STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

DESIGN SPEED: MEETS OR IMPROVES EXISTING CONDITIONS - 20 MPH
FUNCTIONAL CLASS = RURAL MINOR COLLECTOR
ADT (2018) = 100 VPD
ADT (2038) = 150 VPD

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
GRAPHICS	6	BR 2012 (346)		1
	STATE	STATE DIST.NO.	COUNTY	
CHECKED	TEXAS	2	WISE	
	CONT.	SECT.	JOB	HIGHWAY NO.
CHECKED	0902	20	110	CR

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL-AID PROJECT NO. BR 2012 (346)

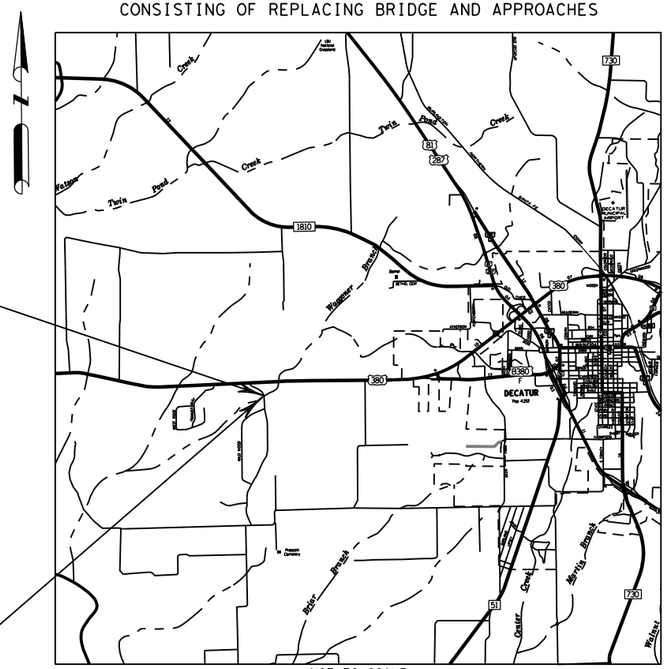
WISE COUNTY

CR (ACORN DR)

LIMITS: AT WAGGONER BRANCH

ROADWAY LENGTH = 300.00 FT = 0.057 MI.
BRIDGE LENGTH = 75.00 FT = 0.014 MI.
TOTAL PROJECT LENGTH = 375.00 FT = 0.071 MI.

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



NOT TO SCALE

BEGIN PROJECT
CSJ: 0902-20-110
STA 10+54.00

END PROJECT
CSJ: 0902-20-110
STA 14+29.00

EQUATIONS : NONE
RAILROAD : NONE
EXCEPTIONS : NONE

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

Texas Department of Transportation

SUBMITTED FOR LETTING: 5/28/2021 DATE
DocuSigned by: _____, PE
1C2C4AEE88A847B... AREA ENGINEER

RECOMMENDED FOR LETTING: 6/8/2021 DATE
DocuSigned by: _____
7879B0B92E5D403... DIRECTOR of TRANSPORTATION PLANNING & DEVELOPMENT

APPROVED FOR LETTING: 6/8/2021 DATE
DocuSigned by: Carl L. Johnson, PE
2FE36139F0614C3... DISTRICT ENGINEER

_____, PE 5/26/2021 DATE

BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

COUNTY_____ PROJ. NO._____
HWY. NO._____ LETTING DATE_____
DATE ACCEPTED_____

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

5/26/2021 10:44:36 AM
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INDEX OF SHEETS

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

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

ACORN DRIVE

INDEX OF SHEETS

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6	BR 2012 (346)			2
STATE	DIST.	COUNTY		
TEXAS	FTW	WISE		
CONT.	SECT.	JOB	HIGHWAY NO.	
0902	20	110	CR	

Project Number: BR 2012 (346)

County: Wise **Control:** 0902-20-110

Highway: CR

Specification Data

Basis of Estimate

Item	Description	Rate	Unit
168	Vegetative Watering	169,400 gal./acre	1,000 gal.
276	Cement (New Flexible Base)(Plant Mixed) (Cl. N)(For Type A, Gr. 1-2)	125 lb./cu. yd.	ton
310	Asph Mat'l (MC-30, EC-30, or CBSMS-1S) (Cement Treated Base)	0.20 gal./sq. yd.*	gal.
3076	Hot Mix (All Types)	115 lb./sq. yd.-in.	ton

* Based On 50% Asphalt Residue.
** Non-Pay, for Contractor's Information Only.

Compaction Requirements for Base Courses

Item	Material	Course	Min. Density
276	Cement Treat.	All	95 %

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

Special Notes

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

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

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

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

Access is read-only.

Project Number: BR 2012 (346)

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

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

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

Area Engineer's Email: Edrean.Cheng@txdot.gov
Assistant Area Engineer's Email: Oscar.R.Chavez@txdot.gov

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

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

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

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

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

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

1. By February 15 begin the removal of any existing mud nests and all other mud placed by swallows for the construction of nests on any portion of the bridge and culverts. The Engineer

will inspect the bridges and culverts for nest building activity. If swallows begin nest building, scrape or wash down all nest sites. Perform these activities daily unless the Engineer determines the need to do this work more frequently. Remove nests and mud through October 1 or until bridge and culvert construction operations are completed.

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

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

Provide all-weather surface for temporary ingress and egress to adjacent property, as directed. Materials, labor, equipment and incidentals necessary to provide temporary ingress and egress will not be paid for directly, but will be subsidiary to the various bid items.

Where necessary, the governing slopes indicated herein may be varied from the limits shown, to the extent approved.
On superelevated curves the shoulders will have the same cross-slope as the pavement, unless otherwise indicated.
On superelevated curves where the grade line is in a sag or on a flat grade, overlay the shoulders to the extent necessary to prevent trapping of water on the high side.

Provide temporary drain openings at all low points or other drainage structures, as required, at the Contractor's expense.

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

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

Item 4 – Scope of Work

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

Project Number: BR 2012 (346)

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Item 5. Control of the Work

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

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

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

Item 7. Legal Relations and Responsibilities

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

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

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

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

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

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

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

The total area disturbed for this project is 0.67 acres. The disturbed area in this project, all project locations in the Contract, and the Contractor project specific locations (PSLs), within 1 mile of the project limits, for the Contract will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the right of way. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the right of way to the Engineer and to the local government that operates a separate storm sewer system.

No significant traffic generator events identified.

Item 8. Prosecution and Progress

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

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Prepare the progress schedule as a Bar Chart, include all planned work activities and sequences and show Contract completion within the number of working days specified. Submit an updated hard copy when changes to the schedule occur or when requested.

Item 100. Preparing Right of Way

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

Item 104. Removing Concrete

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

Item 110. Excavation

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

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

Item 132. Embankment

Do not provide Type B embankment material with a Plasticity Index (PI) higher than 25.

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

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

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

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

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

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

Item 161. Compost

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

The CMT for this project shall be "pre-blended" to produce a suitable soil material, as directed, with 25% compost and 75% topsoil, by volume, to produce the compost manufactured topsoil. The topsoil material shall be from approved source outside the right-of-way and in accordance with Item 160.2. Place the pre-blend compost manufactured topsoil in a loose layer approximately 4" thick, as shown on the plans.

Item 164. Seeding for Erosion Control

Apply seeding required between December 1 and January 31 using seed types and mixtures as shown in Item 164.2.1, Table 3. If, in the opinion of the Engineer, this does not provide an effective vegetative cover, apply "straw or hay mulch" as specified in Article 164.3.2, "Straw or Hay Mulch Seeding" as soon as possible. After February 1, apply warm season seeding in order to establish a permanent protective vegetative cover.

Item 168. Vegetative Watering

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

Project Number: BR 2012 (346)

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

Average weekly rainfall rates for the District are:

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

Item 276. Cement Treatment (Plant-Mixed)

Treat base material with a maximum 4% cement by weight. The 7-day compressive strength of treated material will be 250 psi.

Item 301. Asphalt Antistripping Agent

Furnish a liquid antistripping agent unless otherwise directed.

Item 310. Prime Coat

Provide an MC-30, EC-30, or CBSMS-1S for this Item. MC-30 is restricted to usage from September 16 through April 15.

Item 420. Concrete Structures

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

Provide weepholes at bridge ends in the wingwalls as directed.

Item 421. Hydraulic Cement Concrete

For Class P (Item 360) and S (Item 421) Concrete Only: For concrete plants equipped with 2 aggregate bins or no calibrated metering system, blend manufactured and natural sand at the aggregate source only. For concrete plants equipped with a minimum of 3 bins and a calibrated metering system, blending of the separate sands on-site is permitted to meet gradation and AIR requirements.

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

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

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

Include the approved mix design number on each delivery ticket.

Ensure that Contractor personnel performing job-control (QC) testing on concrete are ACI certified and maintain certification with annual proficiency/split tests performed with TxDOT. Provide a copy of all personnel certification papers to the Engineer at the preconstruction meeting. The Engineer may require the Contractor's testers to provide the certification papers upon arrival and before testing at the job site. Certified testers will be required to participate with certified TxDOT personnel annually for compression testing (Tex-418-A) and capping cylinders (Tex-450-A) to retain their certification on TxDOT projects.

Furnish a hard copy of all testing equipment calibration reports at the preconstruction meeting when non-TxDOT equipment is used to test concrete. Furnish updated reports as equipment is calibrated through the project contract. The calibration frequency will match TxDOT's and will apply for each piece of equipment as follows:

Slump Cone - Annual
Air Meter - Every 3 months
Compression Tester - Annual
Beam breaker - Annual

The Engineer may allow the use of local commercial laboratories under contract to provide these services. The Commercial Laboratory must fulfill requirements listed above prior to performing any work.

Item 427. Surface Finishes for Concrete

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

Item 432. Riprap

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

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Item 440. Reinforcement for Concrete

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

Item 496. Removing Structures

The structure to be removed has surface coatings that contain hazardous materials as follows:

- Paint on existing metal bridge rail has lead content.

The Contractor shall submit a detailed demolition plan for removal of existing structure in accordance with Item 496 at least 60 days prior to starting demolition unless otherwise directed. The demolition plan needs to include dimensions (width, length) for both sides of the locations where the removal will have impacts to lead paint and the need for abatement prior to removal. The dimensions need to be details to provide actual quantities of the areas to receive lead paint removal for demolition

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

Item 502. Barricades, Signs, and Traffic Handling

The contractor force account ‘safety contingency’ that has been established for this project is intended to be utilized for work zone enhancements to improve the effectiveness of the traffic control plan that could typically not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor’s responsible person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

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

Erect Changeable Message Signs indicating planned road closure 7 days prior to implementing proposed detour.

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

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

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

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

Item 506. Temporary Erosion, Sedimentation, and Environmental Controls

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

Item 540. Metal Beam Guard Fence

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

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

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

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

Item 3076. Dense-Graded Hot-Mix Asphalt

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

Natural (field) sands are not allowed.

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Provide a PG 70-28 asphalt for the surface course.

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

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

Grade substitution per Table 5 is not allowed.

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

Include the approved mix design number on each delivery ticket.

Ride quality is not required on this project.

Item 6001. Portable Changeable Message Signs

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

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

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

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

Estimate & Quantity Sheet

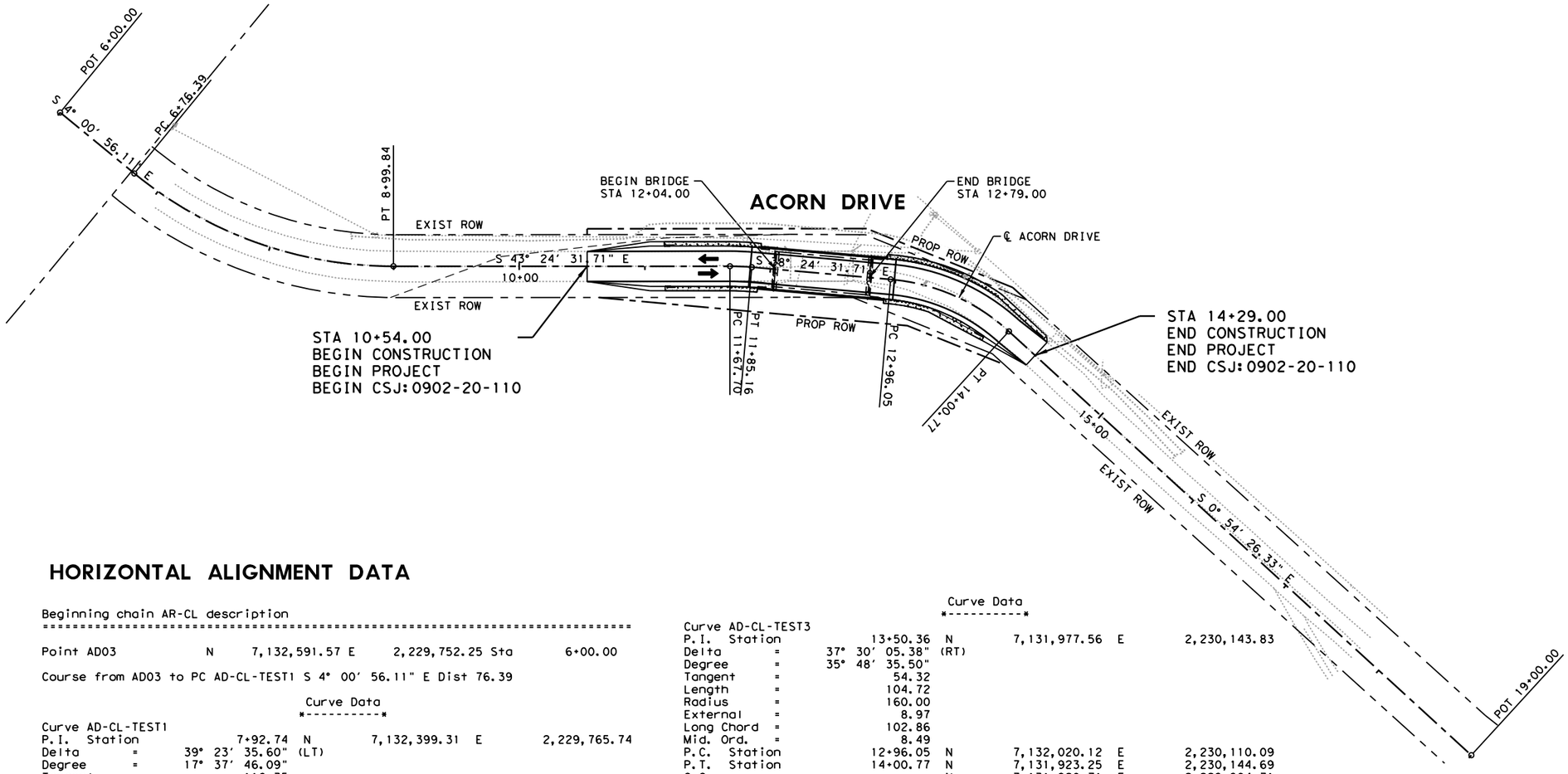
CONTROLLING PROJECT ID 0902-20-110 **DISTRICT** Fort Worth **COUNTY** Wise
HIGHWAY CR 5501

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0902-20-110**			
		PROJECT ID		**A00032679**			
		COUNTY		**Wise**			
		HIGHWAY		**CR 5501**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	3.750		3.750	
	110-6001	EXCAVATION (ROADWAY)	CY	344.000		344.000	
	110-6002	EXCAVATION (CHANNEL)	CY	353.000		353.000	
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	84.000		84.000	
	161-6023	EROSION CONTROL COMPOST (4")	SY	300.000		300.000	
	164-6021	CELL FBR MLCH SEED(PERM)(RURAL)(SANDY)	SY	1,098.000		1,098.000	
	164-6029	CELL FBR MLCH SEED(TEMP)(WARM)	SY	274.000		274.000	
	164-6031	CELL FBR MLCH SEED(TEMP)(COOL)	SY	274.000		274.000	
	168-6001	VEGETATIVE WATERING	MG	38.000		38.000	
	169-6003	SOIL RETENTION BLANKETS (CL 1) (TY C)	SY	105.000		105.000	
	276-6205	CEM TRT(PLNT MX) (CL N)(TYA)(GR1-2)(6")	SY	968.000		968.000	
	310-6001	PRIME COAT (MULTI OPTION)	GAL	182.000		182.000	
	400-6005	CEM STABIL BKFL	CY	156.000		156.000	
	416-6001	DRILL SHAFT (18 IN)	LF	236.000		236.000	
	416-6004	DRILL SHAFT (36 IN)	LF	472.000		472.000	
	420-6014	CL C CONC (ABUT)(HPC)	CY	46.600		46.600	
	422-6002	REINF CONC SLAB (HPC)	SF	2,550.000		2,550.000	
	422-6015	APPROACH SLAB	CY	51.400		51.400	
	425-6036	PRESTR CONC GIRDER (TX34)	LF	298.000		298.000	
	432-6035	RIPRAP (STONE PROTECTION)(24 IN)	CY	584.000		584.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	17.000		17.000	
	450-6018	RAIL (TY T631)	LF	202.000		202.000	
	454-6004	ARMOR JOINT (SEALED)	LF	66.000		66.000	
	496-6009	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	EA	1.000		1.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	5.000		5.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	57.000		57.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	57.000		57.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	668.000		668.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	668.000		668.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	60.000		60.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	60.000		60.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	185.500		185.500	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	2.000		2.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	13.000		13.000	
	666-6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	750.000		750.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0902-20-110 **DISTRICT** Fort Worth **COUNTY** Wise
HIGHWAY CR 5501

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0902-20-110**			
		PROJECT ID		**A00032679**			
		COUNTY		**Wise**			
		HIGHWAY		**CR 5501**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	666-6207	REFL PAV MRK TY II (Y) 4" (SLD)	LF	750.000		750.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	10.000		10.000	
	3076-6046	D-GR HMA TY-D SAC-B PG70-28	TON	99.000		99.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	



0 50 100
HORIZONTAL SCALE: 1"=100'

HORIZONTAL ALIGNMENT DATA

Beginning chain AR-CL description

Point AD03 N 7,132,591.57 E 2,229,752.25 Sta 6+00.00

Course from AD03 to PC AD-CL-TEST1 S 4° 00' 56.11" E Dist 76.39

Curve Data

Curve AD-CL-TEST1

P.I. Station	7+92.74	N	7,132,399.31	E	2,229,765.74
Delta =	39° 23' 35.60"	(LT)			
Degree =	17° 37' 46.09"				
Tangent =	116.35				
Length =	223.45				
Radius =	325.00				
External =	20.20				
Long Chord =	219.08				
Mid. Ord. =	19.02				
P.C. Station	6+76.39	N	7,132,515.37	E	2,229,757.60
P.T. Station	8+99.84	N	7,132,314.79	E	2,229,845.70
C.C.		N	7,132,538.13	E	2,230,081.80
Back = S	4° 00' 56.11" E				
Ahead = S	43° 24' 31.71" E				
Chord Bear = S	23° 42' 43.91" E				

Course from PT AD-CL-TEST1 to PC AD-CL-TEST2 S 43° 24' 31.71" E Dist 267.86

Curve Data

Curve AD-CL-TEST2

P.I. Station	11+76.44	N	7,132,113.85	E	2,230,035.77
Delta =	5° 00' 00.00"	(RT)			
Degree =	28° 38' 52.40"				
Tangent =	8.73				
Length =	17.45				
Radius =	200.00				
External =	0.19				
Long Chord =	17.45				
Mid. Ord. =	0.19				
P.C. Station	11+67.70	N	7,132,120.20	E	2,230,029.77
P.T. Station	11+85.16	N	7,132,107.01	E	2,230,041.20
C.C.		N	7,131,982.76	E	2,229,884.48
Back = S	43° 24' 31.71" E				
Ahead = S	38° 24' 31.71" E				
Chord Bear = S	40° 54' 31.71" E				

Course from PT AD-CL-TEST2 to PC AD-CL-TEST3 S 38° 24' 31.71" E Dist 110.89

Curve Data

Curve AD-CL-TEST3

P.I. Station	13+50.36	N	7,131,977.56	E	2,230,143.83
Delta =	37° 30' 05.38"	(RT)			
Degree =	35° 48' 35.50"				
Tangent =	54.32				
Length =	104.72				
Radius =	160.00				
External =	8.97				
Long Chord =	102.86				
Mid. Ord. =	8.49				
P.C. Station	12+96.05	N	7,132,020.12	E	2,230,110.09
P.T. Station	14+00.77	N	7,131,923.25	E	2,230,144.69
C.C.		N	7,131,920.71	E	2,229,984.71
Back = S	38° 24' 31.71" E				
Ahead = S	0° 54' 26.33" E				
Chord Bear = S	19° 39' 29.02" E				

Course from PT AD-CL-TEST3 to AD04 S 0° 54' 26.33" E Dist 499.23

Point AD04 N 7,131,424.08 E 2,230,152.60 Sta 19+00.00

Ending chain AR-CL description

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

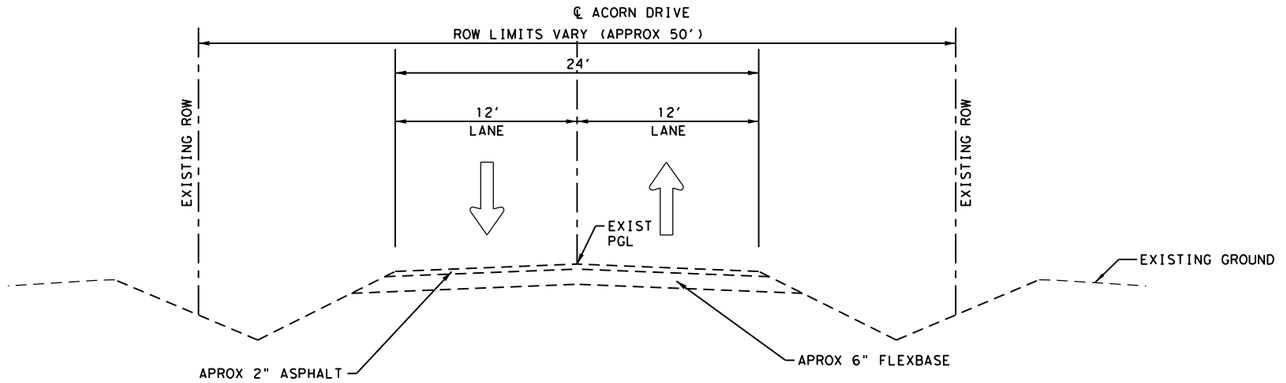
BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

ACORN DRIVE

PROJECT LAYOUT

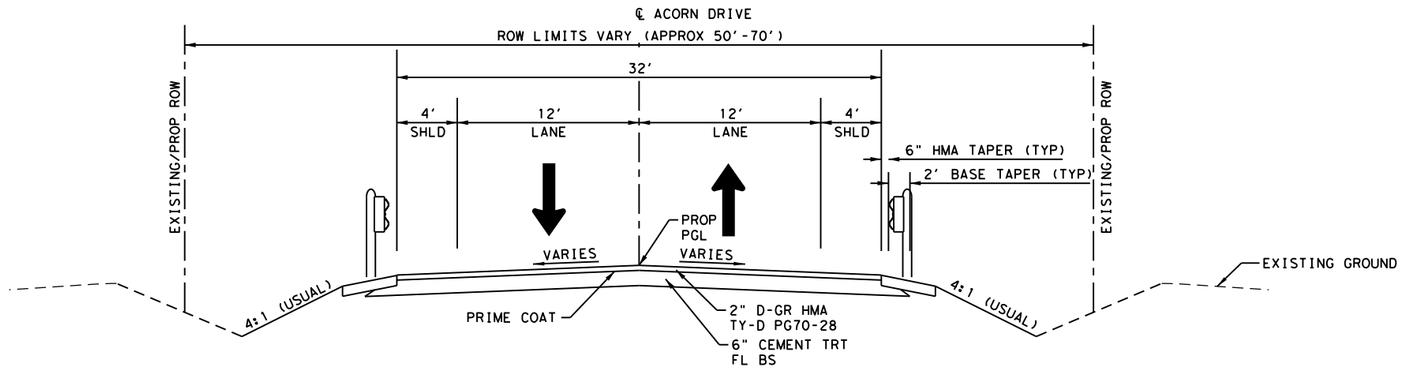
SHEET 1 OF 1

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		5
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR



EXISTING TYPICAL SECTION

FROM STA 10+54.00 TO STA 14+29.00



PROPOSED TYPICAL SECTION

FROM STA 10+54.00 TO STA 11+84.00
FROM STA 12+99.00 TO STA 14+29.00

BRIDGE AND APPROACH SLAB FROM STA 12+04.00 TO STA 12+79.00

0 5 10
SCALE: 1"=10'

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

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TBPE Registration No. F-1046

ACORN DRIVE

TYPICAL SECTIONS

SHEET 1 OF 1

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		6
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR

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SUMMARY OF ROADWAY ITEMS

LOCATION	100 6002	110 6001	110 6002	132 6004	276 6205	310 6001	432 6045	540 6001	544 6001	658 6014	658 6062	3076 6046	6001 6002
	PREPARING ROW	EXCAVATION (ROADWAY) *	EXCAVATION (CHANNEL) *	EMBANKMENT (FINAL) (DENS CONT) (TY B) **	CEM TRT (PLNT MX) (CL N) (TYA) (GR1 -2) (6")	PRIME COAT (MULTI OPTION)	RIPRAP (MOW STRIP) (4 IN)	MTL W-BEAM GD FEN (TIM POST)	GUARDRAIL END TREATMENT (INSTALL)	INSTL DEL ASSM (D-SW) SZ (BR) CTB (BI)	INSTL DEL ASSM (D-SW) SZ 1 (BRF) GF2 (BI)	D GR HMA TY-D SAC-B PG70-28	PORTABLE CHANGEABLE MESSAGE SIGN
	STA	CY	CY	CY	SY	GAL	CY	LF	EA	EA	EA	TON	EA
P&P 01	3.75	344	353	84	968	182	17	185.5	4	2	13	99	2
PROJECT TOTALS	3.75	344	353	84	968	182	17	185.5	4	2	13	99	2

* CONTRACTOR PERMITTED TO USE EXCAVATION AS TYPE B EMBANKMENT IF PI IS LESS THAN 25. PAYMENT FOR REMOVAL AND/OR REWORKING OF EXISTING PAVEMENT IS INCLUDED IN THE EXCAVATION ITEM.

** TYPE B EMBANKMENT SHALL HAVE A PI LESS THAN 25.

SUMMARY OF BRIDGE ITEMS

LOCATION	400 6005	416 6001	416 6004	420 6014	422 6002	422 6015	425 6036	432 6035	450 6018	454 6004	496 6009
	CEM STABIL BKFL	DRILL SHAFT (18 IN)	DRILL SHAFT (36 IN) ***	CL C CONC (ABUT) (HPC)	REINF CONC SLAB (HPC)	APPROACH SLAB	PRESTR CONC GIRDER (TX34)	RIPRAP (STONE PROTECTION) (24 IN)	RAIL (TY T631)	ARMOR JOINT (SEALED)	REMOV STR (BRIDGE 0 - 99 FT LENGTH)
	CY	LF	LF	CY	SF	CY	LF	CY	LF	LF	EA
ABUTMENT 1	78	118	236	23.3		25.7		284	26	33	
ABUTMENT 2	78	118	236	23.3		25.7		300	26	33	
75.00' PREST CONC GIRDER SPAN					2550		298		150		
PROJECT TOTALS	156	236	472	46.6	2550	51.4	298	584	202	66	1

*** TAKE 2 CORE HOLES IN ACCORDANCE WITH TxDOT SPEC 416.3.2.

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	666 6170	666 6207	672 6009
	REFL PAV MRK TY II (W) 4" (SLD)	REFL PAV MRK TY II (Y) 4" (SLD)	REFL PAV MRKR TY II-A-A
	LF	LF	EA
SPMD 01	750	750	10
PROJECT TOTALS	750	750	10

SUMMARY OF EARTHWORK

ITEM	110 *	132 **
DESCRIPTION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY B)
STATION	**CY**	**CY**
11+00.00	32	0
11+50.00	33	1
12+00.00	135	10
12+04.00	19	10
13+00.00	51	12
13+50.00	19	35
14+00.00	35	13
14+29.00	20	3
TOTAL	344	84

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	161 6023	164 6021	164 6029	164 6031	168 6001	169 6003	506 6002	506 6011	506 6038	506 6039	506 6040	506 6043
	EROSION CONTROL COMPOST (4")	CELL FBR MLCH SEED (PERM) (RURAL) (SANDY)	CELL FBR MLCH SEED (TEMP) (WARM)	CELL FBR MLCH SEED (TEMP) (COOL)	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY C)	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	SY	SY	MG	SY	LF	LF	LF	LF	LF	LF
P&P 01	300	1098	274	274	38	105	57	57	668	668	60	60
PROJECT TOTALS	300	1098	274	274	38	105	57	57	668	668	60	60

CO	REV	DESCRIPTION	DATE	BY

Texas Department of Transportation

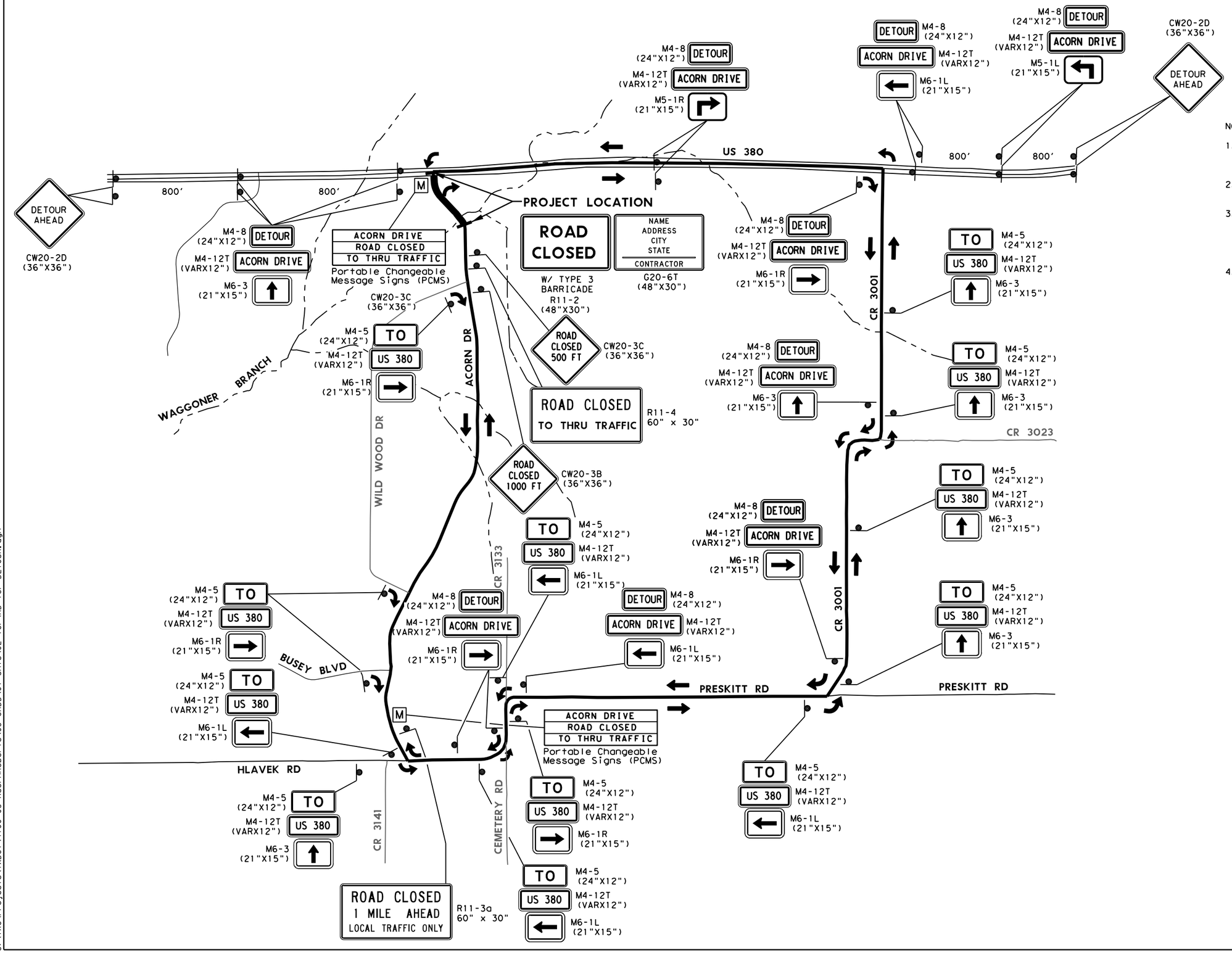
BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

ACORN DRIVE

PROJECT SUMMARY

SHEET 1 OF 1

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		7
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR



NOTES:

1. DETOUR SIGN PLACEMENT SHALL NOT CONFLICT WITH EXISTING PERMANENT SIGNS.
2. SIGNS AND BARRICADES SHOWN SHALL BE SUBSIDIARY TO ITEM 502.
3. COMPLETELY COVER SIGNS THAT CONFLICT WITH THE DETOUR. THESE SIGNS SHALL REMAIN COMPLETELY COVERED UNTIL THE SIGNS ARE APPLICABLE. THIS WORK WILL BE SUBSIDIARY TO ITEM 502.
4. REFER TO WORK ZONE ROAD CLOSURE DETAILS & BC STANDARDS FOR ADDITIONAL SIGNS/BARRICADES AND MINIMUM SIGN SPACING DISTANCE.

0 600 1200

HORIZONTAL SCALE: 1"=1200'

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

ACORN DRIVE

TCP DETOUR LAYOUT

SHEET 1 OF 1

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		8
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

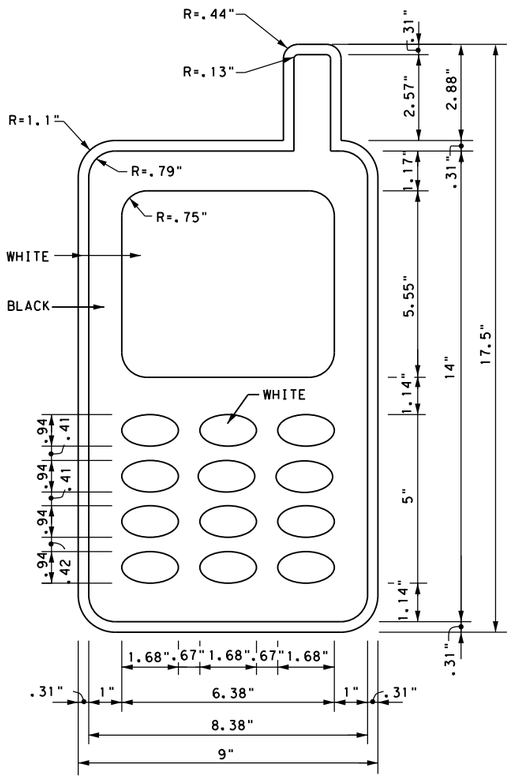
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

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

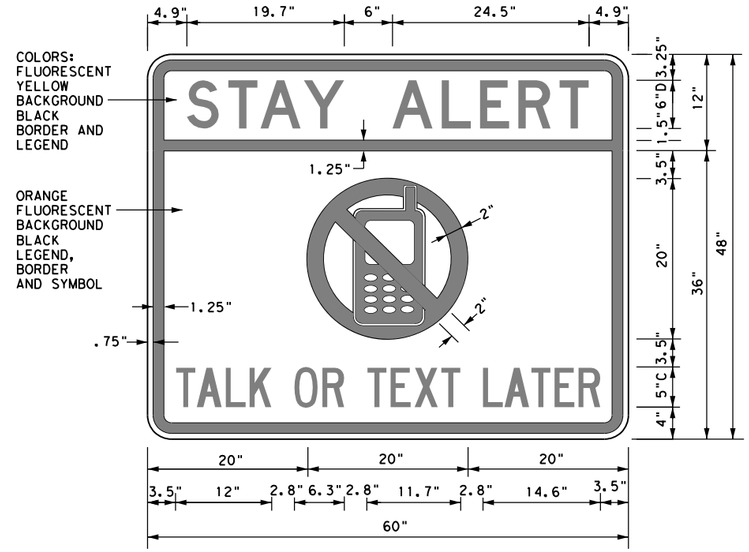
13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY APPAREL NOTES:

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



SIGN DETAIL (G20-10T)



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

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

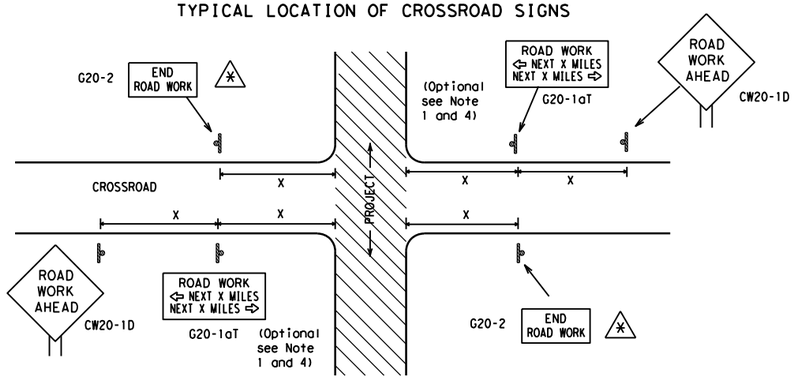
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	FTW	WISE		9

DATE: 5/26/2021 10:44:48 AM
FILE: G:\TXC\Projects\TxDOT\4700-03_AcornRoberts\03_CADD\01_Shts\02-TCP\Stds\Acorn DrBC-14.dgn

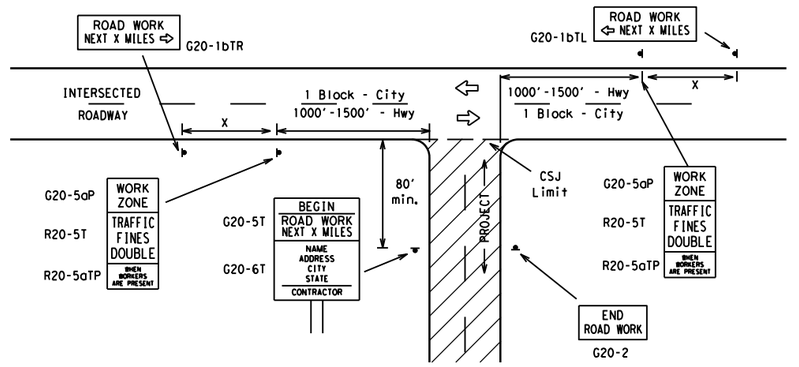
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

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

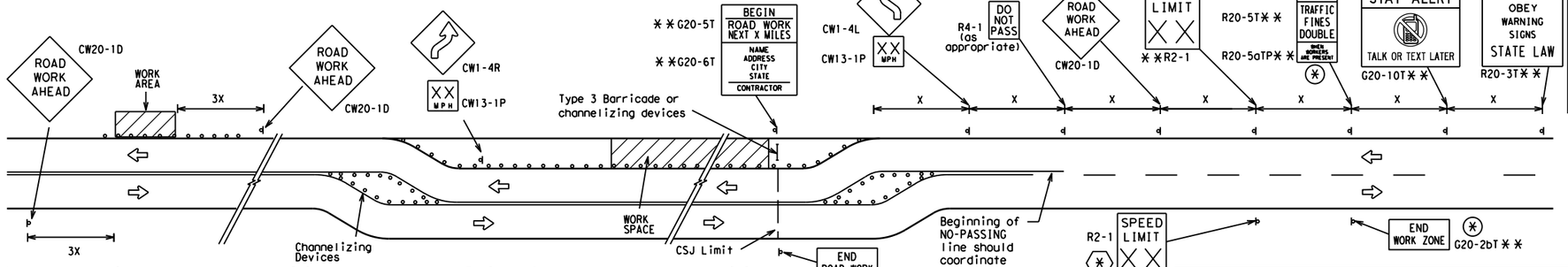
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

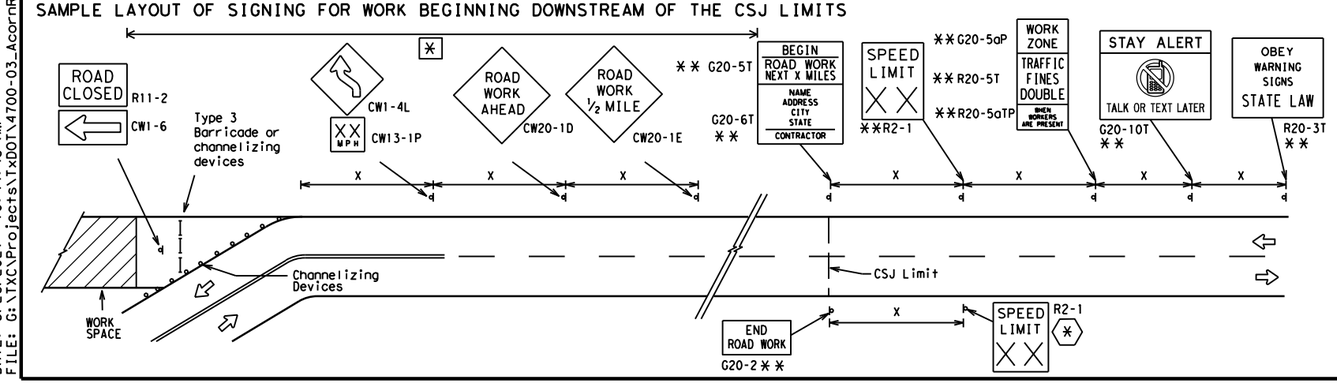
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

(*) Contractor will install a regulatory speed limit sign at the end of the work zone.

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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REVISIONS	0902	20	110	CR
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	FTW	WISE		10

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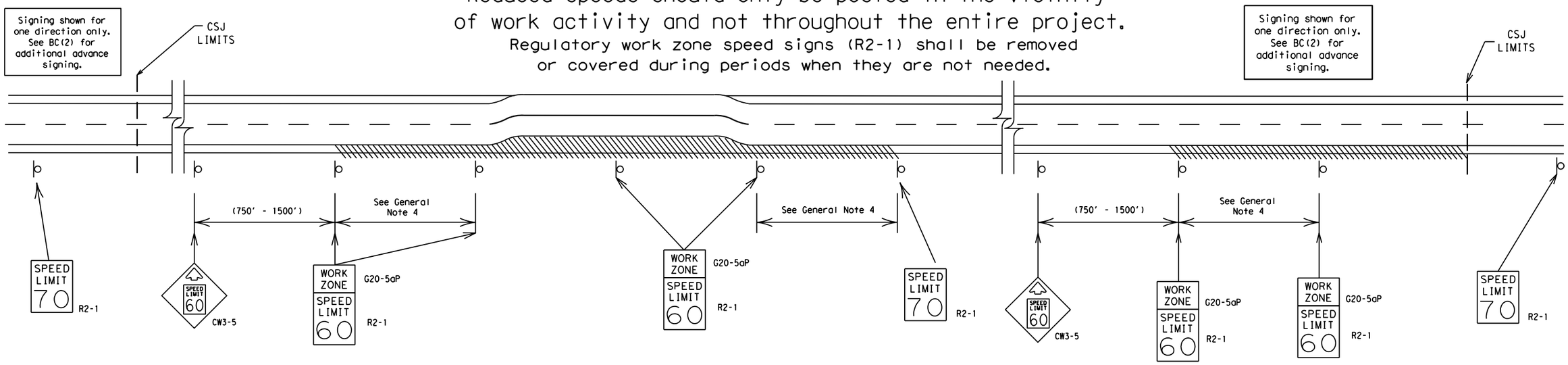
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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	FTW	WISE		11

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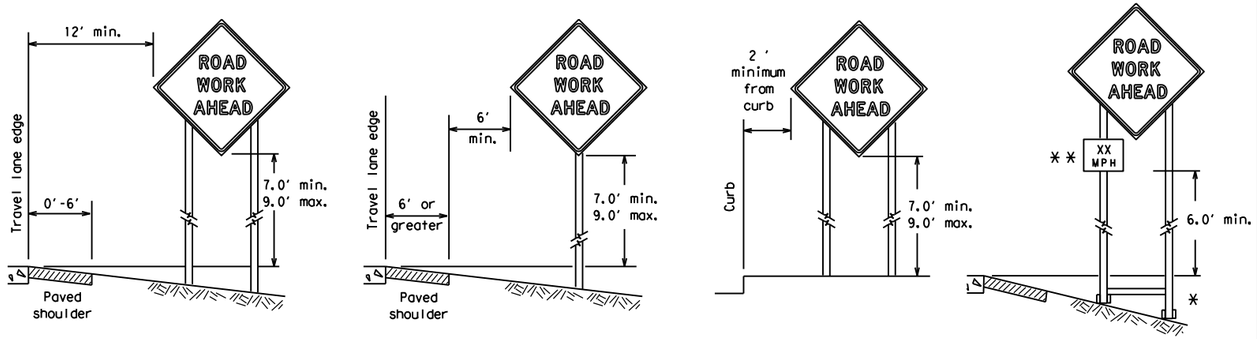
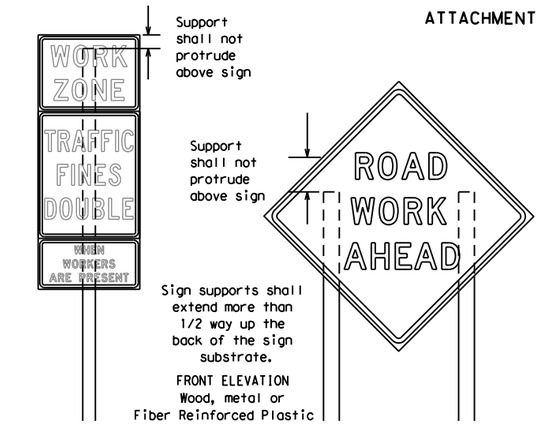
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



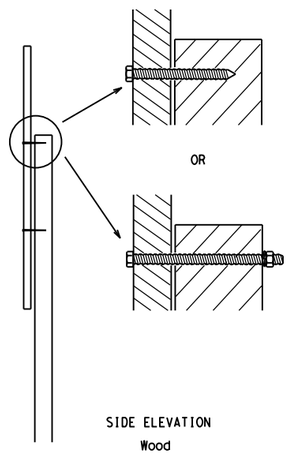
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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.

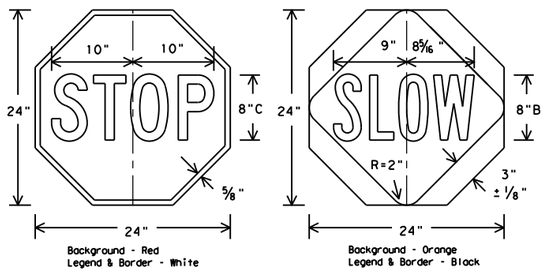


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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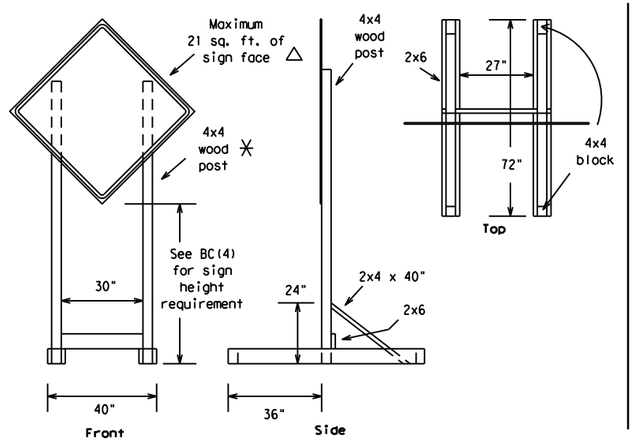
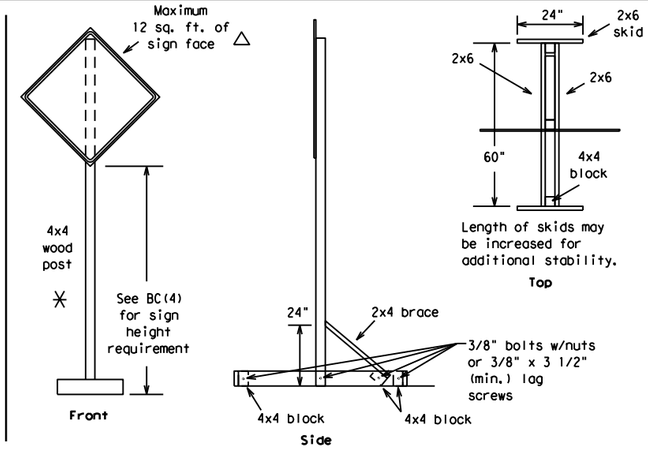
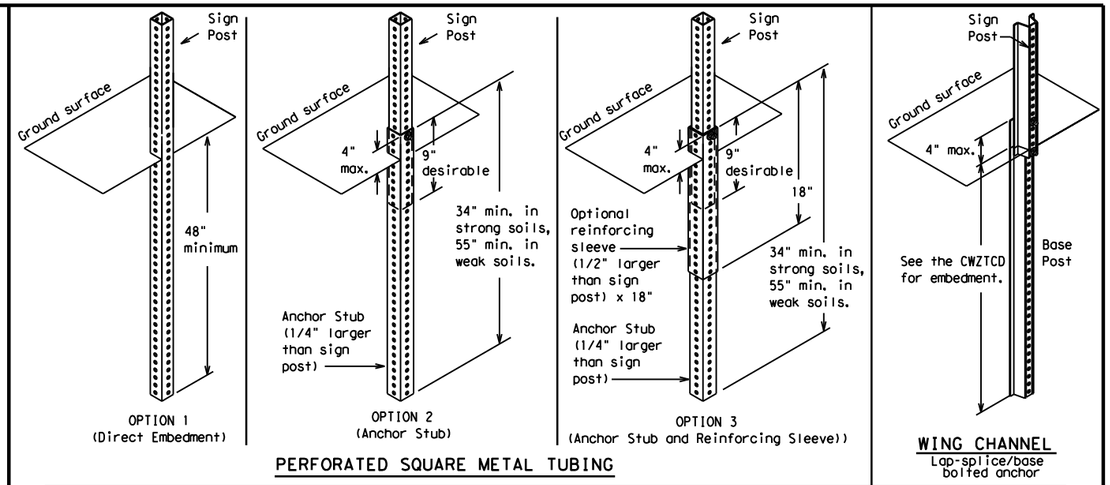




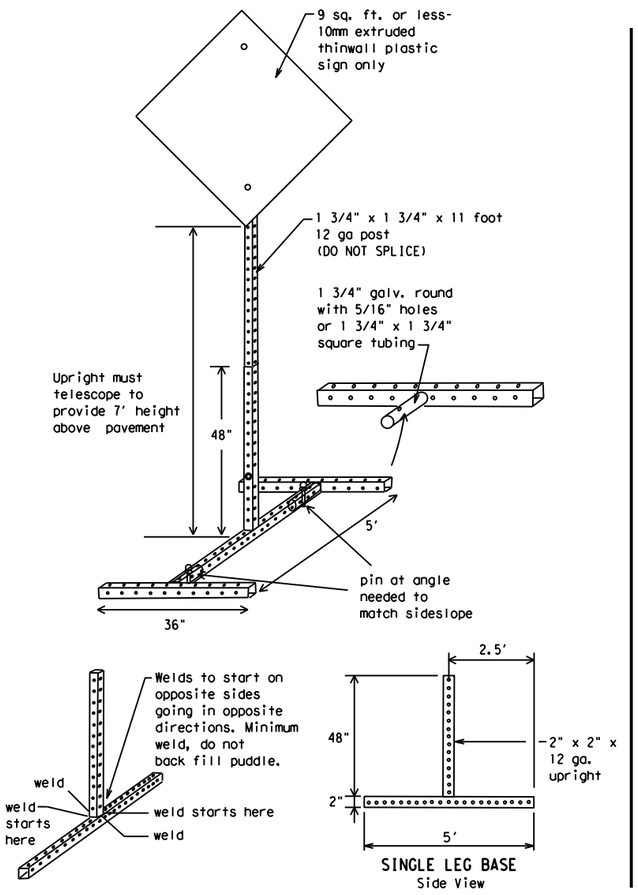
SKID MOUNTED WOOD SIGN SUPPORTS

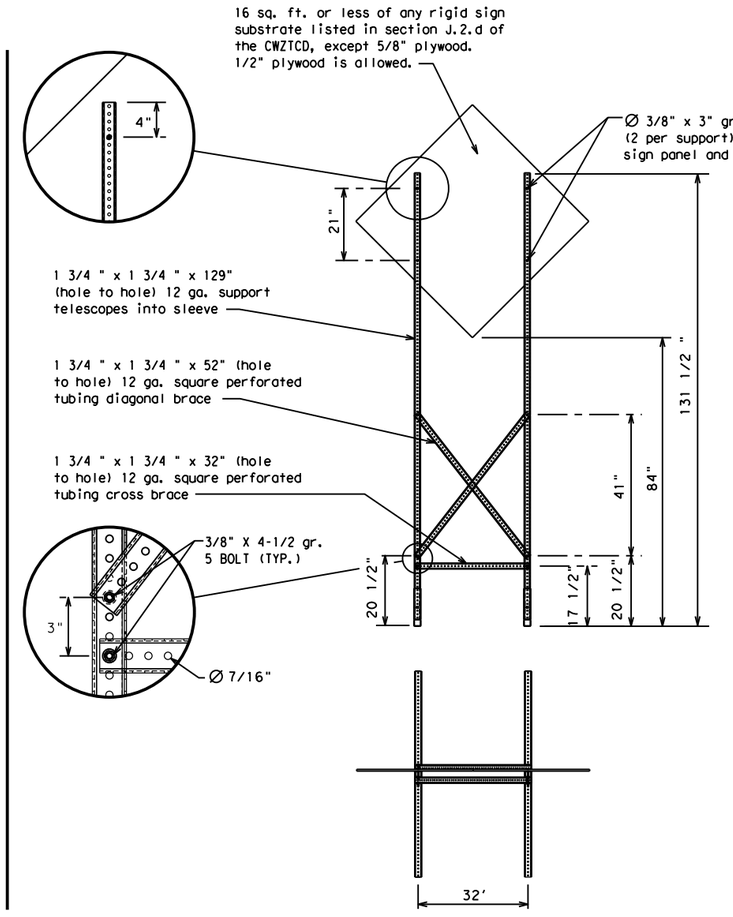
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

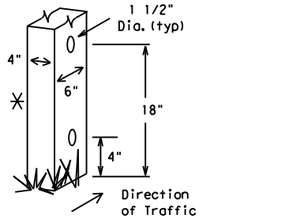


GROUND MOUNTED SIGN SUPPORTS

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.

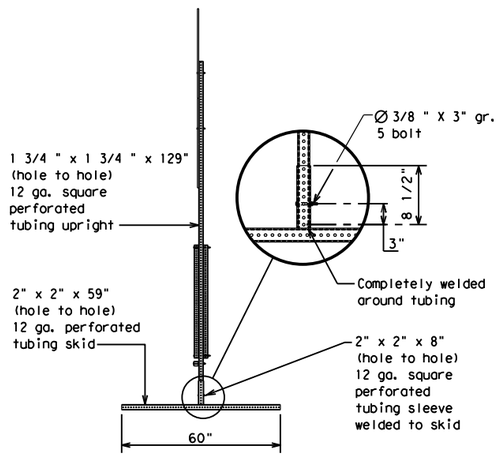






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

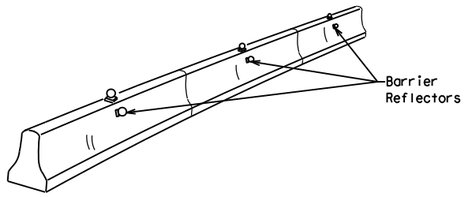
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	FTW	WISE		14

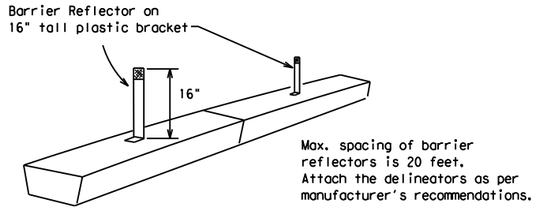
DATE: 5/26/2021 10:44:51 AM
FILE: G:\TXC\Projects\TxDOT\4700-03_AcornRoberts\03_CADD\01_Shts\02-TCP\Srds\Acorn Dr\bc-14.dgn

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

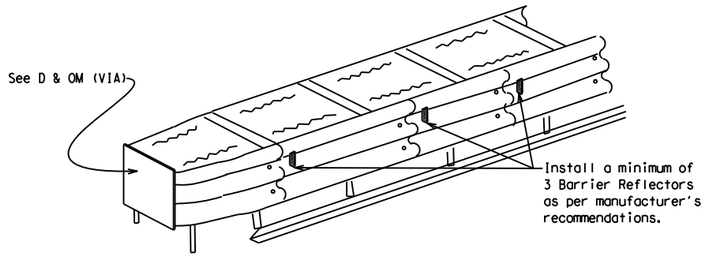


CONCRETE TRAFFIC BARRIER (CTB)

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



LOW PROFILE CONCRETE BARRIER (LPCB)

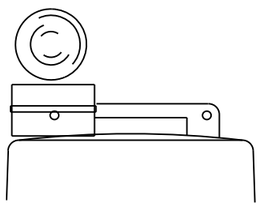


DELINEATION OF END TREATMENTS

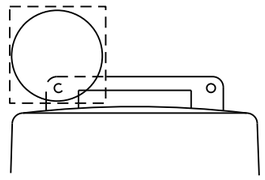
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

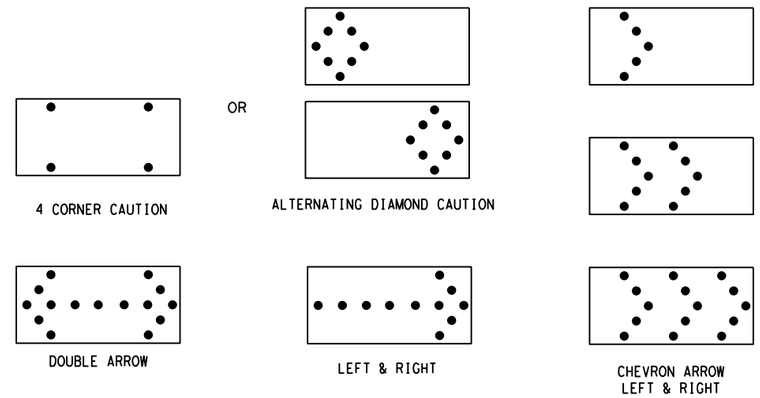
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	FTW	WISE		15

DATE: 5/26/2021 10:44:51 AM
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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

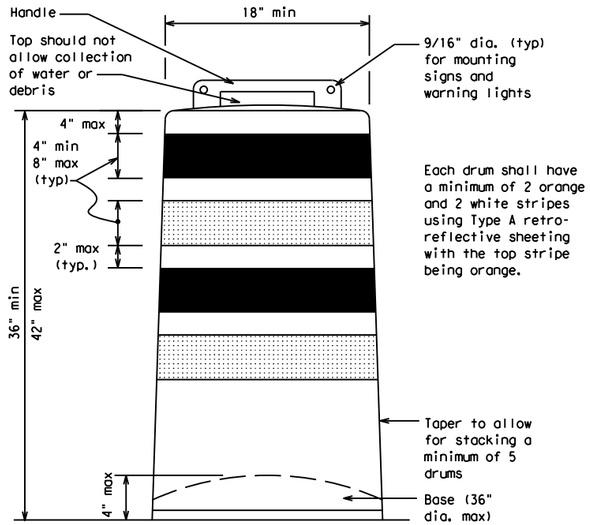
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

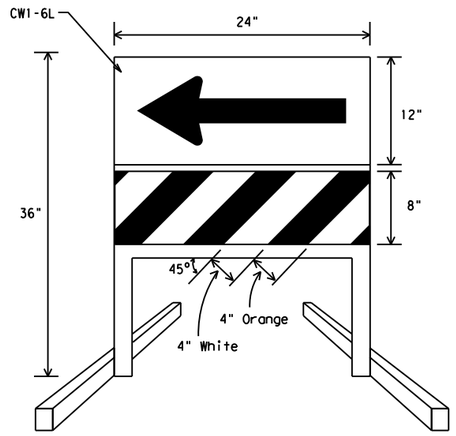
RETROREFLECTIVE SHEETING

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

BALLAST

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





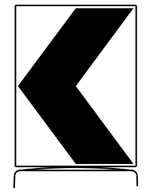
DIRECTION INDICATOR BARRICADE

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

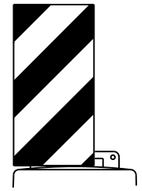
This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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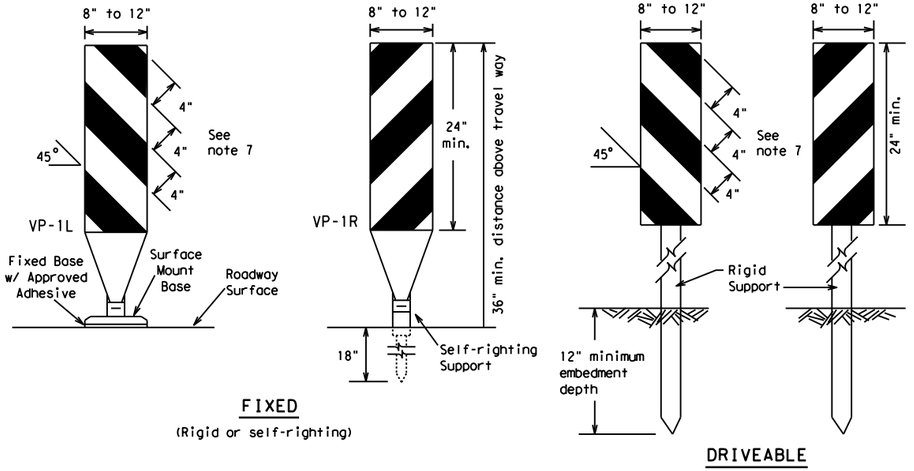
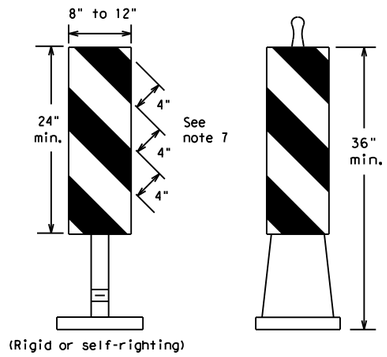


FIXED
(Rigid or self-righting)

DRIVEABLE

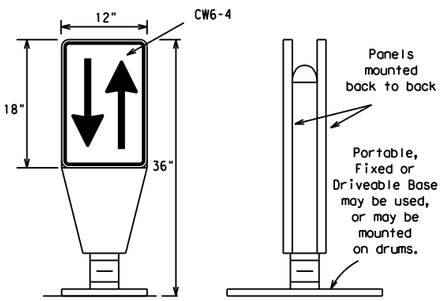


(Rigid or self-righting)

PORTABLE

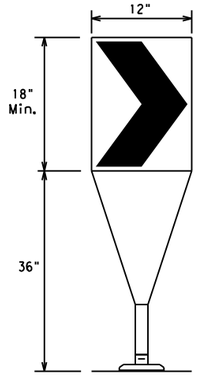
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

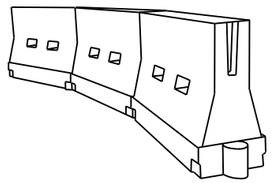
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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

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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

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

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

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.

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

SHEET 9 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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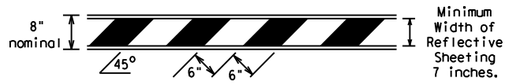
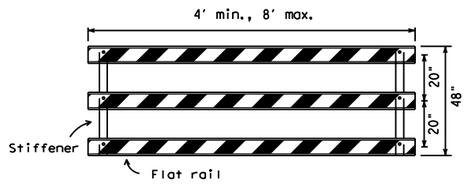
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



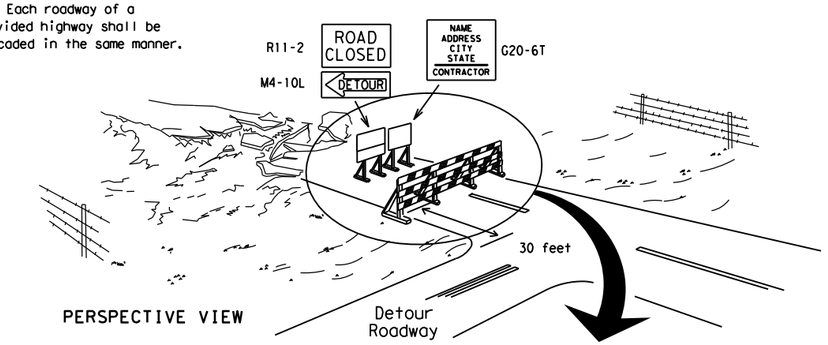
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

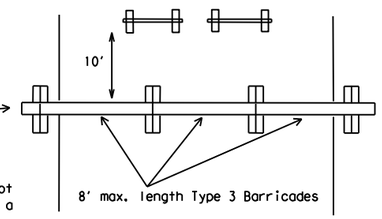
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

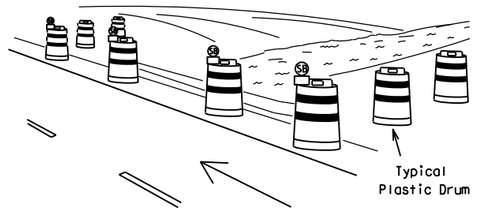
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

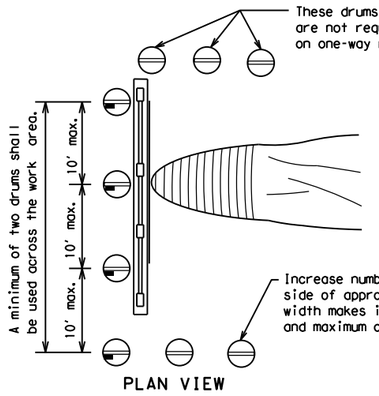
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

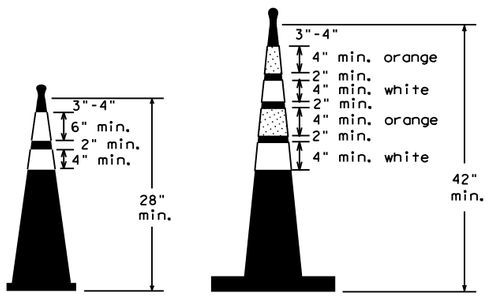
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

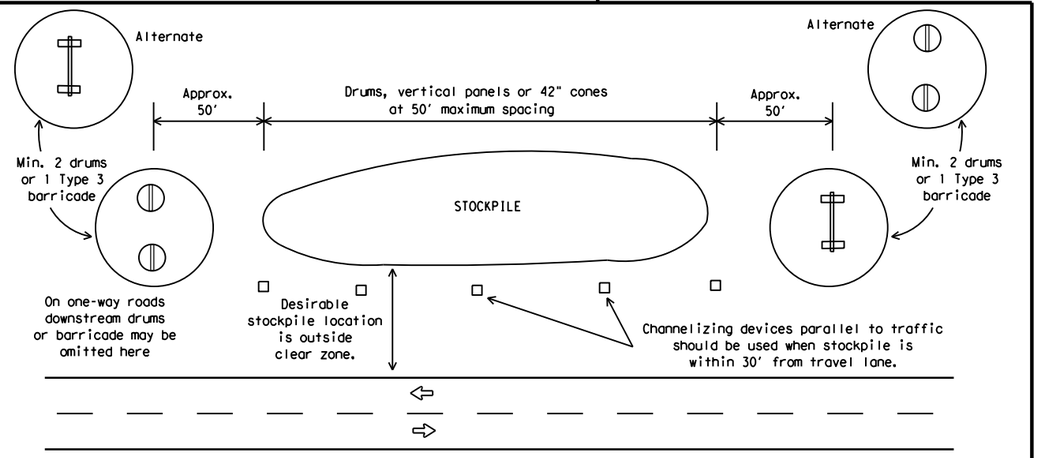
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

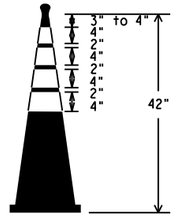
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

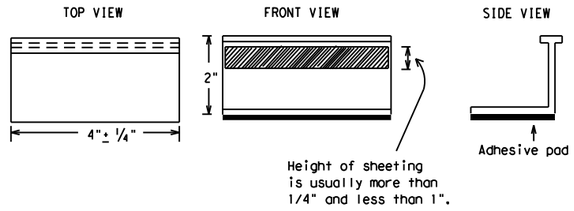
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

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BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
2-98 9-07	DIST	COUNTY		SHEET NO.
1-02 7-13	FTW	WISE		19
11-02 8-14				

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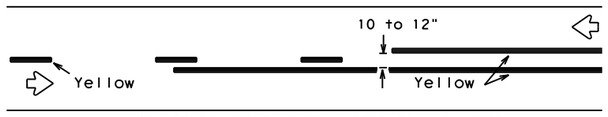
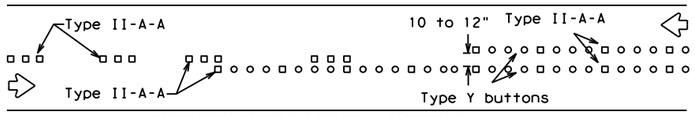
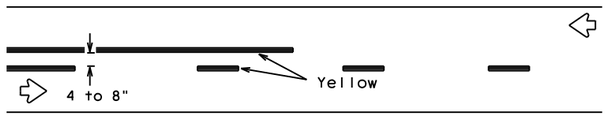
PAVEMENT MARKING PATTERNS



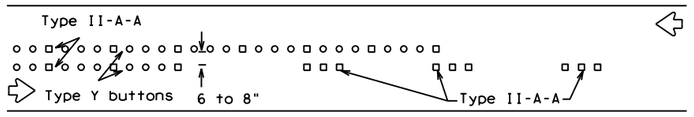
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



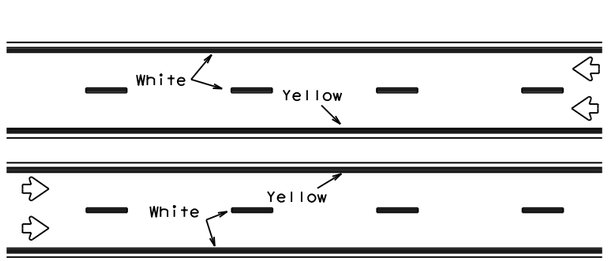
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



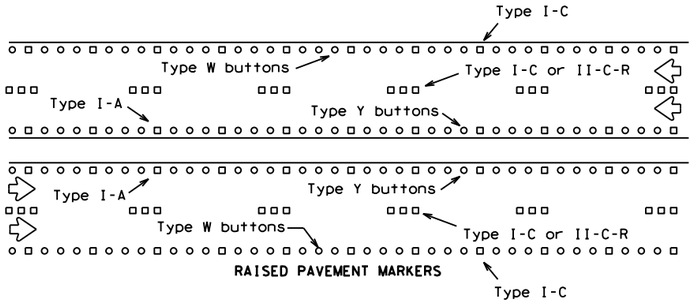
RAISED PAVEMENT MARKERS - PATTERN B

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

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



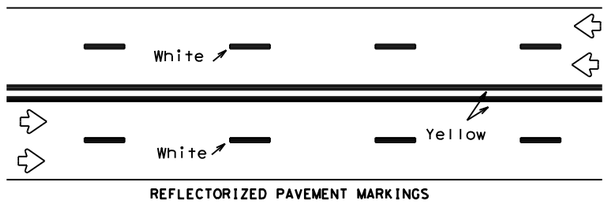
REFLECTORIZED PAVEMENT MARKINGS



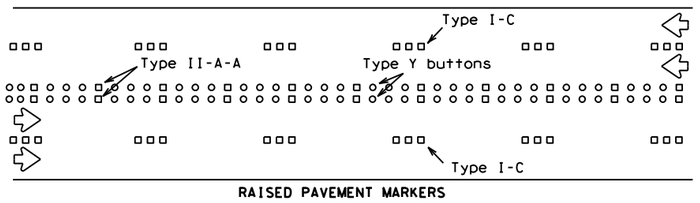
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



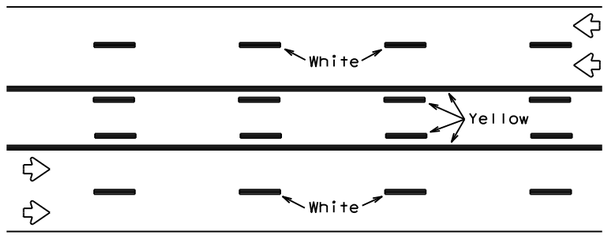
REFLECTORIZED PAVEMENT MARKINGS



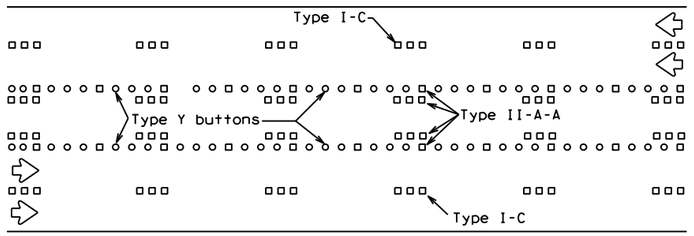
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

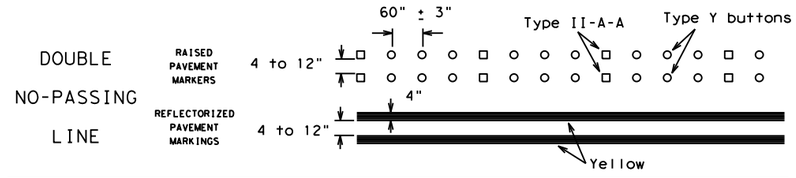
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

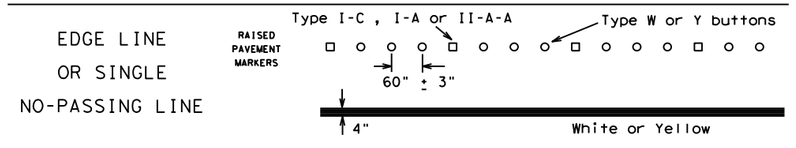
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

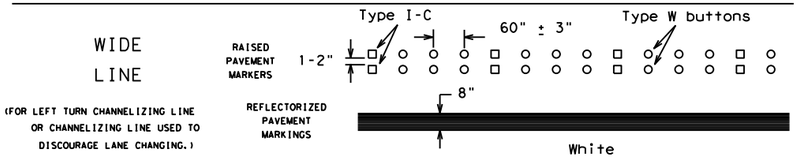


EDGE LINE OR SINGLE NO-PASSING LINE



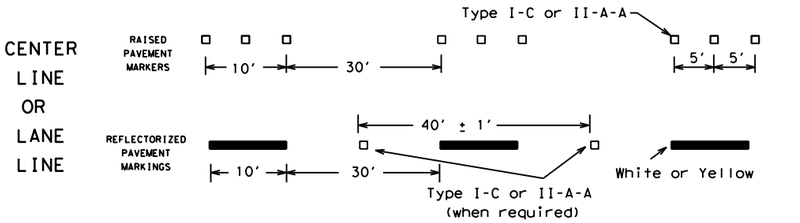
WIDE LINE

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

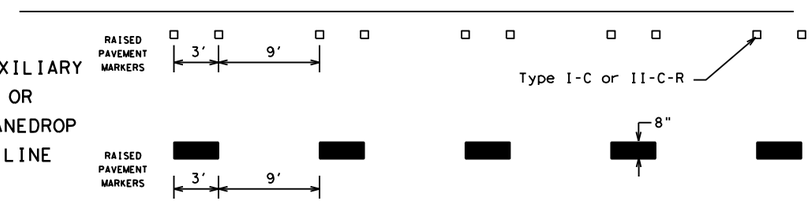


BROKEN LINES

CENTER LINE OR LANE LINE

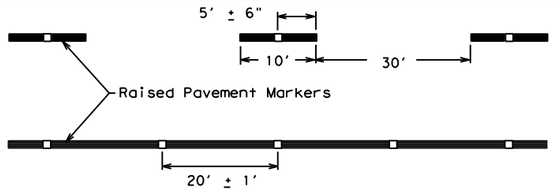


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	FTW	WISE		20
11-02 8-14				

DATE: 5/26/2021 10:44:54 AM
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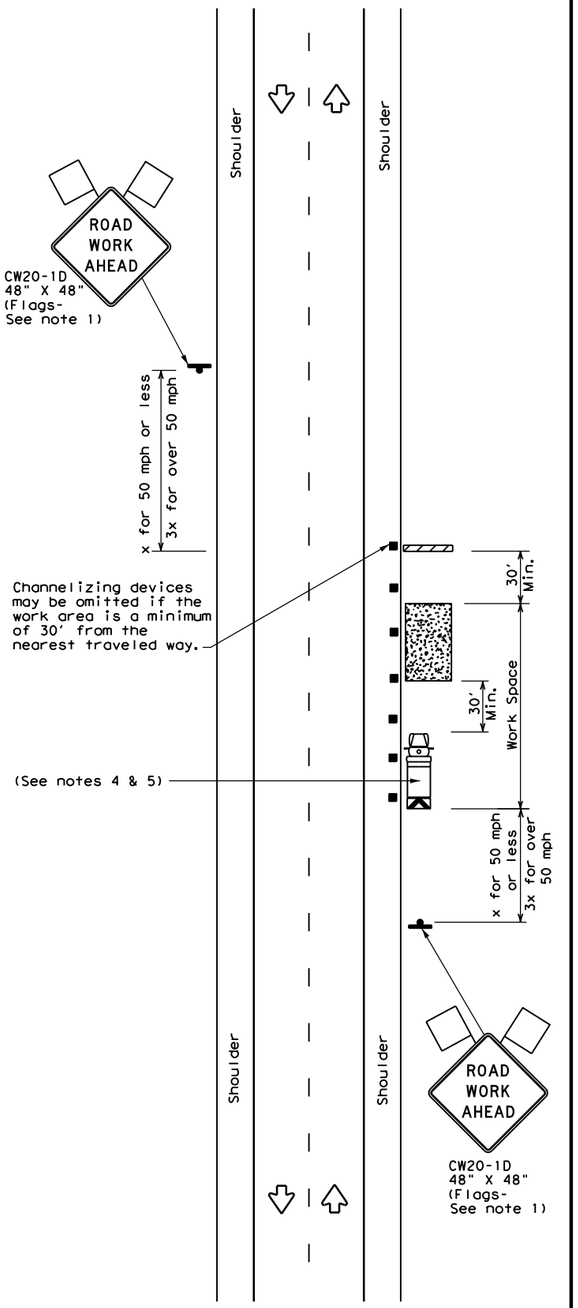
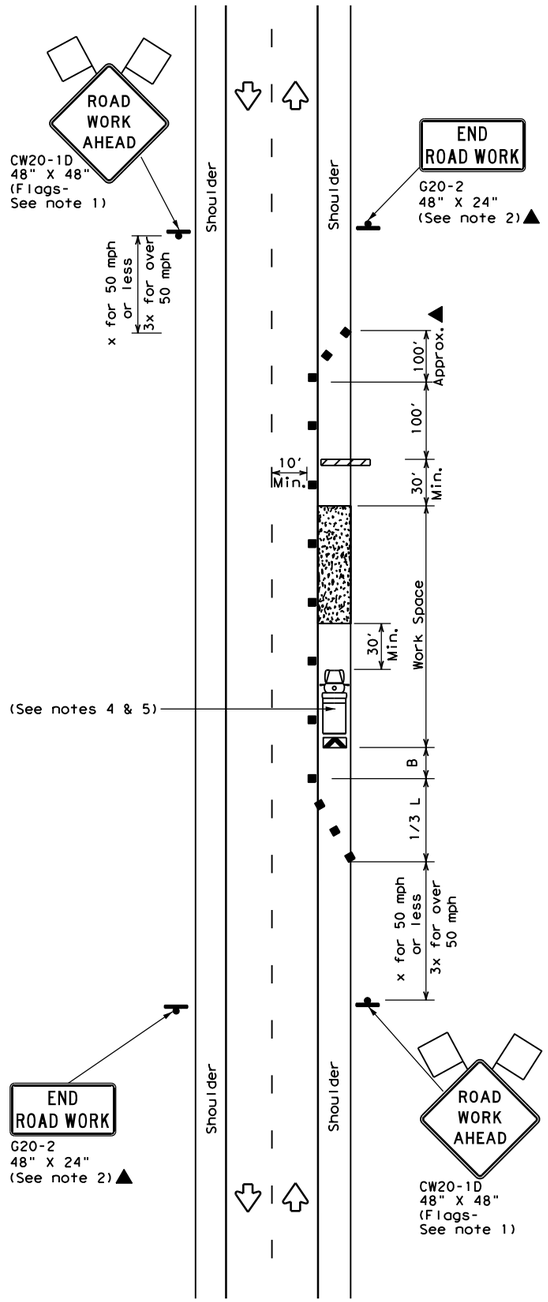


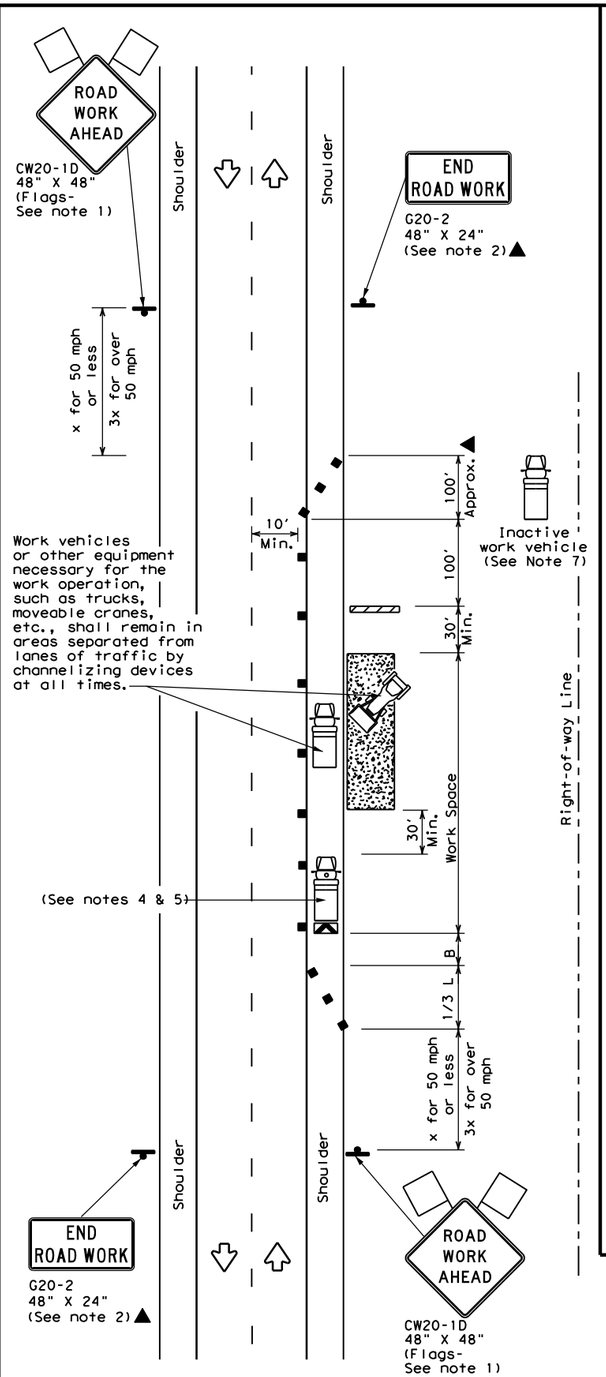
TCP (2-1a)

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
REVISIONS	0902	20	110	CR
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	FTW	WISE		21
1-97 2-18				

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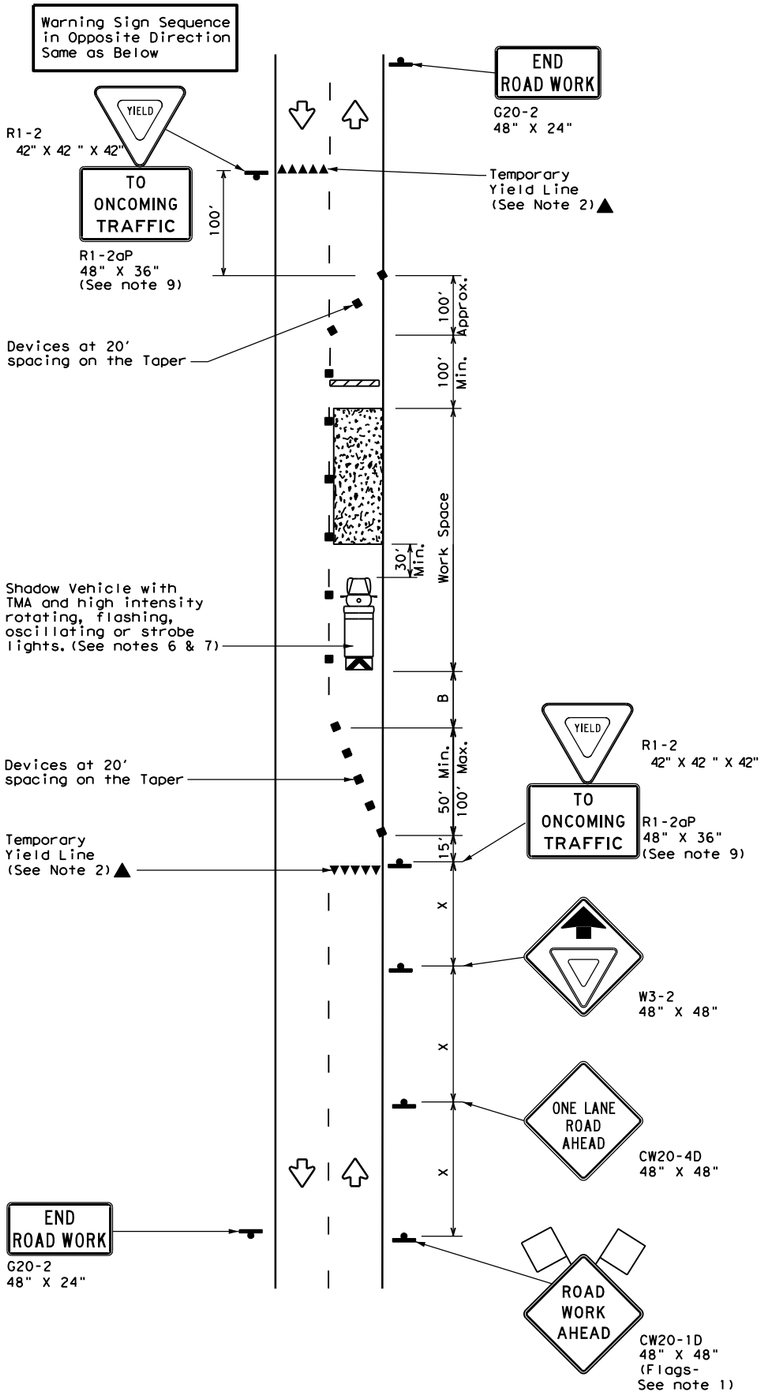
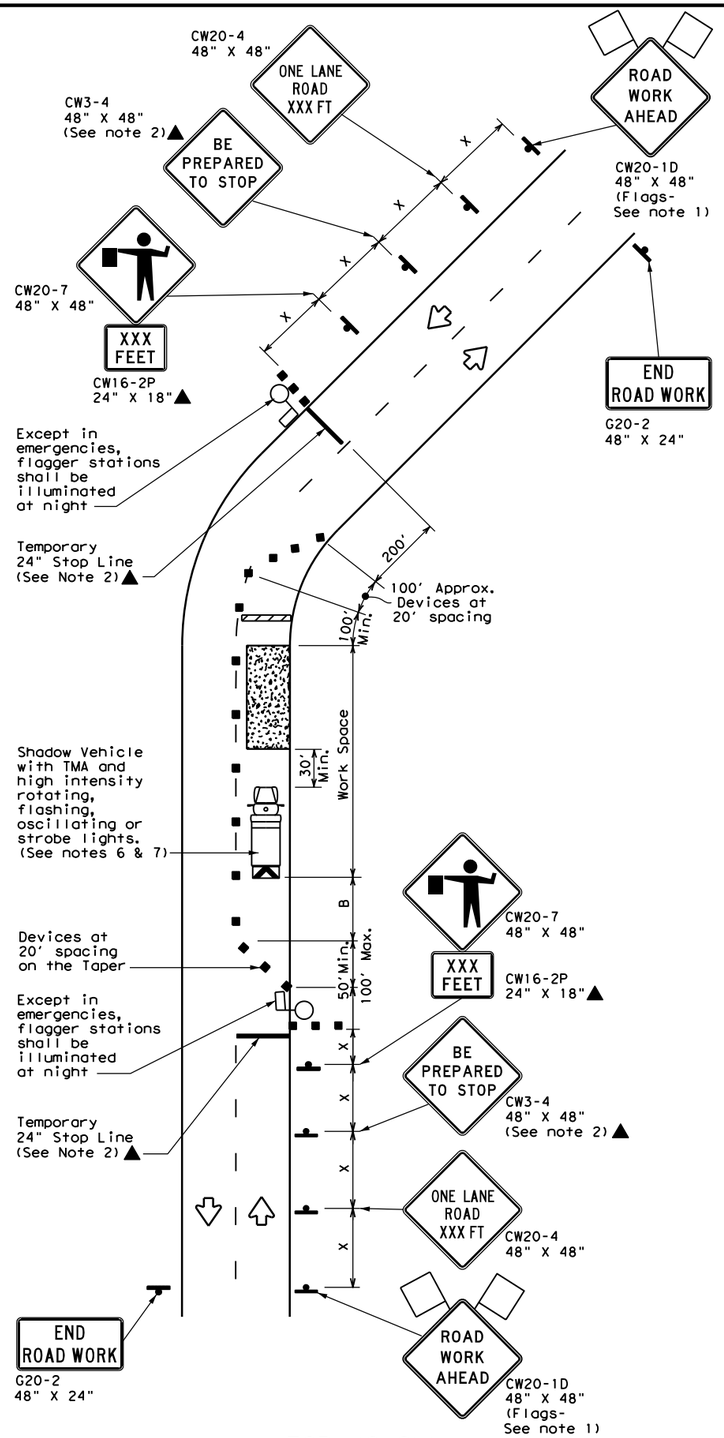


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

LEGEND

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	FTW	WISE		22
4-98 2-18				

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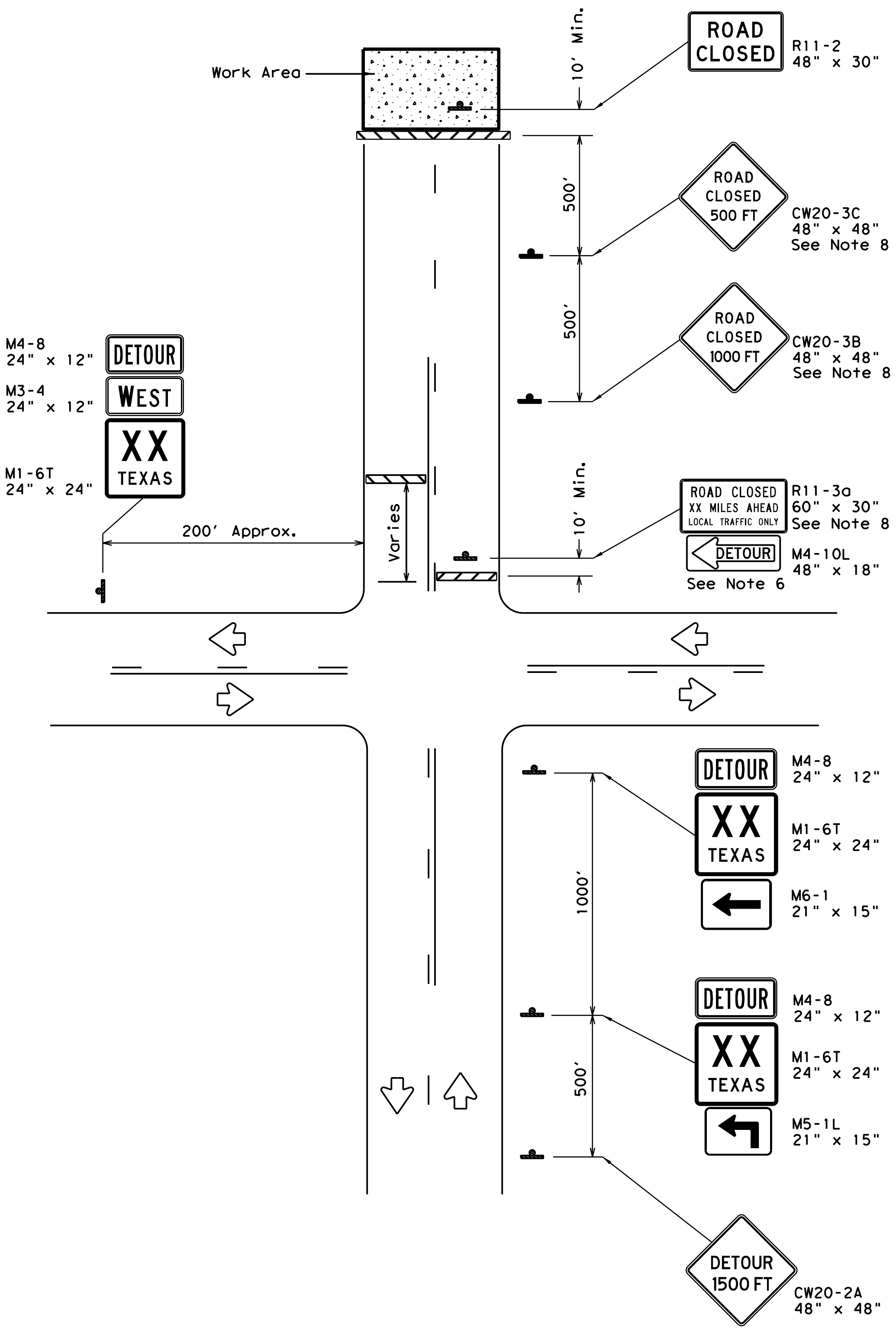
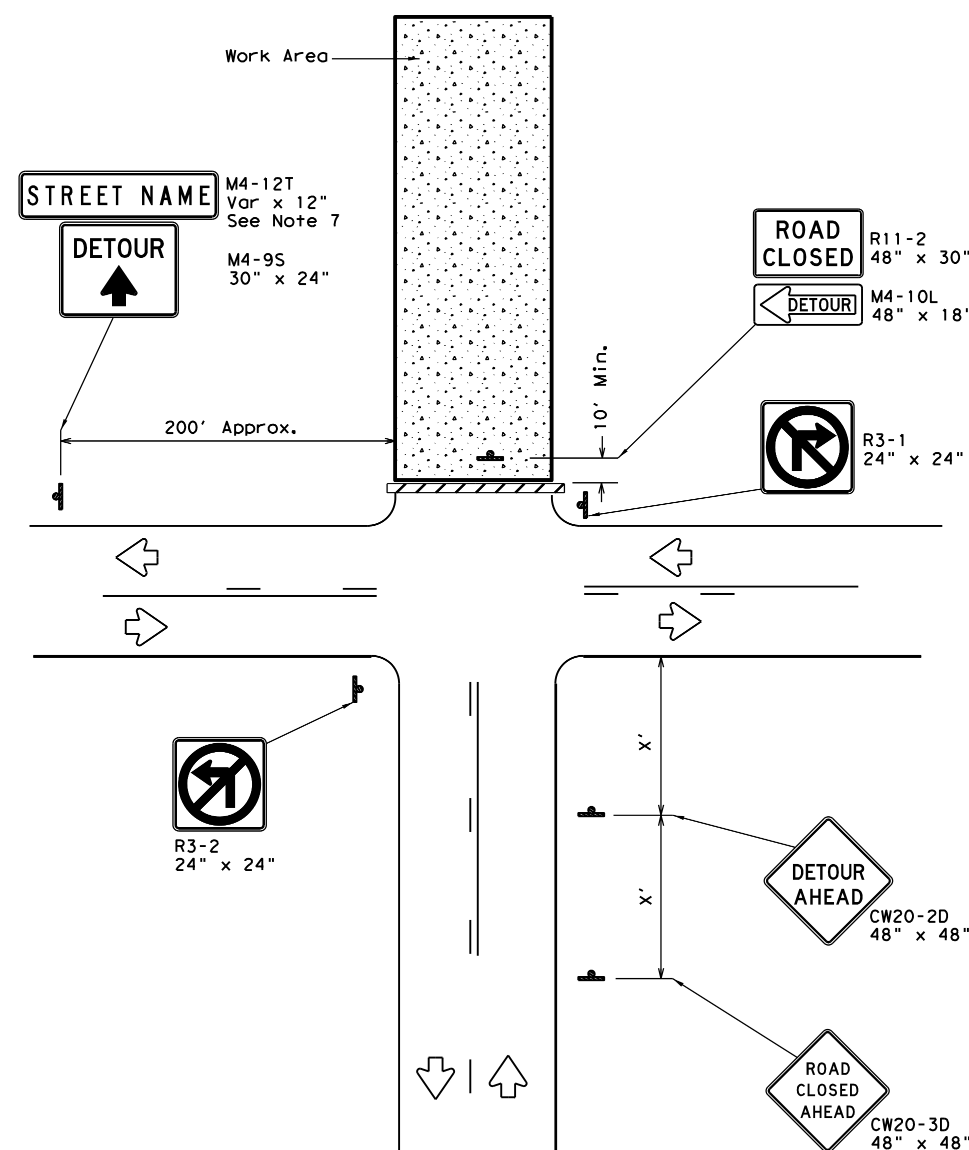


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

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

LEGEND	
(symbol)	Type 3 Barricade
(symbol)	Sign

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

* Conventional Roads Only

GENERAL NOTES

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

Texas Department of Transportation
Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT 0902	SECT 20	JOB 110	HIGHWAY CR
REVISIONS 1-97 4-98 7-13 2-98 3-03	DIST FTW	COUNTY WISE		SHEET NO. 23

113

DATE: 5/26/2021 10:44:55 AM
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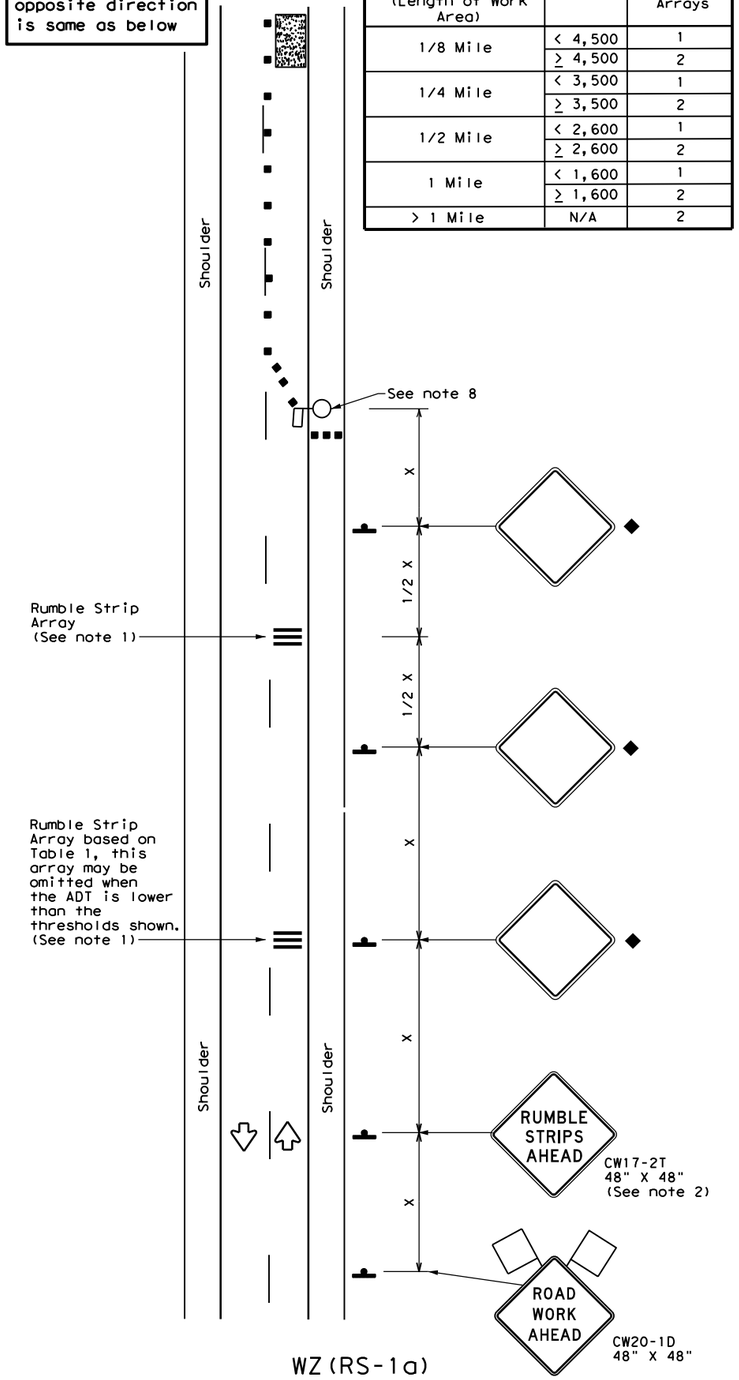
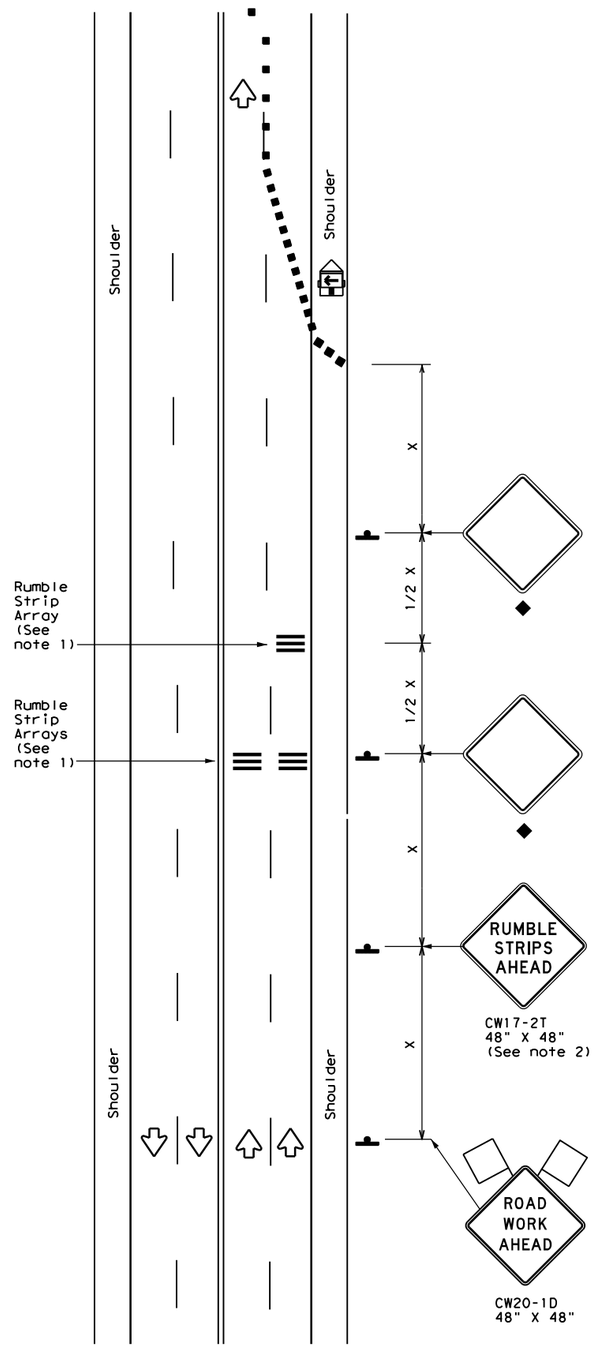
Warning sign and rumble strip sequence in opposite direction is same as below

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)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

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. Removal of the Temporary Rumble Strips should be accomplished before removing the advance 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 AFAD or a portable traffic signal.
9. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

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.

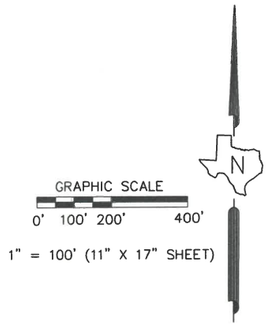
TABLE 2	
Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

Texas Department of Transportation
Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

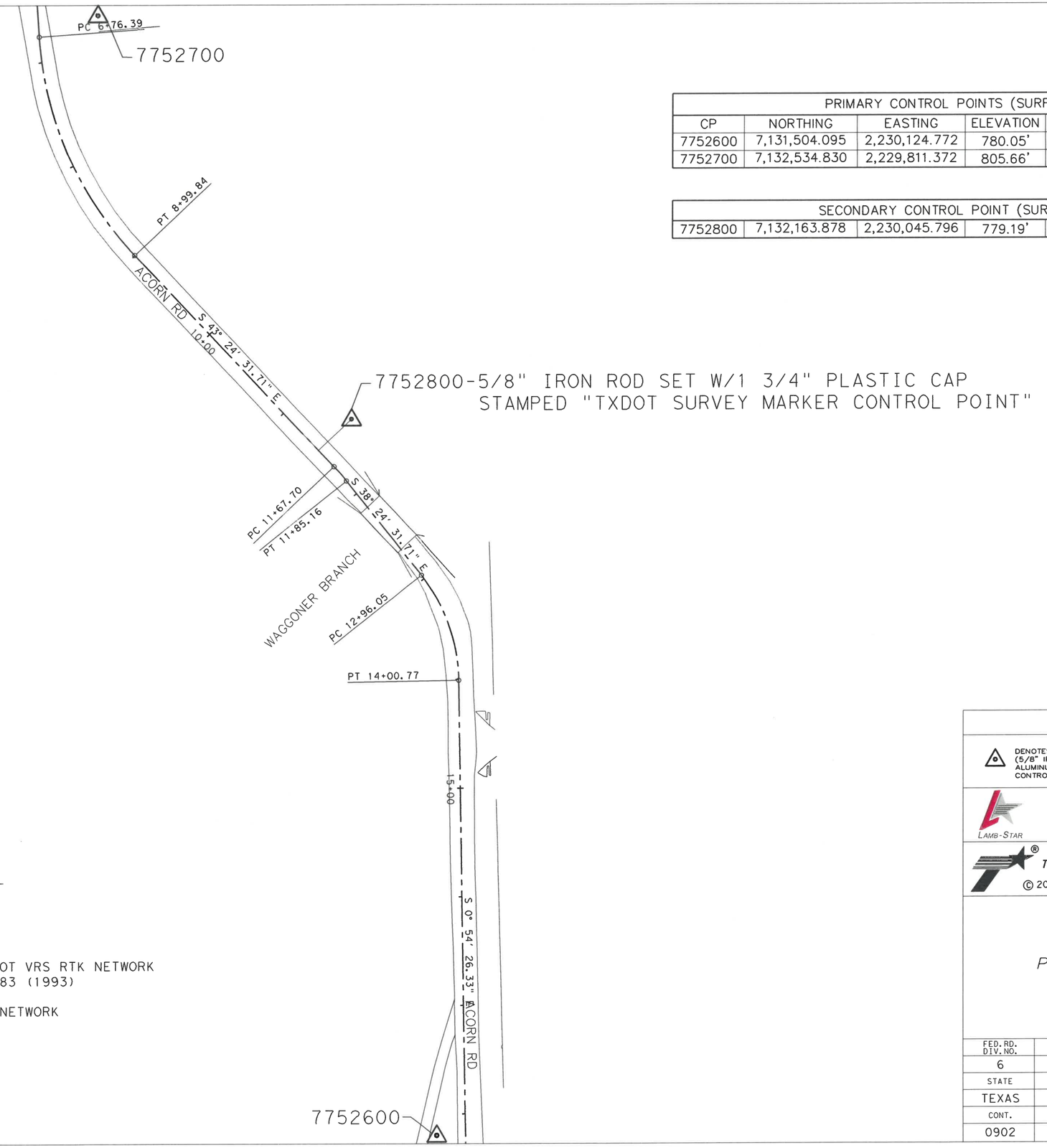
WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
2-14	DIST	COUNTY		SHEET NO.
4-16	FTW	WISE		24

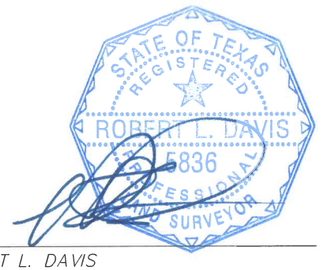


PRIMARY CONTROL POINTS (SURFACE)					
CP	NORTHING	EASTING	ELEVATION	STATION	OFFSET
7752600	7,131,504.095	2,230,124.772	780.05'	18+19.56	26.56' R
7752700	7,132,534.830	2,229,811.372	805.66'	6+60.74	55.01' L

SECONDARY CONTROL POINT (SURFACE)					
7752800	7,132,163.878	2,230,045.796	779.19'	11+46.98	41.66' L



I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY A FIELD SURVEY ON APRIL 12, 2019 UTILIZING THE TxDOT VIRTUAL REFERENCE SYSTEM RTK NETWORK AND IS CORRECTLY SHOWN HEREON.



ROBERT L. DAVIS
Registered Professional Land Surveyor
Texas No. 5836

TBPLS # 10048300

APRIL 29, 2021
DATE

NOTE:
HORIZONTAL COORDINATES DERIVED FROM: TxDOT VRS RTK NETWORK
COORDINATE SYSTEM: TEXAS STATE PLANE NAD83 (1993)
ZONE: NORTH CENTRAL ZONE (4202)
ELEVATIONS ARE BASED UPON TxDOT VRS RTK NETWORK
VERTICAL DATUM: NAVD88
UNITS: U.S. SURVEY FEET

COMBINED SCALE FACTOR: 1.00012

CONTROL POINT LEGEND

△ DENOTES PRIMARY CONTROL POINT (5/8" IRON ROD SET IN CONCRETE WITH A 3 1/2" ALUMINUM CAP STAMPED "TEXAS DEPT. OF TRANSPORTATION CONTROL POINT"), UNLESS OTHERWISE NOTED

LAMB-STAR ENGINEERING, L.P.
5700 W. PLANO PARKWAY, SUITE 1000
PLANO, TX 75093
P 214-440-3600
F 214-440-3601
TBPLS # 10048300

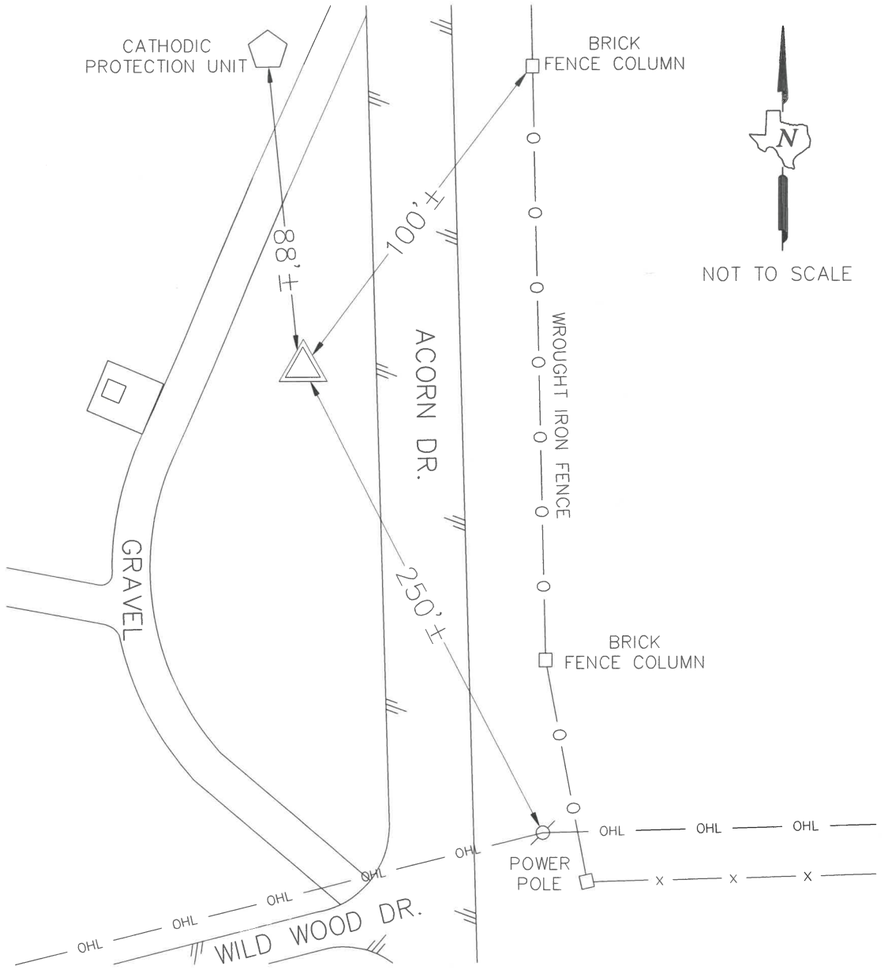
Texas Department of Transportation

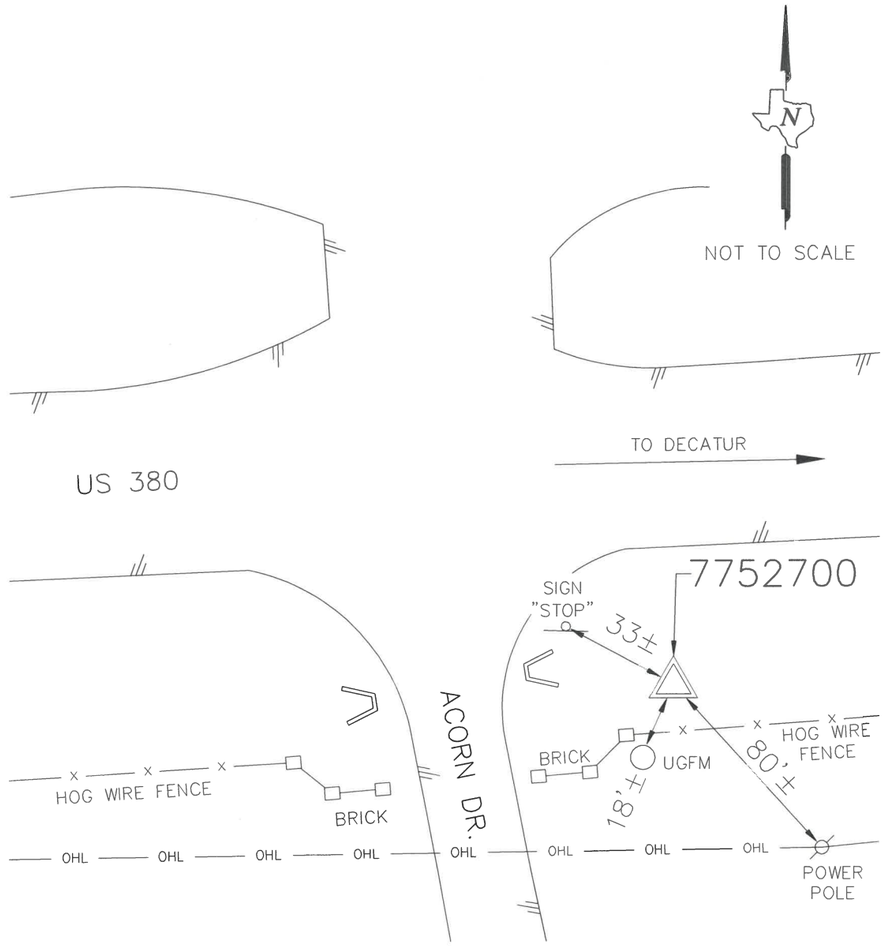
ACORN DRIVE

PRIMARY HORIZONTAL AND VERTICAL CONTROL

SHEET 1 OF 3

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		25
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR





I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY A FIELD SURVEY ON APRIL 12, 2019 UTILIZING THE TxDOT VIRTUAL REFERENCE SYSTEM RTK NETWORK AND IS CORRECTLY SHOWN HEREON.

29-APRIL-2021

STATE OF TEXAS
REGISTERED
ROBERT L. DAVIS
5836
PROFESSIONAL
LAND SURVEYOR

ROBERT L. DAVIS
Registered Professional Land Surveyor
Texas No. 5836

TBPLS # 10048300

APPROXIMATE LOCATION 7752600:

5/8" IRON ROD SET IN CONCRETE WITH A 3 1/2" ALUMINUM CAP STAMPED "TEXAS DEPT. OF TRANSPORTATION CONTROL POINT", ±88' SOUTH OF A SIGN "CATHODIC PROTECTION UNIT, ±100' SOUTHWEST OF A BRICK COLUMN IN THE WROUGHT IRON FENCE LINE, AND ±250' NORTHWEST OF A POWER POLE.

US SURVEY FEET
NAVD 88 ELEVATION= 780.05'
DATE SET: APRIL 12, 2019
MONUMENT: 3 1/2" ALUMINUM CAP STAMPED "TEXAS DEPT. OF TRANSPORTATION CONTROL MARK"
WISE COUNTY SCALE FACTOR: 1.00012
SURFACE ENGLISH CO-ORDS
NORTHING: 7,131,504.095
EASTING: 2,230,124.772
STATE PLANE ENGLISH CO-ORDS
NORTHING: 7,130,648.417
EASTING: 2,229,857.189
ELEVATIONS ARE NAVD 88 BASED UPON TxDOT VRS RTK NETWORK

APPROXIMATE LOCATION 7752700:

5/8" IRON ROD SET IN CONCRETE WITH A 3 1/2" ALUMINUM CAP STAMPED "TEXAS DEPT. OF TRANSPORTATION CONTROL POINT", ±18' NORTHEAST OF AN UNDERGROUND FIBER OPTIC MARKER (UGFM), ±33' SOUTHEAST OF A STOP SIGN, AND ±80' NORTHWEST OF A POWER POLE.

US SURVEY FEET
NAVD 88 ELEVATION= 805.66'
DATE SET: APRIL 12, 2019
MONUMENT: 3 1/2" ALUMINUM CAP STAMPED "TEXAS DEPT. OF TRANSPORTATION CONTROL MARK"
WISE COUNTY SCALE FACTOR: 1.00012
SURFACE ENGLISH CO-ORDS
NORTHING: 7,132,534.830
EASTING: 2,229,811.372
STATE PLANE ENGLISH CO-ORDS
NORTHING: 7,131,679.028
EASTING: 2,229,543.827
ELEVATIONS ARE NAVD 88 BASED UPON TxDOT VRS RTK NETWORK

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TBPLS # 10048300

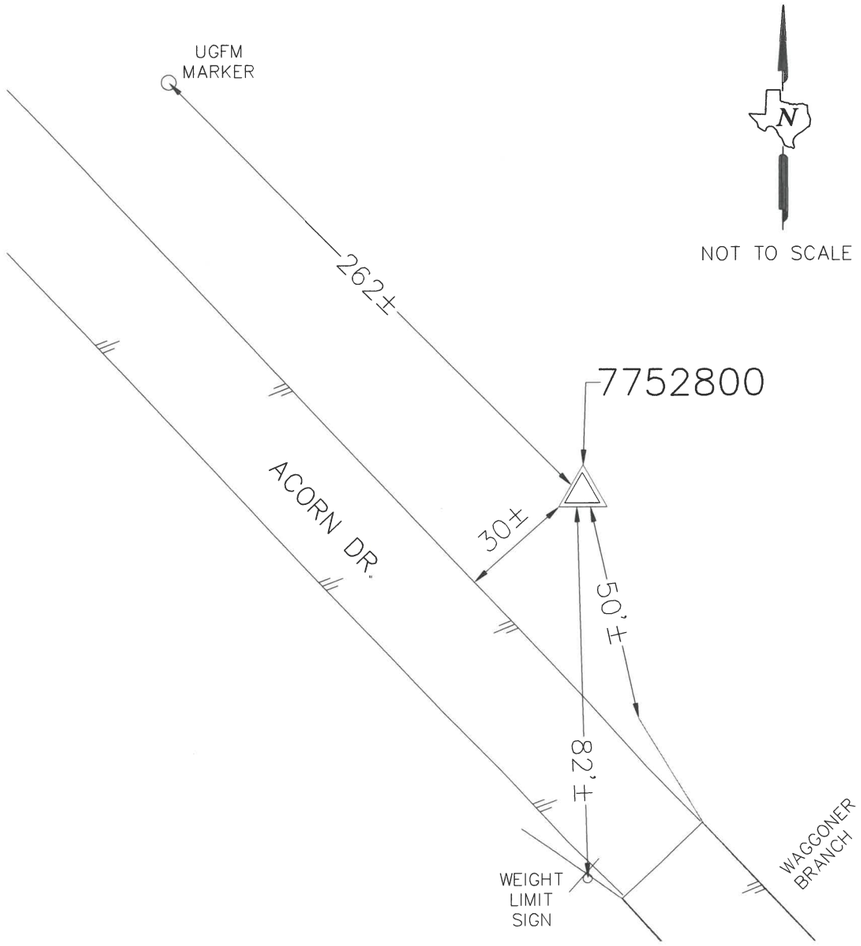
LAMB-STAR

Texas Department of Transportation

ACORN DRIVE

PRIMARY HORIZONTAL AND VERTICAL CONTROL

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		26
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR



APPROXIMATE LOCATION 77752800:

5/8" IRON ROD SET WITH A 1 3/4" PLASTIC CAP STAMPED "TXDOT SURVEY MARKER CONTROL POINT", ±50' NORTHWEST OF THE NORTH END OF A GUARDRAIL, ±30' NORTHEAST OF THE NORTHEAST EDGE OF ACORN DR., ±82' NORTH OF A WEIGHT LIMIT SIGN, AND ±262' SOUTHEAST OF AN UNDERGROUND FIBER OPTIC MARKER.

US SURVEY FEET
NAVD 88 ELEVATION= 779.19'
DATE SET: APRIL 12, 2019
MONUMENT: 1 3/4" PLASTIC CAP STAMPED "TXDOT SURVEY MARKER CONTROL POINT"
WISE COUNTY SCALE FACTOR: 1.00012
SURFACE ENGLISH CO-ORDS
NORTHING: 7,132,163.878
EASTING: 2,230,045.796
STATE PLANE ENGLISH CO-ORDS
NORTHING: 7,131,308.121
EASTING: 2,229,778.222
ELEVATIONS ARE NAVD 88 BASED UPON TxDOT VRS RTK NETWORK

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY A FIELD SURVEY ON APRIL 12, 2019 UTILIZING THE TxDOT VIRTUAL REFERENCE SYSTEM RTK NETWORK AND IS CORRECTLY SHOWN HEREON.

29 APR 2021

STATE OF TEXAS
REGISTERED
ROBERT L. DAVIS
5836
PROFESSIONAL
LAND SURVEYOR

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Registered Professional Land Surveyor
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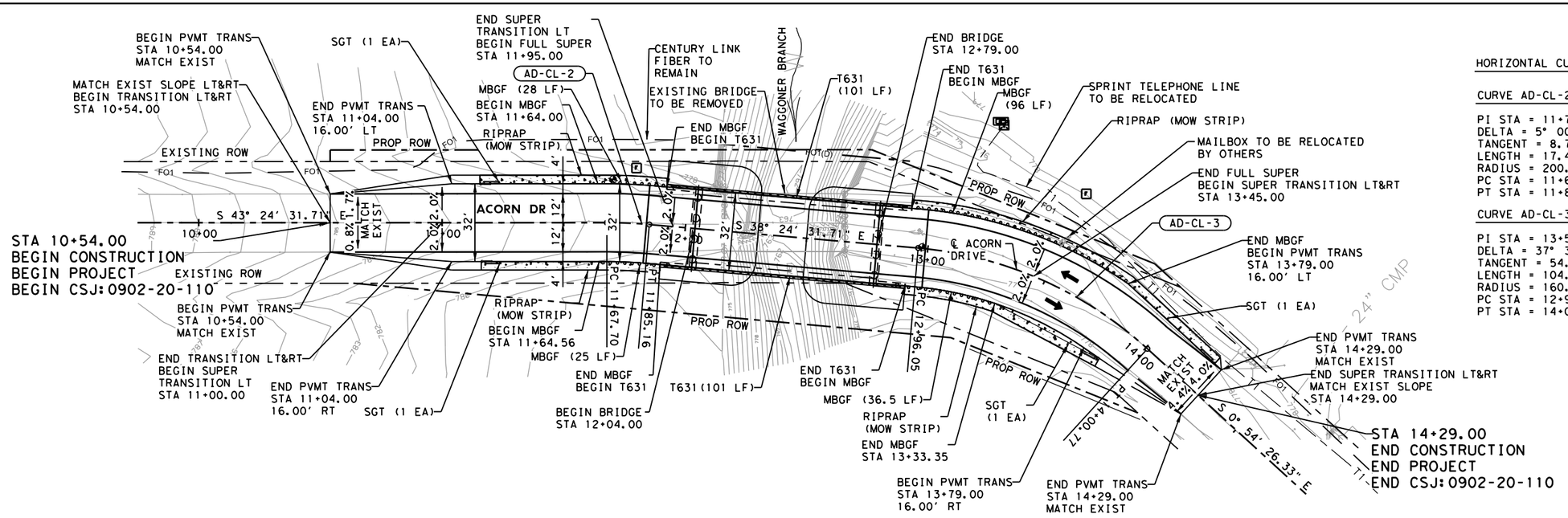
Texas Department of Transportation

ACORN DRIVE

PRIMARY HORIZONTAL AND VERTICAL CONTROL

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		27
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR



HORIZONTAL CURVE DATA

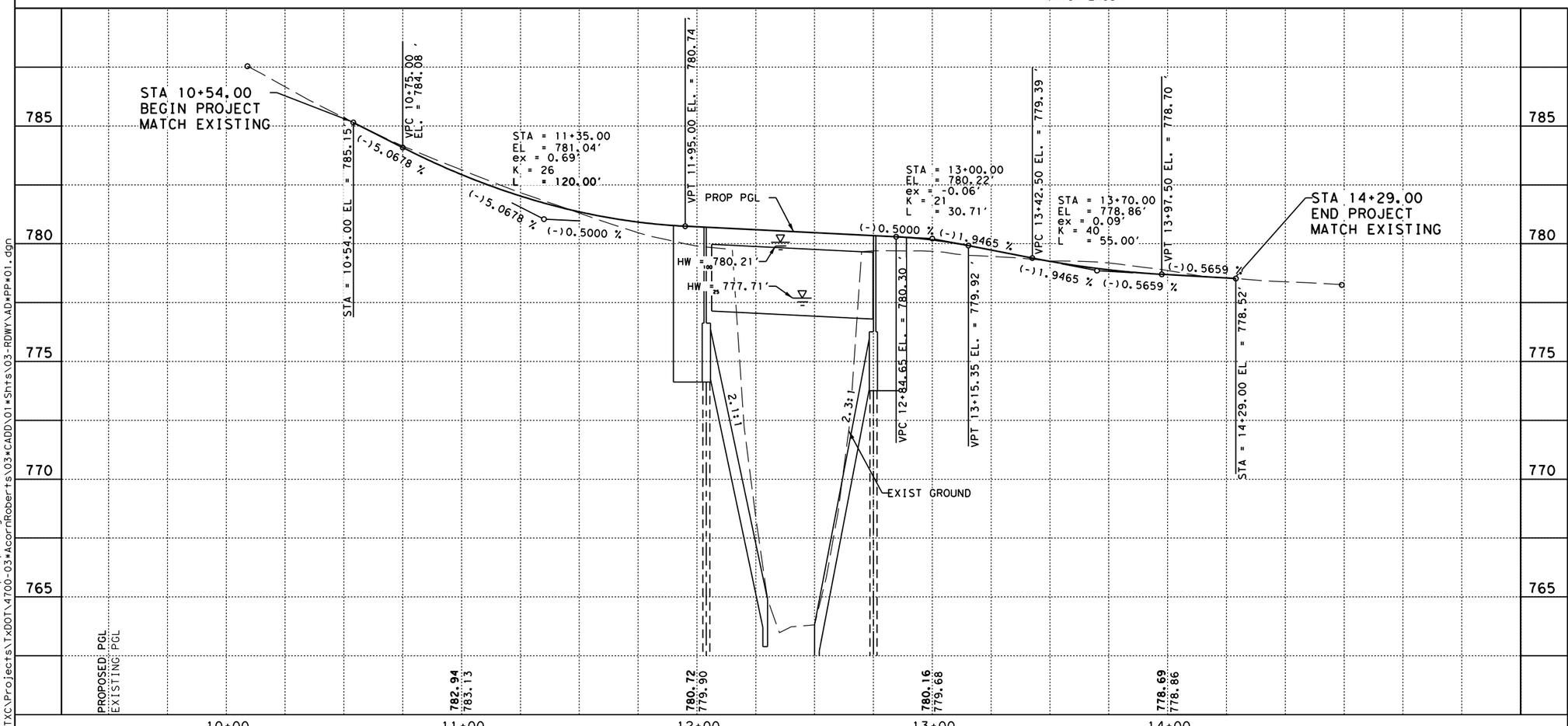
CURVE AD-CL-2

PI STA = 11+76.44
DELTA = 5° 00' 00.00" (RT)
TANGENT = 8.73
LENGTH = 17.45
RADIUS = 200.00'
PC STA = 11+67.00
PT STA = 11+85.16

CURVE AD-CL-3

PI STA = 13+50.36
DELTA = 37° 30' 05.38" (RT)
TANGENT = 54.32
LENGTH = 104.72
RADIUS = 160.00
PC STA = 12+95.05
PT STA = 14+00.77

NOTE:
1. NO RAP SHALL BE USED AS EMBANKMENT UNDER THE NOW STRIP.
2. MOW STRIP SHALL BE REINFORCED WITH WIRE MESH OR CONVENTIONAL STEEL. NO FIBER REINFORCED CONCRETE WILL BE ALLOWED IN MOW STRIP CONSTRUCTION.



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

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

ACORN DRIVE

PLAN & PROFILE
ACORN DRIVE

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		28
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR

5/26/2021 10:45:08 AM pdf.pltcfg
G:\TXC\Projects\Txdot\4700-03*AcornRoberts\03*CADD\01*Shts\03-RDWY\ADePP*01.dgn

DATE: 5/26/2021
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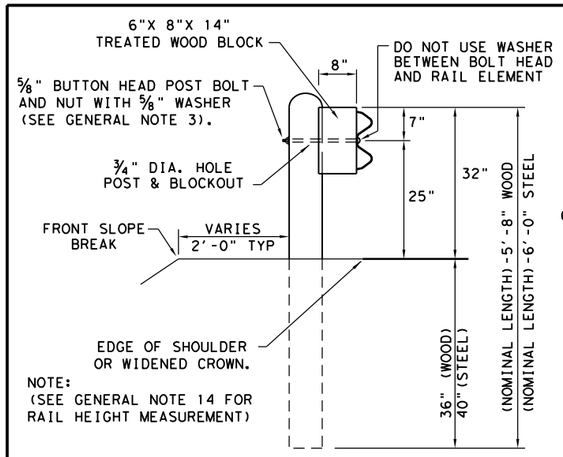
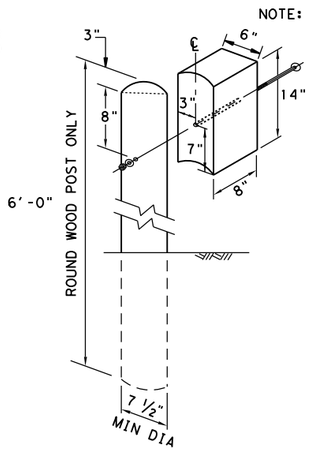
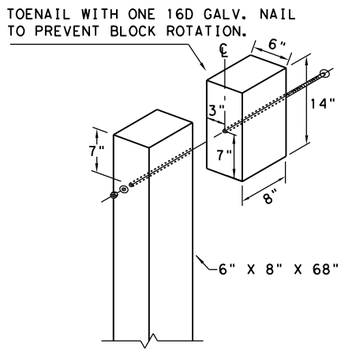


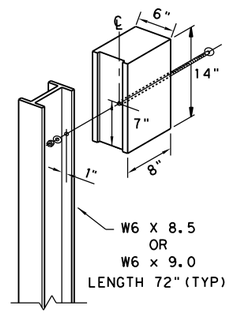
TYPICAL POST PLACEMENT



WOOD BLOCK TO
ROUND WOOD POST

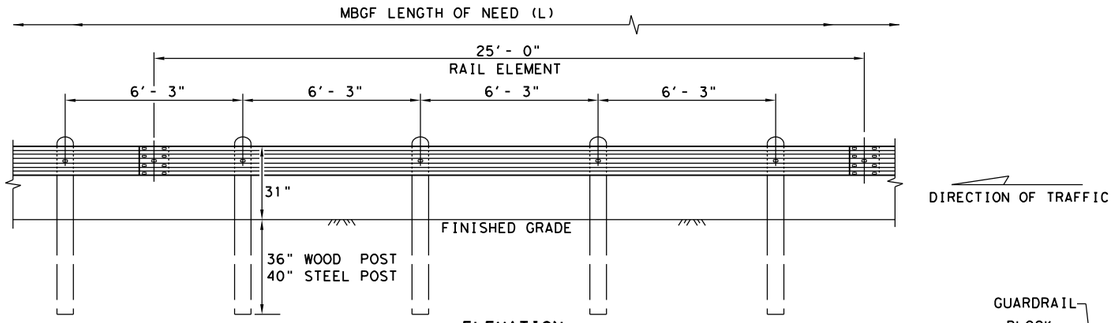


WOOD BLOCK TO
RECTANGULAR WOOD POST



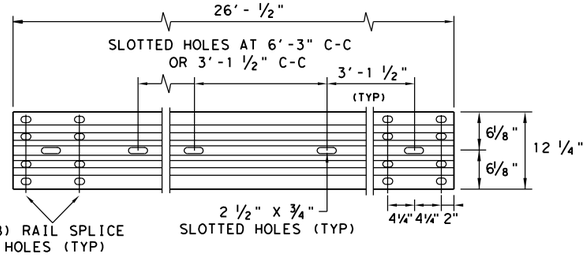
ROUTED WOOD BLOCK
TO I-BEAM STEEL POST

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



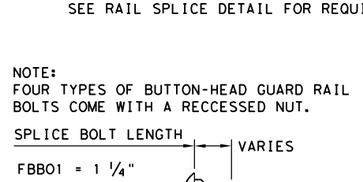
ELEVATION
MID-SPAN RAIL SPLICE

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



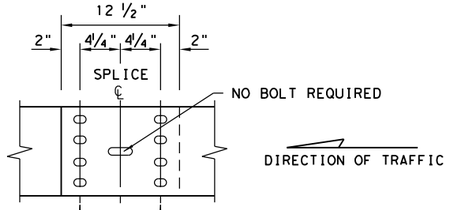
ELEVATION 25'- 0"(NOM.) W-BEAM SECTION

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



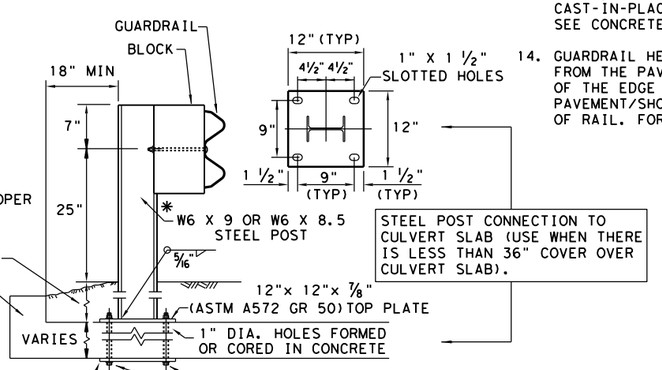
BUTTON HEAD BOLT

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.



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.

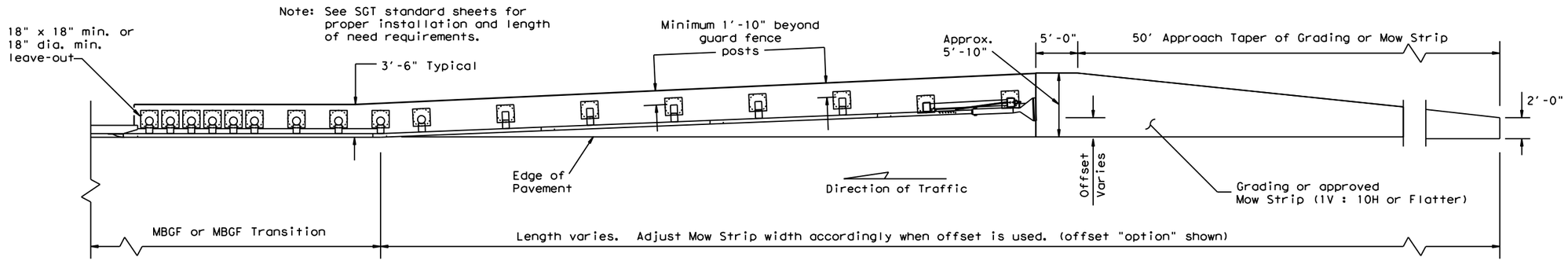
Texas Department of Transportation

Design Division Standard

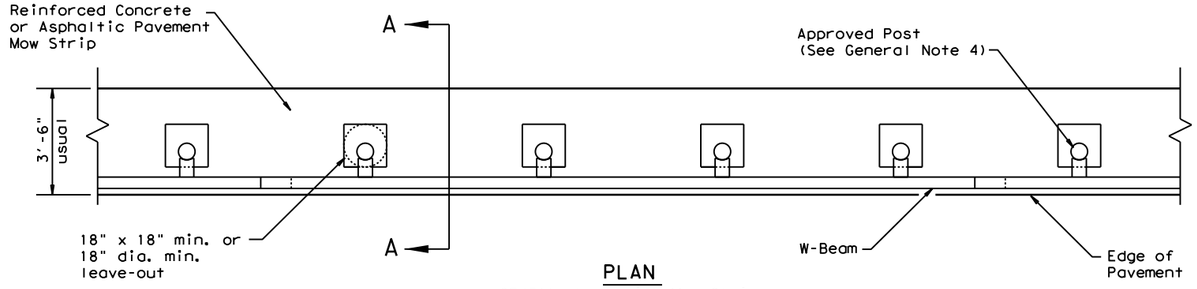
METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
	DIST	COUNTY		SHEET NO.
	FTW	WISE		29

DATE: 5/26/2021
FILE: G:\TxC\Projects\TxDOT\4700-03_AcornRoberts\03_CADD\01_Shts\03-RDWY\Stds\Acorn Dr\gf31ms19.dgn

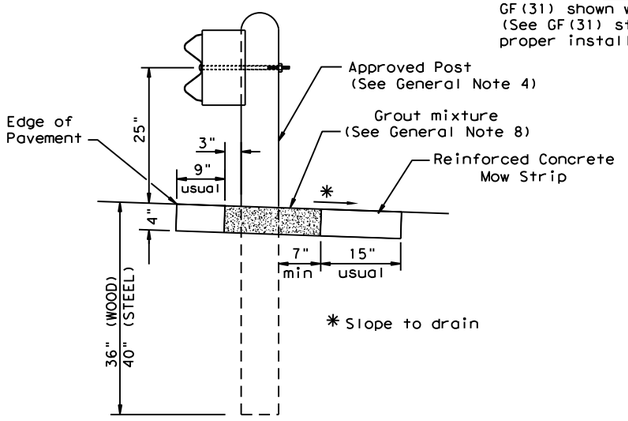


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



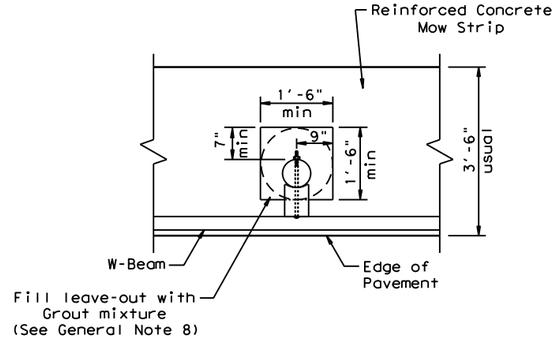
PLAN

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



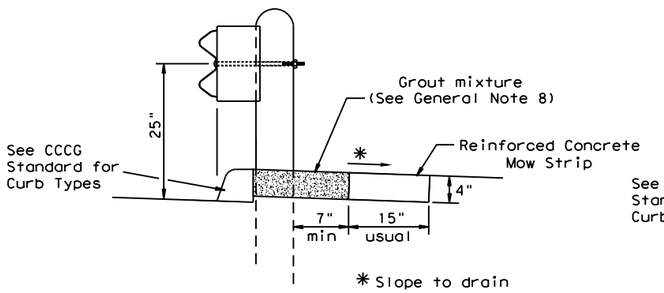
SECTION A-A

Typical



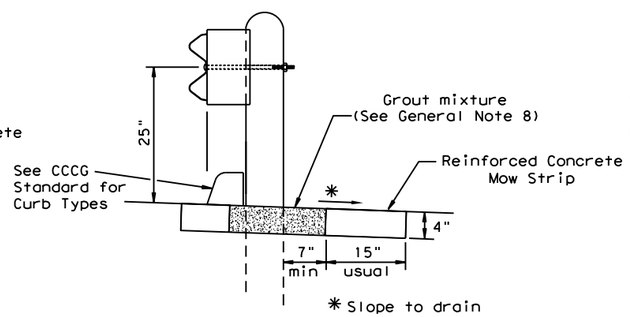
MOW STRIP DETAIL

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



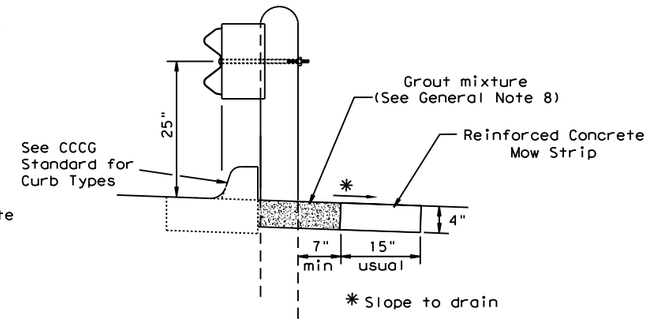
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 ½" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type I or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
	DIST	COUNTY		SHEET NO.
	FTW	WISE		30

DATE: 5/26/2021
FILE: G:\TxC\Projects\TxDOT\4700-03_AcornRoberts\03_CADD\01_Shts\03-RDWY\Stds\Acorn Dr\sgt10s3116.dgn

NOTE: STEEL I-BEAM POST W6 X 8.5 (6'-0") PN: 533G
STANDARD WOOD BLOCKOUTS (6"X8"X14") PN: 4076B
AT (POSTS 2 THRU 8)

⅝" X 10" HGR BOLT PN: 3500G
⅝" HGR NUT PN: 3340G

LINE AT THE BACK OF POST #2 THRU #8

FROM THE CENTERLINE OF POST(1) & POST(0)

ANGLE STRUT PN: 15202G

ANCHOR PADDLE PN: 15204A

16"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(2) POST(1) POST(0)

PLAN VIEW

MASH TEST LEVEL 3 (TL-3) LENGTH OF SoftStop TERMINAL (50'-9 ½")

BEGIN LENGTH OF NEED

DO NOT BOLT ANCHOR RAIL TO - POST (2)

SEE DETAIL 1

TRAFFIC FLOW

50'-9 ½" STANDARD INSTALLATION LENGTH (MASH TL-3 SoftStop)

BEGIN STANDARD MBGF

END PAYMENT FOR SGT

6¼"

3'-1 ½" 6'-3" 6'-3"

ANCHOR RAIL WITH SLOTS - (THREADED THRU HEAD)
SEE SoftStop MANUAL FOR COMPLETE DETAILS

MIDDLE SLOT CUTOUT (1) 1 ¾" X 6'-10 ¼"

OUTSIDE SLOTS CUTOUT (2)1½" X 6'-9 ⅝"

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

25'-0" DOWNSTREAM W-BEAM GUARDRAIL PN: 61G

SoftStop ANCHOR RAIL (12GA) PN: 15215G

SoftStop FACE SEE GN(3) & NOTE: B

3'-1 ½"(+/-) 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 5'-8" 4'-7"

ANCHOR PADDLE PN: 15204A

END OF ANCHOR RAIL PN: 15215G

SEE NOTE: C

POST 32" HEIGHT

31"

RAIL HEIGHT

RAIL 25'-0" PN: 61G

RAIL 25'-0" PN: 15215G

DO NOT BOLT ANCHOR RAIL TO POST(2)

SEE DETAIL 2

SEE NOTE: A

(8) ⅝"x 1- ¼" GR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

POST 40" DEPTH (TYP 1-8)

(8) ⅝"x 1- ¼" HGR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

13/16" DIA. YIELDING HOLES

13/16" DIA. YIELDING HOLES

SEE DETAIL 3

6'-1⅜"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(2) 6'-0" (SYTP) PN: 15000G POST(1) 4'-9 ½" SYTP PN: 15203G POST(0) 6'-5 ⅜" PN: 15205A

ELEVATION VIEW

HARDWARE FOR POST(2) THRU POST(8)
(1) ⅝"x 10" HGR BOLT PN: 3500G
(1) ⅝" HGR HEX NUT PN: 3340G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

(1) ⅝" x 1 ¾" HEX HD BOLT PN 3391G

ANGLE STRUT PN: 15202G

(2) ⅝" WASHERS PN 4372G

(1) ⅝" HGR HEX NUT PN 3340G

DETAIL 1

SHOWN AT POST(1) NEAR GROUND

(1) ⅝" HEX NUT

(1) ⅝" x 1- ½" HEX HD BOLT-GR-5 PN: 105286

(2) ⅝" ROUND WASHERS PN: 3240G

DETAIL 2

SHOWN AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G

ANCHOR PLATE WASHER ½" THICK PN: 15206G

1" ROUND WASHER F463 PN: 4902G

(2) ⅝" x 2 ½" HEX HD BOLT GR-5 PN: 105285G

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

(2) ⅝" ROUND WASHER (WIDE) PN: 3240G

1" NUT PN: 3908G SHALL BE SECURELY TIGHTENED AFTER FINAL ASSEMBLY, BUT NOT DEFORMING THE KEEPER PLATE.

ANCHOR PADDLE PN: 15204A

(2) ⅝" HEX NUT A563 GR.DH PN: 3245G

W-BEAM FLATTENED (4 PLIES)

ANGLE STRUT PN: 15202G

SEE NOTE: A

(2) ¾" x 2 ½" HEX BOLT (TYP) PN: 3717G

(4) ¾" FLAT WASHER (TYP) PN: 3701G

(2) ¾" HEX NUT (TYP) PN: 3704G

6'-1 ⅜" POST DEPTH

(2) ANCHOR POST ANGLE PN: 15201G

DETAIL 3

AT POST(0)

6'-5 ⅜" (W6 X 15) I-BEAM POST PN: 15205A

TRAFFIC FLOW

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

4" X 7 ½" X 14" BLOCKOUT COMPOSITE PN: 6777B

6" X 8" X 14" BLOCKOUT WOOD PN: 4076B

NOTE: DO NOT BOLT ANCHOR RAIL TO POST(2)

8" 6" 14"

⅝" HGR NUT PN: 3340G

⅝" X 10" HGR POST BOLT PN: 3500G

13/16" DIAMETER YIELDING HOLES LOCATED IN FLANGES

FINISHED GRADE

(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW POST(1 & 2)

W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

FINISHED GRADE

LINE POST (3, 4, 5, 6, 7 & 8)

SECTION VIEW B-B

6'-0" (W6 X 8.5)
I-BEAM POST PN: 533G

6" X 8" X 14" BLOCKOUT WOOD

W-BEAM RAIL 25'-0"

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

FINISHED GRADE

POST(2)

SECTION VIEW A-A

6'-0" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15000G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

POST HEIGHT 17"- ½"

4'-9 ½"

13/16" DIA. YIELDING HOLES

40"

POST(1)

FRONT VIEW POST(1)

4'-9 ½" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15203G

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

STANDARD MBGF

EDGE OF PAVEMENT

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

2'-0" MAX. RAIL OFFSET

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

GENERAL NOTES

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

NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-¾" MIN. TO 4" MAX. ABOVE FINISHED GRADE.
NOTE: B	PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
NOTE: C	W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN: 61G ANCHOR RAIL 25'-0" PN: 15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 ⅜")
15203G	1	POST #1 - (SYTP) (4'- 9 ½")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 ½" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (½" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	¾" x 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR.DH
3360G	16	⅝" x 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" x 10" HGR POST BOLT A307
3391G	1	⅝" x 1 ¾" HEX HD BOLT A325
4489G	1	⅝" x 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" x 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" x 1 ½" HEX HD BOLT GR-5
3240G	6	⅝" ROUND WASHER (WIDE)
3245G	3	⅝" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

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

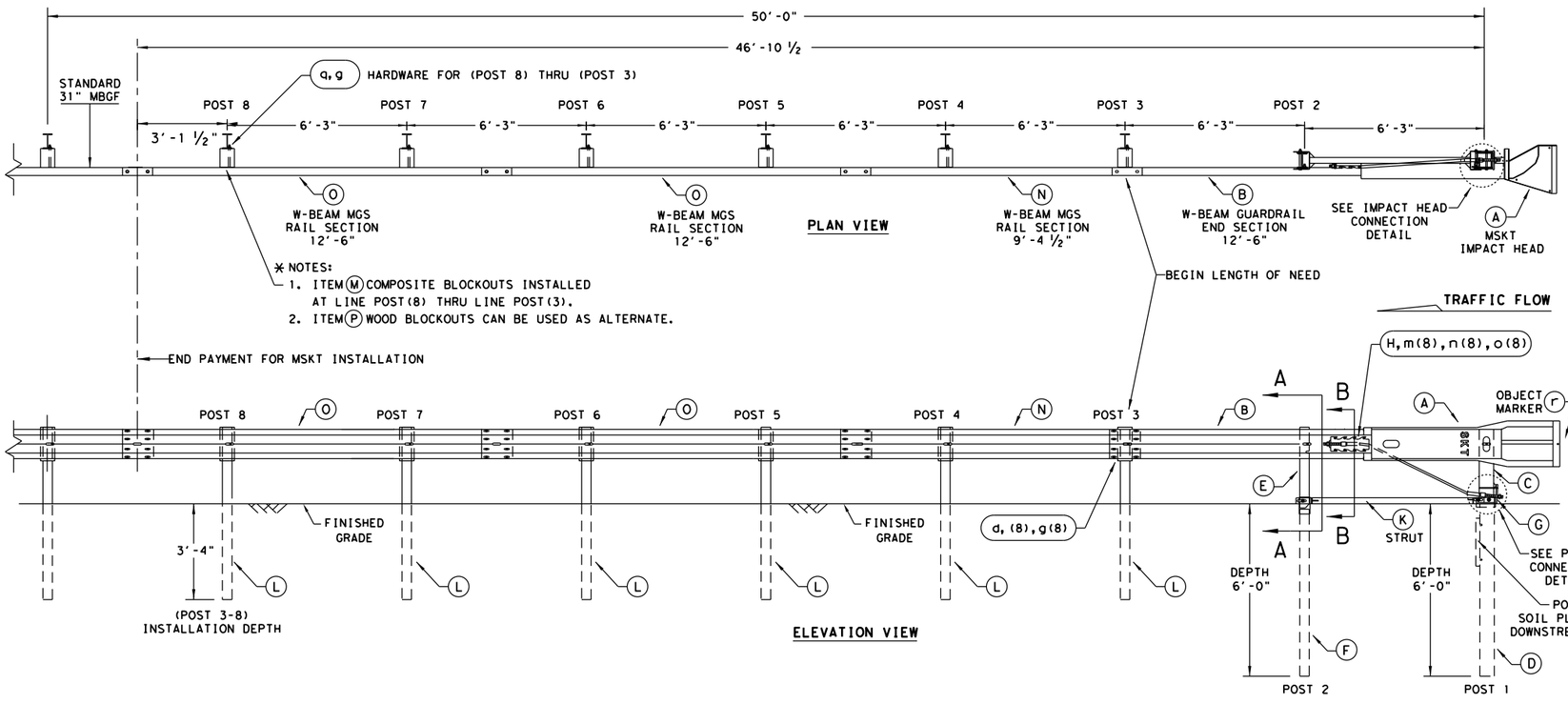
Texas Department of Transportation

Design Division Standard

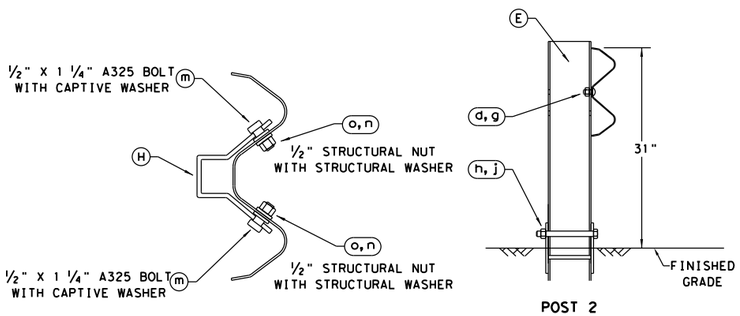
TRINITY HIGHWAY
SOFTSTOP END TERMINAL
MASH - TL-3
SGT(10S)31-16

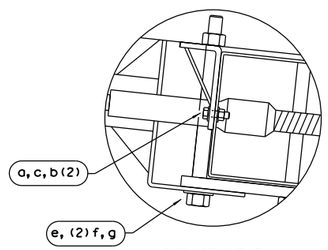
FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
	DIST	COUNTY		SHEET NO.
	FTW	WISE		31

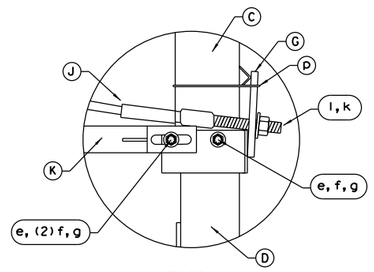
DATE: 5/26/2021
FILE: G:\TXC\Projects\TxDOT\4700-03_AcornRoberts\03_CADD\01_Shts\03-RDWY\Stds\Acorn Dr\sgt12s3118.dgn



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

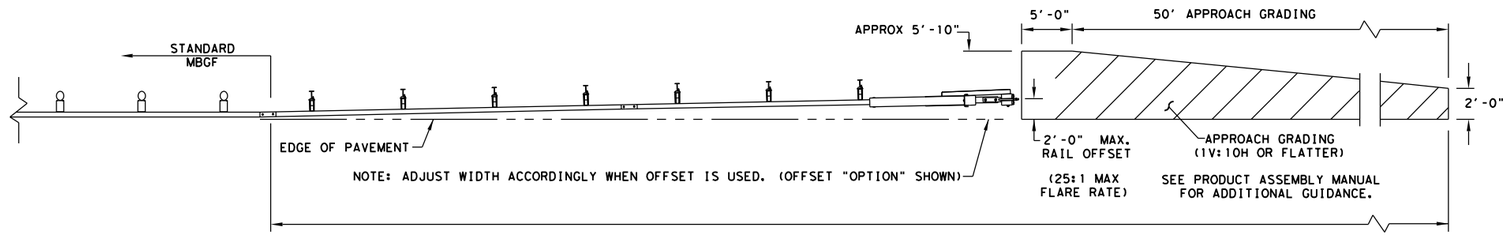






SEE NOTES: *

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



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

GENERAL NOTES

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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	5/16" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/16" WASHER	W0516
c	2	5/16" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 5/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

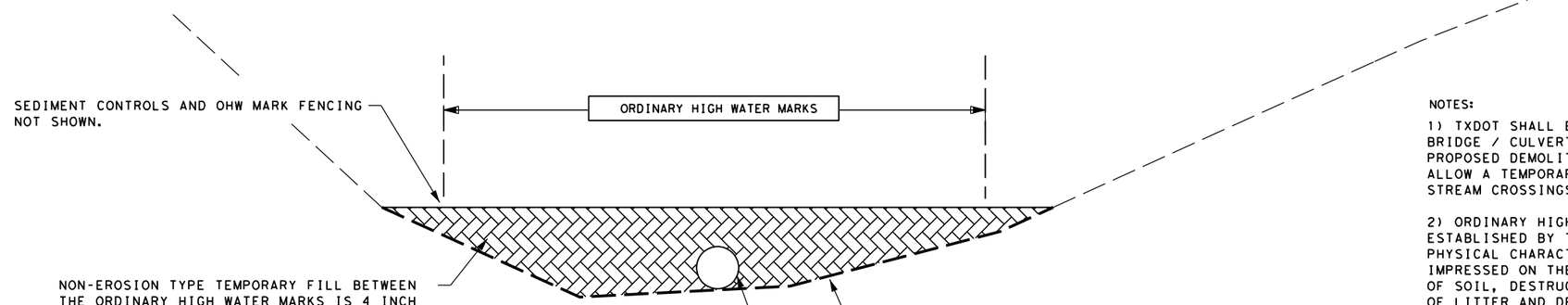
Texas Department of Transportation

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	0902	20	110	CR	
	DIST	COUNTY		SHEET NO.	
	FTW	WISE		32	

NO SOIL SHOULD BE PUSHED OR MOVED FROM ABOVE THE OHW MARKS TO BELOW THE OHW MARKS.



TEMP 404 STREAM CROSSING SECTION WITH CULVERT

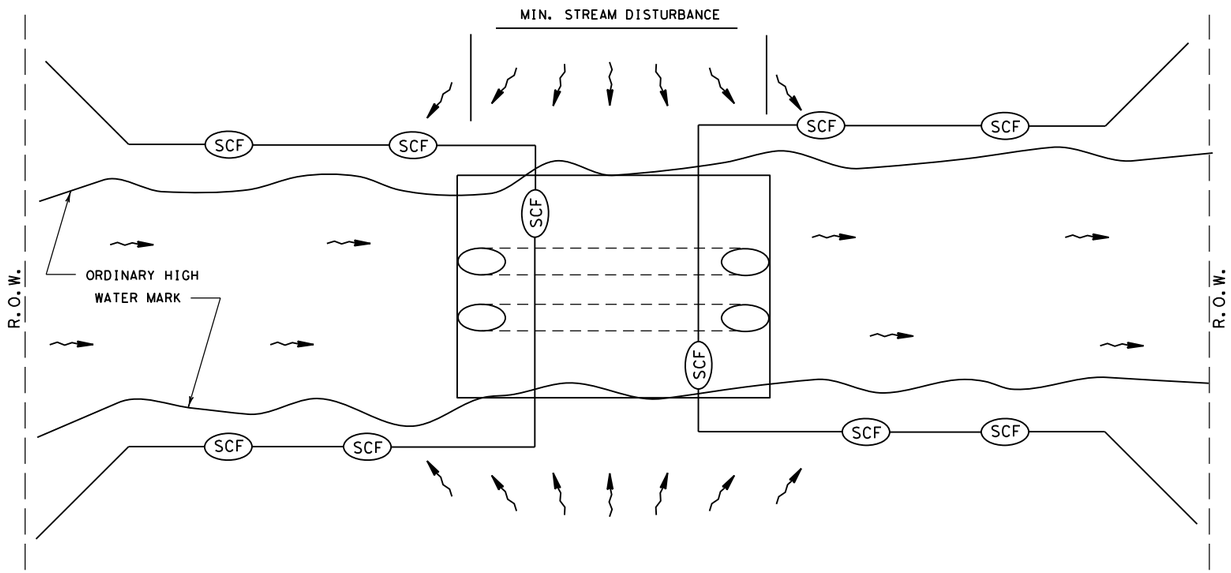
NOTES:

1) TXDOT SHALL EVALUATE ACCESS FROM BOTH SIDES OF THE BRIDGE / CULVERT AND ALSO EVALUATE THE CONTRACTOR'S PROPOSED DEMOLITION AND CONSTRUCTION TECHNIQUES AND ALLOW A TEMPORARAY CROSSING ONLY WHEN NECESSARY. TEMPORARY STREAM CROSSINGS SHOULD BE REMOVED AS SOON AS POSSIBLE.

2) ORDINARY HIGH WATER MARK MEANS LINE ON THE SHORE ESTABLISHED BY THE FLUCTUATIONS OF WATER AND INDICATED BY PHYSICAL CHARACTERSITICS SUCH AS CLEAR, NATURAL LINE IMPRESSED ON THE BANK, SHELVING, CHANGES IN THE CHARACTER OF SOIL, DESTRUCTION OF TERRESTRIAL VEGETATION, THE PRESENCE OF LITTER AND DEBRIS, OR OTEHR APPROPRIATE MEANS THAT CONSIDER THE CHARACTERISTICS OF THE SURROUNDING AREAS.

3) CONTRACTOR WILL SUBMIT, IN WRITING FOR APPROVAL, THE TYPE AND LOCATION OF EACH TEMPORARY STREAM CROSSING. THE SUBMITTAL WILL SHOW, IN DETAIL, THE PROPOSED WORK SEQUENCE AND MATERIALS USED IN THE CONSTRUCTION OF THE TEMPORARY STREAM CROSSING. THE SUBMITTAL WILL BE EVALUATED BY DEQC AND APPROVED BY THE ENGINEER, PRIOR TO COMMENCEMENT OF WORK ON THE STREAM CROSSING.

4) NON-COMPLIANT WORK WILL BE REMOVED AT CONTRACTOR'S EXPENSE AND WILL BE STOPPED UNTIL AN APPROPRIATE PLAN IS RESUBMITTED.



~→	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE

TEMPORARY STREAM CROSSING DETAIL

FORT WORTH DISTRICT STANDARD

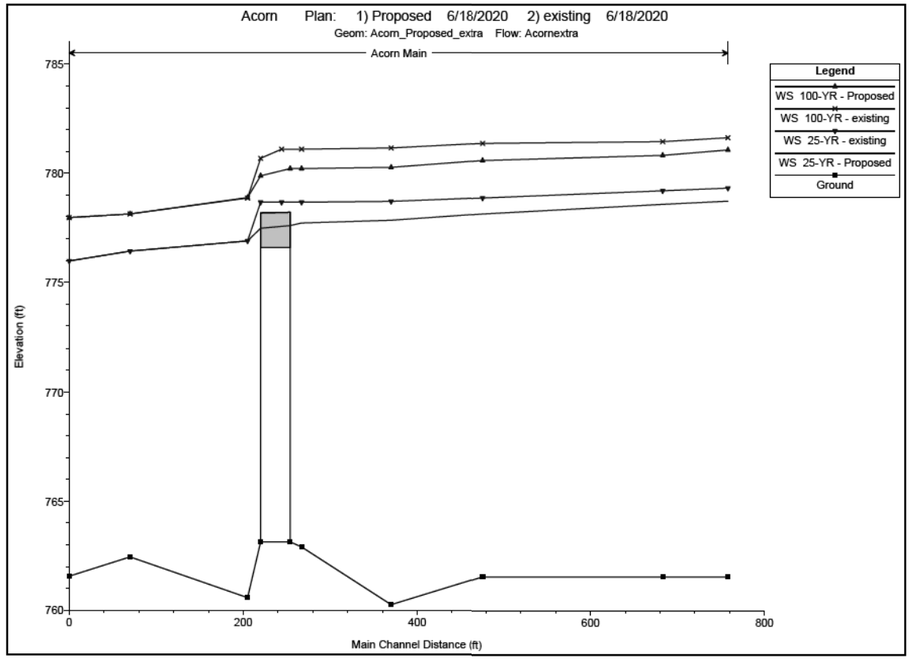
NOT TO SCALE

FED. ROAD DIV. No.	FEDERAL AID PROJECT		SHEET NO.
6	BR 2019(346)		33
STATE	DISTRICT		COUNTY
TEXAS	FTW		WISE
CONTROL	SECTION	JOB	HIGHWAY NO.
0902	20	110	CR

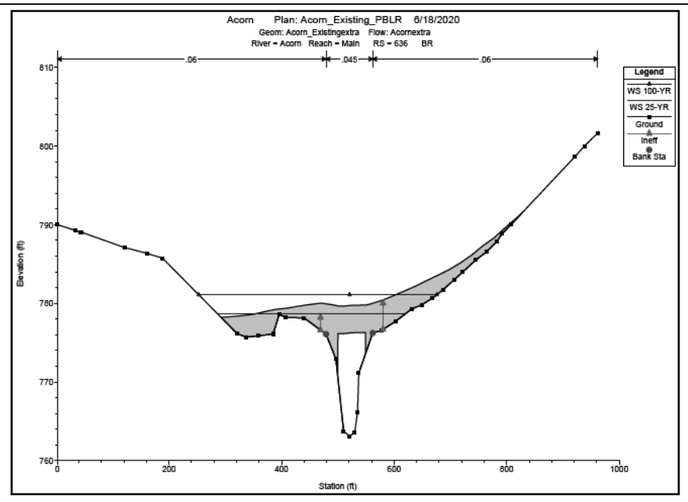
REVISED 08/22/2015

HEC-RAS River: Acorn Reach: Main

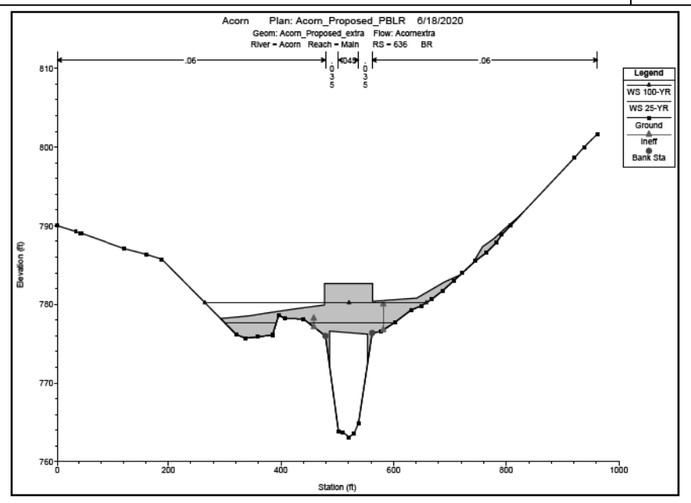
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	1158	25-YR	Proposed	4356.00	761.55	778.72		779.22	0.001689	5.67	768.58	82.61	0.33
Main	1158	25-YR	existing	4356.00	761.55	779.32		779.76	0.001425	5.32	818.76	85.13	0.30
Main	1158	100-YR	Proposed	7293.00	761.55	781.07		781.79	0.002034	7.02	1345.56	405.87	0.37
Main	1158	100-YR	existing	7293.00	761.55	781.63		782.20	0.001582	6.39	1583.66	447.36	0.33
Main	1083	25-YR	Proposed	4356.00	761.55	778.58		779.09	0.001762	5.76	756.53	81.99	0.33
Main	1083	25-YR	existing	4356.00	761.55	779.20		779.65	0.001474	5.39	808.53	84.62	0.31
Main	1083	100-YR	Proposed	7293.00	761.55	780.82		781.62	0.002287	7.33	1242.74	406.58	0.39
Main	1083	100-YR	existing	7293.00	761.55	781.45		782.07	0.001721	6.60	1518.08	464.90	0.34
Main	876	25-YR	Proposed	4356.00	761.55	778.14		778.70	0.002000	6.03	733.97	112.39	0.35
Main	876	25-YR	existing	4356.00	761.55	778.87		779.34	0.001582	5.51	867.50	286.97	0.32
Main	876	100-YR	Proposed	7293.00	761.55	780.59		781.14	0.001851	6.50	1783.00	613.58	0.35
Main	876	100-YR	existing	7293.00	761.55	781.37		781.72	0.001166	5.41	2271.48	631.19	0.28
Main	770	25-YR	Proposed	4356.00	760.25	777.84	772.23	778.47	0.002235	6.43	756.65	204.82	0.37
Main	770	25-YR	existing	4356.00	760.25	778.70		779.17	0.001573	5.63	952.79	248.53	0.32
Main	770	100-YR	Proposed	7293.00	760.25	780.27	775.00	780.92	0.002062	7.09	1560.04	472.75	0.37
Main	770	100-YR	existing	7293.00	760.25	781.16		781.58	0.001314	5.95	1993.17	502.24	0.30
Main	667	25-YR	Proposed	4356.00	762.90	777.71	771.94	778.23	0.001793	5.79	790.27	246.83	0.34
Main	667	25-YR	existing	4356.00	762.90	778.67	771.94	778.98	0.001078	4.80	1176.78	333.49	0.27
Main	667	100-YR	Proposed	7293.00	762.90	780.21	774.62	780.68	0.001430	6.09	1777.07	393.06	0.32
Main	667	100-YR	existing	7293.00	762.90	781.10	774.62	781.43	0.000962	5.25	2140.15	423.15	0.26
Main	636			Bridge									
Main	605	25-YR	Proposed	4356.00	760.57	776.89	772.26	777.88	0.005476	7.97	552.95	148.09	0.55
Main	605	25-YR	existing	4356.00	760.57	776.89	772.26	777.88	0.005496	7.99	546.43	147.87	0.55
Main	605	100-YR	Proposed	7293.00	760.57	778.88	776.38	779.96	0.005342	8.86	1065.75	350.47	0.56
Main	605	100-YR	existing	7293.00	760.57	778.86	776.32	779.96	0.005400	8.93	1055.78	349.30	0.56
Main	469	25-YR	Proposed	4356.00	762.45	776.42	771.74	777.26	0.003103	7.33	594.62	131.41	0.44
Main	469	25-YR	existing	4356.00	762.45	776.43		777.26	0.003091	7.32	606.83	131.80	0.44
Main	469	100-YR	Proposed	7293.00	762.45	778.13	774.43	779.33	0.003968	9.23	1097.23	369.05	0.51
Main	469	100-YR	existing	7293.00	762.45	778.13	774.41	779.33	0.003968	9.23	1097.23	369.05	0.51
Main	399	25-YR	Proposed	4356.00	761.56	775.97	771.75	776.99	0.004008	8.10	541.20	90.82	0.49
Main	399	25-YR	existing	4356.00	761.56	775.97	771.75	776.99	0.004008	8.10	541.20	90.82	0.49
Main	399	100-YR	Proposed	7293.00	761.56	777.96	774.63	778.99	0.004004	8.93	1332.22	529.52	0.50
Main	399	100-YR	existing	7293.00	761.56	777.96	774.63	778.99	0.004004	8.93	1332.22	529.52	0.50



STREAM PROFILE



EXISTING STREAM CROSS-SECTION AT STRUCTURE



PROPOSED STREAM CROSS-SECTION AT STRUCTURE

WEIR FLOW DATA

WEIR FLOW DATA						
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
TOTAL Q	887	2010	2892	4356	5675	7293
EXIST	0	0	0	77	1031	2540
PROP	0	0	0	0	245	1202

NOTES:
1) USACE HEC-RAS VERSION 5.0.6 UTILIZED FOR THE ANALYSIS.
2) THIS SITE IS DESIGNATED AS A ZONE "A" AS SHOWN ON PANEL 48497C0325D, EFFECTIVE DATE 12/16/2011.
3) REFER TO THE H&H REPORT "ACORN DRIVE HYDRAULIC REPORT" FOR ADDITIONAL INFORMATION.
4) ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
5) THE DOWNSTREAM BOUNDARY CONDITION WAS ESTABLISHED USING NORMAL DEPTH WITH A DOWNSTREAM SLOPE OF 0.4 FT/FT.
6) INFORMAL COORDINATION WAS COMPLETED WITH THE LOCAL FLOODPLAIN ADMINISTRATOR, CHAD DAVIS, OF WISE COUNTY AND H&H FILES WERE SENT ON JANUARY 5, 2021.

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
ERIN N. GONZALES
102407
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

ACORN DRIVE

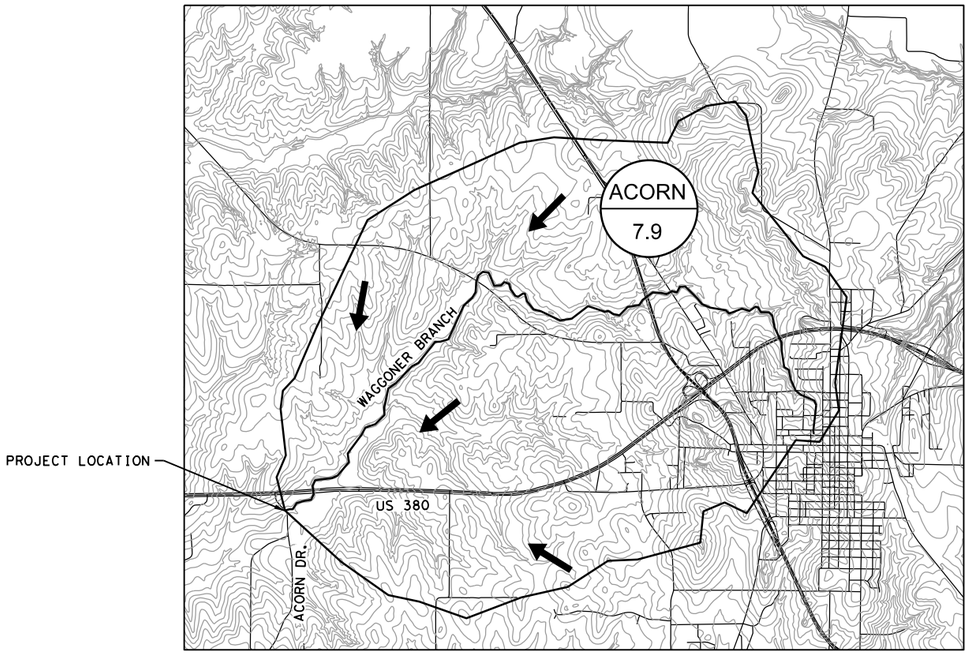
HYDRALUIC DATA

SHEET 1 OF 3

FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
6	BR 2012 (346)	34

STATE	DIST.	COUNTY
TEXAS	FTW	WISE

CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR



DRAINAGE AREA MAP

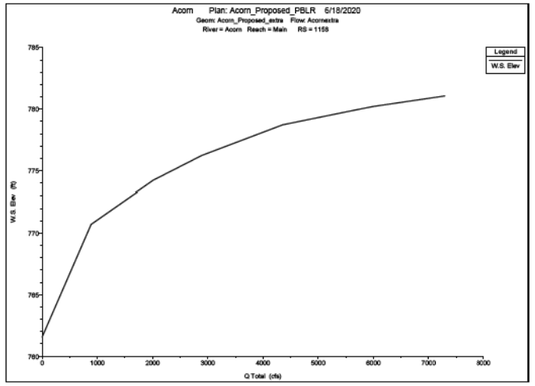
0 2500 5000

SCALE: 1"=5000'

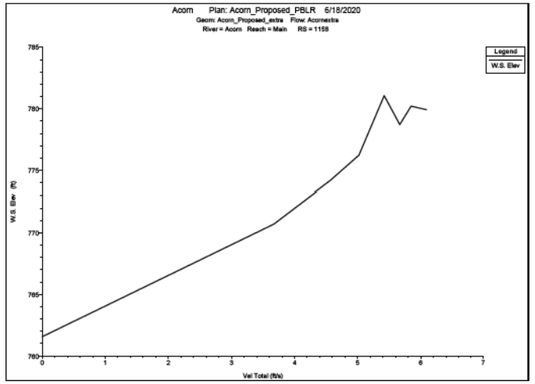
LEGEND

- DRAINAGE AREA BOUNDARY
- DA # / XX — DRAINAGE AREA ID; DRAINAGE AREA (SQ MI)
- DRAINAGE FLOW ARROW

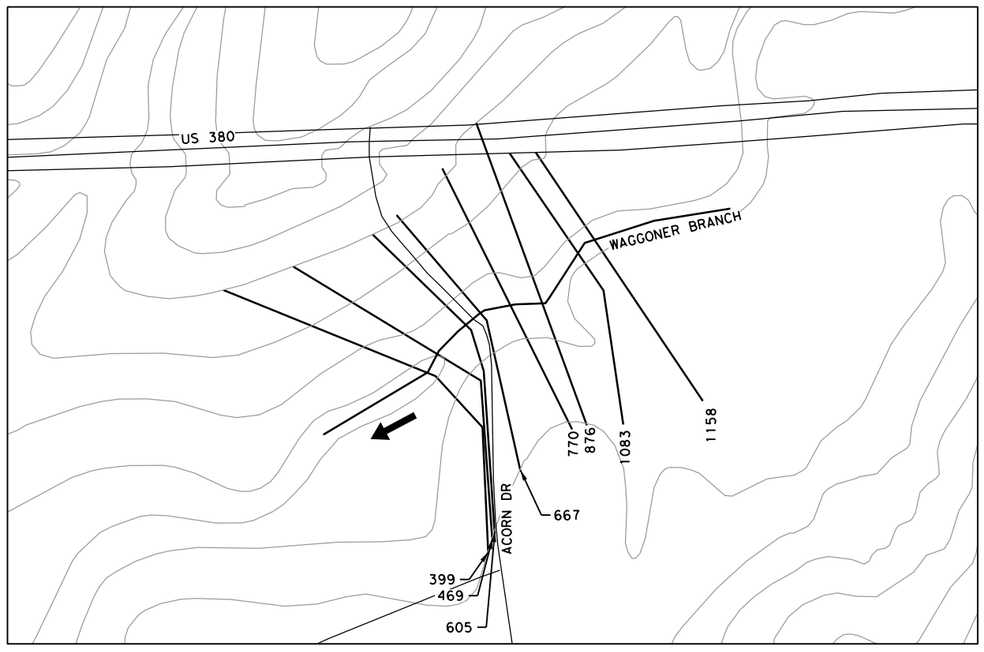
REFERENCES:
1) TXDOT'S HYDRAULIC DESIGN MANUAL
2) TOPOGRAPHIC DATA SOURCE (TNRIS, WISE COUNTY DIGITAL RASTER GRAPHICS)



CONVEYANCE CURVE



VELOCITY CURVE



CROSS SECTION LOCATION MAP

0 250 500

SCALE: 1"=500'

HYDROLOGIC COMPUTATIONS

P	34.5
*	0.061

	2YR	5YR	10YR	25YR	50YR	100YR
a	50.98	16.62	13.62	11.79	11.17	10.82
b	50.3	15.32	11.97	9.819	8.997	8.448
c	1.398	1.308	1.203	1.14	1.105	1.071
d	0.27	0.372	0.403	0.446	0.476	0.507
e	0.77	0.885	0.918	0.945	0.961	0.969
*	-0.0058	-0.0215	-0.0289	-0.0374	-0.0424	-0.0467

DA	Area	Slope	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
Acorn	7.91	0.011	887	2010	2892	4356	5675	7293

NOTES:
1) USACE HEC-RAS VERSION 5.0.6 UTILIZED FOR THE ANALYSIS.
2) THIS SITE IS DESIGNATED AS A ZONE "A" AS SHOWN ON PANEL 48497C0325D, EFFECTIVE DATE 12/16/2011.
3) REFER TO THE H&H REPORT "ACORN DRIVE HYDRAULIC REPORT" FOR ADDITIONAL INFORMATION.
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5) THE DOWNSTREAM BOUNDARY CONDITION WAS ESTABLISHED USING NORMAL DEPTH WITH A DOWNSTREAM SLOPE OF 0.4 FT/FT.
6) INFORMAL COORDINATION WAS COMPLETED WITH THE LOCAL FLOODPLAIN ADMINISTRATOR, CHAD DAVIS, OF WISE COUNTY AND H&H FILES WERE SENT ON JANUARY 5, 2021.

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
ERIN N. GONZALES
102407
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

ACORN DRIVE

HYDRALUIC DATA

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		35
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR

PREDICTED SCOUR RESULTS

Summary of Scour Depths		
Frequency	50-year	100-year
Pier scour (ft)	0.0	0.0
Contraction scour (ft)	2.2	0.4
Contraction Scour (CW or LB)	Live Bed	Live Bed
Long Term Degradation	1.0	1.0
Total Estimated Scour (ft)	3.2	1.4

GENERAL NOTES:
1) SEE "BRIDGE LAYOUT" FOR HORIZONTAL ALIGNMENT AND VERTICAL PROFILE.
2) SCOUR COMPUTATIONS PERFORMED USING OUTPUT FROM HEC-RAS VERSION 5.0.6, ACCORDING TO TXDOT GEOTECHNICAL MANUAL AND FHWA HEC-18 PROCEDURES.
3) D50 LIMITED TO 0.2 MM (TXDOT GEOTECHNICAL MANUAL MARCH 2018 EDITION PG. 5-19).
4) SEE SRR STANDARD FOR LIMITS AND TYPES OF ABUTMENT PROTECTION.
5) USACE HEC-RAS VERSION 5.0.6 UTILIZED FOR THE ANALYSIS.
6) THIS SITE IS DESIGNATED AS A ZONE "A" AS SHOWN ON PANEL 48497C0325D, EFFECTIVE DATE 12/16/2011.
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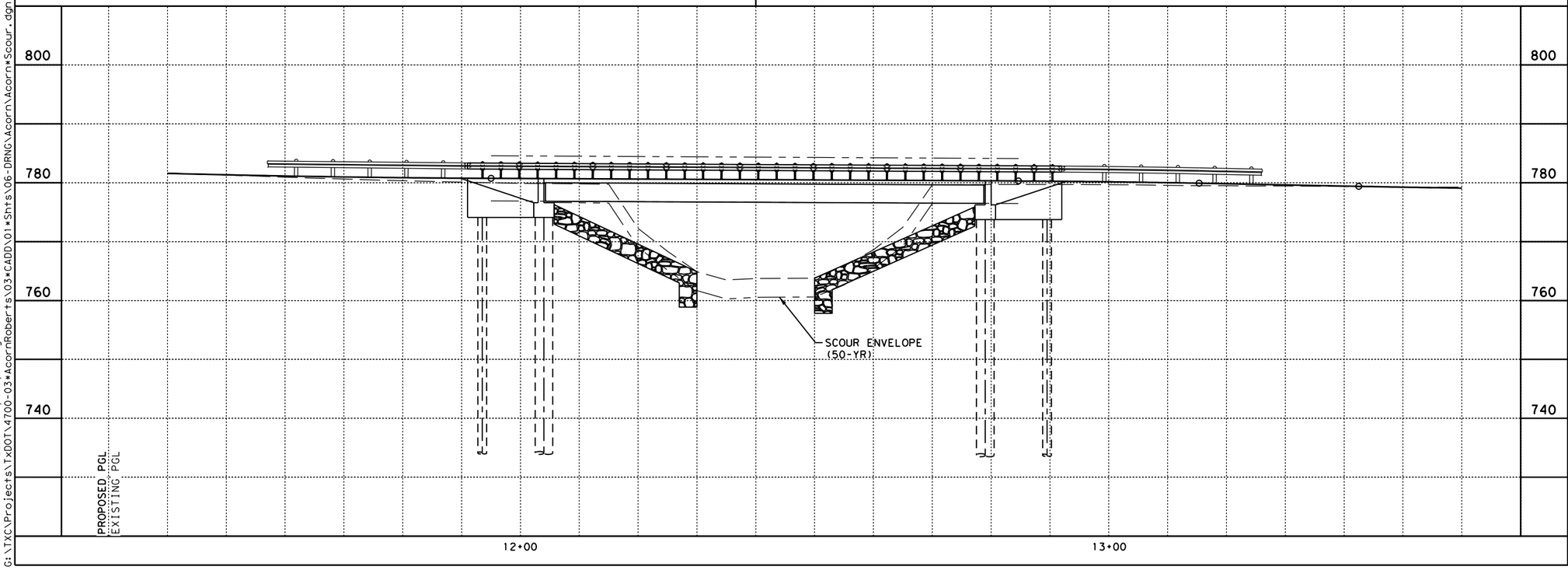

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
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ACORN DRIVE
HYDRALUIC DATA

SHEET 3 OF 3

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		36
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR

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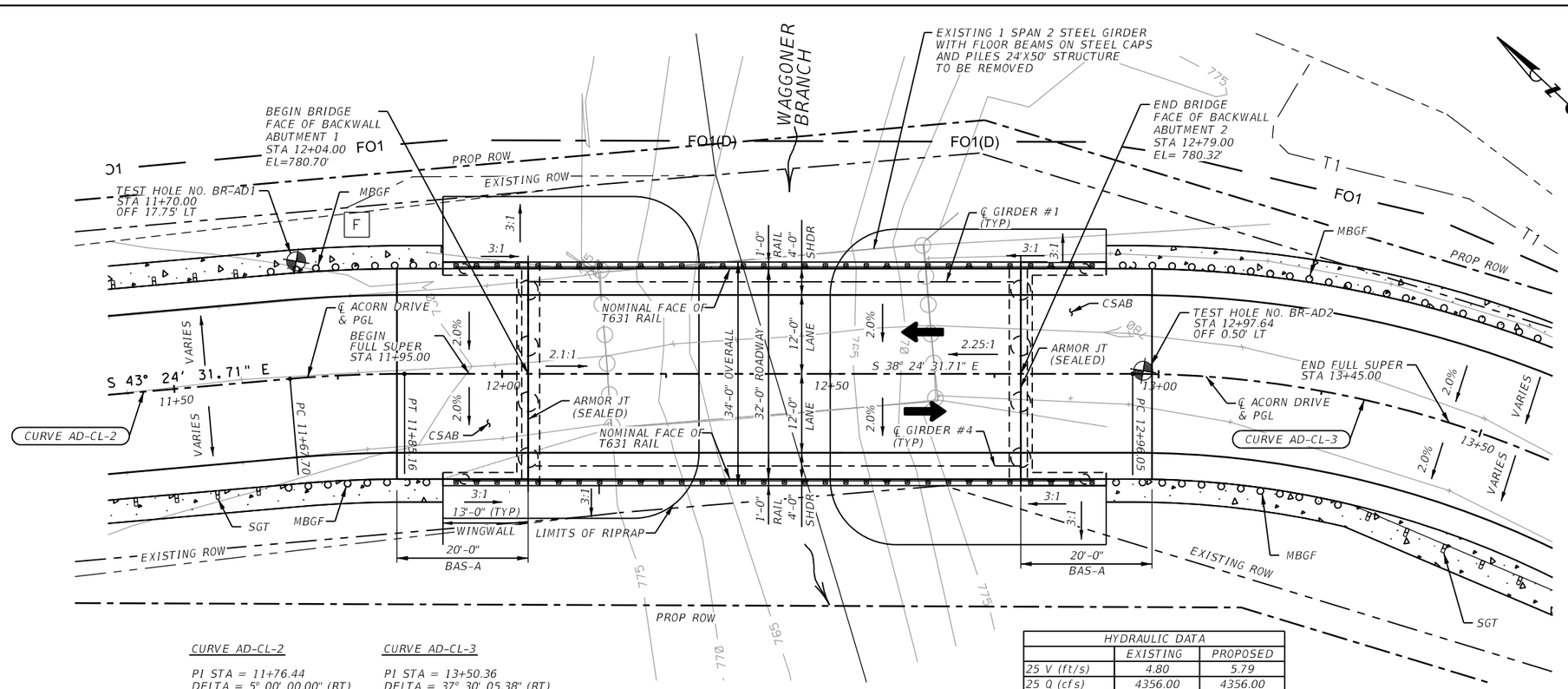


PLAN

ALL ABUTMENTS ARE ALONG N 51° 35' 28.29" E

HL-93 LOADING

0 10 20

SCALE: 1"=20'

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS 2017, 8TH EDITION WITH CURRENT ITERIMS.

ALL DIMENSIONS ARE EITHER HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR GRADE, CROWN AND/OR SUPERELEVATIONS.

CONTRACTOR SHALL VERIFY LOCATIONS OF UTILITIES PRIOR TO CONSTRUCTION, EXCAVATION OR DRILLING.

FOUND DRILLED SHAFTS AT THE ELEVATIONS (LENGTHS) SHOWN OR DEEPER (LONGER) TO OBTAIN A MINIMUM OF 2 SHAFT DIAMETERS INTO MUDSTONE.

SEE BORING LOG SHEETS FOR TEST HOLE INFORMATION.

FOR TYPICAL SECTION SEE SHEET 2 OF 2.

DESIGN SPEED: MEETS OR IMPROVES EXISTING
ADT (2018): 100 VPD
ADT (2038): 150 VPD
FUNCTIONAL CLASSIFICATION:
RURAL MINOR COLLECTOR
TERRAIN: ROLLING

EXISTING NBI NO.: 02-249-0-AA05-50-001
PROPOSED NBI NO.: 02-249-AA05-50-002

LOOSE WATER BEARING SAND WAS ENCOUNTERED IN BORE HOLES. CONTRACTOR MAY NEED TO USE TEMPORARY CASING. IF TEMPORARY CASING IS UNABLE TO BE REMOVED, CONTRACTOR SHALL CONTACT ENGINEER FOR ANALYSIS AND RECOMMENDATIONS.

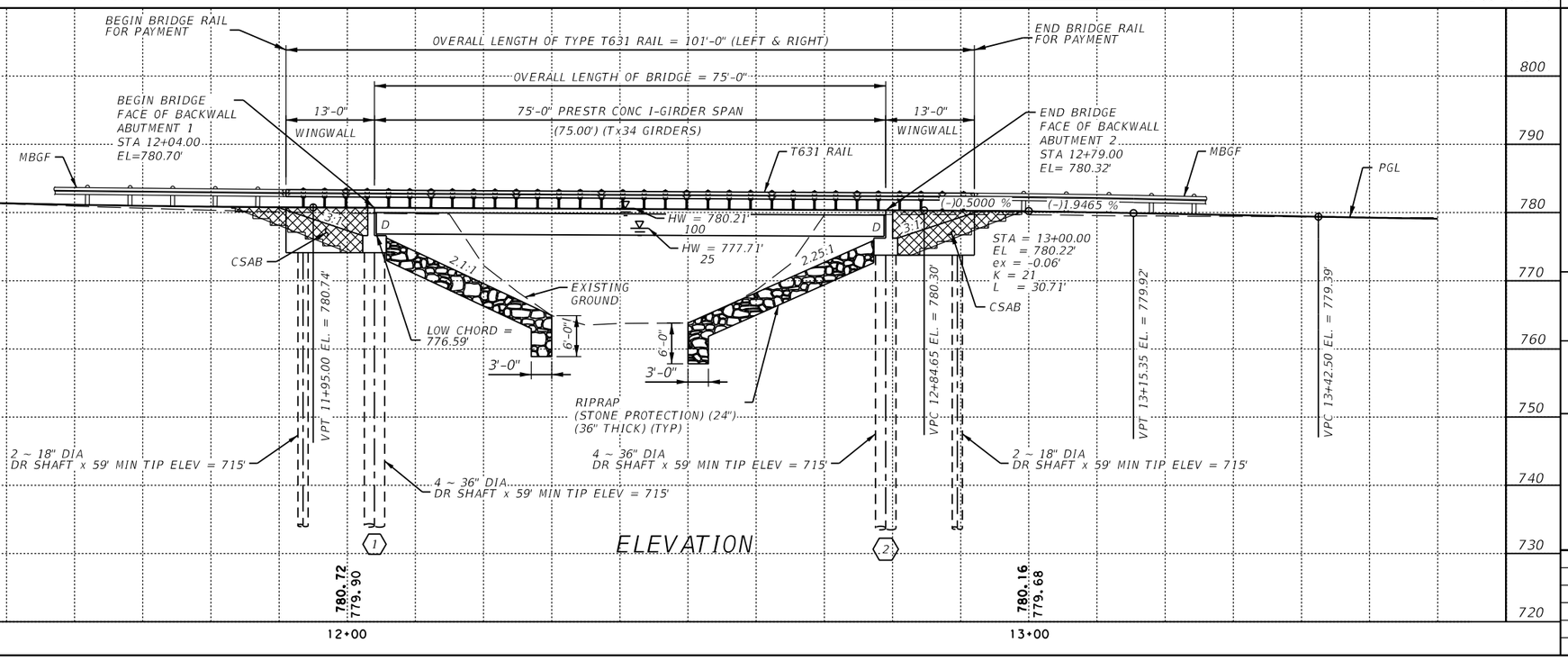
CURVE AD-CL-2

PI STA = 11+76.44
DELTA = 5° 00' 00.00" (RT)
TANGENT = 8.73
LENGTH = 17.45
RADIUS = 200.00'
PC STA = 11+67.00
PT STA = 11+85.16

CURVE AD-CL-3

PI STA = 13+50.36
DELTA = 37° 30' 05.38" (RT)
TANGENT = 54.32
LENGTH = 104.72
RADIUS = 160.00
PC STA = 12+95.05
PT STA = 14+00.77

HYDRAULIC DATA		
	EXISTING	PROPOSED
25 V (ft/s)	4.80	5.79
25 Q (cfs)	4356.00	4356.00
25 WSEL (ft)	778.67	777.71
100 V (ft/s)	5.25	6.09
100 Q (cfs)	7293.00	7293.00
100 WSEL (ft)	781.10	780.21



ELEVATION

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

BGE, Inc.
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TBPE Registration No. F-1046

ACORN DRIVE AT WAGGONER BRANCH BRIDGE LAYOUT

SHEET 1 OF 2

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		37
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR

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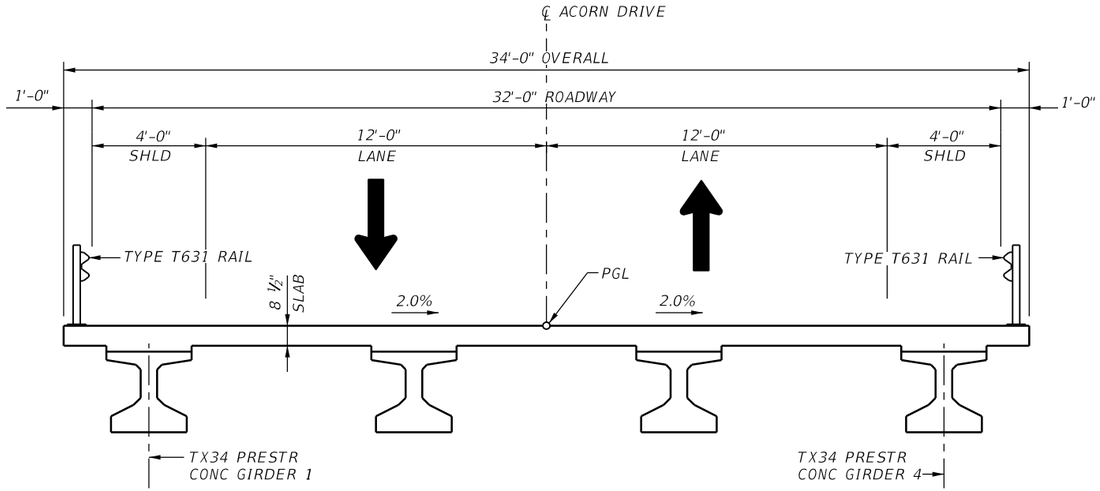

TYPICAL TRANSVERSE SECTION

(N.T.S)

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

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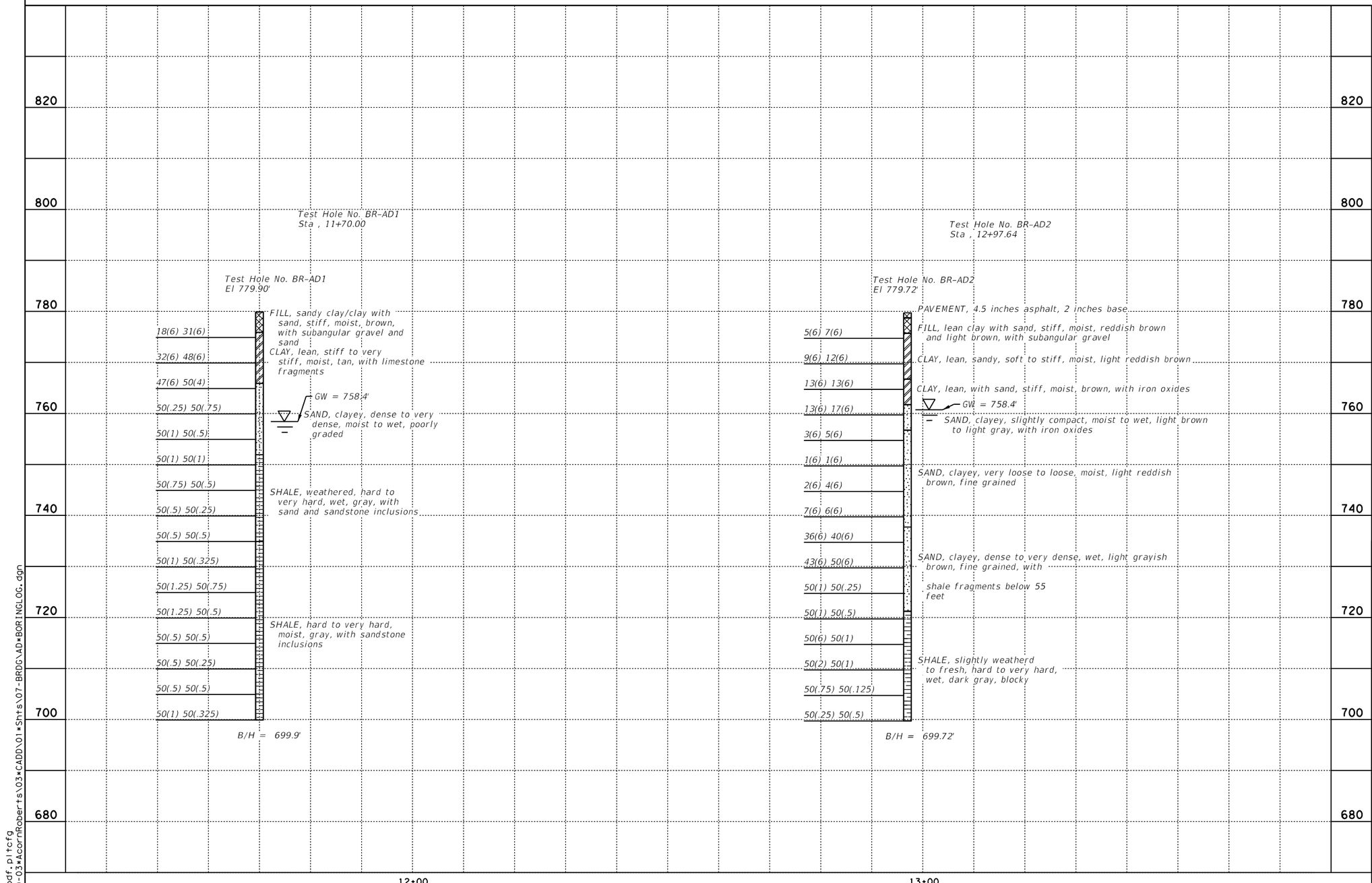
ACORN DRIVE AT WAGGONER BRANCH BRIDGE LAYOUT

SHEET 2 OF 2

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		38
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR



0 10 20

SCALE: 1"=20'

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
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PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

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TBPE Registration No. F-1046

ACORN DRIVE AT WAGGONER BRANCH BORING LOGS

SHEET 1 OF 1

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		39
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR

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SUMMARY OF BRIDGE ITEMS

LOCATION	400 6005	416 6001	416 6004	420 6014	422 6002	422 6015	425 6036	432 6035	450 6018	454 6004	496 6009
	CEM STABIL BKFL	DRILL SHAFT (18 IN)	DRILL SHAFT (36 IN)	CL C CONC (ABUT) (HPC)	REINF CONC SLAB (HPC)	APPROACH SLAB	PRESTR CONC GIRDER (TX34)	RIPRAP (STONE PROTECTION) (24 IN)	RAIL (TY T631)	ARMOR JOINT (SEALED)	REMOV STR (BRIDGE 0 - 99 FT LENGTH)
	CY	LF	LF	CY	SF	CY	LF	CY	LF	LF	EA
ABUTMENT 1	78	118	236	23.3		25.7		284	26	33	
ABUTMENT 2	78	118	236	23.3		25.7		300	26	33	
75.00' PREST CONC GIRDER SPAN					2550		298		150		
PROJECT TOTALS	156	236	472	* 46.6	2550	51.4	298	584	202	66	1

* SHEAR KEY CONCRETE INCLUDED IN QUANTITY SHOWN

BEARING SEAT ELEVATIONS (FT)

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4
ABUT 1 (FWD)	776.911	776.725	776.538	776.351
ABUT 2 (BK)	776.546	776.360	776.173	775.986

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

ACORN DRIVE ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS

SHEET 1 OF 1

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		40
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR

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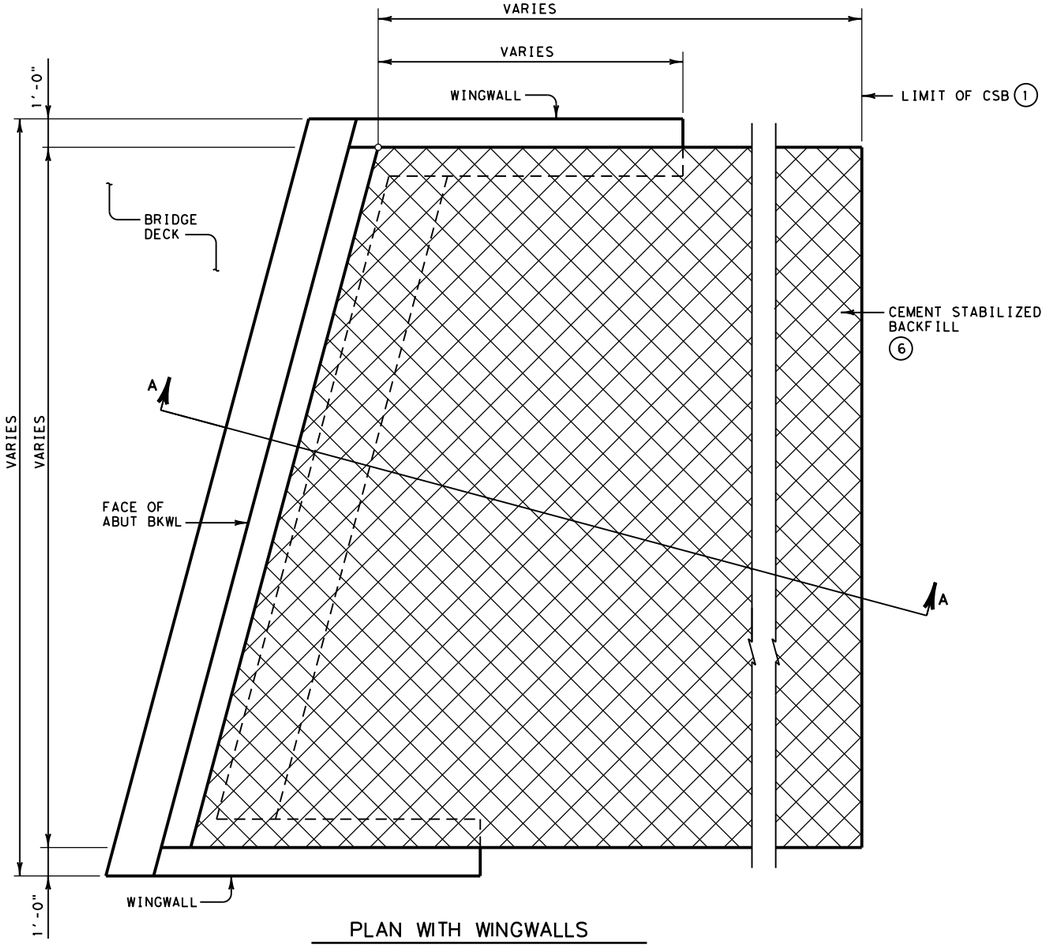
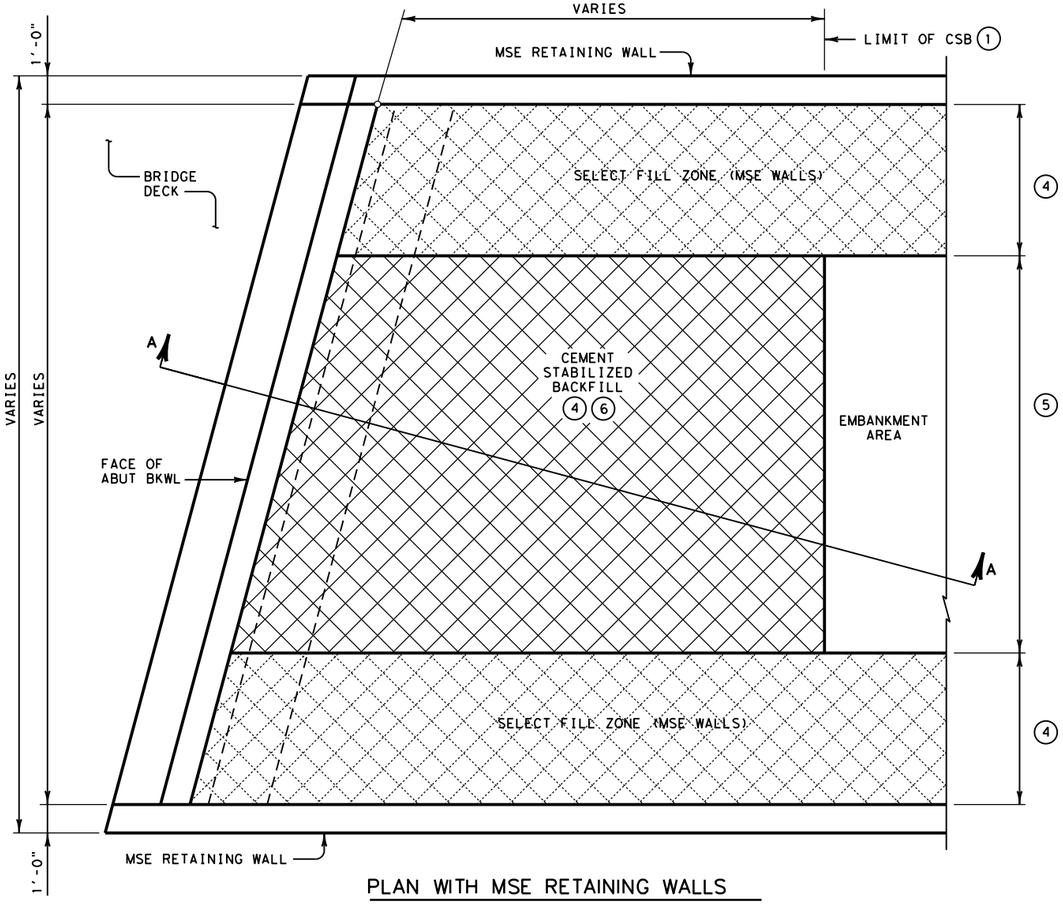
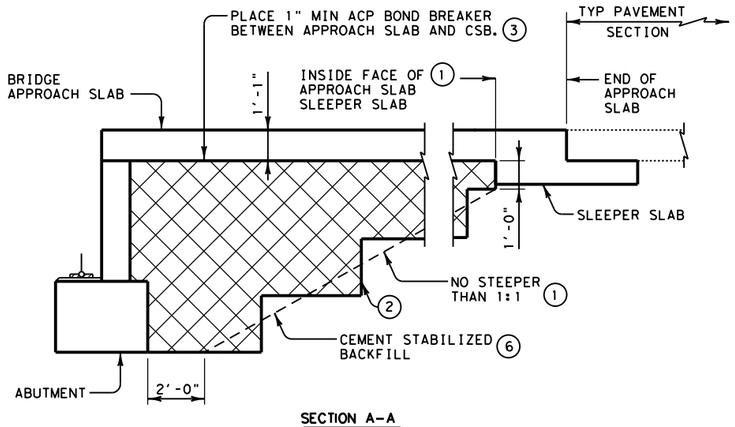


PLAN WITH WINGWALLS
CAST-IN-PLACE RETAINING WALLS SIMILAR



PLAN WITH MSE RETAINING WALLS



SECTION A-A

WITH APPROACH SLAB
N.T.S.

(1) USUAL LIMIT OF CEMENT STABILIZED BACKFILL IS AT INSIDE FACE OF APPROACH SLAB SLEEPER SLAB. 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) OTHER MATERIALS CAN BE USED AS A BOND BREAKER IF PERMITTED BY THE ENGINEER. 2 LAYERS OF 30 LB ROOFING FELT OR 2 LAYERS OF HEAVY MIL POLYETHYLENE SHEETING ARE EXAMPLES.

(4) WHERE MSE RETAINING WALLS ARE PRESENT, ADJUST CSB LIMITS TO ACCOMMODATE THE SELECT FILL ZONE. SEE RETAINING WALL DETAILS FOR ADDITIONAL INFORMATION.

(5) 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.

(6) "NON-EXCAVATABLE" FLOWABLE BACKFILL, AS DEFINED BY ITEM 401, TABLE 2,MAY BE USED AS A SUBSITITUTE FOR CEMENT STABILIZED BACKFILL, WITH THE FOLLOWING CONSTRAINTS:
a). IF FLOWABLE BACKFILL IS TO BE PLACED OVER MSE BACKFILL, PLACE A FILTER FABRIC OVER THE MSE BACKFILL MATERIAL PRIOR TO PLACEMENT OF THE FLOWABLE FILL; AND
b). PLACE FLOWABLE FILL IN LIFTS NOT EXCEEDING 2 FEET IN DEPTH; PLACE EACH SUCCESSIVE LIFT WHEN THE PREVIOUS LIFT HAS STIFFENED/HARDENED (HAS LOST ITS FLOWABILITY).
c). NO ADJUSTMENT IN PAYMENT WILL BE MADE FOR SUBSTITUTION OF FLOWABLE FILL IN LIEU OF CEMENT STABILIZED BACKFILL.

GENERAL NOTES

1. PROVIDE CEMENT STABILIZED BACKFILL (CSB) MEETING THE REQUIREMENTS OF ITEM 400, "EXCAVATION AND BACKFILL FOR STRUCTURES", TO THE LIMITS SHOWN AT BRIDGE ABUTMENTS.
2. DETAILS ARE DRAWN SHOWING LEFT FORWARD SKEW.
3. SEE BRIDGE LAYOUT FOR ACTUAL SKEW DIRECTION.
4. THESE DETAILS DO NOT APPLY WHEN CONCRETE BLOCK RETAINING WALLS ARE USED IN LIEU OF WINGWALLS.

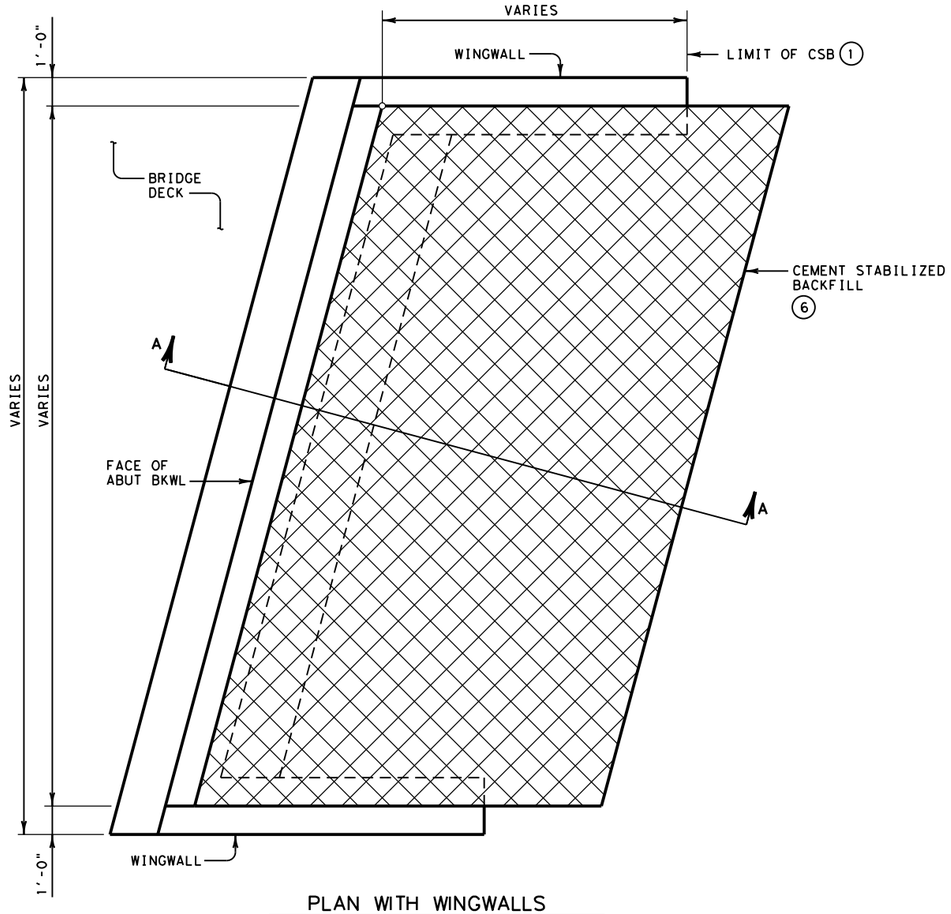
Texas Department of Transportation

Fort Worth District Standard

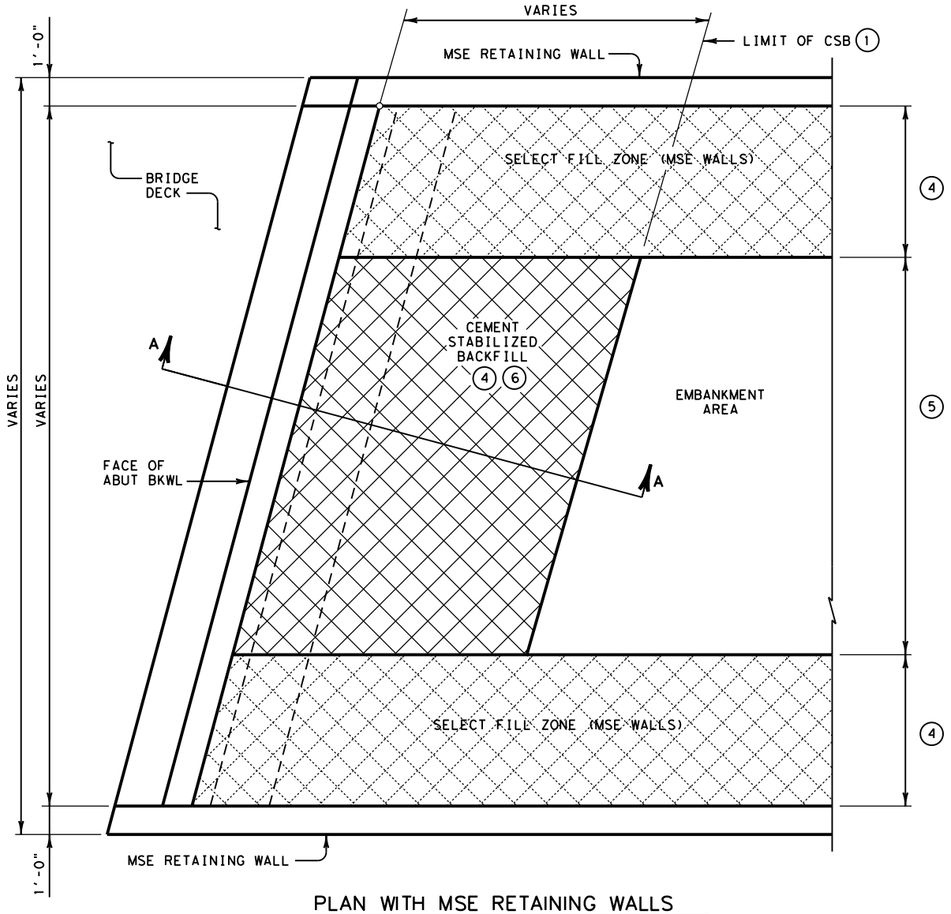
CEMENT STABILIZED ABUTMENT BACKFILL BRIDGE ABUTMENT

CSAB (FTW)

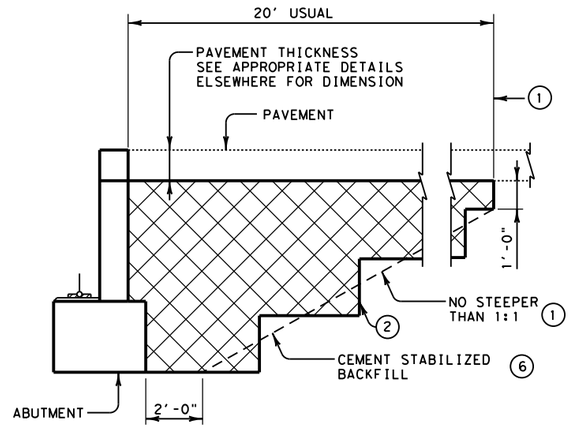
ORIGINAL DRAWING: 05/2019	csab-ftw.dgn	PROJECT NO.			SHEET NO.
DATE	REVISIONS	BR 2012 (346)			41
05/2019	NEW STANDARD	STATE	STATE DIST. NO.	COUNTY	
		TEXAS	FTW	WISE	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0902	20	110	CR



PLAN WITH WINGWALLS
CAST-IN-PLACE RETAINING WALLS SIMILAR



PLAN WITH MSE RETAINING WALLS



SECTION A-A

WITHOUT APPROACH SLAB
N.T.S.

(1) USUAL LIMIT OF CEMENT STABILIZED BACKFILL IS AT INSIDE FACE OF APPROACH SLAB SLEEPER SLAB. 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) OTHER MATERIALS CAN BE USED AS A BOND BREAKER IF PERMITTED BY THE ENGINEER. 2 LAYERS OF 30 LB ROOFING FELT OR 2 LAYERS OF HEAVY MIL POLYETHYLENE SHEETING ARE EXAMPLES.

(4) WHERE MSE RETAINING WALLS ARE PRESENT, ADJUST CSB LIMITS TO ACCOMMODATE THE SELECT FILL ZONE. SEE RETAINING WALL DETAILS FOR ADDITIONAL INFORMATION.

(5) 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.

(6) "NON-EXCAVATABLE" FLOWABLE BACKFILL, AS DEFINED BY ITEM 401, TABLE 2,MAY BE USED AS A SUBSITITUTE FOR CEMENT STABILIZED BACKFILL, WITH THE FOLLOWING CONSTRAINTS:
a). IF FLOWABLE BACKFILL IS TO BE PLACED OVER MSE BACKFILL, PLACE A FILTER FABRIC OVER THE MSE BACKFILL MATERIAL PRIOR TO PLACEMENT OF THE FLOWABLE FILL; AND
b). PLACE FLOWABLE FILL IN LIFTS NOT EXCEEDING 2 FEET IN DEPTH; PLACE EACH SUCCESSIVE LIFT WHEN THE PREVIOUS LIFT HAS STIFFENED/HARDENED (HAS LOST ITS FLOWABILITY).
c). NO ADJUSTMENT IN PAYMENT WILL BE MADE FOR SUBSTITUTION OF FLOWABLE FILL IN LIEU OF CEMENT STABILIZED BACKFILL.

GENERAL NOTES

1. PROVIDE CEMENT STABILIZED BACKFILL (CSB) MEETING THE REQUIREMENTS OF ITEM 400, "EXCAVATION AND BACKFILL FOR STRUCTURES", TO THE LIMITS SHOWN AT BRIDGE ABUTMENTS.
2. DETAILS ARE DRAWN SHOWING LEFT FORWARD SKEW.
3. SEE BRIDGE LAYOUT FOR ACTUAL SKEW DIRECTION.
4. THESE DETAILS DO NOT APPLY WHEN CONCRETE BLOCK RETAINING WALLS ARE USED IN LIEU OF WINGWALLS.

Texas Department of Transportation

Fort Worth District Standard

CEMENT STABILIZED ABUTMENT BACKFILL BRIDGE ABUTMENT

CSAB (FTW)

ORIGINAL DRAWING: 05/2019	csab-ftw.dgn	PROJECT NO.			SHEET NO.
DATE	REVISIONS	BR 2012 (346)			42
05/2019	NEW STANDARD	STATE	STATE DIST. NO.	COUNTY	
		TEXAS	FTW	WISE	
		CONT.	SECT.	JOB	HIGHWAY NO.
		0902	20	110	CR

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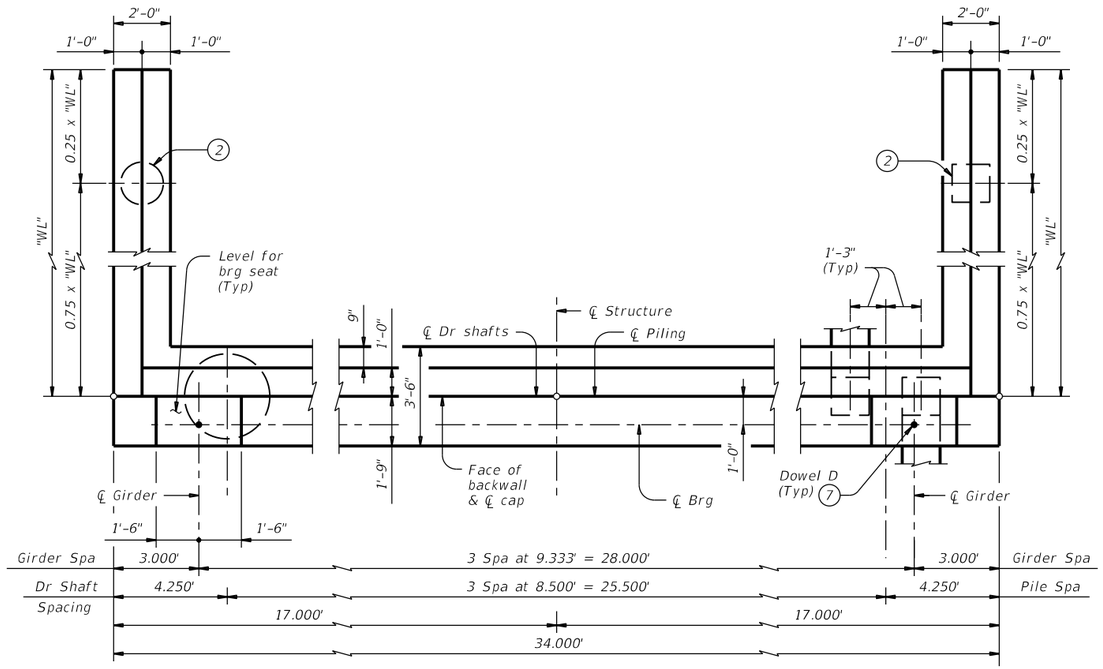
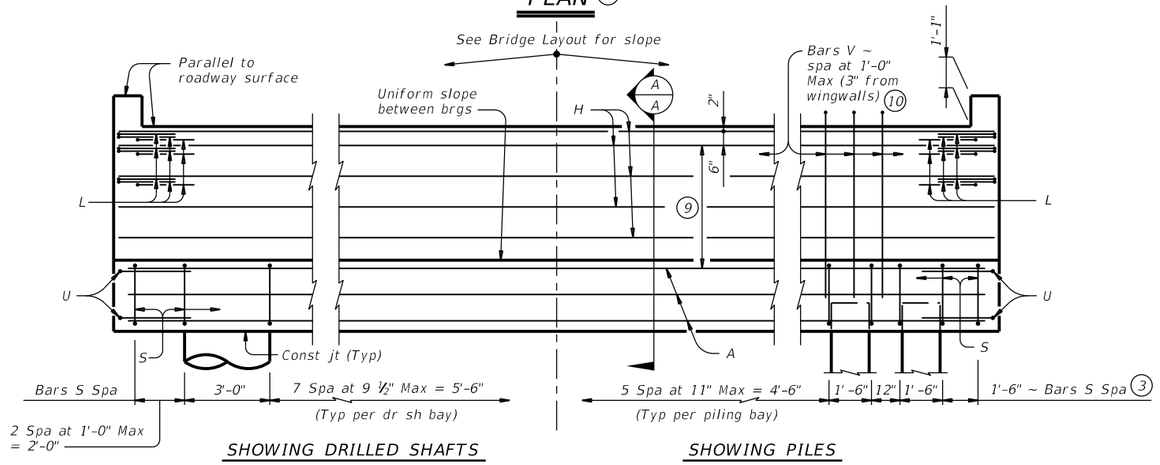
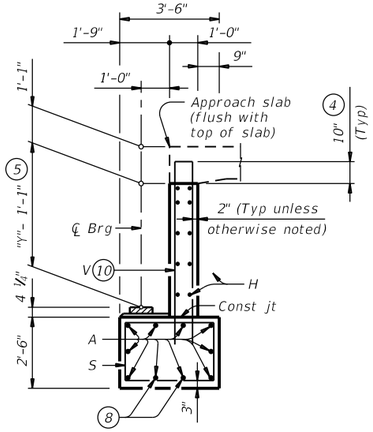


PLAN (1)

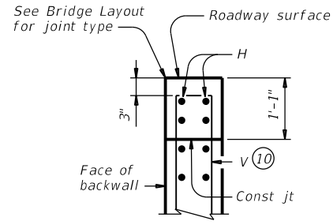


ELEVATION



SECTION A-A

(With approach slab) (6)



BACKWALL DETAIL

(Without approach slab) (6)

TABLE OF FOUNDATION LOADS		
Span Length	All Girder Types	
Ft	Tons/Shaft	Tons/Pile
40	53	47
45	56	49
50	60	51
55	63	53
60	66	54
65	70	56
70	73	58
75	76	59
80	79	61
85	82	62
90	86	64
95	89	66
100	92	67
105	95	69
110	98	70
115	101	72
120	104	74

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

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

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

(4) Increase as required to maintain 3" from finished grade.

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

(6) See Bridge Layout to determine if approach slab is present.

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

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

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

(10) Field bend as needed to clear piles.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

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

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

See applicable rail details for rail anchorage in wingwalls.

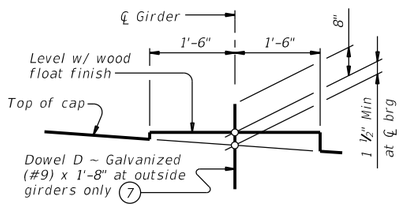
These abutment details may be used with standard SIG-32 only.

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

MATERIAL NOTES:

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

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



BEARING SEAT DETAIL

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

HL93 LOADING

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

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

AIG-32

FILE: aig41sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
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	FTW	WISE		43

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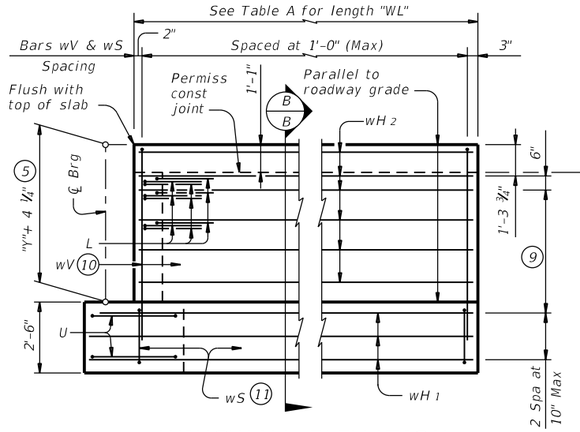
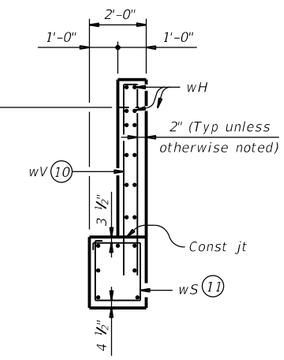
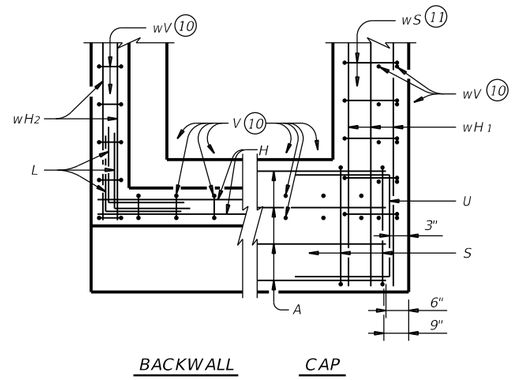


WINGWALL ELEVATION

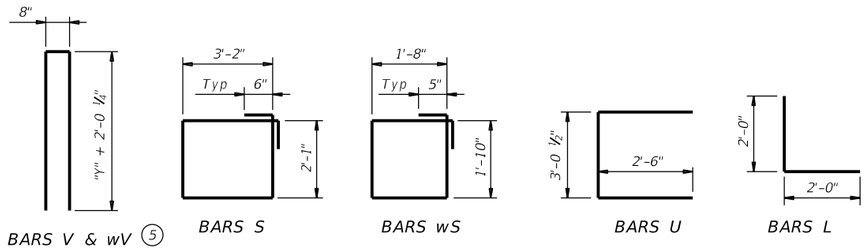


SECTION B-B



BACKWALL CAP

CORNER DETAILS



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

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

(10) Field bend as needed to clear piles.

(11) Adjust as required to avoid piling.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation

Bridge Division Standard

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

AIG-32

FILE: aig41sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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	FTW	WISE		44

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

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	#9	1'-8"	11
H	8	#6	33'-8"	405
L	18	#6	4'-0"	108
S	30	#5	11'-6"	360
U	4	#6	8'-1"	49
V	33	#5	11'-4"	390
wH1	14	#6	9'-5"	198
wH2	20	#6	7'-8"	230
wS	18	#4	7'-10"	94
wV	18	#5	11'-4"	213

Reinforcing Steel	Lb	3,811
Class "C" Concrete	CY	18.5

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	#9	1'-8"	11
H	8	#6	33'-8"	405
L	18	#6	4'-0"	108
S	30	#5	11'-6"	360
U	4	#6	8'-1"	49
V	33	#5	12'-4"	425
wH1	14	#6	10'-5"	219
wH2	20	#6	8'-8"	260
wS	20	#4	7'-10"	105
wV	20	#5	12'-4"	257

Reinforcing Steel	Lb	3,952
Class "C" Concrete	CY	20.1

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	#9	1'-8"	11
H	10	#6	33'-8"	506
L	18	#6	4'-0"	108
S	30	#5	11'-6"	360
U	4	#6	8'-1"	49
V	33	#5	13'-4"	459
wH1	14	#6	11'-5"	240
wH2	24	#6	9'-8"	348
wS	22	#4	7'-10"	115
wV	22	#5	13'-4"	306

Reinforcing Steel	Lb	4,255
Class "C" Concrete	CY	21.8

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	#9	1'-8"	11
H	10	#6	33'-8"	506
L	18	#6	4'-0"	108
S	30	#5	11'-6"	360
U	4	#6	8'-1"	49
V	33	#5	14'-4"	493
wH1	14	#6	12'-5"	261
wH2	24	#6	10'-8"	385
wS	24	#4	7'-10"	126
wV	24	#5	14'-4"	359

Reinforcing Steel	Lb	4,411
Class "C" Concrete	CY	23.5

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	#9	1'-8"	11
H	12	#6	33'-8"	607
L	18	#6	4'-0"	108
S	30	#5	11'-6"	360
U	4	#6	8'-1"	49
V	33	#5	15'-8"	539
wH1	14	#6	13'-5"	282
wH2	28	#6	11'-8"	491
wS	26	#4	7'-10"	136
wV	26	#5	15'-8"	425

Reinforcing Steel	Lb	4,761
Class "C" Concrete	CY	25.6

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

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	#9	1'-8"	11
H	8	#6	33'-8"	405
L	18	#6	4'-0"	108
S	30	#5	11'-6"	360
U	4	#6	8'-1"	49
V	33	#5	11'-4"	390
wH1	14	#6	13'-5"	282
wH2	20	#6	11'-8"	350
wS	26	#4	7'-10"	136
wV	26	#5	11'-4"	307

Reinforcing Steel	Lb	4,151
Class "C" Concrete	CY	21.1

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	#9	1'-8"	11
H	8	#6	33'-8"	405
L	18	#6	4'-0"	108
S	30	#5	11'-6"	360
U	4	#6	8'-1"	49
V	33	#5	12'-4"	425
wH1	14	#6	14'-5"	303
wH2	20	#6	12'-8"	381
wS	28	#4	7'-10"	147
wV	28	#5	12'-4"	360

Reinforcing Steel	Lb	4,302
Class "C" Concrete	CY	22.8

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	#9	1'-8"	11
H	10	#6	33'-8"	506
L	18	#6	4'-0"	108
S	30	#5	11'-6"	360
U	4	#6	8'-1"	49
V	33	#5	13'-4"	459
wH1	14	#6	16'-5"	345
wH2	24	#6	14'-8"	529
wS	32	#4	7'-10"	167
wV	32	#5	13'-4"	445

Reinforcing Steel	Lb	4,732
Class "C" Concrete	CY	25.3

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	#9	1'-8"	11
H	10	#6	33'-8"	506
L	18	#6	4'-0"	108
S	30	#5	11'-6"	360
U	4	#6	8'-1"	49
V	33	#5	14'-4"	493
wH1	14	#6	17'-5"	366
wH2	24	#6	15'-8"	565
wS	34	#4	7'-10"	178
wV	34	#5	14'-4"	508

Reinforcing Steel	Lb	4,897
Class "C" Concrete	CY	27.2

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	33'-0"	1,753
D (7)	2	#9	1'-8"	11
H	12	#6	33'-8"	607
L	18	#6	4'-0"	108
S	30	#5	11'-6"	360
U	4	#6	8'-1"	49
V	33	#5	15'-8"	539
wH1	14	#6	19'-5"	408
wH2	28	#6	17'-8"	743
wS	38	#4	7'-10"	199
wV	38	#5	15'-8"	621

Reinforcing Steel	Lb	5,398
Class "C" Concrete	CY	30.4

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

(12) Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.3 CY Class "C" concrete and 202 lbs reinforcing steel for 4 additional Bars H.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

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

AIG-32

FILE: aig41sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
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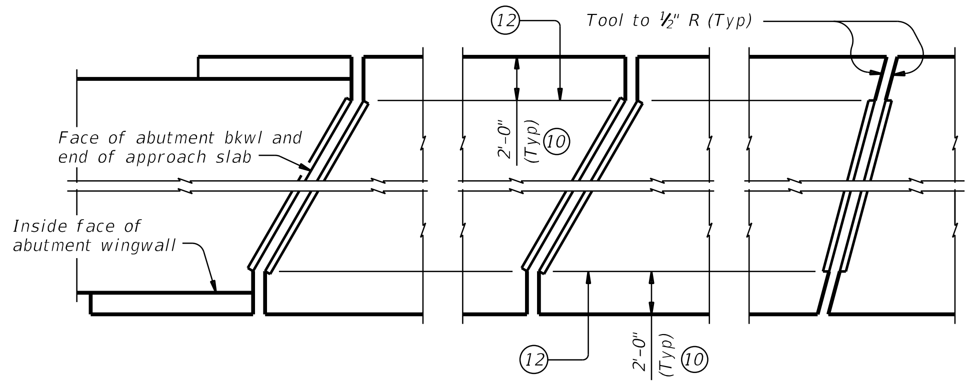
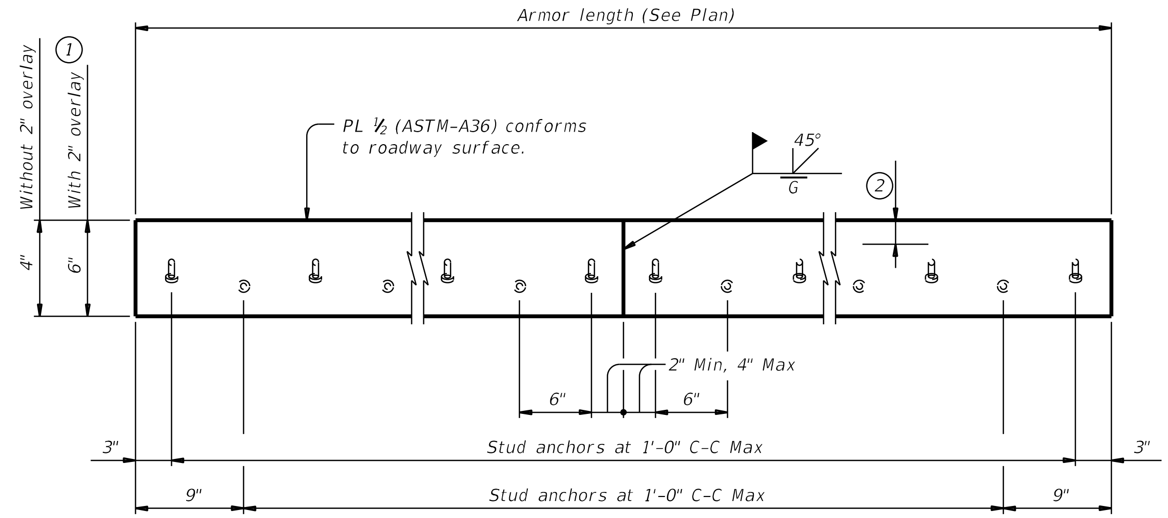
	FTW	WISE		45

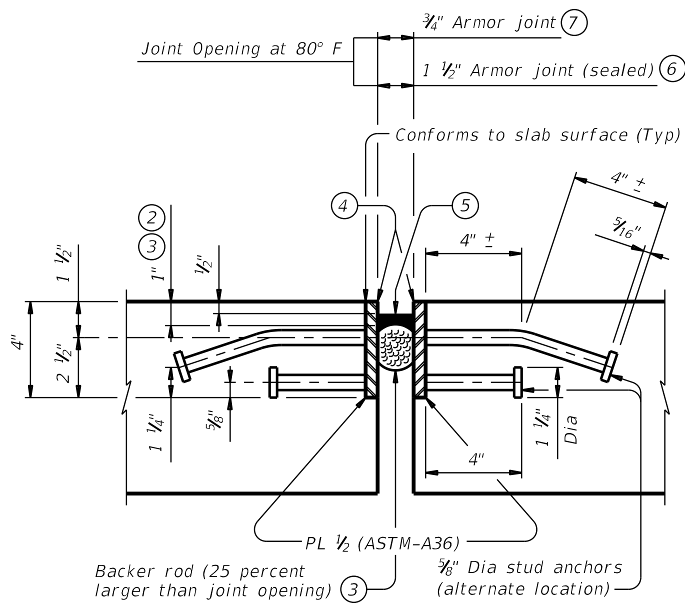


JOINTS AT ABUTMENTS — SKEWS OVER 15° — SKEWS THRU 15°

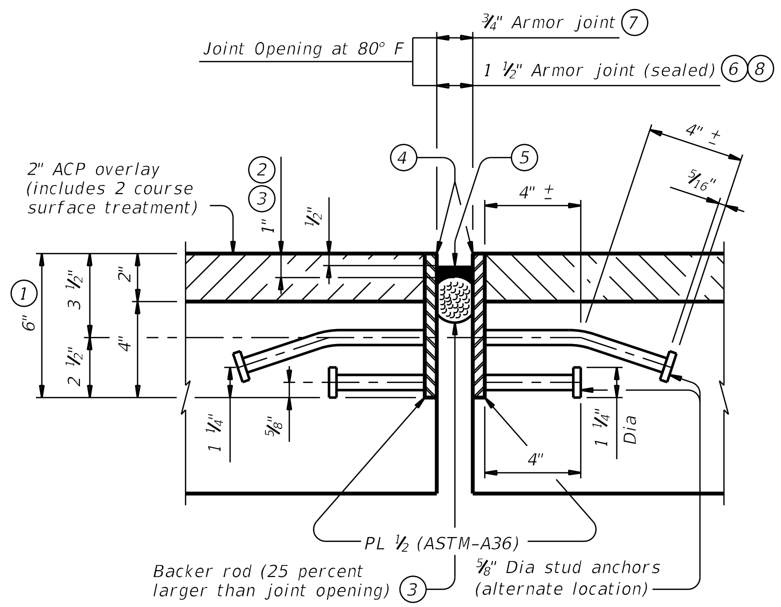
PLANS OF ARMOR PLATES



ELEVATION OF BASIC ARMOR PLATE



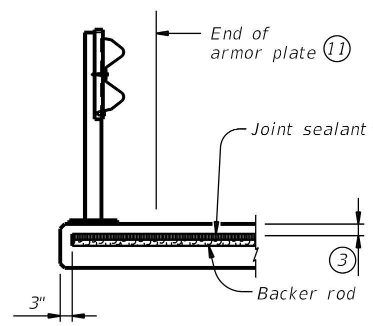
SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION



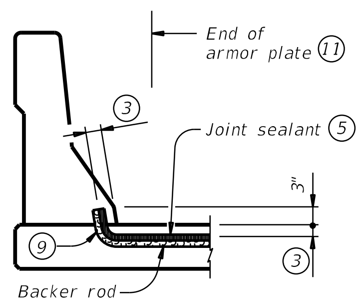
SHOWN WITH 2" OVERLAY AT JOINT LOCATION 1

ARMOR JOINT SECTIONS

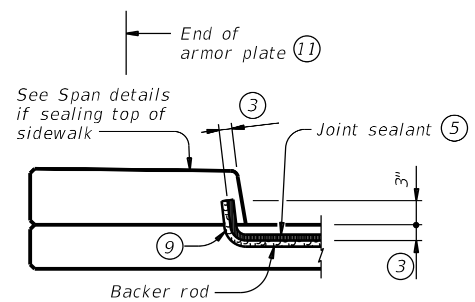
Showing Armor Joint (Sealed)



AT STEEL POST BRIDGE RAIL



AT CONCRETE BRIDGE RAIL



AT SIDEWALK

JOINT SEALANT TERMINATION DETAILS

Armor joint (sealed) only. Armor plate is not shown for clarity.

1. Adjust 6" plate height for overlay thicknesses other than the 2" shown. Adjust weight by 1.70 plf for each ½" variation in thickness.
2. Do not paint top 1 ½" of plate if using sealed armor joint.
3. Set top of backer rod 1" below top of armor plate. Backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.
4. Blast clean entire contact area between sealant and plate (SSPC-SP10) before installing sealant. Light brush blast and thoroughly clean all dust and debris from concrete surfaces in contact with joint sealant before application of silicone seal.
5. Use Class 7 joint sealant that conforms to DMS-6310.
6. Place sealant while ambient temperature is between 55°F and 80°F and is rising.
7. Armor joint does not include joint sealant or backer rod.
8. Armor joint (sealed) includes Class 7 joint sealant and backer rod.
9. Form vertical leg of seal as per the Manufacturer's recommendations. Use Class 4 joint sealant if Class 7 cannot be installed correctly. Install according to Manufacturer's recommendations.
10. Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.
11. See "Plans of Armor Plates".
12. At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.
13. Align shipping angle perpendicular to joint.

FABRICATION NOTES:

Match mark corresponding plate sections and secure together for shipment with shipping angle. Do not use erection bolts.

Ship armor joints in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for stage construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1.

Use groove welds for all shop and field butt splices. Grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section, except as stated in Note 2, with System II or IV primer in accordance with Item 446 "Field Cleaning and Painting Steel." Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Items 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of armor joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure armor joints in position and place to proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for Armor Joint.

Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

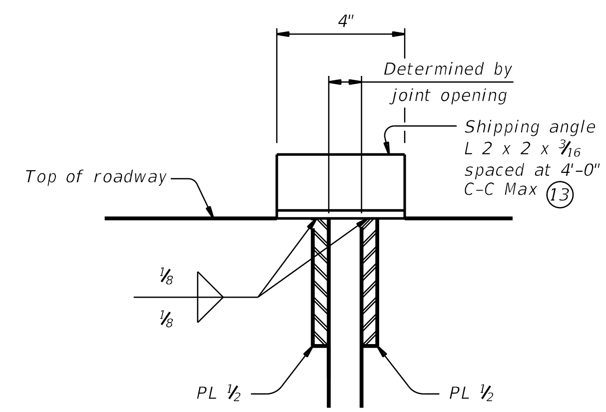
GENERAL NOTES:

Provide armor joints at locations shown on the plans. Provide the seal when "Armor Joint (Sealed)" is noted on the plans.

These joint details accommodate a joint movement range of 1 ⅜" (¾" opening movement and ⅝" closure movement).

Payment for armor joint, with or without seal, is based on length of armor plate.

WEIGHTS FOR ONE ARMOR JOINT (2 PLATES)	
WITHOUT OVERLAY	16.10 plf
WITH 2" OVERLAY 1	22.90 plf



SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION

With overlay similar

SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

Texas Department of Transportation — Bridge Division Standard

ARMOR JOINT DETAILS

AJ

FILE: ajstde01-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
	DIST		COUNTY	SHEET NO.
	FTW		WISE	46

DATE: 5/26/2021 10:45:33 AM
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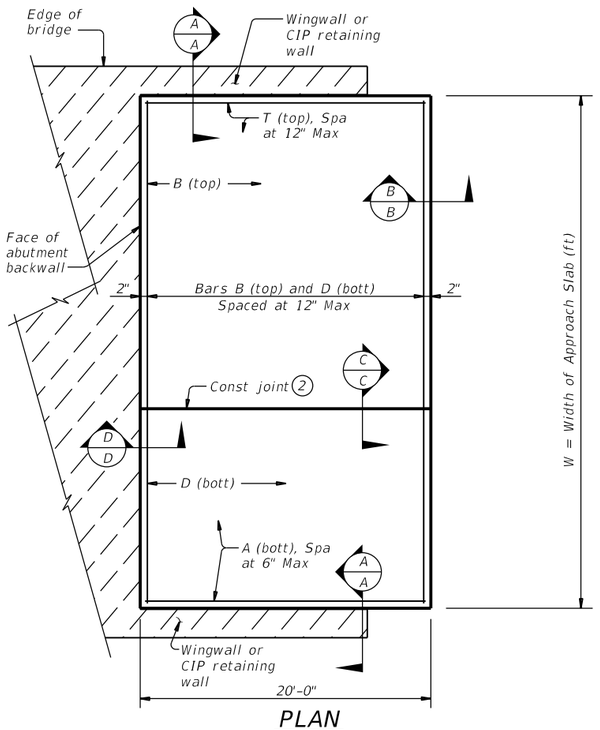
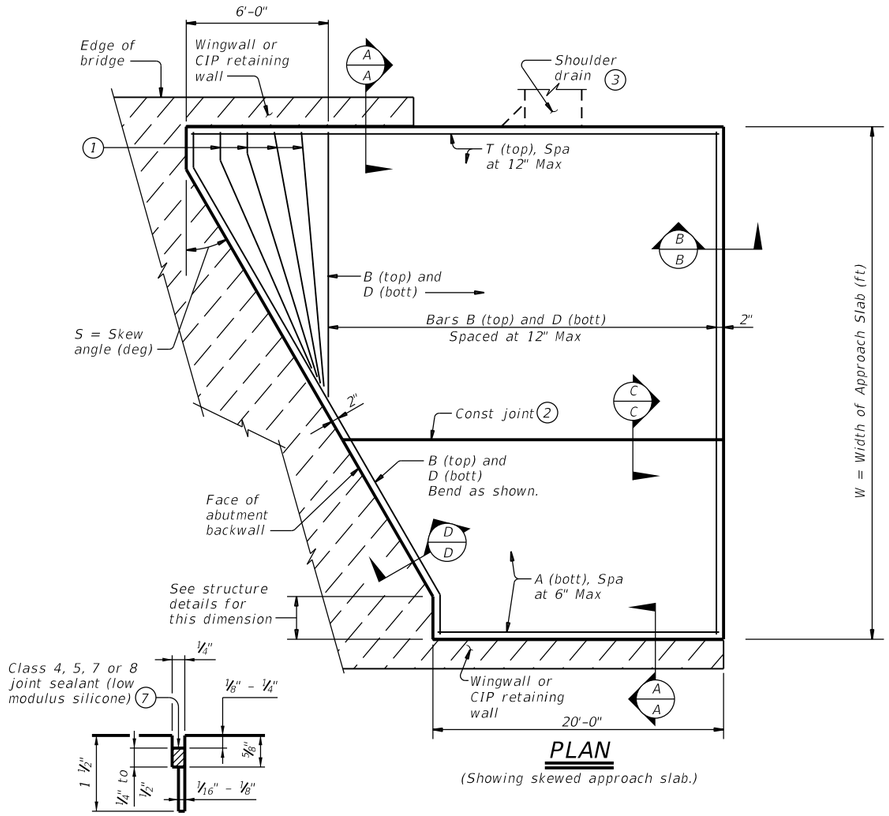


PLAN

(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

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

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

(1) Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.

(2) Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.

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

(4) For Contractor's information only. Quantities shown are for one approach slab.

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

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

(7) Place in accordance with Item 438.

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

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

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

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

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 ½" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 ½" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

Provide rebonded recycled tire rubber joint filler that meets the requirements of DMS-6310. "Joint Sealants and Fillers."

Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

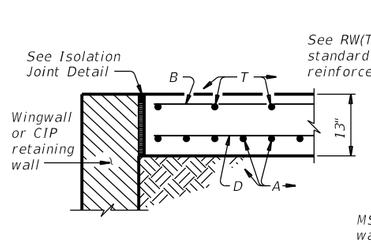
Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.

Cure for 4 days using water or membrane curing per Item 422.

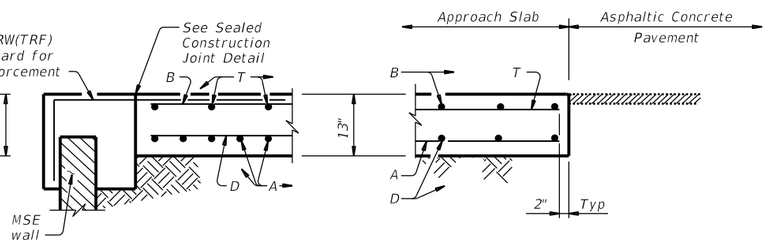
All details shown herein are subsidiary to bridge approach slab.

Cover dimensions are clear dimensions, unless noted otherwise.

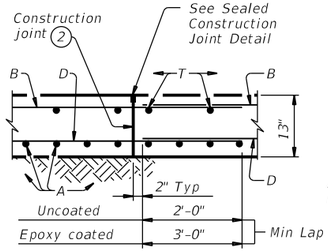
LONGITUDINAL SAW CUT JOINT DETAIL



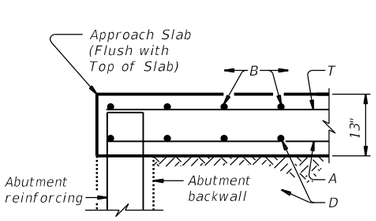
SHOWING WINGWALL OR CIP RETAINING WALL



SHOWING MSE WALL



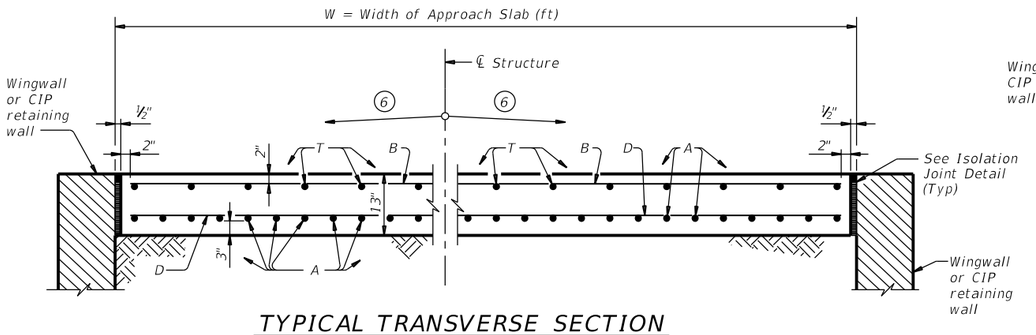
SECTION C-C (5)



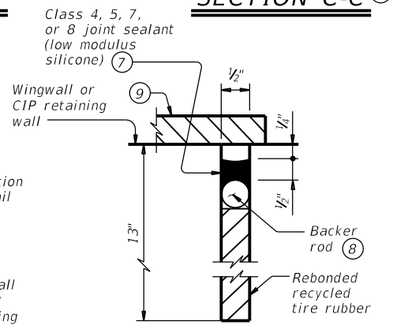
SECTION D-D

SECTION A-A

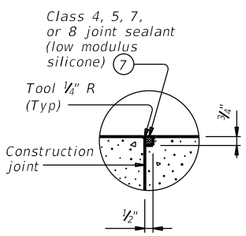
SECTION B-B



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

Texas Department of Transportation

Bridge Division Standard

BRIDGE APPROACH SLAB

ASPHALTIC CONCRETE PAVEMENT

BAS-A

FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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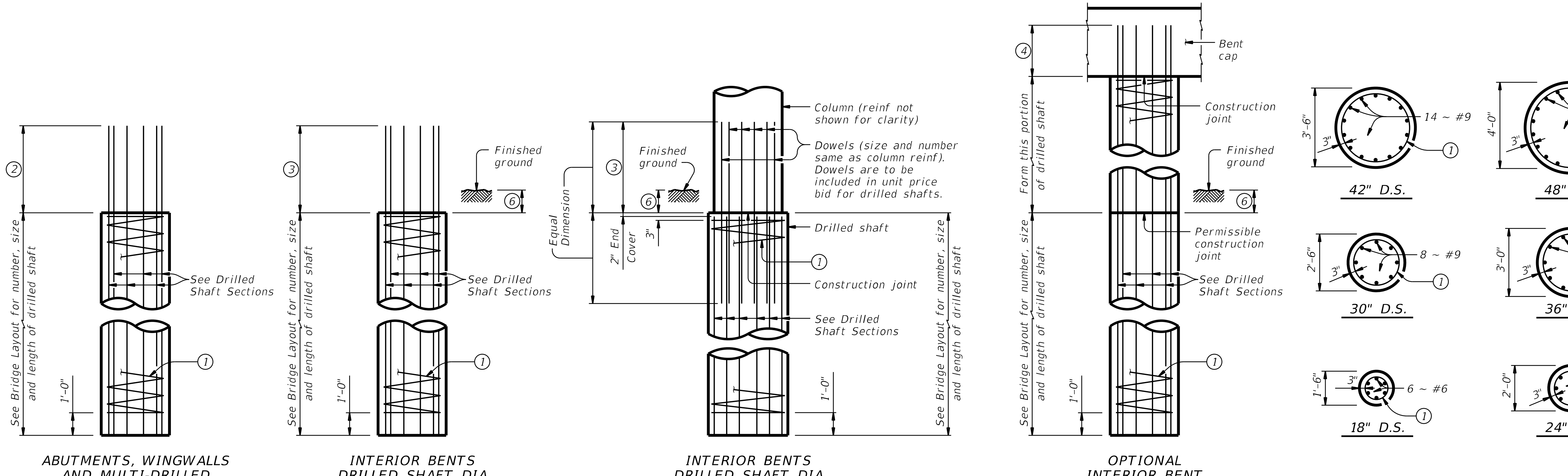
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
	FTW	WISE		47



ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS

INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA

INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA

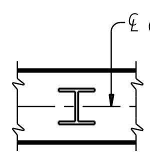
OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL ⑤

DRILLED SHAFT SECTIONS

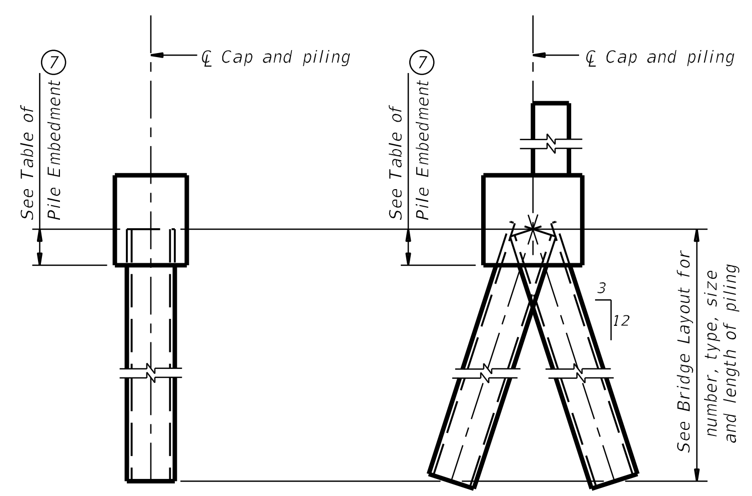
DRILLED SHAFT DETAILS

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

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



ORIENTATION OF STEEL H-PILING

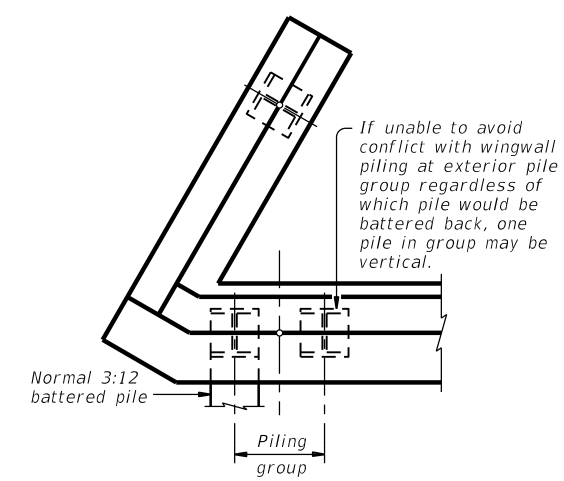


VERTICAL PILE

BATTERED PILE

PILING DETAILS

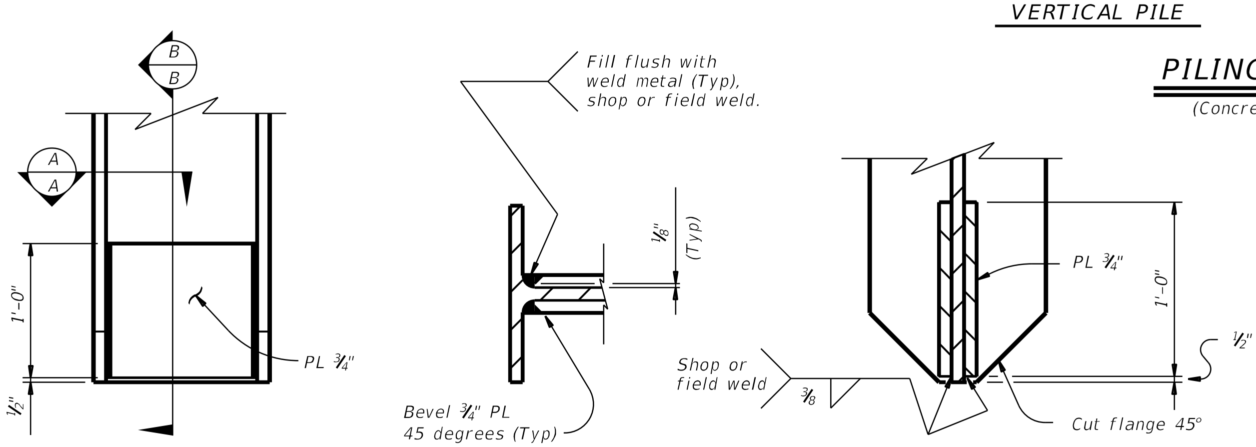
(Concrete or steel H)



DETAIL "A"

(Showing plan view of a 30° skewed abutment)

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



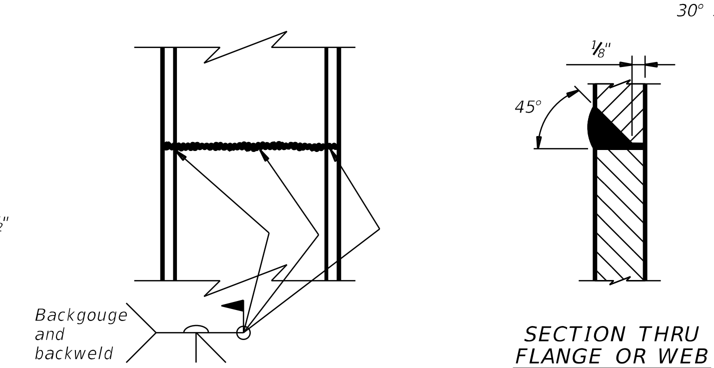
ELEVATION

SECTION A-A

SECTION B-B

STEEL H-PILE TIP REINFORCEMENT

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



SECTION THRU FLANGE OR WEB

STEEL H-PILE SPLICE DETAIL

Use when required.

Texas Department of Transportation — Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS 01-20: Added #11 bars to the FD bars.	0902	20	110	CR
	DIST		COUNTY	SHEET NO.
	FTW		WISE	48

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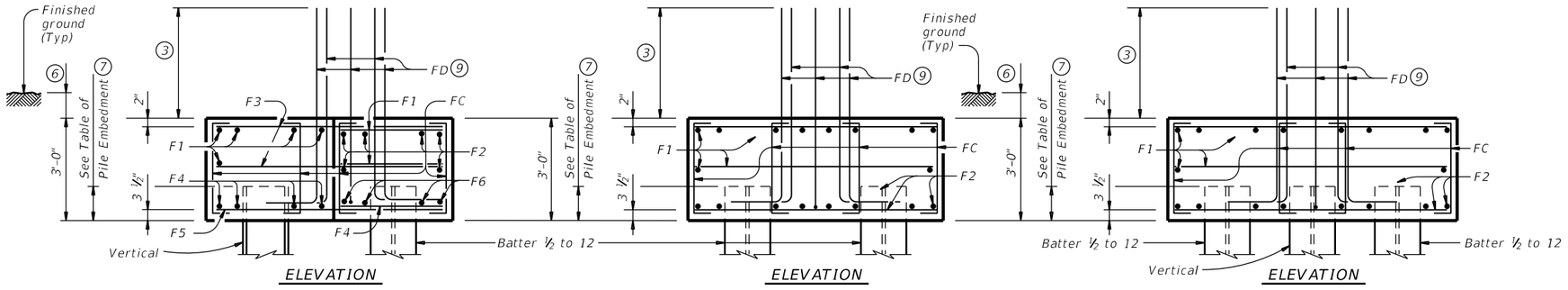
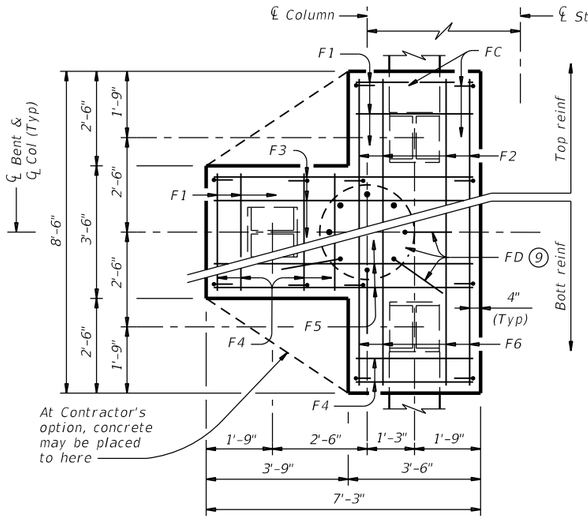
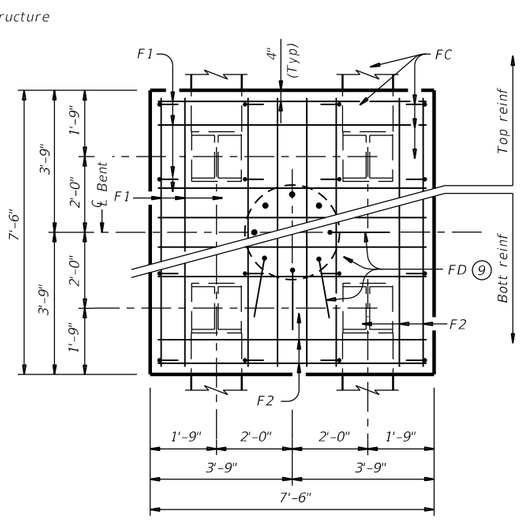




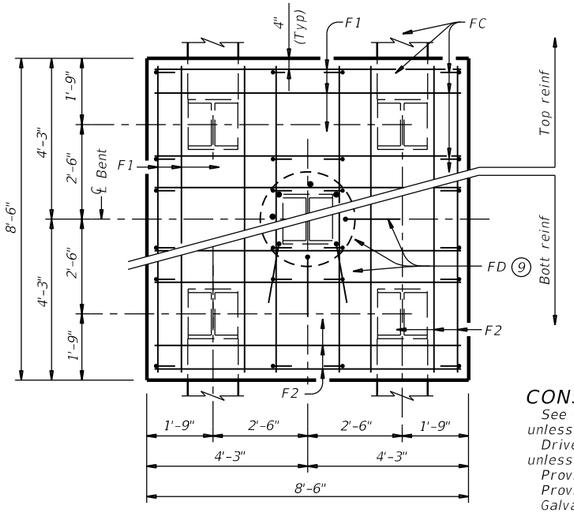
THREE PILE FOOTING (8)

For 36" Dia and smaller columns.



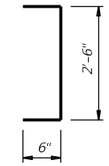
FOUR PILE FOOTING (8)

For 42" Dia and smaller columns.

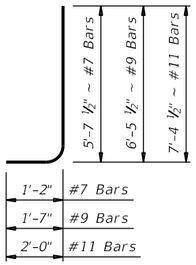


FIVE PILE FOOTING (8)

For 42" Dia and smaller columns.



BARS FC



BARS FD (9)

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

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

(7) Or as shown on plans.

(8) See Bridge Layout for type, size and length of piling.

(9) Number and size of FD bars must match column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.

(10) Adjust FD quantity, size and weight as needed to match column reinforcing.

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

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

ONE 4 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	7'- 2"	96
F2	16	#8	7'- 2"	306
FC	16	#4	3'- 6"	37
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	659
Class "C" Concrete			CY	6.3

ONE 5 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	8'- 2"	109
F2	16	#9	8'- 2"	444
FC	24	#4	3'- 6"	56
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	829
Class "C" Concrete			CY	8.0

CONSTRUCTION NOTES:

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.

Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.

Provide Class C Concrete (f'c = 3,600 psi), unless shown otherwise.

Provide Grade 60 reinforcing steel.

Galvanize reinforcing if shown elsewhere in the plans.

Provide bar laps for drilled shaft reinforcing, where required, as follows:

Uncoated or galvanized (#6) ~ 2'-6"
Uncoated or galvanized (#7) ~ 2'-11"
Uncoated or galvanized (#9) ~ 3'-9"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

DESIGNER NOTES:

Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.

Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.

Maximum allowable pile loads for the footings shown are:

72 Tons/Pile with 24" Dia Columns
80 Tons/Pile with 30" Dia Columns
100 Tons/Pile with 36" Dia Columns
120 Tons/Pile with 42" Dia Columns

Texas Department of Transportation

Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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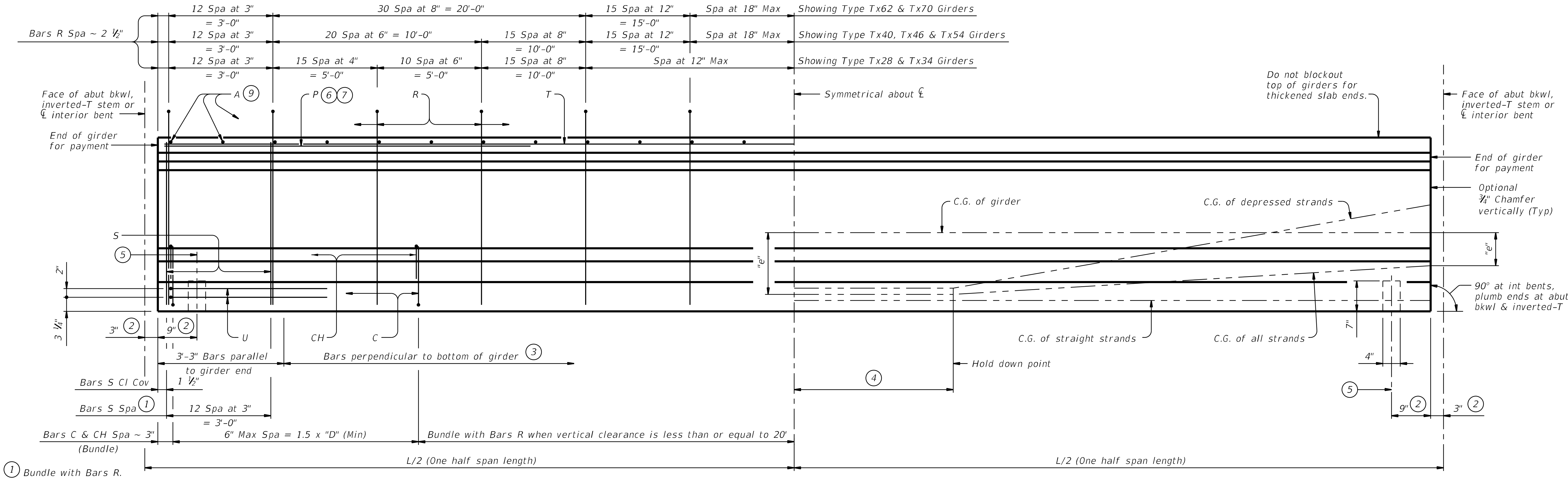
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	FTW	WISE		49



(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').

GIRDER ELEVATION

(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 ⅞") at base. If holes are formed with sheet metal, forms may be left in place.

(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.

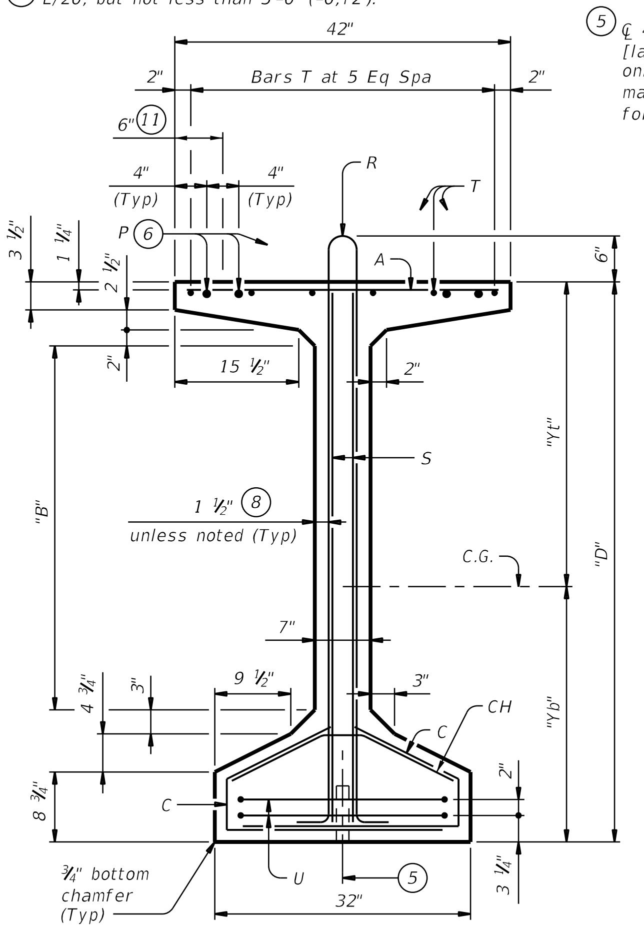
(9) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

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

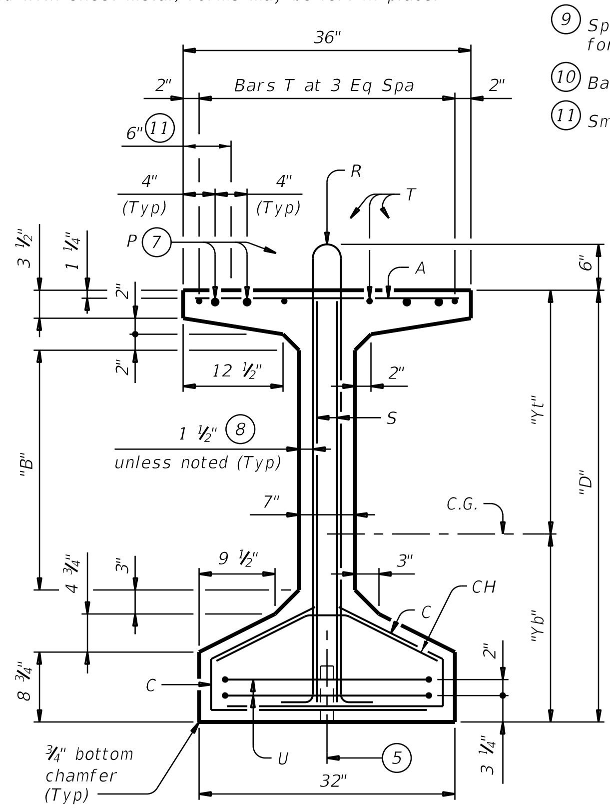
(11) Smooth trowel finish on the slab overhang side of exterior girder.

GIRDER DIMENSIONS AND SECTION PROPERTIES

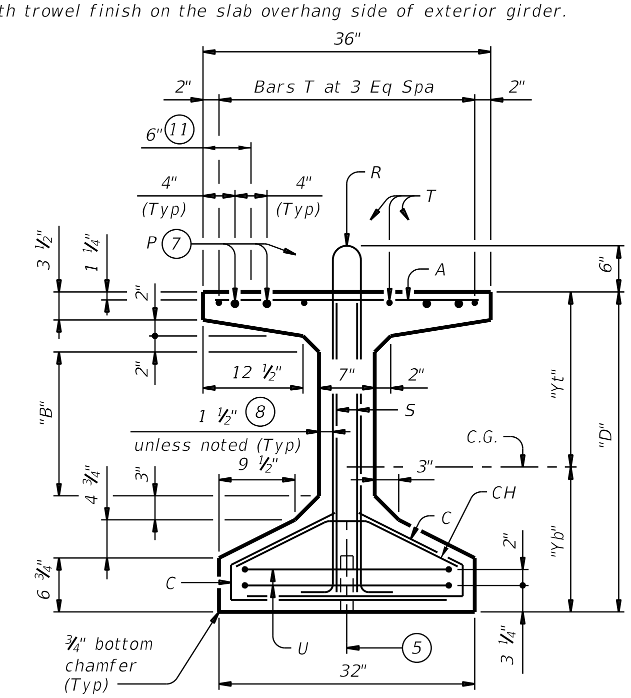
Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.^{2})	"Ix" (in.^{4})	"Iy" (in.^{4})	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	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



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GENERAL NOTES:

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

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

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT 0902	SECT 20	JOB 110	HIGHWAY CR
REVISIONS: 10-19: Added Bars C and CH full length for VC<= 20'	DIST FTW	COUNTY WISE		SHEET NO. 50

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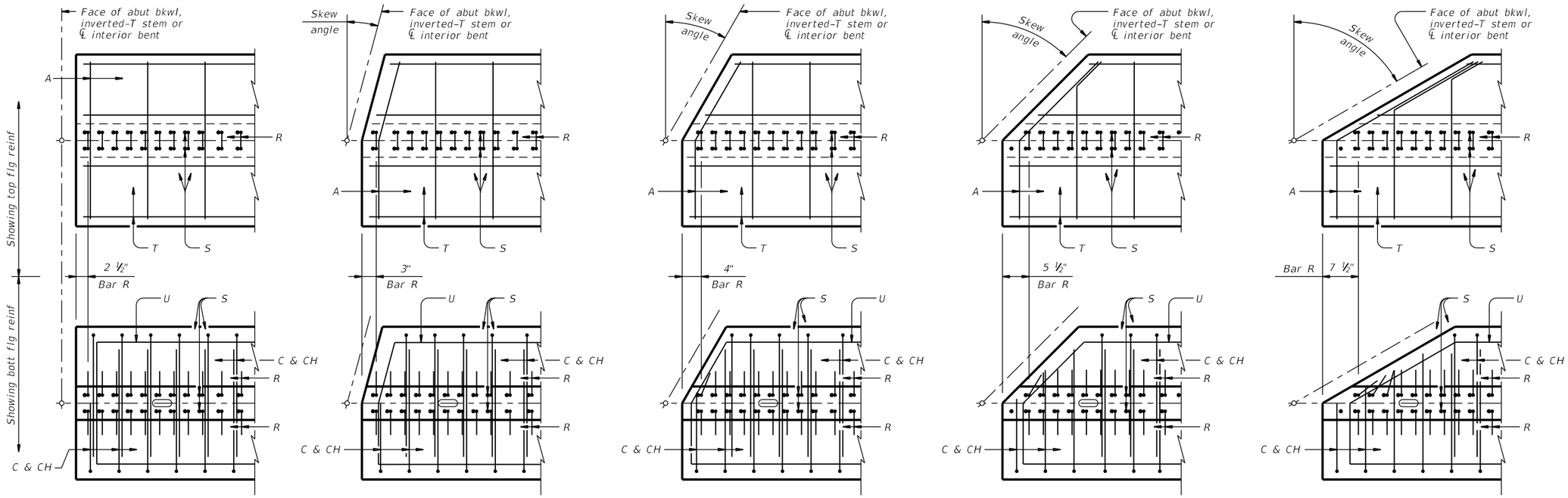
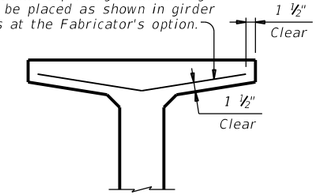
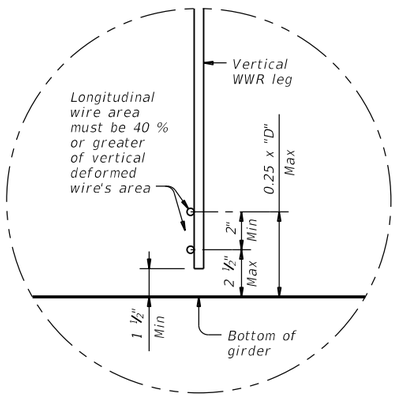


PLAN OF GIRDER ENDS (12)

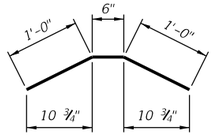
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



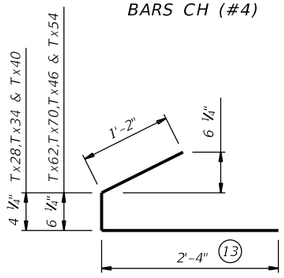
OPTIONAL TOP FLANGE REINFORCING DETAIL



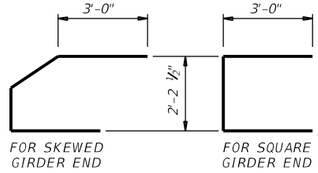
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



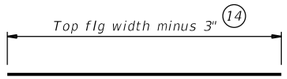
BARS CH (#4)



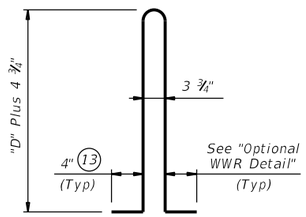
BARS C (#4)



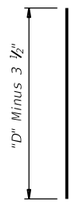
BARS U (#5)



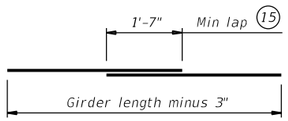
BARS A (#3)



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

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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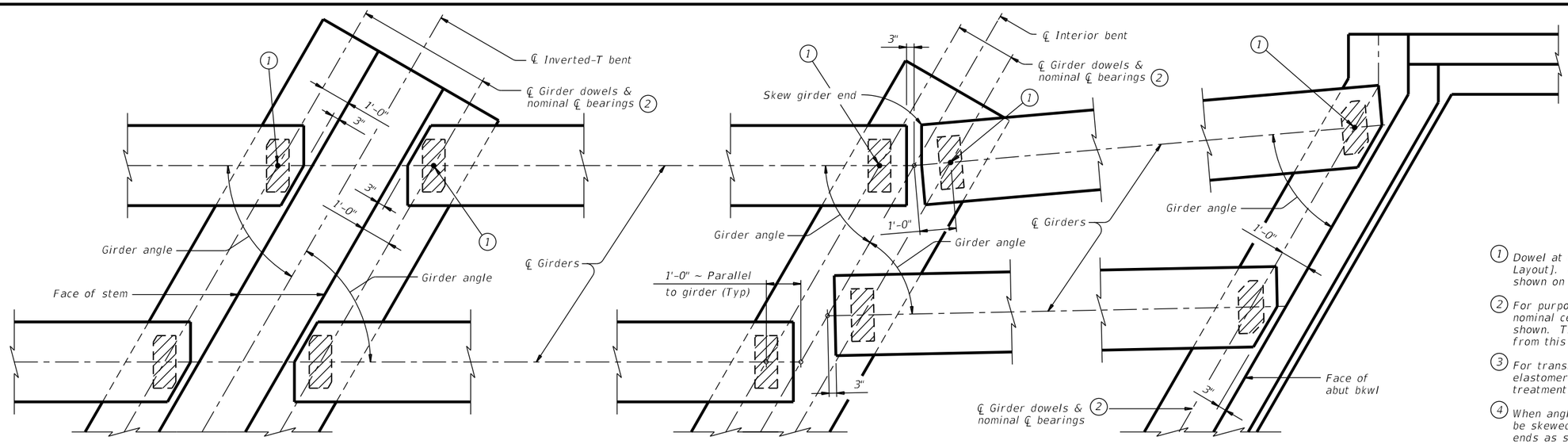


AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW (3)

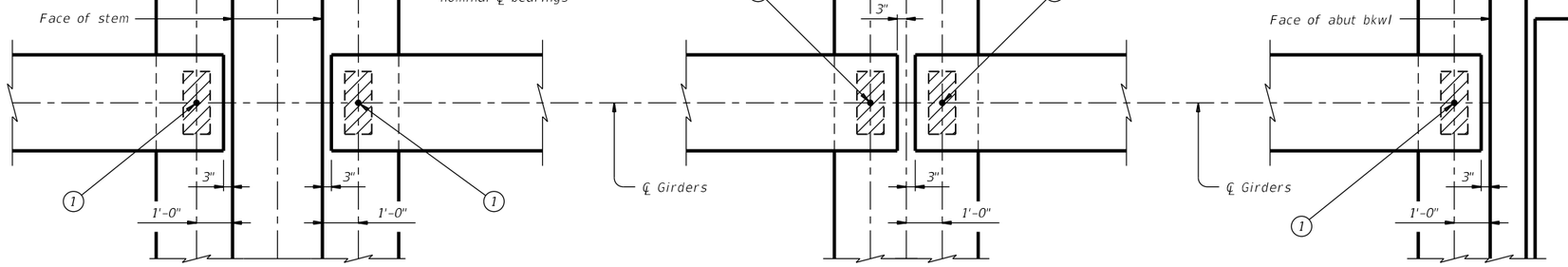
(1) Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

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

(4) When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.

(5) See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.



AT INVERTED-T BENT

AT CONVENTIONAL INTERIOR BENT

AT ABUTMENT (3)

GIRDER END DETAILS

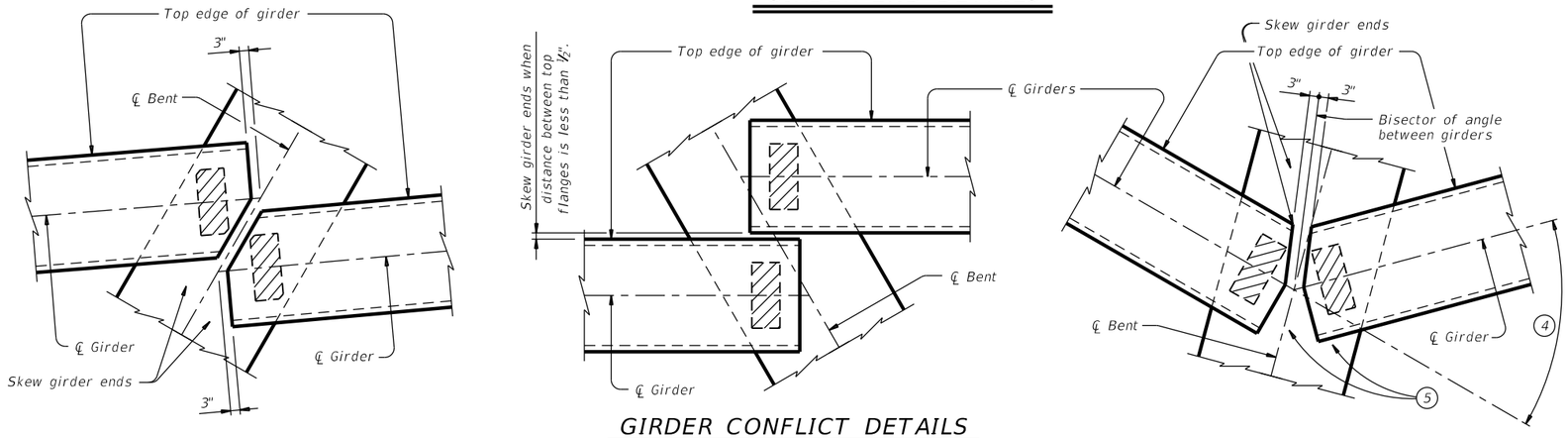
GENERAL NOTES:

These details accommodate skew angles up to 60°.

Shop drawings for approval are required.

A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer.

Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".



GIRDER CONFLICT DETAILS

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

IGEB

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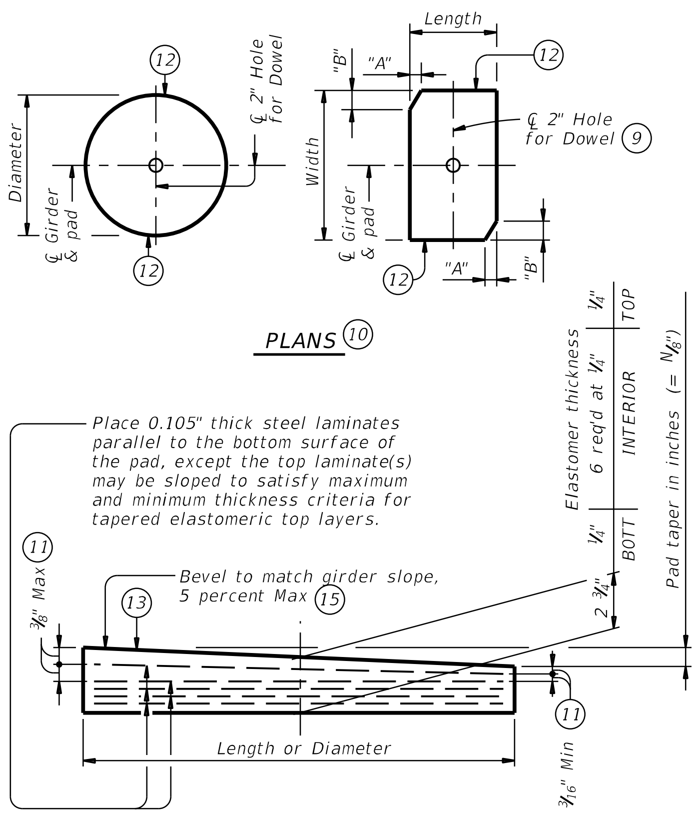
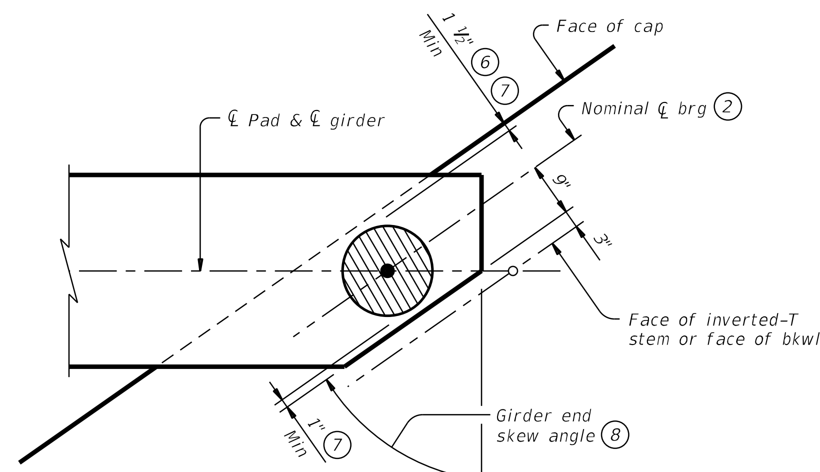
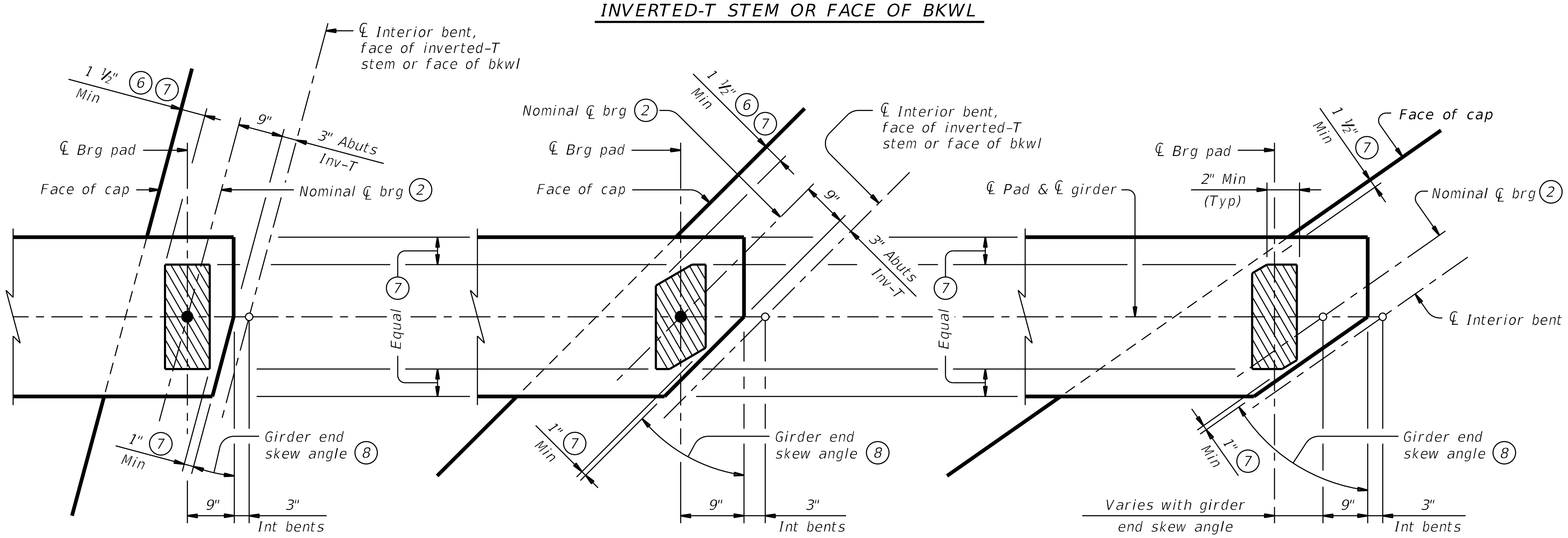


LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)



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



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

SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (16)

(NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

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

TABLE OF BEARING PAD DIMENSIONS

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

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(6) 3" for inverted-T.

(7) Place centerline pad as near nominal centerline bearing as possible between limits shown.

(8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.

(9) Provide 2" dia hole only at locations required. See Substructure details for location.

(10) See Table of Bearing Pad Dimensions for dimensions.

(11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(12) Locate Permanent Mark here.

(13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in 1/8" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for 1/8" taper)
N=2, (for 1/4" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.0625"}{\text{Length or Dia}}\right)$ 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.

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HL93 LOADING — SHEET 2 OF 3

Texas Department of Transportation — Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

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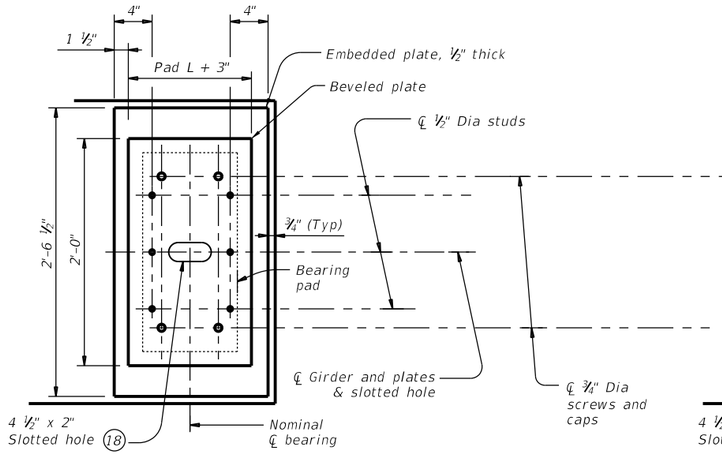
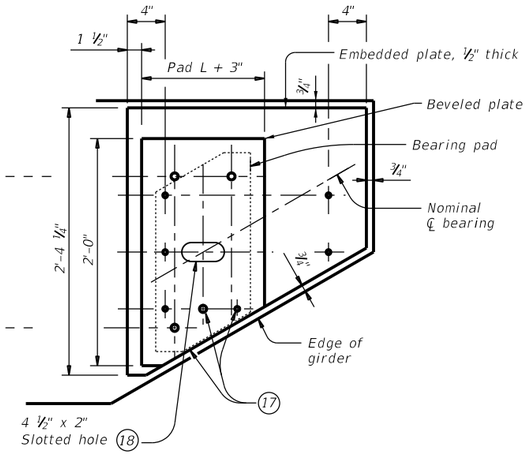
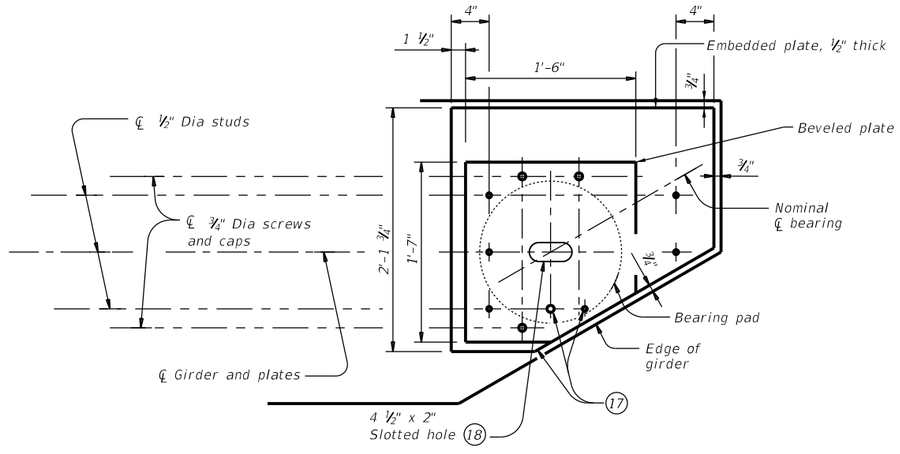


NORMAL GIRDER END
RECTANGULAR BEARING PAD

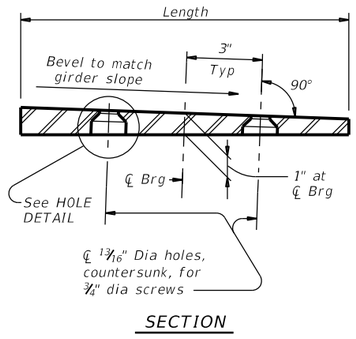


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

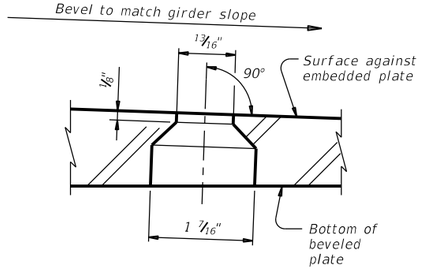


SKEWED GIRDER END
15" DIA BEARING PAD

PLAN VIEW OF SOLE PLATE DETAILS

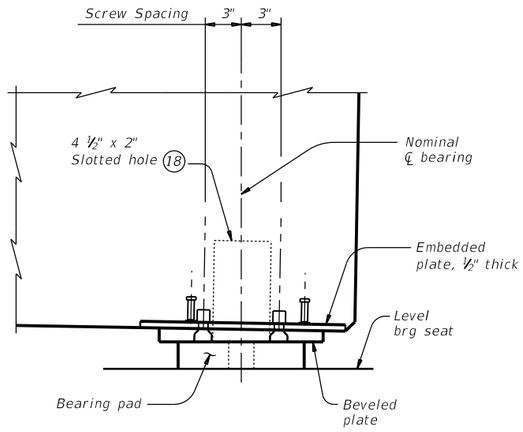


SECTION

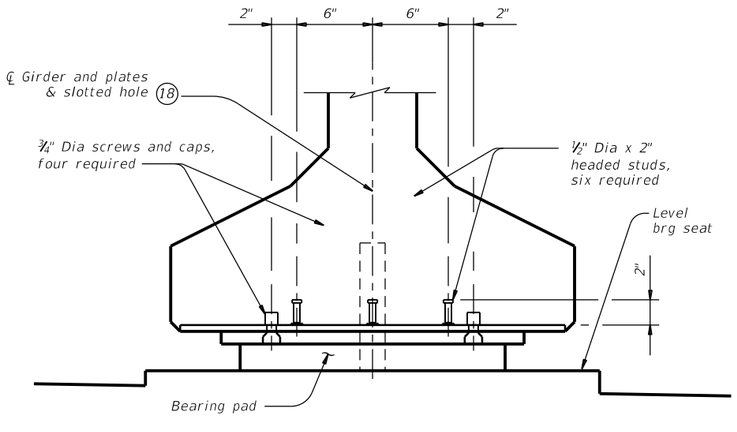


HOLE DETAIL

BEVELED PLATE DETAILS



SIDE ELEVATION



END ELEVATION
Showing normal girder end.

GIRDER DETAILS

(17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.

(18) Slotted hole is required at doweled girder end locations.

SOLE PLATE NOTES:

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

On the shop drawings, dimension sole plates to the nearest 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.

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation | Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
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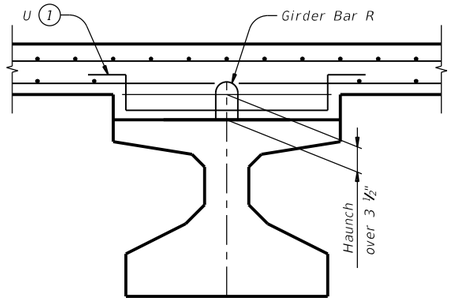
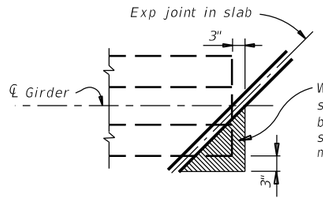
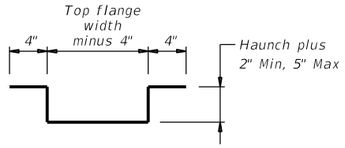


HAUNCH REINFORCING DETAIL



Where flanges project under slab of adjacent span, provide a minimum of ½" clearance between top of girder and bottom of adjacent slab. Polystyrene or other suitable compressible material may be used as a filler.

TREATMENT AT GIRDER END FOR SKEWED SPANS



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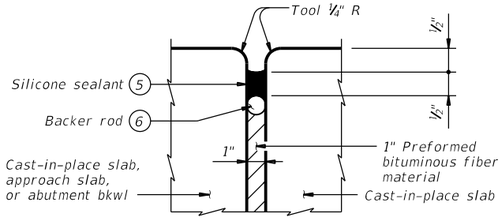
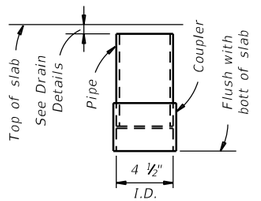
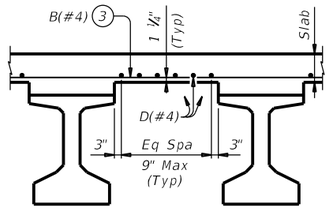


TYPE A JOINT DETAIL (7)

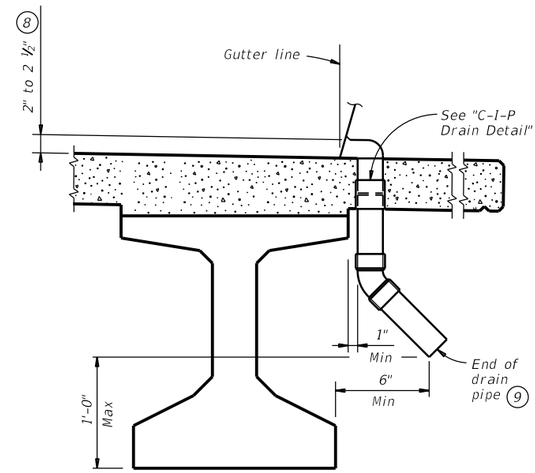


C-I-P DRAIN DETAIL (2)



TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

Top reinforcing steel not shown for clarity.



DRAIN DETAIL (10)

(1) Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 ½".

(2) Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.

(3) Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.

(4) Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

(5) Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.

(6) 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(7) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.

(8) Drain entrance formed in rail or sidewalk.

(9) Water may not be discharged onto girders.

(10) All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railways, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."

All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

Cover dimensions are clear dimensions, unless noted otherwise.

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

DECK FORMWORK NOTES:

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

Texas Department of Transportation

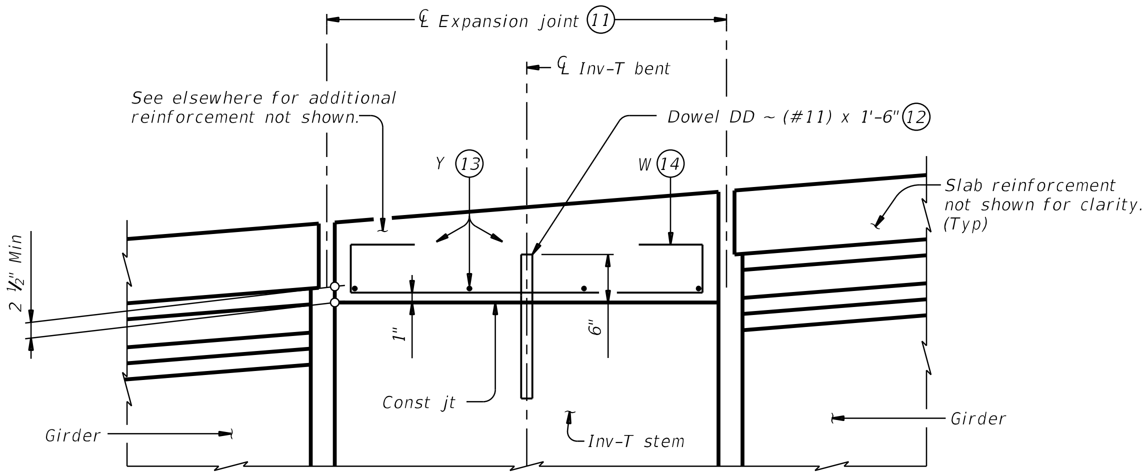
Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

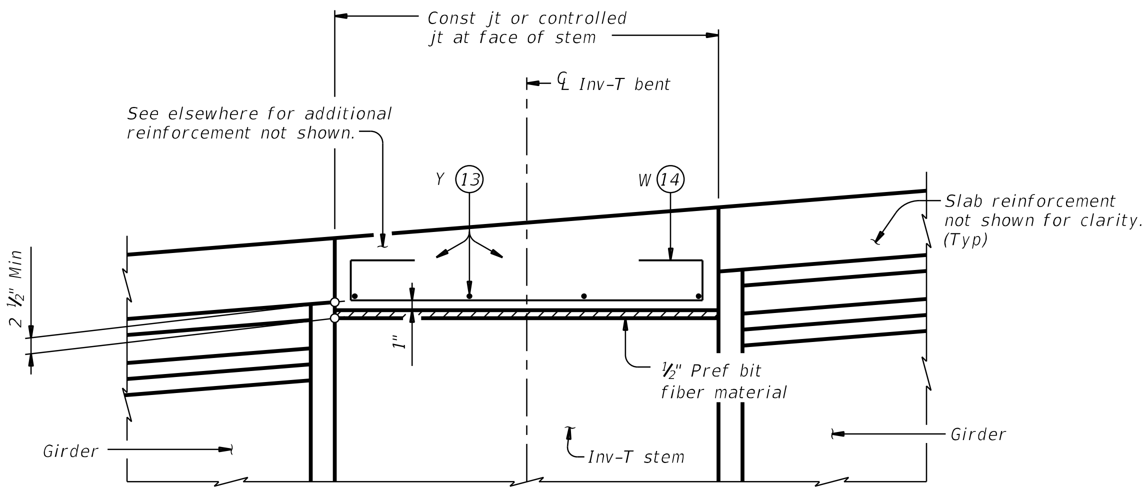
PRESTR CONCRETE I-GIRDERS

IGMS

FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS: 10-19: Modified Note 7. Type A now a pay item.	0902	20	110	CR
	DIST	COUNTY		SHEET NO.
	FTW	WISE		55

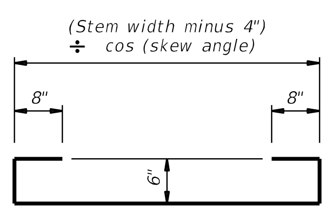


SHOWING EXPANSION JOINTS

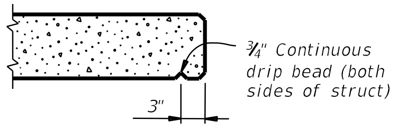


SHOWING CONST JTS OR CONTROLLED JTS

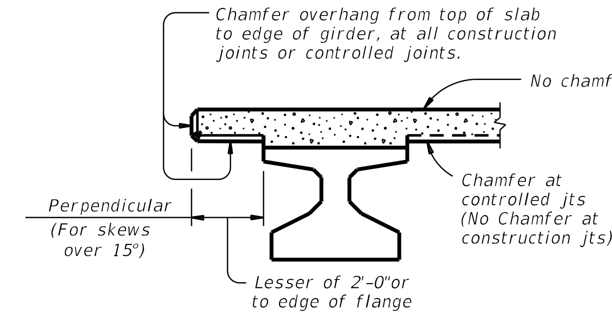
REINFORCEMENT OVER INV-T BENTS



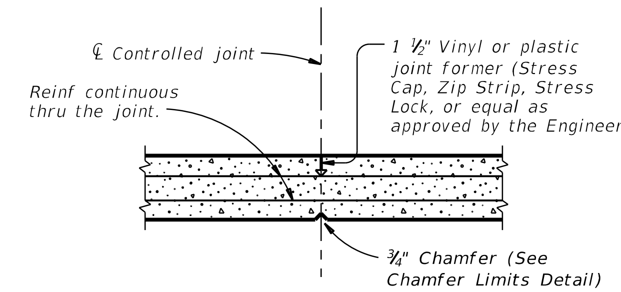
BARS W (#4)



DRIP BEAD DETAIL



CHAMFER LIMITS DETAIL (15)



CONTROLLED JOINT DETAIL

(Saw-cutting is not allowed)

(11) See Layout for joint type.

(12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.

(13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.

(14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.

(15) See Span details for type of joint and joint locations.

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SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

MISCELLANEOUS SLAB DETAILS
PRESTR CONCRETE I-GIRDERS

IGMS

FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
10-19: Modified Note 7. Type A now a pay item.	DIST		COUNTY	SHEET NO.
	FTW		WISE	56

DATE: 5/26/2021 10:45:40 AM
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DESIGNED GIRDERS

STRUCTURE	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS: NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)	DEPRESSED STRAND PATTERN: NO.	TO END (in)	CONCRETE: RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)
Type Tx28 Girders 32' Roadway 8.5" Slab	40	ALL	Tx28		14	0.6	270	10.48	9.34	2	10.5	4.000	5.000
	45	ALL	Tx28		14	0.6	270	10.48	9.34	2	10.5	4.000	5.400
	50	ALL	Tx28		16	0.6	270	10.23	9.23	4	8.5	4.000	5.800
	55	ALL	Tx28		18	0.6	270	10.04	8.26	4	12.5	4.100	6.400
	60	ALL	Tx28		22	0.6	270	9.75	7.57	4	16.5	4.800	6.900
	65	ALL	Tx28		26	0.6	270	9.56	7.71	4	16.5	5.600	7.300
Type Tx34 Girders 32' Roadway 8.5" Slab	40	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000
	45	ALL	Tx34		14	0.6	270	13.01	12.15	2	8.5	4.000	5.000
	50	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000
	55	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000
	60	ALL	Tx34		18	0.6	270	12.57	11.23	4	10.5	4.000	5.500
	65	ALL	Tx34		22	0.6	270	12.28	7.92	4	28.5	4.000	6.000
	70	ALL	Tx34		26	0.6	270	12.09	8.09	4	30.5	4.700	6.500
	75	ALL	Tx34		30	0.6	270	11.81	7.41	6	28.5	5.200	6.700
	80	ALL	Tx34		34	0.6	270	11.48	7.25	6	30.5	5.800	7.000
Type Tx40 Girders 32' Roadway 8.5" Slab	40	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000
	45	ALL	Tx40		14	0.6	270	15.60	15.60			4.700	5.000
	50	ALL	Tx40		14	0.6	270	15.60	15.60			4.500	5.000
	55	ALL	Tx40		16	0.6	270	15.35	14.35	4	8.5	4.000	5.000
	60	ALL	Tx40		18	0.6	270	15.16	13.82	4	10.5	4.000	5.000
	65	ALL	Tx40		18	0.6	270	15.16	13.82	4	10.5	4.000	5.000
	70	ALL	Tx40		20	0.6	270	15.00	13.40	4	12.5	4.000	5.200
	75	ALL	Tx40		24	0.6	270	14.77	9.77	4	34.5	4.100	5.700
	80	ALL	Tx40		28	0.6	270	14.60	10.60	4	32.5	4.900	6.000
	85	ALL	Tx40		32	0.6	270	14.23	8.60	6	36.5	5.100	6.200
	90	ALL	Tx40		36	0.6	270	13.93	9.27	6	34.5	5.900	6.600
Type Tx46 Girders 32' Roadway 8.5" Slab	40	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000
	45	ALL	Tx46		14	0.6	270	17.60	17.60			4.500	5.000
	50	ALL	Tx46		14	0.6	270	17.60	17.60			4.500	5.000
	55	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.000	5.000
	60	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.000	5.000
	65	ALL	Tx46		18	0.6	270	17.16	15.83	4	10.5	4.000	5.000
	70	ALL	Tx46		18	0.6	270	17.16	15.83	4	10.5	4.000	5.000
	75	ALL	Tx46		20	0.6	270	17.00	15.40	4	12.5	4.000	5.000
	80	ALL	Tx46		24	0.6	270	16.77	14.10	4	20.5	4.000	5.100
	85	ALL	Tx46		28	0.6	270	16.60	11.46	4	40.5	4.200	5.500
	90	ALL	Tx46		32	0.6	270	16.23	9.48	6	42.5	4.400	5.700
	95	ALL	Tx46		34	0.6	270	16.07	11.13	6	34.5	5.000	5.900
	100	ALL	Tx46		38	0.6	270	15.81	11.39	6	34.5	5.600	6.600

OPTIONAL DESIGN

STRUCTURE	SPAN NO.	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): Moment	Shear
Type Tx28 Girders 32' Roadway 8.5" Slab	40	1.189	-1.700	1731	0.850	1.070
	45	1.507	-2.077	1717	0.820	1.080
	50	1.853	-2.508	2040	0.800	1.080
	55	2.247	-2.980	2377	0.780	1.090
	60	2.655	-3.462	2715	0.760	1.090
	65	3.104	-3.978	3064	0.740	1.100
Type Tx34 Girders 32' Roadway 8.5" Slab	40	0.934	-1.303	1975	0.880	1.050
	45	1.180	-1.588	2124	0.850	1.060
	50	1.437	-1.907	2248	0.830	1.060
	55	1.739	-2.263	2449	0.810	1.060
	60	2.068	-2.640	2806	0.790	1.070
	65	2.424	-3.039	3173	0.770	1.070
	70	2.807	-3.458	3548	0.750	1.080
	75	3.195	-3.894	3951	0.740	1.080
	80	3.633	-4.373	4378	0.730	1.080
Type Tx40 Girders 32' Roadway 8.5" Slab	40	0.768	-1.053	2052	0.910	1.030
	45	0.967	-1.282	2430	0.880	1.040
	50	1.195	-1.554	2558	0.860	1.040
	55	1.442	-1.834	2685	0.830	1.050
	60	1.687	-2.118	2875	0.810	1.050
	65	1.978	-2.447	3277	0.800	1.060
	70	2.288	-2.783	3666	0.780	1.060
	75	2.619	-3.135	4064	0.760	1.060
	80	2.964	-3.509	4498	0.750	1.070
	85	3.328	-3.900	4944	0.740	1.070
	90	3.695	-4.294	5394	0.730	1.070
Type Tx46 Girders 32' Roadway 8.5" Slab	40	0.678	-0.844	2150	0.950	1.020
	45	0.846	-1.024	2543	0.920	1.020
	50	1.041	-1.235	3012	0.890	1.030
	55	1.257	-1.465	3277	0.870	1.030
	60	1.489	-1.701	3221	0.840	1.040
	65	1.732	-1.957	3424	0.830	1.040
	70	2.001	-2.227	3834	0.810	1.040
	75	2.289	-2.510	4254	0.790	1.040
	80	2.579	-2.804	4703	0.780	1.050
	85	2.905	-3.125	5181	0.770	1.050
	90	3.234	-3.438	5624	0.750	1.050
	95	3.582	-3.777	6117	0.740	1.060
	100	3.961	-4.139	6635	0.730	1.060

LOAD RATING

STRUCTURE	SPAN NO.	STRENGTH I: Inv	STRENGTH I: Opr	SERVICE III: Inv
Type Tx28 Girders 32' Roadway 8.5" Slab	40	1.58	2.04	2.01
	45	1.48	1.91	1.57
	50	1.39	1.80	1.30
	55	1.26	1.69	1.07
	60	1.24	1.82	1.05
	65	1.09	1.76	1.07
Type Tx34 Girders 32' Roadway 8.5" Slab	40	1.77	2.29	2.35
	45	1.75	2.27	2.11
	50	1.64	2.13	1.82
	55	1.37	1.77	1.35
	60	1.30	1.72	1.17
	65	1.59	2.08	1.34
	70	1.08	1.81	1.04
	75	1.44	1.93	1.12
	80	1.23	1.67	1.05
Type Tx40 Girders 32' Roadway 8.5" Slab	40	2.02	2.62	2.88
	45	2.01	2.61	2.63
	50	1.91	2.48	2.29
	55	1.60	2.07	1.79
	60	1.57	2.03	1.61
	65	1.31	1.70	1.22
	70	1.13	1.68	1.08
	75	1.60	2.07	1.26
	80	1.27	1.99	1.14
	85	1.29	2.04	1.08
	90	1.33	1.75	1.07
Type Tx46 Girders 32' Roadway 8.5" Slab	40	2.22	2.88	3.41
	45	2.22	2.88	3.17
	50	1.82	2.36	2.47
	55	1.77	2.30	2.22
	60	1.51	1.95	1.77
	65	1.48	1.92	1.59
	70	1.26	1.64	1.23
	75	1.16	1.63	1.10
	80	1.28	1.83	1.14
	85	1.38	1.98	1.14
	90	1.46	2.11	1.13
	95	1.49	2.12	1.12
	100	1.31	1.78	1.03

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

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

Compression = 0.65 f'ci

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

Optional designs must likewise conform.

(2) Portion of full HL93.

DESIGN NOTES:

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

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

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

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

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

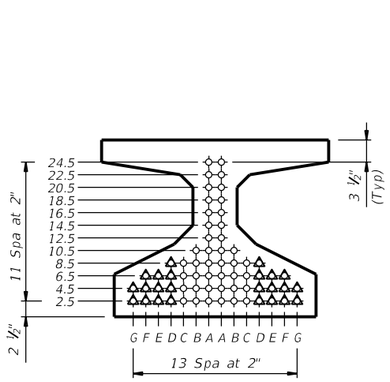
Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked Δ. Double wrap full-length debonded strands in outer most position of each row.

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

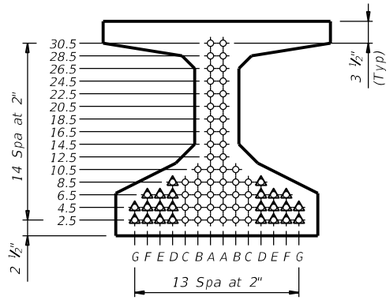
Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must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

DEPRESSED STRAND DESIGNS:

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



TYPE Tx28



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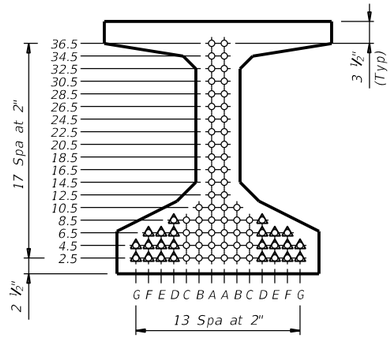

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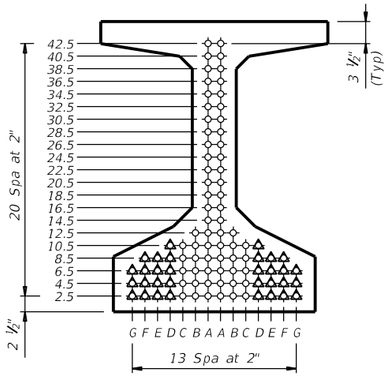


TYPE Tx46

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

32' ROADWAY

IGSD-32

FILE: ig06stds-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Redesigned girders. 1-21: Added load rating.	0902	20	110	CR
	DIST	COUNTY		SHEET NO.
	FTW	WISE		57

STRUCTURE	DESIGNED GIRDERS								DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING			
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.	TO END	RELEASE STRGTH (1)	MINIMUM 28 DAY COMP STRGTH	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)			f'ci (ksi)	f'c (ksi)	fct(ksi)	fcb(ksi)	(kip-ft)	Moment	Shear	Inv	Opr	Inv
Type Tx54 Girders 32' Roadway 8.5" Slab	40	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.561	-0.686	2216	0.980	1.010	2.55	3.30	4.09
	45	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.703	-0.835	2629	0.950	1.010	2.12	2.75	3.32
	50	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	0.858	-1.003	3108	0.920	1.020	2.10	2.73	3.05
	55	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.035	-1.189	3629	0.900	1.020	2.05	2.66	2.77
	60	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.224	-1.381	3931	0.870	1.020	1.76	2.28	2.27
	65	ALL	Tx54		18	0.6	270	20.56	19.23	4	10.5	4.000	5.000	1.430	-1.588	4159	0.850	1.020	1.75	2.26	2.09
	70	ALL	Tx54		18	0.6	270	20.56	19.23	4	10.5	4.000	5.000	1.653	-1.815	4103	0.840	1.030	1.49	1.93	1.68
	75	ALL	Tx54		20	0.6	270	20.41	18.81	4	12.5	4.000	5.000	1.877	-2.035	4399	0.820	1.030	1.50	1.94	1.56
	80	ALL	Tx54		20	0.6	270	20.41	18.81	4	12.5	4.000	5.000	2.129	-2.284	4880	0.810	1.030	1.29	1.67	1.23
	85	ALL	Tx54		22	0.6	270	20.28	18.46	4	14.5	4.000	5.000	2.392	-2.534	5339	0.790	1.040	1.30	1.68	1.12
	90	ALL	Tx54		26	0.6	270	20.08	16.39	4	28.5	4.000	5.000	2.665	-2.800	5839	0.780	1.040	1.22	1.67	1.00
	95	ALL	Tx54		28	0.6	270	20.01	14.29	4	44.5	4.000	5.000	2.951	-3.075	6353	0.770	1.040	1.38	1.86	1.03
	100	ALL	Tx54		32	0.6	270	19.63	12.51	6	44.5	4.300	5.200	3.262	-3.370	6892	0.760	1.040	1.42	1.99	1.03
	105	ALL	Tx54		36	0.6	270	19.34	12.01	6	50.5	4.700	5.400	3.574	-3.667	7434	0.750	1.040	1.48	2.10	1.05
	110	ALL	Tx54		40	0.6	270	19.11	12.51	6	50.5	5.300	6.100	3.899	-3.973	7988	0.740	1.050	1.53	2.19	1.08
	115	ALL	Tx54		44	0.6	270	18.83	11.55	8	48.5	5.600	6.400	4.252	-4.301	8569	0.730	1.050	1.29	1.74	1.03
	120	ALL	Tx54	*	48	0.6	270	18.42	10.09	10	50.5	5.800	7.700	4.619	-4.640	9165	0.720	1.050	1.28	1.69	1.01
Type Tx62 Girders 32' Roadway 8.5" Slab	60	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	0.961	-1.157	4309	0.900	1.010	1.98	2.56	2.74
	65	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.121	-1.331	4614	0.880	1.010	1.69	2.19	2.26
	70	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.292	-1.514	4894	0.860	1.020	1.71	2.21	2.12
	75	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.475	-1.705	4844	0.840	1.020	1.48	1.92	1.75
	80	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.000	5.000	1.659	-1.903	5116	0.830	1.020	1.49	1.93	1.64
	85	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.000	5.000	1.866	-2.120	5578	0.820	1.020	1.29	1.67	1.32
	90	ALL	Tx62		20	0.6	270	25.18	24.38	4	8.5	4.500	5.500	2.080	-2.338	6072	0.800	1.030	1.31	1.70	1.23
	95	ALL	Tx62		24	0.6	270	24.94	22.94	4	16.5	4.000	5.000	2.310	-2.574	6621	0.790	1.030	1.31	1.70	1.12
	100	ALL	Tx62		26	0.6	270	24.85	22.39	4	20.5	4.000	5.000	2.531	-2.805	7159	0.780	1.030	1.27	1.70	1.03
	105	ALL	Tx62		30	0.6	270	24.58	14.18	6	58.5	4.800	5.800	2.771	-3.050	7723	0.770	1.030	1.64	2.16	1.31
	110	ALL	Tx62		34	0.6	270	24.25	15.42	6	56.5	4.200	5.000	3.020	-3.304	8301	0.760	1.030	1.60	2.10	1.21
	115	ALL	Tx62		36	0.6	270	24.11	17.44	6	46.5	4.700	5.600	3.291	-3.576	8909	0.750	1.030	1.53	2.04	1.13
	120	ALL	Tx62		40	0.6	270	23.88	16.68	6	54.5	5.100	6.000	3.545	-3.835	9493	0.740	1.040	1.63	2.12	1.47
	125	ALL	Tx62		44	0.6	270	23.60	14.87	8	56.5	5.300	6.100	3.836	-4.124	10128	0.730	1.040	1.51	2.04	1.35
	130	ALL	Tx62		48	0.6	270	23.28	15.28	8	56.5	5.800	6.700	4.144	-4.438	10849	0.730	1.040	1.44	1.80	1.11

NON-STANDARD STRAND PATTERNS

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

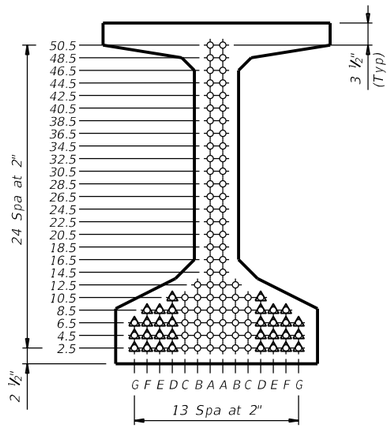
(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

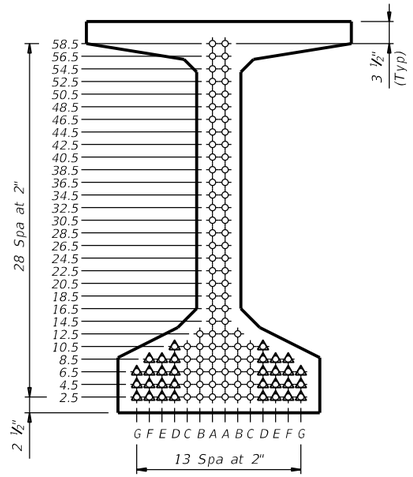
Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.



TYPE Tx54



TYPE Tx62

HL93 LOADING

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

32' ROADWAY

IGSD-32

FILE: ig06stds-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Redesigned girders. 1-21: Added load rating.	0902	20	110	CR
	DIST	COUNTY		SHEET NO.
	FTW	WISE		58

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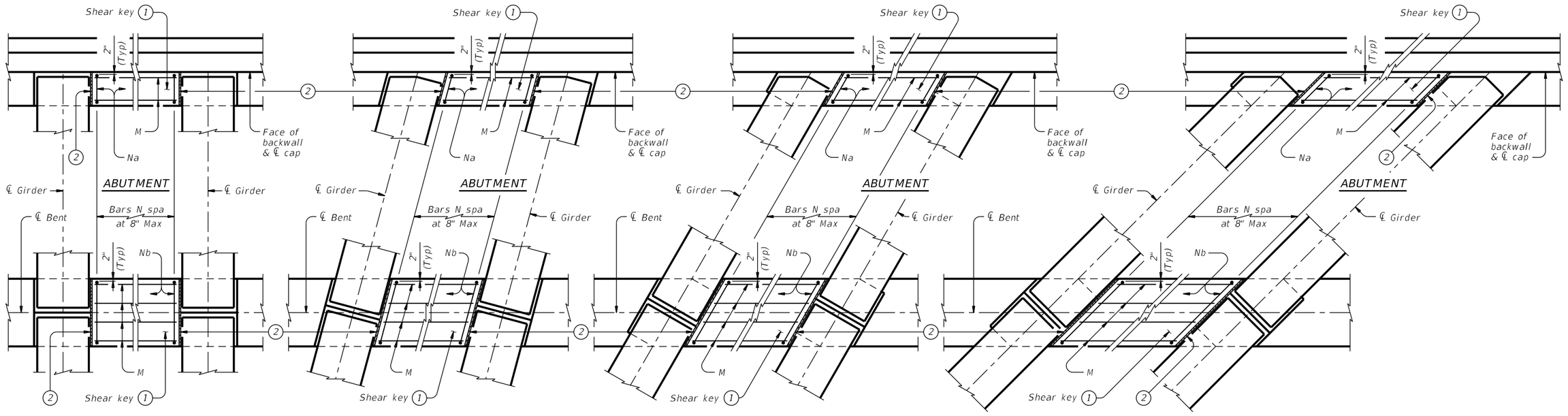


PARTIAL PLANS WITH NO SKEW

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

PARTIAL PLANS WITH 15° SKEW

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

PARTIAL PLANS WITH 30° SKEW

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

PARTIAL PLANS WITH 45° SKEW

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

(1) Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.

(2) UHMW polyethylene wear pad. (Typ)

(3) Leave a ¼" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."

(4) Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.

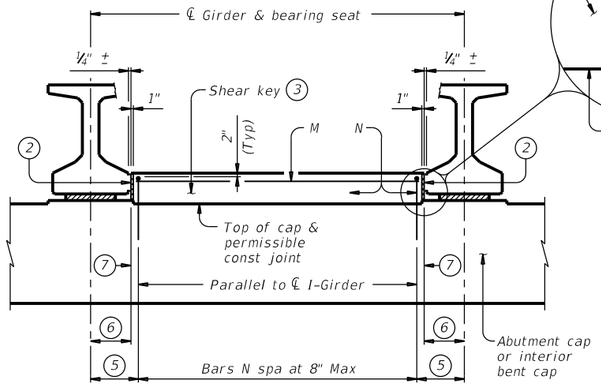
(5) With No Skew = 1'-8 ¼", measured along ℄ cap.
With Skew = 1'-8 ¼" ÷ Cos Skew, measured along ℄ cap.

(6) With No Skew = 1'-4 ¼", measured along ℄ cap.
With Skew = 1'-4 ¼" ÷ Cos Skew, measured along ℄ cap.

(7) Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.

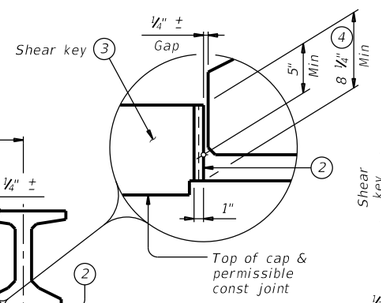
(8) Abutments = ½ Cap width.
Interior bents = Cap width.

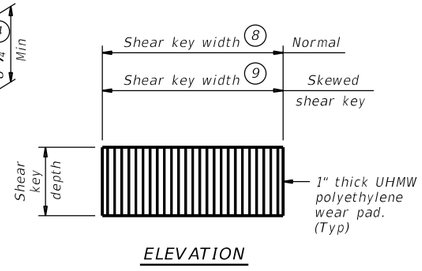
(9) Abutments = ½ Cap width ÷ Cos Skew.
Interior bents = Cap width ÷ Cos Skew.



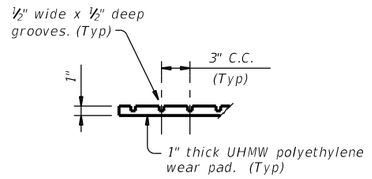
PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

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



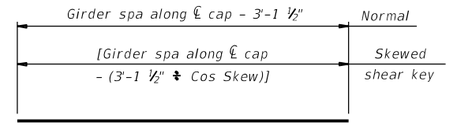


ELEVATION

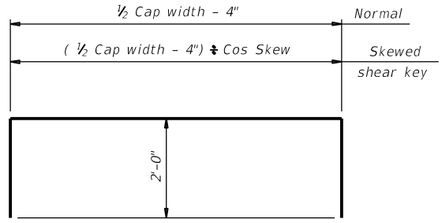


PART SECTION

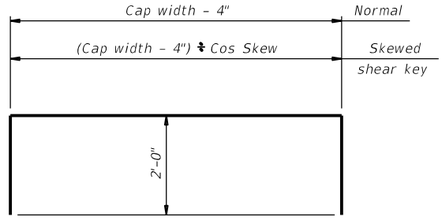
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For abutments)



BARS Nb (#5)
(For interior bents)

CONSTRUCTION NOTES:

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

GENERAL NOTES:

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

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

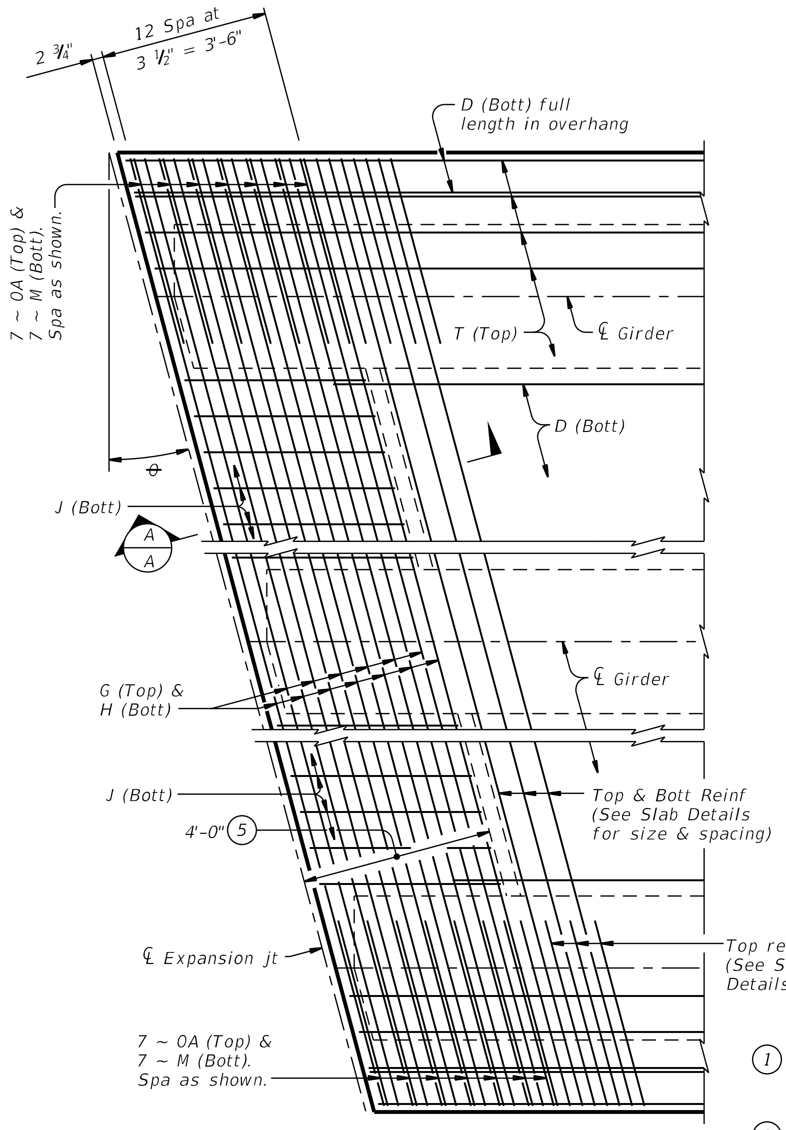
Texas Department of Transportation

Bridge Division Standard

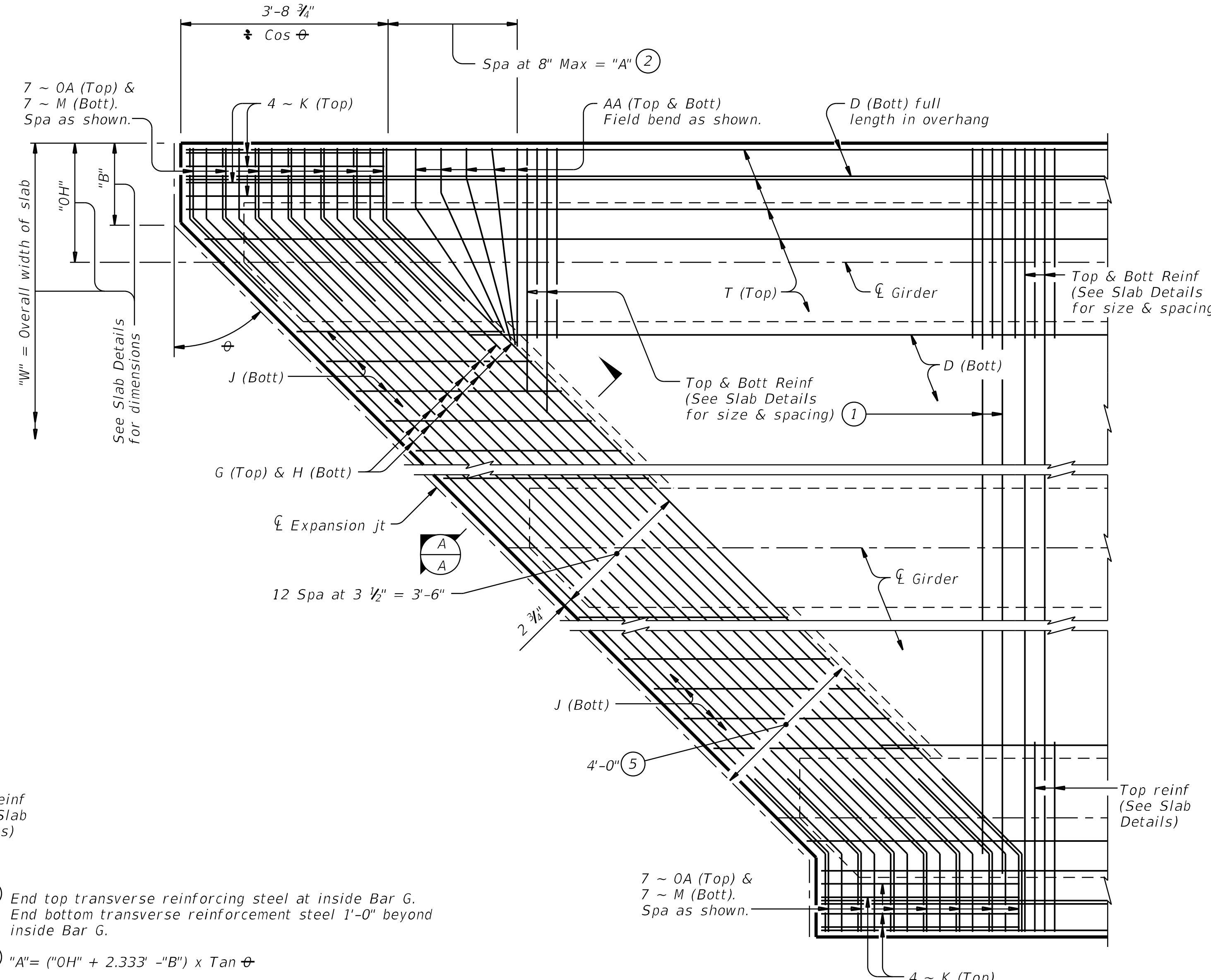
SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

IGSK

FILE: igskstds-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT August 2017 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0902	20	110	CR
	DIST	COUNTY		SHEET NO.
	FTW	WISE		59

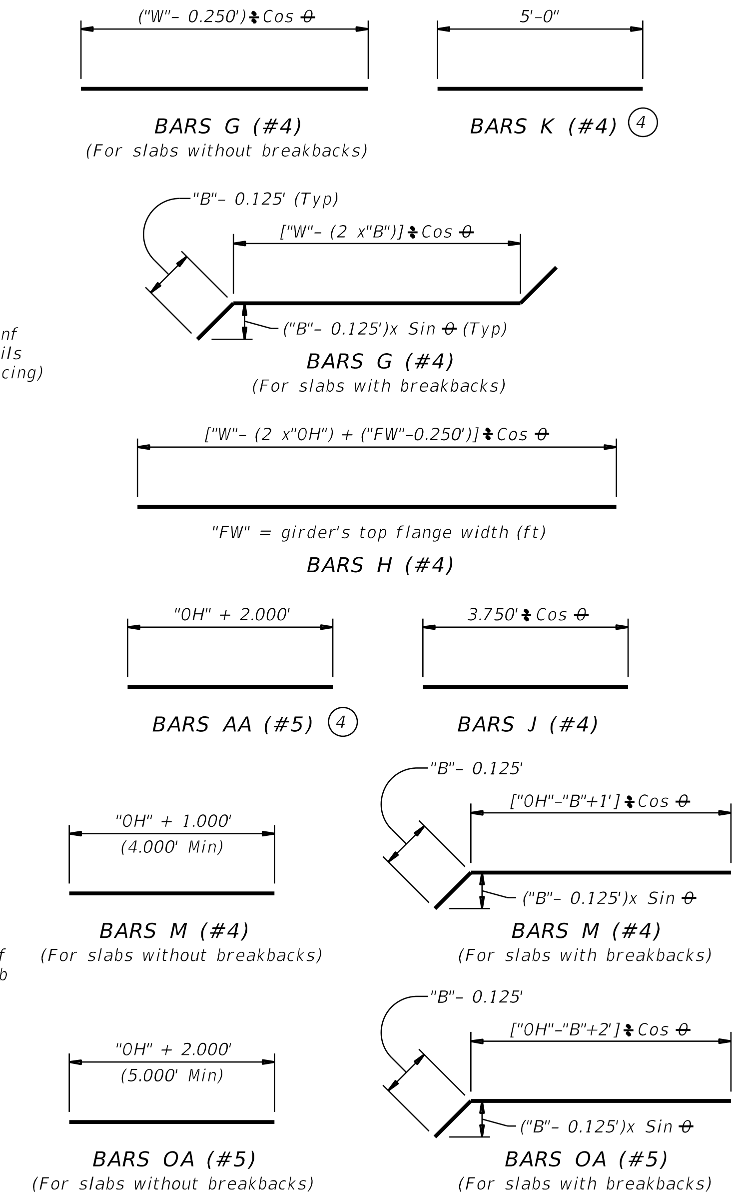


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



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.



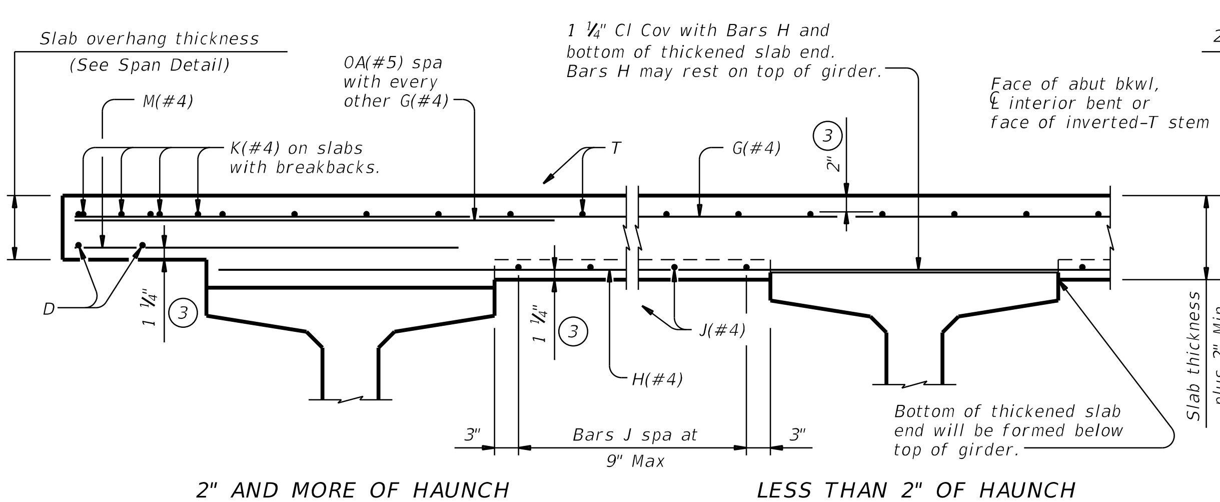
GENERAL NOTES:

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:

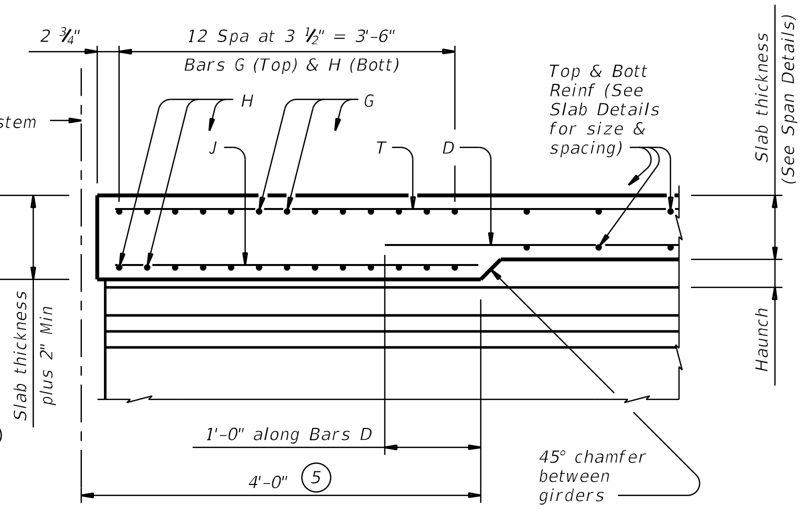
Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

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

FILE: igtssts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
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	FTW	WISE		60

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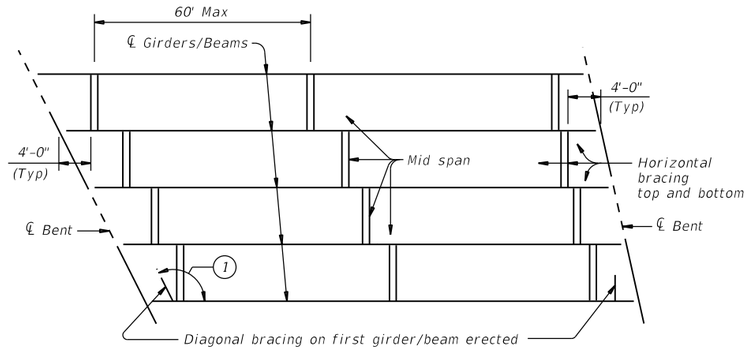
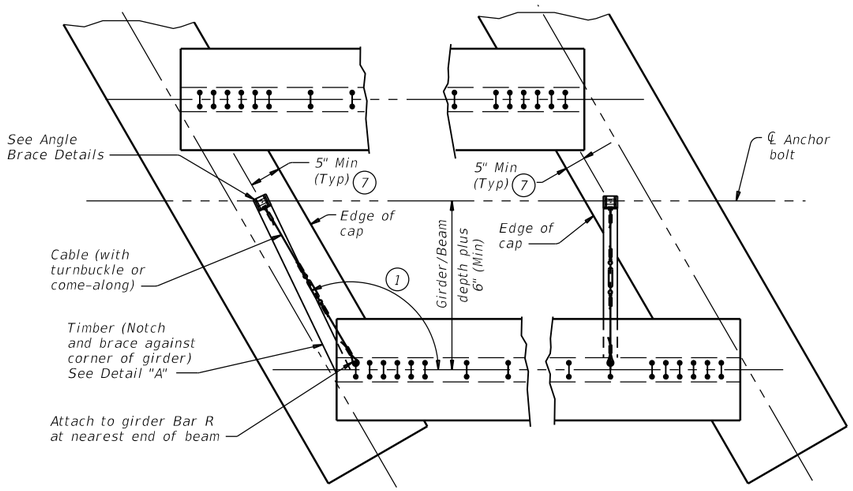
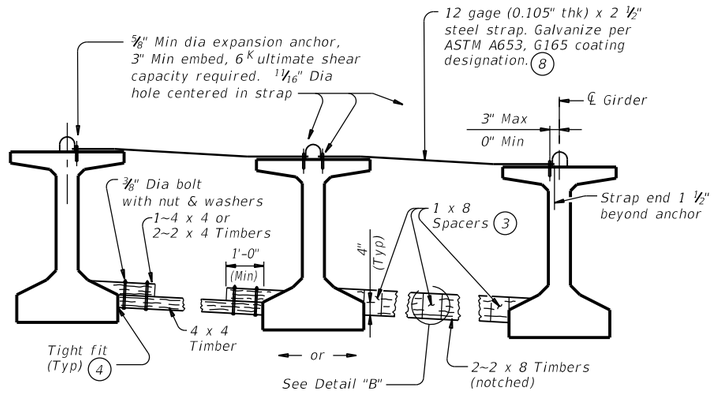


ERECTION BRACING

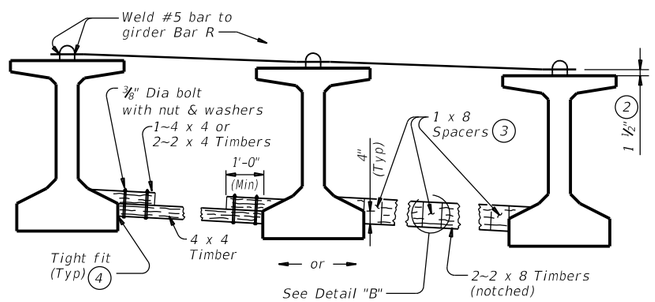


PLAN



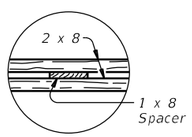
FOR ERECTION BRACING, OPTION 1

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



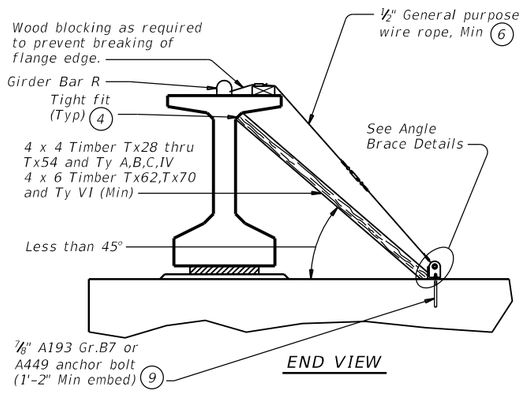
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS 5



PLAN

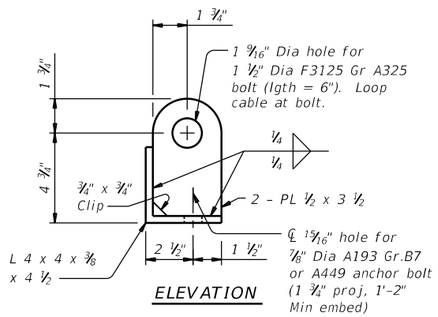
DETAIL "B"



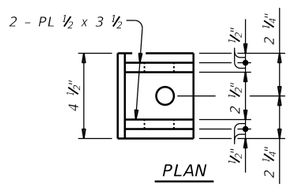
END VIEW

DIAGONAL BRACING DETAILS 5

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



ELEVATION



PLAN

ANGLE BRACE DETAILS

HAULING & ERECTION:

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

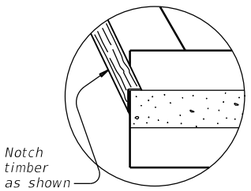
ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

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



DETAIL "A"

(1) If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(6) All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing aginst the dead end.

(7) It is acceptable to tie anchor bolts to cap reinforcement.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(9) Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS
PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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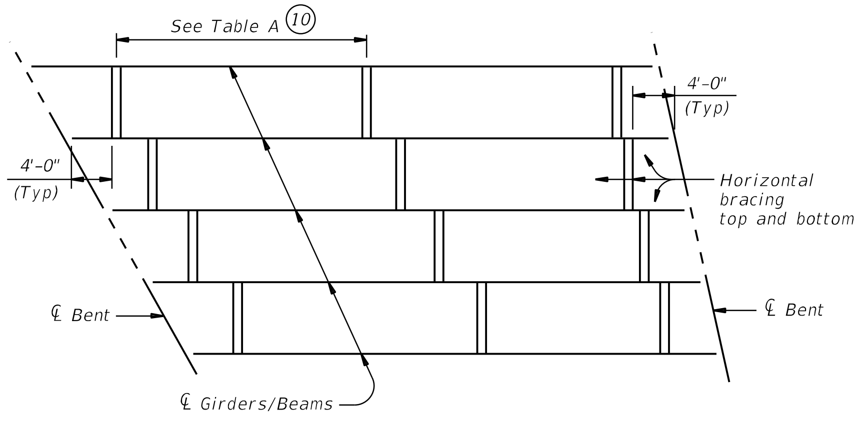
	DIST	COUNTY		SHEET NO.
	FTW	WISE		61

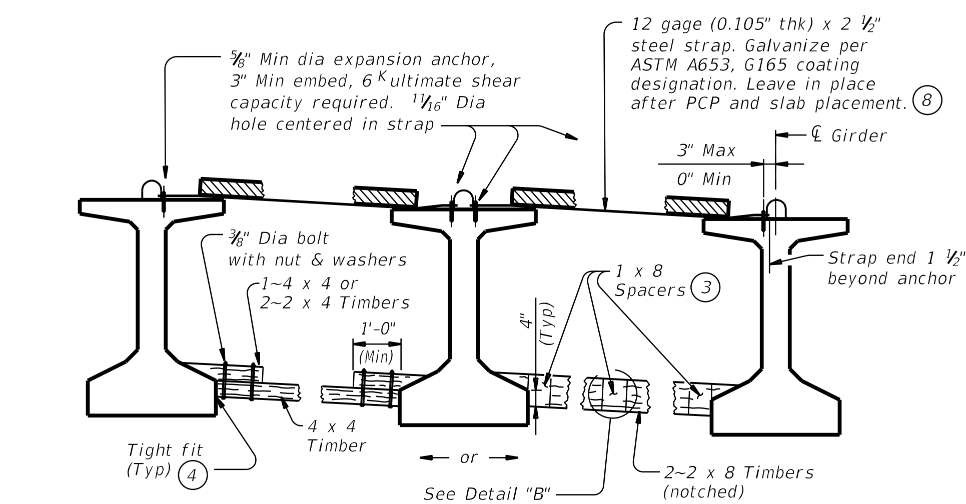


SLAB PLACEMENT BRACING

TABLE A

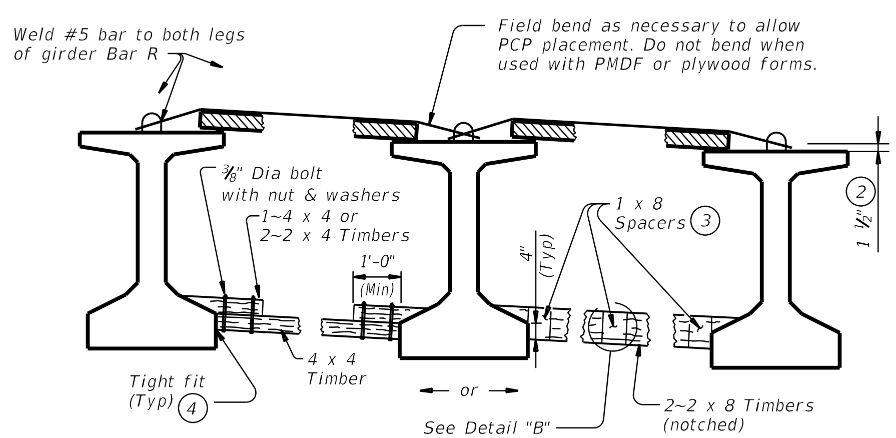
OPTION 1-RIGID BRACING (STEEL STRAP)		
Girder or Beam Type	Maximum Bracing Spacing: Slab Overhang less than 4'-0" (11)	Maximum Bracing Spacing: Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points
Tx34	¼ points	¼ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	⅛ points	⅛ points
B	⅛ points	⅛ points
C	⅛ points	⅛ points
IV	¼ points	⅛ points
VI	¼ points	⅛ points

OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)		
Girder or Beam Type	Maximum Bracing Spacing: Slab Overhang less than 4'-0" (11)	Maximum Bracing Spacing: Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	⅛ points
Tx34	¼ points	⅛ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	¼ points	4.0 ft
VI	¼ points	4.0 ft



FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

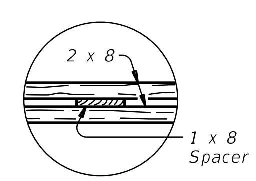
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS (5)



PLAN

DETAIL "B"

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (¼ and ⅛ points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

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

GENERAL NOTES:

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

SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

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©TxDOT August 2017	CONT 0902	SECT 20	JOB 110	HIGHWAY CR
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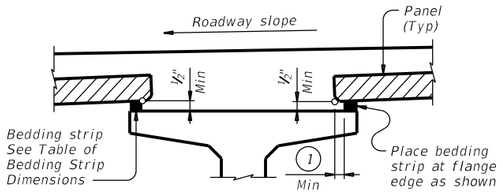
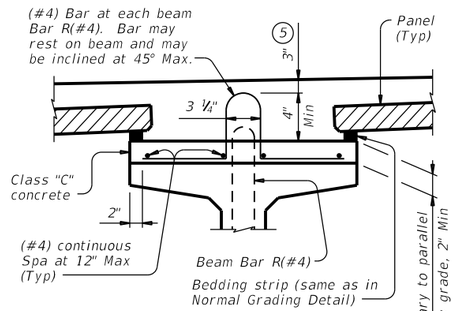


NORMAL GRADING DETAIL (3)

Showing prestressed concrete I-girders.
(Other beam types similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

Showing prestressed concrete I-girders.
(Other beam types similar)

TABLE OF BEDDING STRIP DIMENSIONS		
WIDTH	HEIGHT (4)	
	Min	Max
1" (Min)	½"	2"
1 ¼"	½"	2 ½"
1 ½"	½"	3"
1 ¾"	½"	3 ½"
2"	½"	4"
2 ¼"	½"	4 ½" (2)
2 ½"	½"	5" (2)
2 ¾"	½"	5 ½" (2)
3" (Max)	½"	6" (2)

(1) 2" Min for I-giders, 1 ½" Min for all other beam types.

(2) Allowed for I-girders, not allowed on other beam types.

(3) To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in ¼" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is ¼". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.

(4) Height must not exceed twice the width.

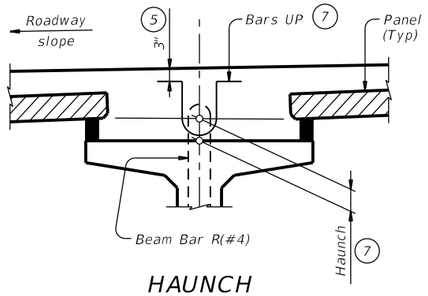
(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(7) Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 ½" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.

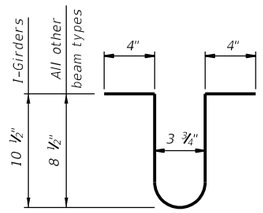
(8) Do not locate construction joints on top of a panel.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

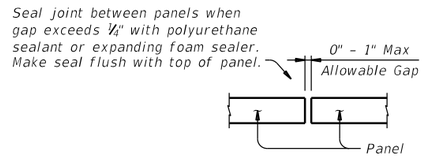


HAUNCH REINFORCING DETAIL

Showing prestressed concrete I-girders.
(Other beam types similar)

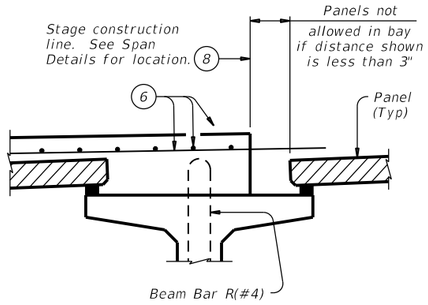


BARS UP (#4) (7)

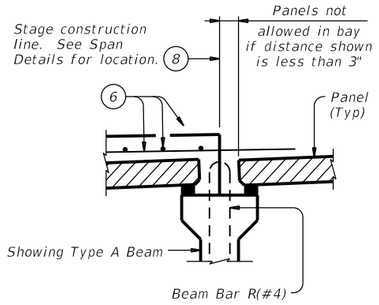


PANEL JOINTS

(Panel reinforcing not shown for clarity.
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



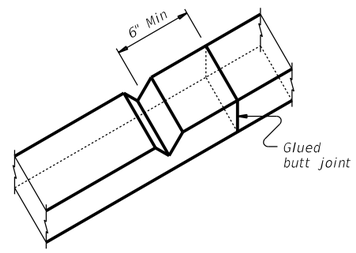
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL (9)

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.

HL93 LOADING SHEET 1 OF 4

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS DECK DETAILS

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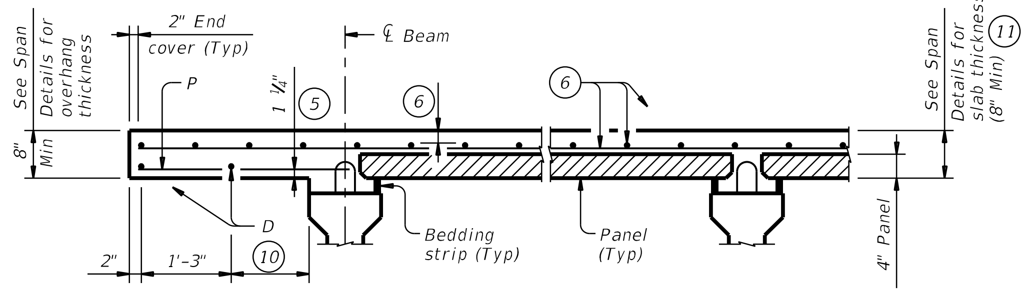
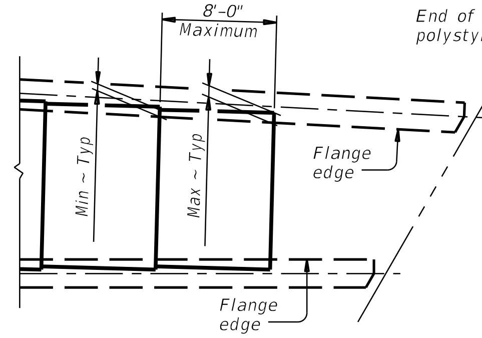
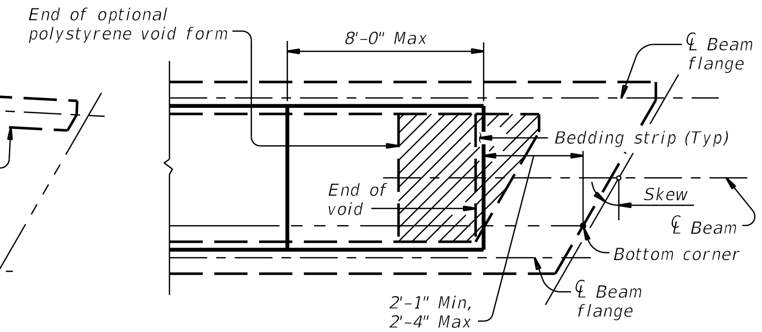


PRESTRESSED CONCRETE I-BEAMS

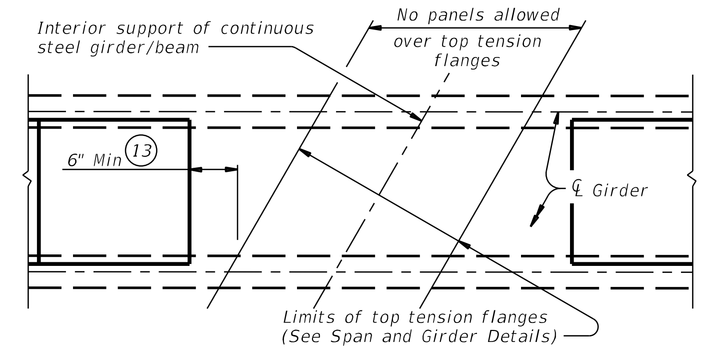


AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on bemm/girder type.

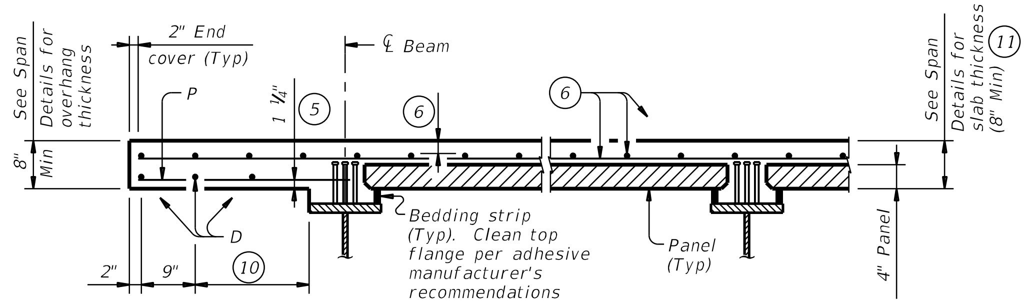


OVER CONC U-BEAMS



AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS

PART PLANS OF PANEL PLACEMENT



STEEL BEAMS

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

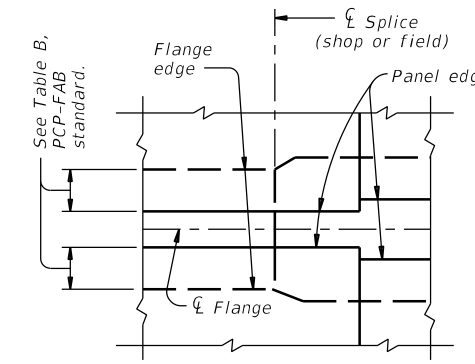
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(10) Equally space additional bar if more than 1'-3" Max.

(11) The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.

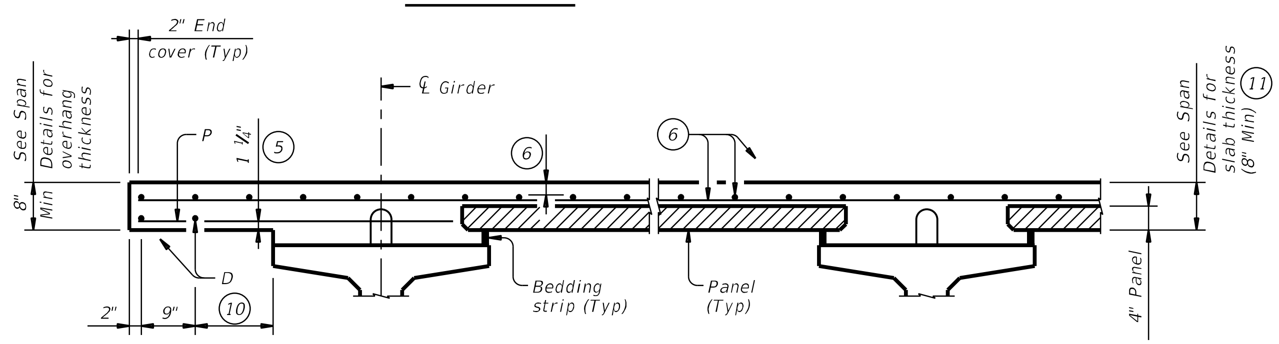
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.

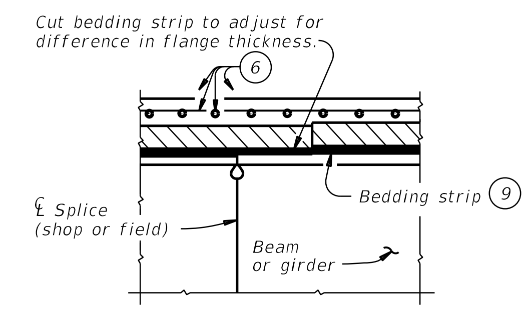


PLAN AT SPLICE

(Showing steel beams with flange width transition)

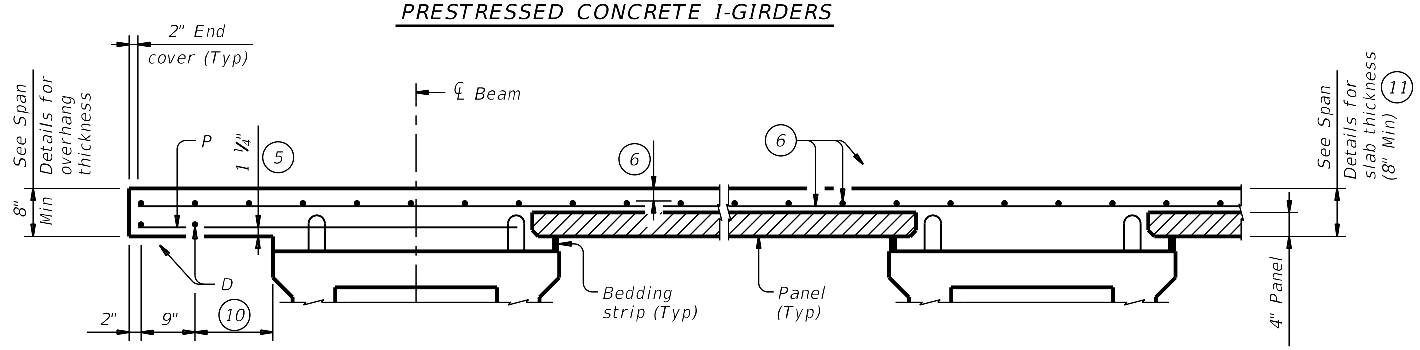


PRESTRESSED CONCRETE I-GIRDERS

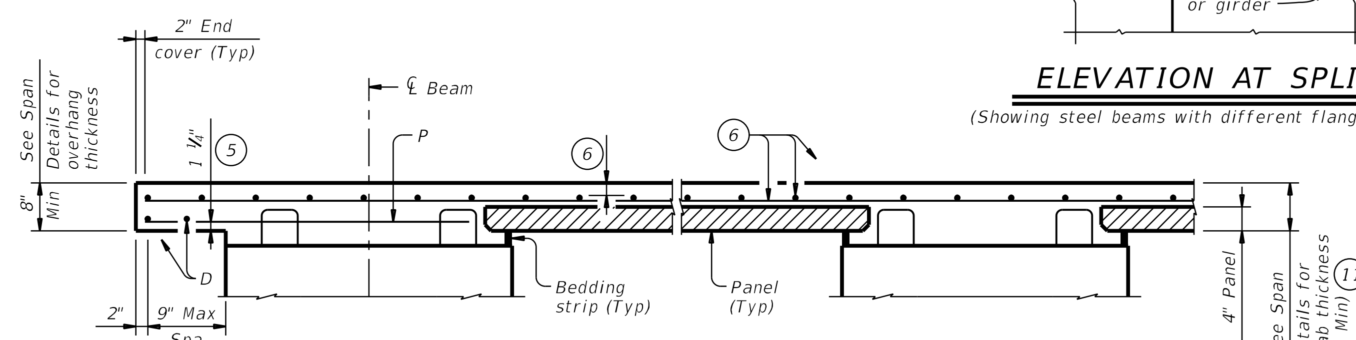


ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)

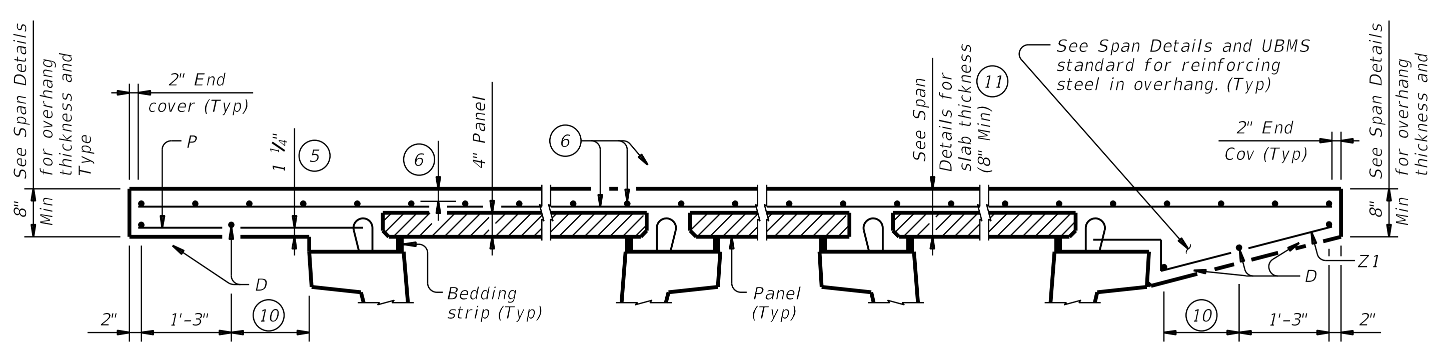


PRESTRESSED CONCRETE X-BEAMS



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

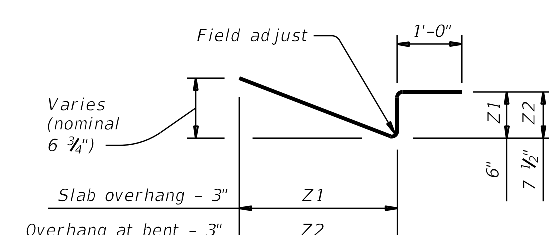
Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS



BARS Z (#4) (12)

HL93 LOADING

SHEET 2 OF 4

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS DECK DETAILS

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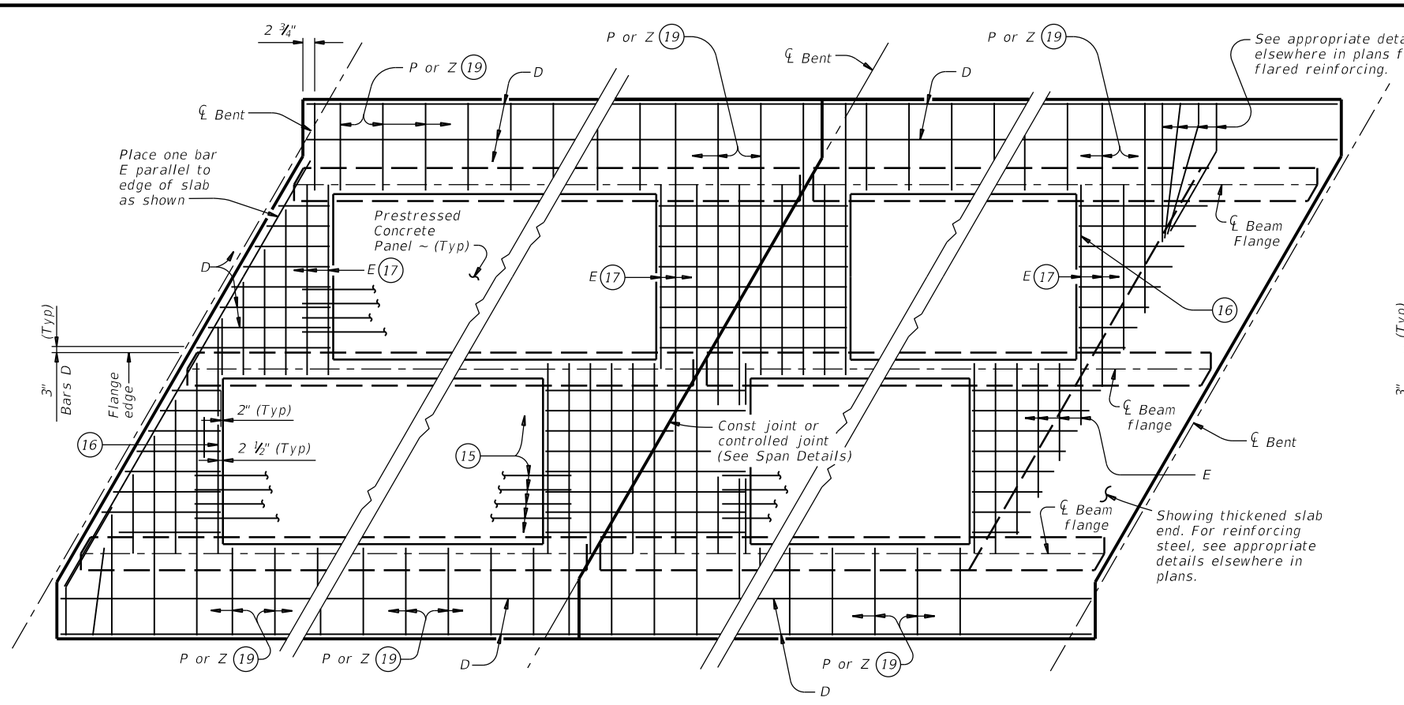
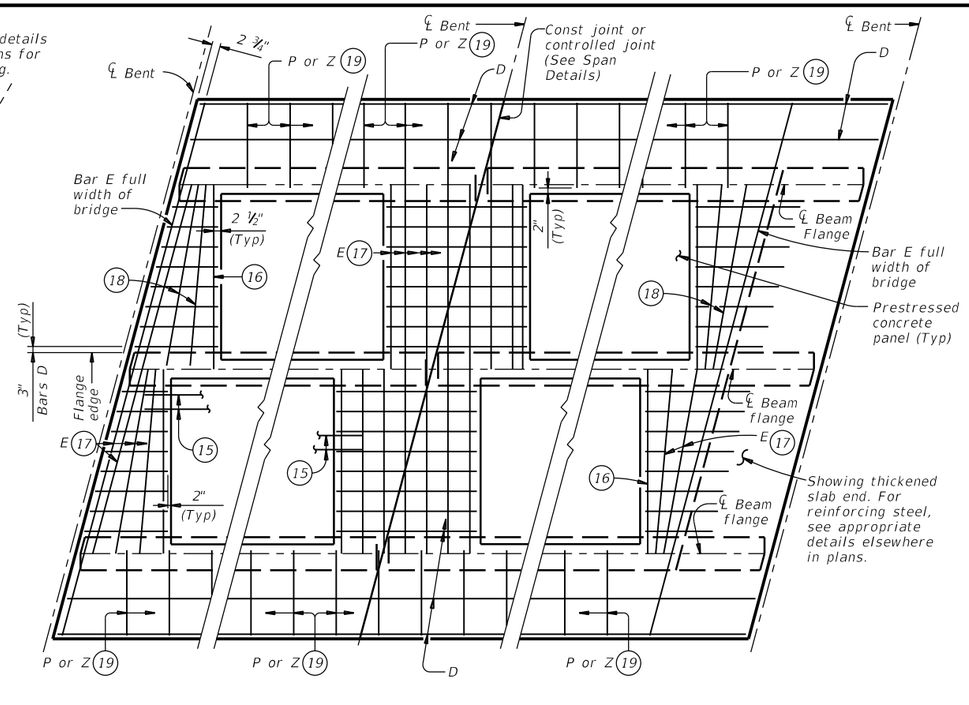


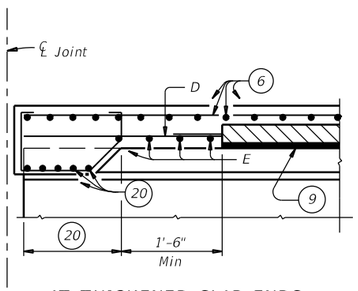
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

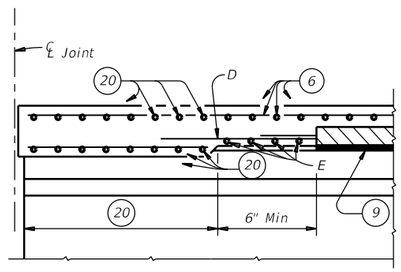


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

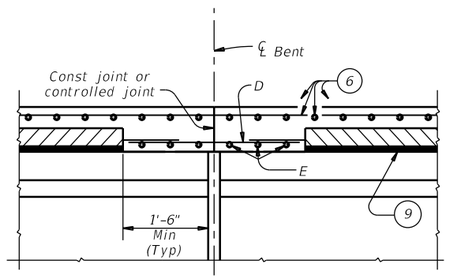
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



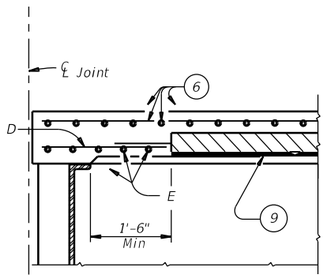
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



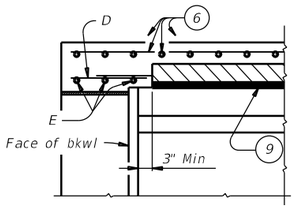
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



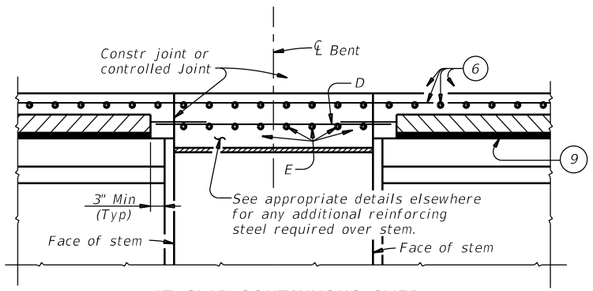
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(14) Max Spacing as listed unless otherwise shown.

(15) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(16) Maintain one Bar E(#4) parallel to panel ends (Typ).

(17) Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.

(18) Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.

(19) Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(20) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

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Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE PANELS DECK DETAILS

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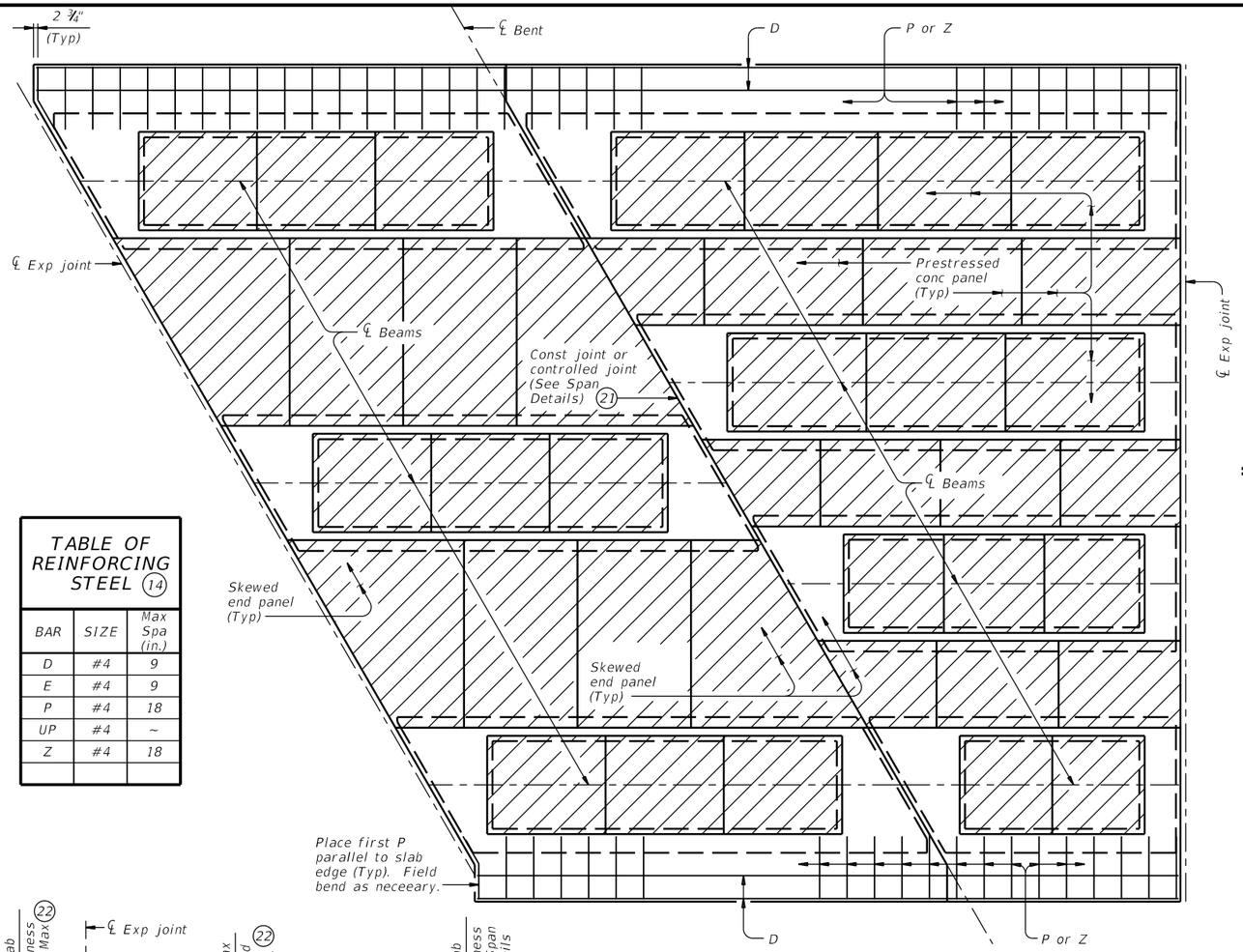
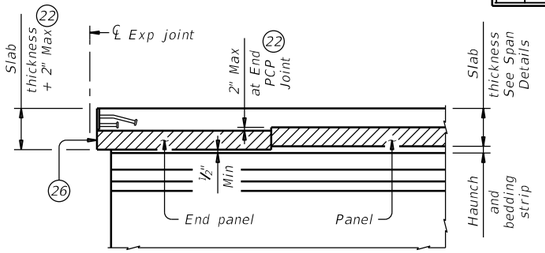


OPTION 2 ~ PLAN OF SLAB

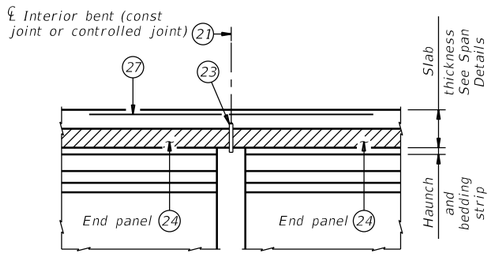
(Showing U-Beams; other beams similar)

TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



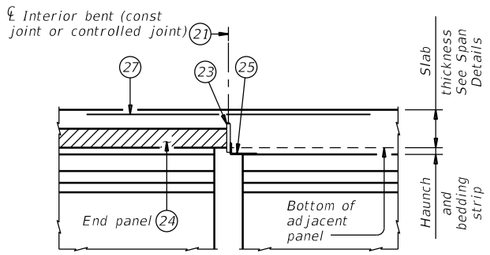
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-A, SEJ-S(0), AJ, and Type A expansion joints only.



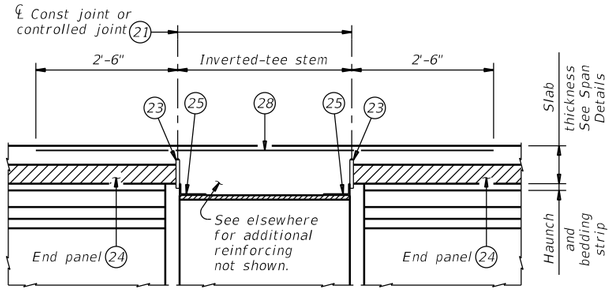
CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT

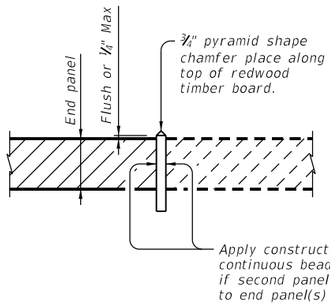
Panel against beam/girder end in adacent span.



INVERTED-T BENT

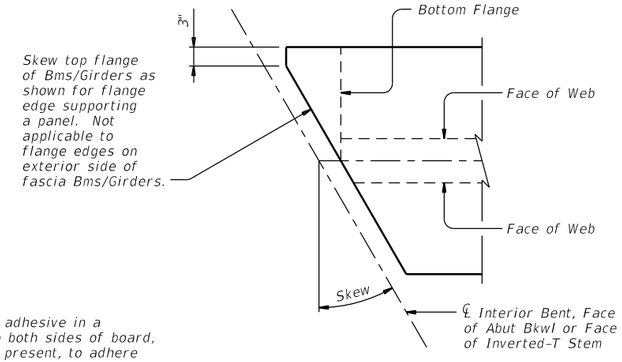
Panels against inverted-tee stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)



ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".



OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Bm/I-Girder, U-Bms and Steel Bms similar.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(14) Max Spacing as listed unless otherwise shown.

(21) 1 ½" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

(22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than ½" thick.

(23) ¾" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within ¼" Max above panel. Place ¾" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within ¼" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.

(24) Place panel within ½" of ¾" thick board.

(25) Permanent galvanized steel sheet form. Removable formwork is acceptable.

(26) Place end panel within ½" of expansion joint opening. End panel cannot encroach on required expansion joint opening.

(27) Place additional (#4) bar 5'-0" in length between every slab bars T. Center (#4) bar on Joint.

(28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

SPECIAL OPTION 2 CONSTRUCTION NOTES:

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 ½".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-A and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and 0A from standard IGTS in the slab.

HL93 LOADING SHEET 4 OF 4

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

FILE: pcpstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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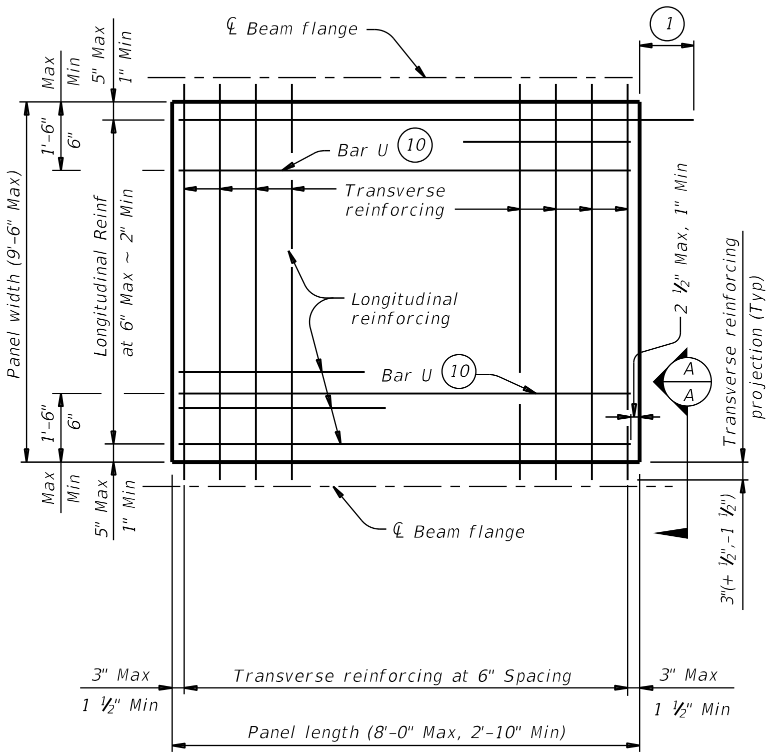
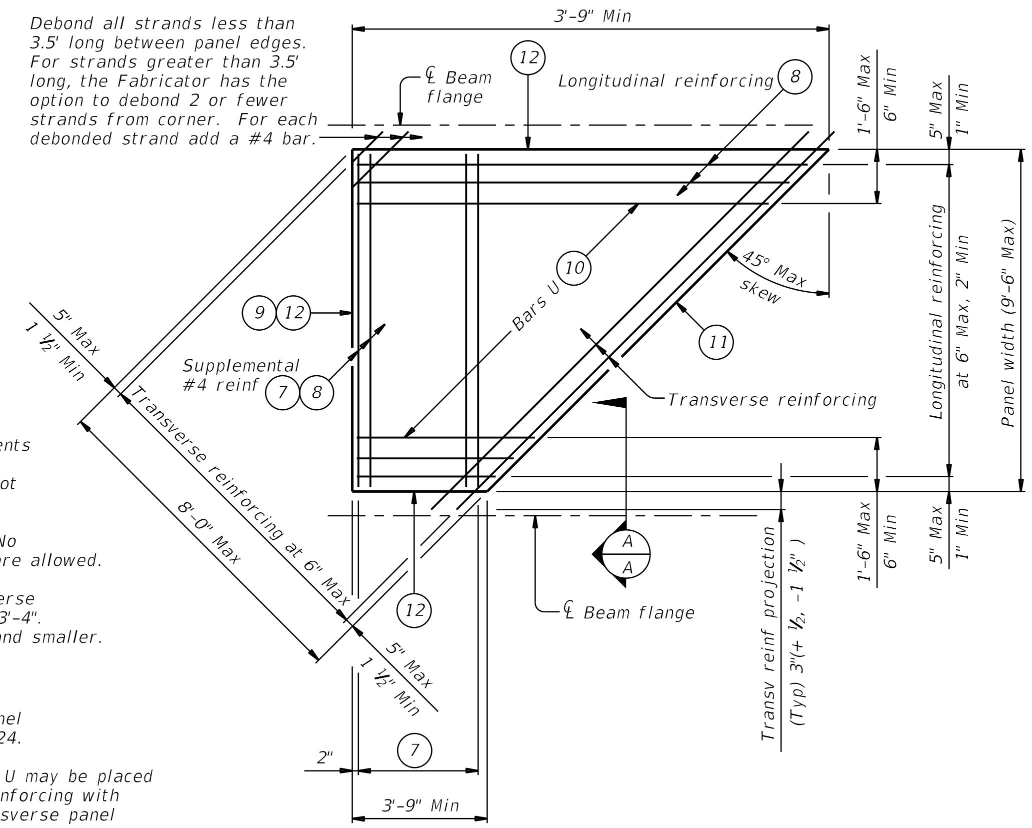
	FTW	WISE		66



TYPICAL NON-SKEWED PANEL PLAN

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.

Debond all strands less than 3.5' long between panel edges. For strands greater than 3.5' long, the Fabricator has the option to debond 2 or fewer strands from corner. For each debonded strand add a #4 bar.



TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3	4 ½
IV	6	4	7 ½
VI	6 ½	4 ½"	8 ½
U40 - 54	5 ½	5 ½	7
Tx28-70	6	5	7 ½
XB20 - 40	4	3	4 ½
XSB12 - 15	4	3	4 ½

TABLE B (4) (5)			
Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3	3 ¼
Over 15" to 18"	4	3	4 ¾
Over 18"	5	3 ½	6 ¼

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3,500 psi. Minimum 28 day strength f'c=5,000 psi.

Provide ¾" chamfer along bottom edge of panel on beam side.

Do not use epoxy-coated reinforcing steel bar or strand in panels.

Remove laitance from top panel surface.

Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.

For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).

Place transverse panel reinforcement at panel centroid and space at 6" Max.

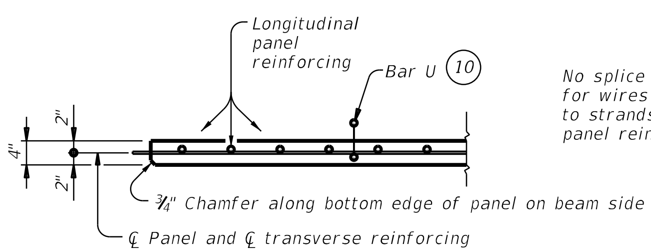
LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

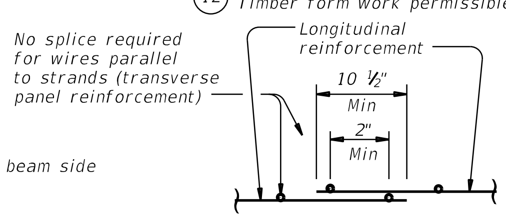
No combination of longitudinal reinforcement options in a panel is allowed.

Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

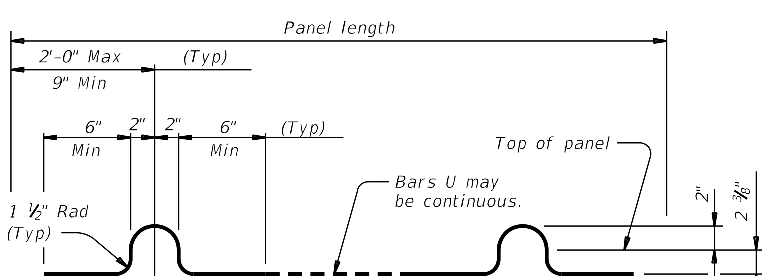


SECTION A-A

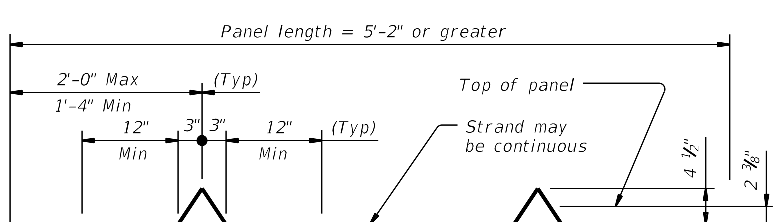
(Not showing supplemental #4 bars for skewed end panels.)



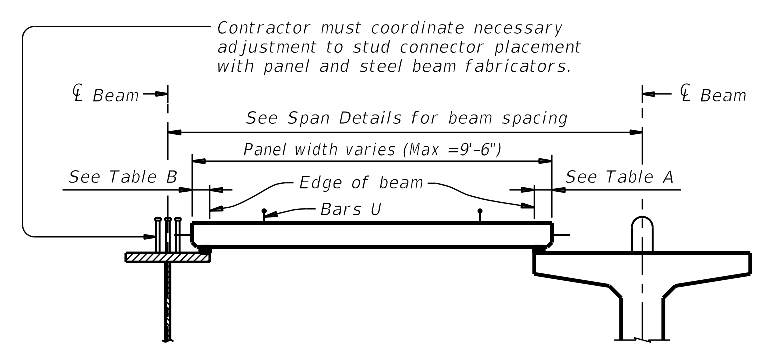
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



BARS U (#3) (2)



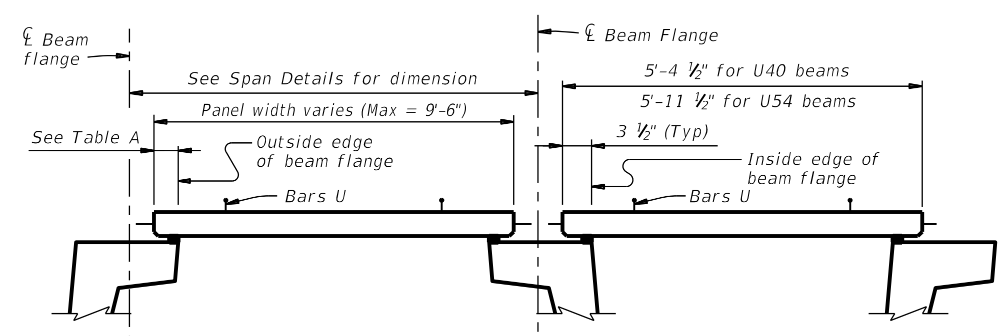
OPTIONAL STRAND FOR BARS U (3)



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

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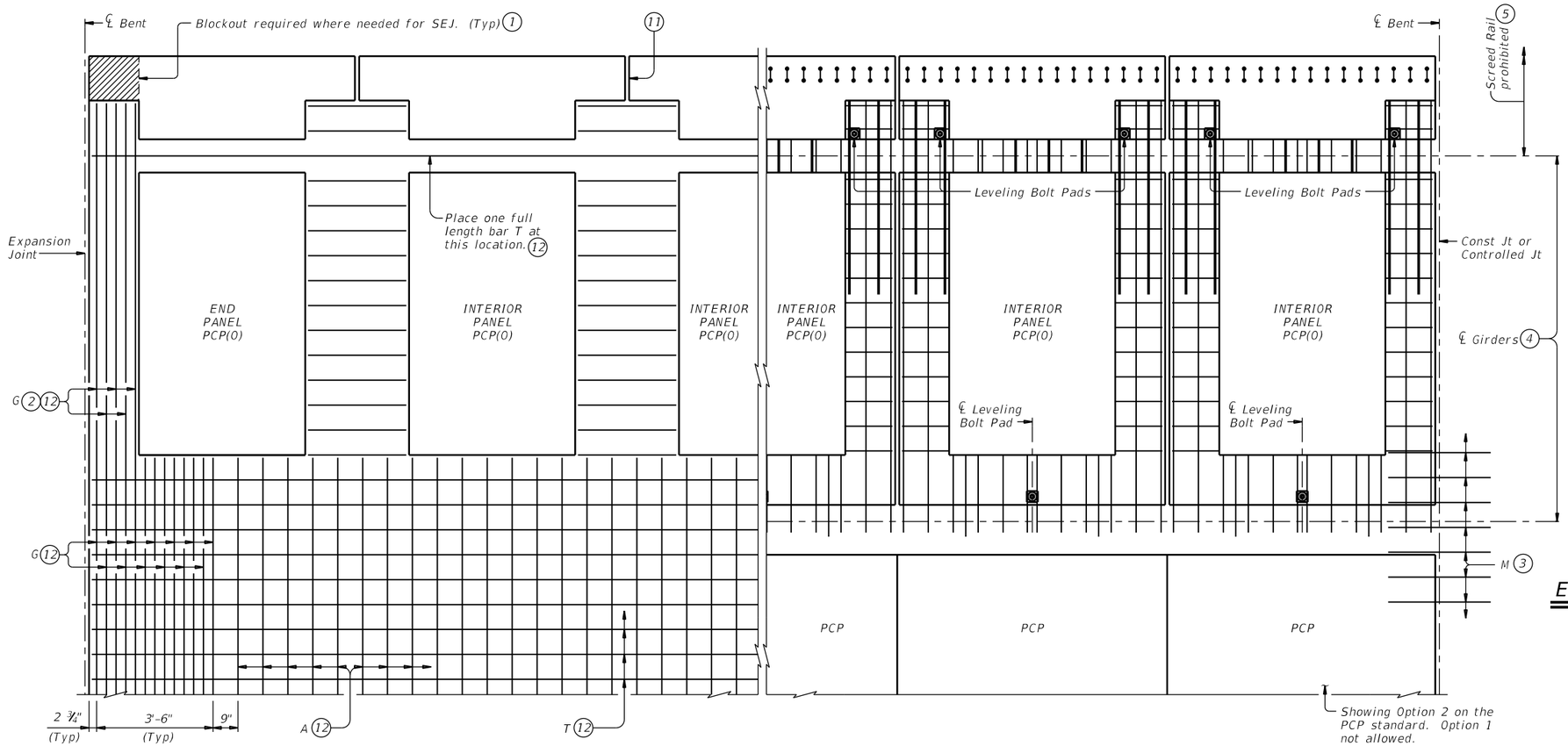


SHOWING FIELD PLACEMENT OF TOP REINFORCING STEEL

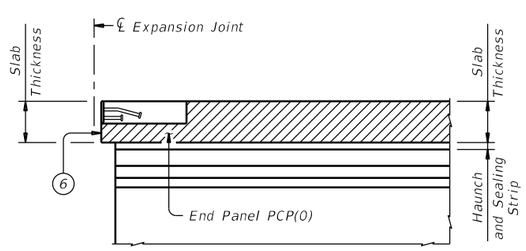
SHOWING PCP(O) EXPOSED REINFORCING STEEL

Field placed bars M shown for clarity.

PANEL LAYOUT

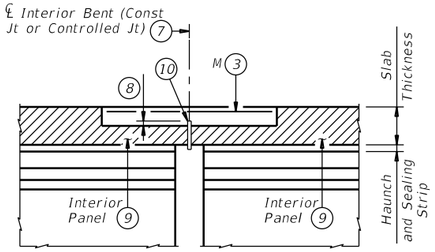
PCP(O) shown with gaps between panels for clarity.
The gap cannot be considered as a panel fabrication tolerance.

1. 1'-4" x 1'-6" x 4 ½" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.
2. When blockout is required, extend bars G into blockout.
3. Place additional bars M 2'-11" in length on top of bars A and between every bar T. Center bars M at center of bent. Located at bents with construction joints or controlled joints only. Bars M may replace additional (#4) bars 5'-0" in length as shown on PCP standard in Option 2 ~ Elevations At Beam Ends. Option 1 not allowed.
4. It is recommended to profile every 4 ft by surveying each girder under PCP(O) for proper grading of panels.
5. Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.
6. Place end panel PCP(O) within ½" of expansion joint opening. Do not encroach on required expansion joint opening.
7. Top Plastic Joint Former at Controlled Joints (Stress Cap, Zip Strip, Stress Lock, etc.) is not required with these Details.
8. 0" Min, ¾" Max, support as necessary.
9. Place panel within ½" of ¾" thick board.
10. ¾" thick wood/timber board, leave in place. Place straight, within ¼" of Centerline of Bent, across bridge width and end board at exterior flange edge of fascia girders. Do not extend into overhang.
11. Seal top of panel only, with a Class 4 sealant prior to rail construction. Typical between panels. Do not seal at Expansion Joints.
12. 1 ½" End Cover. (Typ)



EXPANSION JOINT

For SEJ-A, SEJ-S(0), AJ and Type A Expansion Joints only.

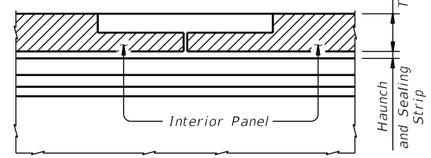


CONST JT OR CONTROLLED JT

Panel against Panel between Bms/Girders.

ELEVATIONS AT GIRDER ENDS WITH PCP(O)

Reinforcing steel not shown for clarity.



ELEVATION BETWEEN PCP(O)

The gap cannot be considered as a panel fabrication tolerance.
Reinforcing steel not shown for clarity.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS

PCP(O)

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BAR TABLE		
BAR	SIZE	MAX SPA (IN)
A (12)(17)	#4	9"
G (12)(17)	#4	3½"
M	#4	9"
T (12)(17)	#4	9"

(4) It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.

(5) Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.

(12) 1 ½" End Cover on bars. (Typ)

(13) Space bars UP(#4) with girder bars R(#4) in all areas where measured haunch exceeds 3 ½" with Prestressed Concrete I-Girders. Epoxy coating for Bars UP is not required.

(14) 6" plus or minus.

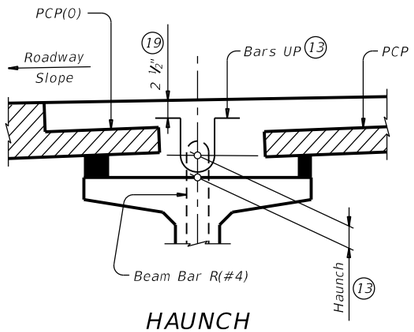
(15) Place sealing strip at flange edge as shown. Butt adjacent sealing strips longitudinally together with adhesive. Use pencil vibrators with concrete placement over girder and between sealing strips to avoid rupturing sealing strips. Cut sealing strips 2" higher than anticipated haunch thickness and compress to grade.

(16) (#3) Panel bars F must be field bent and welded to the R bars in girder. Two bars F per panel.

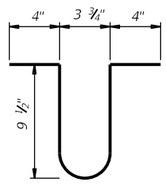
(17) Field placed bars that are allowed to be lapped. Reinforcing steel that protrudes from panels are not considered bars to be lapped. See "Material Notes" for applicable bar laps.

(18) ℄ Leveling Bolt Pad. 1" Dia Coil Rod or 1" Dia Coil Bolt shown, are furnished by the contractor. After grading each PCP(0) panel with the 1" Dia coil rods or coil bolts, secure each panel in its final resting position (plastic shims, welding, etc) and remove all 1" Dia coil rods or coil bolts for the cast-in-place concrete. Coil rods/bolts may be left in place at contractor's option. If coil rods/bolts are left in place, coil rods/bolts must have at least 2 ½" of cover to top of finish grade. Grading bolts are inadequate to carry all conceivable screed/construction loads. Panel support method must be calculated, location identified, and placed on shop drawings. Method chosen to support panels must be adequate for all construction loads. Panel support method must be placed/constructed after final grading and before screed rail placement.

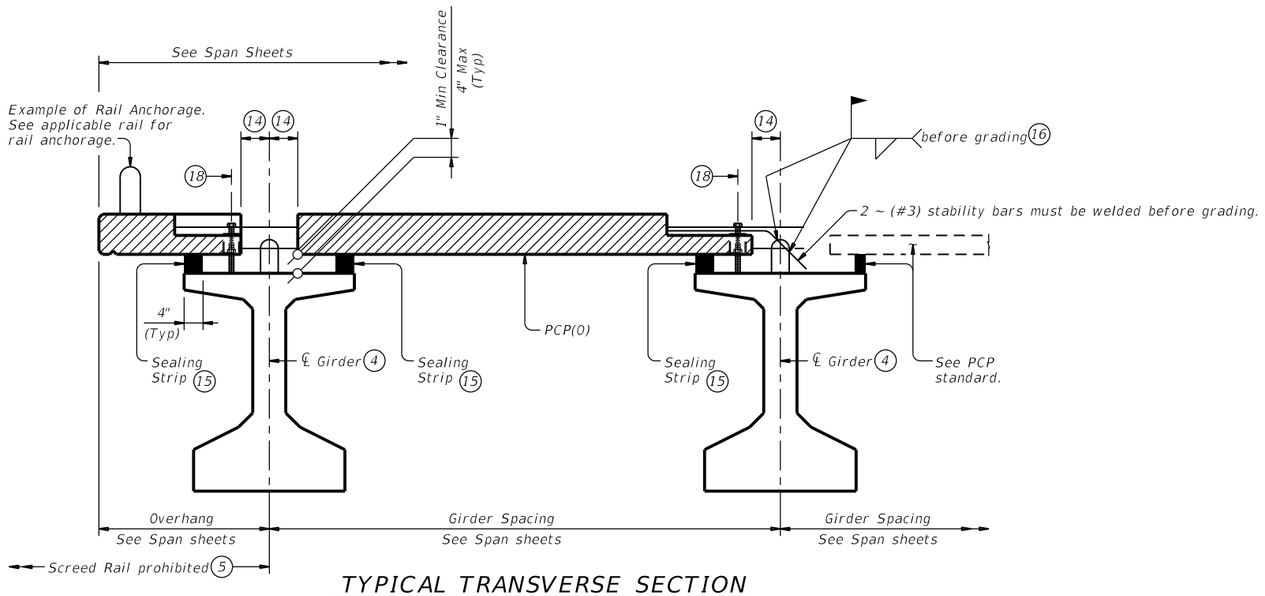
(19) Unless shown otherwise on Span Details.



HAUNCH REINFORCING DETAIL (4)



BARS UP (#4) (13)



TYPICAL TRANSVERSE SECTION

(Showing Girder Type Tx46)

CONSTRUCTION NOTES:

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended.

Ensure proper cleaning of construction debris and consolidation of concrete mortar under the edges of the panels. Place sealing strips at girder flange edges so that adequate space is provided for the mortar to flow a minimum of 8" transversely under the panels as the slab concrete is placed.

Panel placement with Option 1 on the PCP standard is not allowed.

It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.

To allow the proper amount of mortar to flow between girder and panel, maintain a minimum vertical opening of 1". Roadway cross-slope reduces the opening available for entry of the mortar. Sealing strips vary in thickness along girder are therefore required.

Seal the top panel with a Class 4 sealant as shown in the Panel Layout.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the reinforcing steel is shown on the Span Details to be epoxy coated, then epoxy coat bars A, G, M, & T.

Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"

Epoxy Coated ~ #4 = 2'-5"

Provide sealing strips comprised of one layer low density polyurethane (1.0 Lbs density) foam sealing strips or equivalent. Oversize the height of sealing strips by 2". Bond sealing strips to the girder with 3M Scotch ® 4693 or equivalent adhesive compatible with sealing strips.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

These details can be used as an option to construct the deck overhang when noted on the Span details and in conjunction with the PCP(0)-FAB, PCP and applicable Standard sheets.

These details are only applicable for Prestr Conc I-Girders.

Any additional reinforcement or concrete required on these details is subsidiary to the bid Item "Reinforced Concrete Slab".

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

HL93 LOADING

Texas Department of Transportation | Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS

PCP(0)

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BAR TABLE	
BAR	SIZE
A (2)	#4
B (2)	#4
D (2) (3)	#4
F (3)	#3
G (2)	#4
H (2)	#4
K (2) (3)	#8
T (2) (3)	#4

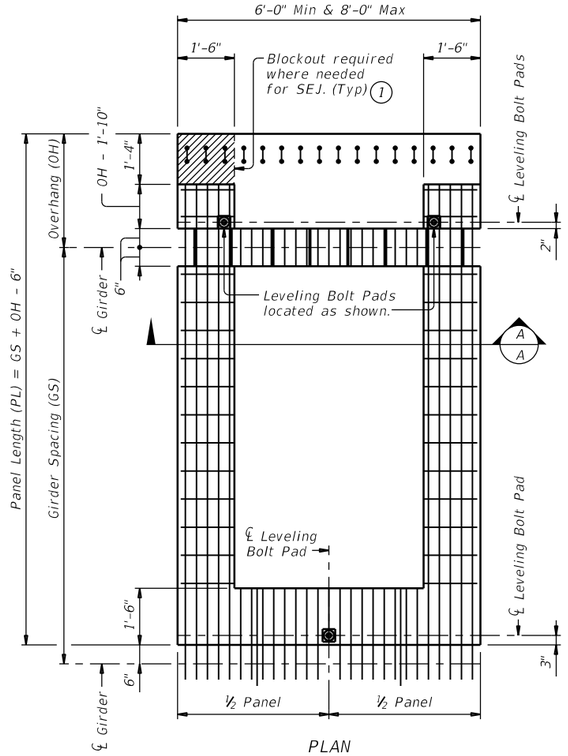
(1) 1'-4" x 1'-6" x 4 ½" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.

(2) 1 ½" End Cover on bars. (Typ)

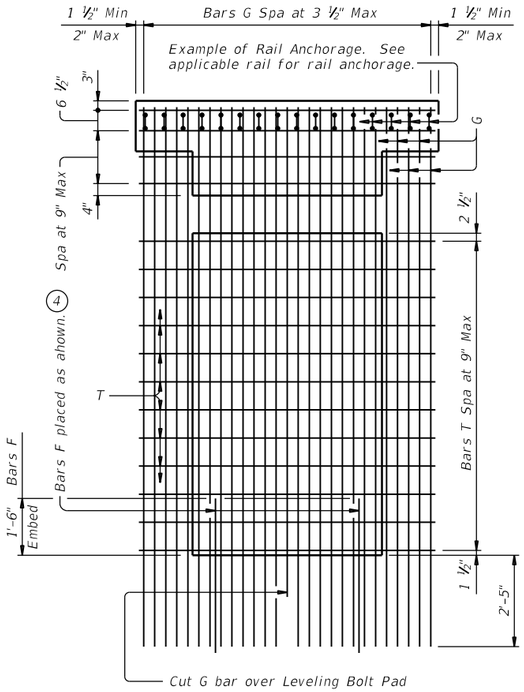
(3) Bars that are not allowed to have lap splices.

(4) Place F bars under bars T and against bars G.

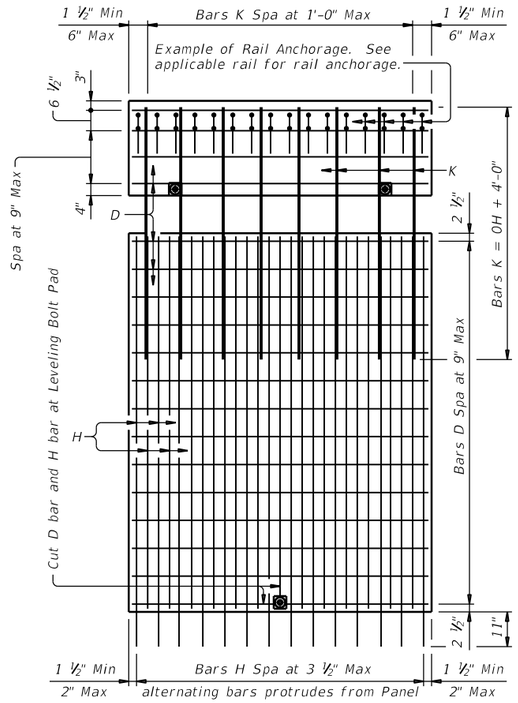
(5) Place F bars under bars T and between bars A.



PLAN

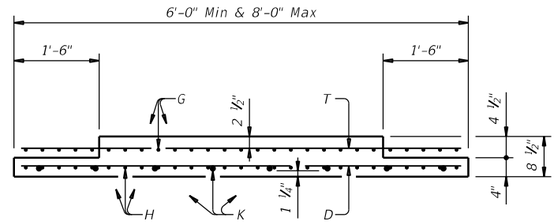


TOP REINFORCING STEEL

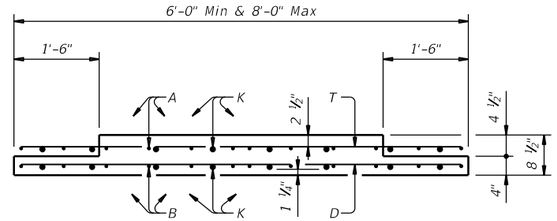


BOTTOM REINFORCING STEEL

END PANEL



SECTION A-A



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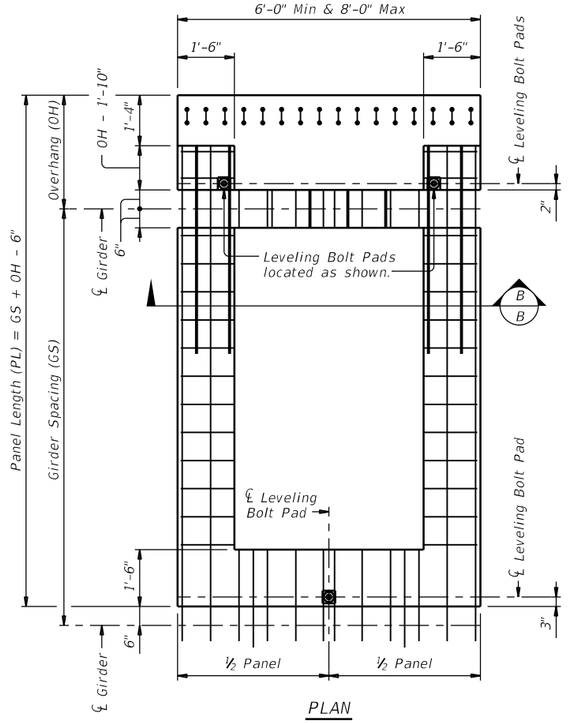
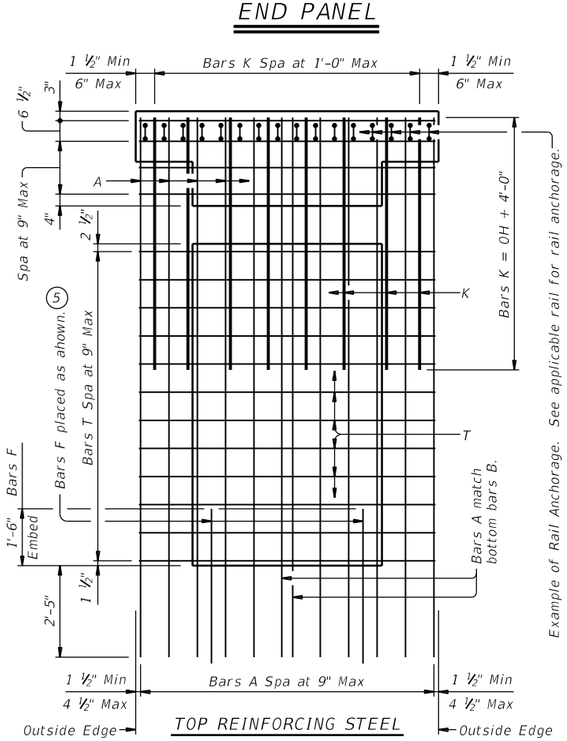
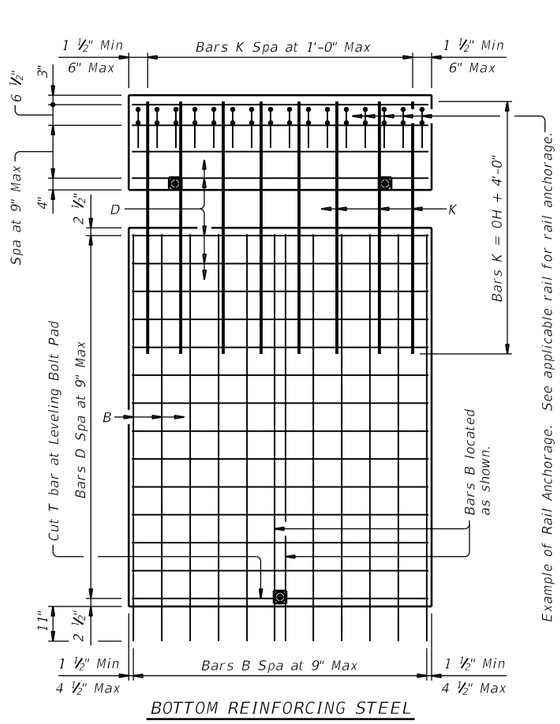


PLAN



TOP REINFORCING STEEL



BOTTOM REINFORCING STEEL

INTERIOR PANEL

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

FILE: pcpostd2-17.dgn	DN: KLM	CK: DVL	DW: JTR	CK: KLM
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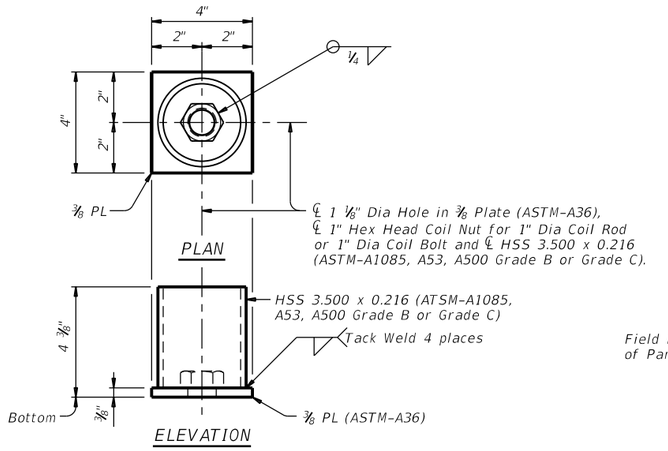
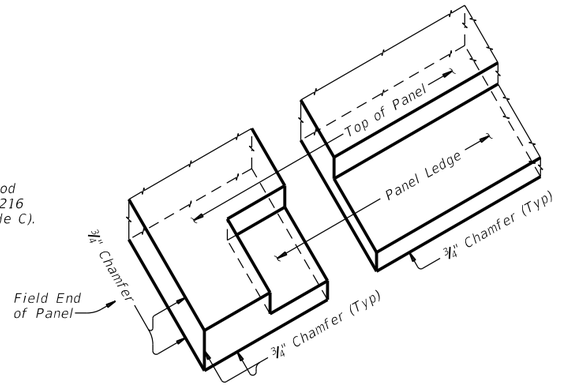


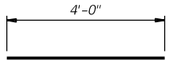
LEVELING BOLT PAD DETAILS

Galvanize if epoxy coated reinforcing steel is used in slab. Do not oil this assembly.



ISOMETRIC VIEW AT CORNER OF PANEL

Showing Typical Chamfers on Panel. Drip Bead and reinforcing steel not shown for clarity.



BARS F

CONSTRUCTION/FABRICATION NOTES:

Remove laitance from top panel surface.

Finish top surface area of panel with a broom finish. Finish top ledge of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Provide ¾" concrete chamfers as shown on these details.

Do not lap splice bars D, F, K & T. Bars A, B, G & H, may be spliced with only one lap splice allowed on each bar.

Panels must be fabricated by a fabricator meeting the requirements of DMS 7300 for Multi-Project Nonstressed Member Fabrication Plant.

MATERIAL NOTES:

Provide Class H concrete (f'c=4000 psi) in panels. Provide Class H (HPC) concrete for panels if required elsewhere in plans. Maximum large aggregate size is 1".

Provide material as shown on this standard for the Leveling Bolt Pad.

Provide Grade 60 conventional reinforcing steel.

Provide epoxy coated reinforcement for bars A, B, D, G, H, K & T if slab reinforcement is epoxy coated.

An equal area and spacing of deformed Welded Wire Reinforcement (WWR) ASTM-A1064 may be substituted for bars A, B, D, G, H & T, unless otherwise noted. Bars F and K can not be replaced with WWR.

Galvanize leveling bolt pad assembly if epoxy-coated reinforcing steel is used in slab.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

These details are only applicable for Prestr Conc I-Girders.

Any additional reinforcement, lifting devices or epoxy coated reinforcement required on these details are subsidiary to the bid Item "Reinforced Concrete Slab".

See railing details for rail anchorage in panel overhang.

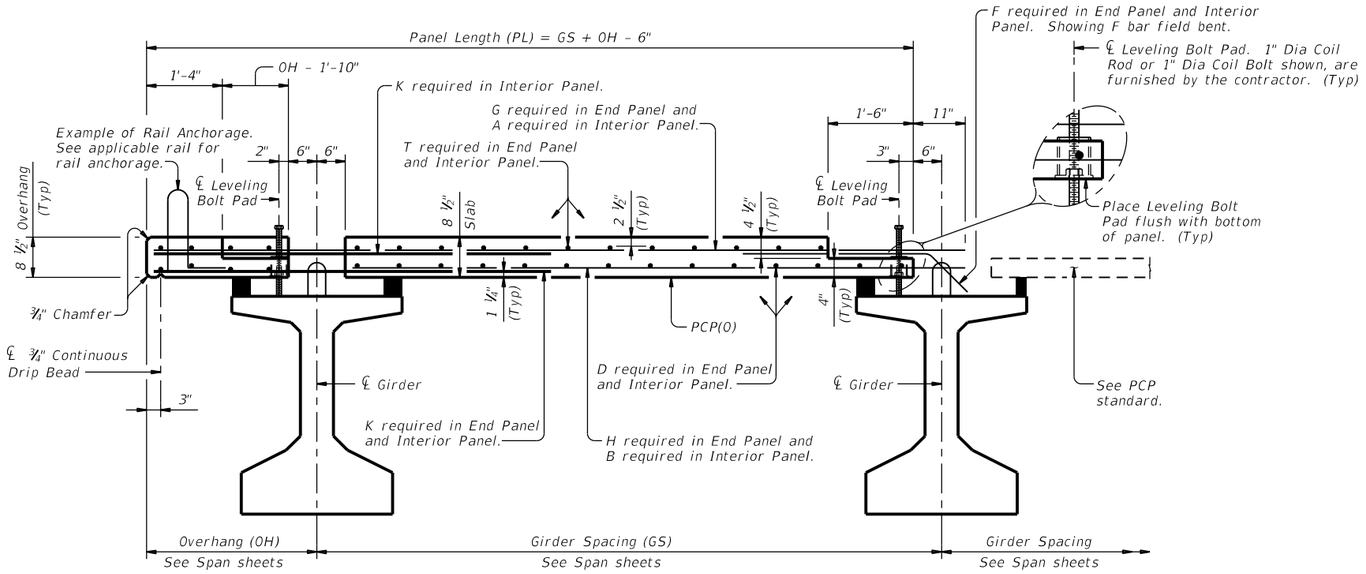
A panel layout which identifies location of each panel must be developed by the fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

Submit stable lifting methods and devices to the Engineer for approval.

Shop drawings for the fabrication of panels will require the Engineer's approval.

Cover dimensions are clear dimensions, unless noted otherwise.

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



TYPICAL TRANSVERSE SECTION

(Showing Girder Type Tx46)

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

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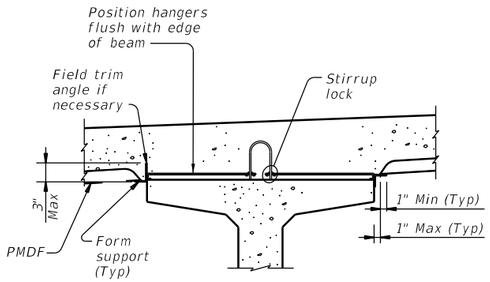
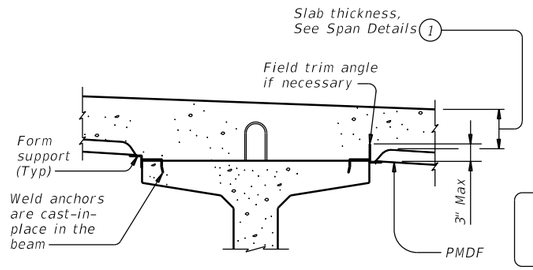
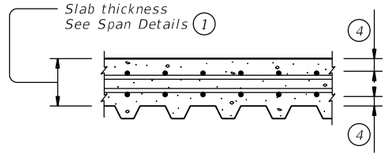


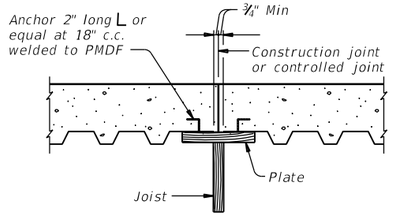
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS

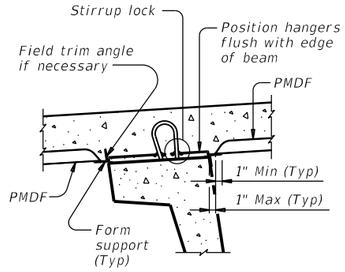


TYP LONGITUDINAL SLAB SECTION

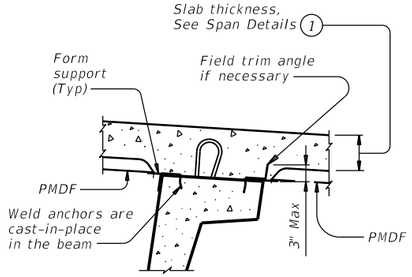


Note: In spans where PMD forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

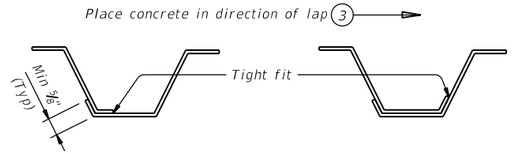
SECTION THRU CONSTRUCTION JOINT



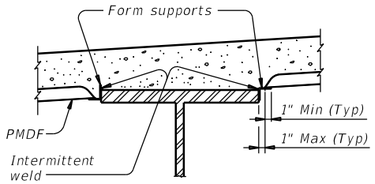
U-BEAMS WITH STIRRUP LOCKS



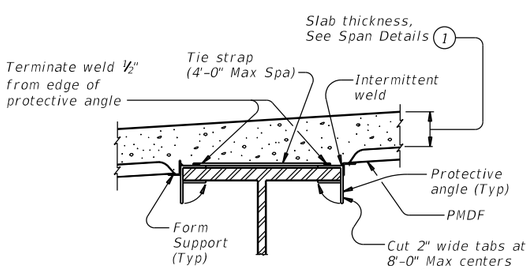
U-BEAMS WITH WELD ANCHORS



SIDE LAP DETAILS



STEEL BEAMS AT COMPRESSION FLANGES



STEEL BEAMS AT TENSION FLANGES (2)

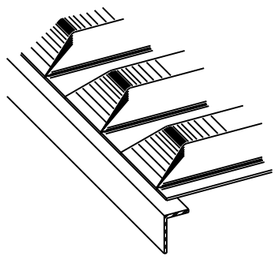
TYPICAL TRANSVERSE SECTIONS

(1) Slab thickness minus 7/8" if corrugations match reinforcing bars.

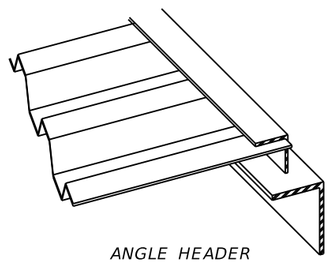
(2) Welding of form supports to tension flanges will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension flange zones will be considered. At least one layer of sheet metal must be provided between the flange and the weld joint.

(3) The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.

(4) See Span details for cover requirements.



PRECLOSED



ANGLE HEADER

NOTE: This type is to be used for skewed ends only.

TYPES OF END CLOSURES

DESIGN NOTES:

As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi.

Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.

1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.

The form design span must not be less than the clear distance between beam flanges, measured parallel to the form flutes, minus 2".

CONSTRUCTION NOTES:

Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

FOR PRESTR CONC U-BEAM AND STEEL GIRDER BRIDGES:
Unless shown elsewhere in the plans, size, spacing, and orientation of bottom mat of slab reinforcement must match the top mat of reinforcing shown on the span details except all bottom mat bars are to be #5. Bottom mat reinforcement and additional concrete is subsidiary to Item 422 "Concrete Superstructures."

FOR PRESTR CONC TX-GIRDER BRIDGES:
See Miscellaneous Slab Details, Prestr Concrete I-Girders (IGMS) standard sheet for bottom mat reinforcing.

GENERAL NOTES:

Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, structural steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage.

Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension flanges for steel beams and provisions for protecting the tension flanges from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans.

The details and notes shown on this standard are to be used as a guide in preparation of the forming plans.

All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Concrete Superstructures".

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
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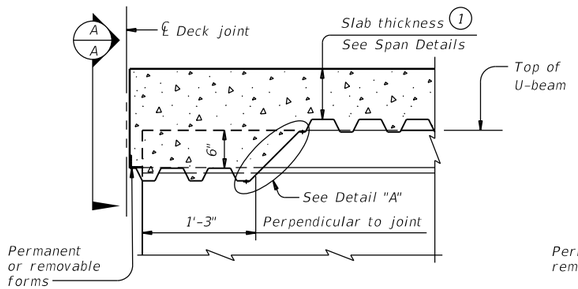
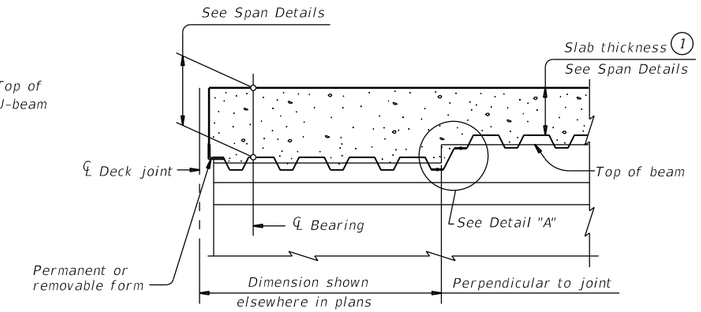
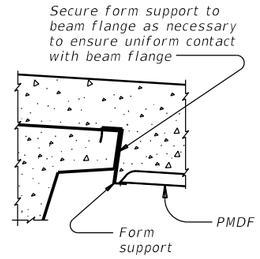


AT THICKENED SLAB END FOR U-BEAMS

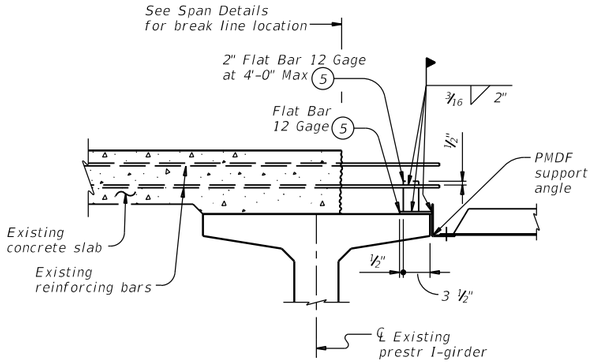


AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS

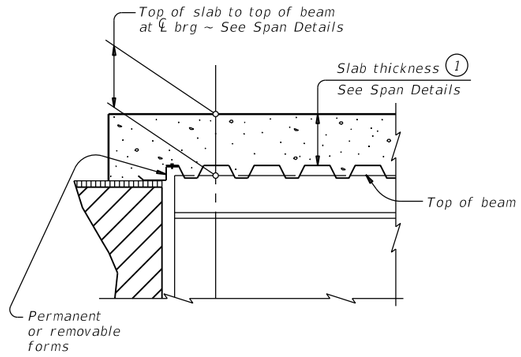
Showing I-beam block-out. No block-out for I-girders or steel beams.



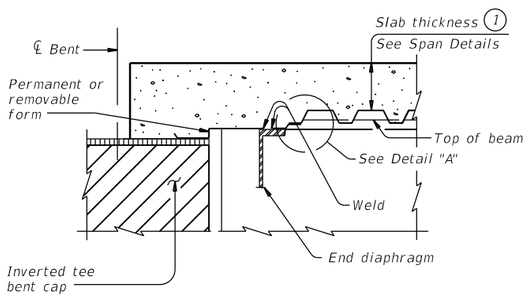
SECTION A-A



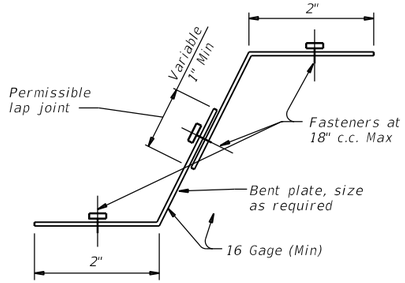
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



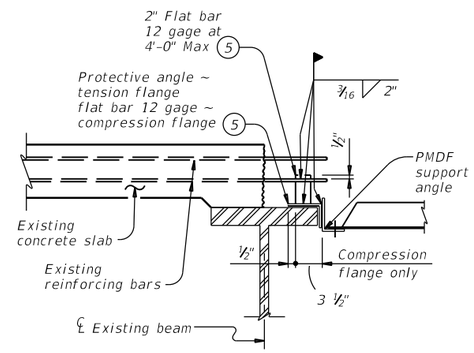
AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END



AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END

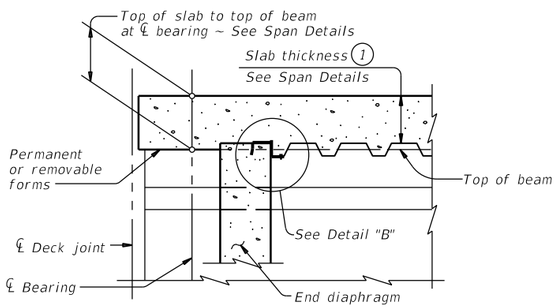


DETAIL "A"

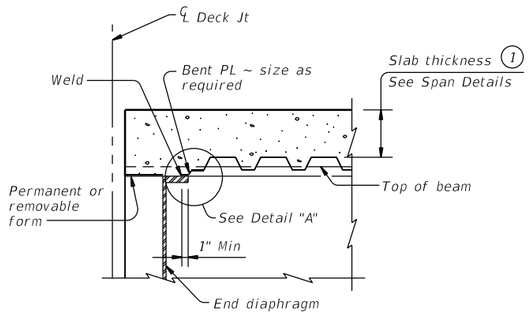


SHOWING STEEL BEAMS

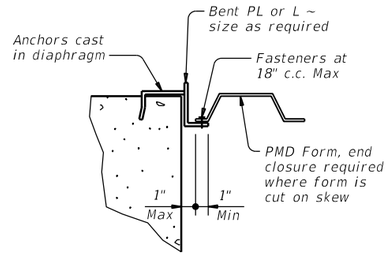
WIDENING DETAILS



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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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
	FTW	WISE		73

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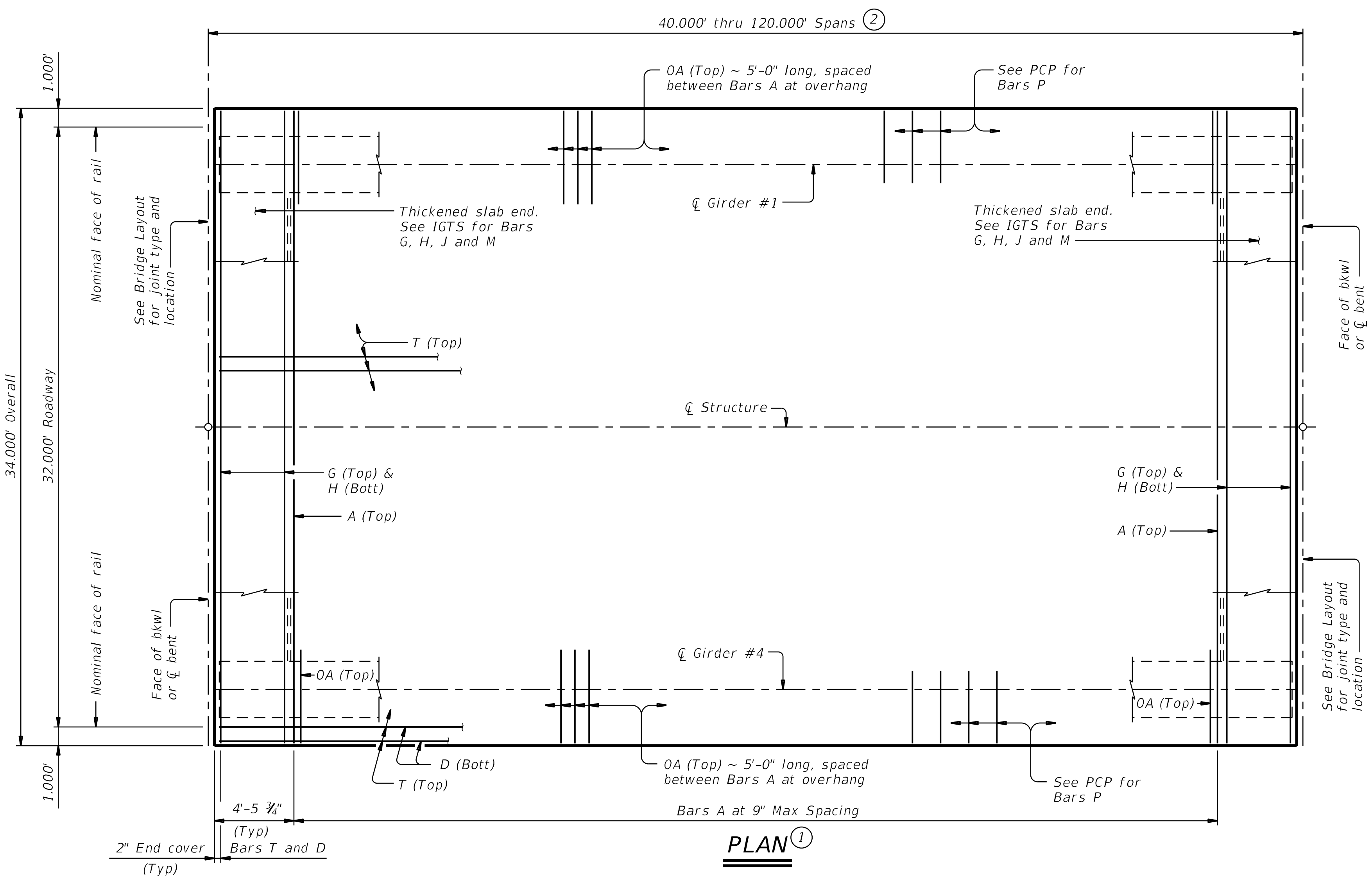
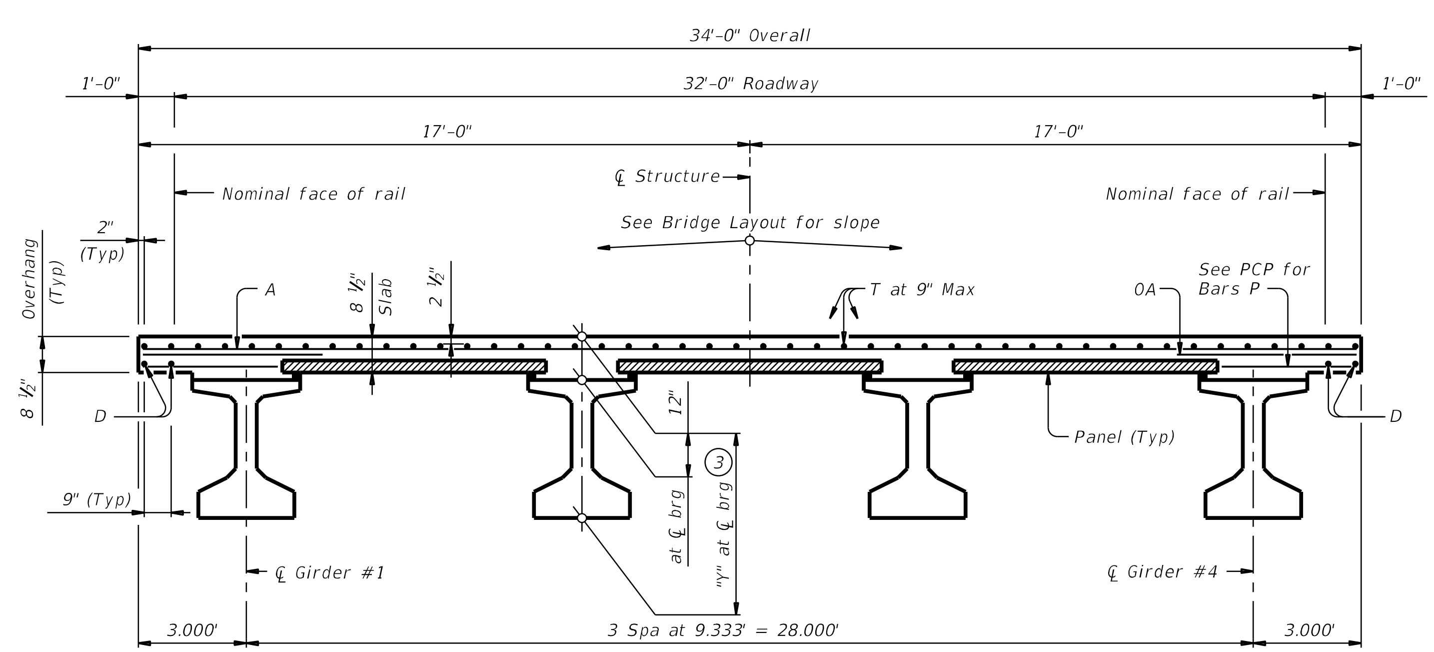


PLAN (1)



TYPICAL TRANSVERSE SECTION

(Showing girder type Tx46)

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
0A	#5
P	#4
T	#4

(1) If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see standard IGCS for adjustment to slab reinforcement and quantities.

(2) Span lengths for prestressed concrete I-Girder type:
Type Tx28 for spans lengths 40.000' thru 65.000'.
Type Tx34 for spans lengths 40.000' thru 80.000'.
Type Tx40 for spans lengths 40.000' thru 90.000'.
Type Tx46 for spans lengths 40.000' thru 100.000'.
Type Tx54 for spans lengths 40.000' thru 120.000'.

(3) "Y" value shown is based on theoretical girder camber, dead load deflection from an 8 1/2" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve and/or if the precast overhang panel (PCP(O)) option is used.

TABLE OF SECTION DEPTHS

GIRDER TYPE	"Y" AT ℄ BRG (3) Ft/In
Tx28	3'-4"
Tx34	3'-10"
Tx40	4'-4"
Tx46	4'-10"
Tx54	5'-6"

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

32' ROADWAY

SIG-32

FILE: sig41sts-19.dgn	DN: JMH	CK: ASB	DW: JTR	CK: TAR
©TxDOT August 2017	CONT 0902	SECT 20	JOB 110	HIGHWAY CR
REVISIONS 10-19: Increased "X" and "Y" Values	DIST FTW	COUNTY WISE		SHEET NO. 74

DATE: 5/26/2021 10:45:52 AM
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TABLE OF DEAD LOAD DEFLECTIONS

TYPE Tx28 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.011	0.015
45	0.017	0.024
50	0.026	0.037
55	0.040	0.056
60	0.057	0.080
65	0.079	0.111

TYPE Tx34 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.006	0.009
45	0.010	0.014
50	0.016	0.022
55	0.024	0.033
60	0.034	0.048
65	0.047	0.066
70	0.064	0.090
75	0.085	0.120
80	0.111	0.156

TYPE Tx40 GIRDERS

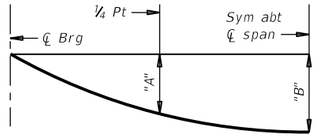
SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.004	0.006
45	0.006	0.009
50	0.011	0.015
55	0.016	0.022
60	0.022	0.031
65	0.031	0.043
70	0.042	0.059
75	0.056	0.078
80	0.073	0.102
85	0.093	0.131
90	0.118	0.165

TYPE Tx46 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.003	0.004
45	0.004	0.006
50	0.007	0.010
55	0.011	0.015
60	0.015	0.021
65	0.021	0.030
70	0.028	0.040
75	0.038	0.053
80	0.049	0.069
85	0.063	0.089
90	0.080	0.113
95	0.100	0.140
100	0.123	0.173

TYPE Tx54 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.002	0.003
45	0.003	0.004
50	0.005	0.007
55	0.007	0.010
60	0.010	0.014
65	0.014	0.020
70	0.019	0.027
75	0.025	0.035
80	0.033	0.046
85	0.042	0.059
90	0.053	0.074
95	0.066	0.093
100	0.081	0.114
105	0.100	0.140
110	0.120	0.169
115	0.144	0.202
120	0.172	0.241



DEAD LOAD DEFLECTION DIAGRAM

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

TABLE OF ESTIMATED QUANTITIES

SPAN LENGTH	REINF CONCRETE SLAB	Prestressed Concrete Girders			TOTAL REINF STEEL (5)
		ABUT TO INT BT (4)	INT BT TO INT BT (4)	ABUT TO ABUT (4)	
Ft	SF	LF	LF	LF	Lb
40	1,360	158.00	158.00	158.00	3,128
45	1,530	178.00	178.00	178.00	3,519
50	1,700	198.00	198.00	198.00	3,910
55	1,870	218.00	218.00	218.00	4,301
60	2,040	238.00	238.00	238.00	4,692
65	2,210	258.00	258.00	258.00	5,083
70	2,380	278.00	278.00	278.00	5,474
75	2,550	298.00	298.00	298.00	5,865
80	2,720	318.00	318.00	318.00	6,256
85	2,890	338.00	338.00	338.00	6,647
90	3,060	358.00	358.00	358.00	7,038
95	3,230	378.00	378.00	378.00	7,429
100	3,400	398.00	398.00	398.00	7,820
105	3,570	418.00	418.00	418.00	8,211
110	3,740	438.00	438.00	438.00	8,602
115	3,910	458.00	458.00	458.00	8,993
120	4,080	478.00	478.00	478.00	9,384

(4) Fabricator will adjust lengths for girder slopes as required.

(5) Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and standard IGCS.

See IGTS standard for Thickened Slab End details and quantity adjustments.

See PCP and PCP-FAB for panel details not shown.

See PCP(O) and PCP(O)-FAB for precast overhang panel details if this option is used.

See IGMS standard for miscellaneous details.

See applicable rail details for rail anchorage in slab.

See PMDF standard for details and quantity adjustments if this option is used.

This standard does not support the use of transition bents.

Cover dimensions are clear dimensions, unless noted otherwise.

MATERIAL NOTES:

Provide Class S concrete (f'c = 4,000 psi).

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

Provide Grade 60 reinforcing steel.

Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"

Epoxy coated ~ #4 = 2'-5"

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, OA, P or T unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

32' ROADWAY

SIG-32

FILE: sig41sts-19.dgn	DN: JMH	CK: ASB	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
10-19: Increased "X" and "Y" Values	DIST	COUNTY		SHEET NO.
	FTW	WISE		75

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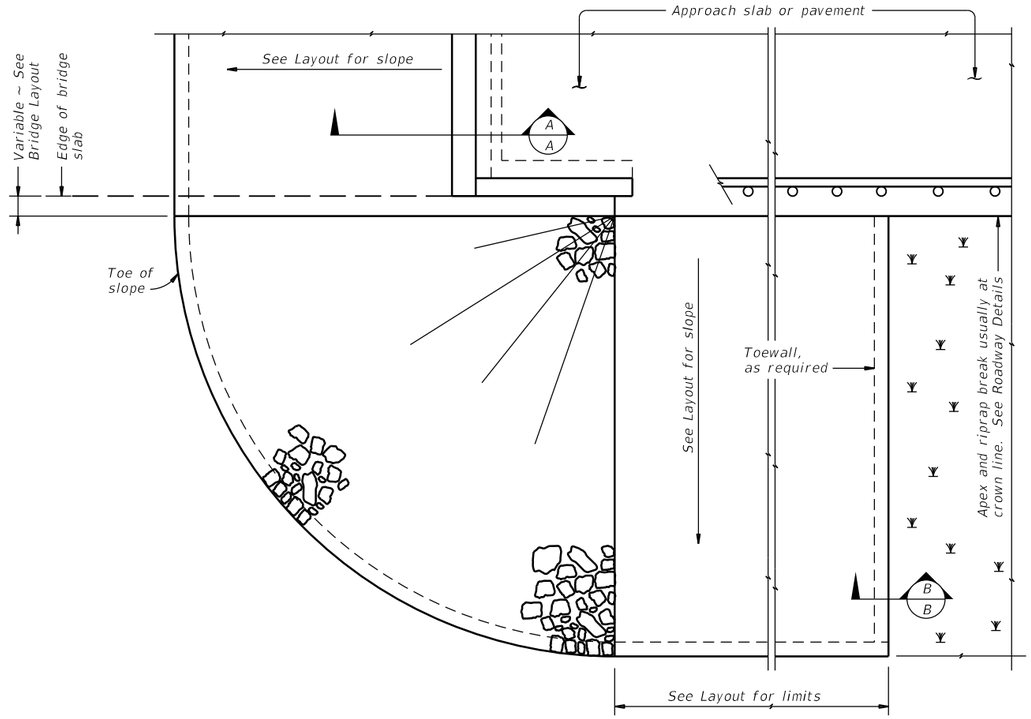
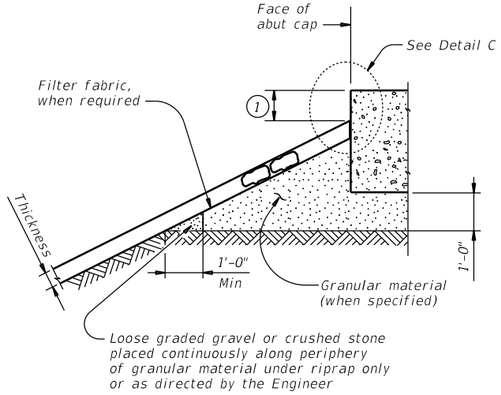
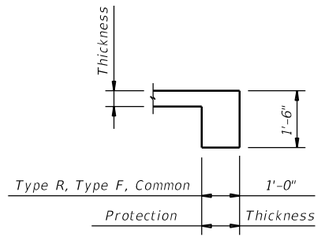


PLAN

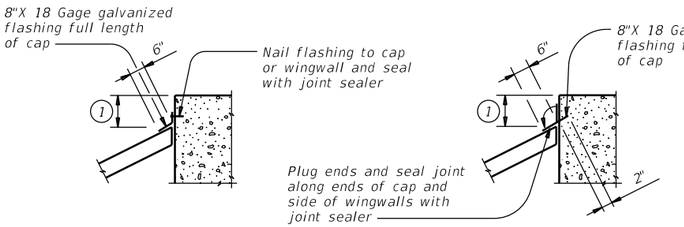


SECTION A-A AT CAP



SECTION B-B

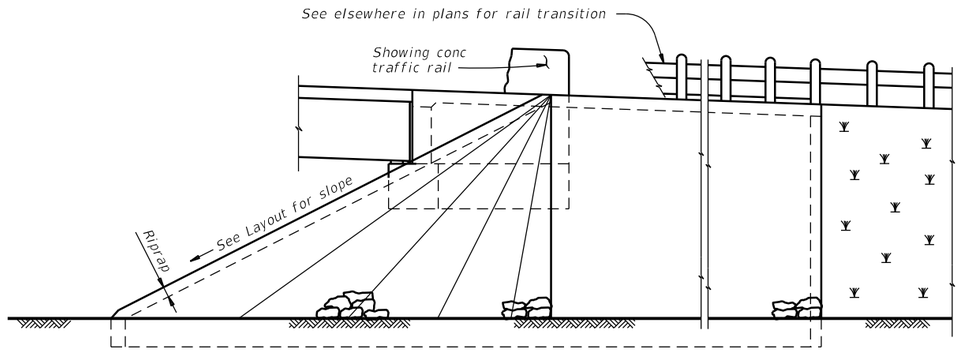
Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C



ELEVATION

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
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	FTW	WISE		76

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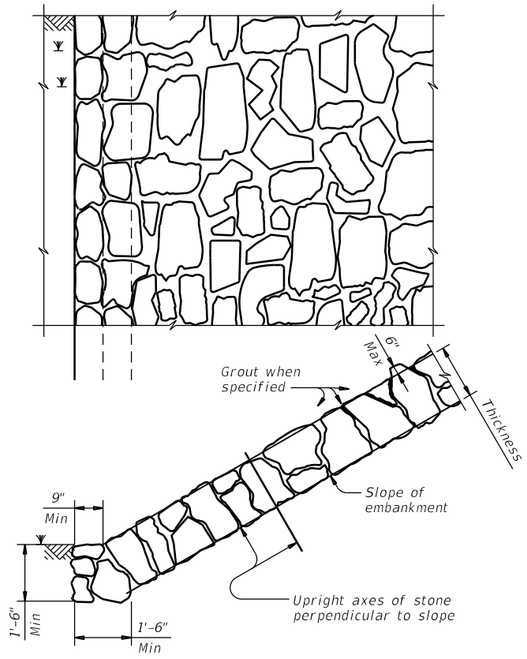


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

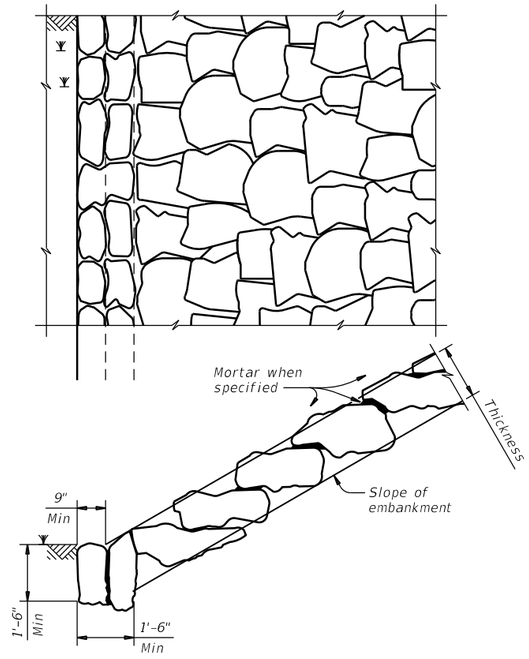


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

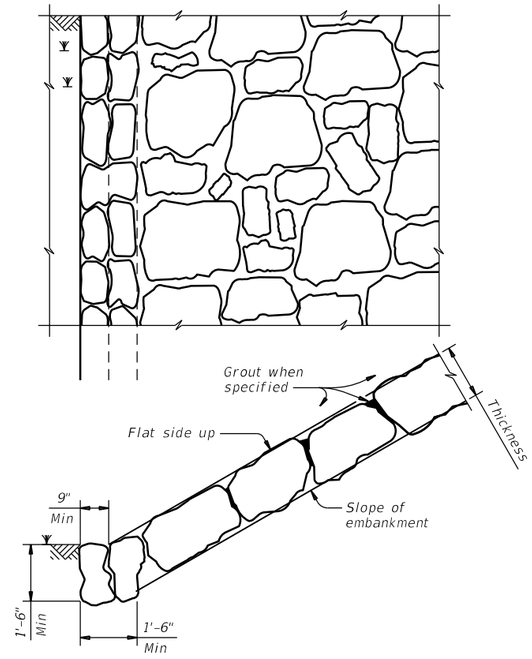


FIGURE 3 ~ TYPE F STONE RIPRAP

grouted

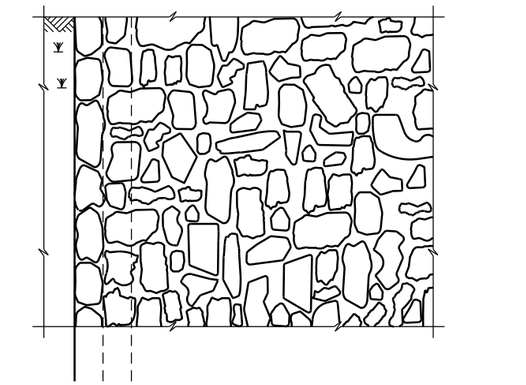


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

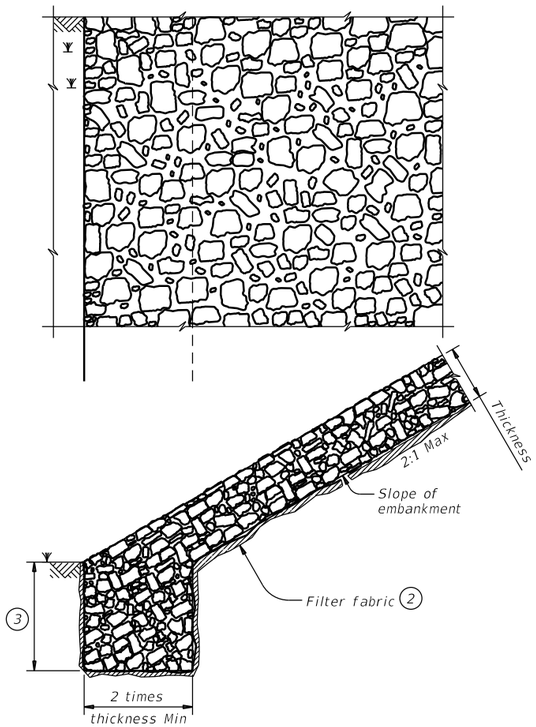


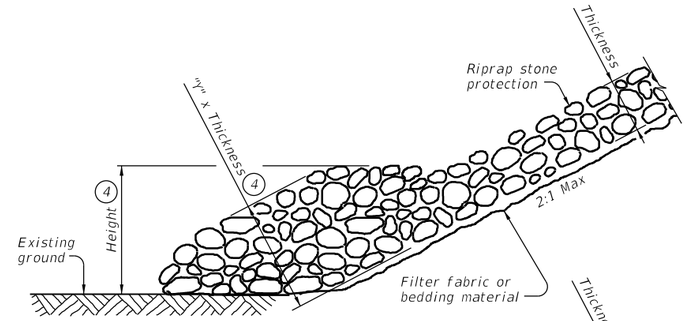
FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

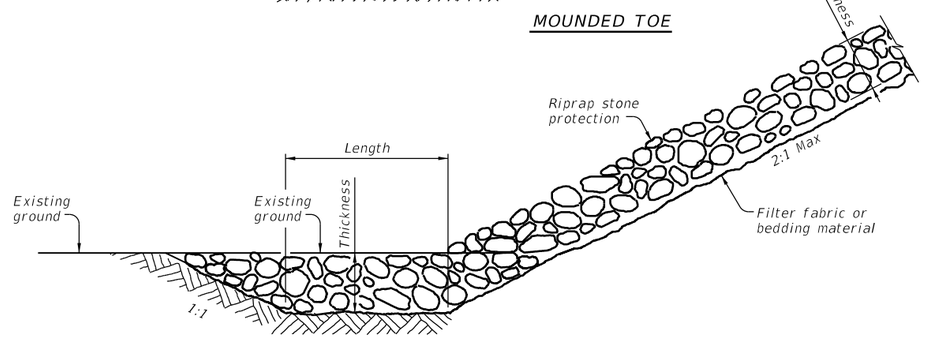
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(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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©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0902	20	110	CR
	DIST	COUNTY		SHEET NO.
	FTW	WISE		77

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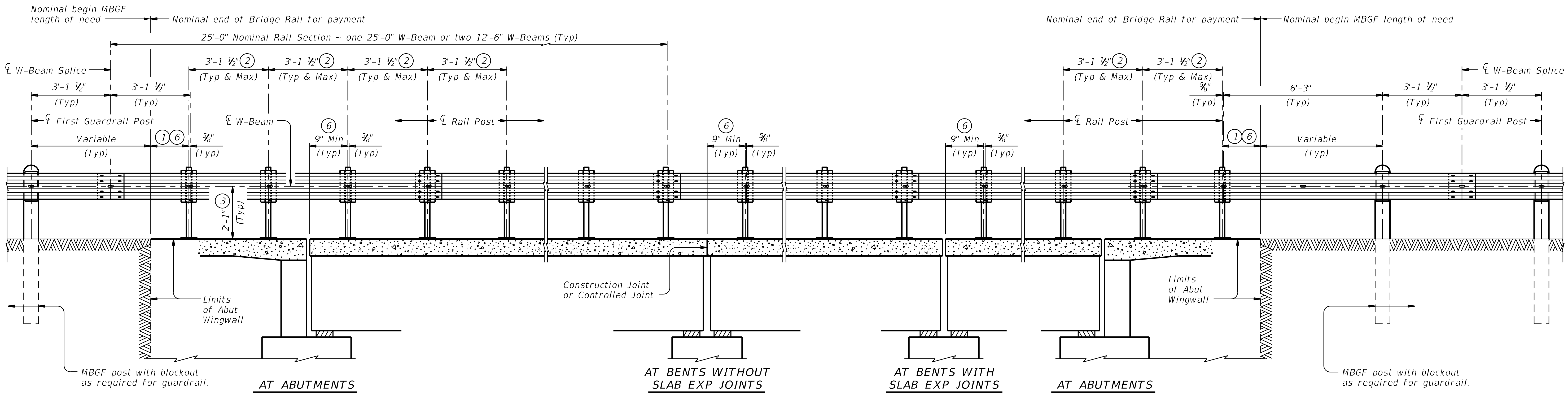
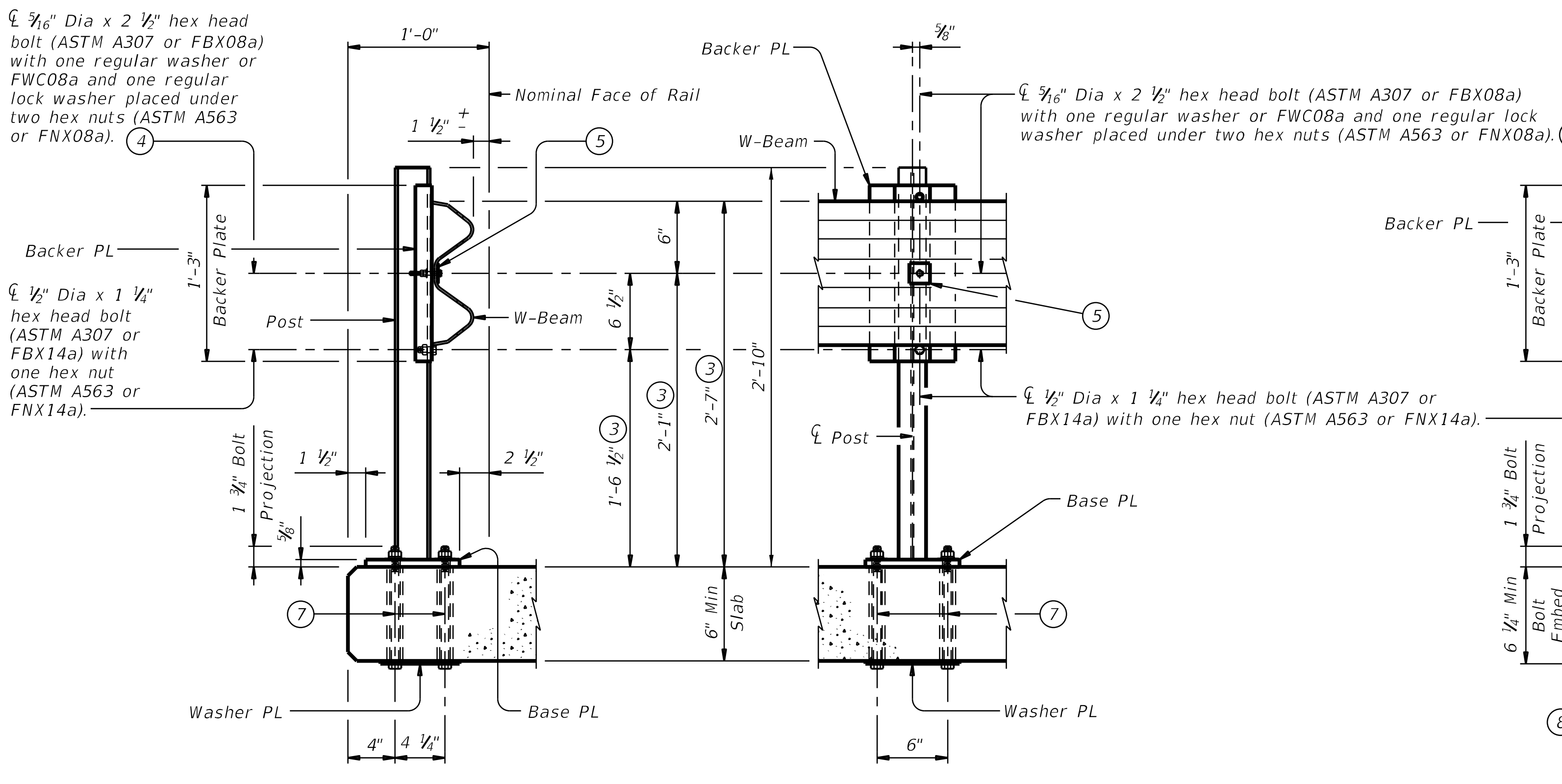


ROADWAY ELEVATION OF RAIL

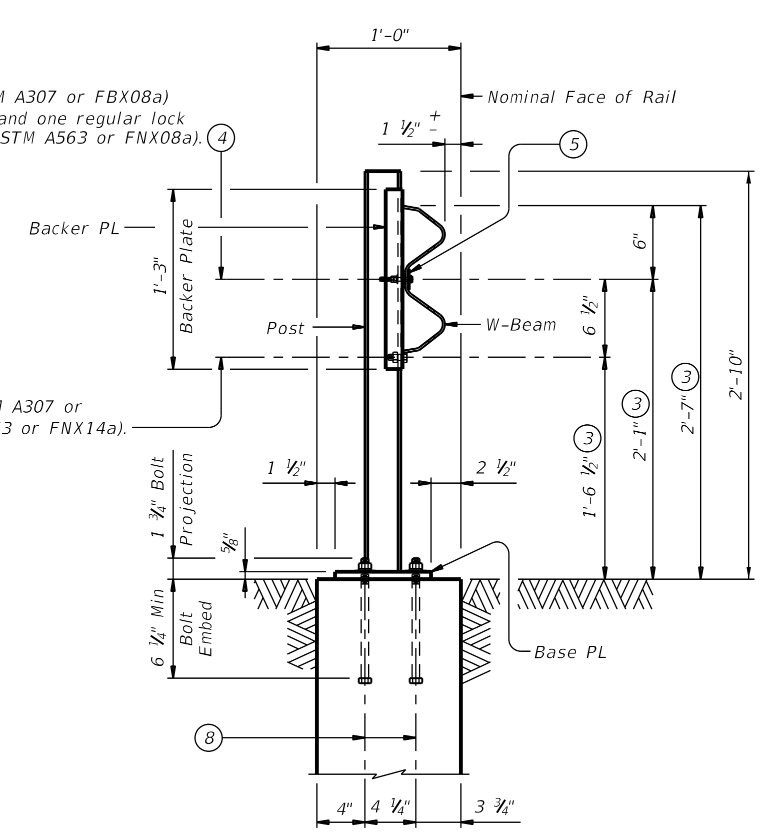
Showing without overlay.

1. 9" Min, 5'-9" Max
2. Maintain 3'-1 ½" Rail Post spacing wherever possible for use with nominal 25'-0" or 12'-6" W-Beam sections. Symmetry of post spacing on both sides and along the structure is not necessary.
3. Increase 2" for structures with overlay.
4. Tighten the first hex nut by hand until the top and bottom edges of the W-Beam engage the Backer Plate (Backer Plate should be snug against the post). Then tighten hex nut one revolution with wrench and secure with the second hex nut.
5. PL ⅛ x 1 ¾ x 1¾ with ⅜ Dia Hole centered in PL (ASTM A36). Square Guardrail Washer (FWR01).
6. The post nearest to a slab joint or end of structure may be shifted up to 9" in order to satisfy the minimum offset dimension. Drill a new ¾" Dia hole on the centerline of W-beam for shifted post. Paint hole with two coats of zinc-rich paint conforming to the Item "Galvanizing". All other posts must remain on the typical spacing.
7. ℄ ⅞" Dia formed holes for ℄ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack weled for each threaded rod. See "Cast-In-Place & Formed Hole Anchor Bolt Options".
8. ℄ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack weled for each threaded rod. See "Cast-In-Place & Formed Hole Anchor Bolt Options".



RAIL DETAILS ON BRIDGE SLAB

Showing without overlay.



RAIL SECTION ON ABUTMENT WINGWALL

Showing without overlay.

SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

TRAFFIC RAIL

TYPE T631

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©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
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07-20: Allowing 9'-4 ½" or 6'-3" W-Beam sections.	DIST		COUNTY	SHEET NO.
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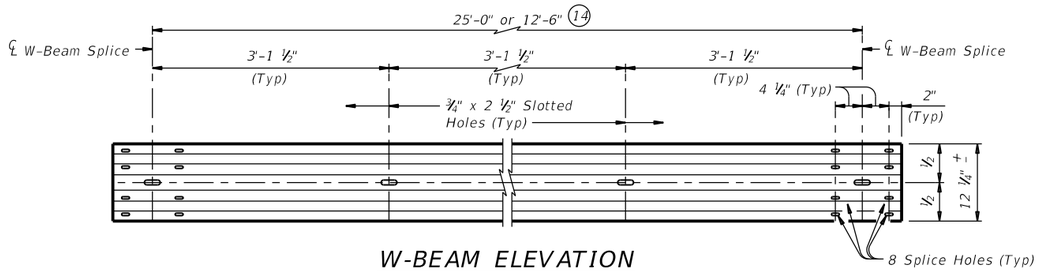
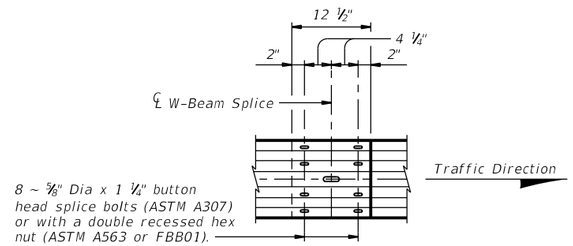
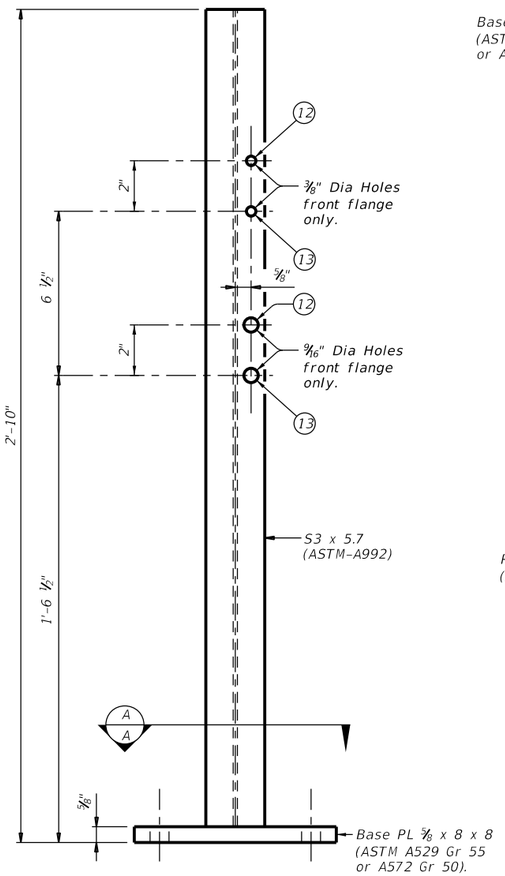


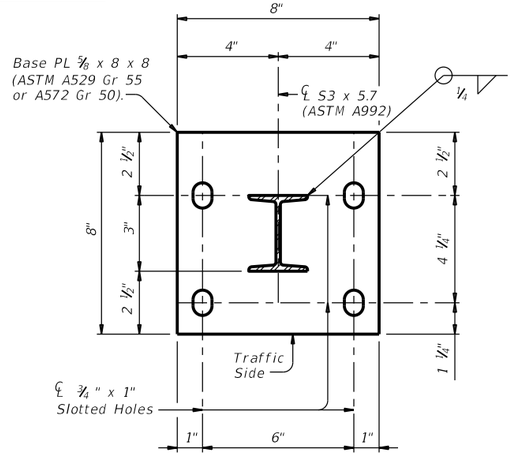
W-BEAM ELEVATION



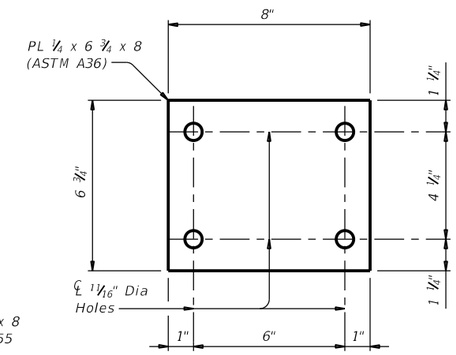
W-BEAM SPLICE ELEVATION



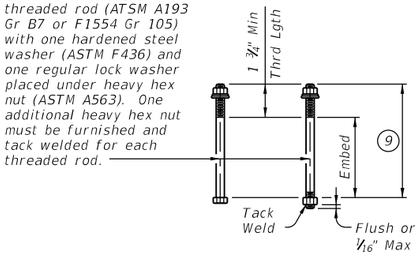
POST ELEVATION



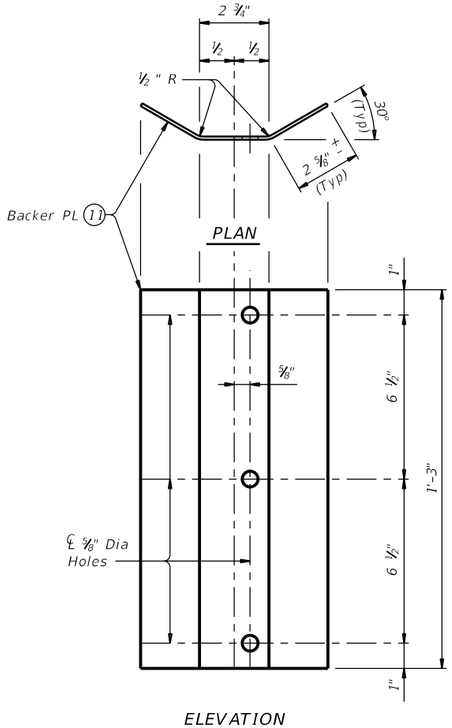
SECTION A-A



WASHER PLATE DETAIL



CAST-IN-PLACE & FORMED HOLE ANCHOR BOLT OPTIONS (10)



BACKER PLATE

(9) See "Rail Details On Bridge Slab" and/or "Rail Section On Abutment Wingwall".

(10) See "Material Notes" for anchor bolt information.

(11) Backer PL ⅛ x 8 x 1'-3" (ASTM A1011 CS or SS Gr 33, or A1008 CS or SS Gr 33 (11 Gage acceptable)).

(12) Used for structures with overlay.

(13) Used for structures without overlay.

(14) At the nominal end of the bridge rail for payment, one 9'-4 ½" or 6'-3" W-beam section is permitted in order to achieve the required W-Beam splice location on the MBGF.

MBGF AND END TREATMENT NOTES:

This traffic railing must be anchored by metal beam guard fence (MBGF) and guard fence end treatments. Determine MBGF length of need in accordance with the Roadway Design Manual, unless otherwise specified. The minimum MBGF length of need required for anchoring the railing is 25' of MBGF plus the appropriate end treatment.

CONSTRUCTION NOTES:

Face of rail post must be plumb unless otherwise approved by the Engineer. Post must be perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

Fully anchored guardrail must be attached to each end of rail. A metal beam guard fence transition is not used with this rail.

At the Contractor's option anchor bolts may be an adhesive anchor system. See "Material Notes".

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

It is recommended to show a Rail Layout with rail posts and W-beam splices. Fabricator must submit erection drawings to the Engineer for approval.

Round or chamfer exposed edges of rail post and backer plate to approximately 1/16" by grinding.

Shop drawings are not required for this rail.

MATERIAL NOTES:

Galvanize all steel components.

Anchor bolts for base plate must be ⅝" Dia ASTM F3125 Gr A325 or A449 bolts (or ASTM A193 Gr B7 or F1554 Gr 105 threaded rods with one tack welded heavy hex nut each) with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements.

Optional adhesive anchorage system must be ⅝" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed fully threaded rod into slab and/or abutment wingwall using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4 ¾". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 8 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing."

W-beam must 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" (Nominal) lengths and a single rail element of 9'-4 ½" or 6'-3" (Nominal) length.

W-Beam must have slotted holes at 3'-1 ½".

Some part numbers from the "Task Force 13" Guide to Standardized Highway Barrier Hardware have been furnished for quick reference.

GENERAL NOTES:

This railing has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This railing can be used for speeds of 50 mph and greater.

This rail is designed to deflect approximately 4' to 4'-6" as it contains and redirects the errant vehicle. This rail may not be installed on top of or behind curbs that project above finished grade, on bridges with expansion joints providing more than 5" movement, on retaining walls, or on grade separations and interchanges.

Repairs to impact-damaged post and base plate unit are not permitted. Replace all impact-damaged posts with a new post and base plate unit.

Average weight of railing with no overlay: 20 plf total.

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T631

FILE: rlstd038-20.dgn	DN: TxDOT	CK: AES	DW: JTR	CK: AES
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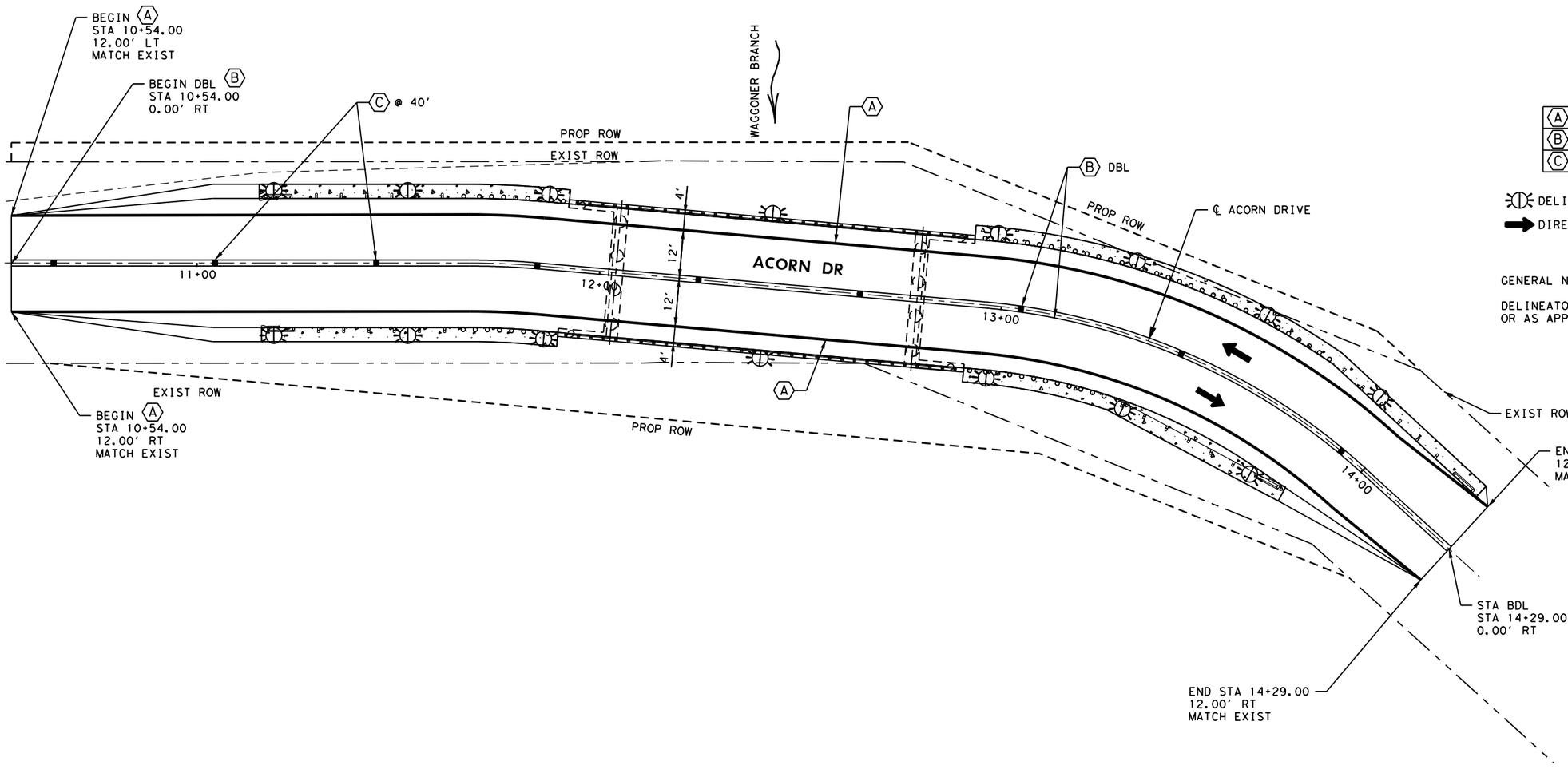
REVISIONS	0902	20	110	CR
07-20: Allowing 9'-4 ½" or 6'-3" W-Beam sections.	DIST	COUNTY		SHEET NO.
	FTW	WISE		79



LEGEND

(A)	W 4" SOLID
(B)	Y 4" SOLID
(C)	TY II-A-A

DELINEATOR (D-SW)SZ1(BRF)(GF2)(BI), OR CTB

DIRECTION OF TRAFFIC

GENERAL NOTES:

DELINEATORS TO BE SHUR-TITE
OR AS APPROVED EQUAL BY THE ENGINEER

0 15 30

SCALE: 1"= 30'

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

7/21/2021

Texas Department of Transportation

BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

ACORN DRIVE SIGNING AND PAVEMENT MARKING

SHEET 1 OF 1

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		80
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR

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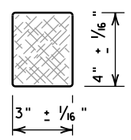
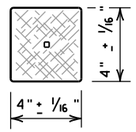
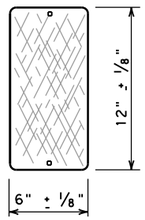
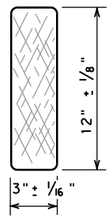
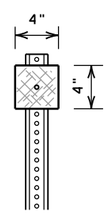
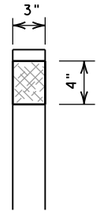
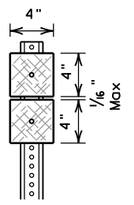
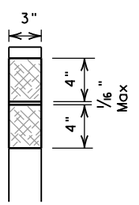
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	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

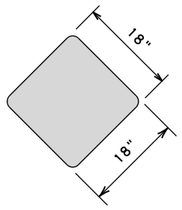
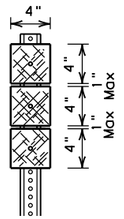
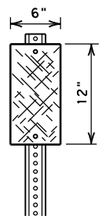
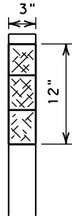
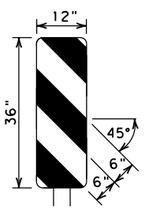
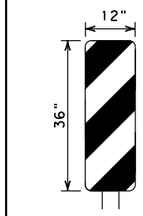
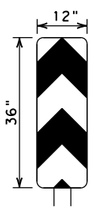
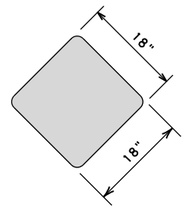
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

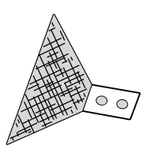
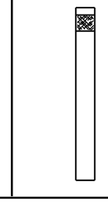
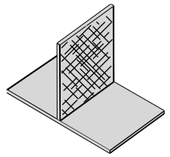
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

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)

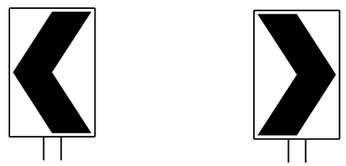
	GF1	GF2	CTB
DEVICE			

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



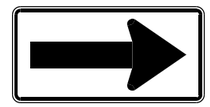
W1-8

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"	

DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

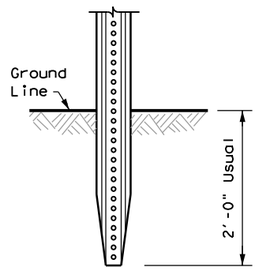
FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	FTW	WISE		81

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

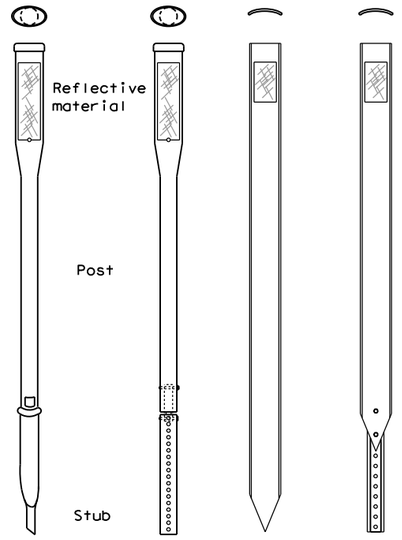


NOTES

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.

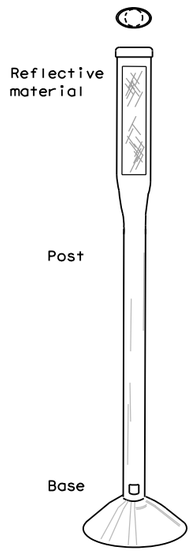
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



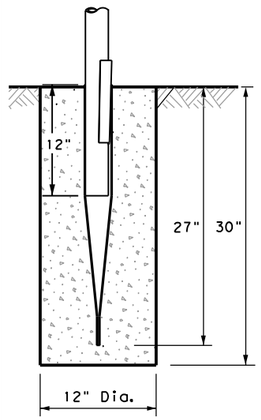
SURFACE MOUNT

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.

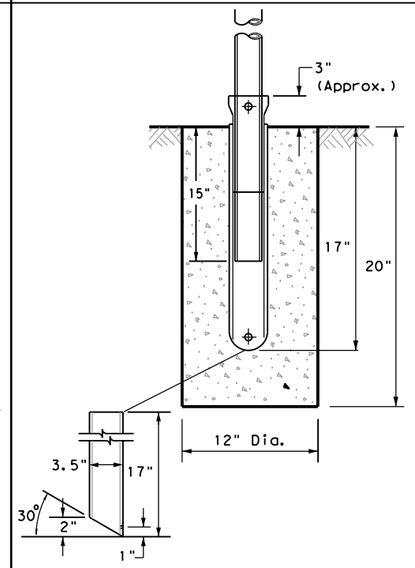
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

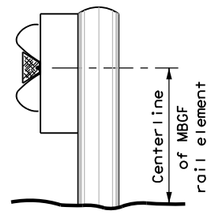
NOTE

1. Install per manufacturer's recommendations.

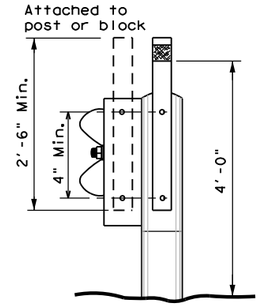
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

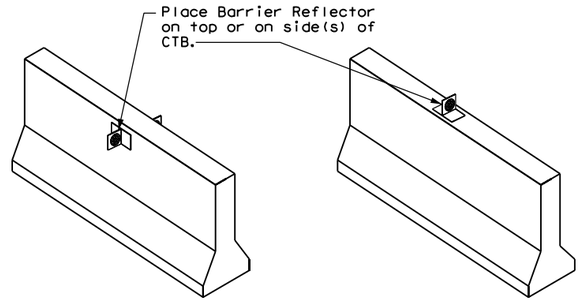
GF1



GF2



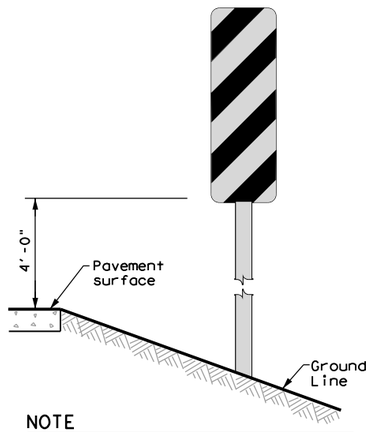
CONCRETE TRAFFIC BARRIER (CTB)



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.

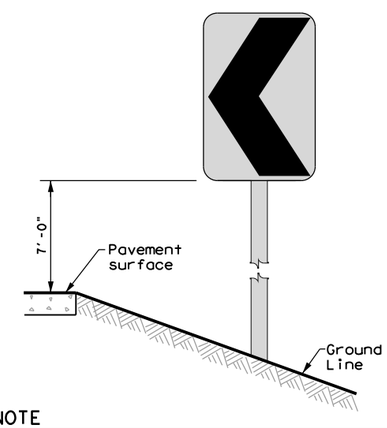
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

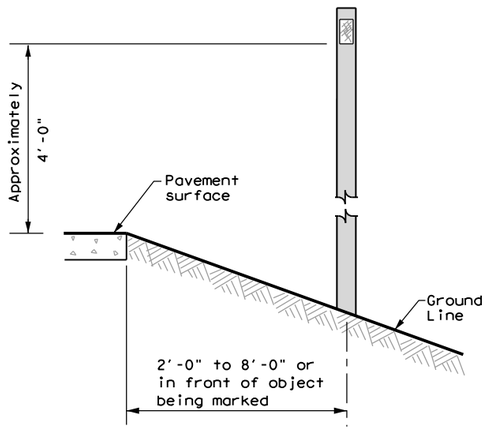
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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	0902	20	110	CR
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	FTW	WISE		82

20B

DATE: 5/26/2021 10:45:59 AM
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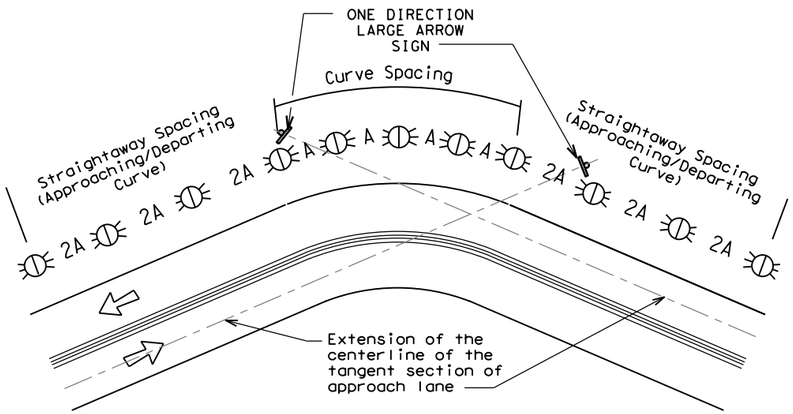
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

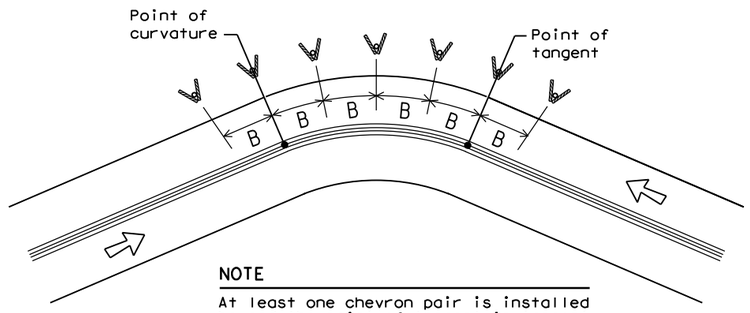
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
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3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	FTW	WISE		83

20C

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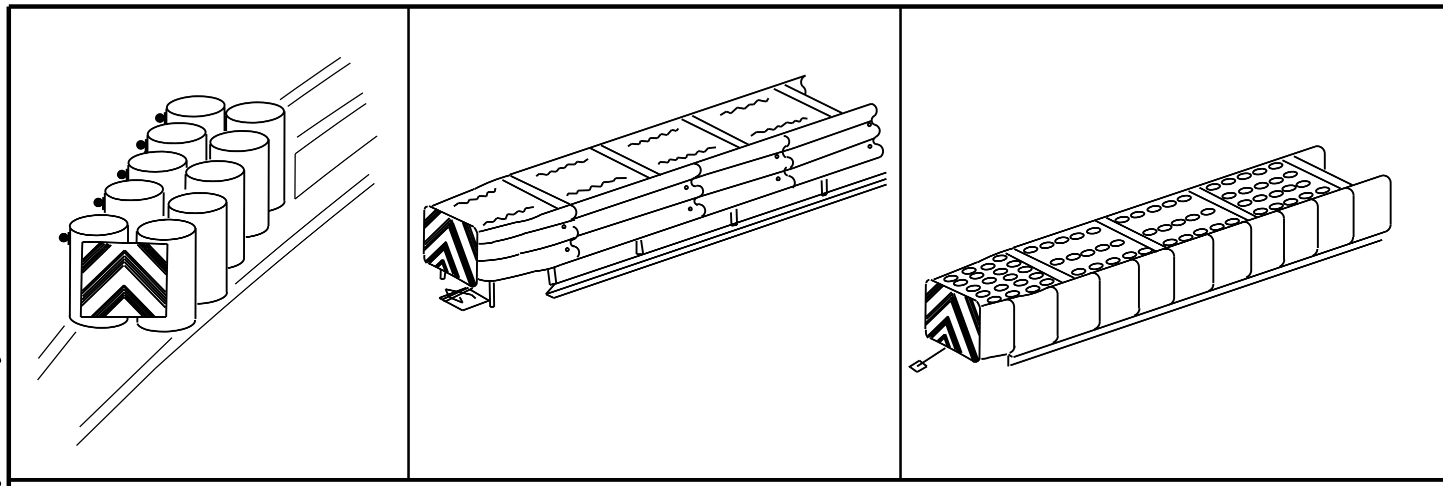
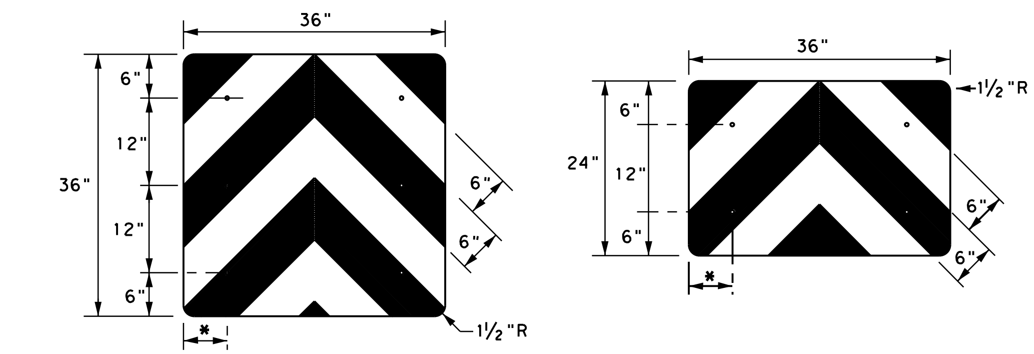
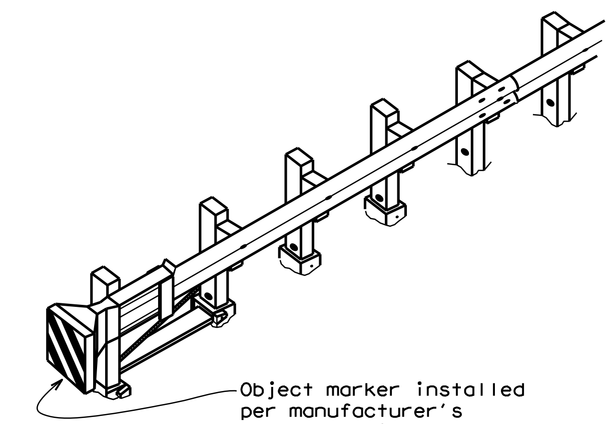
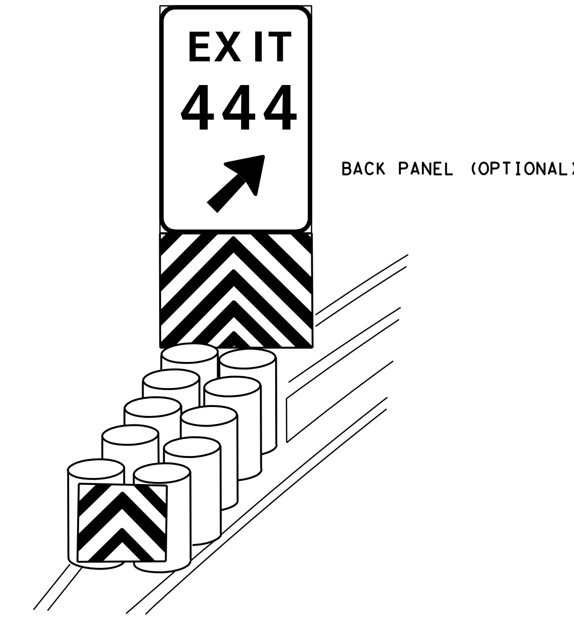
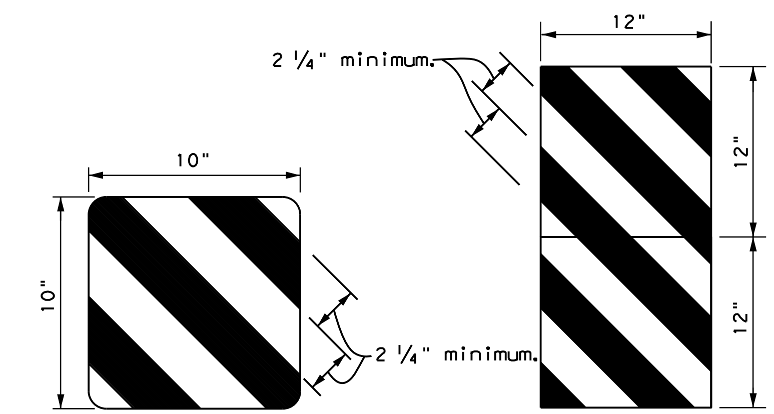




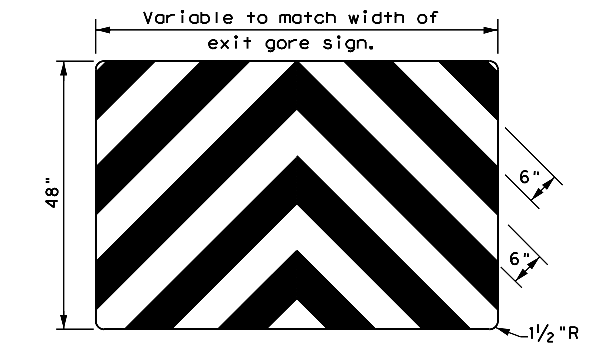
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

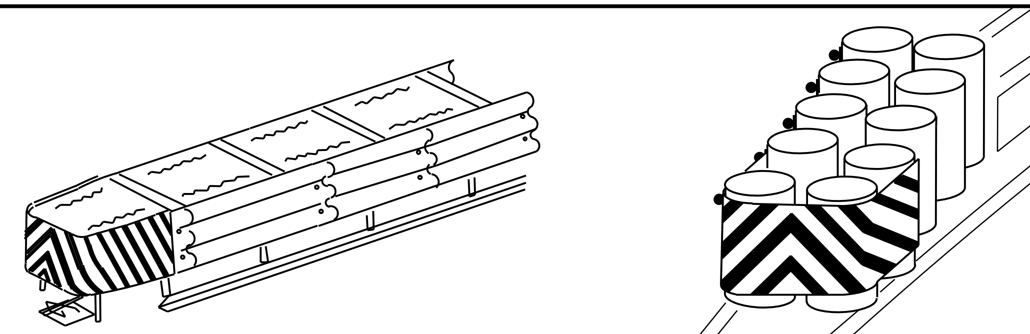


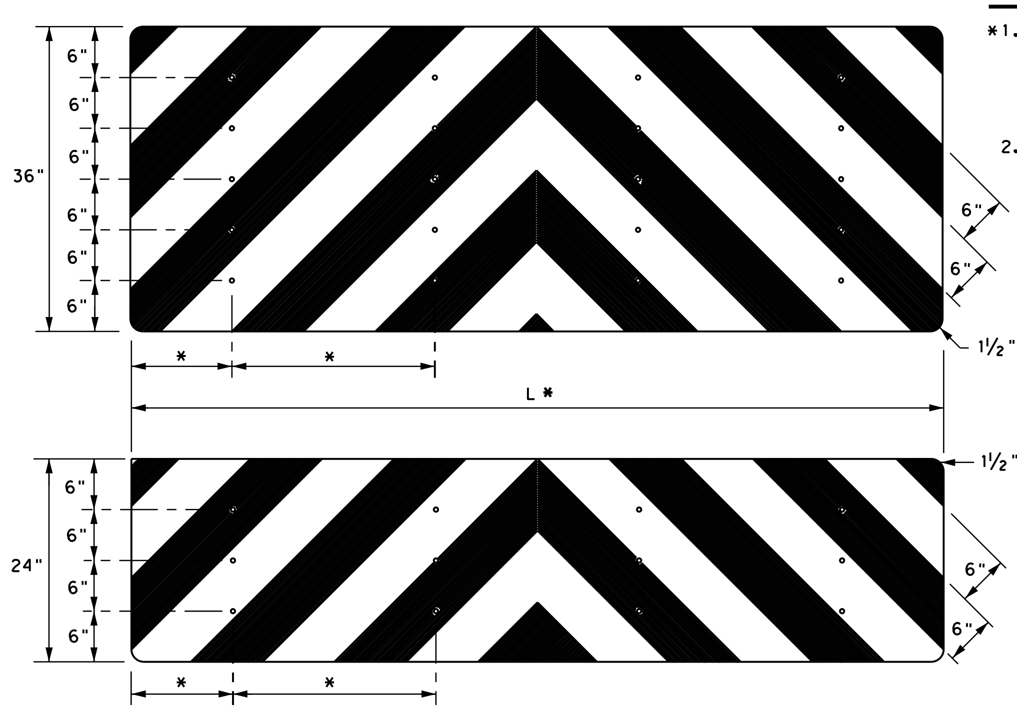




OBJECT MARKERS SMALLER THAN 3 FT^2







NOTES

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

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

NOTES

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

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

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

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

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

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

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
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8-95 3-15 4-98 7-20	FTW		WISE	84

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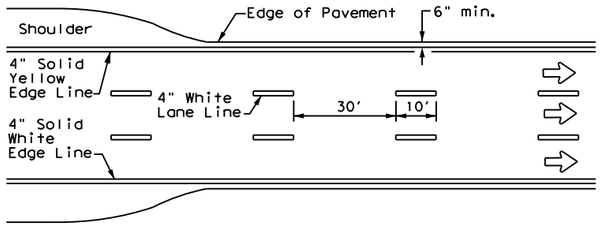
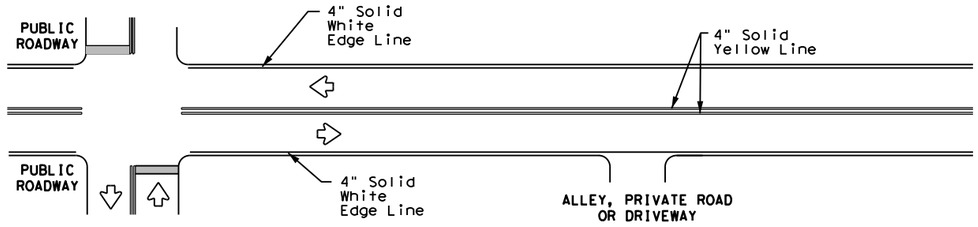
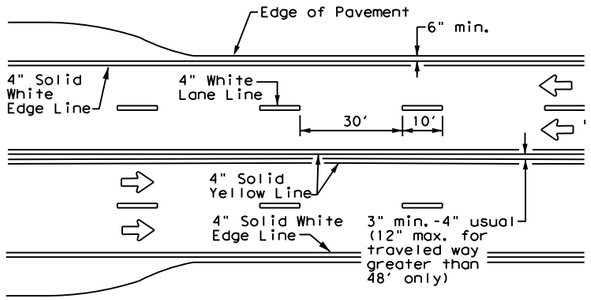


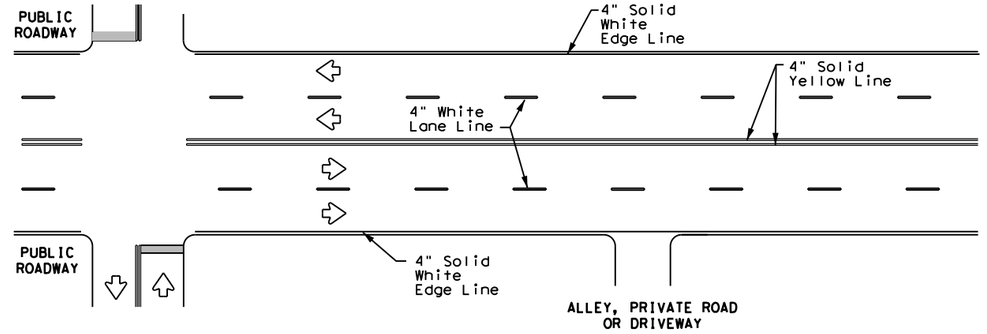
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



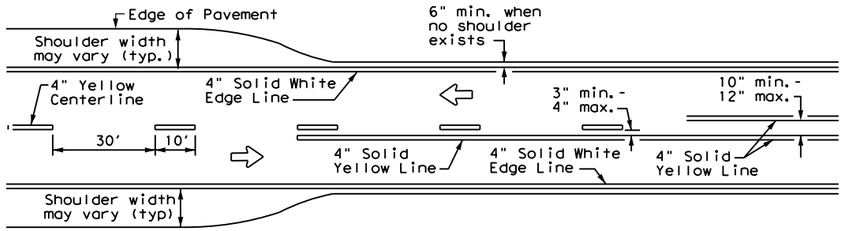
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



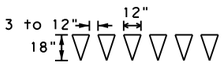
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



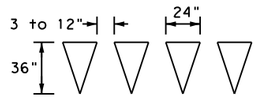
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

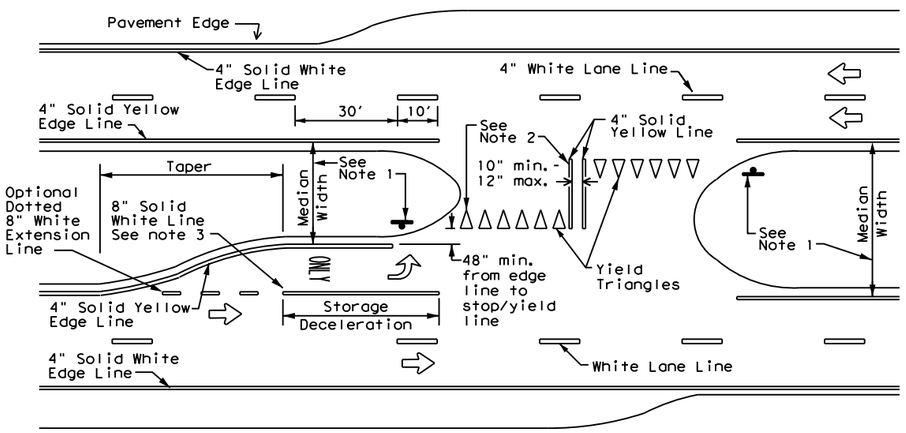


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

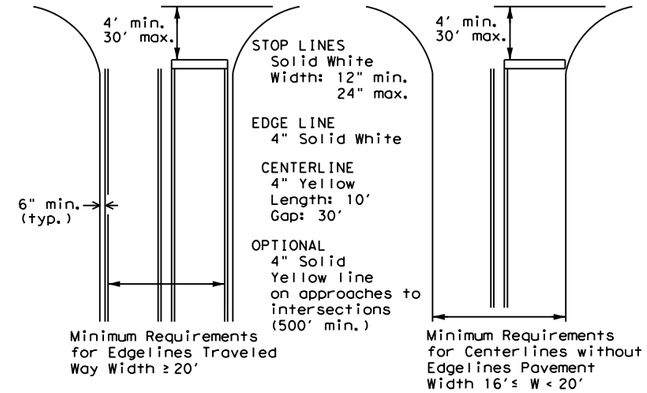
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

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©TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
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8-00 6-20	FTW	WISE		85

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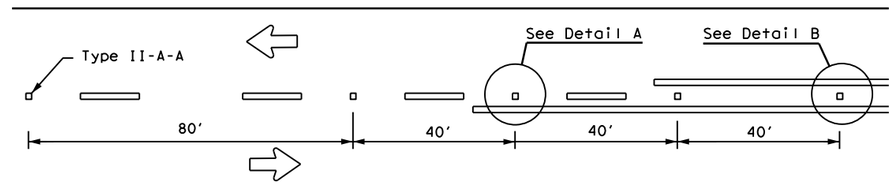
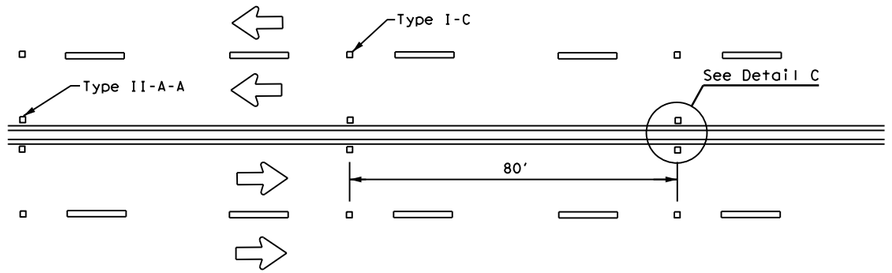
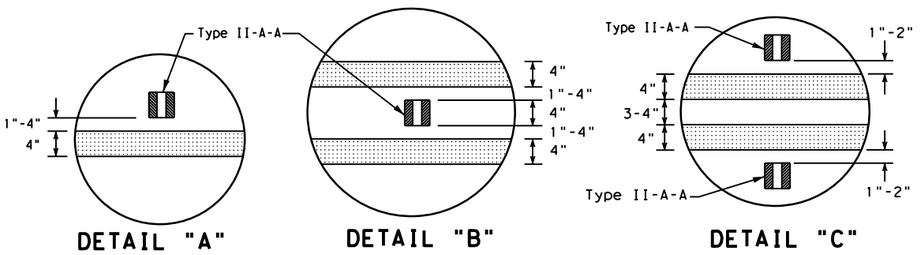
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



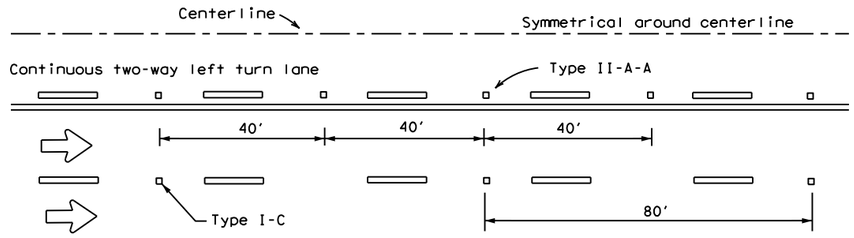
CENTERLINE FOR ALL TWO LANE ROADWAYS



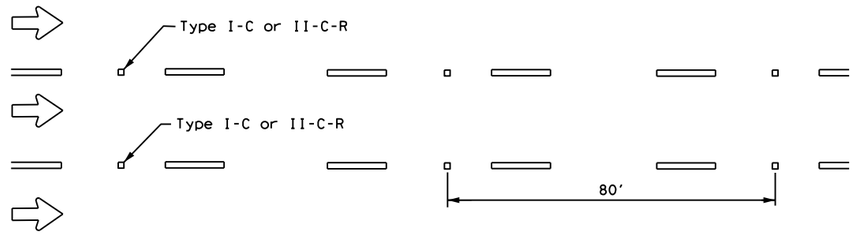
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

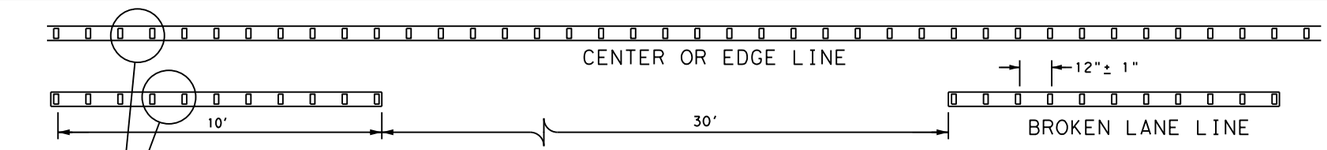


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



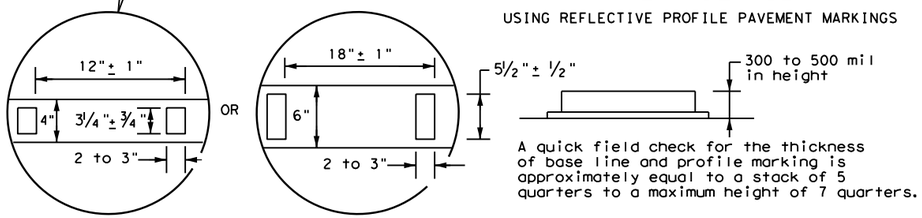
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

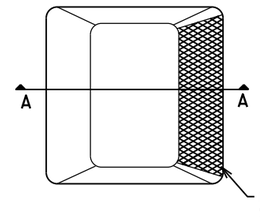
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

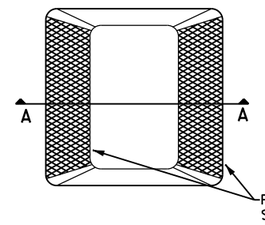
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

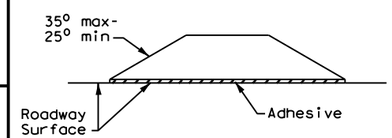
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

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©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
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8-00 6-20	FTW	WISE		86

228

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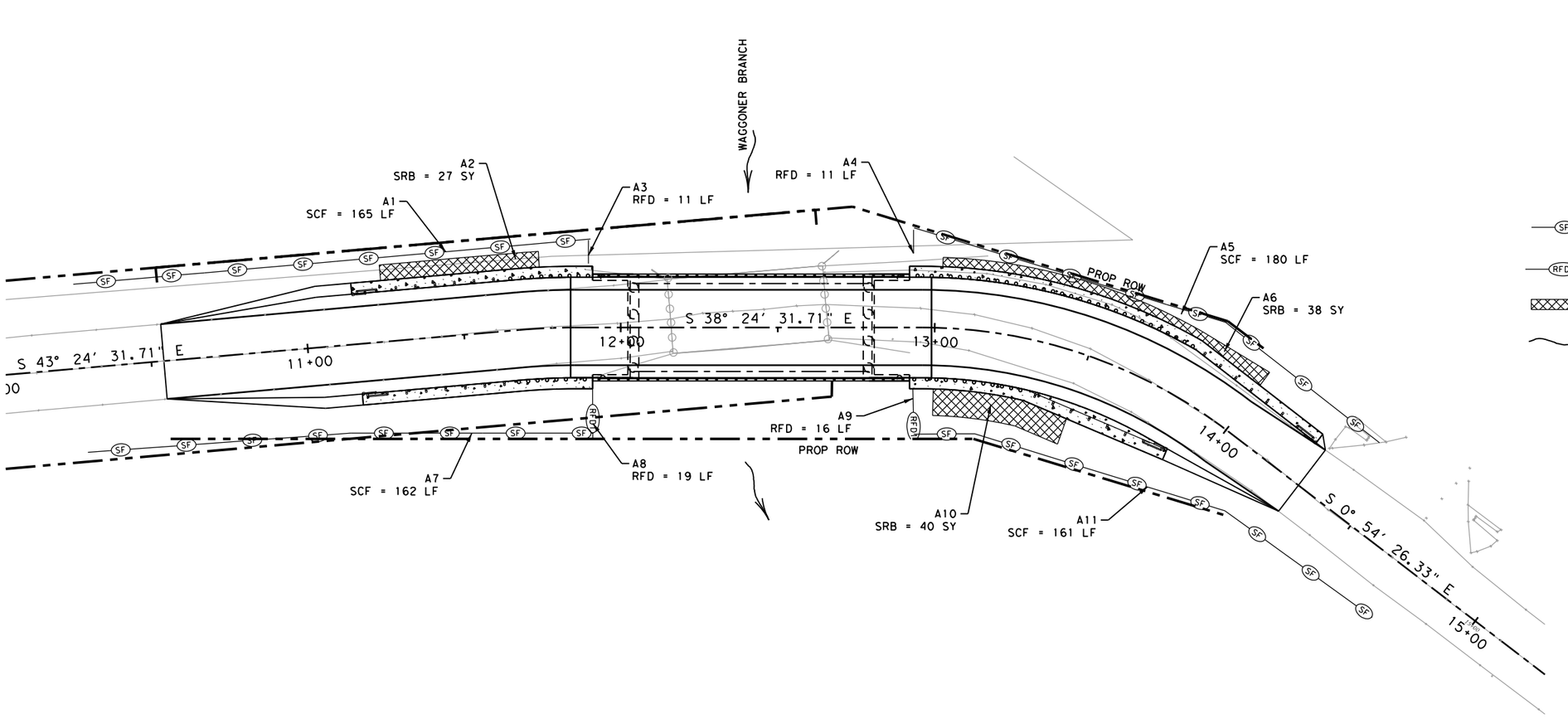

LEGEND

- SF — SILT CONTROL FENCE
- RFD1 — ROCK FILTER DAM
- SOIL RETENTION BLANKETS
- DIRECTION OF FLOW

0 20 40
SCALE: 1"=40'

AREA (A)
DISTURBED DATE:_ _ _ _ _ _ _ _ _ _ _ _ _ _ _
STABILIZED DATE:_ _ _ _ _ _ _ _ _ _ _ _ _ _ _.

SCF/ECL/RDF	BMP #A1	BMP #A2	BMP #A3	BMP #A4	BMP #A5	BMP #6A	BMP #A7	BMP #A8	BMP #A9	BMP #A10	BMP #A11
INSTALLED DATE:											
REMOVE Date:											

CO	REV	DESCRIPTION	DATE	BY

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

BGE, Inc.
1701 Directors Blvd., Suite 1000, Austin, TX 78744
Tel: 512-879-0400 • www.bgeinc.com
TBPE Registration No. F-1046

ACORN DRIVE

SW3P LAYOUT

SHEET 1 OF 1

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2012 (346)		87
STATE	DIST.	COUNTY	
TEXAS	FTW	WISE	
CONT.	SECT.	JOB	HIGHWAY NO.
0902	20	110	CR

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DATE:
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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. Waggoner Branch 12+50

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☒ Silt Fence	☒ Vegetative Filter Strips
☐ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☐ No Action Required ☒ Required Action

If cultural materials are encountered during project activities, work should cease in the immediate area; work can continue where no cultural materials are present. Please contact the TxDOT project manager to consult on further actions that may be necessary to protect the cultural remains.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. Minimize the amount proposed for clearing and removal of native vegetation will be avoided.

2. The use of any non-native plant species in revegetation will be discouraged.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☒ Required Action

Action No.

1. Migratory Bird Treaty Act: Between October 1 and February 15, the contractor would remove all migratory bird nests from any structure that would be affected by the proposed project, and complete any bridge work/demolition and/or vegetation clearing. In addition, the contractor would be prepared to prevent migratory birds from building nests by utilizing nest prevention methods, such as bird-deterrent netting and bird-repellent sprays and/or gels, between February 15 and October 1. In the event that migratory birds are encountered on-site during project construction, adverse impacts on protected birds, active nests, eggs, and/or young would be avoided.

2. The contractor will be advised of potential occurrence of state threatened and endangered species or species of greatest conservation need (SGCN) and TPWD approved BMPs will be implemented during the project. See EPIC Sheet 2 of 2.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☒ Yes ☐ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☐ No Action Required ☒ Required Action

Action No.

1. Lead based paint may be present on bridge rails.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☒ Required Action

Action No.

1. FEMA Flood Plain Notifications: the project is located in a Federal Emergency Management Area (FEMA) designated 100-year flood plain. The hydraulic design for this project would be in accordance with current FHWA and TxDOT design policies. The facility would permit the conveyance of the 100-year flood, inundation of the roadway being acceptable, without causing significant damage to the facility, stream or other property. The proposed project would not increase the base flood elevation to a level that would violate applicable floodplain regulations and ordinances. Coordination with the local Floodplain Administration (Wise County) will be required.

Texas Department of Transportation

Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

SHEET 1 OF 2

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-12-2011 (DS)	0902	20	110	CR
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY		SHEET NO.
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	FTW	WISE		88

DATE:
FILE:

CSJ: 0902-20-110 – Acorn Drive at Waggoner Branch

TPWD Approved BMPs

Strecker's chorus frog (Pseudacris streckeri)
Woodhouse's toad (Anaxyrus woodhousii)

Amphibian & Aquatic Reptile BMPs

- Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered.
- Minimize impacts to wetland, temporary and permanent open water features, including depressions, and riverine habitats.
- Maintain hydrologic regime and connections between wetlands and other aquatic features.
- Use barrier fencing to direct animal movements away from construction activities and areas of potential wildlife-vehicle collisions in construction areas directly adjacent, or that may directly impact, potential habitat for the target species.
- Apply hydromulching and/or hydroseeding in areas for soil stabilization and/or revegetation of disturbed areas where feasible. If hydromulching and/or hydroseeding are not feasible due to site conditions, using erosion control blankets or mats that contain no netting, or only contain loosely woven natural fiber netting is preferred. Plastic netting should be avoided to the extent practicable.
- Project specific locations (PSLs) proposed within state-owned ROW should be located in uplands away from aquatic features.
- When work is directly adjacent to the water, minimize impacts to shoreline basking sites (e.g., downed trees, sand bars, exposed bedrock) and overwinter sites (e.g., brush and debris piles, crayfish burrows where feasible.
- Avoid or minimize disturbing or removing downed trees, rotting stumps, and leaf litter, which may be refugia for terrestrial amphibians, where feasible.
- When riprap or other bank stabilization devices are necessary, their placement should not impede the movement of terrestrial or aquatic wildlife through the water feature. Where feasible, biotechnical streambank stabilization methods using live native vegetation, or a combination of vegetative and structural materials should be used.

Water Quality BMPs
In addition to BMPs required for a TCEQ Storm Water Pollution Prevention Plan and/or 401 water quality permits:

- Minimize the use of equipment in streams and riparian areas during construction. When possible, equipment access should be from banks, bridge decks, or barges.
- When temporary system stream crossings are unavoidable, remove stream crossings once they are no longer needed and stabilize banks and soils around the crossing.

Additional Water Quality BMPs:

- Wet-Bottomed detention ponds are recommended to benefit wildlife and downstream water quality. Consider potential wildlife-vehicle interactions when siting detention ponds.
- Rubbish found near bridges on TxDOT ROW should be removed and disposed of properly to minimize the risk of pollution. Rubbish does not include brush piles or snags.

Western burrowing owl *(Athene cunicularia hypugaea)*

Bird BMPs:
In addition to complying with the Migratory Bird Treaty Act (MBTA) perform the following BMPs:

- Prior to construction, perform daytime surveys for nests including under bridges and in culverts to determine if they are active before removal. Nests that are active should not be disturbed.
- Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season;
- Avoid the removal of unoccupied, inactive nests, as practicable;
- Prevent the establishment of active nests during the nesting season on TxDOT owned and operated facilities and structures proposed for replacement or repair;
- Do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.

plains spotted skunk (*Pilogale putorius interrupta*)
American bumblebee *(Bombus pensylvanicus)*
eastern spotted skunk *(Spilogale putorius)*
long-tailed weasel *(Mustela frenata)*
mink *(Neovison vison)*
Short-tailed shrew (*Blarina hylophaga*)
Thirteen-lined ground squirrel (*Ictidomys tridecemileanatus*)
Woodland vole (*Microtus pinetorum*)

Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered, and to avoid unnecessary impacts to dens or nests.

Texas garter snake (*Thamnophis sirtalis annectens*)
timber (canebreak) rattlesnake (*Crotalus horridus*)
massasauga (*Sistrurus tergeminus*)
slender glass lizard (*Ophisaurus attenuates*)
western box turtle *(Terrapene ornata)*
eastern box turtle *(Terrapene carolina)*
western hognose snake (*Heterodon nasicus*)

Terrestrial Reptile BMPs:

- Apply hydromulching and/or hydroseeding in areas for solid stabilization and/or revegetation of disturbed areas where feasible. If hydromulching and/or hydroseeding are not feasible due to site conditions, utilize erosion control blankets or mats that contain no netting or contain loosely woven, natural fiber netting is preferred. Plastic netting should be avoided to the extent possible.
- For open trenches and excavated pits, install escape ramps at an angle of less than 45 degrees (1:1) in areas left uncovered. Visually inspect excavation areas for trapped wildlife prior to backfilling.
- Inform contractors that if reptiles are found on project site allow species to safely leave the project area.
- Avoid or minimize disturbing or removing downed trees, rotting stumps, and leaf litter where feasible.
- Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered.

For all Protected Species and SGCN potentially occurring in the project area:

- Allow the wildlife to leave the site safely.
- Report all observations to TxDOT.

Texas Department of Transportation | Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

SHEET 2 OF 2

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR		
	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0902	20	110		CR	
12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	DIST	COUNTY			SHEET NO.	
	FTW	WISE			89	

http://www.dot.state.tx.us/ftw/specinfo/standard.htm
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A. GENERAL SITE DATA

1. PROJECT LIMITS: *Highway: ACORN DRIVE*
From: AT WAGGONER BRANCH
To: ON ACORN DRIVE

LATTITUDE: 33.22922 LONGITUDE: -97.64535

2. PROJECT SITE MAPS:

- *Project Location Map: Title Sheet (Sheet 1)*
- *Drainage Patterns: Drainage Area Maps (Sheets 33-35)*
- *Approx. Slopes Anticipated After Major Gradings and Areas of Soil Disturbance: Typical Sections (Sheets 6)*
- *Major Controls and Locations of Stabilization Practices: (Sheets 82) SW3P Site Map Sheets*
- *Project Specific Locations:*
  To be specified by Project Field Office and located in the Project SW3P File
- *Surface Waters and Discharge Locations: Drainage and Culvert Layout Sheets (Sheets 33-35)*

3. PROJECT DESCRIPTION:
For the construction of replace bridge and approaches consisting of replacing bridge and approaches.

4. MAJOR SOIL DISTURBING ACTIVITIES:
(Provide description of disturbing activities in sequence of construction)

5. EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:
(Provide description of soil condition, vegetative cover and percentage)

6. TOTAL PROJECT AREA: *0.67* Acres

7. TOTAL AREA TO BE DISTURBED: *0.67* Acres (100 % OF TOTAL PROJECT AREA)

8. WEIGHTED RUNOFF COEFFICIENT

BEFORE CONSTRUCTION: *0.56*
AFTER CONSTRUCTION: *0.69*

9. NAME OF RECEIVING WATERS:

TCEQ Stream Segment: 0810 West Fork Trinity River Below Bridgeport Reservoir

10. ENDANGERED SPECIES, DESIGNATED CRITICAL HABITAT AND HISTORIC PROPERTY:

1. Will be completed once Archaeological Coordination as been completed.

2. The Potential for the occurrence of State or federally protected species and/or Species of Greatest Conservation Need (SGCN) has been identified. See EPIC Sheets for full list of commitments.

Note: Designer shall supply applicable statement.

The documentation satisfying TPDES Construction General Permit eligibility pertaining to the existence or of any protective action taken with regards to endangered species or designated critical habitat or historical property in this project area is contained in the project's Enviromental document (EA or EIS) and can be viewed under the State Open Records Act at the address shown below:

TEXAS DEPARTMENT OF TRANSPORTATION
FORT WORTH DISTRICT HEADQUARTERS
DISTRICT DESIGN SECTION
2501 SW LOOP
FORT WORTH, TX 76133
PHONE: 817-370-6500

B. EROSION AND SEDIMENT CONTROLS

1. SOIL STABILIZATION PRACTICES:

(Select T = Temporary or P = Permanent, as applicable)

T	TEMPORARY SEEDING		PRESERVATION OF NATURAL RESOURCES
	MULCHING (Hay or Straw)		FLEXIBLE CHANNEL LINER
	BUFFER ZONES		RIGID CHANNEL LINER
	PLANTING	P	SOIL RETENTION BLANKET
P	SEEDING	P	COMPOST MANUFACTURED TOPSOIL
	SODDING		OTHER: (Specify Practice)

2. STRUCTURAL PRACTICES:

(Select T = Temporary or P = Permanent, as applicable)

T	SILT FENCES		DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
	HAY BALES		DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
T	ROCK FILTER DAMS		DIVERSION DIKE AND SWALE COMBINATIONS
	PIPE SLOPE DRAINS		ROCK BEDDING AT CONSTRUCTION EXIT
	PAVED FLUMES		TIMBER MATTING AT CONSTRUCTION EXIT
	CHANNEL LINERS		STONE OUTLET STRUCTURES
	SEDIMENT TRAPS		VELOCITY CONTROL DEVICES
	SEDIMENT BASINS		CURBS AND GUTTERS
	STORM SEWERS		STORM INLET SEDIMENT TRAP
T	OTHER: *(Specify Practice)*		
T	EROSION CONTROL LOGS		
T	SOIL RETENTION BLANKETS		

3. STORM WATER MANAGEMENT: *(Example Below - May be used as applicable, revised or expanded)*

1. Storm water drainage will be provided by the ditches, inlets and storm water systems that will carry drainage within the R.O.W. to the low points within the roadway and project site which drain to natural facilities.

2. Other permanent erosion controls include hydraulic design to limit structure outlet velocities and grading design generally consisting of 4:1 or flatter slopes with permanent vegetative cover.

4. STORM WATER MANAGEMENT ACTIVITIES: (Sequence of Construction)

(Describe Storm Water Management Activities by Phases)

5. NON-STORM WATER DISCHARGES:
Non-storm water discharges should be filtered, or held in retention basins, before being allowed to mix with storm water. These discharges consist of non-polluted ground water, spring water, foundation and/or footing drain water, and water used for dust control, pavement washing and vehicle washwater containing no detergents.

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Design Consultant Logo here - delete block if not applicable

Texas Department of Transportation

Fort Worth District Standard

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

SHEET 1 OF 2 SHEETS

ORIGINAL DRAWING: 09/2002	sw3p-ftw.dgn	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DATE	REVISIONS	6	BR 2012 (346)		90
09/2008	NPDES TO TPDES	STATE	STATE DIST.NO.	COUNTY	
01/2012	CLARIFY NOTE C.2.	TEXAS	FTW	WISE	
08/2013	ADDED SIGN	CONT.	SECT.	JOB	HIGHWAY NO.
05/2019	2-SHEET FORMAT	0902	20	110	CR

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:

All erosion and sediment controls shall be maintained in good working order. If a repair is necessary, it shall be performed at the earliest date possible but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. Disturbed areas on which construction activities have ceased, temporarily or permanently, shall be stabilized within 14 calendar days unless they are scheduled to and do resume within 21 calendar days. The areas adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.

2. INSPECTION:

An inspection shall be performed by a TxDOT inspector every 14 calendar days as well as within 24 hours after any rainfall of one-half inch or more is recorded on a non-freezing rain gauge to be located at the project site, or every 7 calendar days. An Inspection and Maintenance Report shall be filed for each inspection. Based on the inspection results, the controls shall be revised in accordance with the inspection report.

3. WASTE MATERIALS:

Except as noted below, all waste materials shall be collected in a metal dumpster having a secure cover. The dumpster shall meet all state and local solid waste management regulations. All trash and debris from construction shall be deposited in the dumpster. The dumpster shall be emptied, as necessary or as required by local regulation, and hauled to a local approved land fill site. The burying of construction waste on the project site shall not be permitted.

Concrete washout areas shall be required and shall consist of a pit, lined with an impervious material, of sufficient size to contain, until evaporation, all water used and washout material produced during concrete washout operations. The concrete washout locations shall be as directed by the engineer.

Lime slaking tanks shall be surrounded by an earthen berm, capable of containing any overflow.

4. HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

As a minimum, any products in the following categories are considered to be hazardous: paints, acids, solvents, asphalt products, chemical additives for soil stabilization, and concrete curing compounds or additives. In the event of a spill which may be hazardous, the spill coordinator shall be contacted immediately.

5. SANITARY WASTE:

All sanitary waste shall be collected from the portable units, as necessary or as required by local regulation, by a licensed sanitary waste management contractor.

6. OFFSITE VEHICLE TRACKING:

The Contractor shall be required, on a regular basis or as may be directed by the Engineer, to dampen haul roads for dust control, stabilize construction entrances and to remove excess dirt from the roadway.

7. MANAGEMENT PRACTICES: *(Example Below - May be used as applicable, revised or expanded)*

1. Disposal areas, stockpiles and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, waterbody or streambed.

2. Construction staging areas and vehicle maintenance areas shall be constructed by the Contractor in a manner to minimize the runoff of pollutants.

3. All temporary fills placed in waterways shall be built of erosion resistant material. (NWP 14)

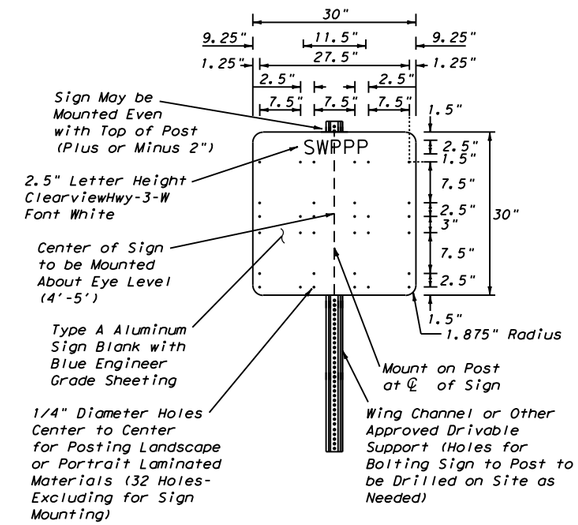
4. All waterways shall be cleared as soon as practicable of temporary embankment, temporary bridges, matting, falsework, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.

8. OTHER:

1. Listing of construction materials stored on site to be provided by Project Field Office.

2. The Project SW3P File located at the project field office shall contain the N.O.I., CGP Coverage Notice, TCEQ TPDES Form, Signature Authorization, Certification/Qualification Statements, Inspection Reports, Required Maps, and a copy of the TPDES General Permit No. TXR150000.

STORM WATER POLLUTION PREVENTION PLAN PERMIT POSTING



No Permanent Installation Allowed.
Sign to be Removed After Project Completion.

STATE OF TEXAS
JOHN W. TULEY
102441
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

Design Consultant Logo here - delete block if not applicable

Texas Department of Transportation

Fort Worth District Standard

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

SHEET 2 OF 2 SHEETS

ORIGINAL DRAWING: 09/2002	sw3p-ftw.dgn	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DATE	REVISIONS	6	BR 2012 (346)		91
09/2008	NPDES TO TPDES	STATE	STATE DIST.NO.	COUNTY	
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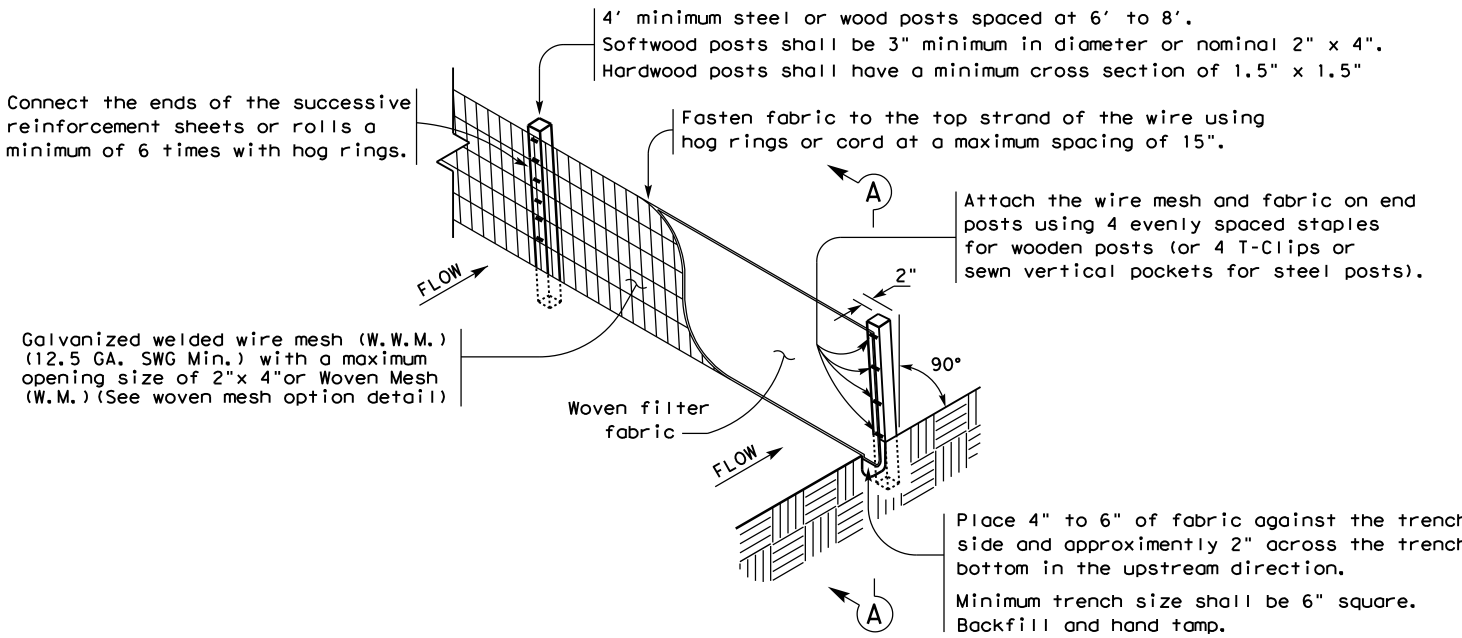
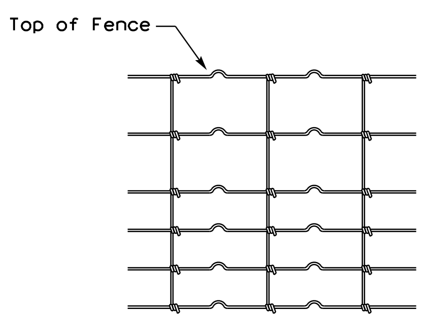
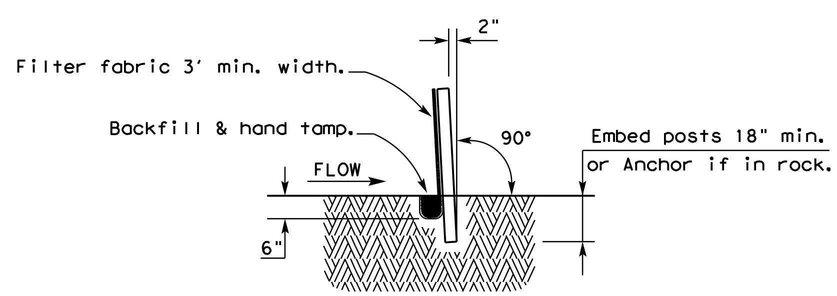


TEMPORARY SEDIMENT CONTROL FENCE

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.

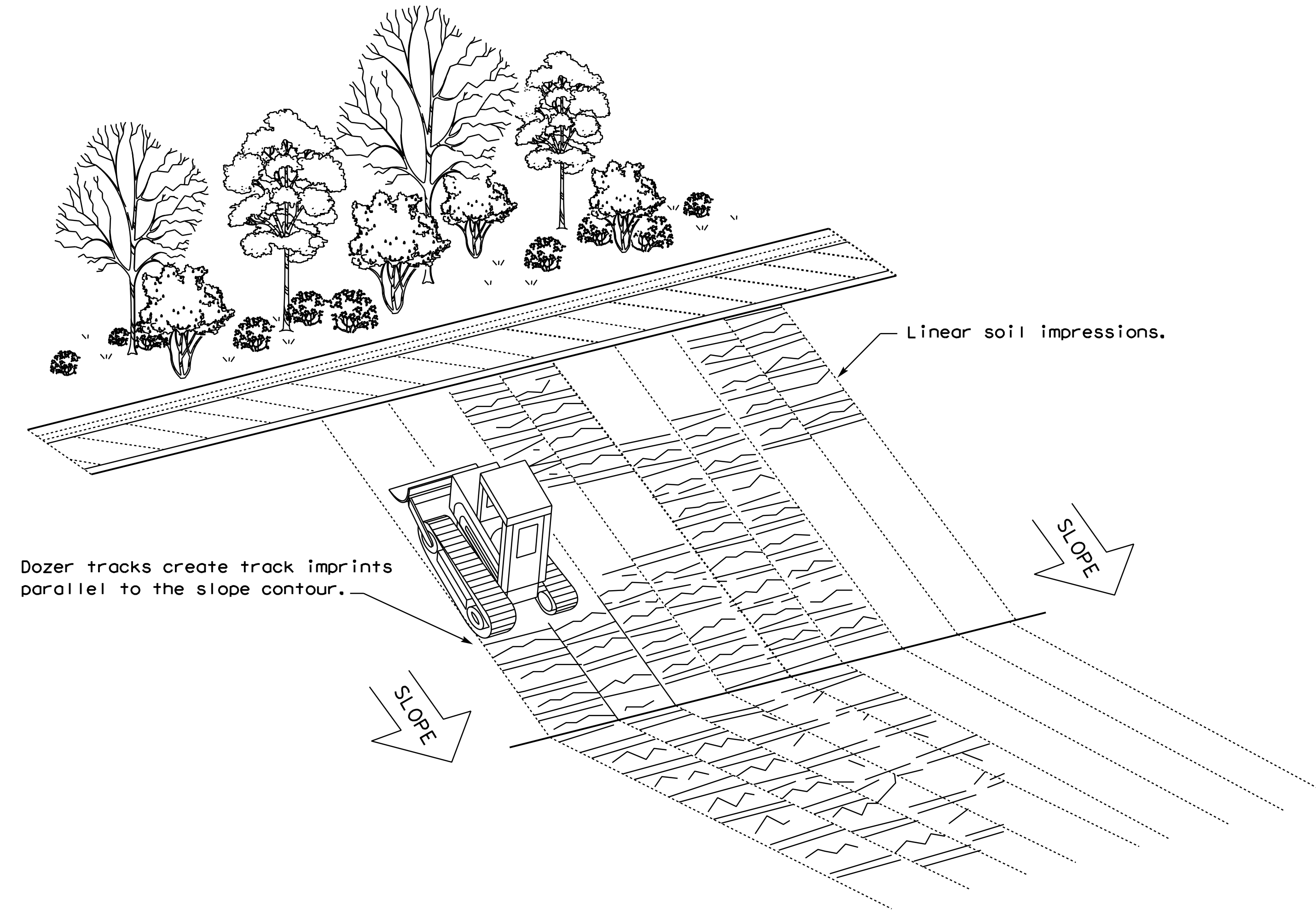
LEGEND

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	0902	20	110	CR
	DIST	COUNTY		SHEET NO.
	FTW	WISE		92

DATE: 5/26/2021
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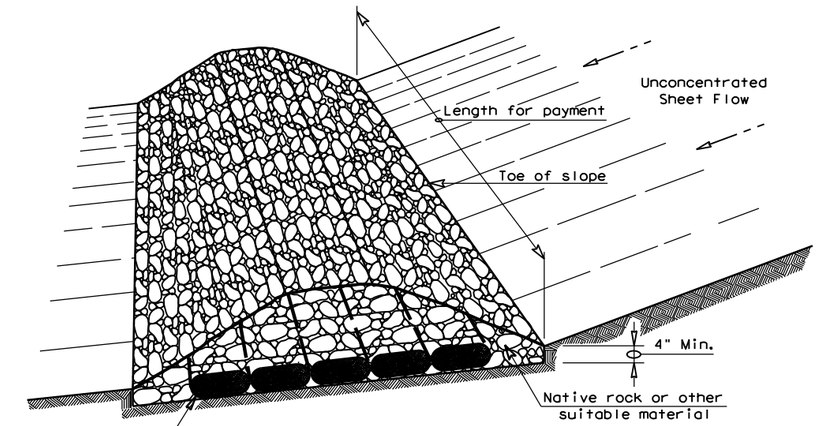
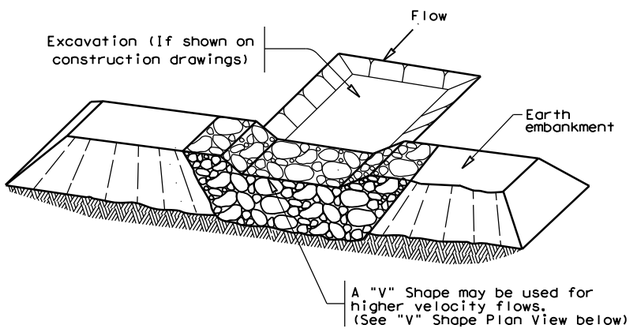


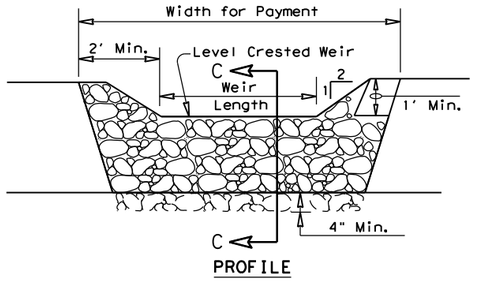
FILTER DAM AT TOE OF SLOPE

RFD1

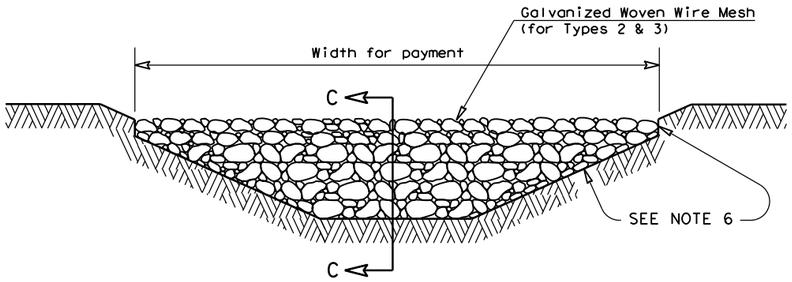


FILTER DAM AT SEDIMENT TRAP

RFD1 — OR — RFD2

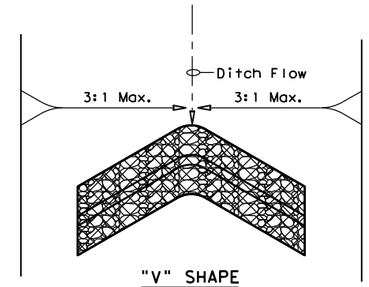


PROFILE

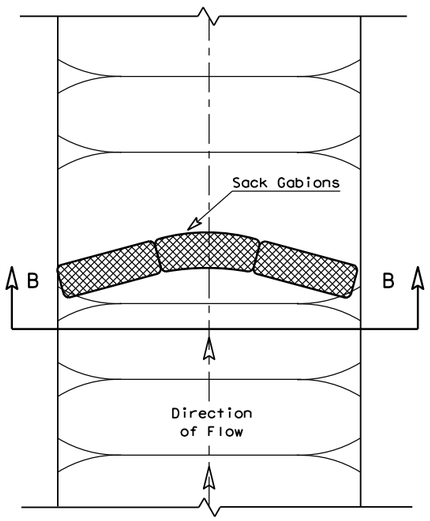


FILTER DAM AT CHANNEL SECTIONS

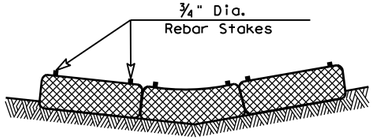
RFD1 — OR — RFD2 — OR — RFD3



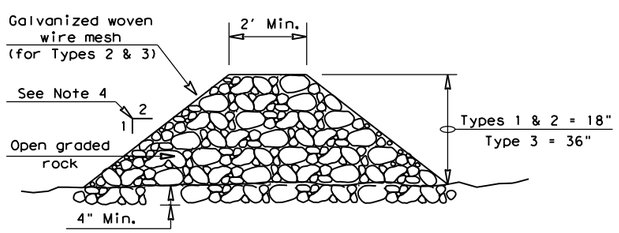
"V" SHAPE
PLAN VIEW



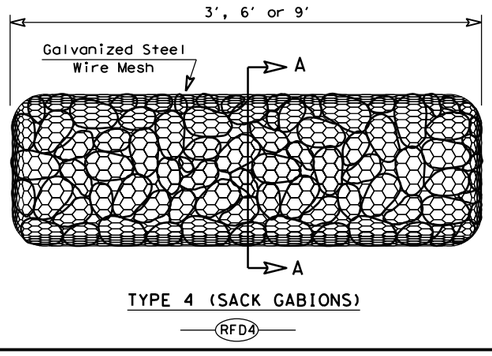
PLAN VIEW



SECTION B-B

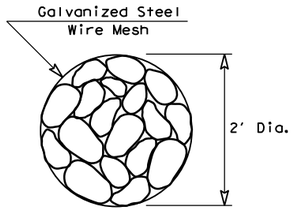


SECTION C-C



TYPE 4 (SACK GABIONS)

RFD4



SECTION A-A

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0902	20	110	CR
	DIST	COUNTY		SHEET NO.
	FTW	WISE		93

DATE: 5/26/2021
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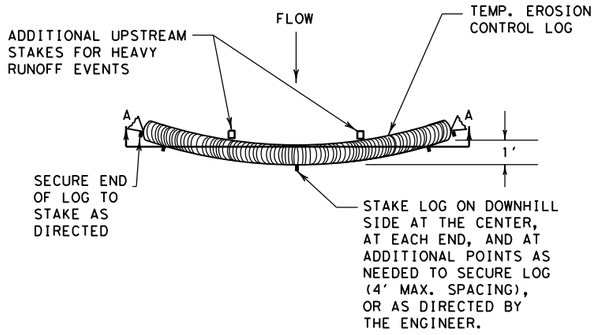
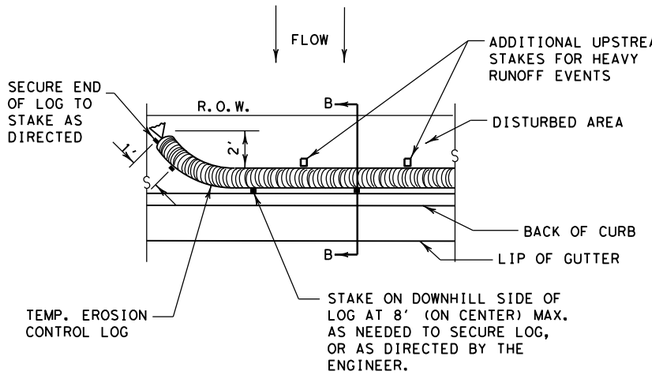


PLAN VIEW



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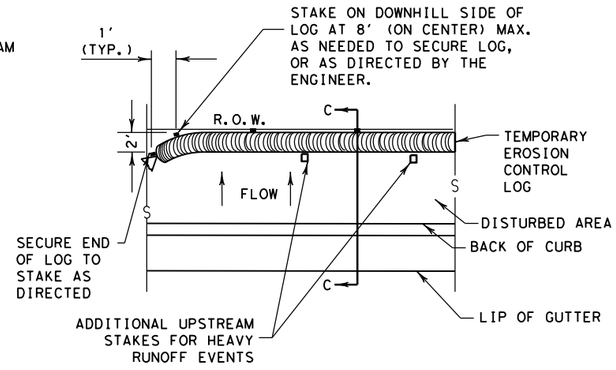
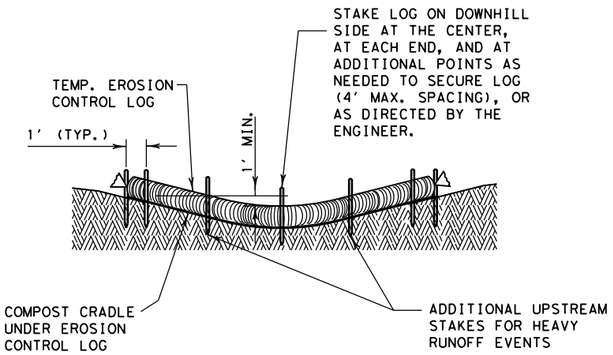


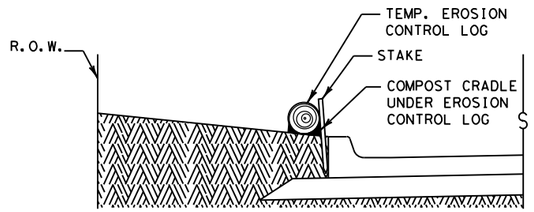
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

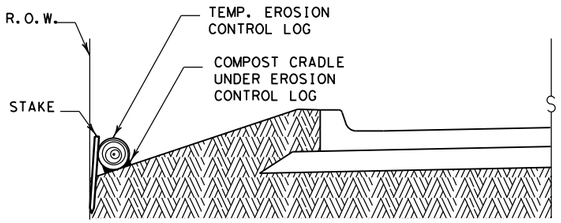
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

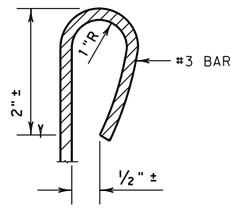
CL-BOC



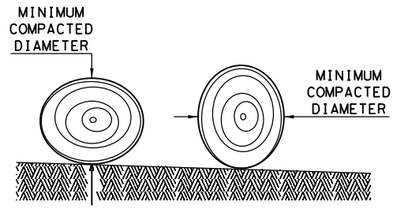
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

SHEET 1 OF 3

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TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
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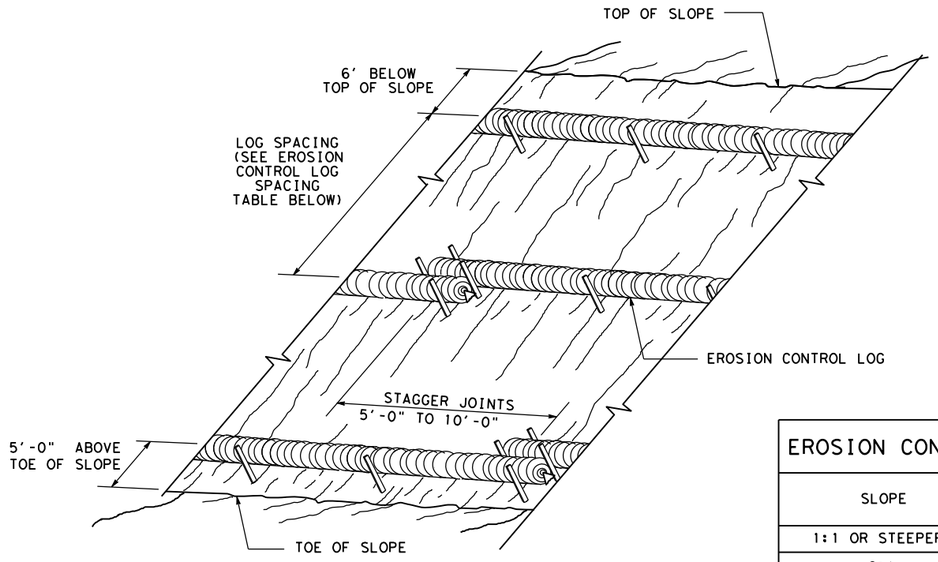
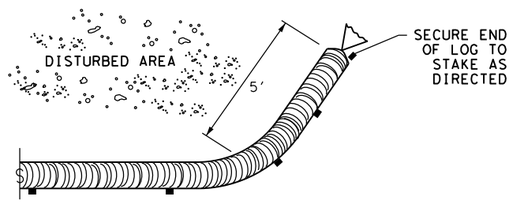


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

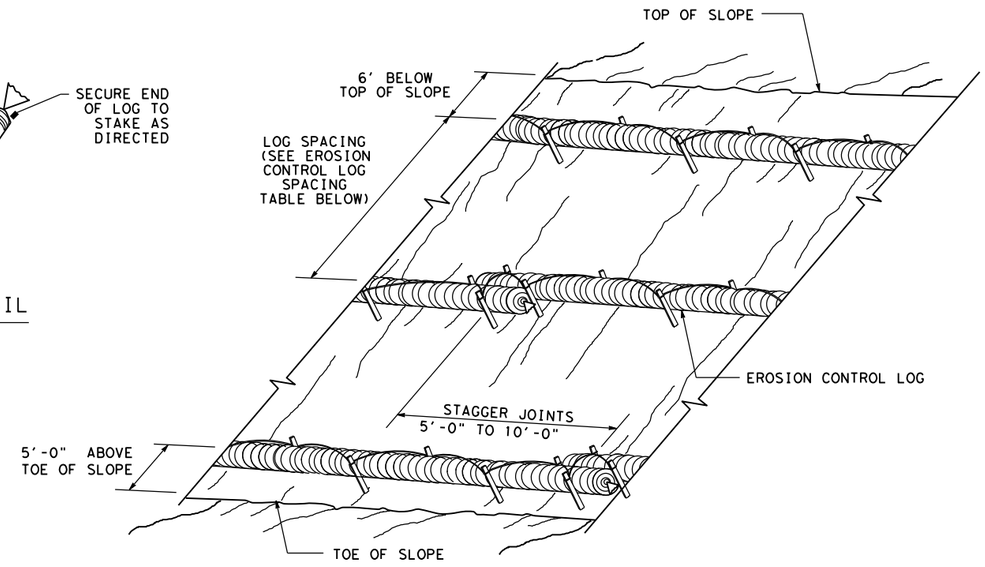
CL-SST



END SECTION RAP DETAIL

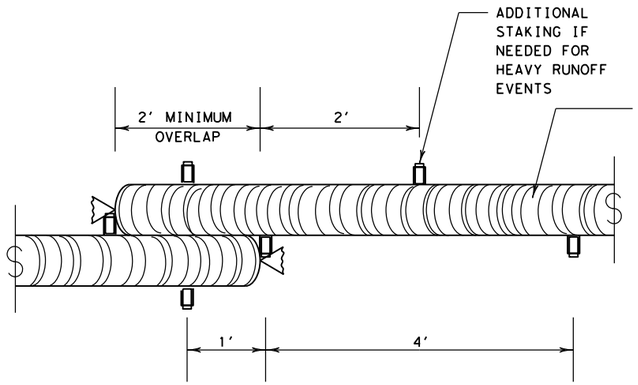
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

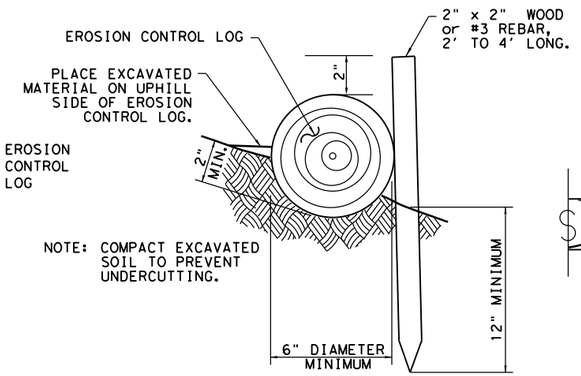
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

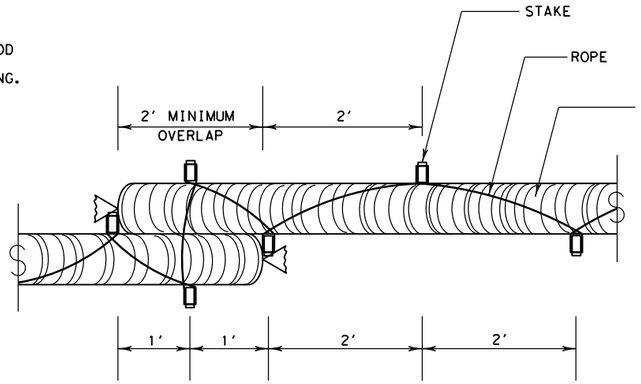


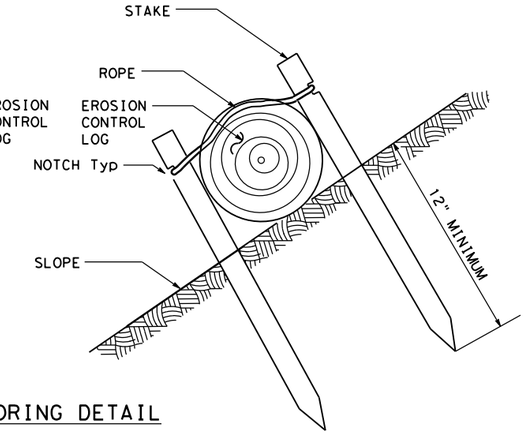


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

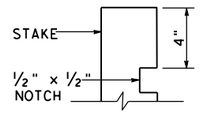
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

SHEET 2 OF 3

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

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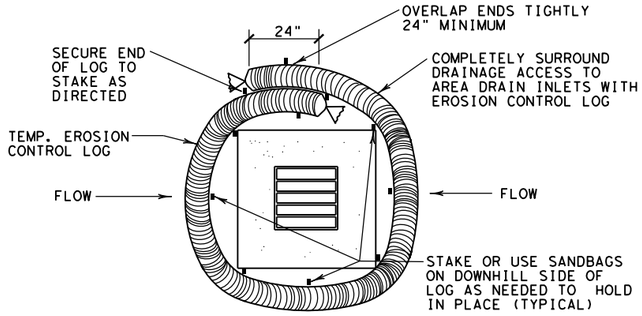
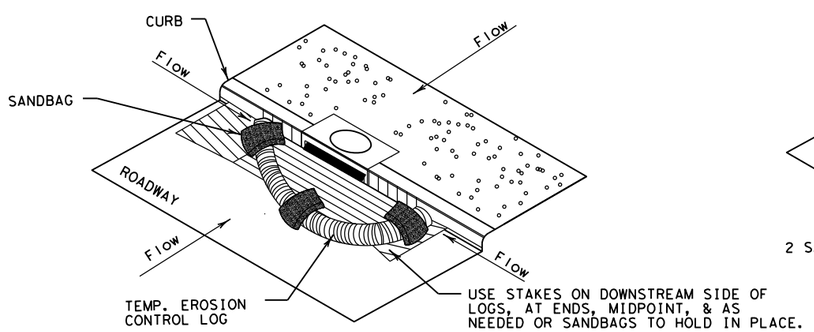


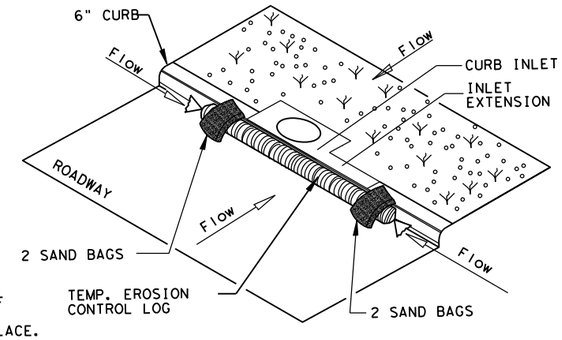
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

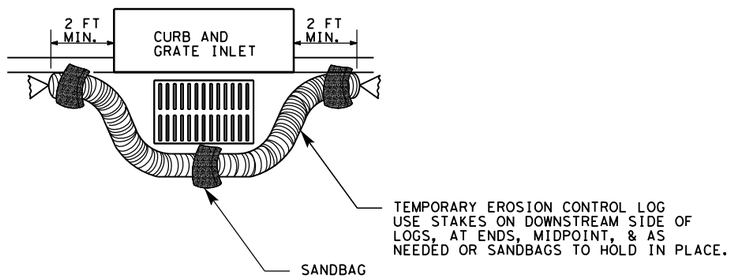
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

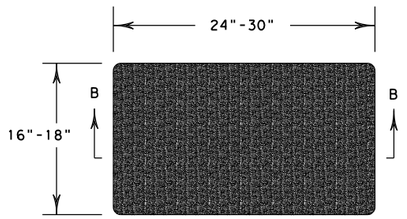
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

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