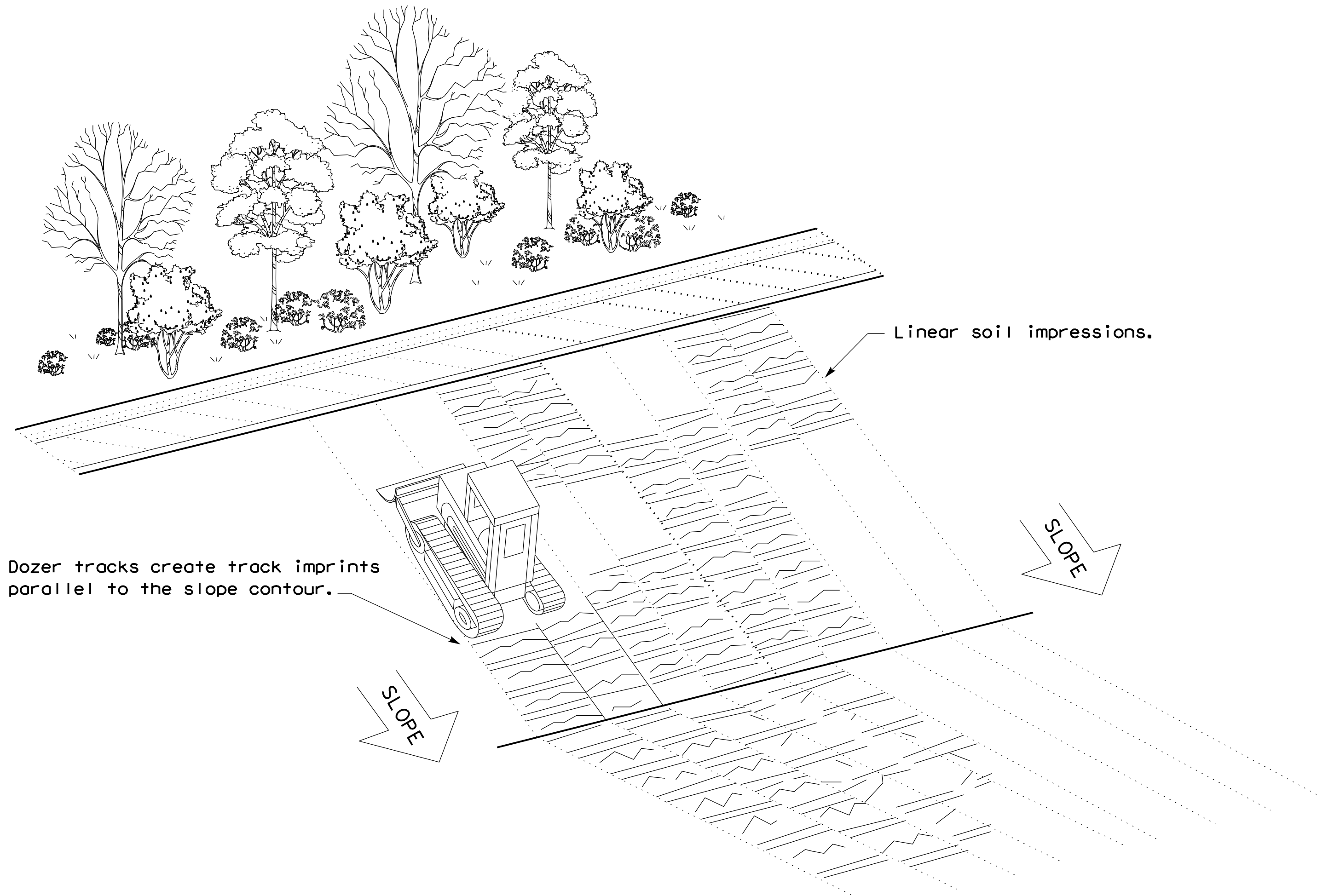
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

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



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP		DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY
REVISIONS	2950	01	008, ETC		FM 2403
	DIST		COUNTY		SHEET NO.
	HOU		BRAZORIA		177

5/18/2023
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DATE: 5/18/2023
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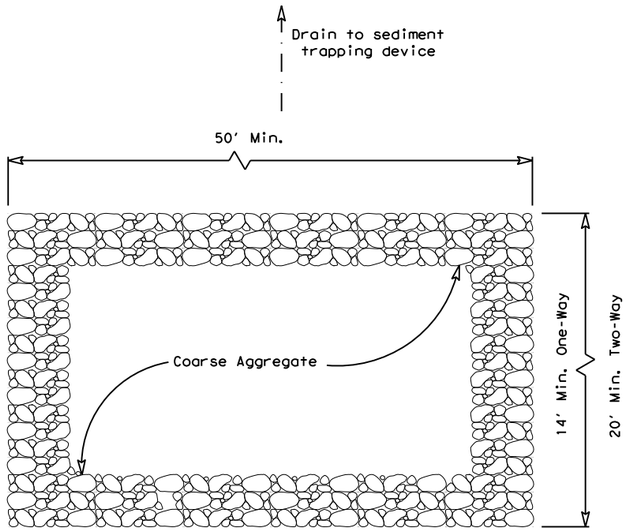
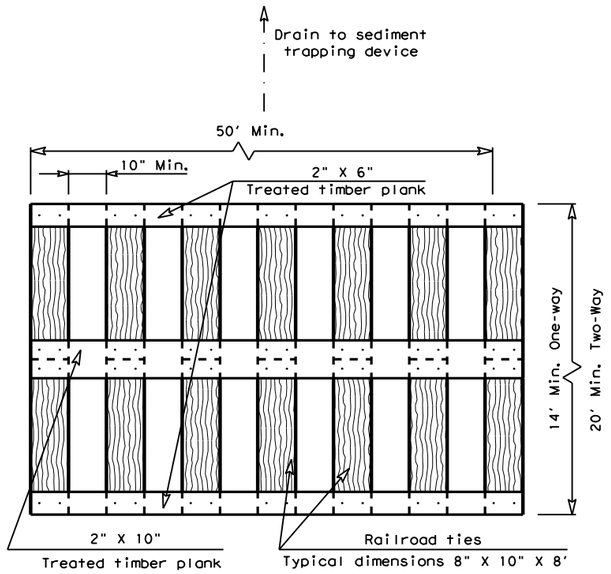
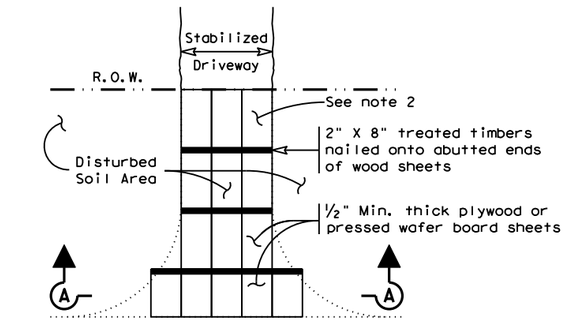


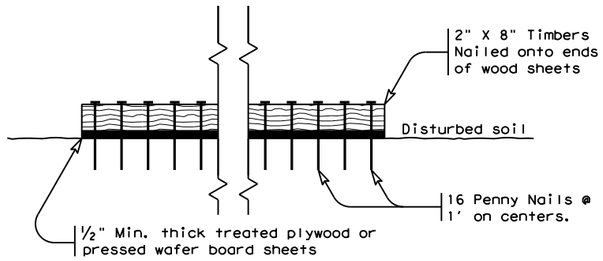
PLAN VIEW



PLAN VIEW



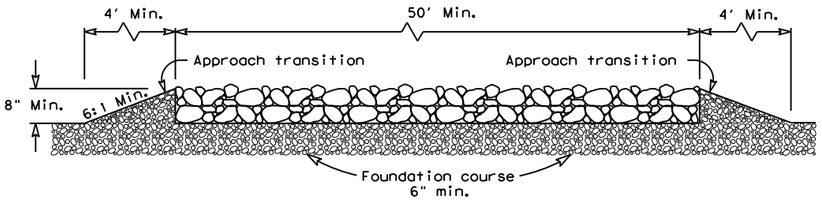
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

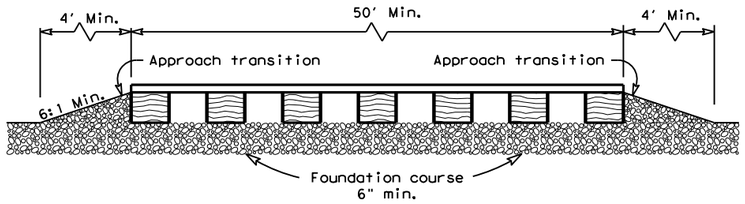
SHORT TERM



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	2950	01	008,J ETC	FM [illegible]03
	DIST	COUNTY		SHEET NO.
	BRY	BRAZORIA		178

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	FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
10/2014 UPDATED TO 2014 SPECS 3/2015 MINOR CORRECTIONS	OCT 2014	6	TEXAS				179
	ORIGINAL:	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
		12	BRAZORIA	2950	01	008,ETC	FM 2403

STD K-1

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 the TxDOT SWP3 Summary Sheets, SWP3 Binder Template, and Form 2118.

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

Additional Comments

This project will be authorized under a non-reporting Nationwide Permit 14. If impacts below the ordinary high water marks (OHWMs) of Briscoe Canal and an unnamed drainage ditch exceed 0.1 acre, please contact the environmental project manager (PM).

In addition, there is a wetland located west of the roadway north of Briscoe Canal near the north end of the project site. If impacts to this wetland occur, please contact the environmental PM.

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:

DATE: May 12, 2023
FILE:

Version 2.2

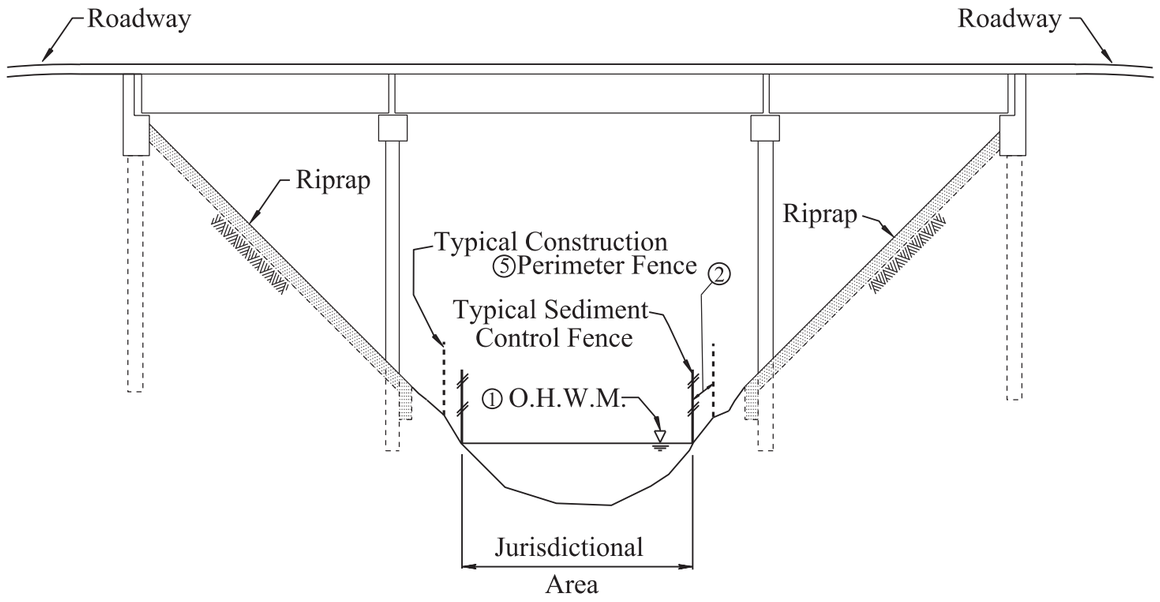
Texas Department of Transportation

TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

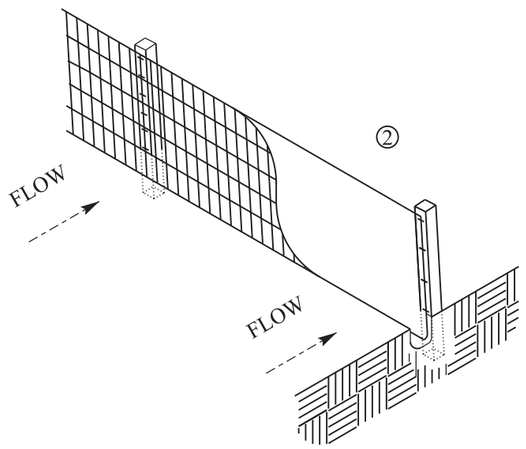
EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2950	01	008, etc.	FM 2403
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	HOU	Brazoria		180



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	2950	01	008, etc.	FM 2403
ADDED construction fencing (06/17)	DIST	COUNTY		SHEET NO.
UPDATED typical relationship diagram (09/17)	HOU	Brazoria		181
UPDATED notes 2 and 5 (09/17)				
UPDATED note 5 (05/18)				

DATE:
FILE: