

# STATE OF TEXAS DEPARTMENT OF TRANSPORTATION

## PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

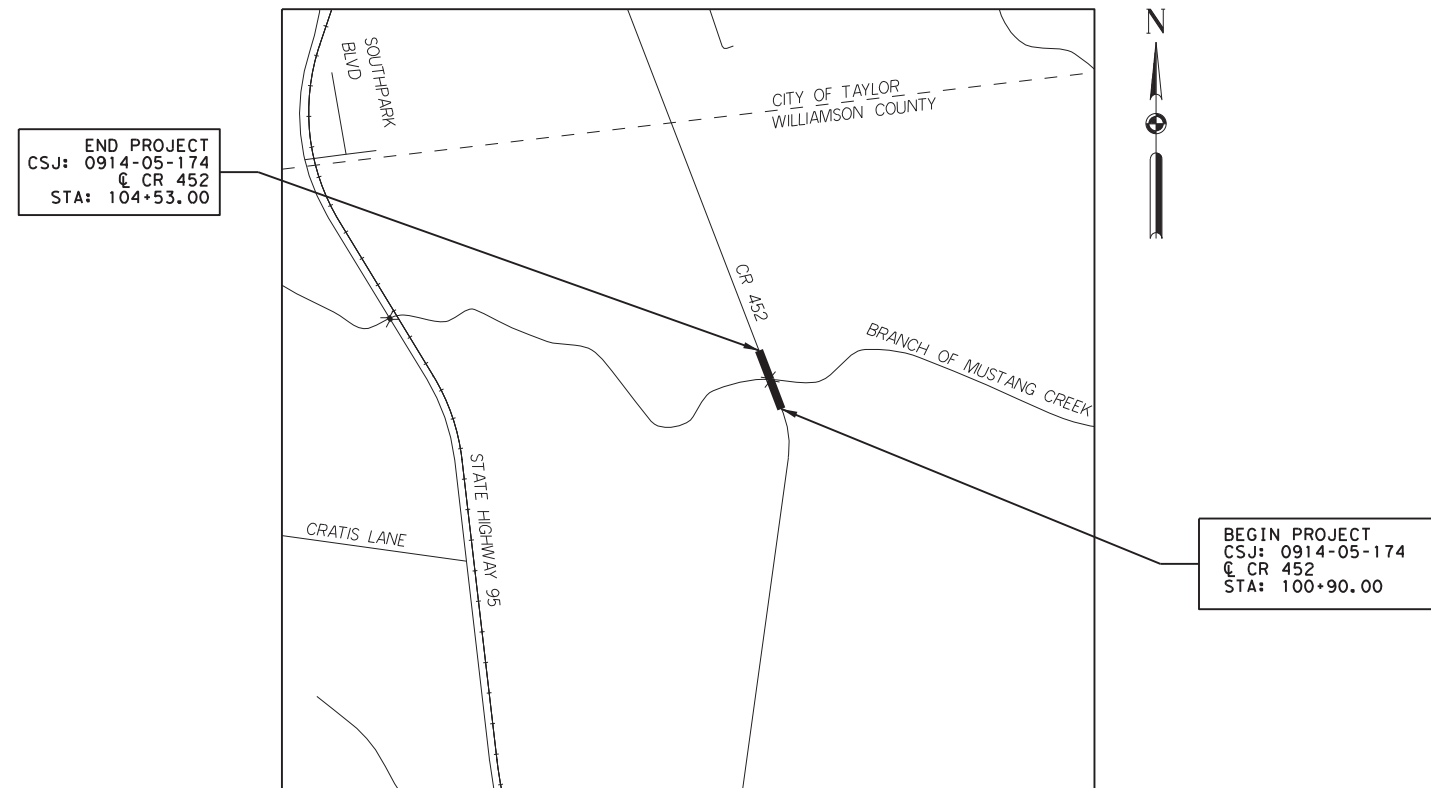
FEDERAL AID PROJECT NUMBER  
BR 2020(731)  
CSJ: 0914-05-174

NET LENGTH OF PROJECT - 363.00 FEET = 0.069 MILES  
 ROADWAY = 293.00 FEET = 0.055 MILES  
 BRIDGE = 70.00 FEET = 0.014 MILES

### WILLIAMSON COUNTY CR 452 AT MUSTANG CREEK

FROM: CR 452 AT BRANCH OF MUSTANG CREEK  
TO: STR# 14-246-0-AA04-13-001

FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT  
CONSISTING OF REPLACING BRIDGE



LOCATION MAP NOT TO SCALE

EXCEPTIONS: NONE  
EQUATIONS: NONE  
RAILROAD CROSSINGS: NONE



**Texas Department of Transportation**  
ALL RIGHTS RESERVED

CONT	SECT	JOB	HIGHWAY
0914	05	174	CR 452
DIST	COUNTY		SHEET NO.
AUS	WILLIAMSON		1

DESIGN SPEED

RURAL: MEET OR IMPROVE EXISTING

A. D. T.

2023: 125 VPD  
2043: 175 VPD

FINAL PLANS

NAME OF CONTRACTOR: \_\_\_\_\_  
 DATE OF LETTING: \_\_\_\_\_  
 DATE WORK BEGAN: \_\_\_\_\_  
 DATE WORK COMPLETED: \_\_\_\_\_  
 DATE WORK ACCEPTED: \_\_\_\_\_  
 FINAL CONTRACT COST: \_\_\_\_\_  
 LIST OF APPROVED CHANGE ORDERS:

I CERTIFY THAT THIS PROJECT WAS CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE FINAL AS-BUILT PLANS AND SPECIFICATIONS.

AREA ENGINEER \_\_\_\_\_ P. E. \_\_\_\_\_ DATE \_\_\_\_\_

*TJN*  
11/3/2022  
  
 TREY NEAL  
 LICENSED PROFESSIONAL ENGINEER

**Kimley»Horn**  
F-928

RECOMMENDED FOR LETTING: 1/4/2023

DocuSigned by:  
  
 Susana Ceballos P.E.  
 E1816167B5C7414  
 DISTRICT DESIGN ENGINEER

APPROVED FOR LETTING: 1/4/2023

DocuSigned by:  
  
 AREA ENGINEER

APPROVED FOR LETTING: 1/4/2023

DocuSigned by:  
  
 DIRECTOR OF TRANSPORTATION  
 PLANNING & DEVELOPMENT

TDLR INSPECTION NOT REQUIRED

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

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	<u>TRAFFIC CONTROL PLAN</u>
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21	*WZ(RCD)-13
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22	SURVEY CONTROL LAYOUT SHEET
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24	REMOVAL LAYOUT
25	PLAN & PROFILE
26	MISCELLANEOUS DETAILS
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30	*GF(31)MS-19
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32	*SGT(10S)31-16
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\* THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.



DESIGN ENGINEER

11/3/2022

DATE

**Kimley»Horn** F-928



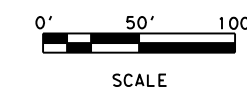
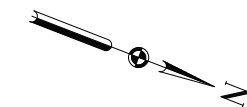
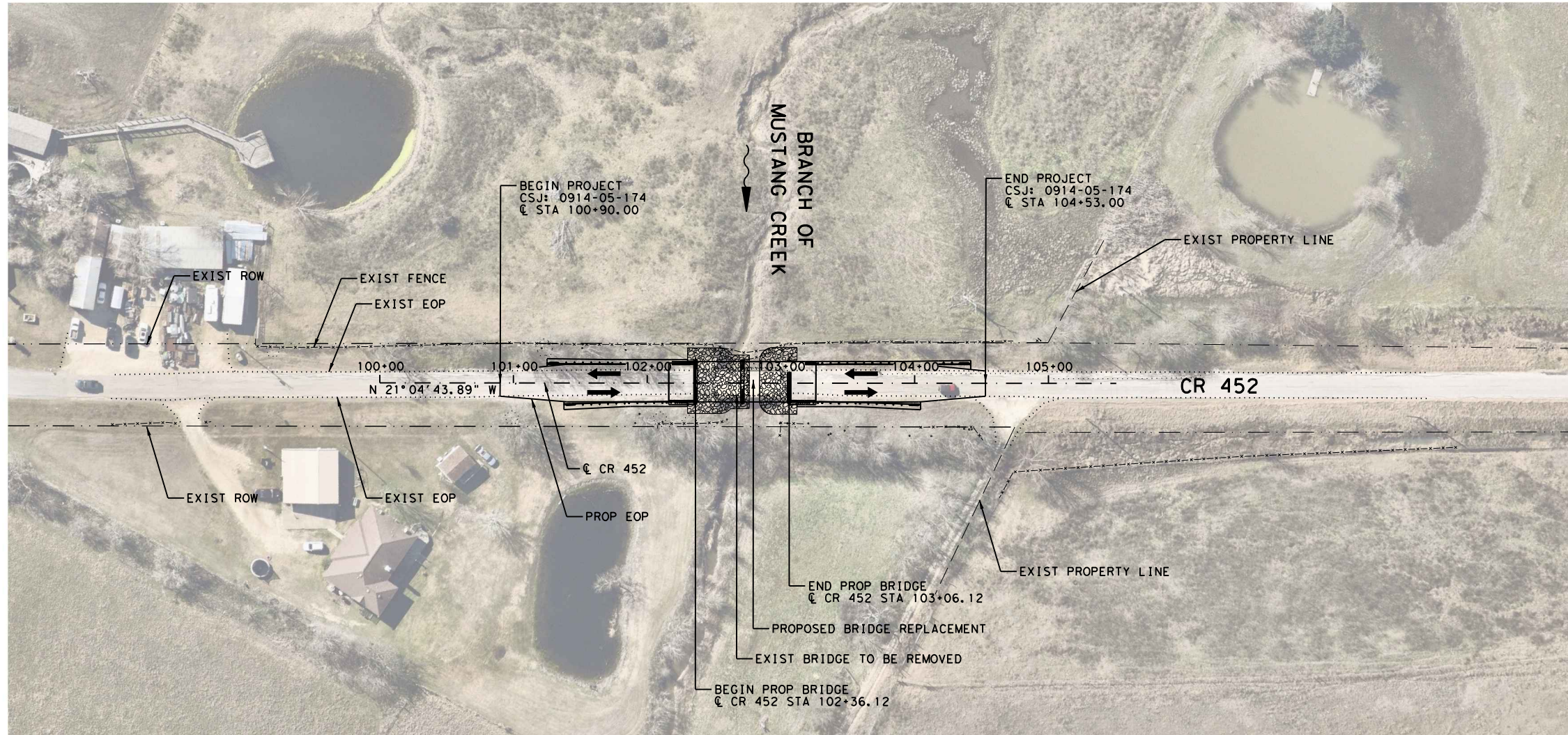
CR 452 AT BRANCH OF  
 MUSTANG CREEK  
 INDEX OF SHEETS


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©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		2




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TJN  
 11/3/2022  


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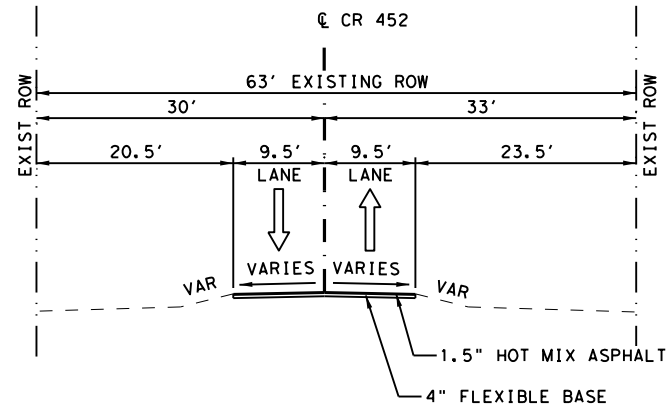
 Texas Department of Transportation

**CR 452 AT BRANCH OF MUSTANG CREEK  
 PROJECT LAYOUT**

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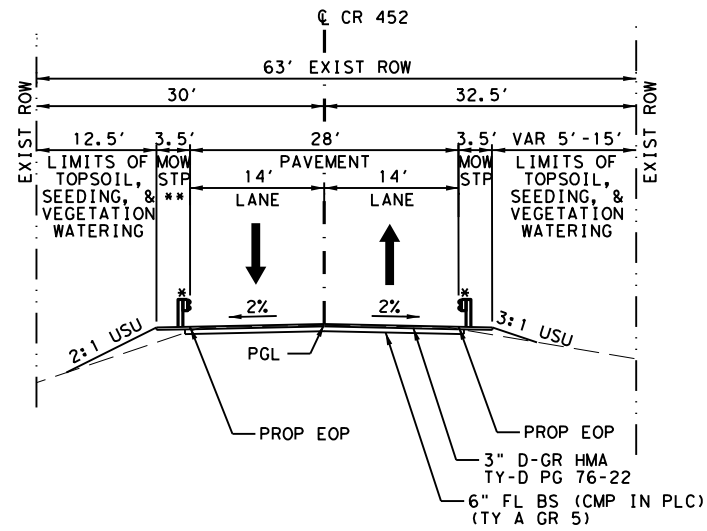
©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
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**EXISTING TYPICAL SECTION**

STA 100+90.00 TO STA 102+50.00  
 EXIST BRIDGE STA 102+50.00 TO STA 103+00.75  
 STA 103+00.00 TO STA 104+53.00



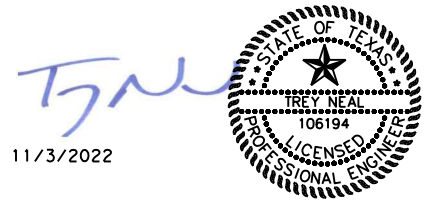
**PROPOSED TYPICAL SECTION**

STA 100+90.00 TO STA 102+36.12  
 STA 103+06.12 TO STA 104+53.00

\*SEE PLAN AND PROFILE FOR LIMITS OF MBGF  
 \*\*REDUCED MOW STRIP WIDTH STA 103+12.06 TO STA 104+42.00

**NOTES:**

1. PROPOSED BRIDGE FROM STATION 102+36.12 TO STATION 103+06.12. SEE BRIDGE TYPICAL SECTION FOR MORE INFORMATION.



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CR 452 AT BRANCH OF MUSTANG CREEK  
 TYPICAL SECTIONS

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**GENERAL NOTES: Version: November 4, 2022**

Item	Description	**Rate
**204	<b>Sprinkling</b> (Dust) (Item 132) (Item 247)	30 GAL/CY 30 GAL/CY 30 GAL/CY
**210	<b>Rolling (Flat Wheel)</b> (Item 247) (Item 316)	1 HR/200 TON 1 HR/6000 SY
**210	<b>Rolling (Tamping and Heavy Tamping)</b>	1 HR/200 CY
**210	<b>Rolling (Lt Pneumatic Tire)</b> (Item 132) (Item 247) (Item 316 - Seal Coat) (Item 316 - Two Course)	1 HR/500 CY 1 HR/200 TON 1 HR/6000 SY 1 HR/3000 SY
247	<b>Flexible Base (CMP IN PLC)</b>	132 LB/CF
310	<b>Prime Coat</b>	0.20 GAL/SY
314	<b>Emulsified Asphalt Treatment (SS-1 or MS-2)</b>	0.30 GAL/SY
316	<b>Underseals Asphalts (Multi Option)</b>	0.20 GAL/SY
	<b>Surface Treatments</b>	
	<b>Seal Coat</b>	
	<b>Grade 4</b>	
	Asphalt	0.38 GAL/SY
	Aggregate	1 CY/120 SY
	<b>Grade 5</b>	
	Asphalt	0.32 GAL/SY
	Aggregate	1 CY/150 SY
	<b>Two Course Surface Treatment</b>	
	Asphalt 1st Application	0.28 GAL/SY
	Asphalt 2nd Application	0.24 GAL/SY
	Aggregate 1st Application Grade 4	1 CY/110 SY
	Aggregate 2nd Application Grade 4	1 CY/130 SY
341/3076, 344/3077	<b>Dense-Graded Hot-Mix Asphalt and Superpave</b>	110 LB/SY/IN
342/3079	<b>Permeable Friction Course (PFC)</b>	90.0 LB/SY/IN
346/3080	<b>Stone-Matrix Asphalt</b>	113 LB/SY/IN
347/3081	<b>Thin Overlay Mixtures (TOM)</b> SAC B SAC A	113.0 LB/SY/IN 116.0LB/SY/IN
350	<b>Microsurfacing</b>	25 LB/SY
3084	<b>Bonding Course</b>	0.09 GAL/SY
3085	<b>UnderSeal Course</b>	0.20 GAL/SY
	<b>Tack Coat</b>	0.08 GAL/SY

\*\* For Informational Purposes Only

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**GENERAL**

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

Georgetown [Jason.Hudson@txdot.gov](mailto:Jason.Hudson@txdot.gov)  
Georgetown [John.Peters@txdot.gov](mailto:John.Peters@txdot.gov)

Questions and request for documents will be accepted via the Letting Pre-Bid Q&A web page. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:  
<https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors>

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

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

If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

The roadbed will be free of organic material prior to placing any section of the pavement structure. Equip all construction equipment used in roadway work with highly visible omnidirectional flashing warning lights.

Provide a smooth, clean sawcut along the existing asphalt or concrete pavement structure, as directed. Consider subsidiary to the pertinent Items.

Use a self-contained vacuum broom to sweep the roadway and keep it free of sediment as directed. The contractor will be responsible for any sweeping above and beyond the normal maintenance required to keep fugitive sediment off the roadway as directed by the Engineer.

Damage to existing pipes and SET's due to Contractor operations will be repaired at Contractor's expense.

All locations used for storing construction equipment, materials, and stockpiles of any type, within the right of way, will be as directed. Use of right of way for these purposes will be restricted to those locations where driver sight distance to businesses and side street intersections is not obstructed and at other locations where an unsightly appearance will not exist. The Contractor will not have exclusive use of right of way but will cooperate in the use of the right of way with the city/county and various public utility companies as required.

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Coordinate and obtain approval for all bridgework over existing roadways.

**Bridge Vertical Clearance and Traffic Handling.**

Notify TxDOT project staff and the local bridge engineer 10 business days prior to the following: change in vertical clearance, placing beams/girders over traffic, opening or removing traffic from a bridge or portion of a bridge, and completion of bridge work. This requirement includes bridge class culverts. Provide vertical clearance for all structures (including signal mast arms, span wires, and overhead sign bridge structures) within the project limit. Submit information and notices to local bridge engineer at [AUS\\_BRG\\_Notify@txdot.gov](mailto:AUS_BRG_Notify@txdot.gov).

During evacuation periods for Hurricane events the Contractor will cooperate with Department for the restricting of Lane Closures and arranging for Traffic Control to facilitate Coastal Evacuation Efforts.

**ITEM 5 – CONTROL OF THE WORK**

Place construction stakes at intervals of no more than 100 ft. This work is subsidiary.

**Precast Alternate Proposals.**

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 [Alternate Precast Proposal Submission \(txdot.gov\)](http://www.txdot.gov). 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.

**Electronic Shop Drawing Submittals.**

Submit electronic shop drawing submittals according to the current [Guide to Electronic Shop Drawing Submittal](https://www.txdot.gov/business/resources/specifications/shop-drawings.html) (<https://www.txdot.gov/business/resources/specifications/shop-drawings.html>) (TxDOT.gov Business > Resources - General > Shop Drawings). Pre-approved producers can be found online at TxDOT.gov > Business > Resources - Material Producer List. Use the following contact list for all submittals that are not required to be sent to Bridge Division and to copy the Engineer for all submittals to the Bridge Division.

Submittal Contact List

Georgetown [Jason.Hudson@txdot.gov](mailto:Jason.Hudson@txdot.gov) AUS\_GE-ShopReview@txdot.gov

**ITEM 6 - CONTROL OF MATERIALS**

Give a minimum of 1 business day notice for materials, which require inspection at the Plant.

For structures with paint containing hazardous materials, provide locations of material removal 60 days prior to begin removal. For metal elements to be removed, mechanical shear or unbolting for removal and disposal does not require paint abatement but requires 60 day advance notice.

For Federally Funded Contracts, comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, by submitting a notarized

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original of the TxDOT Construction Material Buy America Certification Form for all items classified as construction materials. This form is not required for materials classified as a manufactured product. Refer to the Buy America Material Classification Sheet, located at the following link, for clarification on material categorization. <https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html>

**ITEM 7 – LEGAL RELATIONS AND RESPONSIBILITIES**

TxDOT will coordinate with TDLR regarding pedestrian elements and sidewalks. The contractor will procure and provide all permits, licenses, and inspections; pay all charges, fees, and taxes regarding TDLR rules governing industrialized housing and buildings.

Roadway closures during key dates and/or special events are prohibited. See notes for Item 502 for the key dates and/or special events.

Refer to the Environmental Permits, Issues and Commitments (EPIC) plan sheets for additional requirements and permits.

When any abandoned well is encountered, cease construction operations in this area and notify the Engineer who will coordinate the proper plugging procedures. A water well driller licensed in the State of Texas must be used to plug a well.

Perform maintenance of vehicles or equipment at designated maintenance sites. Keep a spill kit on-site during fueling and maintenance. This work is subsidiary.

Maintain positive drainage for permanent and temporary work for the duration of the project. Be responsible for any items associated with the temporary or interim drainage and all related maintenance. This work is subsidiary.

Suspend all activities near any significant recharge features, such as sinkholes, caves, or any other subterranean openings that are discovered during construction or core sampling. Do not proceed until the designated Geologist or TCEQ representative is present to evaluate and approve remedial action.

Locate aboveground storage tanks kept on-site for construction purposes in a contained area as to not allow any exposure to soils. The containment will be sized to capture 150% of the total capacity of the storage tanks.

**Work over or near Bodies of Water (lakes, rivers, ponds, creeks, dry waterways, etc.).**

Keep on site a universal spill kit adequate for the body of water and the work being performed. Debris is not allowed to fall into the ordinary high-water level (OHWL). Debris that falls into the OHWL must be removed at the end of each work day. Debris that falls into the floodway must be removed at the end of each work week or prior to a rain event. Install and maintain traffic control devices to maintain a navigable corridor for water traffic, except during bridge demo and beam placement. This work is subsidiary.

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Obtain written approval from the Engineer for temporary fill or crossings not specifically addressed in the plans. Provide a signed sketch of the location 60 business days prior to begin work at the location. Complete and return any forms provided by TxDOT. Approval of the work is not guaranteed. Unapproved work is not a compensable impact.

**DSHS Asbestos and Demolition Notification.**

Complete and provide the Texas Department of State Health Services (DSHS) notification form to the Engineer and email to [AUS\\_BRG\\_Notify@txdot.gov](mailto:AUS_BRG_Notify@txdot.gov) at least 30 calendar days prior to bridge removal or renovation for each phase or step of work. Notify the Engineer via email of any changes to the work start and end dates.

**Migratory Birds and Bats.**

Migratory birds and bats may be nesting within the project limits and concentrated on roadway structures such as bridges and culverts. Remove all old and unoccupied migratory bird nests from any structures, trees, etc. between September 16 and February 28. Prevent migratory birds from re-nesting between March 1 and September 15. Prevention shall include all areas within 25 ft. of proposed work. All methods used for the removal of old nesting areas and the prevention of re-nesting must be submitted to TxDOT 30 business days prior to begin work. This work is subsidiary.

If active nests are encountered on-site during construction, all construction activity within 25 ft. of the nest must stop. Contact the Engineer to determine how to proceed.

**Tree and Brush Trimming and Removal.**

Work will be conducted September 16 thru February 28. Work conducted outside this timeframe will require a bird survey. Submit a survey request to TxDOT 30 business days prior to begin work.

No extension of time or compensation will be granted for a delay or suspension due to the above bird, bat and tree/brush requirements.

**Vegetation BMP**

- Minimize the amount of vegetation cleared. Removal of native vegetation, particularly mature native trees and shrubs should be avoided.
- The use of any non-native vegetation in landscaping and revegetation is discouraged. Locally adapted native species should be used.
- The use of seed mix that contains seeds from only regional ecotype native species is recommended.

**Water Quality BMP**

In addition to BMP required for a TCEQ Storm Water Pollution Prevention Plan and/or 401 Water Quality Certification:

- 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 stream crossings are unavoidable, remove stream crossings once they are no longer needed and stabilize banks and soils around the crossing.

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**Aquatic Amphibian and Reptile BMP**

- Minimize impacts to wetlands, temporary and permanent open water features, including depressions, and riverine habitats.
- Maintain the existing hydrologic regime and any 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 around wetlands and in riparian areas. If erosion control blankets or mats will be used, the product should not contain netting, but should only contain loosely woven natural fiber netting in which the mesh design allows the threads to move, therefore allowing expansion of the mesh openings. Plastic netting should be avoided.
- Project specific locations (PSLs) proposed within state-owned ROW should be located in uplands away from aquatic features.

**Terrestrial Amphibian and Reptile BMP**

- 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
- Avoid or minimize disturbing or removing cover objects, such as downed trees, rotting stumps, brush piles, and leaf litter. If avoidance or minimization is not practicable, consider removing cover objects prior to the start of the project and replace them at project completion.
- Examine heavy equipment stored on site before use, particularly after rain events when reptile and amphibian movements occur more often, to ensure use will not harm individuals that might be seeking temporary refuge.
- Due to increased activity (mating) of reptiles and amphibian during the spring, construction activities like clearing or grading should attempt to be scheduled outside of the spring (March-May) season. Also, timing ground disturbing activities before October when reptiles and amphibians become less active and may be using burrows in the project area is also encouraged.

**Back Up Alarm.**

For hours 9 P to 5 A, utilize a non-intrusive, self-adjusting noise level reverse signal alarm. This is not applicable to hotmix or seal coat operations. This is subsidiary.

**ITEM 100 - PREPARING RIGHT OF WAY**

Prep ROW must not begin until accessible trees designated for preservation have been protected, items listed in the EPIC have been addressed, and SW3P controls installed in accessible areas.

Backfill material will be Type B Embankment using ordinary compaction.

Follow Item 752.4 Work Methods and Item 752 general notes when removing or working on or near trees and brush.

Unless shown otherwise in the plans or a designated non-mow area, perform trimming or removal for areas within 30 ft. of edge of pavement under construction. Trim or remove to provide minimum of 5 ft. of horizontal clearance and 7 ft. of vertical clearance for the following:



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sidewalks, paths, guard fence, rails, signs, object markers, and structures. Trim to provide a minimum of 14 ft. vertical clearance under all trees. This work is subsidiary.

**ITEM 105 – REMOVING TREATED AND UNTREATED BASE AND ASPHALT PAVEMENT**

Existing typical is based on information available. This typical may not account for all maintenance work such as overlays or pavement repairs. A change in material type or thickness does not warrant additional payment. Payment is full compensation for removing all material to the depth specified.

**ITEM 110 – EXCAVATION**

The Engineer will define unsuitable material.

**ITEM 132 – ALL EMBANKMENT**

At no time will the retaining wall backfill material exceed the adjacent embankment operation by more than one lift. At no time will the embankment adjacent to the retaining wall backfill exceed the wall backfill by any elevation. Embankment placed over the area of MSE backfill must meet the same backfill requirements for the type specified under Item 423.

The Engineer will define unsuitable material. Material which the Contractor might deem to be unsuitable due to moisture content will not be considered unsuitable material.

Prior to begin embankment of existing area, correct or replace unstable material to a depth of 6 in. below existing grade. Embankment areas will be inspected prior to beginning work.

Rock or broken concrete produced by the project is allowed in earth embankments. The size of the rock or broken concrete will not exceed the layer thickness requirements in Section 132.3.4., "Compaction Methods." The material will not be placed vertically within 5 ft. of the finished subgrade elevation.

Embankment placed vertically within 5 ft. of the finished subgrade elevation or within the edges of the subgrade and treated with lime, cement, or other calcium based additives must have a sulfate content less than 3000 ppm. Allow 5 business days for testing. Treatment of sulfate material 3000 ppm to 7000 ppm requires 7 days of mellowing and continuous water curing, in accordance TxDOT guidelines for Treatment of Sulfate-Rich Soils and Bases in Pavement Structures (9/2005). Material over 7000 ppm is not allowed.

**ITEM 160 - TOPSOIL**

Off-site topsoil will have a minimum PI of 25.

No Sandy Loam allowed.

Obtain approval of the actual depth of the topsoil sources for both on-site and off-site sources. Construct topsoil stockpiles of no more than five (5) feet in height.

It is permissible to use topsoil dikes for erosion control berms within the right of way, as directed.

General Notes

Sheet G

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Seed or track slopes within 14 days of placement.

Salvage topsoil from sites of excavation and embankment. Maximum salvage depth is 6 inches.

Windrowing of topsoil obtained from the Right of Way (ROW) is not allowed.

**ITEM 168 – VEGETATIVE WATERING**

Water all areas of project to be seeded or sodded.

Maintain the seedbed in a condition favorable for the growth of grass. Watering can be postponed immediately after a rainfall on the site of ½ inch or greater, but will be resumed before the soil dries out. Continue watering until final acceptance.

Vegetative watering rates and quantities are based on ¼ inch of watering per week over a 3-month watering cycle. The actual rates used and paid for will be as directed and will be based on prevailing weather conditions to maintain the seedbed.

Obtain water at a source that is metered (furnish a current certification of the meter being used) or furnish the manufacturer's specifications showing the tank capacity for each truck used. Notify the Engineer, each day that watering takes place, before watering, so that meter readings or truck counts can be verified.

**ITEM 169 – SOIL RETENTION BLANKETS**

Type A blankets containing straw fibers are not allowed. Type B and D blankets shall be a spray type blanket.

**ITEM 247 - FLEXIBLE BASE**

The layer thickness will be 4 in. to 6 in. unless shown on the plans. Placing in a single layer is allowed when total thickness of base is 8 in. or less. When placed in multiple layers, compact the bottom and middle layers to at least 95% and 98% of the maximum dry density, respectively. When placed in a single layer or the final layer, compact to at least 100%.

Correction of subgrade soft spots is subsidiary.

Complete per plans the subgrade, ditches, slopes, and drainage structures prior to the placement of base.

Do not use a vibratory roller to compact base placed directly on top of a drainage structure.

Grade 4 will have the same material requirements as Grade 5 except minimum compressive strength at lateral pressure 3 psi will be 70 psi and at lateral pressure 15 psi will be 150 psi. Grade 4 does not have a minimum compressive strength at lateral pressure 0 psi.

Flex base may use ordinary compaction. Proof rolling of the base is required and subsidiary.

General Notes

Sheet H

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**ITEMS 341, 344, & 3076 THRU 348/3082 - HOT-MIX ASPHALT PAVEMENT**

Core holes may be filled with an Asphaltic patching material meeting the requirements of DMS-9203 or with SCM meeting requirements of DMS-9202.

Install transverse butt joints with 50 ft. H: 1 in. V transition from the new ACP to the existing surface. Install a butt joint with 24 in. H: 1 in. V transition from the new ACP to a driveway, pullout or intersection. Saw cut the existing pavement at the butt joints. This work is subsidiary.

Use a device to create a maximum 3H:1V notched wedge joint on all longitudinal joints of 2 in. or greater. This work is subsidiary.

Prior to milling, core the existing pavement to verify thickness. This work is subsidiary.

Ensure placement sequence to avoid excess distance of longitudinal joint lap back not to exceed one day's production rates.

Submit any proposed adjustments or changes to a JMF before production of the new JMF.

Tack every layer. Do not dilute tack coat. Apply it evenly through a distributor spray bar.

Provide a minimum transition of 10' for intersections, 10' for commercial driveways, and 6' for residential driveways unless otherwise shown on the plans.

Irregularities will require the replacement of a full lane width using an asphalt paver. Replace the entire subplot if the irregularities are greater than 40% of the subplot area.

Lime or an approved anti-stripping agent must be used when crushed gravel is utilized to meet a SAC "A" requirement.

When using RAP or RAS, include the management methods of processing, stockpiling, and testing the material in the QCP submitted for the project. If RAP and RAS are used in the same mix, the QCP must document that both of these materials have dedicated feeder bins for each recycled material. Blending of RAP and RAS in one feeder bin or in a stockpile is not permitted.

Asphalt content and binder properties of RAP and RAS stockpiles must be documented when recycled asphalt content greater than 20% is utilized.

No RAS is allowed in surface courses.

Department approved warm-mix additives is required for all surface mix application when RAP is used. Dosage rates will be approved during JMF approval.

The Hamburg Wheel Test will have a minimum rut depth of 3mm except for SMA with HPG or PG 76.

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**ITEMS 341/3076 - DENSE-GRADED HOT-MIX ASPHALT**

Use the SGC for design and production testing of all mixtures. Design all Type D mixtures as a surface mix, maximum 15% RAP and no RAS. Contractor may not use a substitute PG binder for 76-22. When using substitute binders, mold specimens for mix design and production at the temperature required for the substitute binder used to produce the HMA.

The Hamburg Wheel minimum number of passes for PG 64 or lower is reduced to 7,000. The Engineer may accept Hamburg Wheel test results for production and placement if no more than 1 of the 5 most recent tests is below the specified number of passes and the failing test is no more than 2,000 passes below the specified number of passes.

**ITEM 400 - EXCAVATION AND BACKFILL FOR STRUCTURES**

Unless shown on the plans, the following backfill will apply to cutting and restoring flexible pavement. Backfill with cement-stabilized backfill. The cement-stabilized backfill is subsidiary. Cap the backfill with Type B hot-mix to a depth equal to the adjacent hot-mix. At locations where the backfill surface is final, place 1-1/2 in. Type D for the surface. The minimum hot-mix depth will be 4 in.

Unless shown on the plans, flowable fill option 1 item will be used for pavement widening.

Saw-cut the pavement at the edge of the excavation. This work is subsidiary.

Backfill the bridge ends in accordance with the limits shown on TxDOT "CSAB" Standard. Use material in accordance with "CSAB" or Item 423, Type BS. The "CSAB" optional bond breaker materials are allowed. This work is subsidiary.

**ITEM 416 - DRILLED SHAFT FOUNDATIONS**

Stake all Foundations, for approval, before beginning drilling operations.

Calculate the vertical signal head clearance before placing any signal pole foundation.

For mast-arm signal and strain pole anchor bolts, set two in tension and two in compression.

Obtain approval of placement prior to placing concrete.

Remove spoils from a flood plain at the end of each workday.

**ITEMS 420, 425, 441, & 462 - STRUCTURES**

**Bridge Vertical Clearance and Traffic Handling.**

Notify TxDOT project staff and the local bridge engineer 10 business days prior to the following: change in vertical clearance, placing beams/girders over traffic, opening or removing traffic from a bridge or portion of a bridge, and completion of bridge work. This requirement includes bridge class culverts. Provide vertical clearance for all structures (including signal mast arms, span wires, and overhead sign bridge structures) within the project limit. Submit information and notices to local bridge engineer at [AUS\\_BRG\\_Notify@txdot.gov](mailto:AUS_BRG_Notify@txdot.gov).

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**ITEM 420 – CONCRETE SUBSTRUCTURES**

Do not use PMDF in areas where a “Free Joint” is indicated in the plans.  
Check the sign plans for locations of clearance signs and brackets on structures, which will require inserts in the pre-stressed beams.  
Where Retaining Walls are integral parts of the abutment header, do not place the abutment cap prior to backfilling the wall and the abutment area up to the elevation of the bottom of the abutment cap.

Mass placements are defined as placements with a least dimension greater than or equal to 5 ft., or designated elsewhere on the plans.

The “H” values shown on Bridge Layouts are estimated column heights. Calculate the actual column heights based on field conditions.

Perform work during good weather unless otherwise directed. If work is performed at Contractor’s option, when inclement weather is impending, and the work is damaged by the weather, the Contractor is responsible for all costs associated with repairs/replacement.

Upon completion of the structure, stencil the National Bridge Inventory (NBI) number (structure number) using black paint and 4 in. tall numbers at 4 locations designated by TxDOT. This work is subsidiary.

Bonding agents are required at construction joints. Do not use membrane curing for structural concrete as defined in Item 421, Table 8.  
Remove all loose Formwork and other Materials from the floodplain or drainage areas daily.

**ITEM 432 - RIPRAP**

Mow strip riprap will be 4 in. and all other riprap will be 5 in. unless otherwise shown on the plans. Mow strip for cable barrier may be placed monolithically with the barrier foundations if using concrete in accordance with Item 543. Fiber reinforcement is not allowed except in mow strip for cable barrier if foundation and mow strip are placed monolithically. GFRP is allowed reinforcement for all applications.

Saw-cut existing riprap then epoxy 12 in. long No. 3 or No. 4 bars 6 in. deep at a maximum spacing of 18 in. in each direction to tie new riprap to existing riprap. This work is subsidiary. Provide Type A Grade 3 or 5 flexible base for cement stabilized riprap. Compressive strengths for flexible base are waived.

SGT approach taper, paid for using mow strip item, will be installed using concrete, flexible base coated with SS-1 at a rate of 0.12 GAL/SY, or HMA Type B/C/D. Placement will be ordinary compaction and does not require placement using an asphalt paver.

**ITEM 450 - RAILING**

Use the elliptical tube option for rails T401, T402, and C402.

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**ITEM 454 - BRIDGE EXPANSION JOINTS**

Apply protection System II in accordance with Item 446 to armor joint.

**ITEM 502 - BARRICADES, SIGNS, AND TRAFFIC HANDLING**

Table 1

Roadway	Limits	Allowable Closure Time
IH 35	All (1 lane closed)	9 P to 5 A
IH 35	All (2 lanes closed, see allowable work below)	9 P to 5 A
IH 35	All (2 lanes closed, all work)	11 P to 5 A
SH 45	US 183 to SH130	8 P to 5 A
LP 1	William Cannon to Parmer Lane	8 P to 5 A
US 183	SH 29 to FM 1327	8 P to 5 A
SH 71	SH 130 to IH 35	8 P to 5 A
SH 71	SH 304 to Tahitian Drive	8 P to 5 A
SH 71	US 290 W to RM 3238	8 P to 5 A
US 290 W	IH 35 to Nutty Brown Rd	8 P to 5 A
US 290 E	IH 35 to SH 95	8 P to 5 A
FM 734	FM 1431 to US 290 E	8 P to 5 A
US 79	IH 35 to Bus 79 in Taylor	8 P to 5 A
RM 1431	Lohmans Ford Rd to IH 35	8 P to 5 A
SH 29	LP 332 western terminus to SH 130	8 P to 5 A
SH 80	Charles Austin to River Road	8 P to 5 A
RM 2222	All	8 P to 5 A
RM 620	All	8 P to 5 A
RM 2244	All	8 P to 5 A
SPUR 69	All	8 P to 5 A
LP 360	All	8 P to 5 A
LP 343	All	8 P to 5 A
LP 275	All	8 P to 5 A
FM 1325	All	8 P to 5 A
All	Within 200’ of a signalized intersection	9 P to 5 A
All	All (Full Closure, see allowable work below)	11 P to 4 A

Table 2

Roadway	Limits	Allowable Closure Time
CR 452	CR 452 at Branch of Mustang Creek to STR# 14-246-0-AA04-13-001	8 P to 6 A

Table 3 (Mobile Operations)

Roadway	Allowable Sun Night thru Fri Noon	Allowable Sat thru Sun Morn
Within Austin City Limits	10 A to 2 P and 7 P to 6 A	7 P to 10 A
Outside Austin City Limits	9 A to 3 P and 7 P to 7 A	6 P to 11 A
IH 35 main lanes	10 P to 5 A	9 P to 9 A
AADT over 50,000	8 P to 6 A	8 P to 10 A



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For roadways without defined allowable closure times, nighttime lane closures will be allowed from 8 P to 6 A. Unless stated, daytime or Friday night lane closures will not be allowed and one lane in each direction will remain open at all times for all roadways.

Two lanes closed on IH 35 allowed to begin at 9 P for main lane (shoulder work not included) hotmix overlay or pavement repair operations (does not include bridge joint work).

Full closures only allowed Friday night thru Monday morning for bridge beam installation, bridge demolition, or OSB truss removal/installation. Full closures only allowed for roadways with frontage roads or if a designated detour route is provided in the plans.

No closures will be allowed on the weekends, working day prior, and working day after the National Holidays defined in the Standard Specifications, Good Friday, and Easter weekend. Closures the Sunday of the Super Bowl will not be allowed from 1 P to 11 P. No closures will be allowed on Friday and the weekends for projects within 20 miles of Formula 1 at COTA, ACL Fest, SXSW, ROT Rally, UT home football games (includes games not on a Friday or weekend), sales tax holiday, Dell Match Play (includes Thursday), Rodeo Austin, or other special events that could be impacted by the construction. All lanes will be open by noon of the day before these special events.

To account for directional traffic volumes, begin and end times of closures may be shifted equally by the Engineer. The closure duration will remain. Added compensation is not allowed.

Submit an emailed request for a lane closure (LCN) to TxDOT. The email will be submitted in the format provided. Receive concurrence prior to implementation. Submit a cancellation of lane closures a minimum of 18 hours prior to implementation. Blanket requests for extended periods are not allowed. Max duration of a request is 2 weeks prior to requiring resubmittal.

Provide 2 hour notice prior to implementation and immediately upon removal of the closure.

For roadways listed in Table 1: Submit the request 96 hours prior to implementation.

For roadways not listed in Table 1: Submit the request a minimum of 48 hours prior to the closure and by the following deadline immediately prior to the closure: 11A on Tuesday or 11A on Friday. For all roadways: Submit request for traffic detours and full roadway closures 168 hours prior to implementation. Submit request for nighttime work 96 hours to implementation date.

Cancellations of accepted closures (not applicable to full closures or detours) due to weather will not require resubmission in accordance with the above restrictions if the work is completed during the next allowable closure time.

Closures that conflict with adjacent contractor will be prioritized according to critical path work per latest schedule. Conflicting critical path or non-critical work will be approved for first LCN submitted. Denial of a closure due to prioritization or other reasons will not be reason for time suspension, delay, overhead, etc.

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Meet with the Engineer prior to lane closures to ensure that sufficient equipment, materials, devices, and workers will be used. Take immediate action to modify current and future traffic control, if at any time the queue becomes greater than 20 minutes.

Consider inclement weather prior to implementing the lane closures. Do not set up traffic control when the pavement is wet.

Cover, relocate, or remove existing small, large, and overhead signs that conflict with traffic control. Cover large and overhead signs to remain using latest standard TS-CD. This work is subsidiary.

Install all permanent signs, delineation, and object markers required for the operation of the roadway before opening to traffic. Use of temporary mounts is allowed or may be required until the permanent mounts are installed or not impacted by construction. Maintain the temporary mounts. This work is subsidiary.

Place a 28-inch cone, meeting requirements of BC (10), on top of foundations that have protruding studs. This work is subsidiary.

A series of sequential flashing warning lights, per BC(7), must be installed in a merging taper for long term stationary TCP. This includes all TCP setups, such as those shown on the plans or TCP setups per the standards.

Edge condition treatment types must be in accordance with the TxDOT standard. Installation and removal of a safety slope is subsidiary.

To determine a speed limit or an advisory speed limit, submit a request to TxDOT 60 business days prior to manufacture of the sign.

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

#### ITEM 504 - FIELD OFFICE AND LABORATORY

Projects with HMA, furnish a Type D structure for the Engineer's exclusive use. The structure will include high speed internet service with WIFI signal, one desk, two chairs, and one file cabinet. Provide a minimum of three 120-volt circuits with 20-amp breakers and at most two grounded convenience outlets per circuit.

#### ITEM 506 - TEMPORARY EROSION, SEDIMENTATION, AND ENV CONTROLS

If SW3P plan sheets are not provided, place the control measures as directed.

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Install, maintain, remove control measures in areas of the right of way utilized by the Contractor that are outside the limits of disturbance required for construction. Permanently stabilize the area. This work is subsidiary.

Erosion control measures must be initiated immediately in areas where construction activities have ceased and will not resume for a period exceeding 14 calendar days. Vertical track all exposed soil, stockpiles, and slopes. Re-track after each rain event or every 14 days, whichever occurs first. Sheep foot roller is allowed for vertical tracking. This work is subsidiary.

Unless a specific pay item is provided in the plans, the installation of the 6:1 or flatter for RFD side slopes in the safety zone will be subsidiary to pertinent bid items.

**ITEMS 540, 542, & 544 - METAL BEAM GUARD FENCE AND GUARDRAIL END TREATMENTS**

Furnish round timber posts for guard fence. Steel posts for low fill culvert applications is subsidiary including use of low fill culvert application due to other concrete structures such as inlets. Long span application at inlets may be used as an alternate to low fill culvert. Unless otherwise specified on the plans, use of low fill culvert or long span at inlets will be subsidiary to pertinent items. Stake the locations for approval before installation. Adjust the limits of the fence to meet field conditions. Install delineators before opening the road to traffic.

Retain all materials. Existing materials that are structurally sound and dent free may be reused. All reused material will be from this project and in compliance with current standards. Structurally sound rust spots with the largest dimension of 4 in. may be cleaned and repaired in accordance with Section 540.3.5. Punch or field drill holes in the metal rail element to accommodate post spacing. Additional holes for splice or connections are not allowed. Space the field holes in accordance with the latest standard but no closer than the minimum spacing shown on the current standard.

Remove, replace, and install mow strip block out material. Construct new block outs and backfill unused block outs with class B concrete. This work is subsidiary.

Repair of mow strip damage, not caused by contractor negligence, and installation of new mow strip will be paid with appropriate bid items. Backfill and shoulder up of area around fence and mow strip will be paid using embankment item.

**ITEM 644 – SMALL ROADSIDE SIGN ASSEMBLIES**

Triangular slip base that use set screws to secure the post will require 1 of the set screws to penetrate the post by drilling a hole in the post at the location of the screw. All set screws shall be treated with anti-seize compound.

**ITEM 658 – DELINEATOR AND OBJECT MARKER ASSEMBLIES**

Installation and maintenance of portable CTB reflectors will be subsidiary to the barrier.

Flexible posts YFLX and WFLX must be tubular in shape. The “flat” flexible posts are not allowed.

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**ITEM 666 - RETROREFLECTORIZED PAVEMENT MARKINGS**

Notify the Engineer at least 24 hr. before beginning work.

Place longitudinal markings nightly for IH 35 main lanes or roadways with AADT greater than 100,000. Use of temporary flexible reflective roadway marker tabs is subsidiary and at the Contractor's option. Replace missing or damaged tabs nightly. If using tabs, place longitudinal markings weekly by 5 AM Friday for all weekday work and by 5 AM Monday for all weekend work. Failure to maintain tabs or place longitudinal markings by deadline will require nightly placement of longitudinal markings.

Place longitudinal markings no later than 7 calendar days after placement of the surface for roadways with AADT greater than 20,000.

When the raised portion of a profile marking is placed as a separate operation from the pavement marking, the raised portion must be placed first then covered with TY I.

When using black shadow to cover existing stripe apply a non-retroreflective angular abrasive bead drop. The marking color shall be adjusted to resemble the pavement color. If Item 677 is not used prior to placement of black shadow, scrape the top of the marking with a blade or large piece of equipment unless surface is a seal coat. The scraping of the marking is subsidiary.

**ITEM 752 – TREE AND BRUSH REMOVAL**

Follow Item 752.4 Work Methods and Item 752 general notes when removing or working on or near trees and brush even if Item 752 is not included as a pay item.

Flailing equipment is not allowed. Burning brush is not allowed in urban areas or on ROW. Use hand methods or other means of removal if doing work by mechanical methods is impractical.

Prior to begin tree pruning, send email confirmation to the Engineer that training and demonstration of work methods has been provided to the employees. This work is subsidiary.

Shredded vegetation may be blended, at a rate not to exceed 15 percent by volume, with Item 160 if the maximum dimension is not greater than 2 in.

**ITEM 6001 – PORTABLE CHANGEABLE MESSAGE SIGN**

Provide 1 PCMS. Provide a replacement within 12 hours. PCMS will be available for traffic control, event notices, roadway conditions, service announcements, etc.

Place PCMS 10 calendar days prior to begin work stating “Road Work Begin Soon, Contact 832-7000 For Info”.

Place PCMS at time of LCN request. Place the PCMS at the expected end of queue caused by the closure. When the closure is active, revise the message to reflect the actual condition during the closure, such as “RIGHT LN CLOSED XXX FT”.



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0914-05-174

DISTRICT Austin  
HIGHWAY CR 452

COUNTY Williamson

CONTROL SECTION JOB				0914-05-174		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00040067			
COUNTY				Williamson			
HIGHWAY				CR 452			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	100-6002	PREPARING ROW	STA	3.630		3.630	
	105-6071	REMOVING STAB BASE & ASPH PAV (5" - 6")	SY	649.000		649.000	
	110-6001	EXCAVATION (ROADWAY)	CY	70.000		70.000	
	132-6005	EMBANKMENT (FINAL)(ORD COMP)(TY C)	CY	267.000		267.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	682.000		682.000	
	164-6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	SY	682.000		682.000	
	164-6071	BROADCAST SEED (TEMP)(WARM OR COOL)	SY	682.000		682.000	
	168-6001	VEGETATIVE WATERING	MG	1.200		1.200	
	169-6003	SOIL RETENTION BLANKETS (CL 1) (TY C)	SY	682.000		682.000	
	247-6366	FL BS (CMP IN PLC)(TY A GR 5)(FNAL POS)	CY	123.000		123.000	
	400-6005	CEM STABIL BKFL	CY	81.000		81.000	
	416-6002	DRILL SHAFT (24 IN)	LF	249.000		249.000	
	420-6013	CL C CONC (ABUT)	CY	19.800		19.800	
	420-6029	CL C CONC (CAP)	CY	7.600		7.600	
	420-6037	CL C CONC (COLUMN)	CY	2.800		2.800	
	422-6007	REINF CONC SLAB (SLAB BEAM)	SF	2,106.000		2,106.000	
	422-6015	APPROACH SLAB	CY	54.000		54.000	
	425-6010	PRESTR CONC SLAB BEAM (5SB12)	LF	414.020		414.020	
	432-6031	RIPRAP (STONE PROTECTION)(12 IN)	CY	588.000		588.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	19.300		19.300	
	450-6006	RAIL (TY T223)	LF	164.000		164.000	
	454-6004	ARMOR JOINT (SEALED)	LF	59.000		59.000	
	496-6009	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	EA	1.000		1.000	
	496-6043	REMOV STR (SMALL FENCE)	LF	55.000		55.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	6.000		6.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	100.000		100.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	LF	68.000		68.000	
	506-6004	ROCK FILTER DAMS (INSTALL) (TY 4)	LF	100.000		100.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	368.000		368.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	592.000		592.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	592.000		592.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	100.000		100.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	100.000		100.000	
	506-6053	ROCK FILTER DAMS (INSTALL) (TY 2) (6:1)	LF	100.000		100.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	150.000		150.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	



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DISTRICT	COUNTY	CCSJ	SHEET
Austin	Williamson	0914-05-174	6





# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0914-05-174

DISTRICT Austin  
HIGHWAY CR 452

COUNTY Williamson

CONTROL SECTION JOB				0914-05-174		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00040067			
COUNTY				Williamson			
HIGHWAY				CR 452			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000	
	552-6008	WIRE FENCE (WATER GAP)	LF	55.000		55.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	4.000		4.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	6.000		6.000	
	658-6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	4.000		4.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	12.000		12.000	
	666-6345	REF PROF PAV MRK TY I(Y)4"(SLD)(100MIL)	LF	363.000		363.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	9.000		9.000	
	3076-6072	D-GR HMA TY-D PG 76-22 (EXEMPT)	TON	122.000		122.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	30.000		30.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

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SUMMARY OF ROADWAY ITEMS								
LOCATION	0100 6002	0247 6366	0432 6045	0540 6001	0540 6006	0544 6001	0552 6008	3076 6072
	PREPARING ROW	FL BS (CMP IN PLC) (TY A GR 5) (FNAL POS)	RIPRAP (MOW STRIP) (4 IN)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	WIRE FENCE (WATER GAP)	D-GR HMA TY-D PG76-22 (EXEMPT)
	STA	CY	CY	LF	EA	EA	LF	TON
CR 452	3.63	123	19.3	150	4	4	55	122
<b>TOTAL</b>	<b>3.6</b>	<b>123</b>	<b>19.3</b>	<b>150</b>	<b>4</b>	<b>4</b>	<b>55</b>	<b>122</b>

SUMMARY OF SIGNING AND PAVEMENT MARKING ITEMS							
LOCATION	0644 6001	0644 6076	0658 6014	0658 6060	0658 6062	0666 6345	0672 6009
	IN SM RD SN SUP&AM TY10BWG (1) SA (P)	REMOVE SM RD SN SUP&AM	INSTL DEL ASSM (D-SW) SZ (BRF) CTB (BI)	REMOVE DELIN & OBJECT MARKER ASSMS	INSTL DEL ASSM (D-SW) SZ1 (BRF) GF2 (BI)	REFL PROF PAV MRK TY I (Y) 4" (SLD) (100 MIL)	REFL PAV MRKR TY II-A-A
	EA	EA	EA	EA	EA	LF	EA
CR 452	1	4	6	4	12	363	9
<b>TOTAL</b>	<b>1</b>	<b>4</b>	<b>6</b>	<b>4</b>	<b>12</b>	<b>363</b>	<b>9</b>

SUMMARY OF EARTHWORK ITEMS		
STATION TO STATION	0110 6001	0132 6003
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)
	CY	CY
100+90.00 TO 101+00.00	5	1.9
101+00.00 TO 101+50.00	5	41.5
101+50.00 TO 102+00.00	5	67.7
102+00.00 TO 102+36.00	35.2	33.4
102+36.00 TO 103+07.00	BRIDGE	
103+07.00 TO 103+50.00	34.4	22.9
103+50.00 TO 104+00.00	5	58.3
104+00.00 TO 104+50.00	5	40.6
104+50.00 TO 104+53.00	5	0.7
<b>TOTAL</b>	<b>69.6</b>	<b>266.3</b>

SUMMARY OF EROSION CONTROL ITEMS															
LOCATION	0160 6003	0164 6003	0164 6071	0168 6001	0169 6003	0506 6002	0506 6003	0506 6004	0506 6011	0506 6038	0506 6039	0506 6041	0506 6043	0506 6053	
	FURNISHING AND PLACING TOPSOIL (4")	BROADCAST SEED (PERM) (RURAL) (CLAY)	BROADCAST SEED (TEMP) (WARM OR COOL)	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY C)	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (INSTALL) (TY 4)	ROCK FILTER DAMS (REMOVE)	TEMP SDMT CONT FENCE (INSTALL)	TEMP SDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)	ROCK FILTER DAMS (INSTL) (TY 2) (6:1)	
	SY	SY	SY	MG	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	
CR 452	682	682	682	1.2	682	100	68	100	368	592	592	100	100	100	
<b>TOTAL</b>	<b>682</b>	<b>682</b>	<b>682</b>	<b>1.2</b>	<b>682</b>	<b>100</b>	<b>68</b>	<b>100</b>	<b>368</b>	<b>592</b>	<b>592</b>	<b>100</b>	<b>100</b>	<b>100</b>	

SUMMARY OF REMOVAL ITEMS			
LOCATION	0105 6071	0496 6009	0496 6043
	REMOVING STAB BASE & ASPH PAV (5"-6")	REMOV STR (BRIDGE 0-99 FT LENGTH)	REMOV STR (SMALL FENCE)
	SY	EA	LF
CR 452	649	1	55
<b>TOTAL</b>	<b>649</b>	<b>1</b>	<b>55</b>

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS		
LOCATION	0502 6001	6001 6001
	BARRICADES, SIGNS AND TRAFFIC HANDLING	PORTABLE CHANGEABLE MESSAGE SIGN
	MO	DAY
CR 452	6	30
<b>TOTAL</b>	<b>6</b>	<b>30</b>

**Kimley»Horn** F-928

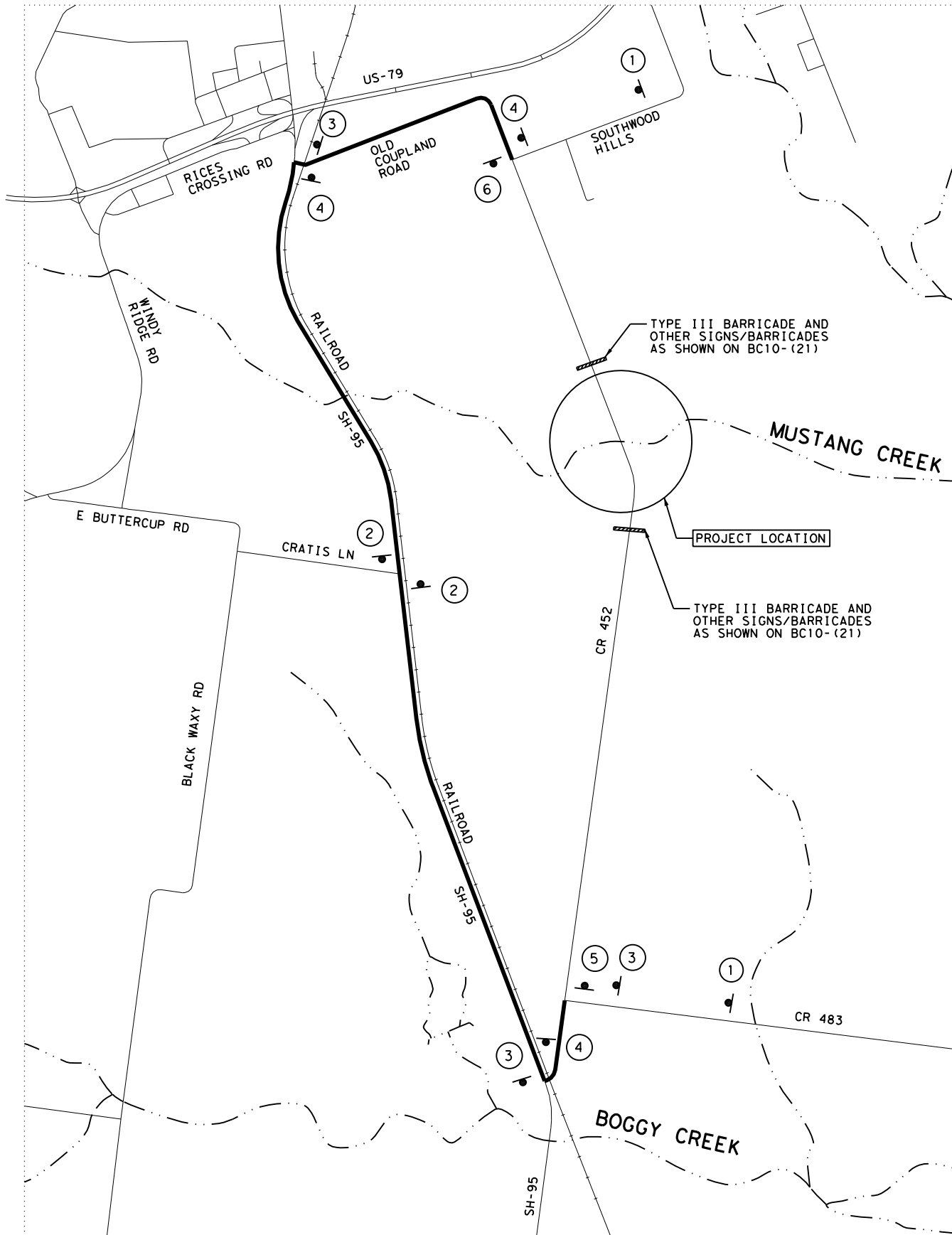
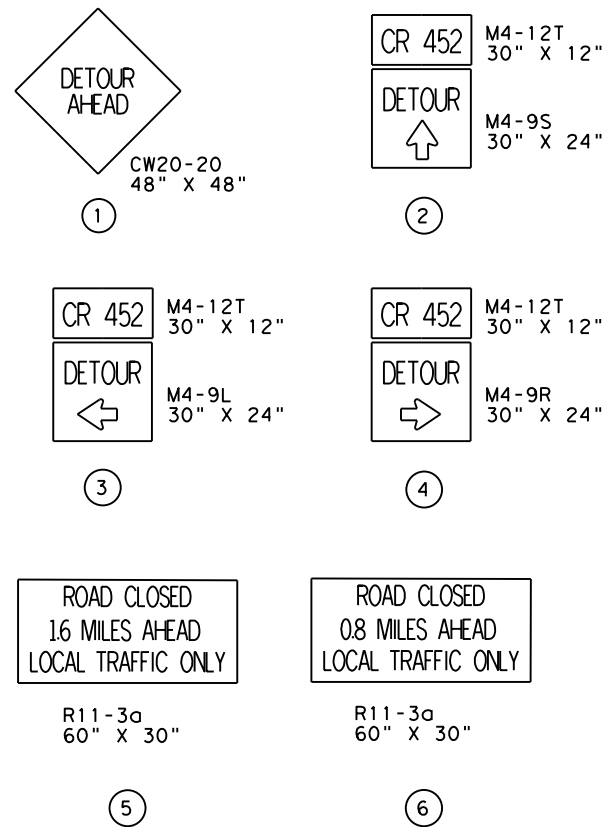


**CR 452 AT BRANCH OF  
MUSTANG CREEK  
QUANTITY SUMMARY**

SHEET 1 OF 1

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	7	

FILENAME: pw:\kh-pw-bentley.com\kh-pw-01\Documents\01 Active Projects\TX-AUS-069284003 - Williamson County Bridges\DesignData\4 - Design\Plan Set\2. Traffic Control Plan\CR 452\CR452\_TCP\_DET.dgn  
 PLOTTED: 11/3/2022 3:31:23 PM



**GENERAL NOTES:**

1. NOTIFY THE PROPER CITY, COUNTY, EMERGENCY MEDICAL SERVICES, FIRE DEPARTMENT, POLICE DEPARTMENT, TEXAS DEPARTMENT OF PUBLIC SAFETY AND THE ENGINEER WHEN MAJOR TRAFFIC CHANGES ARE TO BE PERFORMED. THE NOTIFICATION MUST BE PROVIDED AT LEAST FOURTEEN (14) DAYS PRIOR TO THE CHANGE.

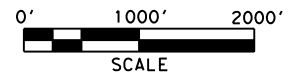
**TCP NARRATIVE**

1. PLACE WORK ZONE APPROACH SIGNAGE IN ACCORDANCE WITH BC STANDARD SHEETS.
2. PLACE DETOUR SIGNAGE AND BARRICADES AS NOTED ON DETOUR LAYOUT.
3. PLACE EROSION CONTROL MEASURES AS NOTED ON SW3P SHEETS.
4. REMOVE EXISTING COUNTY ROAD 452 BRIDGE, AS SHOWN IN THE PLANS.
5. CONSTRUCT PROPOSED COUNTY ROAD 452 BRIDGE, AS SHOWN IN THE PLANS.
6. REOPEN ROAD UPON COMPLETION OF CONSTRUCTION.

SIGNS MAY BE ADJUSTED TO FIT EXISTING DRIVEWAYS WITH PERMISSION OF ENGINEER.

ACCESS TO ADJOINING DRIVEWAYS MUST BE MAINTAINED AT ALL TIMES.

NO SIGNS WILL BE PERMITTED IN THE RAILROAD ROW.



TJN  
 11/3/2022

**Kimley»Horn** F-928

Texas Department of Transportation

**CR 452 AT BRANCH OF MUSTANG CREEK**  
**TRAFFIC CONTROL PLAN**  
**DETOUR LAYOUT**

SHEET 1 OF 1

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	8



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DATE:  
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**BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:**

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.
6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.
11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.
12. The Engineer has the final decision on the location of all traffic control devices.
13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

**WORKER SAFETY NOTES:**

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

**COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES**

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT <a href="http://www.txdot.gov">http://www.txdot.gov</a>
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

SHEET 1 OF 12



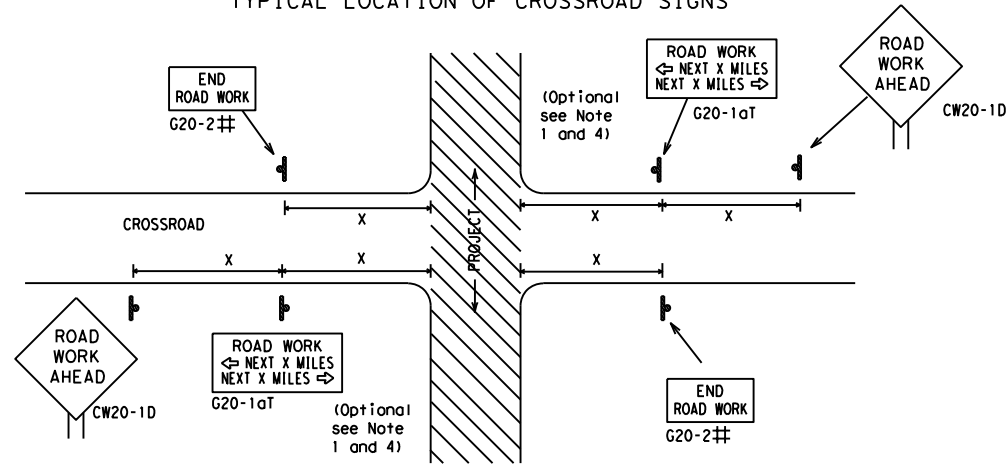
**BARRICADE AND CONSTRUCTION  
 GENERAL NOTES  
 AND REQUIREMENTS**

**BC (1) - 21**

FILE:	bc-21.dgn	DN:	TxDOT	CR:	TxDOT	DR:	TxDOT	CR:	TxDOT
© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
4-03	7-13	0914	05	174	CR 452				
9-07	8-14	DIST	COUNTY		SHEET NO.				
5-10	5-21	AUS	WILLIAMSON		9				

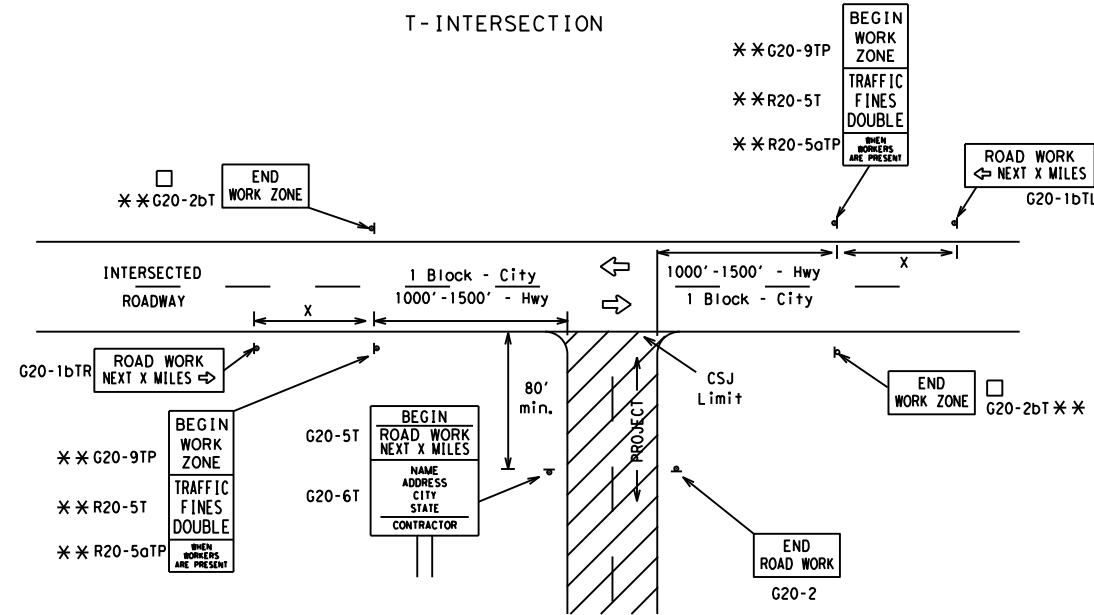
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ## May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)
- 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.
  - The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK" (G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
  - 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.
  - 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.
  - Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
  - 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

- 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.
- 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<sup>1,5,6</sup>

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

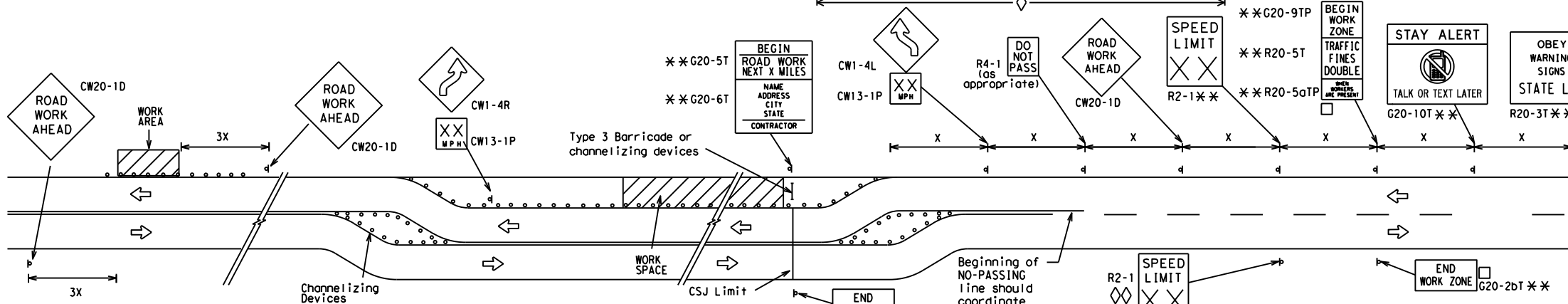
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

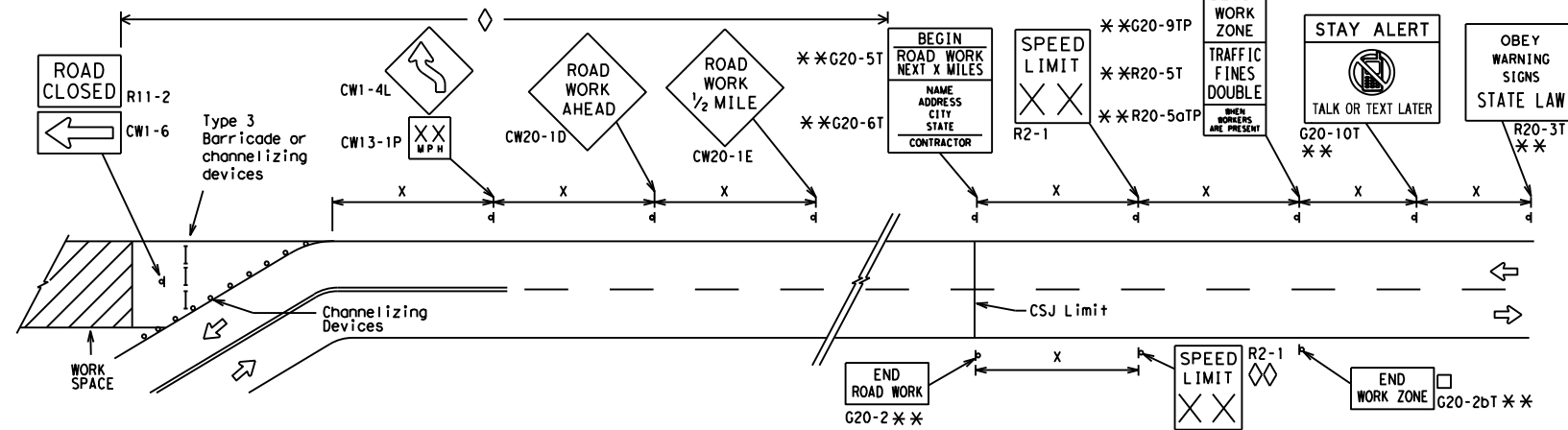
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

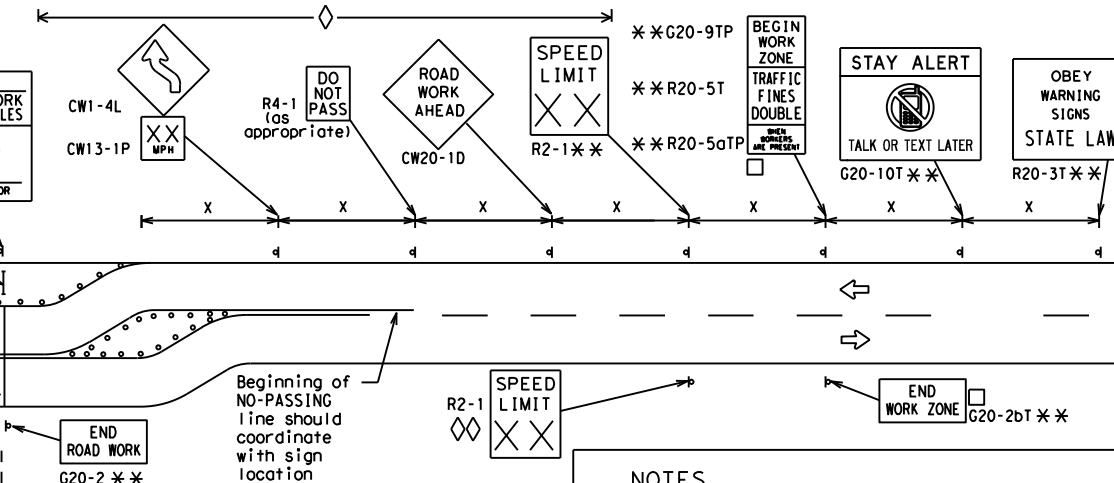


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



NOTES

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "x" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
  - CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.
  - Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
  - Contractor will install a regulatory speed limit sign at the end of the work zone.

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

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

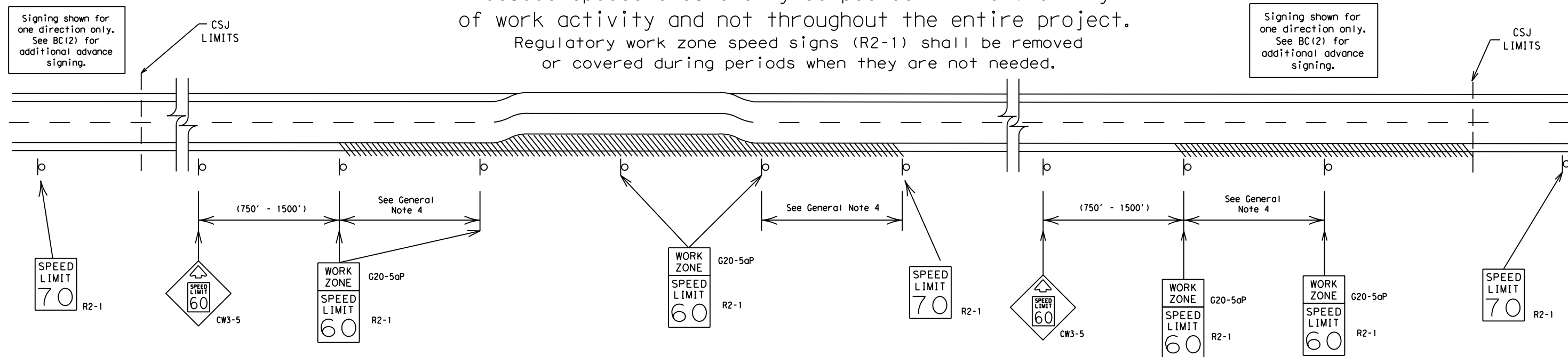
FILE: bc-21.dgn	DN: TxDOT	CR: TxDOT	OW: TxDOT	CR: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	AUS	WILLIAMSON	10	

DATE: FILE:

# 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:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

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

### SHORT TERM WORK ZONE SPEED LIMITS

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

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

## GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- 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
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- 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.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
  - Law enforcement.
  - Flagger stationed next to sign.
  - Portable changeable message sign (PCMS).
  - Low-power (drone) radar transmitter.
  - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

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SHEET 3 OF 12



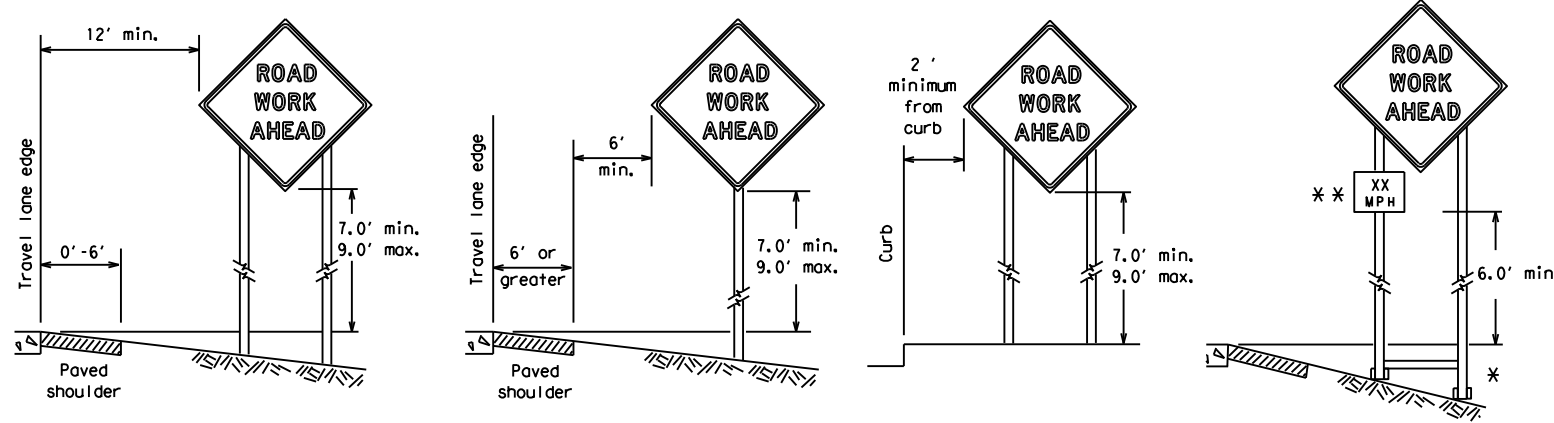
## BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC (3) - 21

FILE:	bc-21.dgn	DN:	TxDOT	CR:	TxDOT	DR:	TxDOT	CR:	TxDOT
© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0914	05	174	CR 452				
9-07	8-14	DIST	COUNTY		SHEET NO.				
7-13	5-21	AUS	WILLIAMSON		11				

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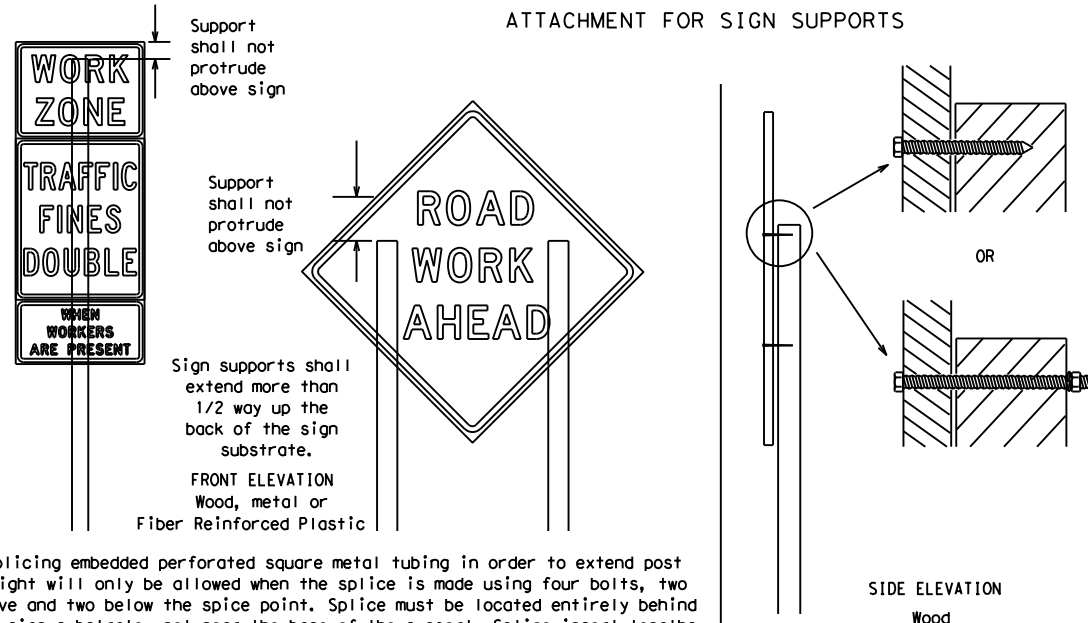
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



\* 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



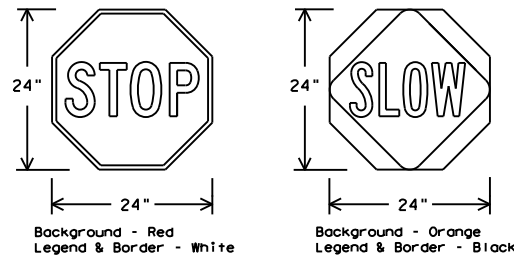
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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



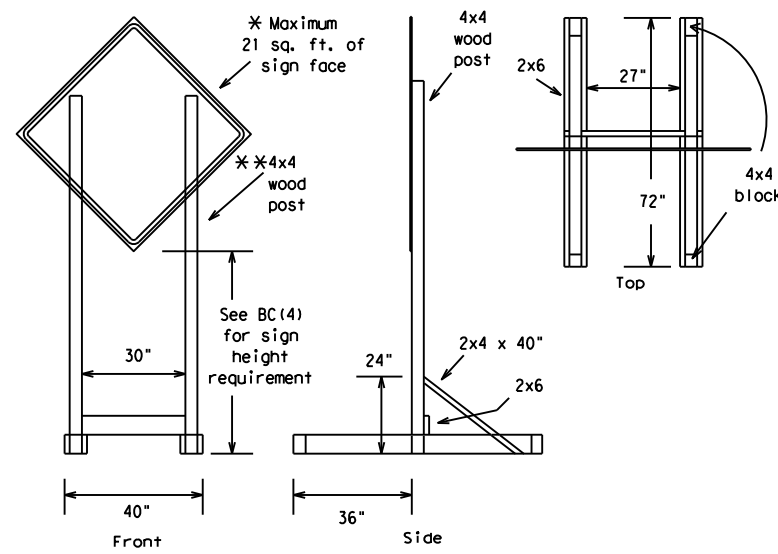
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 21

FILE:	bc-21.dgn	DN:	TxDOT	CR:	TxDOT	DM:	TxDOT	CR:	TxDOT
© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0914	05	174	CR 452				
9-07	8-14	DIST		COUNTY	SHEET NO.				
7-13	5-21	AUS		WILLIAMSON	12				

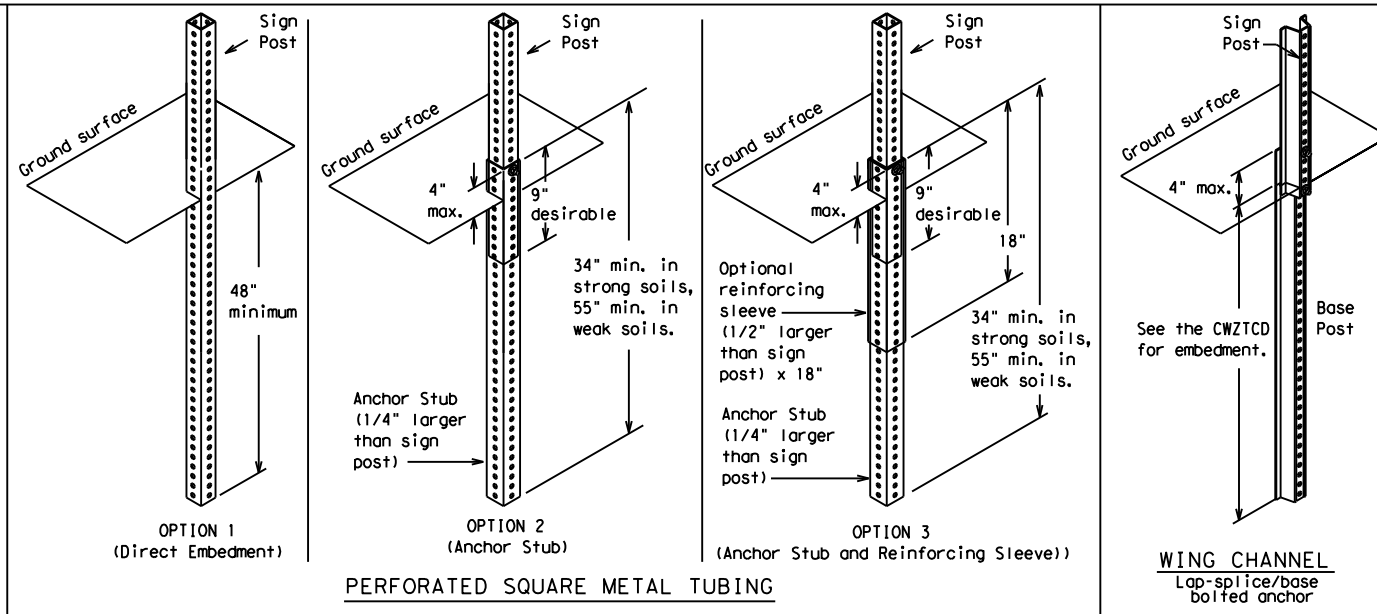
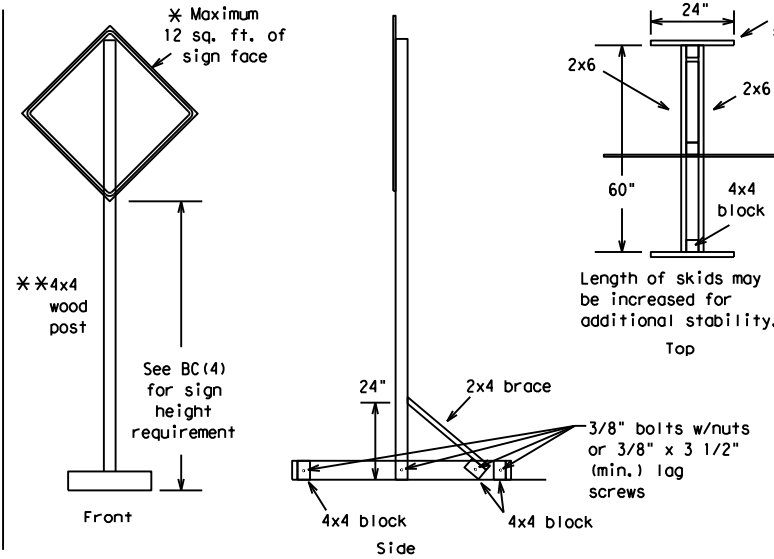


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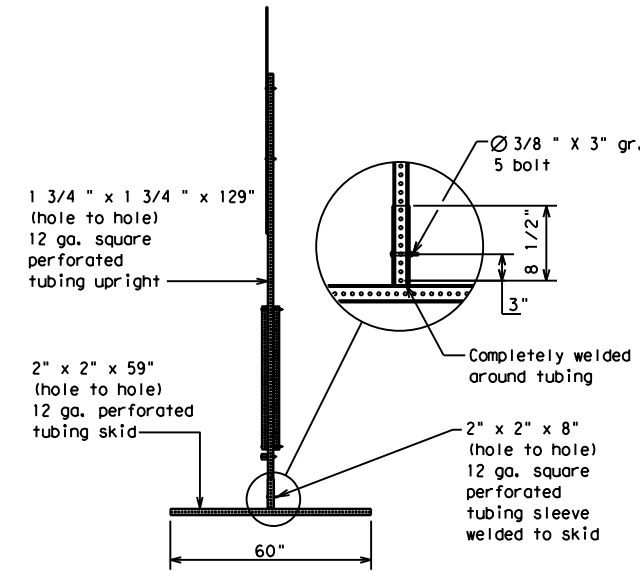
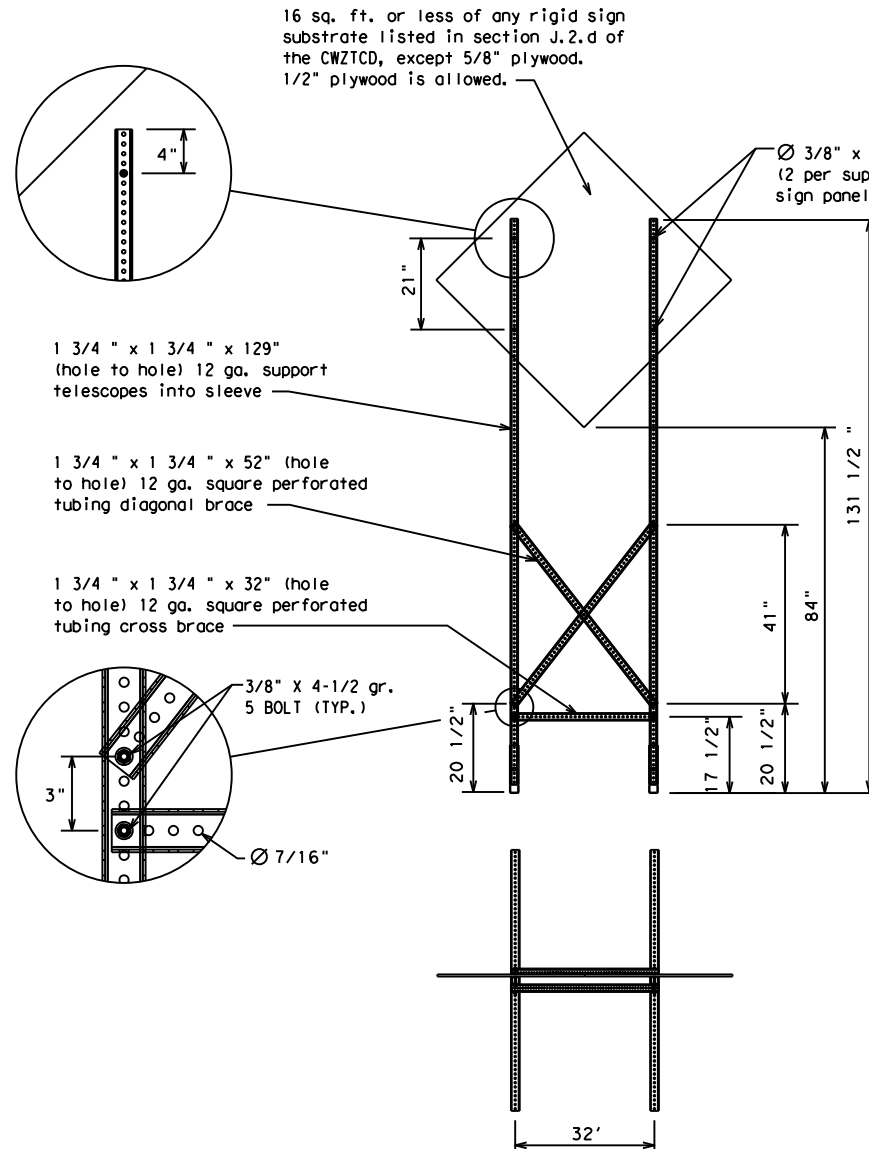
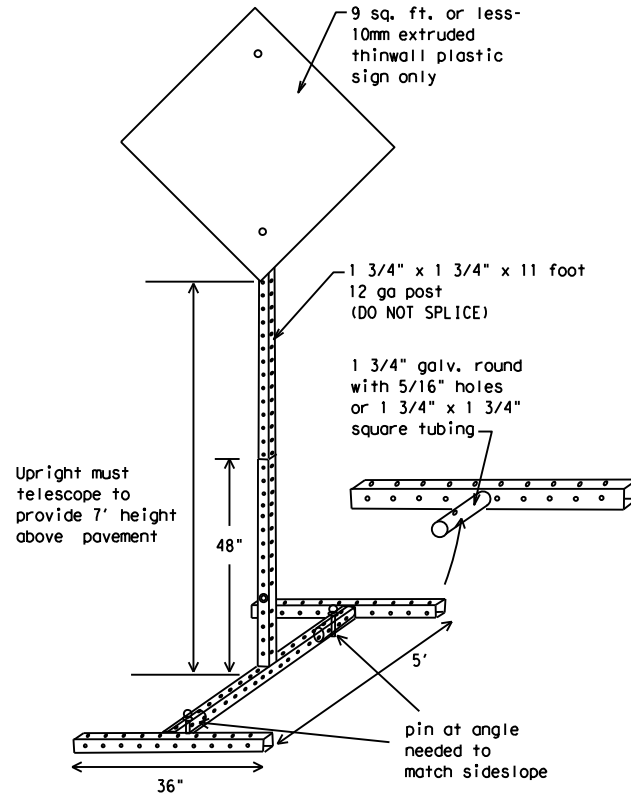
**SKID MOUNTED WOOD SIGN SUPPORTS**

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



**GROUND MOUNTED SIGN SUPPORTS**

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



**SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS**

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

**WEDGE ANCHORS**

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

**OTHER DESIGNS**

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

**GENERAL NOTES**

- Nails may be used in the assembly of wooden sign supports, but 3/8 inch bolts with nuts or 3/8 inch x 3 1/2 inch lag screws must be used on every joint for final connection.
- No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
- 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.

SHEET 5 OF 12



**BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT**

**BC(5) - 21**

FILE: bc-21.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	CR: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	AUS	WILLIAMSON	13	

DATE:  
FILE:

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

# RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

## PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- 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.
- 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.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- 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.
- 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.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- 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.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- 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.
- 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.
- Each line of text should be centered on the message board rather than left or right justified.
- 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.

## Phase 1: Condition Lists

### Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE
ROAD CLOSED AT SH XXX
ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED
CENTER LANE CLOSED
NIGHT LANE CLOSURES
VARIOUS LANES CLOSED
EXIT CLOSED
MALL DRIVEWAY CLOSED
XXXXXXXX BLVD CLOSED

### Other Condition List

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT
RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN
DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED
EXIT XXX CLOSED X MILE
RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI

ROADWORK XXX FT
FLAGGER XXXX FT
RIGHT LN NARROWS XXXX FT
MERGING TRAFFIC XXXX FT
LOOSE GRAVEL XXXX FT
DETOUR X MILE
ROADWORK PAST SH XXXX
BUMP XXXX FT
TRAFFIC SIGNAL XXXX FT

ROAD REPAIRS XXXX FT
LANE NARROWS XXXX FT
TWO-WAY TRAFFIC XX MILE
CONST TRAFFIC XXX FT
UNEVEN LANES XXXX FT
ROUGH ROAD XXXX FT
ROADWORK NEXT FRI-SUN
US XXX EXIT X MILES
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
DETOUR NEXT X EXITS
USE EXIT XXX
STAY ON US XXX SOUTH
TRUCKS USE US XXX N
WATCH FOR TRUCKS
EXPECT DELAYS
REDUCE SPEED XXX FT
USE OTHER ROUTES
STAY IN LANE *

### Location List

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

### Warning List

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

### \*\* Advance Notice List

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

\*\* See Application Guidelines Note 6.

## APPLICATION GUIDELINES

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- 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.
- 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

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- 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

- 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.
- 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.
- 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.
- 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.

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DATE: FILE:

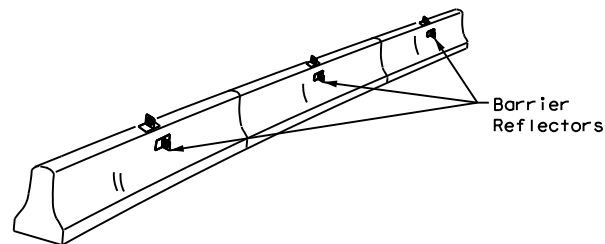
WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canot	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking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

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

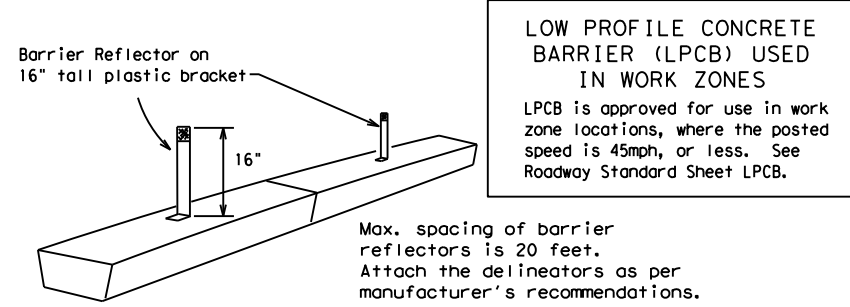
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<h2>BC (6) - 21</h2>			
FILE:	bc-21.dgn	DN:	TxDOT
©TxDOT	November 2002	CR:	TxDOT
REVISIONS		JOB	174
0914	05	HIGHWAY	CR 452
9-07	8-14	DIST	COUNTY
7-13	5-21	AUS	WILLIAMSON
		SHEET NO.	14

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- 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).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



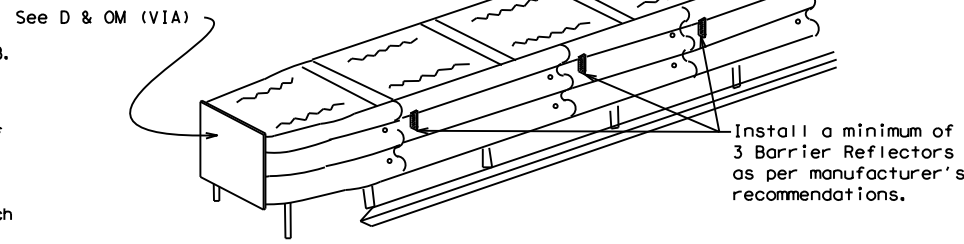
CONCRETE TRAFFIC BARRIER (CTB)



**LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES**  
 LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

LOW PROFILE CONCRETE BARRIER (LPCB)

- 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.
- 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.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.



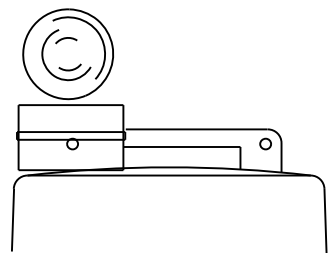
DELINEATION OF END TREATMENTS

**END TREATMENTS FOR CTB'S USED IN WORK ZONES**  
 End treatments used on CTB's in work zones shall meet the appropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

**BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS**

**WARNING LIGHTS**

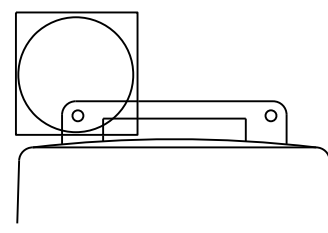
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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<sub>FL</sub> or C<sub>FL</sub> Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- 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".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- 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.
- 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.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.



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

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- 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.
- 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.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.



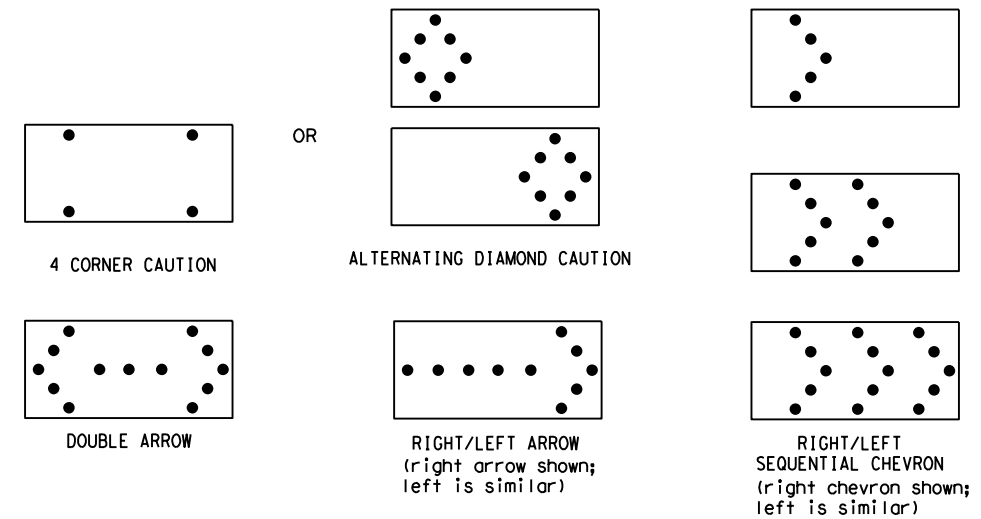
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

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

- 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.
- 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.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- 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.
- 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.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- 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.

- 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.
- 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.
- 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.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- 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.
- 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.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- 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.
- 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**

SHEET 7 OF 12

**TRUCK-MOUNTED ATTENUATORS**

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- 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.
- 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.



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

**BC (7) - 21**

FILE:	bc-21.dgn	DN:	TxDOT	CR:	TxDOT	OW:	TxDOT	CR:	TxDOT
©TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0914	05	174	CR 452				
9-07	8-14	DIST	COUNTY		SHEET NO.				
7-13	5-21	AUS	WILLIAMSON		15				

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**GENERAL NOTES**

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- 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.
- 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.
- 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).
- 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.
- 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:

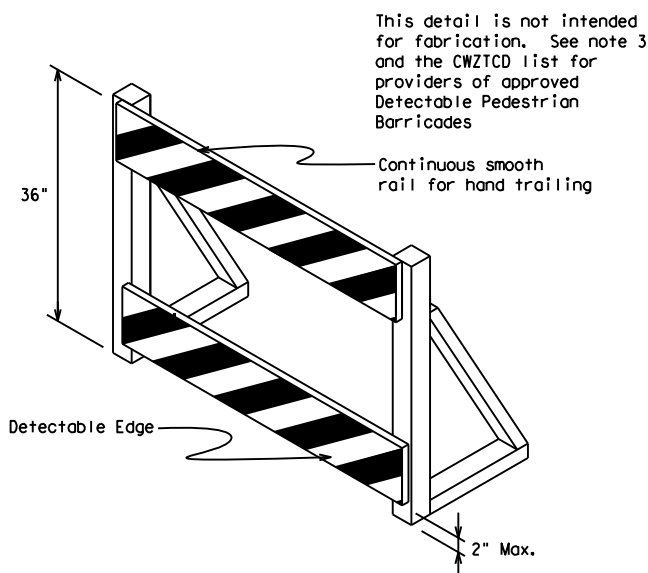
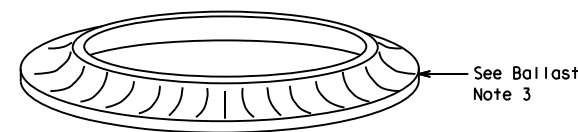
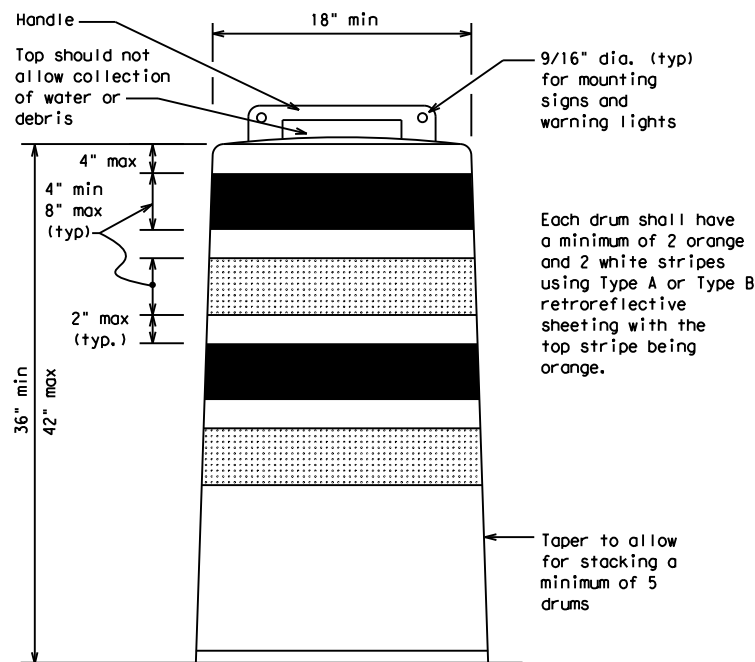
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- 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.
- 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.
- 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.
- 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.
- 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.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a maximum unballasted weight of 11 lbs.
- Drum and base shall be marked with manufacturer's name and model number.

**RETROREFLECTIVE SHEETING**

- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
- 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.

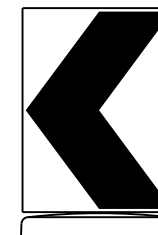
**BALLAST**

- 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.
- 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.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- 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.
- 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.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.

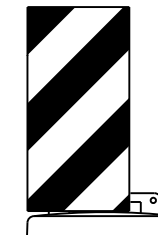


**DETECTABLE PEDESTRIAN BARRICADES**

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



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



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

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

**SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS**

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B<sub>FL</sub> or Type C<sub>FL</sub> Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- 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.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- 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.
- 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.

SHEET 8 OF 12



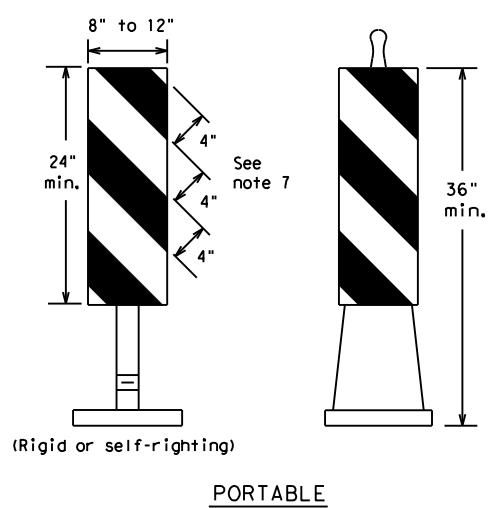
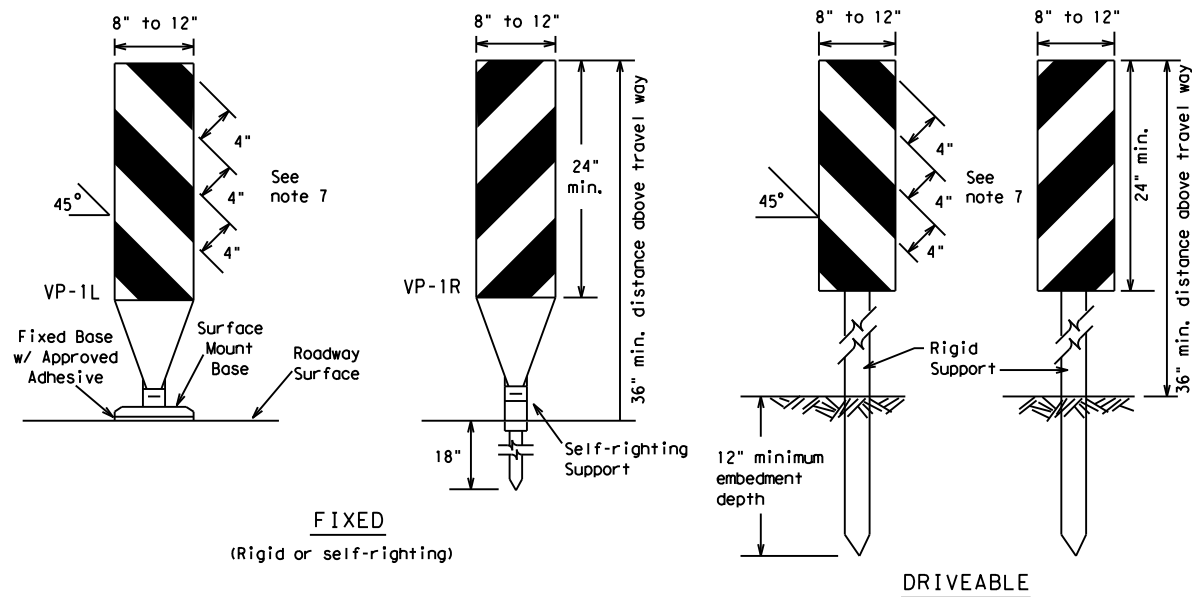
**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (8) - 21**

FILE: bc-21.dgn	DN: TxDOT	CR: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
4-03 8-14	DIST	COUNTY	SHEET NO.	
9-07 5-21	AUS	WILLIAMSON	16	
7-13				

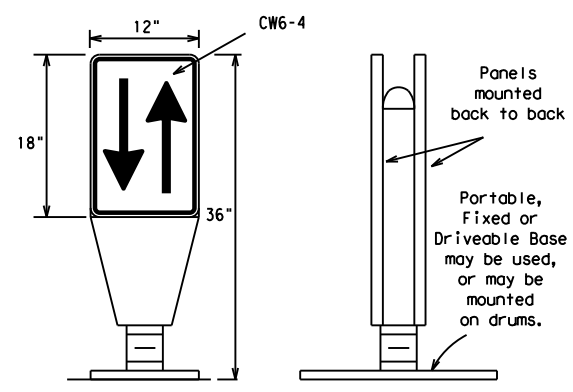


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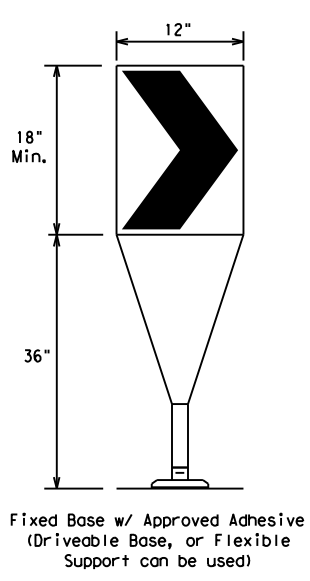
- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
- 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.
- VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- 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)**



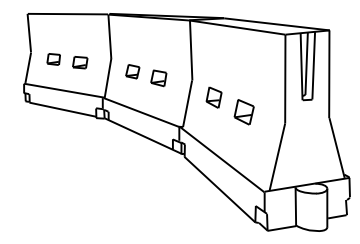
- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base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

**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**



- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- 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.
- 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.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B<sub>FL</sub> or Type C<sub>FL</sub> conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
- 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)**

- 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.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

**WATER BALLASTED SYSTEMS USED AS BARRIERS**

- Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
- 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.
- 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.
- 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.
- 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**

- 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).
- 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.
- 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).
- 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.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- 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.
- 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 **			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS <sup>2</sup> / 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



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (9) - 21**

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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY	SHEET NO.	
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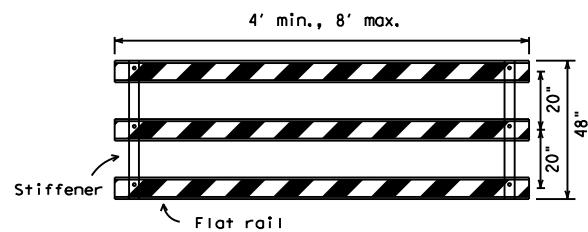
**TYPE 3 BARRICADES**

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

Barricades shall NOT be used as a sign support.



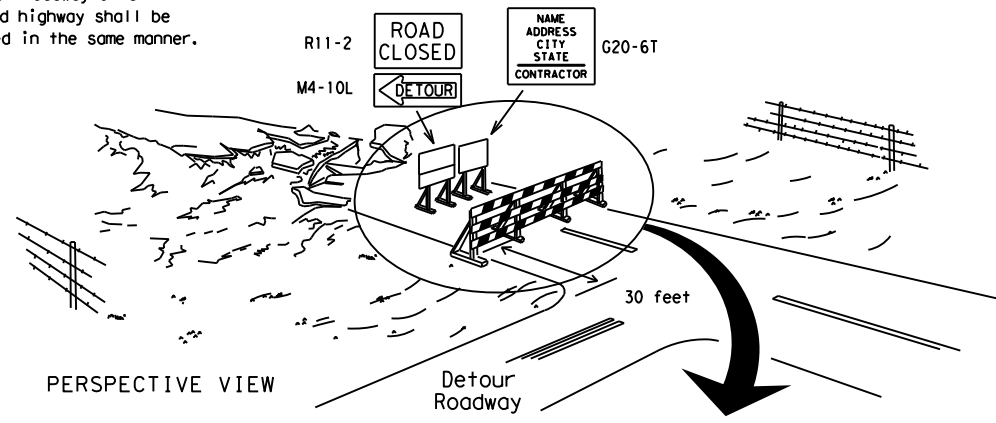
**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



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

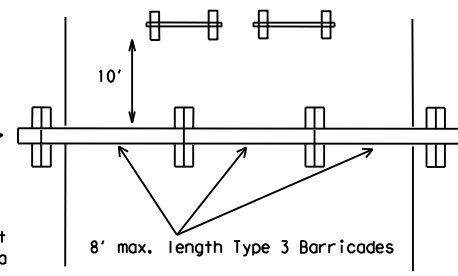
**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

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



PERSPECTIVE VIEW

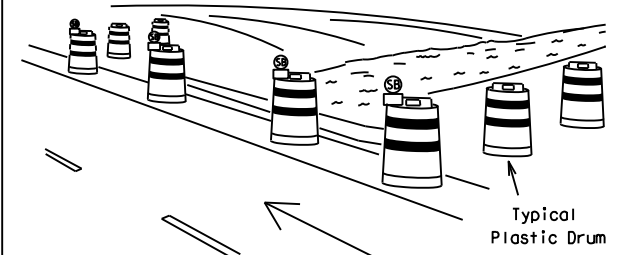
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



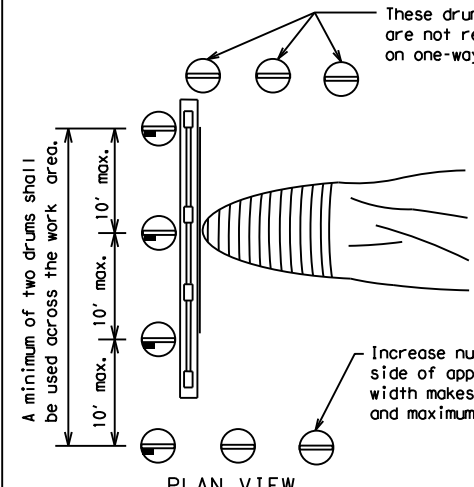
PLAN VIEW

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

**TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION**



PERSPECTIVE VIEW

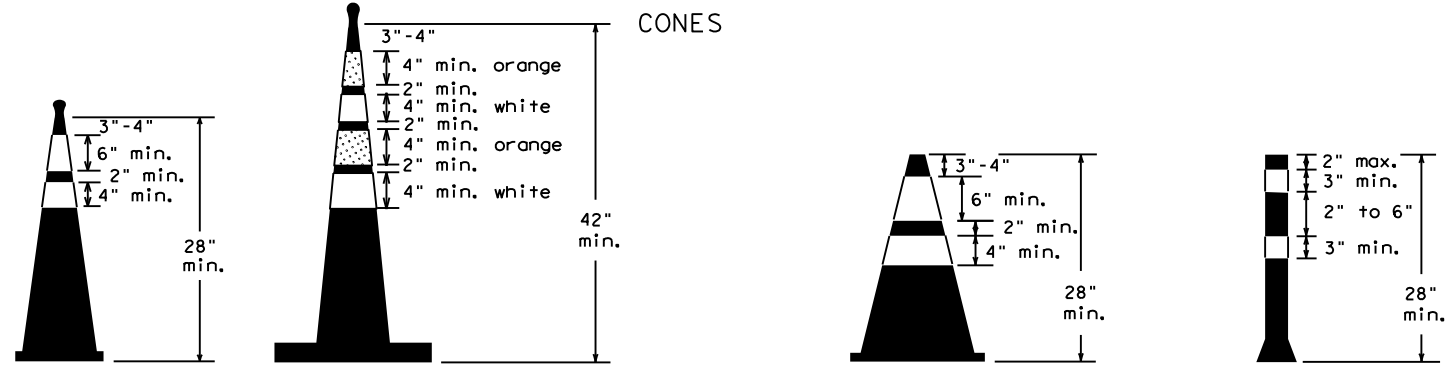


PLAN VIEW

**CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS**

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

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



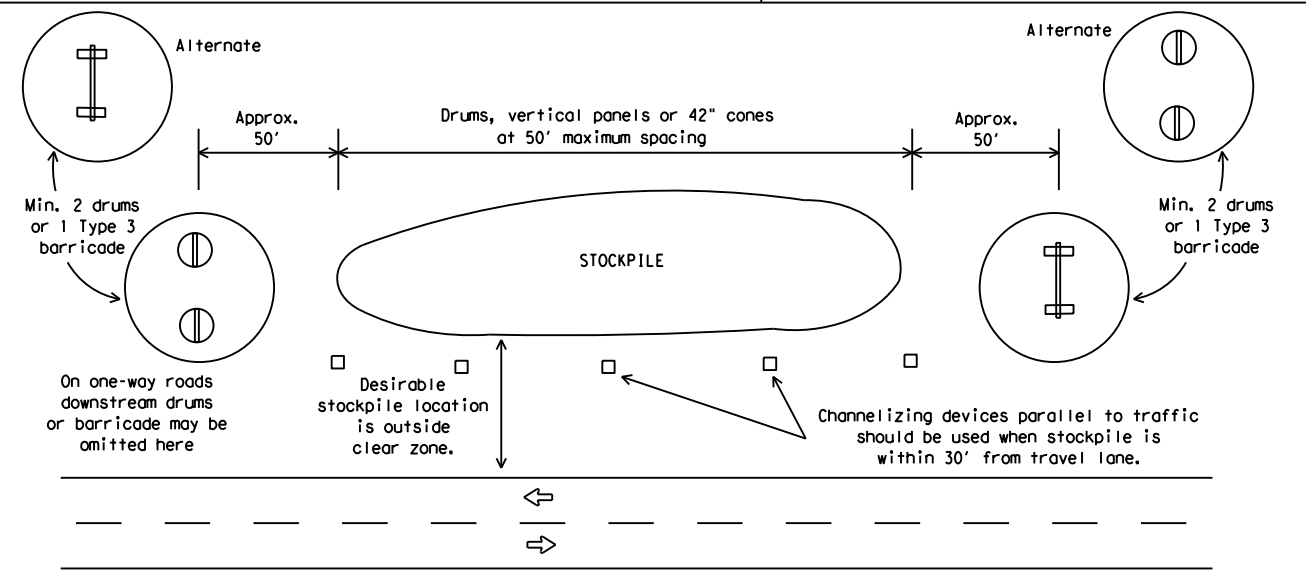
Two-Piece cones

One-Piece cones

Tubular Marker

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

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



**TRAFFIC CONTROL FOR MATERIAL STOCKPILES**



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC(10)-21**

FILE: bc-21.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	CR: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	AUS	WILLIAMSON	18	

DATE:  
FILE:

## WORK ZONE PAVEMENT MARKINGS

### GENERAL

- 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.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- 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).
- 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.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

### RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- 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

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

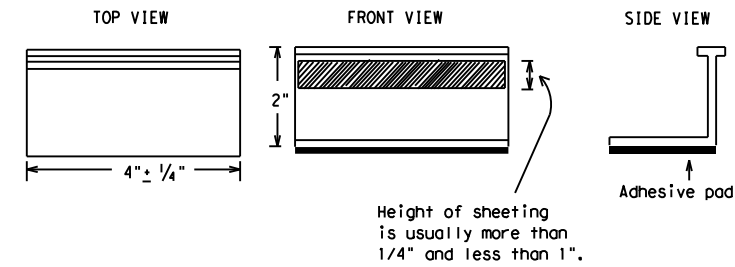
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- 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.
- 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.
- 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

- 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.
- 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.
- 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".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- 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.
- 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

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- 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.
  - 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.
  - 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.
- Small design variances may be noted between tab manufacturers.
- 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

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- 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).

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:  
FILE:

SHEET 11 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

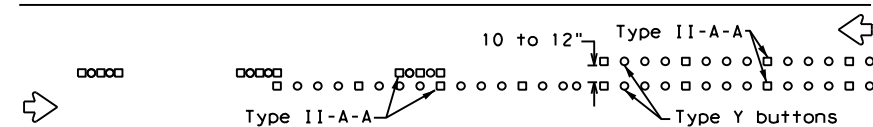
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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
2-98 9-07 5-21	DIST	COUNTY	SHEET NO.	
1-02 7-13	AUS	WILLIAMSON	19	
11-02 8-14				

105

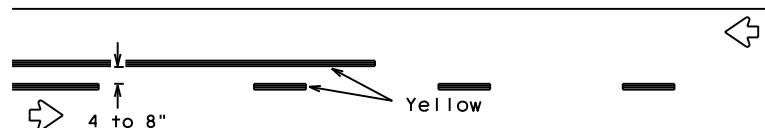
## PAVEMENT MARKING PATTERNS



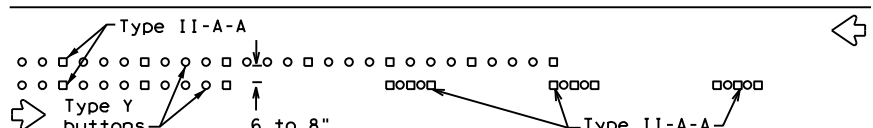
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



RAISED PAVEMENT MARKERS - PATTERN B

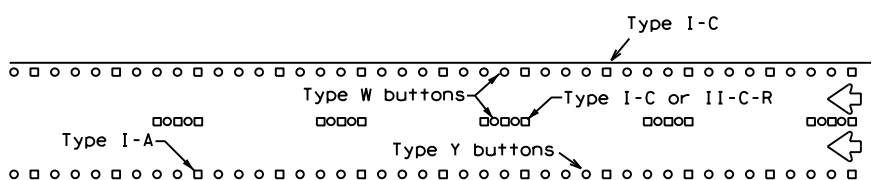
Pattern A is the TxDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectORIZED pavement markings.

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



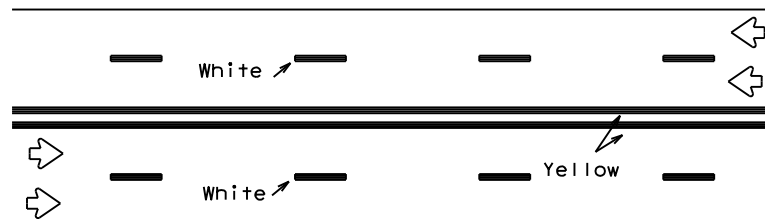
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



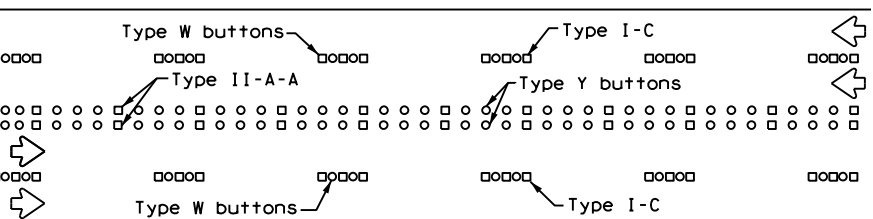
RAISED PAVEMENT MARKERS

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



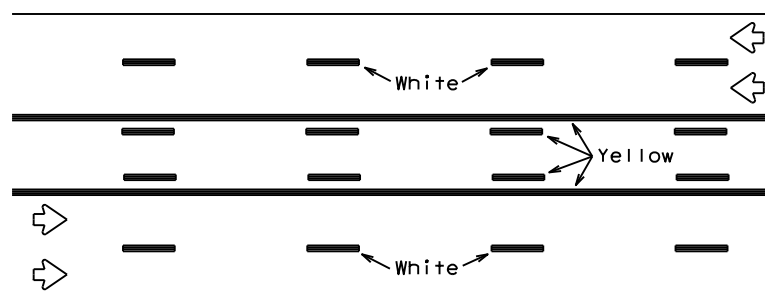
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



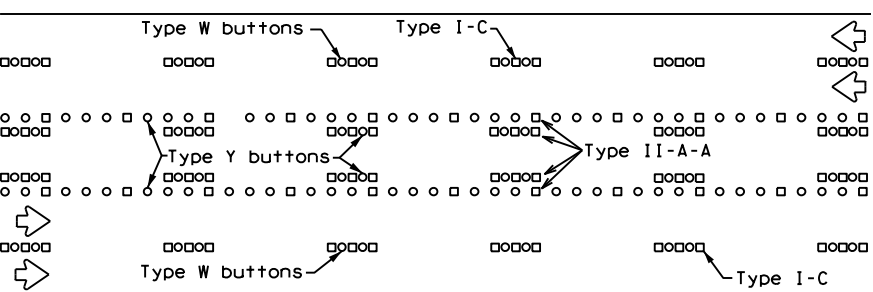
RAISED PAVEMENT MARKERS

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

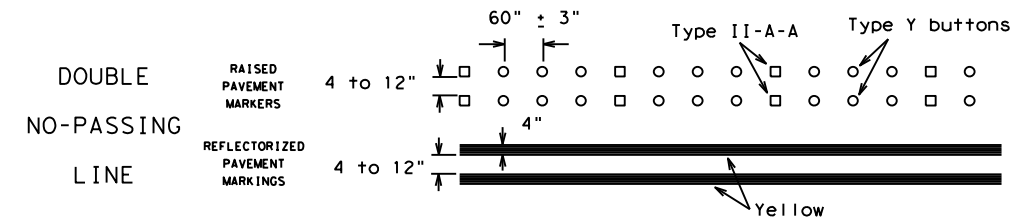
Prefabricated markings may be substituted for reflectORIZED pavement markings.



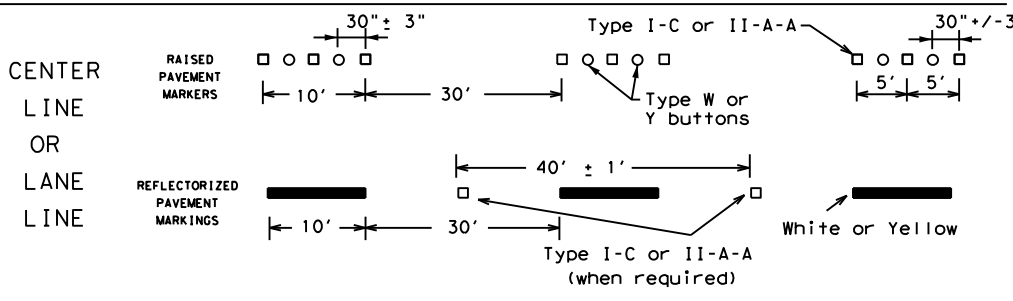
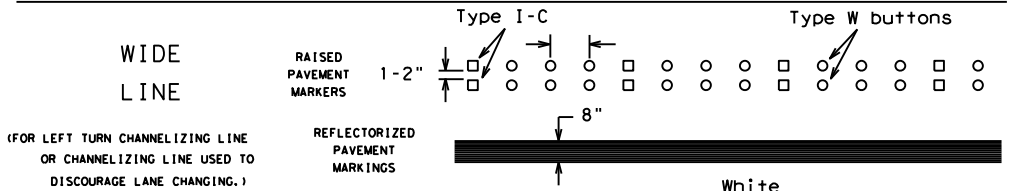
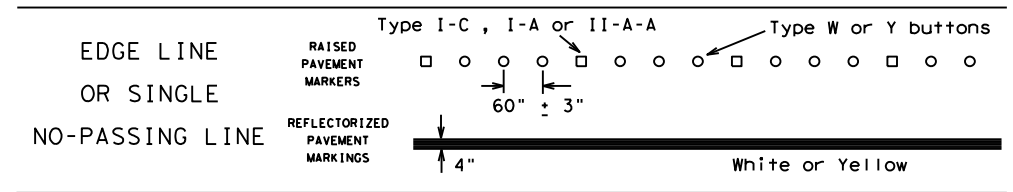
RAISED PAVEMENT MARKERS

## TWO-WAY LEFT TURN LANE

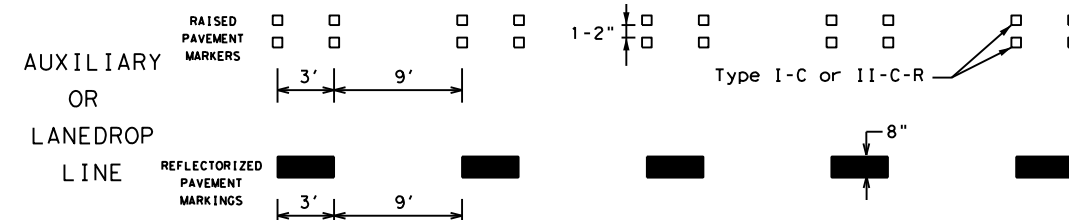
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



### SOLID LINES

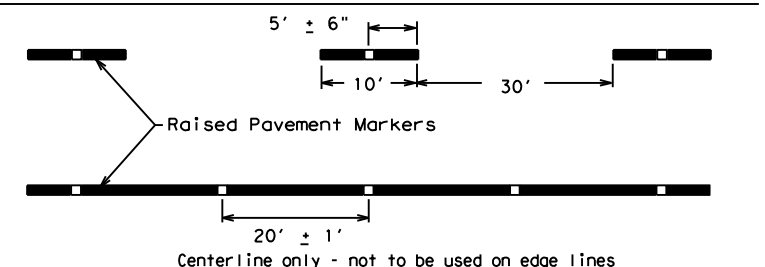


### BROKEN LINES



### 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.



SHEET 12 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CR: TxDOT	DM: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
1-97 9-07 5-21				
2-98 7-13				
11-02 8-14	AUS		WILLIAMSON	SHEET NO. 20

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."

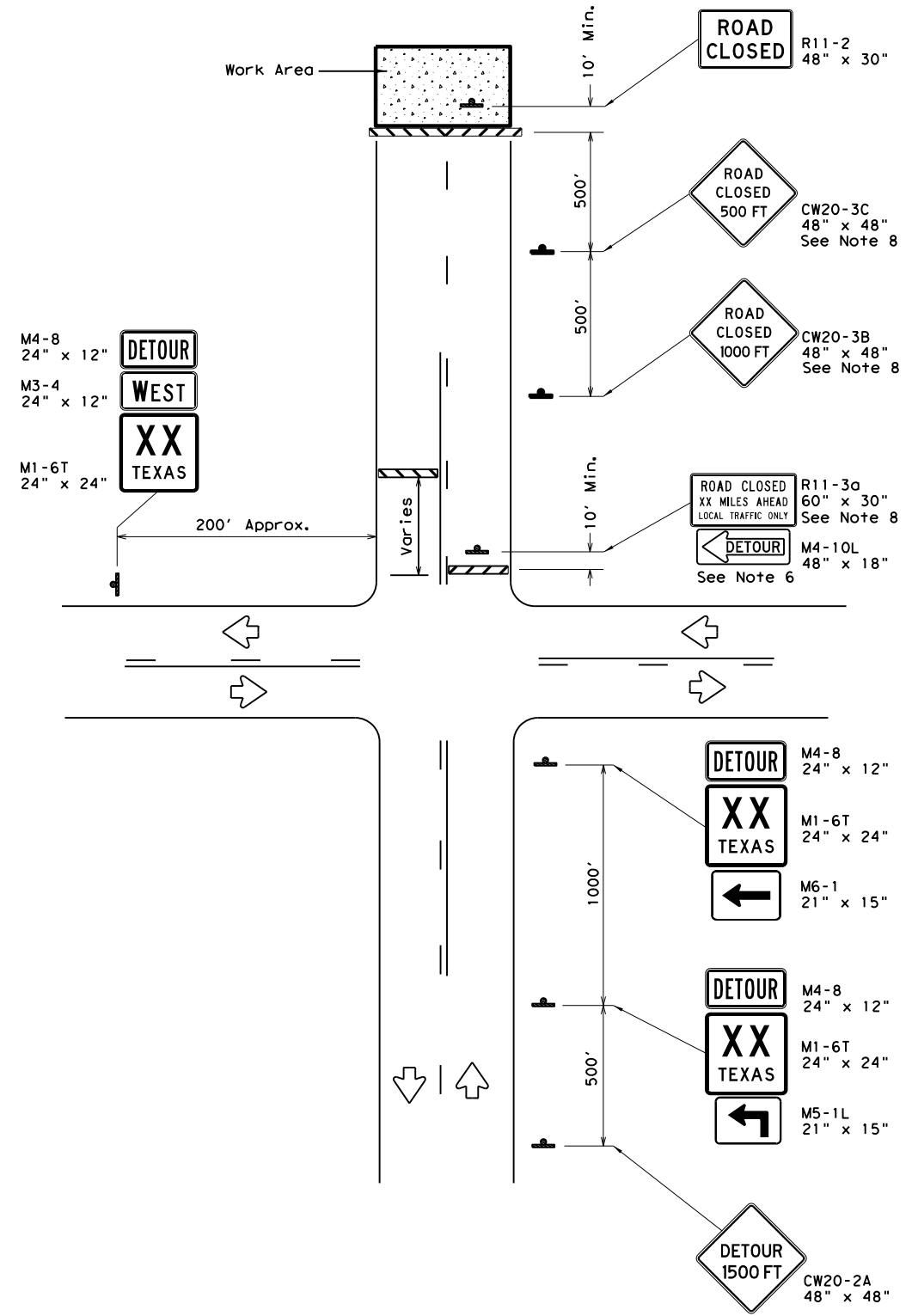
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:  
FILE:

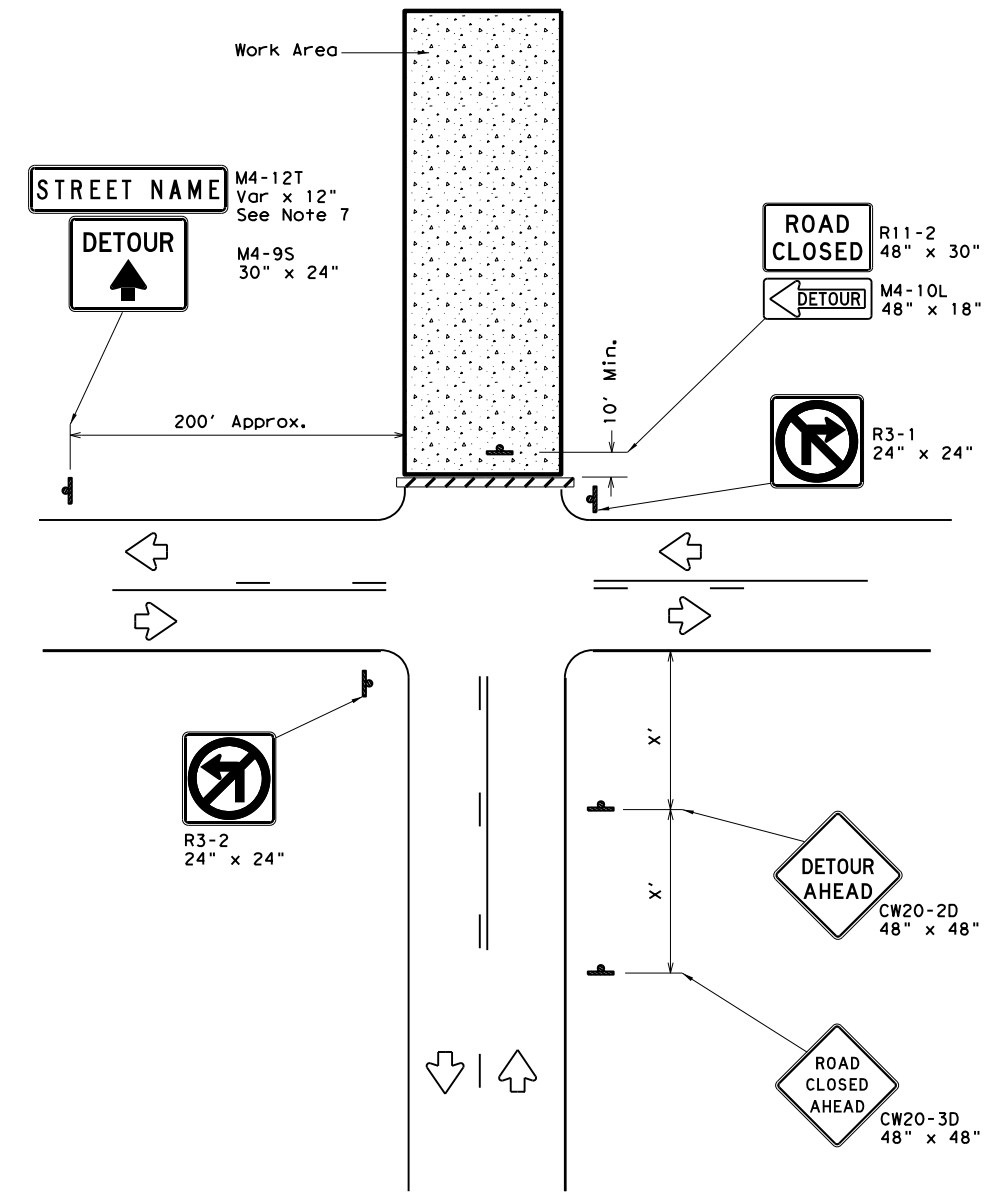


DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:  
FILE:



**ROAD CLOSURE BEYOND THE INTERSECTION**  
Signing for a Numbered Route with an Off-Site Detour



**ROAD CLOSURE AT THE INTERSECTION**  
Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

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

\* Conventional Roads Only

**GENERAL NOTES**

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

Texas Department of Transportation Traffic Operations Division Standard

**WORK ZONE ROAD CLOSURE DETAILS**

**WZ (RCD) - 13**

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
1-97 4-98 7-13	DIST	COUNTY	SHEET NO.	
2-98 3-03	AUS	WILLIAMSON	21	

# SURVEY CONTROL LAYOUT SHEET

RIDGE VIEW DRIVE

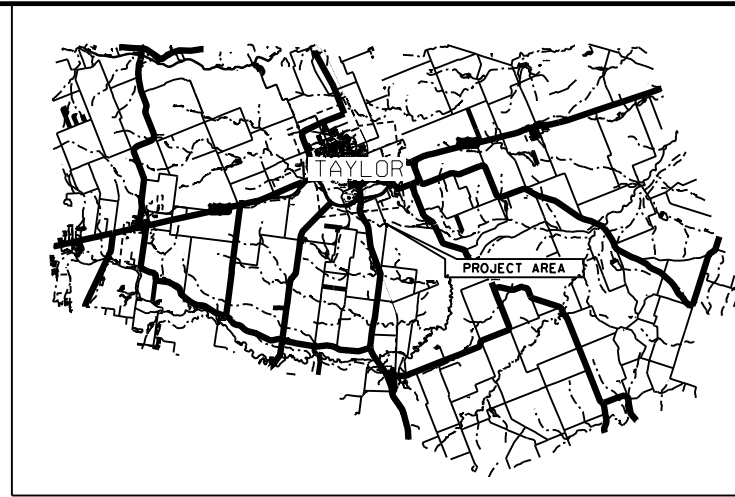
CR 452

CP-10

CP-11

CR 452

BOGGY CREEK



VICINITY MAP  
NOT TO SCALE

### HORIZONTAL AND VERTICAL CONTROL - GRID

PNT	NORTHING	EASTING	ELEV.	DESCRIPTION
CP-10	10,173,309.66	3,221,863.90	518.05'	CP-IRS 5/8"W/TXDOT ALC
CP-11	10,172,401.59	3,222,256.57	533.24'	CP-IRS 5/8"W/TXDOT ALC

### HORIZONTAL AND VERTICAL CONTROL - SURFACE

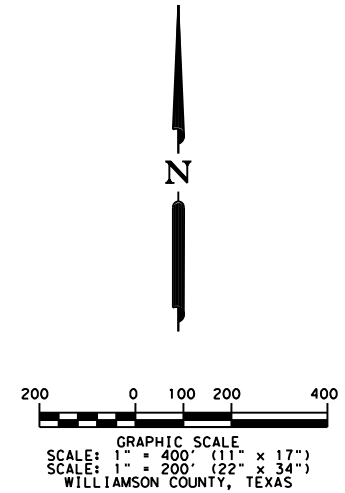
PNT	NORTHING	EASTING	ELEV.	DESCRIPTION
CP-10	10,174,401.36	3,222,209.64	518.05'	CP-IRS 5/8"W/TXDOT ALC
CP-11	10,173,493.19	3,222,602.35	533.24'	CP-IRS 5/8"W/TXDOT ALC

**NOTES:**

- ALL PROJECT COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NAD 83 (2011)/NAVD 88, GEOID MODEL 12B. ALL COORDINATES SHOWN HEREON ARE ADJUSTED TO SURFACE BY MULTIPLYING BY A COMBINED ADJUSTMENT FACTOR OF 1.0001073106. UNITS: U. S. SURVEY FEET.
- CONTROL POINTS SHOWN HEREON ARE BASED UPON THE TXDOT VRS NETWORK. ELEVATIONS ARE DERIVED FROM REPITIVE VRS OBSERVATIONS.
- A SITE CALIBRATION SHOULD BE PERFORMED WHEN UTILIZING THE CONTROL SHOWN HEREIN.



*Scott C. Brashear*  
4/17/20



FILE:\admin\cvs\PROJECTS\10\925244\100\36\wp\925244\452\Control\_Points\CD-452\_CONTROL\_LAYOUT\_SHEETS\_SURFACE\_1.0001073106.dgn

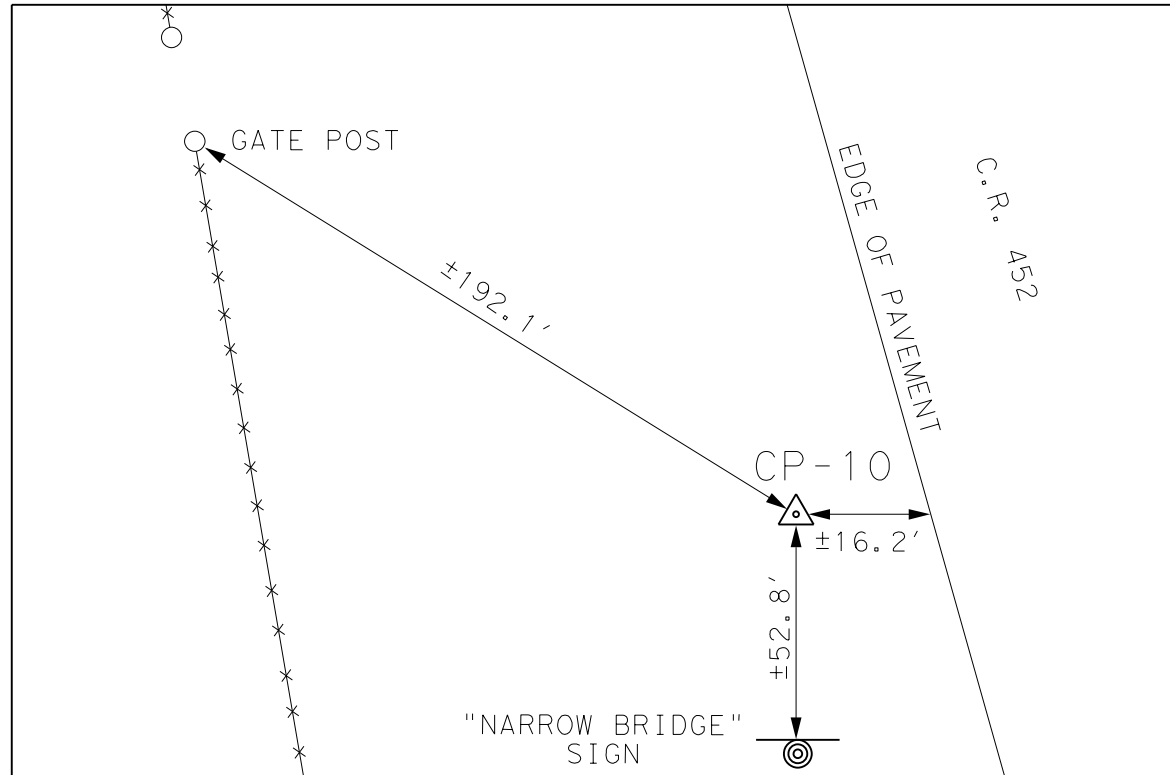
Survey Date: APRIL, 2020



**SURVEY CONTROL  
LAYOUT SHEET**

SHEET 1 OF 2

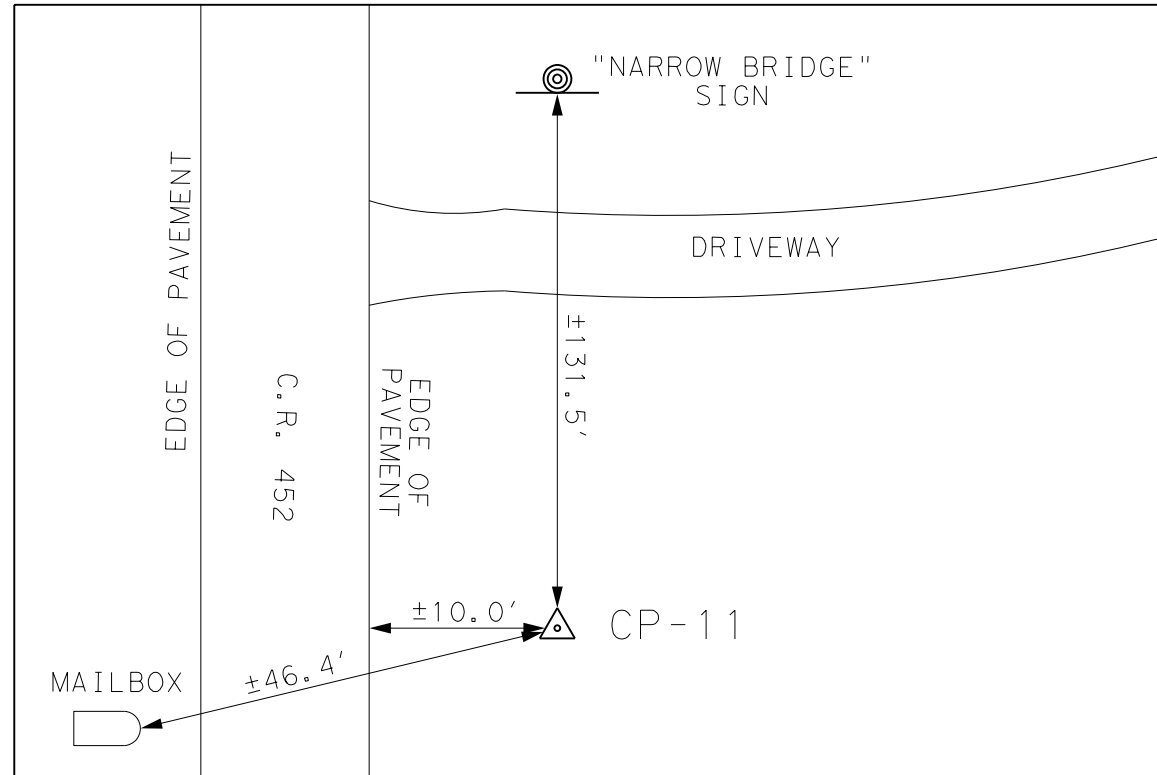
FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
			22
STATE	DISTRICT	COUNTY	
TEXAS	AUS	WILLIAMSON	
CONTROL	SECTION	JOB	HIGHWAY NO.
0914	15	174	CR 452



CP-10 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM CAP SET IN CONCRETE LOCATED IN THE WEST RIGHT-OF-WAY OF C.R. 452 ±16.2 FEET WEST OF THE EDGE OF PAVEMENT OF C.R. 452, ±52.8 FEET NORTH OF A "NARROW BRIDGE" SIGN AND ±192.1 FEET SOUTHEAST OF A GATE POST.

SURFACE COORDINATES  
 N = 10,174,401.36  
 E = 3,222,209.64  
 ELEV = 518.05'

GRID COORDINATES  
 N = 10,173,309.66  
 E = 3,221,863.90  
 ELEV = 518.05'



CP-11 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM CAP SET IN CONCRETE LOCATED IN THE EAST RIGHT-OF-WAY OF C.R. 452 ±10.0 FEET EAST OF THE EDGE OF PAVEMENT OF C.R. 452, ±46.4 FEET NORTHEAST OF A MAILBOX AND ±131.5 FEET SOUTH OF A "NARROW BRIDGE" SIGN.

SURFACE COORDINATES  
 N = 10,173,493.19  
 E = 3,222,602.35  
 ELEV = 533.24'

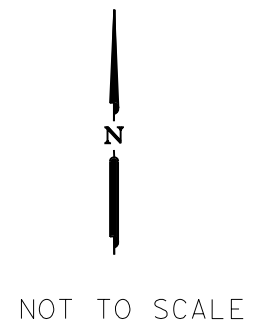
GRID COORDINATES  
 N = 10,172,401.59  
 E = 3,222,256.57  
 ELEV = 533.24'

NOTES:

- ALL PROJECT COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NAD 83 (2011)/NAVD 88, GEOID MODEL 12B. ALL COORDINATES SHOWN HEREON ARE ADJUSTED TO SURFACE BY MULTIPLYING BY A COMBINED ADJUSTMENT FACTOR OF 1.0001073106. UNITS: U.S. SURVEY FEET.
- CONTROL POINTS SHOWN HEREON ARE BASED UPON THE TXDOT VRS NETWORK. ELEVATIONS ARE DERIVED FROM REPITIVE VRS OBSERVATIONS.
- A SITE CALIBRATION SHOULD BE PERFORMED WHEN UTILIZING THE CONTROL SHOWN HEREIN.



*Scott C. Brashear*  
 4/17/20



FILE \\nasim\inc\us\PROJECTS\10\952524\100\Survey\02Base\CR\_452\Control\2020\CR\_452\_CONTROL\_LAYOUT\_SHEETS\_SURFACE\_1\_0001073106.dwg

Survey Date: APRIL, 2020

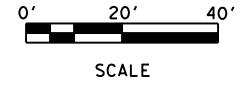
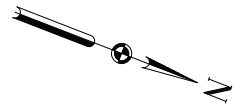
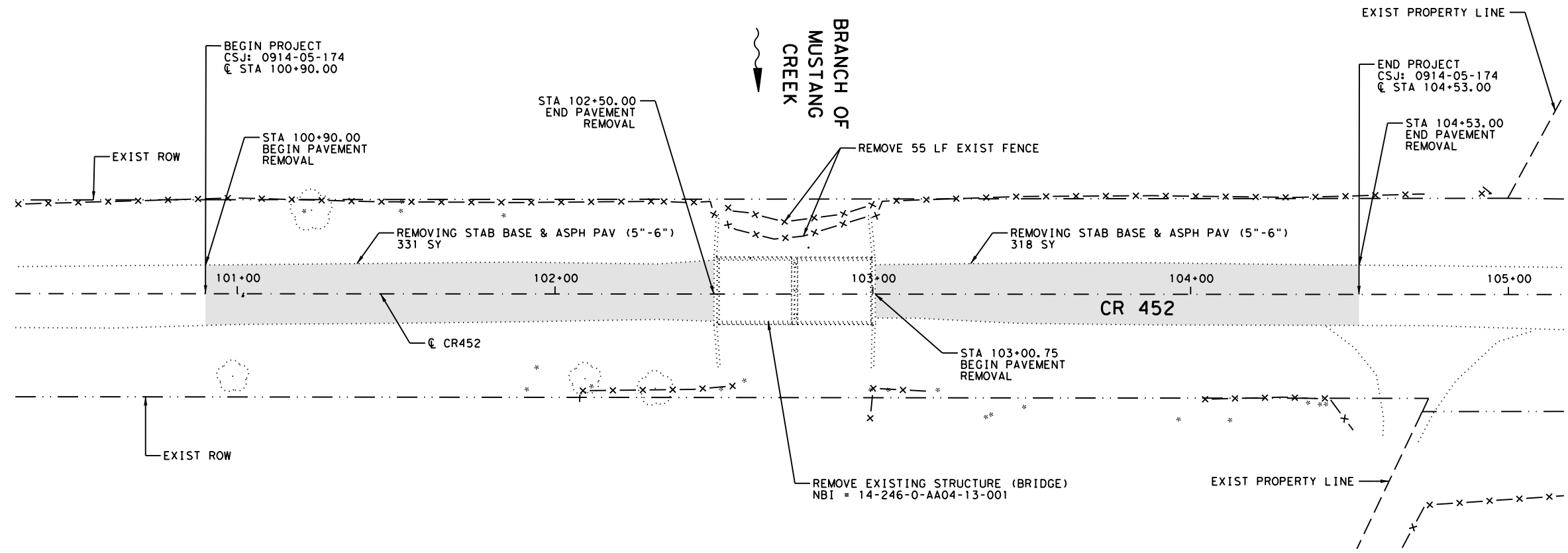


**SURVEY CONTROL INDEX SHEET**

SHEET 2 OF 2

FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
			23
STATE	DISTRICT	COUNTY	
TEXAS	AUS	WILLIAMSON	
CONTROL	SECTION	JOB	HIGHWAY NO.
0914	15	174	CR 452

FILENAME: pw:\kh-pw\ben\ley.com\kh-pw-01\Documents\01 Active Projects\TX-AUS-069284003 - Williamson County Bridges\DesignData\4 - Design\Plan Set\1. General\CR452\CR452\_GEN\_REM.dgn  
 PLOTTED: 11/3/2022 3:31:53 PM



TJN  
 11/3/2022  
 STATE OF TEXAS  
 TROY NEAL  
 106194  
 LICENSED PROFESSIONAL ENGINEER

**Kimley»Horn** F-928



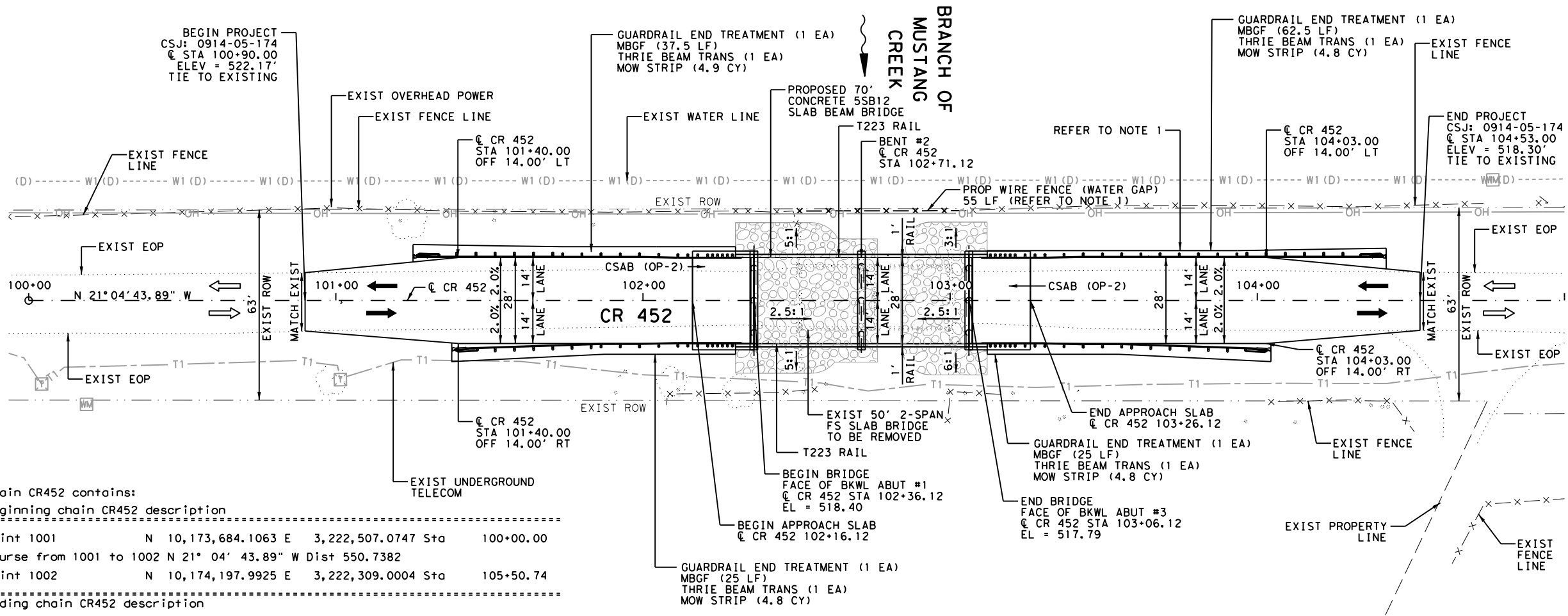
**CR 452 AT BRANCH OF MUSTANG CREEK  
 REMOVAL LAYOUT**

SHEET 1 OF 1

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
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	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	24

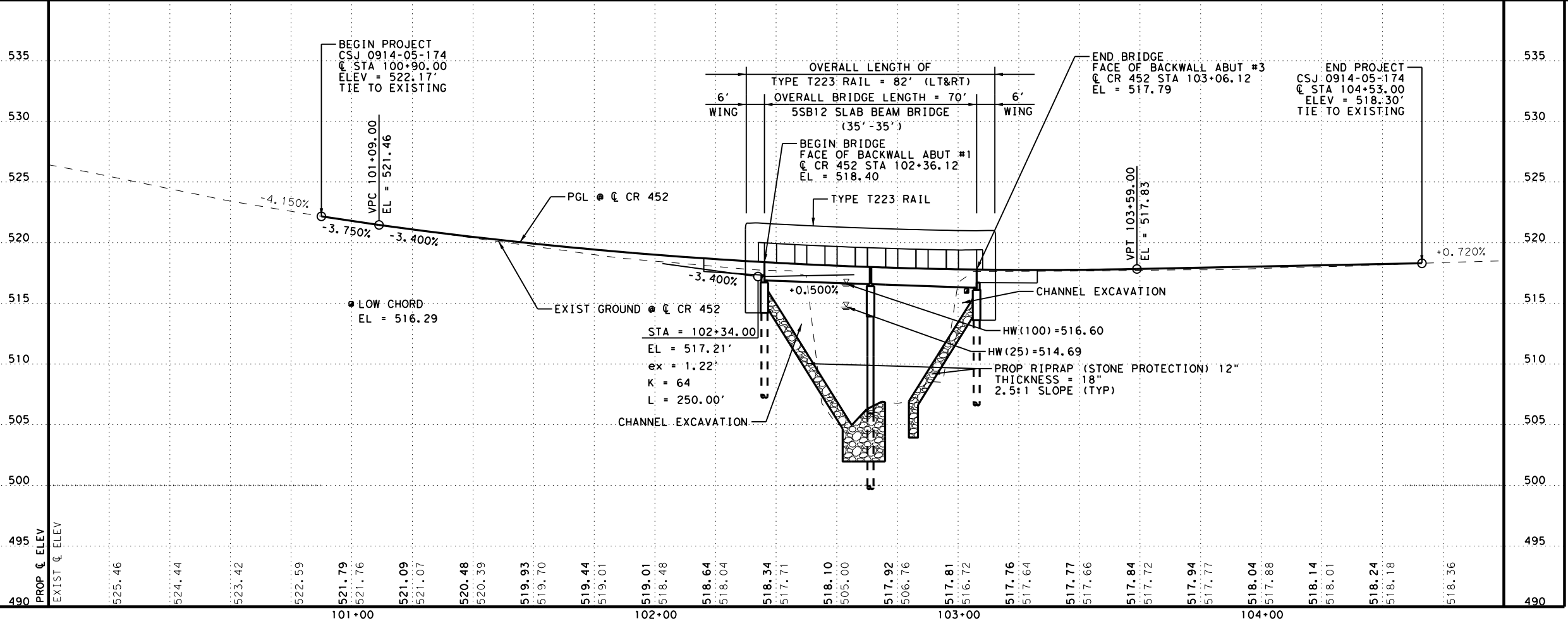
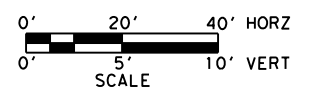


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 PLOTTED: 11/23/2022 3:32:02 PM



Chain CR452 contains:  
 Beginning chain CR452 description  
 =====  
 Point 1001      N 10,173,684.1063 E    3,222,507.0747 Sta    100+00.00  
 Course from 1001 to 1002 N 21° 04' 43.89" W Dist 550.7382  
 Point 1002      N 10,174,197.9925 E    3,222,309.0004 Sta    105+50.74  
 =====  
 Ending chain CR452 description

**NOTES:**  
 1. REFER TO MISCELLANEOUS DETAILS FOR MORE INFORMATION ON WATER GAP FENCE AND REDUCED MOW STRIP.



*TJN*  
 11/3/2022  
  
 LICENSED PROFESSIONAL ENGINEER

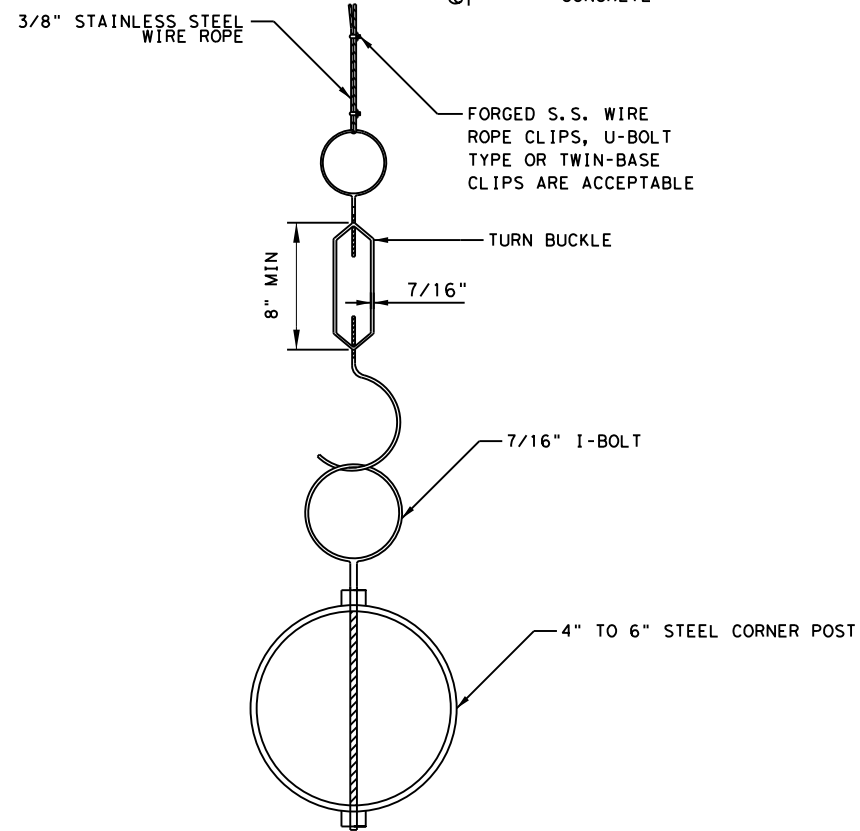
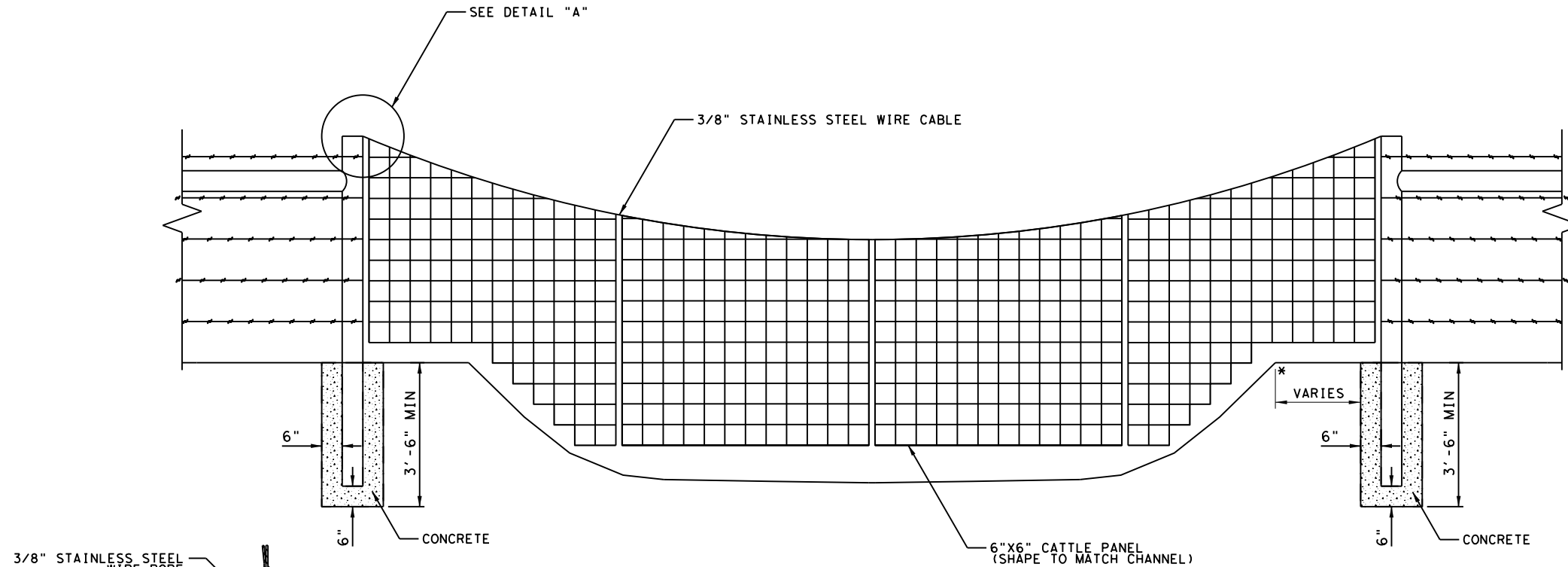
**Kimley»Horn** F-928  
  
 Texas Department of Transportation

**CR 452 AT BRANCH OF MUSTANG CREEK  
 PLAN AND PROFILE**

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0914	05	174	CR 452
DIST	COUNTY		SHEET NO.
AUS	WILLIAMSON		25

FILENAME: pw:\kh-pw-bentley.com\kh-pw-01\Documents\01 Active Projects\TX-AUS-069284003 - Williamson County Bridges\DesignData\4 - Design\Plan Set\3. Roadway\CR 452\CR452-RDW-MISCDET.dgn  
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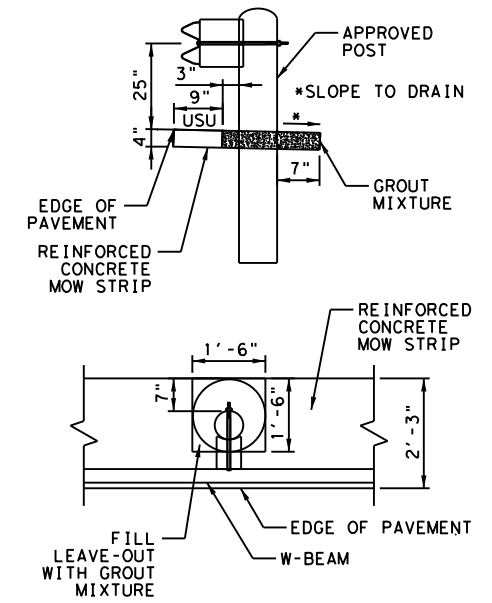


**DETAIL A**


\*TO BE DETERMINED IN THE FIELD BASED ON CHANNEL SLOPE STABILITY

- NOTES:
1. NUMBER OF CATTLE PANELS VARY W/ CHANNEL WIDTH.
  2. PLACE WIRE TWISTED STAYS AT CENTER OF CATTLE PANELS.
  3. ATTACH EACH VERTICAL STRAND OF CATTLE PANEL TO WIRE ROPE.
  4. SPACING BETWEEN CATTLE PANELS SHALL NOT EXCEED 3".
  5. CUT CATTLE PANELS TO CONFORM TO THE SHAPE OF CHANNEL AND MAINTAIN A 24" GAP BETWEEN CHANNEL BOTTOM.
  6. DESIGN AND CONSISTENCY OF CONCRETE WILL BE APPROVED BY THE ENGINEER AND WILL CONTAIN AT LEAST 4 SACKS OF CEMENT PER CUBIC YARD.
  7. INSTALL A TURNBUCKLE AT EACH END OF THE CABLE.

**WATER GAP FENCE DETAIL**



**REDUCED MOWSTRIP DETAIL**

TJN  
 11/21/2022  


**Kimley»Horn** F-928

Texas Department of Transportation

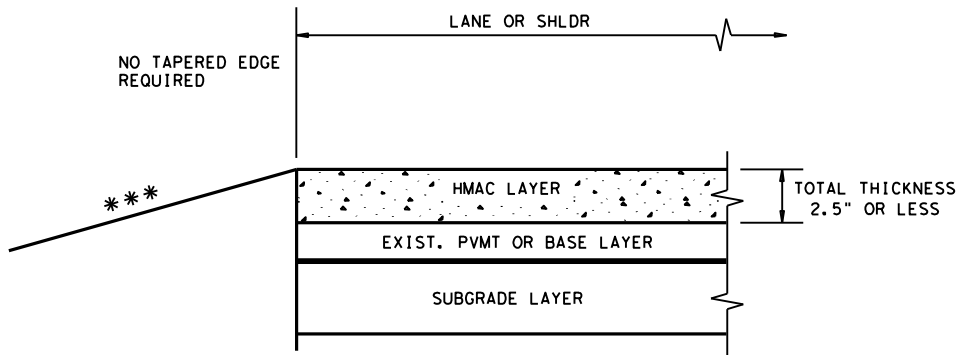
CR 452 AT BRANCH OF MUSTANG CREEK  
 MISCELLANEOUS DETAILS

SHEET 1 OF 1

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	26	

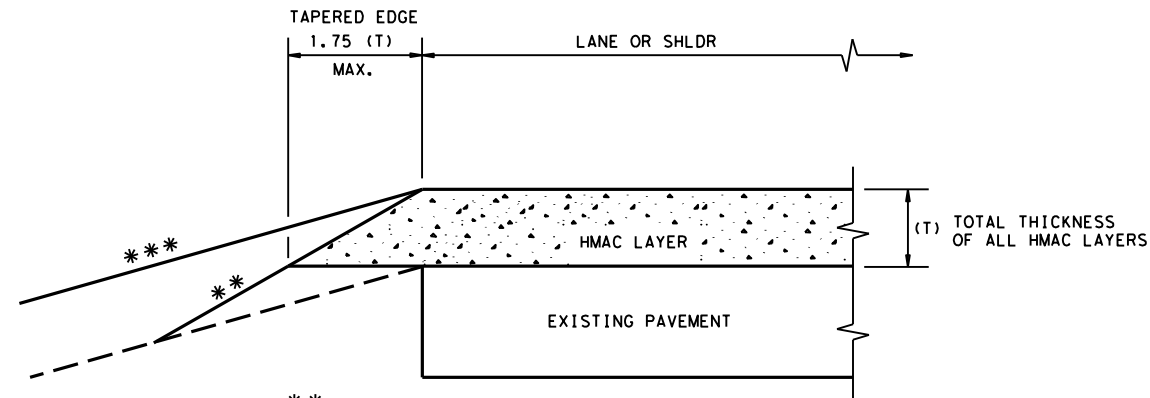
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DATE: 11/23/2022  
 FILE: c:\pw\khl\d0187881\tehmoc11.dgn



\*\*\* SEE TYPICAL SECTION FOR ROADSIDE DETAILS

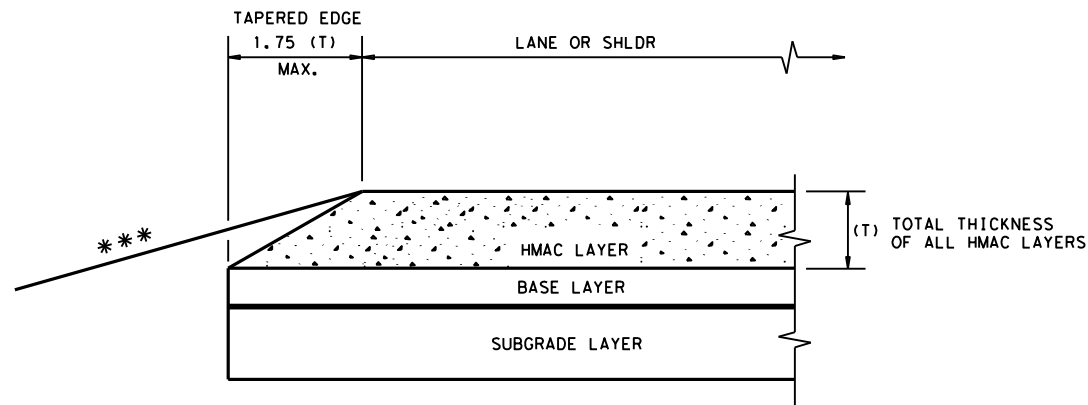
**CONDITION - 1**  
 THIN HMAC SURFACES OR HMAC OVERLAY  
 WITH THICKNESS OF 2.5" OR LESS



\*\* EXISTING ROADSIDE EMBANKMENT TO BE GRADED TO PRODUCE A SMOOTH LEVEL SURFACE FOR PLACEMENT OF TAPERED EDGE. THIS WORK IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

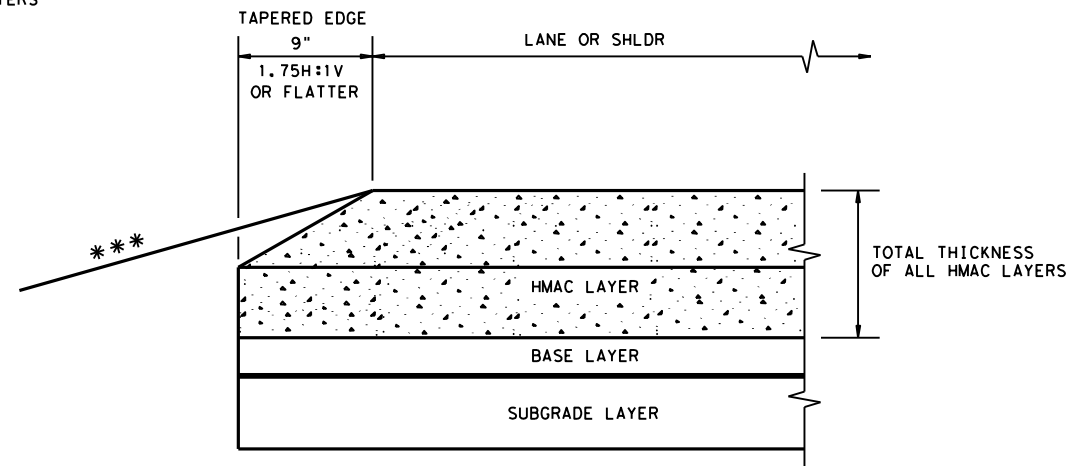
\*\*\* SEE TYPICAL SECTION FOR ROADSIDE DETAILS

**CONDITION - 2**  
 OVERLAY OF EXISTING PAVEMENT  
 HMAC THICKNESS 2.5" TO 5"



\*\*\* SEE TYPICAL SECTION FOR ROADSIDE DETAILS

**CONDITION - 3**  
 NEW OR RECONSTRUCTED PAVEMENT  
 HMAC THICKNESS 2.5" TO 5"



\*\*\* SEE TYPICAL SECTION FOR ROADSIDE DETAILS

**CONDITION - 4**  
 NEW OR RECONSTRUCTED PAVEMENT  
 HMAC THICKNESS 5" OR GREATER

**GENERAL NOTES**

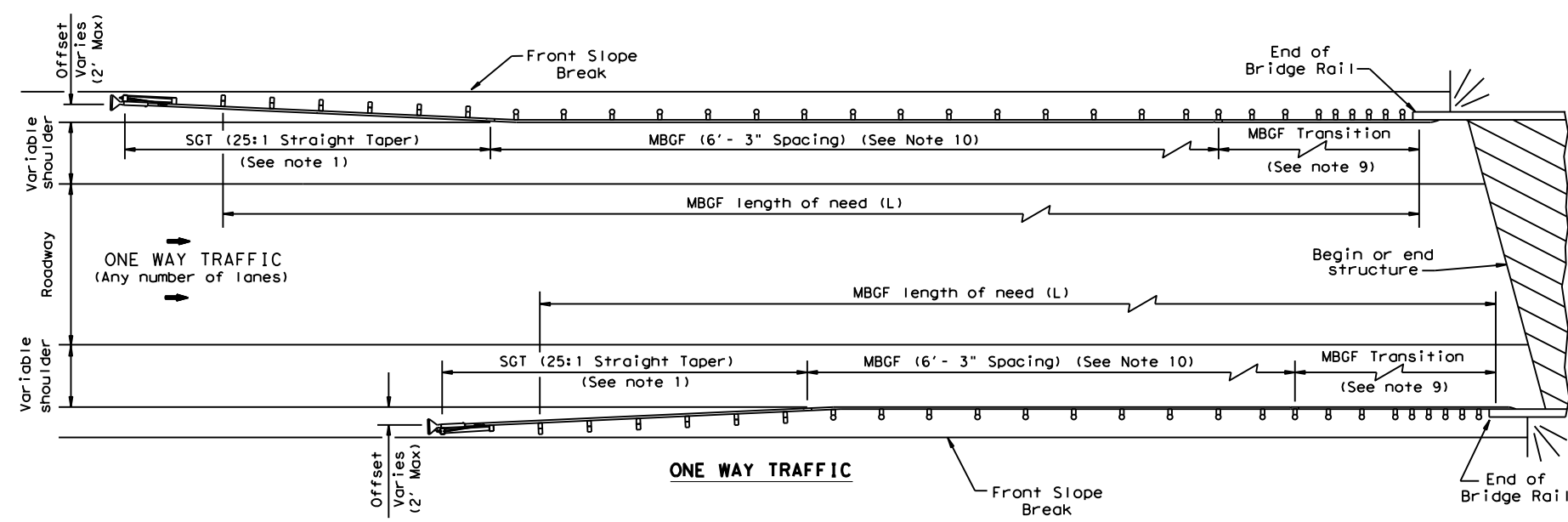
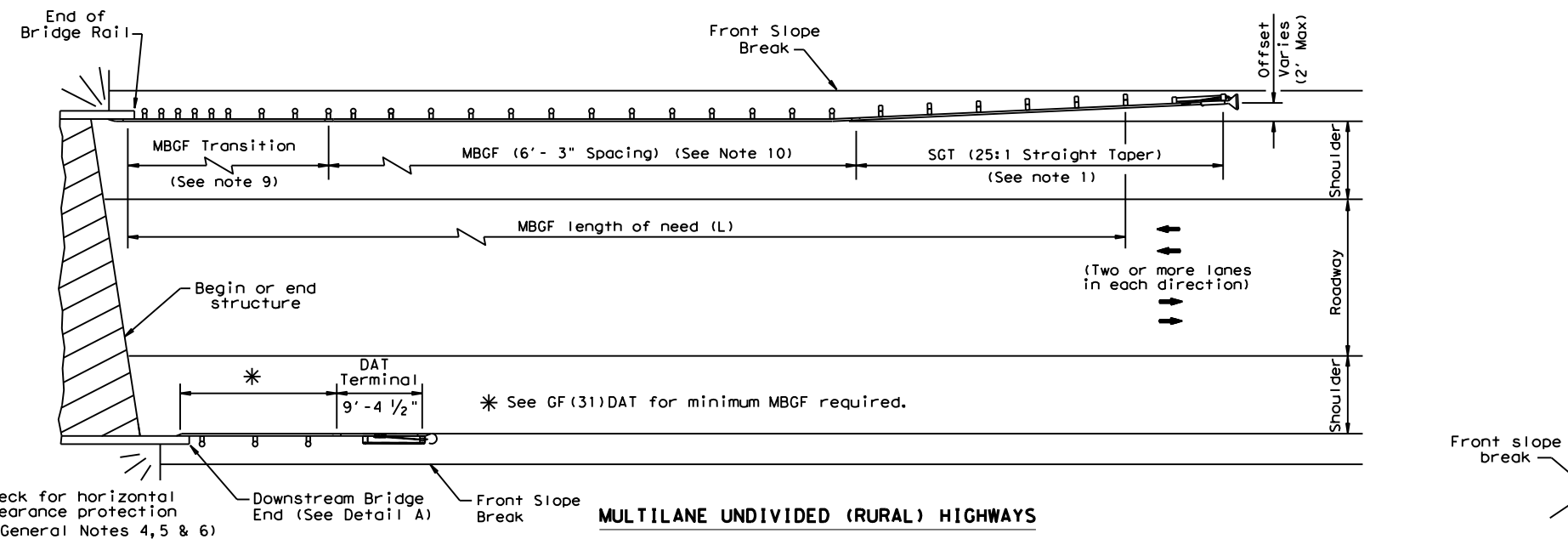
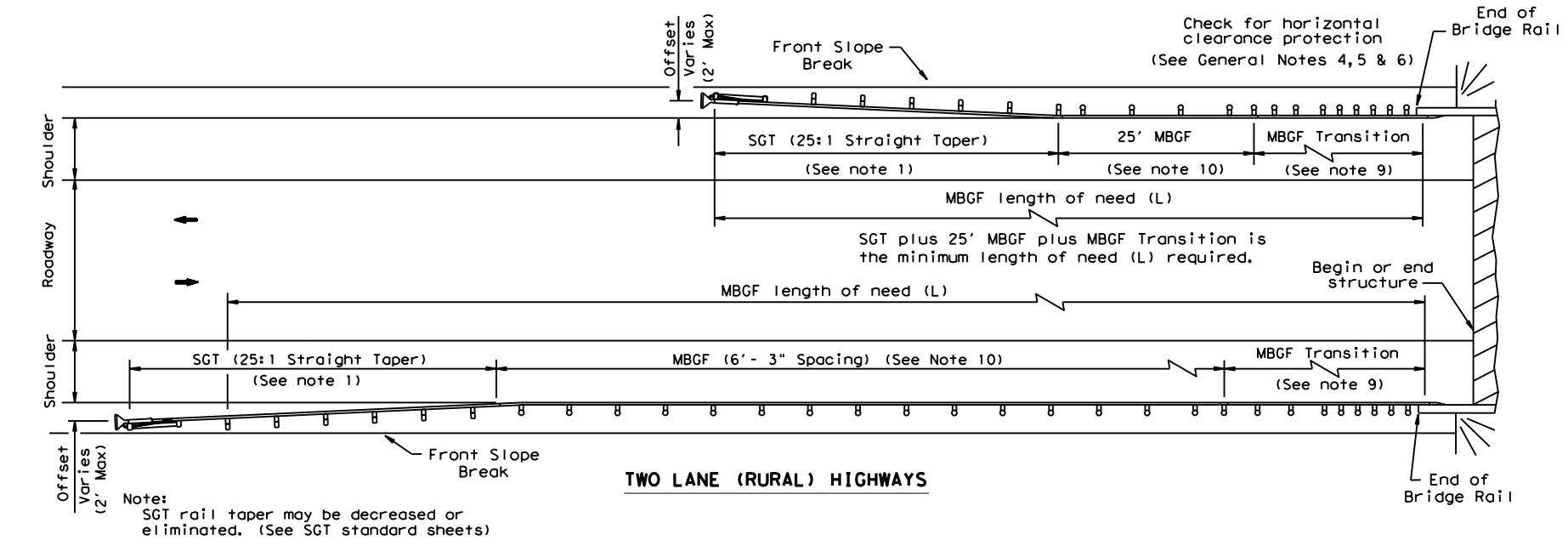
1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
5. THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.

(NOT TO SCALE)

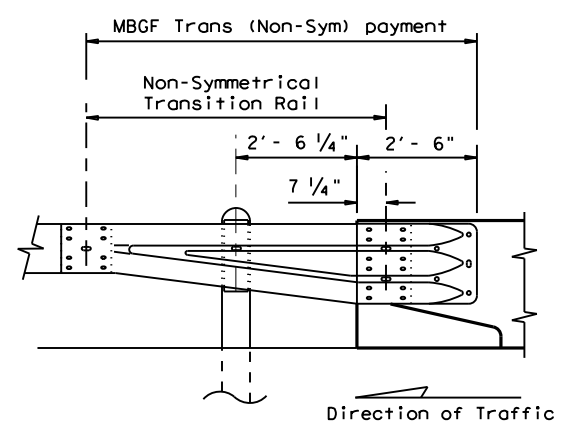
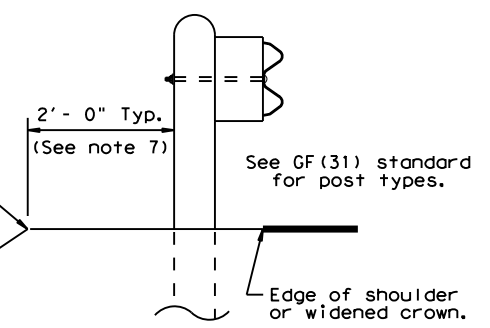
					Design Division Standard
<b>TAPERED EDGE DETAILS          HMAC PAVEMENT</b>					
<b>TE (HMAC) - 11</b>					
FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:	
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0914	05	174	CR 452	
	DIST	COUNTY	SHEET NO.		
	AUS	WILLIAMSON	27		

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



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

Texas Department of Transportation  
 Design Division Standard

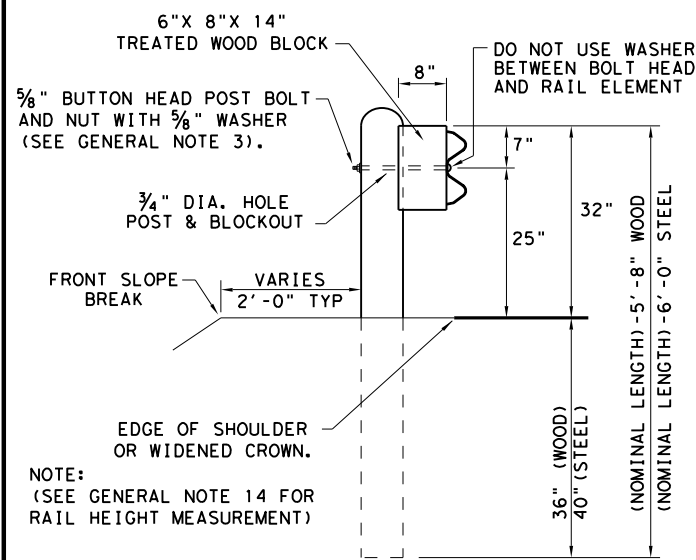
**BRIDGE END DETAILS**  
 (METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

**BED-14**

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISED APRIL 2014 SEE (MEMO 0414)	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	28	

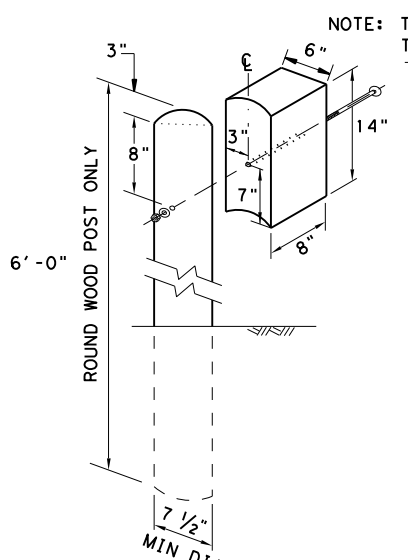
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DATE: 11/23/2022  
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**TYPICAL POST PLACEMENT**

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

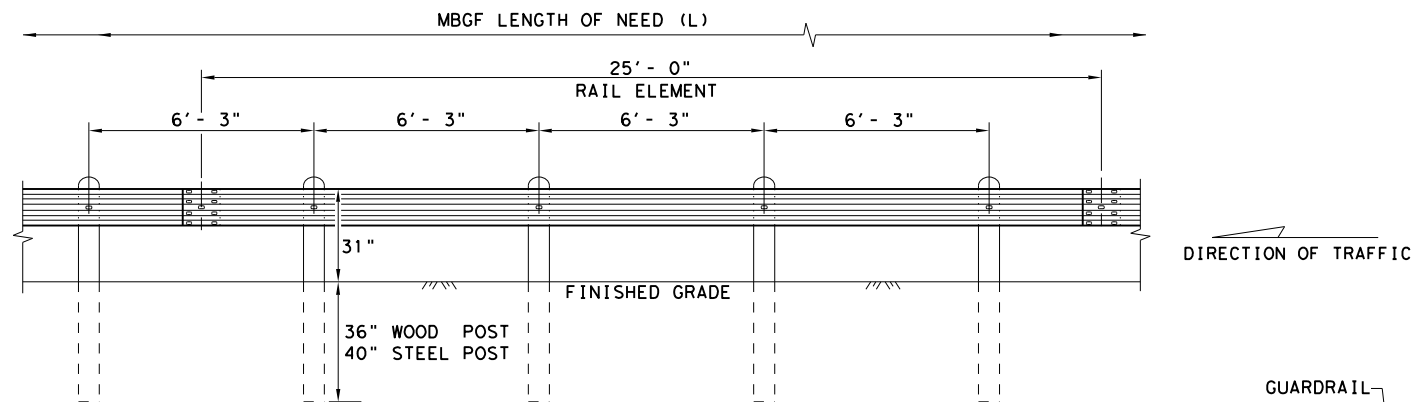


**WOOD BLOCK TO ROUND WOOD POST**

**WOOD BLOCK TO RECTANGULAR WOOD POST**

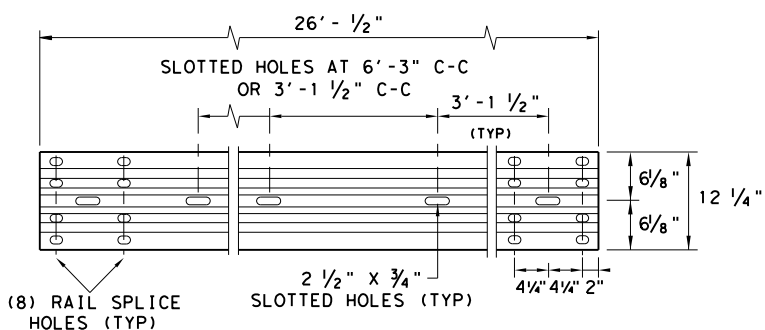
**ROUTED WOOD BLOCK TO I-BEAM STEEL POST**

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.

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

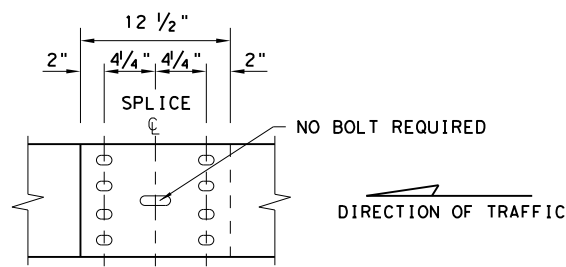
SPLICE BOLT LENGTH VARIES

FBB01 = 1 1/4"  
 FBB02 = 2"

POST & BLOCK LENGTH  
 FBB03 = 10"  
 FBB04 = 18"

**BUTTON HEAD BOLT**

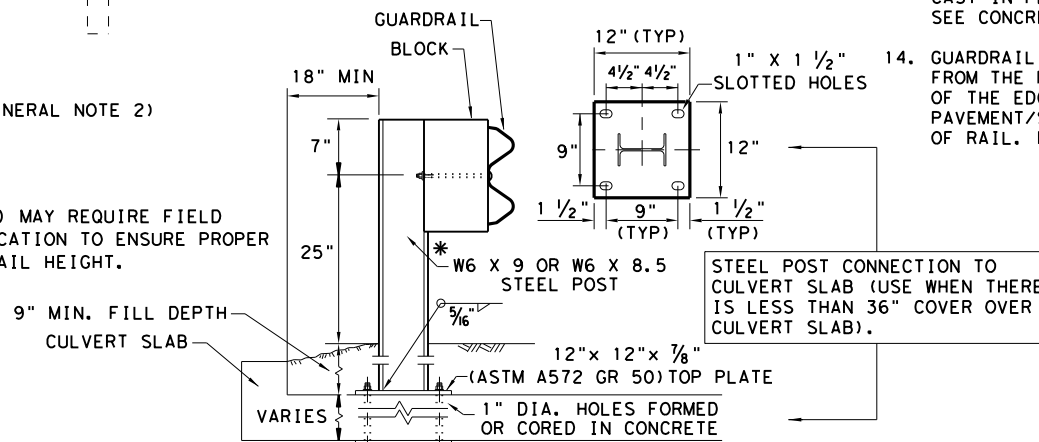
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



**MID-SPAN RAIL SPLICE DETAIL**

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

\* POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.



**LOW FILL CULVERT POST**

12" x 12" x 1/4" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

NOTE: TWO INSTALLATION OPTIONS.

1. **BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.

2. **EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" 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 1/4" MIN. BEYOND NUT.

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

**GENERAL NOTES**

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25' - 0", OR 12' - 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 1/2" 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 3/8" WASHER (FWC160) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

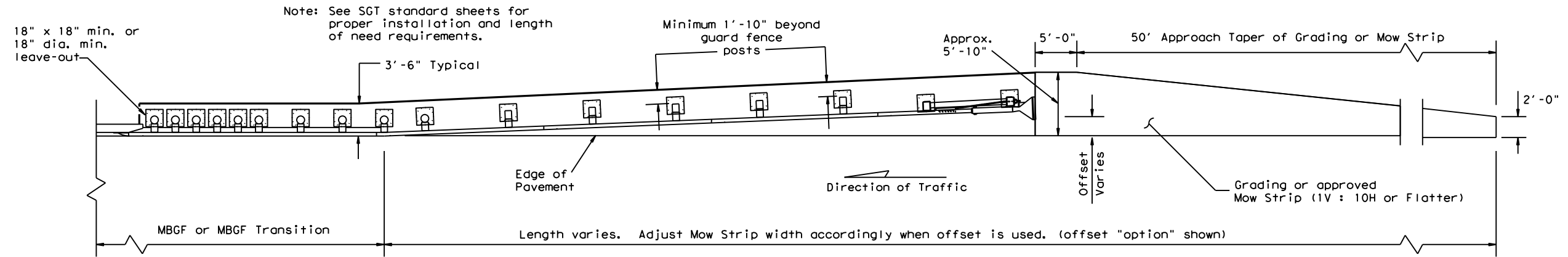
NOTE: TRANSITIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS. SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS. SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

				Design Division Standard
<b>METAL BEAM GUARD FENCE</b> <b>TL-3 MASH COMPLIANT</b> <b>GF(31)-19</b>				
FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	29	



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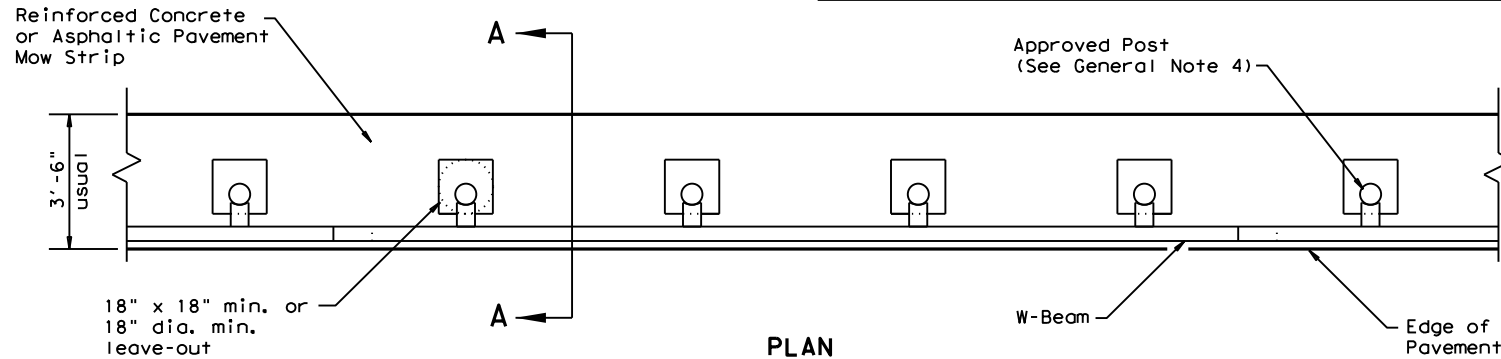
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Note: See SGT standard sheets for proper installation and length of need requirements.

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.

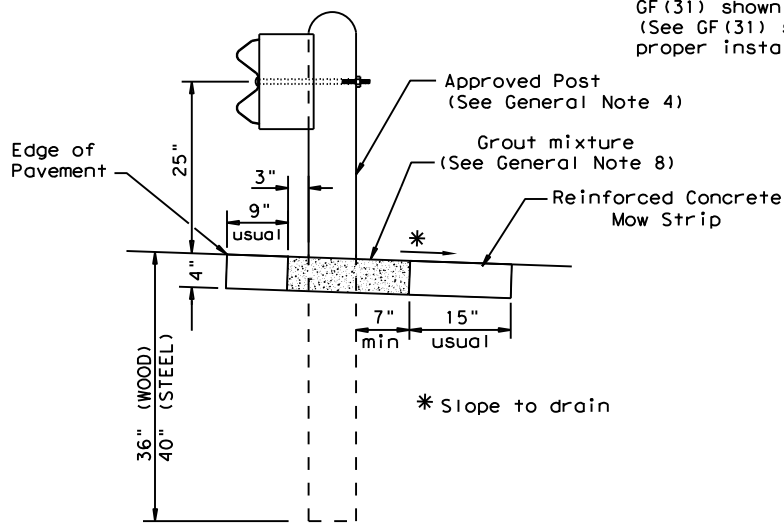
**GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS**



**PLAN**

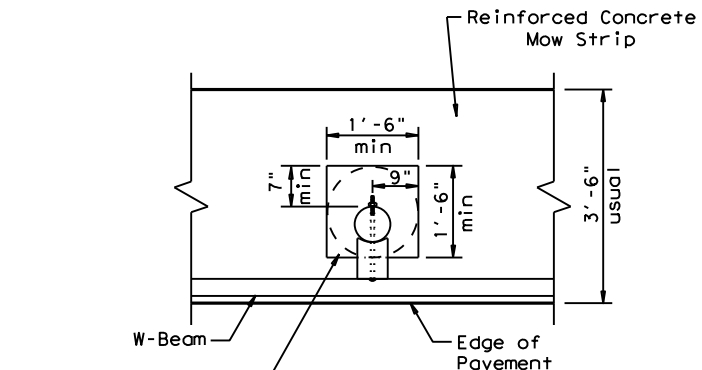
**GENERAL NOTES**

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 1/2" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.



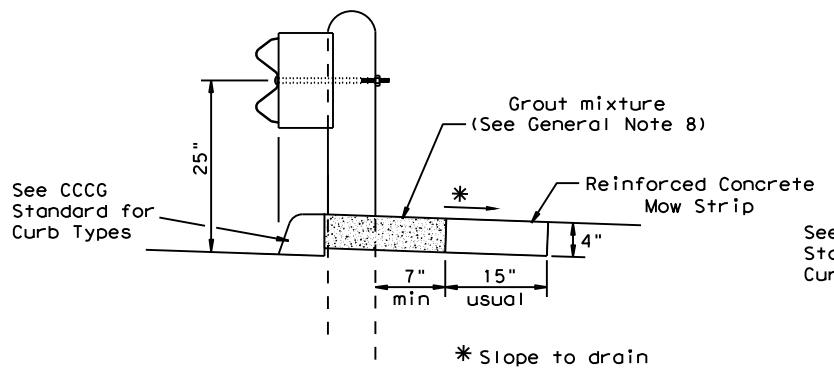
**SECTION A-A**

Typical



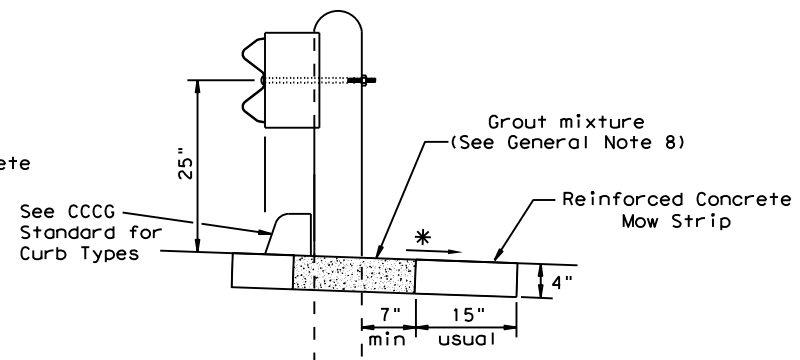
**MOW STRIP DETAIL**

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



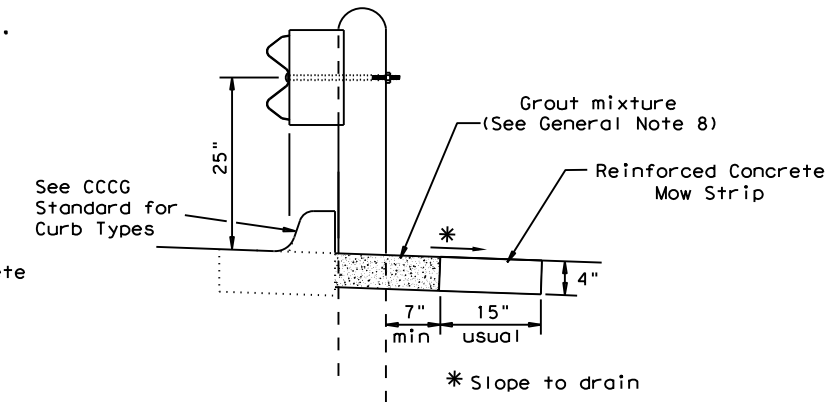
**CURB OPTION (1)**

This option will increase the post embedment throughout the system.



**CURB OPTION (2)**

Curb shown on top of mow strip

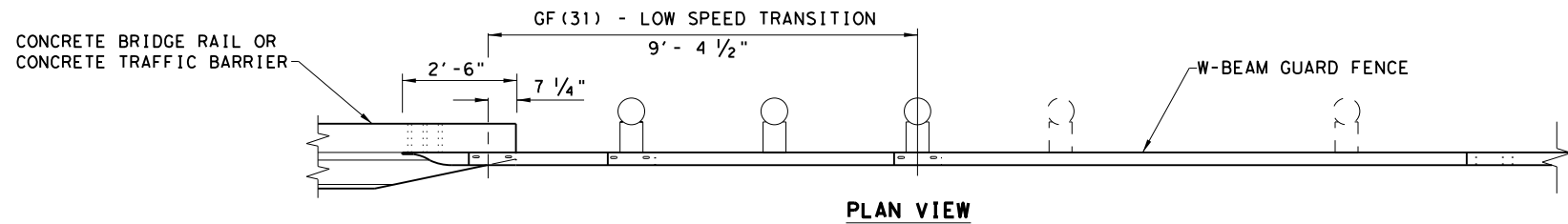


**CURB OPTION (3)**

		Design Division Standard	
<b>METAL BEAM GUARD FENCE (MOW STRIP)</b> <b>TL-3 MASH COMPLIANT</b> <b>GF(31)MS-19</b>			
FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB
REVISIONS	0914	05	174
	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	30

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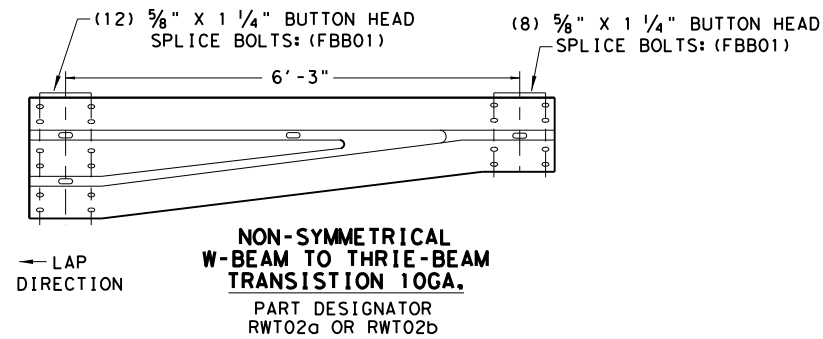
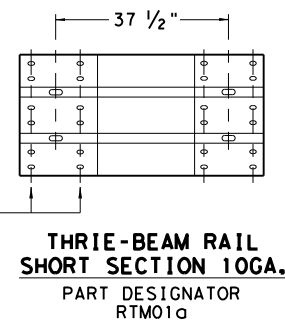
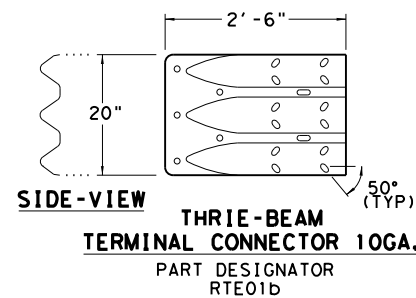
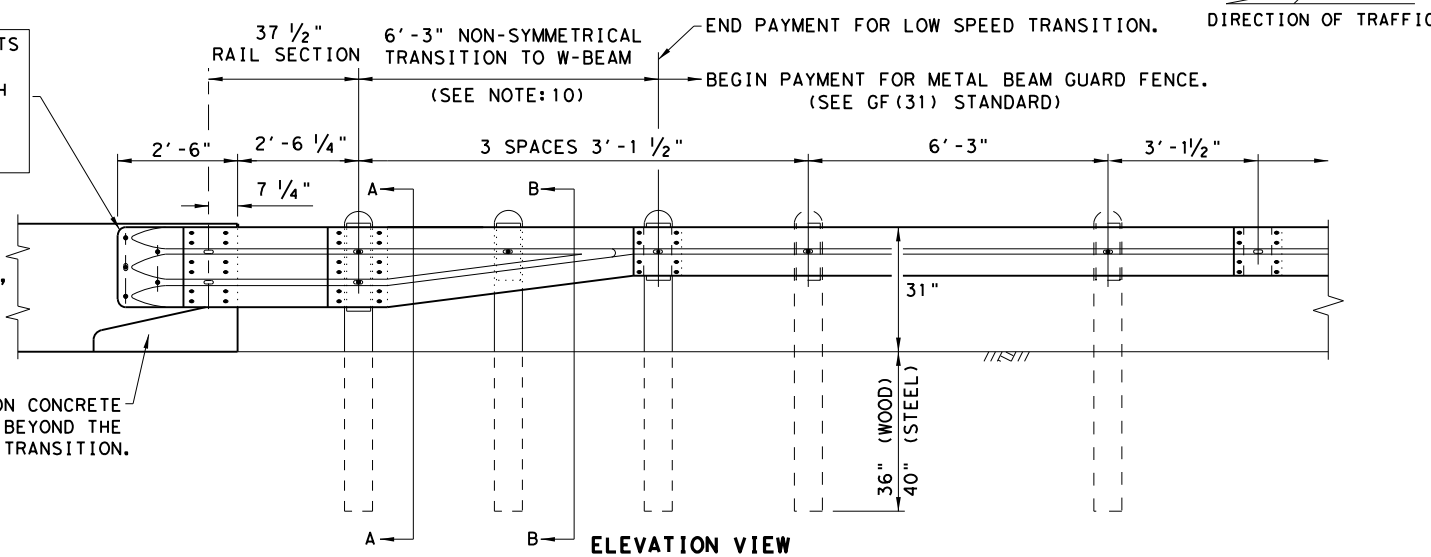
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- (5) 7/8" DIA. HEAVY HEX HEAD BOLTS (ASTM A325 OR A449)
- (10) 1 3/4" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
- (5) 7/8" DIA. HEAVY HEX NUTS (ASTM A194 OR A563)

NOTE: HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE 7/8" HEX NUT. TRIM AS REQUIRED.

NOTE: CHAMFER REQUIRED ON CONCRETE RAILS THAT EXTEND BEYOND THE FACE OF GUARDRAIL TRANSITION.

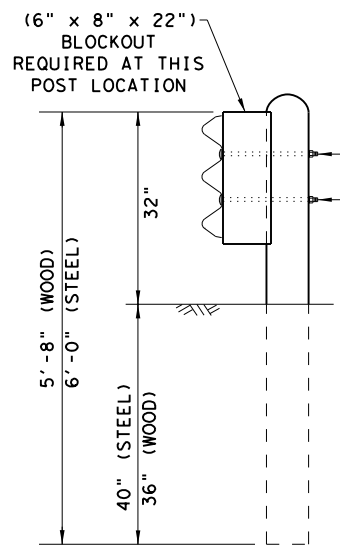


- (2) 5/8" BUTTON HEAD POST BOLTS & NUTS: (FBB04)
- (1) 5/8" FLAT WASHER: (FWC14a) UNDER EACH NUT

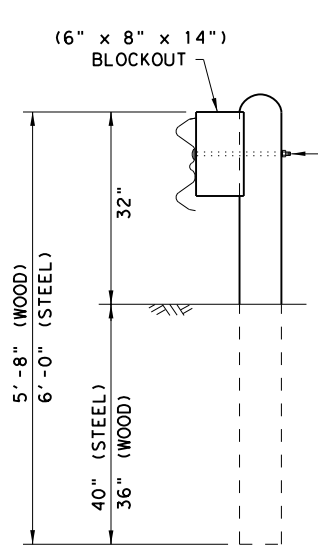
- (1) 5/8" BUTTON HEAD POST BOLT & NUT: (FBB04)
- (1) 5/8" FLAT WASHER: (FWC14a) UNDER EACH NUT

PLATE WASHER INSTRUCTIONS

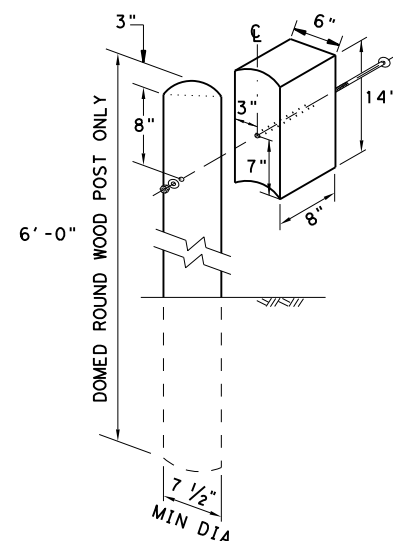
BRIDGE APPROACH - UPSTREAM: THE SHORT RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.  
BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF CONNECTOR.



SECTION A-A

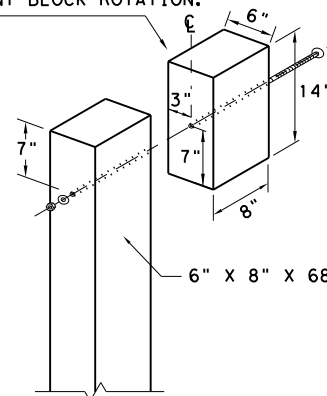


SECTION B-B

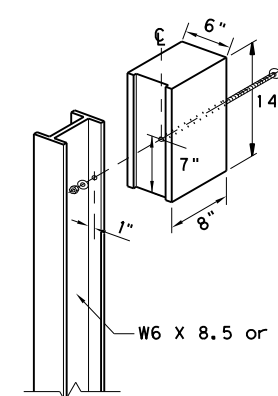


WOOD BLOCK TO ROUND WOOD POST

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



WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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

**GENERAL NOTES**

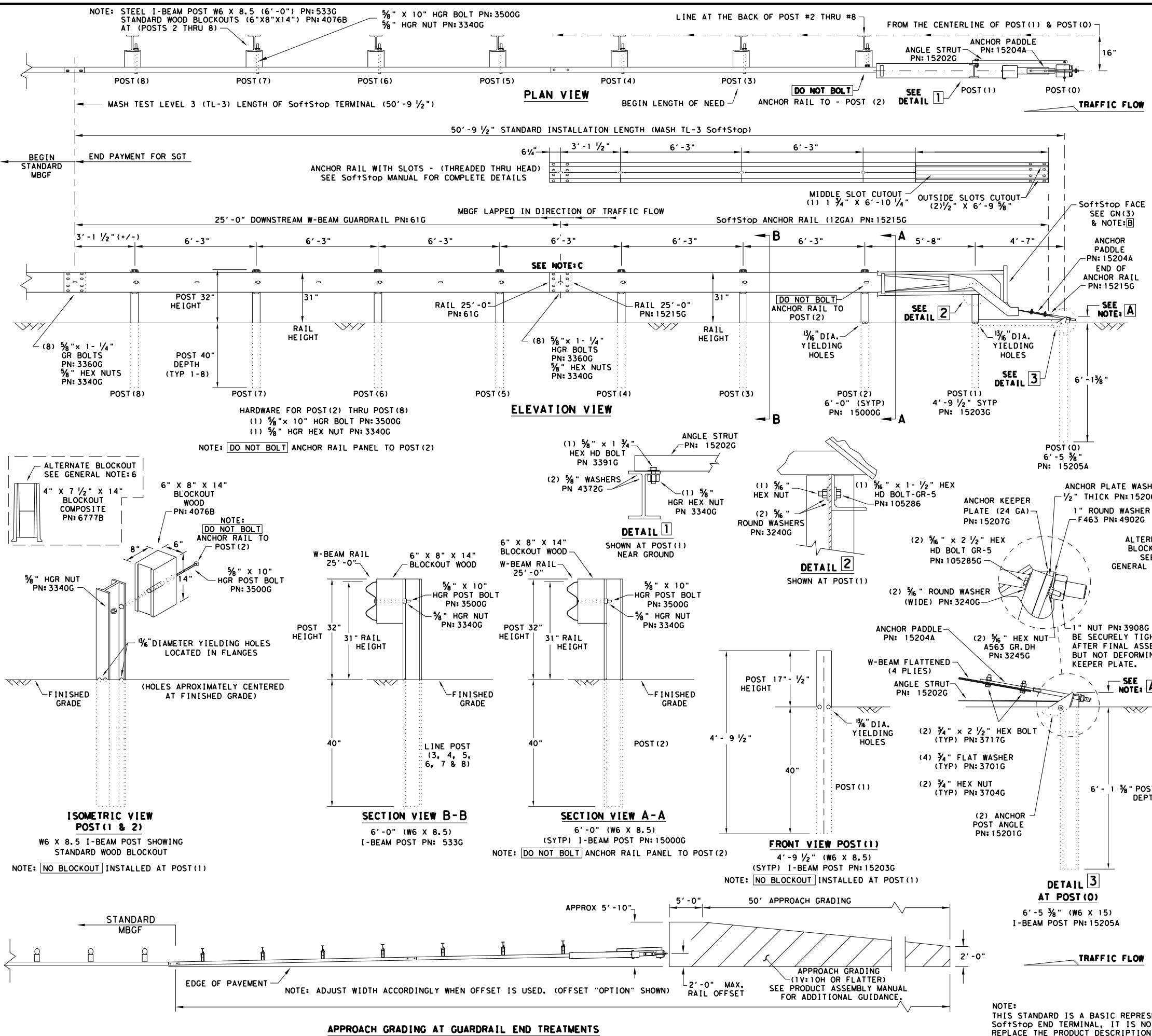
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. REFER TO GF(31) STANDARD SHEET.
2. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS.
3. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
4. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM BOLT LENGTH TO MEET REQUIRED LENGTH.
5. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
6. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
7. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
8. 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 CAN FURNISH COMPOSITE MATERIAL BLOCKS.
9. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
10. FOR ROUND WOOD POSTS SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE TRANSITION.

**LOW-SPEED TRANSITION**

				Design Division Standard
<b>METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-2 MASH COMPLIANT GF(31) TR TL2-19</b>				
FILE: gf31tr+1219.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	31	

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DATE: 11/23/2022  
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- GENERAL NOTES**
- 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
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
  - 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.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - 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.
  - IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBBF STANDARD FOR INSTALLATION GUIDANCE.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
  - DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
  - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
  - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRoaching ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

**NOTE: A** THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE.

**NOTE: B** PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)  
 PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)

**NOTE: C** W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5)  
 GUARDRAIL PANEL 25'-0" PN: 61G  
 ANCHOR RAIL 25'-0" PN: 15215G  
 LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

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

Texas Department of Transportation  
 Design Division Standard

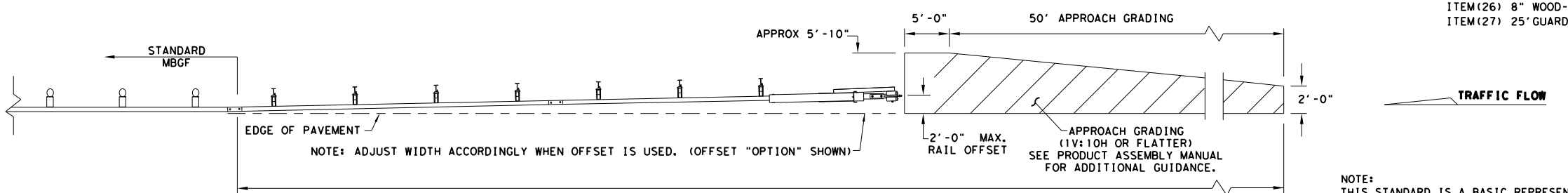
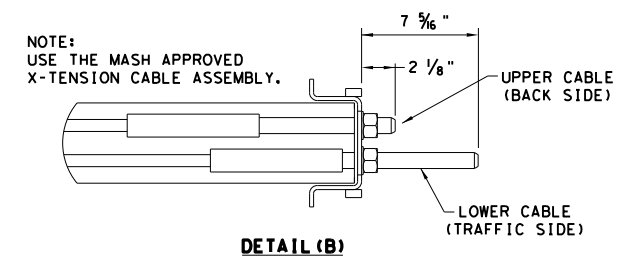
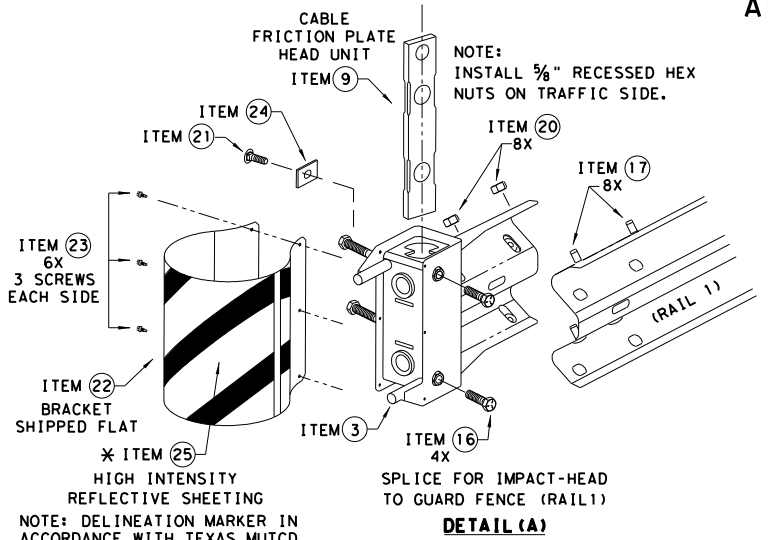
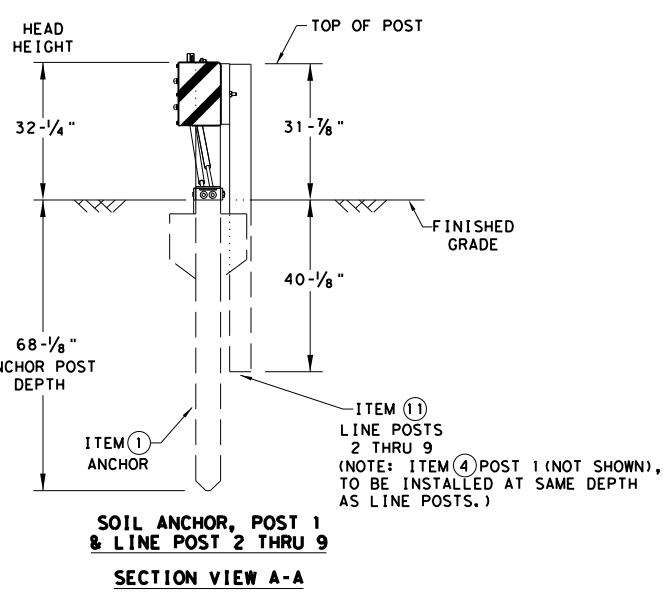
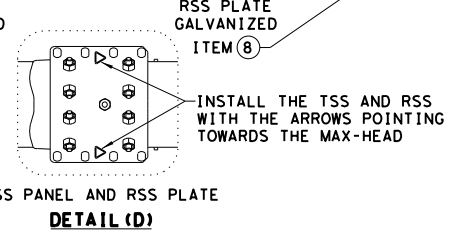
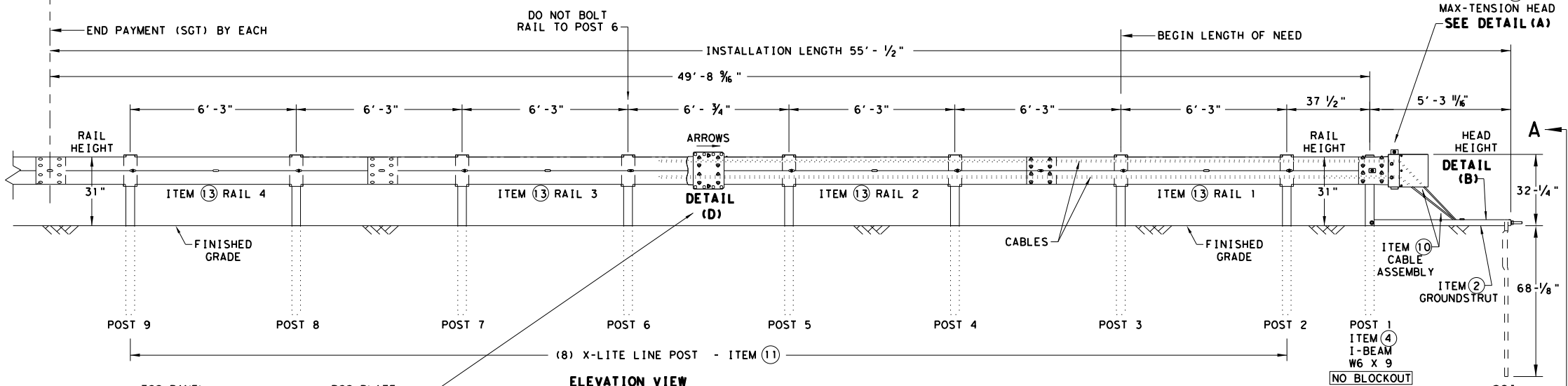
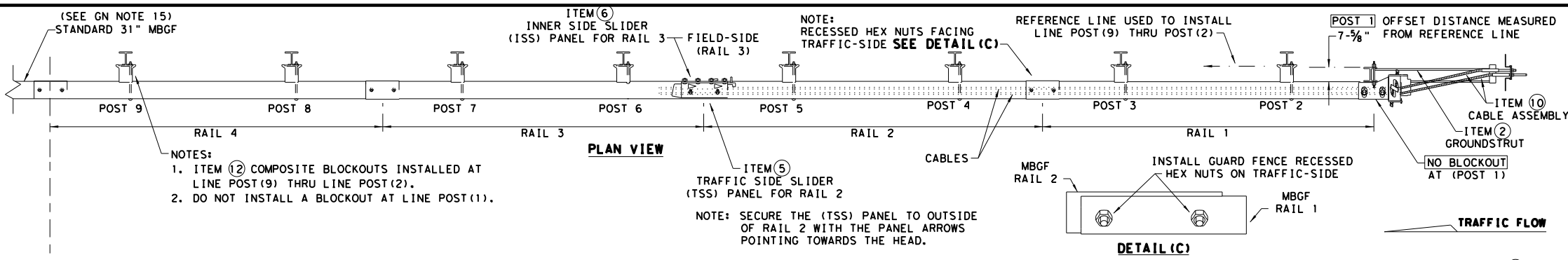
**TRINITY HIGHWAY  
 SOFTSTOP END TERMINAL  
 MASH - TL-3  
 SGT (10S) 31-16**

FILE: sgt10s3116	DW: TxDOT	CK: KM	DW: VP	CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	32	

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

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DATE: 11/23/2022  
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NOTE: TxDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

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

**GENERAL NOTES**

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

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT. -GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	3/8" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	3/8" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWRO3	1
25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

\* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.  
 \*\* ALTERNATIVE ITEMS NOT SHOWN.  
 ITEM (26) 8" WOOD-BLOCKOUTS  
 ITEM (27) 25' GUARD FENCE PANELS

Texas Department of Transportation  
 Design Division Standard

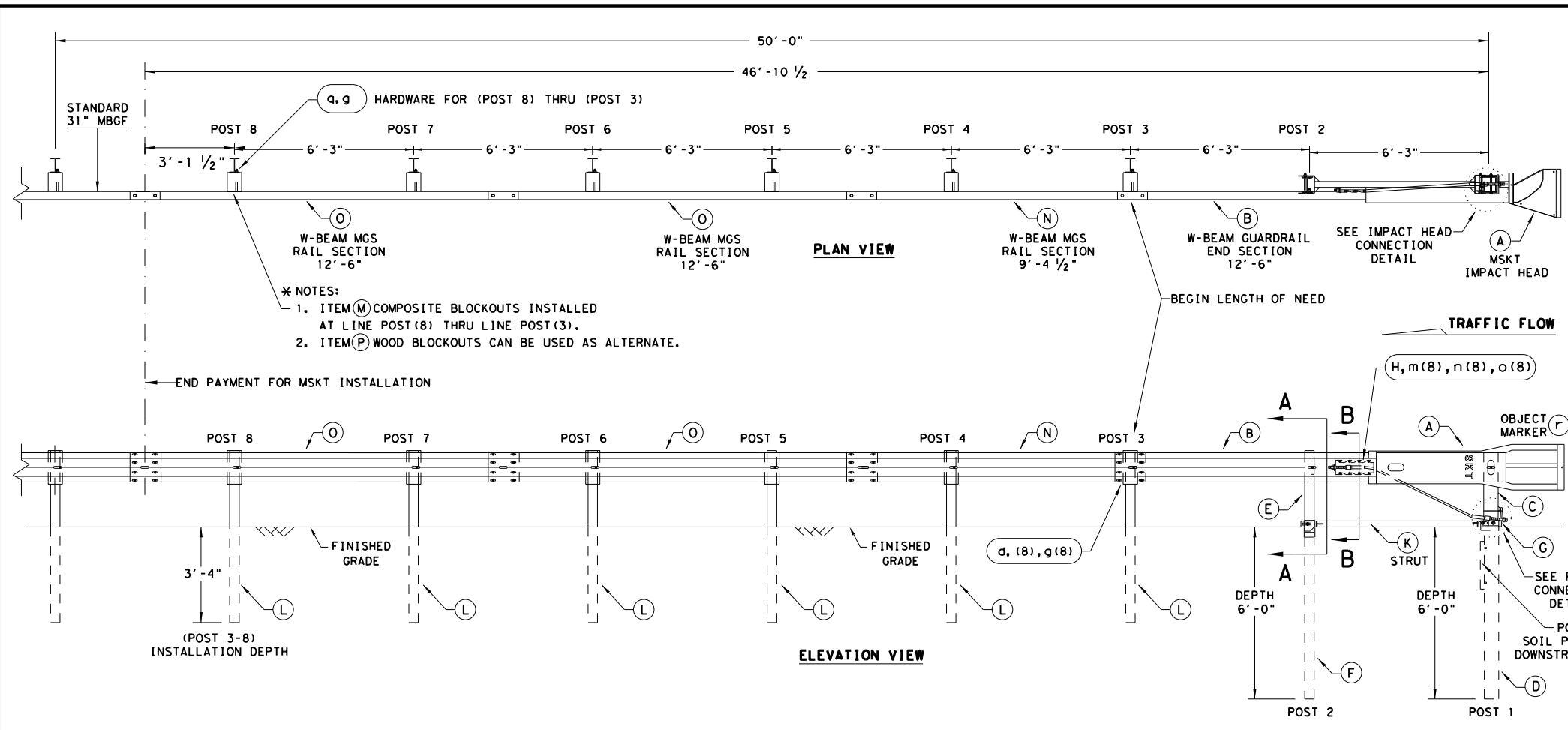
**MAX-TENSION END TERMINAL  
 MASH - TL-3**

**SGT (11S) 31-18**

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
DIST	COUNTY		SHEET NO.	
AUS	WILLIAMSON		33	

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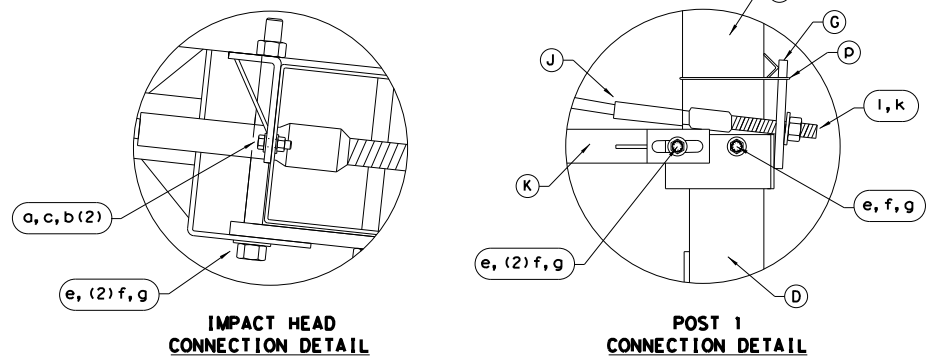
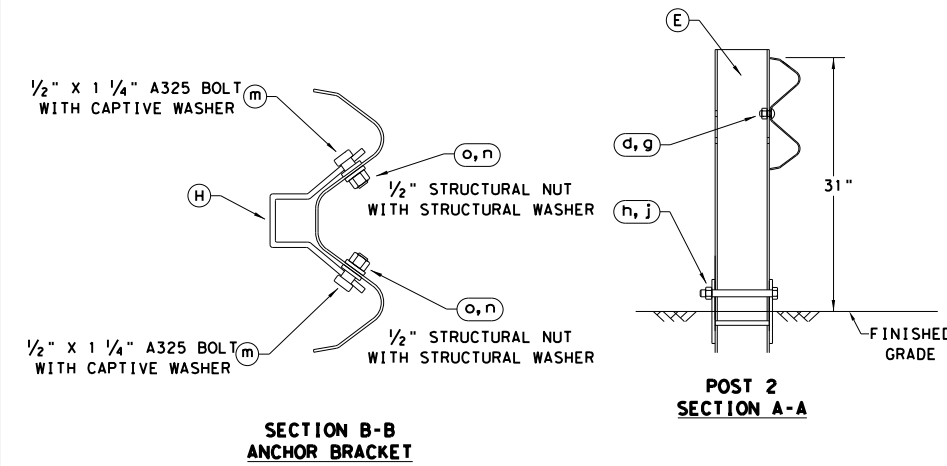
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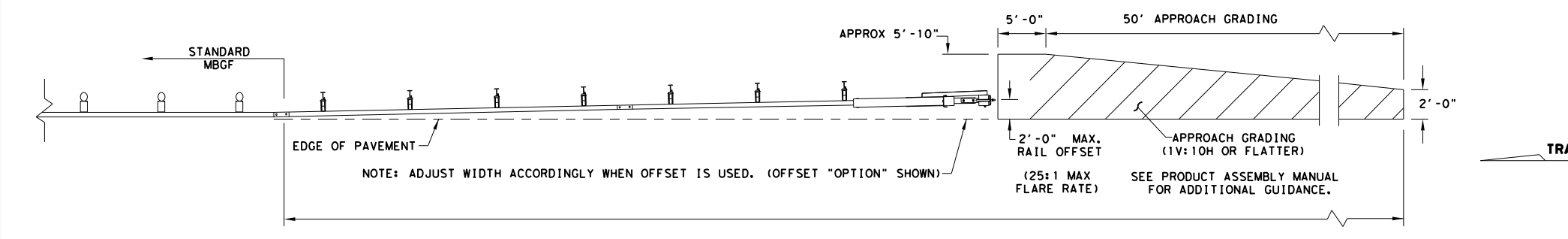
- \* NOTES:**
- ITEM (M) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (8) THRU LINE POST (3).
  - ITEM (P) WOOD BLOCKOUTS CAN BE USED AS ALTERNATE.

- GENERAL NOTES**
- 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
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE: MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
  - 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.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
  - 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.
  - IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MOW STRIP STANDARD FOR INSTALLATION GUIDANCE.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
  - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
  - 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.
  - THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN ITS PLACE.
  - 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 Go.	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			
o	2	3/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	3/8" WASHER	W0516
c	2	3/8" HEX NUT	N0516
d	25	3/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	3/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	3/8" WASHER	W050
g	33	3/8" 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 1/8" O.D. x 3/8" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	3/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151



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



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.

Design Division Standard

## SINGLE GUARDRAIL TERMINAL

### MSKT-MASH-TL-3

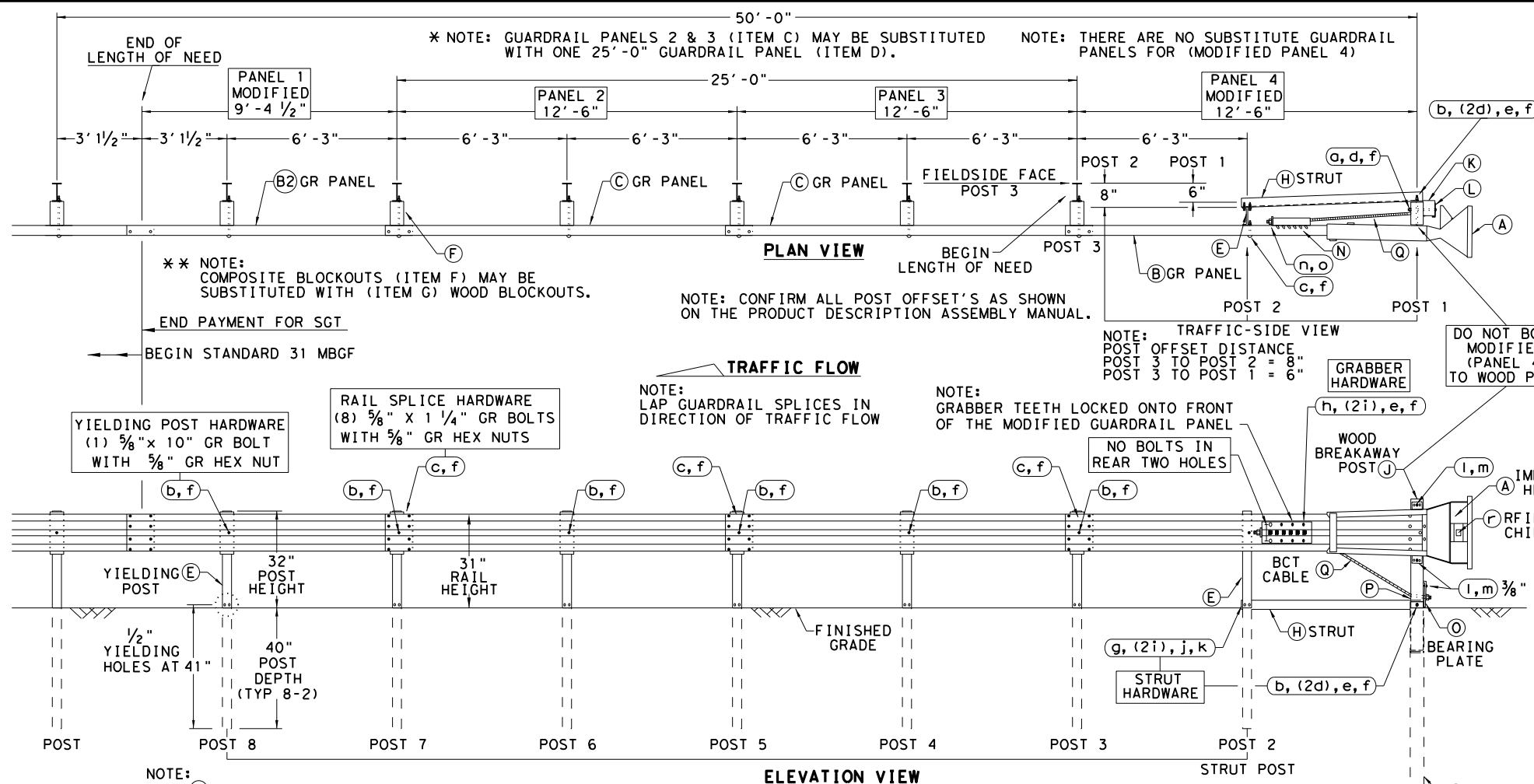
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© TXDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	34	



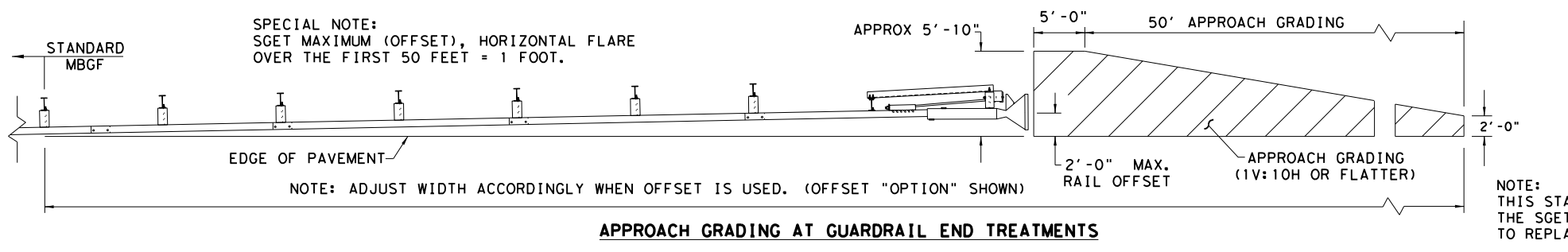
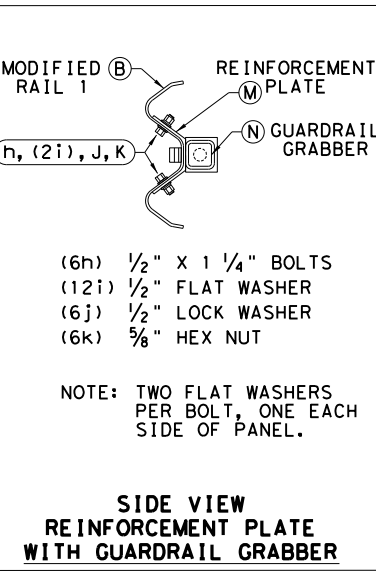
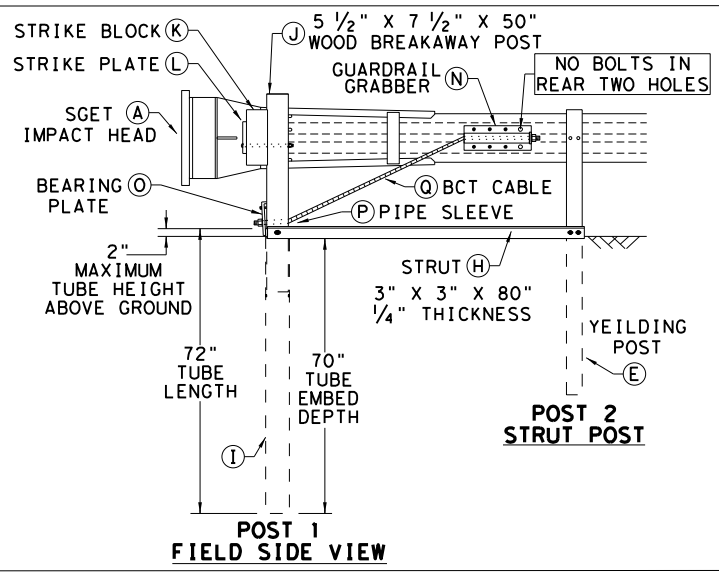
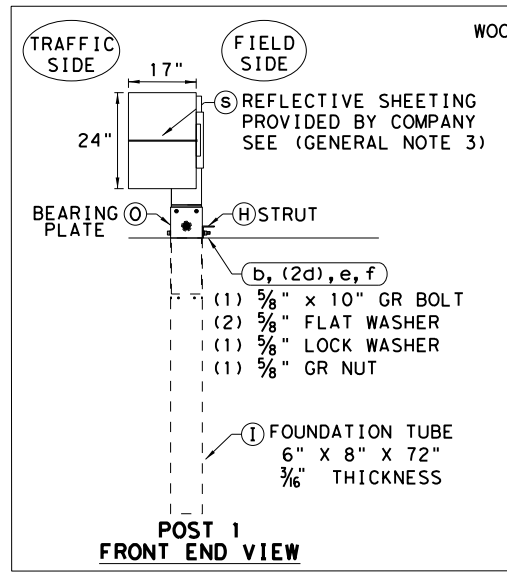
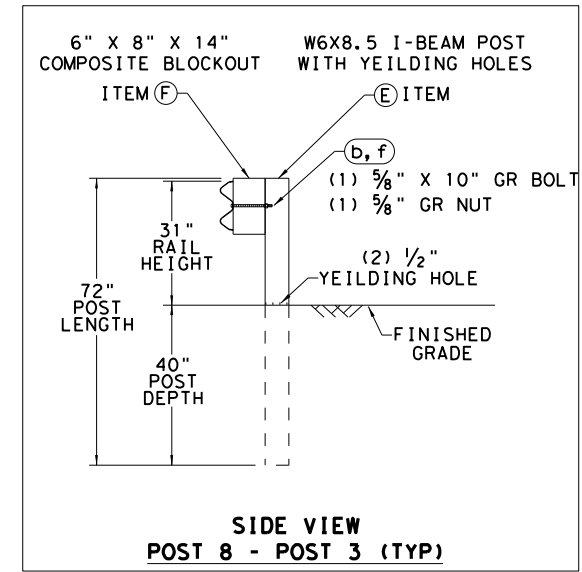
DISCLAIMER: THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

DATE: 11/23/2022  
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- ### GENERAL NOTES
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
  - MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
  - THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
  - THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" X 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" X 3/8"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" X 7 1/2" X 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
SMALL HARDWARE			
o	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPlice BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M



NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

Texas Department of Transportation  
 Design Division Standard

## SPIG INDUSTRY, LLC

### SINGLE GUARDRAIL TERMINAL

### SGET - TL-3 - MASH

### SGT (15) 31-20

FILE: sg153120.dgn	DN: TXDOT	CK: KM	DW: VP	CK: VP
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REVISIONS	DIST: AUS	COUNTY: WILLIAMSON	SHEET NO. 35	

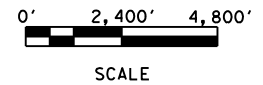


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**NOTES:**

1. REFER TO THE HYDROLOGIC DATA SHEET FOR DETAIL CALCULATIONS.
2. MUSTANG CREEK TRIBUTARY 5 IS LOCATED IN A FEMA ZONE A FLOODPLAIN PER FIRM PANEL 48491C0524F DATED DECEMBER 20, 2019.
3. DRAINAGE AREA DELINEATED BASED ON TNRIS 2016 LIDAR.



*ASH*  
 11/3/2022  


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CR 452 AT BRANCH OF MUSTANG CREEK  
 DRAINAGE AREA MAP

SHEET 1 OF 1

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	36



FILENAME: \\kh-pw-bentley.com\kh-pw-01\Documents\01 Active Projects\TX-AUS-069284003 - Williamson County Bridges\DesignData\4 - Design\Plan Set\5. Drainage\CR452\_DRC\_HYGCALC.dgn  
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HYDROLOGIC MODELING INPUT PARAMETERS													
Name	Subbasin		Weighted Curve Number	T <sub>c</sub> (min)	T <sub>lag</sub> (min)	T <sub>interval</sub> (min)	2 yr (in)	5 yr (in)	10 yr (in)	25 yr (in)	50 yr (in)	100 yr (in)	500 yr (in)
	Area (sq mi)	Area (ac)											
DA-CR 452	2.52	1613.00	81	136	82	18	3.95	5.18	6.35	8.13	9.65	11.40	16.60

FLOW COMPUTATION (Q)						
2 yr (cfs)	5 yr (cfs)	10 yr (cfs)	25 yr (cfs)	50 yr (cfs)	100 yr (cfs)	500 yr (cfs)
1054	1559	2025	2709	3261	3862	5495

Loss Method:	SCS Curve Number
Surface Method:	SCS Unit Hydrograph
Precipitation:	SCS Storm - Atlas 14 Depths

CR 452 Time of Concentration	
Calculation Method	Kerby Kirpich Method
Kerby Variables	
Overland Flow Roughness	0.4
Slope (ft/ft)	0.004
Length (ft)	1200
Kerpich Flow Variables	
Slope (ft/ft)	0.007
Length (ft)	14380
Time of Concentration (min)	136

**NOTES:**

1. RAINFALL DATA OBTAINED FROM NOAA ATLAS 14.
2. RUNOFF MODELED IN HECHMS V 4.5 USING SCS LOSS AND TRANSFORM METHODS, AND SCS STORM WITH RAINFALL DEPTHS FROM NOAA ATLAS 14.

  
 11/3/2022  


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CR 452 AT BRANCH OF  
 MUSTANG CREEK  
 HYDROLOGIC DATA SHEET

SHEET 1 OF 1

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	37	

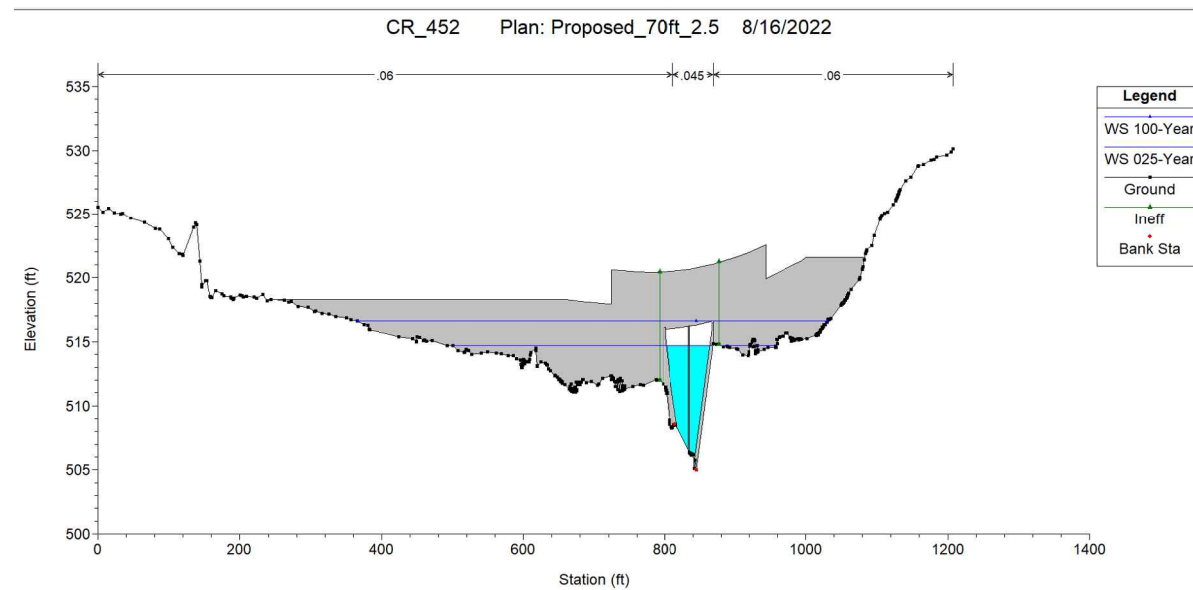
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### HEC-RAS HYDRAULIC CALCULATIONS


Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Mustang Creek	4956	025-Year	CR 452 EX	2709	508.18	519.09		519.1	0.000078	1.28	3846.52	741.48	0.07
Mustang Creek	4956	025-Year	Proposed	2709	508.18	516.38		516.42	0.000499	2.58	1952.62	595.1	0.18
Mustang Creek	4956	100-Year	CR 452 EX	3862	508.18	519.78		519.79	0.000109	1.58	4362.54	752.95	0.09
Mustang Creek	4956	100-Year	Proposed	3862	508.18	519.36		519.38	0.000136	1.72	4051.34	746.45	0.1
Mustang Creek	4825	025-Year	CR 452 EX	2709	507.61	519.08		519.09	0.000074	1.36	3800.05	704.41	0.07
Mustang Creek	4825	025-Year	Proposed	2709	507.61	516.33		516.37	0.000379	2.53	1958.38	583.94	0.16
Mustang Creek	4825	100-Year	CR 452 EX	3862	507.61	519.76		519.78	0.000105	1.7	4287.98	717.73	0.09
Mustang Creek	4825	100-Year	Proposed	3862	507.61	519.35		519.37	0.00013	1.84	3989.02	709.97	0.1
Mustang Creek	4672	025-Year	CR 452 EX	2709	506.74	519.05		519.07	0.000174	2.1	2967.29	785.9	0.11
Mustang Creek	4672	025-Year	Proposed	2709	506.74	516.22	513.17	516.3	0.000609	3.21	1432.74	645.46	0.2
Mustang Creek	4672	100-Year	CR 452 EX	3862	506.74	519.72		519.76	0.000219	2.46	3504.19	797.37	0.13
Mustang Creek	4672	100-Year	Proposed	3862	506.74	519.33	513.71	519.35	0.00013	1.85	4199.53	790.7	0.1
Mustang Creek	4541	025-Year	CR 452 EX	2709	505.12	518.8	512.25	519.01	0.000673	4.25	1460.27	895.71	0.22
Mustang Creek	4541	025-Year	Proposed	2709	505.12	515.21	512.43	515.95	0.003206	7.24	434.53	524.93	0.45
Mustang Creek	4541	100-Year	CR 452 EX	3862	505.12	519.49	513.57	519.69	0.000728	4.59	2086.4	918.5	0.23
Mustang Creek	4541	100-Year	Proposed	3862	505.12	518.58	513.59	519.14	0.001639	6.54	717.97	875.52	0.34
Mustang Creek	4512		Bridge										
Mustang Creek	4465	025-Year	CR 452 EX	2709	505.22	513.86	511.97	513.96	0.000946	3.86	1447.27	481.17	0.25
Mustang Creek	4465	025-Year	Proposed	2709	505.22	513.48	511.28	514.06	0.003354	7.03	493.95	440.75	0.46
Mustang Creek	4465	100-Year	CR 452 EX	3862	505.22	514.53	513.01	514.66	0.001171	4.55	1800.35	564.48	0.28
Mustang Creek	4465	100-Year	Proposed	3862	505.22	514.01	512.19	514.98	0.005139	9.13	541.25	495.24	0.58
Mustang Creek	4394	025-Year	CR 452 EX	2709	505.28	513.61	511.91	513.82	0.002235	5.26	1001.39	387.21	0.37
Mustang Creek	4394	025-Year	Proposed	2709	505.28	513.46	511.91	513.69	0.002286	5.24	893.74	366.75	0.37
Mustang Creek	4394	100-Year	CR 452 EX	3862	505.28	514.23	512.58	514.5	0.002635	6.08	1252.61	430.57	0.4
Mustang Creek	4394	100-Year	Proposed	3862	505.28	514.08	512.58	514.38	0.002729	6.1	1084.69	413.29	0.41
Mustang Creek	4130	025-Year	CR 452 EX	2709	505.03	511.31	511.04	511.87	0.006505	8.02	662.09	339.08	0.61
Mustang Creek	4130	025-Year	Proposed	2709	505.03	511.31	511.04	511.87	0.006505	8.02	662.09	339.08	0.61
Mustang Creek	4130	100-Year	CR 452 EX	3862	505.03	511.96	511.48	512.54	0.006498	8.65	908.39	410.42	0.62
Mustang Creek	4130	100-Year	Proposed	3862	505.03	511.96	511.48	512.54	0.006498	8.65	908.39	410.42	0.62

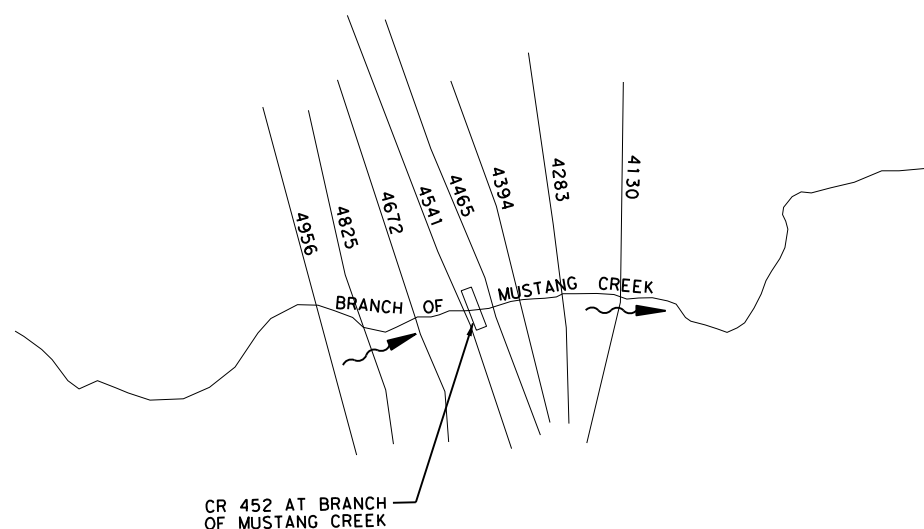
### NOTES:

- HEC-RAS VERSION 5.0.7 WAS USED FOR HYDRAULIC ANALYSIS AND DESIGN.
- THE TAILWATER BOUNDARY CONDITION USED WAS NORMAL DEPTH WITH A SLOPE OF 0.0065 FT/FT.
- DESIGN FLOW BASED ON 100-YR FREQUENCY.
- THERE ARE NO INSURABLE STRUCTURES THAT WOULD BE ADVERSLY AFFECTED FOR THE 25 YR AND 100 YR DESIGN FREQUENCY.
- COORDINATION WITH THE LOCAL FLOODPLAIN ADMINISTRATOR WAS COMPLETED 09/13/2022.

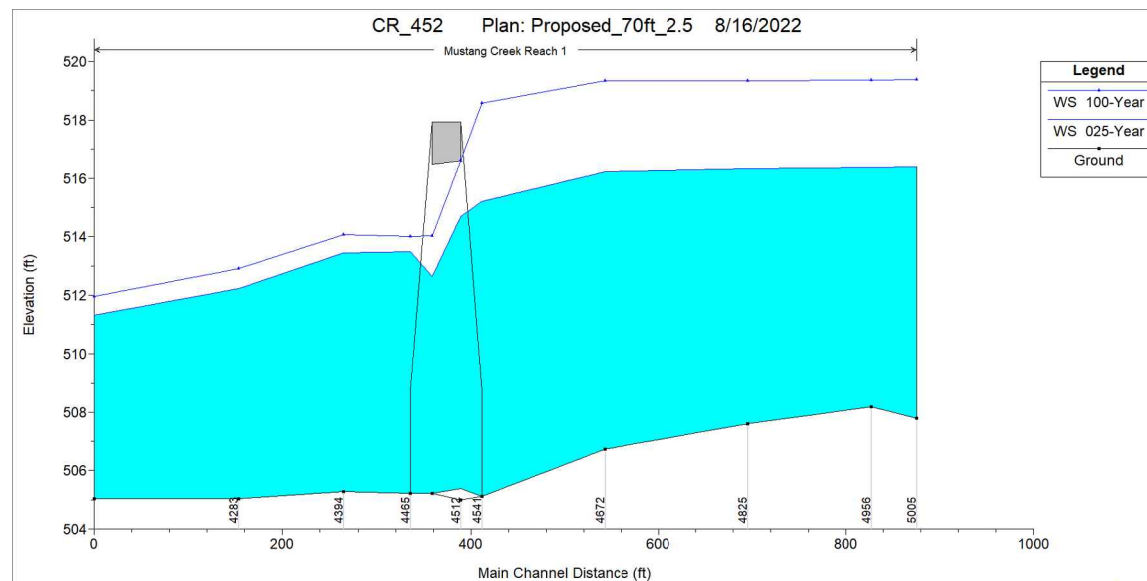


**PROPOSED CR 452 US BRIDGE FACE**

  
 ASH  
 11/3/2022



**HEC-RAS CROSS SECTION LOCATIONS**



**WATER SURFACE PROFILE**

**Kimley»Horn** F-928


 Texas Department of Transportation

**CR 452 AT BRANCH OF MUSTANG CREEK**  
**HYDRAULIC DATA SHEET**

SHEET 1 OF 2

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		38

**HEC-RAS HYDRAULIC CALCULATION BRIDGE OUTPUT**


Plan: CR 452 EX Mustang Creek Reach 1 RS: 4512 Profile: 025-Year		Element		
		Inside BR US	Inside BR DS	
E.G. US. (ft)	519.01			
W.S. US. (ft)	518.8	E.G. Elev (ft)	519.01	518.95
Q Total (cfs)	2709	W.S. Elev (ft)	518.8	518.63
Q Bridge (cfs)	2021.31	Crit W.S. (ft)	514.5	513.41
Q Weir (cfs)	687.69	Max Chl Dpth (ft)	13.38	13.31
Weir Sta Lft (ft)	492.36	Vel Total (ft/s)	6.35	5.16
Weir Sta Rgt (ft)	873.38	Flow Area (sq ft)	426.94	525.12
Weir Submerg	5	Froude # Chl	0.4	0.29
Weir Max Depth (ft)	1.37	Specif Force (cu ft)	2226.2	2941.44
Min El Weir Flow (ft)	517.65	Hydr Depth (ft)	1.57	2.22
Min El Prs (ft)	516.52	W.P. Total (ft)	403.75	368.83
Delta EG (ft)	5.06	Conv. Total (cfs)		
Delta WS (ft)	4.95	Top Width (ft)	272.1	236.98
BR Open Area (sq ft)	224.19	Frctn Loss (ft)		
BR Open Vel (ft/s)	9.02	C & E Loss (ft)		
BR Sluice Coef	0.48	Shear Total (lb/sq ft)		
BR Sel Method	Press/Weir	Power Total (lb/ft s)		

Plan: Prop 70 2.5 slope Mustang Creek Reach 1 RS: 4512 Profile: 025-Year		Element		
		Inside BR US	Inside BR DS	
E.G. US. (ft)	515.95			
W.S. US. (ft)	515.21	E.G. Elev (ft)	515.84	514.99
Q Total (cfs)	2709	W.S. Elev (ft)	514.69	512.65
Q Bridge (cfs)	2709	Crit W.S. (ft)	513.07	512.65
Q Weir (cfs)		Max Chl Dpth (ft)	9.3	7.43
Weir Sta Lft (ft)		Vel Total (ft/s)	8.43	11.47
Weir Sta Rgt (ft)		Flow Area (sq ft)	321.38	236.28
Weir Submerg		Froude # Chl	0.58	0.79
Weir Max Depth (ft)		Specif Force (cu ft)	1794.97	1678.1
Min El Weir Flow (ft)	520.45	Hydr Depth (ft)	5.44	4.6
Min El Prs (ft)	516.6	W.P. Total (ft)	82.17	78.02
Delta EG (ft)	1.89	Conv. Total (cfs)	27601.8	18182.3
Delta WS (ft)	1.73	Top Width (ft)	59.06	51.4
BR Open Area (sq ft)	417.18	Frctn Loss (ft)		
BR Open Vel (ft/s)	11.47	C & E Loss (ft)		
BR Sluice Coef		Shear Total (lb/sq ft)	2.35	4.2
BR Sel Method	Momentum	Power Total (lb/ft s)	19.83	48.12

Plan: CR 452 EX Mustang Creek Reach 1 RS: 4512 Profile: 100-Year		Element		
		Inside BR US	Inside BR DS	
E.G. US. (ft)	519.69			
W.S. US. (ft)	519.49	E.G. Elev (ft)	519.69	519.65
Q Total (cfs)	3862	W.S. Elev (ft)	519.49	519.22
Q Bridge (cfs)	2186.22	Crit W.S. (ft)	519.9	514.64
Q Weir (cfs)	1675.78	Max Chl Dpth (ft)	14.07	13.9
Weir Sta Lft (ft)	149.74	Vel Total (ft/s)	5.69	5.46
Weir Sta Rgt (ft)	896.51	Flow Area (sq ft)	678.49	706.99
Weir Submerg	5	Froude # Chl	0.35	0.31
Weir Max Depth (ft)	2.05	Specif Force (cu ft)	2765.99	3569.79
Min El Weir Flow (ft)	517.65	Hydr Depth (ft)	1.52	1.83
Min El Prs (ft)	516.52	W.P. Total (ft)	578.43	519.19
Delta EG (ft)	5.03	Conv. Total (cfs)		
Delta WS (ft)	4.96	Top Width (ft)	445.41	386.15
BR Open Area (sq ft)	224.19	Frctn Loss (ft)		
BR Open Vel (ft/s)	9.75	C & E Loss (ft)		
BR Sluice Coef	0.49	Shear Total (lb/sq ft)		
BR Sel Method	Press/Weir	Power Total (lb/ft s)		

Plan: Prop 70 2.5 slope Mustang Creek Reach 1 RS: 4512 Profile: 100-Year		Element		
		Inside BR US	Inside BR DS	
E.G. US. (ft)	519.14			
W.S. US. (ft)	518.58	E.G. Elev (ft)	519.14	516.8
Q Total (cfs)	3862	W.S. Elev (ft)	516.6	514.04
Q Bridge (cfs)	3862	Crit W.S. (ft)	514.39	514.04
Q Weir (cfs)		Max Chl Dpth (ft)	11.21	8.82
Weir Sta Lft (ft)		Vel Total (ft/s)	9.26	12.4
Weir Sta Rgt (ft)		Flow Area (sq ft)	417.18	311.34
Weir Submerg		Froude # Chl	0.5	0.79
Weir Max Depth (ft)		Specif Force (cu ft)	2932.79	2611.98
Min El Weir Flow (ft)	520.45	Hydr Depth (ft)	5.47	5.47
Min El Prs (ft)	516.6	W.P. Total (ft)	164.89	86.99
Delta EG (ft)	4.16	Conv. Total (cfs)	27342	25855.2
Delta WS (ft)	4.57	Top Width (ft)		56.95
BR Open Area (sq ft)	417.18	Frctn Loss (ft)		
BR Open Vel (ft/s)	9.26	C & E Loss (ft)		
BR Sluice Coef	0.47	Shear Total (lb/sq ft)	3.15	4.99
BR Sel Method	Press Only	Power Total (lb/ft s)	29.17	61.84

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 11/3/2022  


**Kimley»Horn** F-928

 Texas Department of Transportation

CR 452 AT BRANCH OF  
MUSTANG CREEK  
HYDRAULIC DATA SHEET

SHEET 2 OF 2

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		39



**50 YEAR SCOUR CALCULATIONS  
PIER SCOUR COMPUTATION RESULTS**

FREQ (yrs)	K	K <sub>n</sub>	K <sub>s</sub>	Y <sub>1</sub>	α	Fr <sub>1</sub>	V	Y <sub>s</sub>	REDUCTION FACTOR	Y <sub>s</sub> * REDUCTION FACTOR
50	1.0	1.0	1.1	10.57	2.00	0.51	6.06	5.90	0.50	2.95

\*VELOCITY IS THE VELOCITY AT THE PIER FROM HEC-RAS FLOW DISTRIBUTION ASSUMING MAXIMUM FLOW VELOCITY IN SECTION

**CONTRACTION SCOUR COMPUTATION RESULTS**

FREQ (yrs)	Q <sub>1</sub>	Q <sub>2</sub>	W <sub>1</sub>	W <sub>2</sub>	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>c</sub>	PRESSURE SCOUR
50	645	2216	32.50	64.00	10.23	18.47	8.24	8.96

**100 YEAR SCOUR CALCULATIONS  
PIER SCOUR COMPUTATION RESULTS**

FREQ (yrs)	K	K <sub>n</sub>	K <sub>s</sub>	Y <sub>1</sub>	α	Fr <sub>1</sub>	V	Y <sub>s</sub>	REDUCTION FACTOR	Y <sub>s</sub> * REDUCTION FACTOR
100	1.0	1.0	1.1	10.96	2.00	0.36	6.85	5.17	0.50	2.58

\*VELOCITY IS THE VELOCITY AT THE PIER FROM HEC-RAS FLOW DISTRIBUTION ASSUMING MAXIMUM FLOW VELOCITY IN SECTION

**CONTRACTION SCOUR COMPUTATION RESULTS**

FREQ (yrs)	Q <sub>1</sub>	Q <sub>2</sub>	W <sub>1</sub>	W <sub>2</sub>	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>c</sub>	PRESSURE SCOUR
100	698	2450	32.50	70.00	10.79	18.64	7.85	11.76

**PIER SCOUR ANALYSIS**

USING HEC-18 EQ 7.1

$$Y_s = 2.0 * K * K_n * K_s * Y_1 * (α / Y_1)^{0.6} * Fr_{1,0.5}$$

WHERE:

Y<sub>s</sub> = PIER SCOUR DEPTH (FT)

K = CORRECTION FACTOR FOR PIER NOSE SHAPE (FOR A GROUP OF CYLINDERS, K = 1.0)

K<sub>n</sub> = CORRECTION FACTOR FOR ANGLE OF ATTACK (ANGLE OF ATTACK = 8°)

K<sub>s</sub> = CORRECTION FACTOR FOR BED CONDITION (DUNE HEIGHT < 10', K<sub>s</sub> = 1.1)

Y<sub>1</sub> = FLOW DEPTH DIRECTLY UPSTREAM OF THE PIER (FT)

α = PIER WIDTH (FT)

Fr<sub>1</sub> = V / (g\*Y<sub>1</sub>)<sup>0.5</sup> = FROUDE NUMBER UPSTREAM OF PIER, WHERE V = VELOCITY AT PIER (FT / SEC),

AND g = 32.2 FT / SEC<sup>2</sup> (GRAVITATIONAL CONSTANT)

**LIVE BED CONTRACTION SCOUR ANALYSIS**

USING HEC-18 EQ 6.2

$$Y_c / Y_1 = (Q_2 / Q_1)^{0.33} * (W_1 / W_2)^{0.33} \text{ and } Y_c = Y_2 - Y_1$$

WHERE:

Y<sub>c</sub> = AVERAGE CONTRACTION SCOUR DEPTH

Y<sub>1</sub> = AVERAGE DEPTH IN MAIN CHANNEL UPSTREAM OF CONTRACTED SECTION

Y<sub>2</sub> = AVERAGE DEPTH IN CONTRACTED SECTION

Q<sub>1</sub> = FLOW IN UPSTREAM CHANNEL TRANSPORTING SEDIMENT

Q<sub>2</sub> = FLOW IN CONCENTRATED CHANNEL

W<sub>1</sub> = BOTTOM WIDTH OF MAIN CHANNEL UPSTREAM OF CONTRACTED SECTION

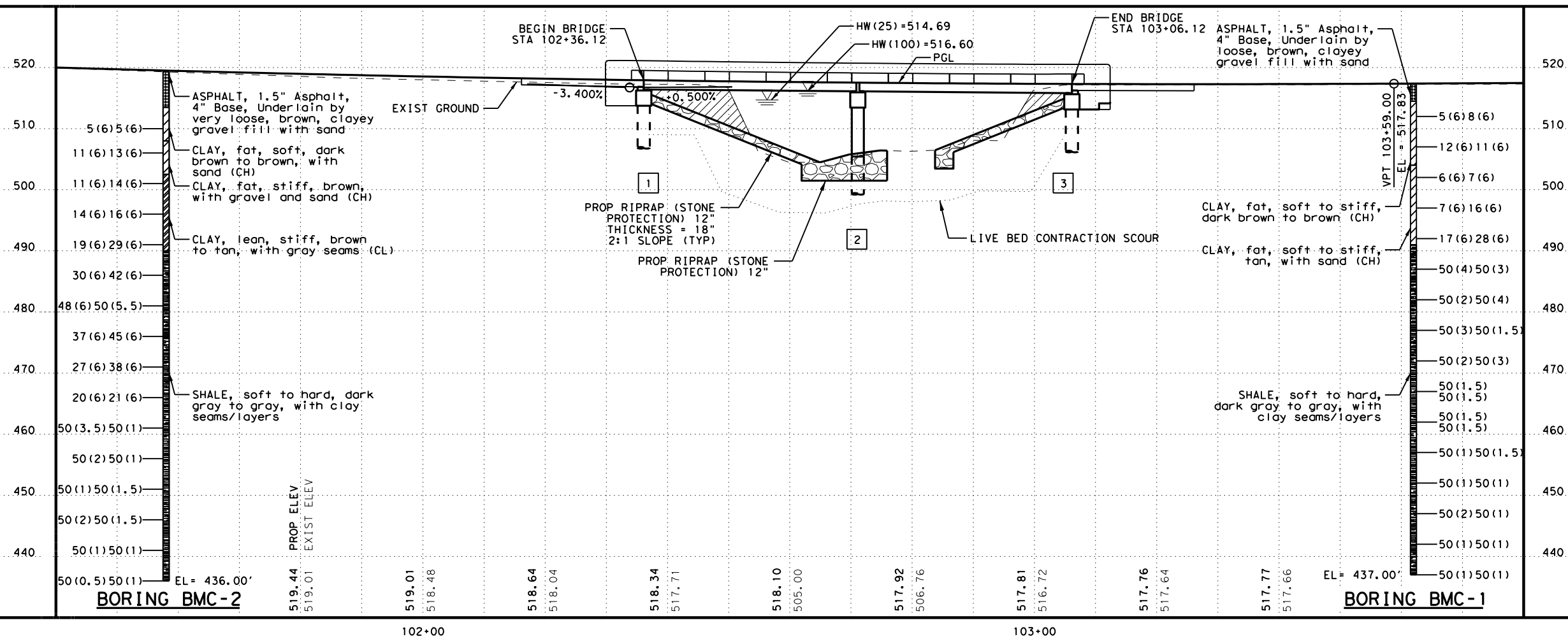
W<sub>2</sub> = BOTTOM WIDTH OF CONTRACTED SECTION LESS THE CUMULATIVE WIDTH OF PIERS

**NOTES:**

- SCOUR ANALYSIS BASED ON TXDOT GEOTECHNICAL MANUAL (GM) AND FHWA H.E.C.-18, "EVALUATING SCOUR AT BRIDGES".
- THE D50 SOIL PARTICLE SIZE FOR THIS PROJECT IS THE MINIMUM SIZE ALLOWED BY THE GM.
- THE MAXIMUM CALCULATED SCOUR WAS DURING THE 50 YR STORM AT A DISCHARGE OF 2216 CFS. THE BRIDGE WAS ANALYZED IN THE 50 AND 100 YR EVENTS.
- ACCORDING TO SECTION 6 OF THE TXDOT GEOTECHNICAL MANUAL, A REDUCTION FACTOR OF 0.5 WAS APPLIED TO THE PIER SCOUR CALCULATION AS THE SOIL WAS FOUND TO BE MORE THAN 11% CLAY.



FILENAME: pw:\kh-pw\ent\ley.com\kh-pw\01\Documents\01 Active Projects\TX-AUS-069284003 - Williamson County Bridges\DesignData\4 - Design\Plan Set\5. Drainage\CR452\_SCOUR\_ANALYSIS.dgn  
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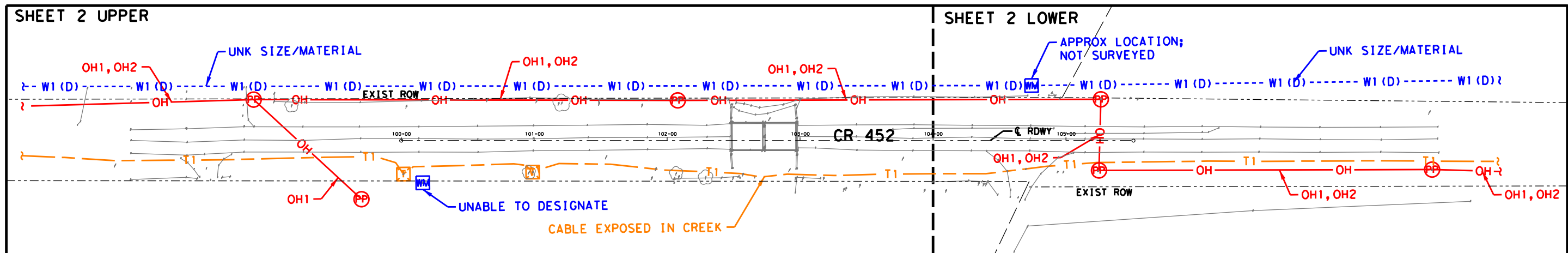
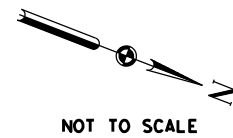
11/3/2022

F-928

**CR 452 AT BRANCH OF MUSTANG CREEK  
SCOUR ANALYSIS**

SHEET 1 OF 1

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	40	



SPECIAL NOTES

1. ALL PIPE SIZES WERE TAKEN FROM UTILITY RECORDS WHERE POSSIBLE. THE UTILITIES DEPICTED WERE INVESTIGATED BY THE RIOS GROUP, INC.. ALL OTHER PLAN INFORMATION, NOTABLY THE BACKGROUND INFORMATION, WAS PROVIDED BY OTHERS AND THE RIOS GROUP, INC. DISCLAIMS RESPONSIBILITY FOR ITS ACCURACY.
2. EXISTING SUBSURFACE UTILITY INVESTIGATIONS WERE COMPLETED ON 02/14/2022. THE RIOS GROUP, INC. EXPRESSLY DISCLAIMS ANY AND ALL RESPONSIBILITY FOR NEW UTILITY INSTALLATIONS, MODIFICATIONS, AND/OR ADJUSTMENTS TO EXISTING UTILITIES AFTER THE COMPLETION DATE.
3. UTILITY LOCATIONS ON THESE DRAWINGS ARE INTENDED FOR DESIGN PURPOSES AND NOT CONSTRUCTION. THEY REFLECT SUBSURFACE UTILITIES AT THE TIME OF FIELD INVESTIGATION. CALL TEXAS ONE CALL SYSTEM (800)245-4545 FOR UTILITY LOCATIONS 48 HOURS PRIOR TO ANY WORK.
4. WHERE POSSIBLE, WATER, GAS, AND COMMUNICATION SERVICE LINES WERE DESIGNATED. HOWEVER, SOME SERVICE LINES ARE CONSTRUCTED OF NON-CONDUCTIVE MATERIAL AND UTILITY COMPANY DRAWINGS MAY NOT SHOW SERVICE LINE LOCATIONS. THEREFORE ALL SERVICE LINES MAY NOT BE SHOWN.

QUALITY LEVELS

- Quality Level "D" - Information derived from existing records and/or oral collection.
- Quality Level "C" - Information obtained by surveying and plotting visible above ground utility features and by using professional judgment in correlating information to Quality Level "D" information.
- Quality Level "B" - Designate: Two-dimensional horizontal mapping. This information is obtained through the application and interpretation of appropriate non-destructive surface geophysical methods. Utility indications are referenced to established survey control. Incorporates Quality Levels "C" and "D" information to produce Quality Level "B" information.
- Quality Level "A" - Locate: Precise horizontal and vertical location of utilities obtained by the actual exposure and subsequent measurement of subsurface utilities at a specific point. Diameters shown are verified visually and may not be exact.

MATERIAL ABBREVIATIONS

- STL - STEEL
- PE - POLYETHYLENE
- AC - TRANSITE
- CI - CAST IRON
- PVC - POLYVINYL CHLORIDE
- DBC - DIRECT BURIED CABLE
- RCP - REINFORCED CONCRETE PIPE
- VC - VITRIFIED CLAY
- FG - FIBERGLASS
- CSC - CONCRETE/STEEL CYLINDER
- CMP - CORRUGATED METAL PIPE
- CONC - CONCRETE
- CLAY - CLAY
- UNK - UNKNOWN

REFER TO S.U.E PLAN SHEET FOR UTILITY LEGEND

Subsurface Utility Engineering (SUE) Certification  
 The engineer's seal hereon is to certify that the utilities shown have been investigated in accordance with standard SUE industry practices. Where indicated utility sizes and materials taken from best available records. All other information hereon has been provided by others and is not a part of this certification.

The Rios Group, Inc.  
 TBPE Firm # F-14595

Travis S. Isaacson  
 11-04-2022

90% PLANS

CR 452 AT BRANCH OF MUSTANG CREEK  
 INDEX LAYOUT

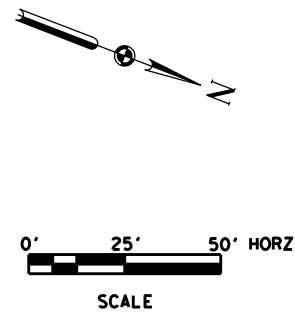
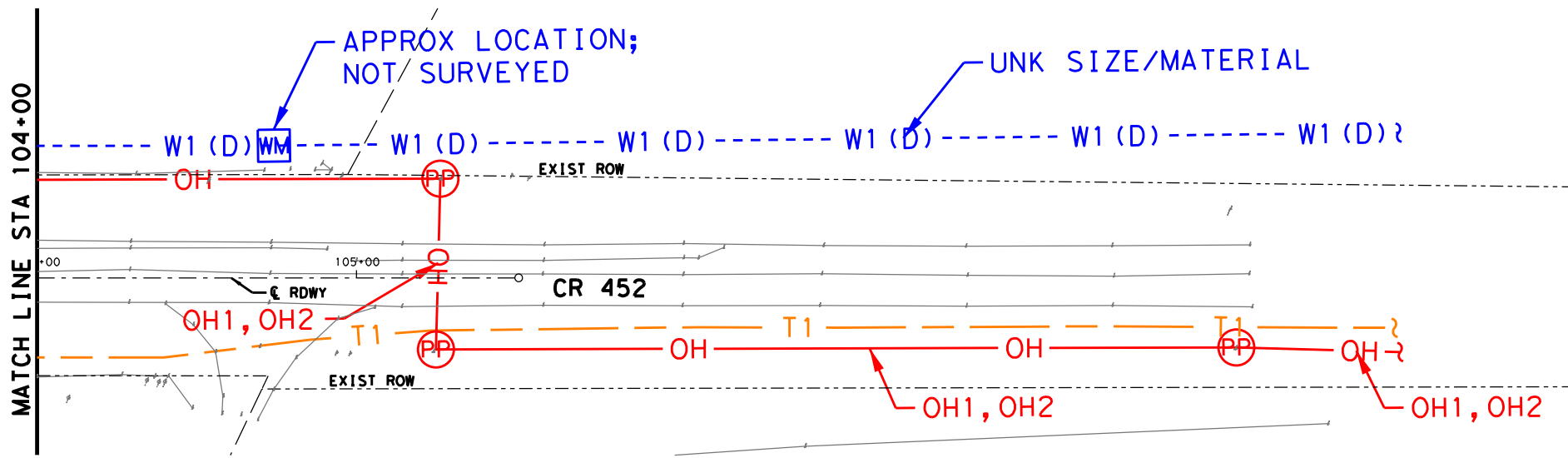
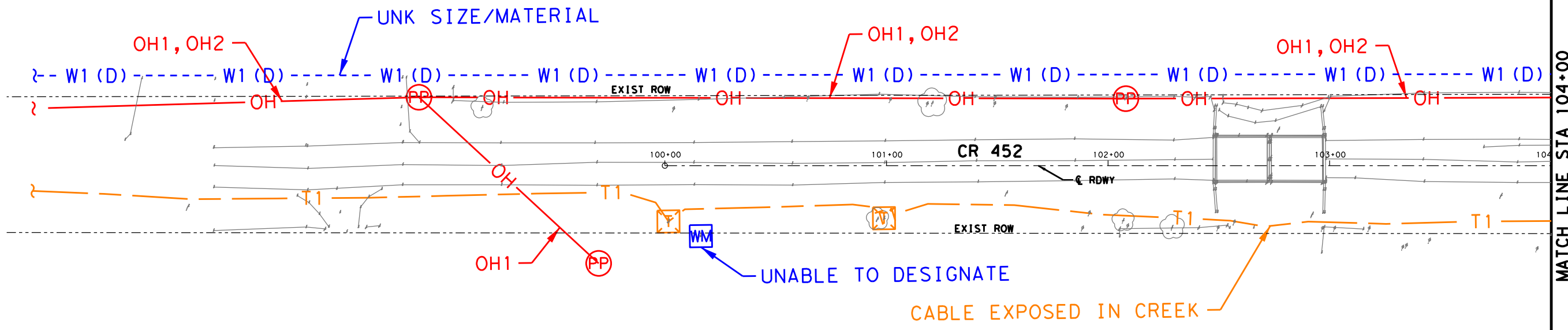
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SHEET 01 OF 02

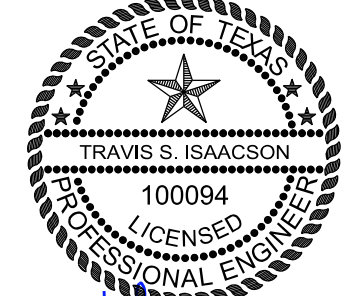
CONT	SECT	JOB	HIGHWAY
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DIST		COUNTY	
AUS		WILLIAMSON	

SHEET NO. 41

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The Rios Group, Inc.  
TBPE Firm # F-14595



*Travis S. Isaacson*  
11-04-2022

90% PLANS

**Kimley»Horn** F-928

**THE RIOS GROUP**  
SUBSURFACE UTILITY ENGINEERING  
UTILITY COORDINATION  
575 Round Rock West Drive  
Building K, Suite 400  
Round Rock, TX 78681



**CR 452 AT BRANCH OF  
MUSTANG CREEK**  
**S. U. E. PLAN SHEET**

**ALIGNMENT STA 100+00 TO  
ALIGNMENT STA 105+50.73**

**SHEET 02 OF 02**

CONT	SECT	JOB	HIGHWAY
0914	05	174	CR 452
DIST	COUNTY		SHEET NO.
AUS	WILLIAMSON		42

**LEGEND OF UTILITY TYPES**

ABANDONED UTILITY —X—X—X—X—  
PROPOSED UTILITY ————  
UNKNOWN UTILITY - - - - -

**COMMUNICATIONS**  
AT&T (TELE) QL "B" T1  
AT&T (TELE) QL "C"/QL "D" T1

**ELECTRIC / POWER**  
ONCOR QL "B" E1

**POTABLE WATER**  
MANVILLE WATER SUPPLY COMPANY QL "C"/QL "D" W1 (D)

**OVERHEAD**  
OH1 - ONCOR QL "B" OH  
OH2 - SPECTRUM

**LEGEND OF UTILITY SYMBOLS**

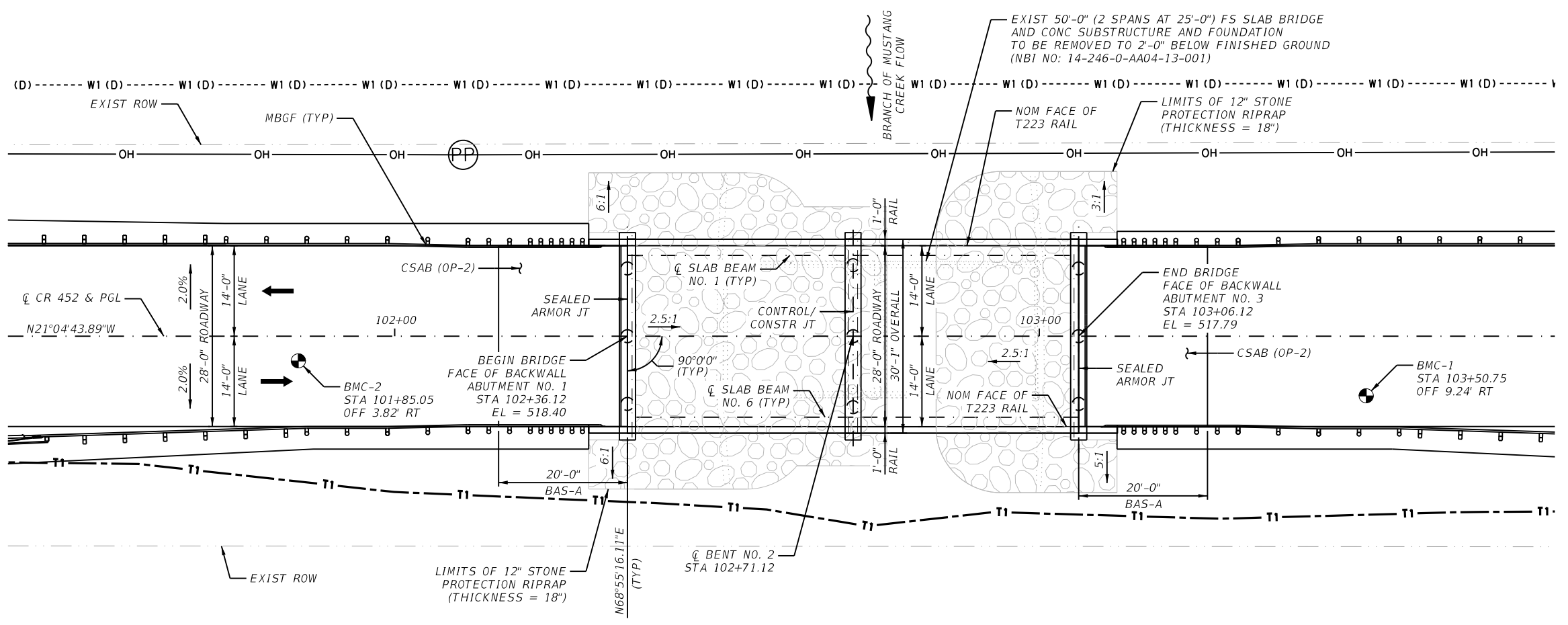
END CAP [ ]  
QUALITY LEVEL CHANGE [ ]  
TEST HOLE ( )  
UTILITY CONTINUATION }  
TELEPHONE PEDESTAL [T]  
ELECTRIC POLE (POWER) [PP]  
WATER METER [WM]

Subsurface Utility Engineering (SUE) Certification

The engineer's seal hereon is to certify that the utilities shown have been investigated in accordance with standard SUE industry practices. Where indicated utility sizes and materials taken from best available records. All other information hereon has been provided by others and is not a part of this certification.

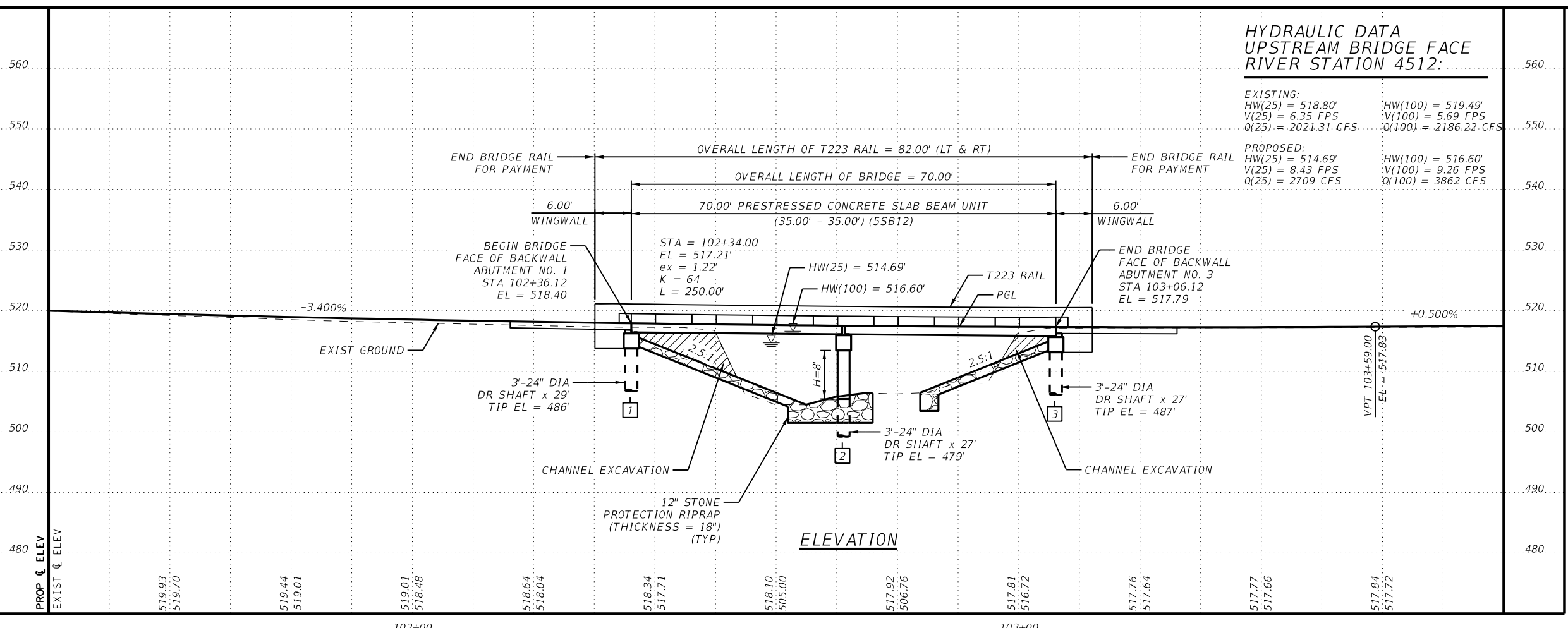
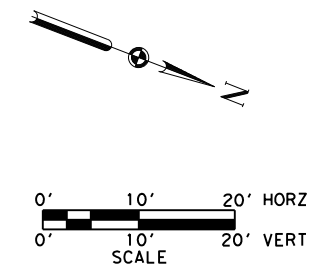
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 PLOTTED: 11/23/2022



- NOTES:**
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND CURRENT INTERIMS.
  - ALL DIMENSIONS ARE HORIZONTAL AND MUST BE CORRECTED FOR GRADE AND CROSS SLOPE.
  - THE "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS AND ARE FOR BIDDING PURPOSES ONLY. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.
  - SEE BRIDGE BORING LOGS SHEET FOR GEOTECHNICAL INFORMATION.
  - EXTEND DRILLED SHAFTS TO THE LENGTHS SHOWN OR LONGER AS NECESSARY TO OBTAIN A MINIMUM OF TWO (2) DRILLED SHAFT DIAMETERS INTO SHALE.

DESIGN SPEED = MEET OR IMPROVE EXISTING  
 ADT (2023) = 125 VPD  
 ADT (2043) = 175 VPD  
 FUNCT CLASS = RURAL LOCAL ROAD  
 EXIST NBI NO: 14-246-0-AA04-13-001  
 PROP NBI NO: 14-246-0-AA04-13-501



HL-93 LOADING

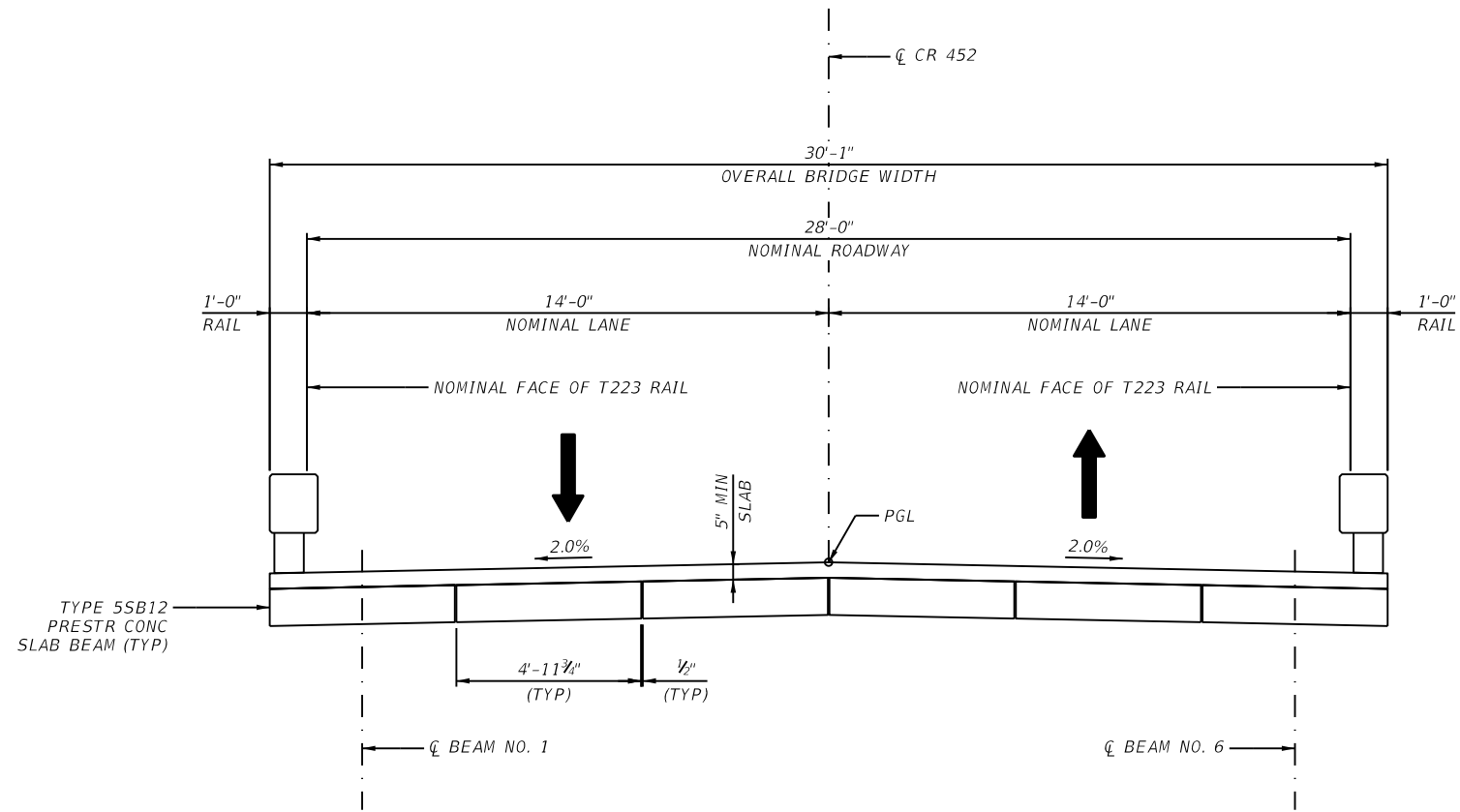


CR 452 AT BRANCH OF MUSTANG CREEK  
 BRIDGE LAYOUT

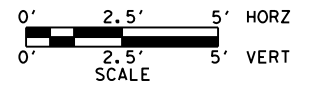
SHEET 1 OF 1

©TXDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	43	

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PROPOSED BRIDGE TYPICAL SECTION



*Ryan C. Laurent*

**Kimley»Horn** F-928



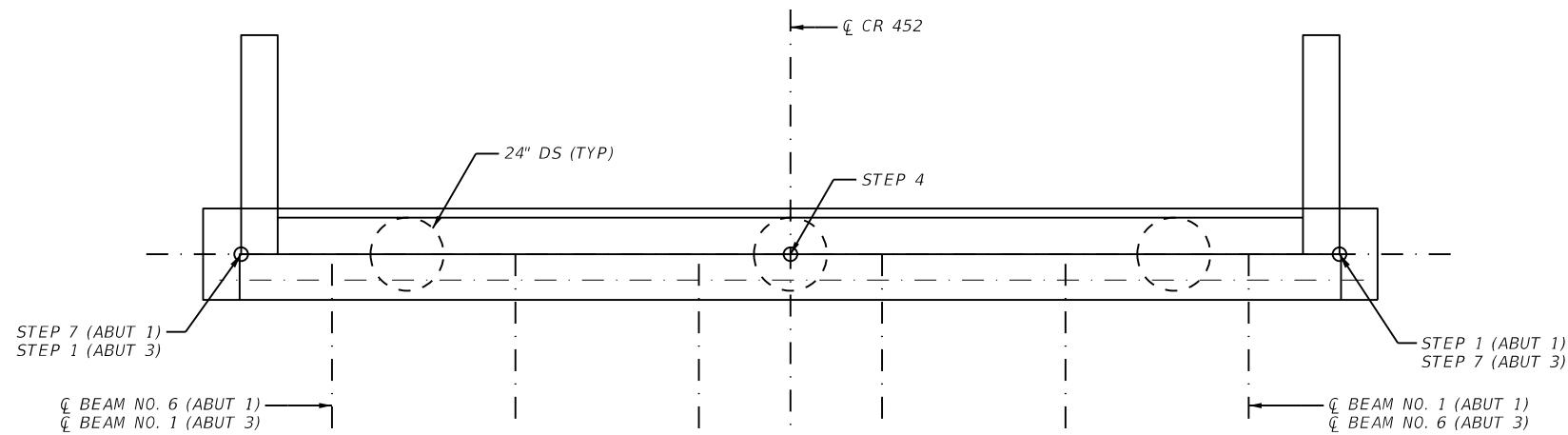
CR 452 AT BRANCH OF  
 MUSTANG CREEK  
 BRIDGE TYPICAL  
 SECTION

SHEET 1 OF 1

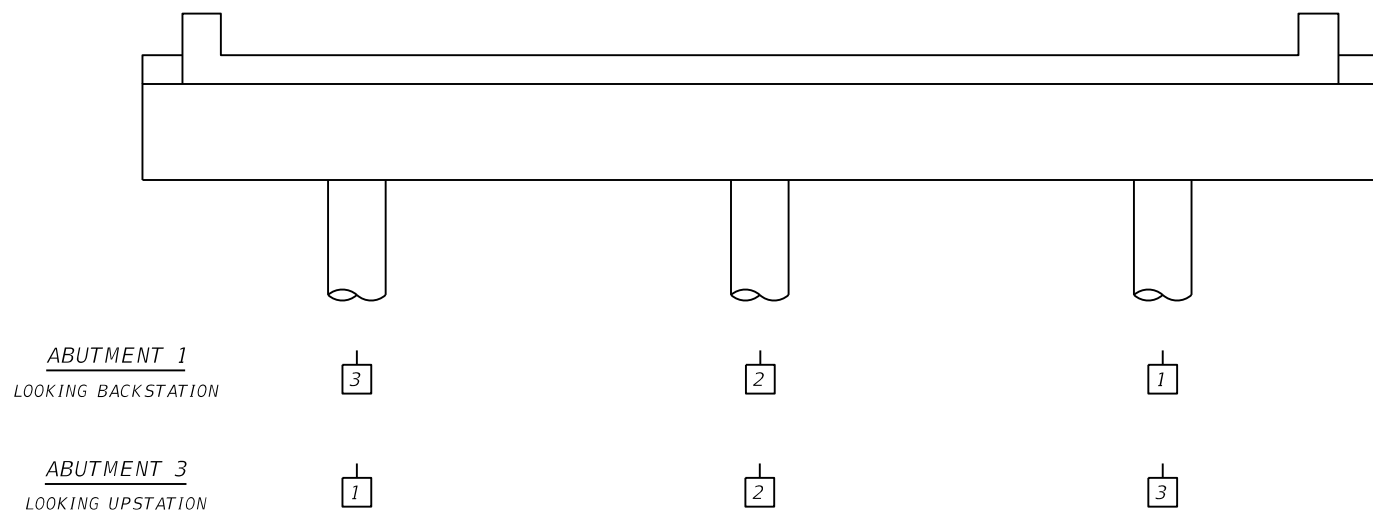
©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	44	



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NOTES:  
 1. REFER TO TXDOT STANDARDS APSB-28 AND SPSB-28 FOR DETAILS NOT SHOWN.



	CONTROL ELEVATIONS					
	TOP OF CAP			TOP OF DRILLED SHAFT*		
	STEP 1	STEP 4	STEP 7	DS 1	DS 2	DS 3
ABUT 1	516.502	516.803	516.502	514.093	514.303	514.093
ABUT 3	515.905	516.206	515.905	513.496	513.706	513.496

\* ELEVATIONS AT  $\phi$  OF DRILLED SHAFT

NOT DRAWN TO SCALE

BENT REPORT

BENT NO. 1 (N 68 55 15.30 E)

DISTANCE BETWEEN STATION LINE AND STEP LINE 1, 15.0416 L

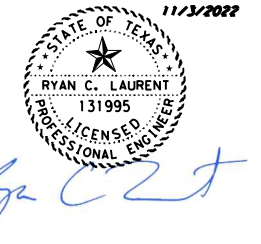
STEP	BOX	STEP SPAC. (CL BENT)	BEAM ANGLE D M S CL BENT	DIST CL BENT TO PERP TO CL BEAM	DIST CL BRNG TO CL BENT	DIST CL BENT TO PERP TO CL BEAM	DIST CL BENT TO END OF BM
STEP 1		0.0000	90 0 0.00	0.7083	0.7083	0.2500	0.2500
BOX 1	LEFT	5.0000	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
BOX 2	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
BOX 3	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
STEP 4	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
BOX 4	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
BOX 5	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
BOX 6	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
STEP 7		5.0000	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	TOTAL	30.0833					

BENT REPORT

BENT NO. 3 (N 68 55 15.30 E)

DISTANCE BETWEEN STATION LINE AND STEP LINE 1, 15.0416 L

STEP	BOX	STEP SPAC. (CL BENT)	BEAM ANGLE D M S CL BENT	DIST CL BENT TO PERP TO CL BEAM	DIST CL BRNG TO CL BENT	DIST CL BENT TO PERP TO CL BEAM	DIST CL BENT TO END OF BM
STEP 1		0.0000	90 0 0.00	0.7083	0.7083	0.2500	0.2500
BOX 1	LEFT	5.0000	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
BOX 2	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
BOX 3	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
STEP 4	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
BOX 4	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
BOX 5	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
BOX 6	LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	CENTER						
STEP 7		5.0000	90 0 0.00	0.7083	0.7083	0.2500	0.2500
	TOTAL	30.0833					

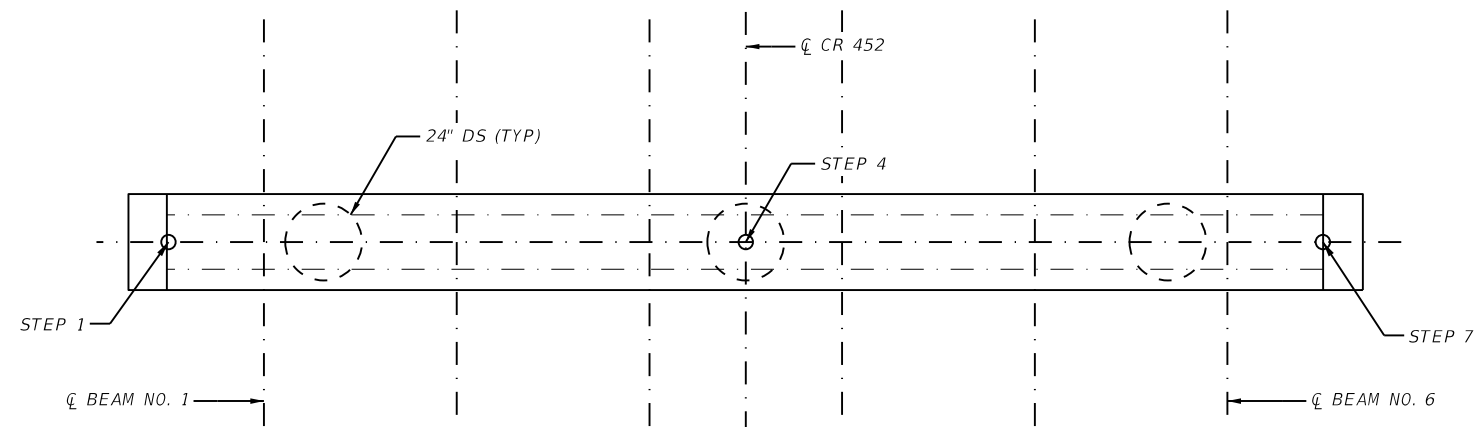


CR 452 AT BRANCH OF MUSTANG CREEK BRIDGE GEOMETRY

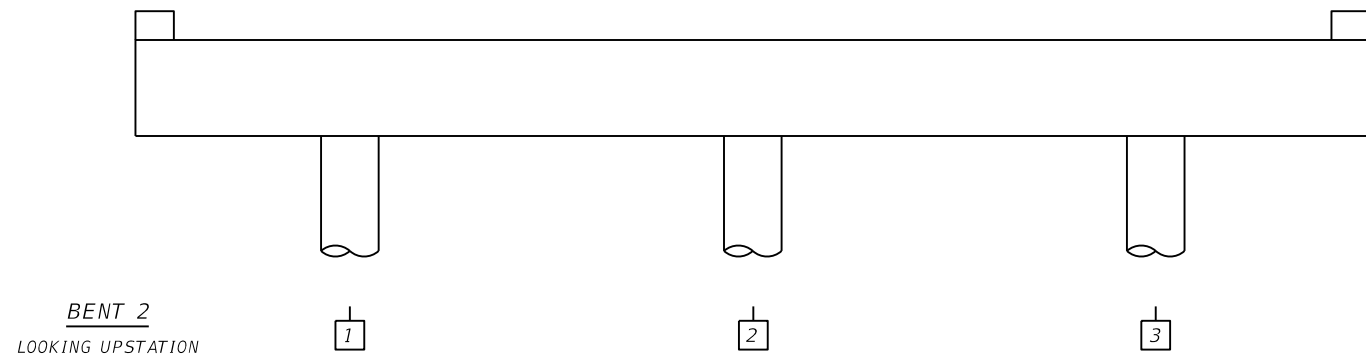
SHEET 1 OF 2

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		45

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NOTES:  
 1. REFER TO TXDOT STANDARDS BPSB-28 AND SPSB-28 FOR DETAILS NOT SHOWN.



CONTROL ELEVATIONS						
	TOP OF CAP			TOP OF COLUMN *		
	STEP 1	STEP 4	STEP 7	COL 1	COL 2	COL 3
BENT 2	516.106	516.407	516.106	513.687	513.907	513.687

\* ELEVATIONS AT  $\bar{C}$  OF COLUMN

NOT DRAWN TO SCALE

BENT REPORT  
 BENT NO. 2 (N 68 55 15.30 E)  
 DISTANCE BETWEEN STATION LINE AND STEP LINE 1, 15.0416 L

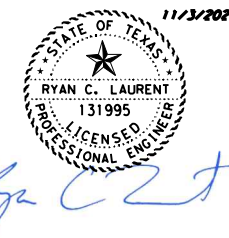
BOX	STEP SPAC. (CL BENT)	BEAM ANGLE D M S CL BENT	DIST CL BENT PERP TO CL BEAM	CL BRNG CL BENT	DIST CL BENT PERP TO CL BEAM	END OF BM CL BENT
STEP 1	0.0000	90 0 0.00	0.7083	0.7083	0.2500	0.2500
BOX 1						
LEFT						
CENTER	5.0000	90 0 0.00	0.7083	0.7083	0.2500	0.2500
RIGHT						
BOX 2						
LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
CENTER						
RIGHT						
BOX 3						
LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
CENTER						
RIGHT						
STEP 4	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
BOX 4						
LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
CENTER						
RIGHT						
BOX 5						
LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
CENTER						
RIGHT						
BOX 6						
LEFT	5.0208	90 0 0.00	0.7083	0.7083	0.2500	0.2500
CENTER						
RIGHT						
STEP 7	5.0000	90 0 0.00	0.7083	0.7083	0.2500	0.2500
TOTAL	30.0833					

BEAM REPORT AT CENTER OF BOX, SPAN 1

	HORIZONTAL C-C BENT	DISTANCE C-C BRG.	TRUE DISTANCE BOT. BM. FLG.	BEAM SLOPE	BEAM BEARING
BOX 1	35.0000	33.5833	34.5023	-0.01143	N 21 4 44.70 W
BOX 2	35.0000	33.5833	34.5023	-0.01143	N 21 4 44.70 W
BOX 3	35.0000	33.5833	34.5023	-0.01143	N 21 4 44.70 W
BOX 4	35.0000	33.5833	34.5023	-0.01143	N 21 4 44.70 W
BOX 5	35.0000	33.5833	34.5023	-0.01143	N 21 4 44.70 W
BOX 6	35.0000	33.5833	34.5023	-0.01143	N 21 4 44.70 W

BEAM REPORT AT CENTER OF BOX, SPAN 2

	HORIZONTAL C-C BENT	DISTANCE C-C BRG.	TRUE DISTANCE BOT. BM. FLG.	BEAM SLOPE	BEAM BEARING
BOX 1	35.0000	33.5833	34.5006	-0.00598	N 21 4 44.70 W
BOX 2	35.0000	33.5833	34.5006	-0.00598	N 21 4 44.70 W
BOX 3	35.0000	33.5833	34.5006	-0.00598	N 21 4 44.70 W
BOX 4	35.0000	33.5833	34.5006	-0.00598	N 21 4 44.70 W
BOX 5	35.0000	33.5833	34.5006	-0.00598	N 21 4 44.70 W
BOX 6	35.0000	33.5833	34.5006	-0.00598	N 21 4 44.70 W



**Kimley»Horn** F-928

Texas Department of Transportation

CR 452 AT BRANCH OF  
 MUSTANG CREEK  
 BRIDGE GEOMETRY

SHEET 2 OF 2

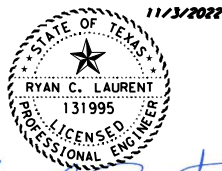
©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	46	

FILENAME: pw:\kh-pw-bent\ley.com\kh-pw-01\Documents\01 Active Projects\TX-AUS-069284003 - Williamson County Bridges\DesignData\4 - Design\Plan Set\7. Bridge\CR452\CR452\_BRC.E0.dgn  
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SUMMARY OF ESTIMATED QUANTITIES - CR 452 AT BRANCH OF MUSTANG CREEK												
CSJ: 0914-05-174	ITEM NO.	0400 6005	0416 6002	0420 6013	0420 6029	0420 6037	0422 6007	0422 6015	0425 6010	0432 6031	0450 6006	0454 6004
BRIDGE ELEMENT		CEM STABIL BKFL	DRILL SHAFT (24 IN)	CL C CONC (ABUT)	CL C CONC (CAP)	CL C CONC (COLUMN)	REINF CONC SLAB (SLAB BEAM)	APPROACH SLAB	PRESTR CONC SLAB BEAM (5SB12)	RIPRAP (STONE PROTECTION) (12 IN)	RAIL (TY T223)	ARMOR JOINT (SEALED)
		CY	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF
NBI#: 14-246-0-AA04-13-501												
2 - ABUTMENTS		81	168	19.8				54			164.0	59
1 - BENT			81		7.6	2.8						
1 - 70.00' PRESTR CONC 5SB12 SLAB BEAM UNIT							2,106		414.02	588		
TOTAL		81	249	19.8	7.6	2.8	2,106	54	414.02	588	164.0	59

**NOTES:**

1. PSN-19 (AUS) WILL BE CONSIDERED SUBSIDIARY TO OTHER PERTINENT ITEMS.



*Ryan C. Laurent*

**Kimley»Horn** F-928



CR 452 AT BRANCH OF  
MUSTANG CREEK  
BRIDGE ESTIMATED  
QUANTITIES

SHEET 1 OF 1

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	47	

FILENAME: \\kh-pw-bentley.com\kh-pw-01\Documents\01 Active Projects\TX-AUS-069284003 - Williamson County Bridges\DesignData\4 - Design\Plan Set\1. General\CR452\CR452\_GEN\_BOR01.dgn  
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## DRILLING LOG

1 of 2

WinCore Version 3.3	County Williamson Highway CR 452 CSJ 0914-05-174	Hole BMC-1 Structure Bridge Station Offset	District Austin Date 4/20/2022 Grnd. Elev. 517.00 ft GW Elev. N/A
------------------------	--	---	--

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties			Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	
514.5			ASPHALT, 1.5" Asphalt, 4" Base, Underlain by loose, brown, clayey gravel fill with sand						SPT(mod):4-4-4 SPT(mod):2-3-4
5		5 (6) 8 (6)	CLAY, fat, soft to stiff, dark brown to brown (CH)			18	72	51	#200(%):97; SPT(mod):3-6-9 HP=4.5
10		12 (6) 11 (6)		0	115	18		128	HP=4.5
504			CLAY, fat, soft to stiff, tan, with sand (CH)			23	72	50	#200(%):77; HP=4.0
15		6 (6) 7 (6)		0	32	29		119	HP=4.5
20		7 (6) 16 (6)				27	87	63	-gray below 23' #200(%):100; HP=3.0
25		17 (6) 28 (6)							
491			SHALE, soft to hard, dark gray to gray, with clay seams/layers	0	97	26		122	HP=4.5
30		50 (4) 50 (3)							SPT(mod):12-20-23
35		50 (2) 50 (4)							SPT(mod):11-14-29
40		50 (3) 50 (1.5)							

Remarks: Advancement Method: Dry auger to completion. GPS: (Lat:30.54148, Lon:-97.39308). SPT testing was modified using a 170-lb hammer with a 24-inch drop height. Ground elevation based on Google Earth Imagery.

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

Driller: M. Soto      Logger: H. Perez      Organization: Terracon Consultants, Inc.

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## DRILLING LOG

2 of 2

WinCore Version 3.3	County Williamson Highway CR 452 CSJ 0914-05-174	Hole BMC-1 Structure Bridge Station Offset	District Austin Date 4/20/2022 Grnd. Elev. 517.00 ft GW Elev. N/A
------------------------	--	---	--

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties			Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	
45		50 (2) 50 (3)	SHALE, soft to hard, dark gray to gray, with clay seams/layers						SPT(mod):12-20-32
50		50 (1.5) 50 (1.5)							SPT(mod):10-15-28
55		50 (1.5) 50 (1.5)							SPT(mod):14-30-32
60		50 (1) 50 (1.5)							SPT(mod):15-27-39
65		50 (1) 50 (1)							SPT(mod):19-33-43
70		50 (2) 50 (1)							SPT(mod):20-36-50
75		50 (1) 50 (1)							SPT(mod):21-37-31
437.80		50 (1) 50 (1)							SPT(mod):20-27-26

Remarks: Advancement Method: Dry auger to completion. GPS: (Lat:30.54148, Lon:-97.39308). SPT testing was modified using a 170-lb hammer with a 24-inch drop height. Ground elevation based on Google Earth Imagery.

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

Driller: M. Soto      Logger: H. Perez      Organization: Terracon Consultants, Inc.

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Kimley»Horn



**CR 452 AT BRANCH OF  
MUSTANG CREEK  
SOIL BORE LOG**

SHEET 1 OF 2

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST COUNTY			SHEET NO.
	AUS WILLIAMSON			48

FILENAME: \\kh-pw-bentley.com\kh-pw-01\Documents\01 Active Projects\TX-AUS-069284003 - Williamson County Bridges\DesignData\4 - Design\Plan Set\1. General\CR452\CR452\_GEN\_BOR02.dgn  
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## DRILLING LOG

1 of 2



WinCore  
Version 3.3

County Williamson  
Highway CR 452  
CSJ 0914-05-174

Hole BMC-2  
Structure Bridge  
Station  
Offset

District Austin  
Date 4/22/2022  
Grnd. Elev. 516.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties			Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	
513.5			ASPHALT, 1" Asphalt, 4" Base, Underlain by very loose, brown, clayey gravel fill with sand						SPT(mod):1-2-3
			CLAY, fat, soft, dark brown to brown, with sand (CH)			20	55	38	#200(%)-82; HP=3.0
5		5 (6) 5 (6)		0	20	22			120 HP=3.0
508			CLAY, fat, stiff, brown, with gravel and sand (CH)						SPT(mod):2-1-9
10		11 (6) 13 (6)							#200(%)-71; SPT(mod):6-7-8
502.5			CLAY, lean, stiff, brown to tan, with gray seams (CL)						SPT(mod):8-9-12
15		11 (6) 14 (6)							
20		14 (6) 16 (6)				29	46	24	#200(%)-98; SPT(mod):9-7-13
25		19 (6) 29 (6)							-gray below 23' SPT(mod):7-11-15
490			SHALE, soft to hard, dark gray to gray, with clay seams/layers			25	83	62	#200(%)-100; SPT(mod):9-14-21
30		30 (6) 42 (6)							
35		48 (6) 50 (5.5)							SPT(mod):12-20-24
40		37 (6) 45 (6)		0	80	19			125 REC:78%; RQD:78%

Remarks: Advancement Method: Dry auger to 35 feet; Air rotary thereafter. GPS: (Lat:30.54120, Lon:-97.39299). SPT testing was modified using a 170-lb hammer with a 24-inch drop height. Ground elevation based on Google Earth Imagery.

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

Driller: D. Diver

Logger: A. Arce

Organization: Terracon Consultants, Inc.

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## DRILLING LOG

2 of 2



WinCore  
Version 3.3

County Williamson  
Highway CR 452  
CSJ 0914-05-174

Hole BMC-2  
Structure Bridge  
Station  
Offset

District Austin  
Date 4/22/2022  
Grnd. Elev. 516.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties			Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	
			SHALE, soft to hard, dark gray to gray, with clay seams/layers						REC:100%; RQD:100%
45		27 (6) 38 (6)							
50		20 (6) 21 (6)							REC:33%; RQD:0%
55		50 (3.5) 50 (1)							SPT(mod):17-32-46
60		50 (2) 50 (1)							SPT(mod):3-22-40
65		50 (1) 50 (1.5)							SPT(mod):29-42-50/5in
70		50 (2) 50 (1.5)							SPT(mod):23-40-50/5in
75		50 (1) 50 (1)							SPT(mod):26-40-50/4in
436.80		50 (0.5) 50 (1)							SPT(mod):20-50-50/4in

Remarks: Advancement Method: Dry auger to 35 feet; Air rotary thereafter. GPS: (Lat:30.54120, Lon:-97.39299). SPT testing was modified using a 170-lb hammer with a 24-inch drop height. Ground elevation based on Google Earth Imagery.

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

Driller: D. Diver

Logger: A. Arce

Organization: Terracon Consultants, Inc.

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Kimley»Horn



**CR 452 AT BRANCH OF  
MUSTANG CREEK**  
**SOIL BORE LOG**

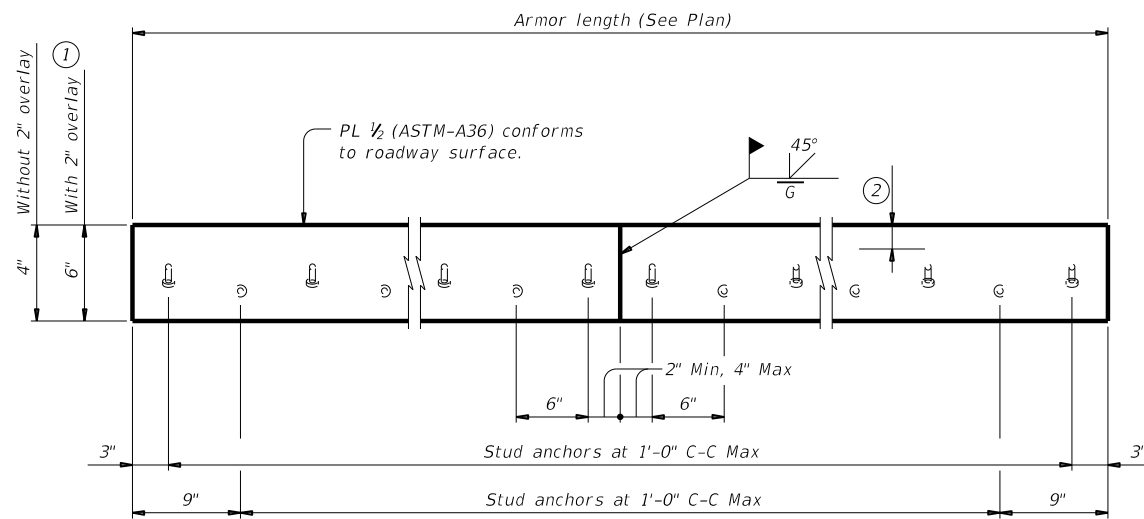
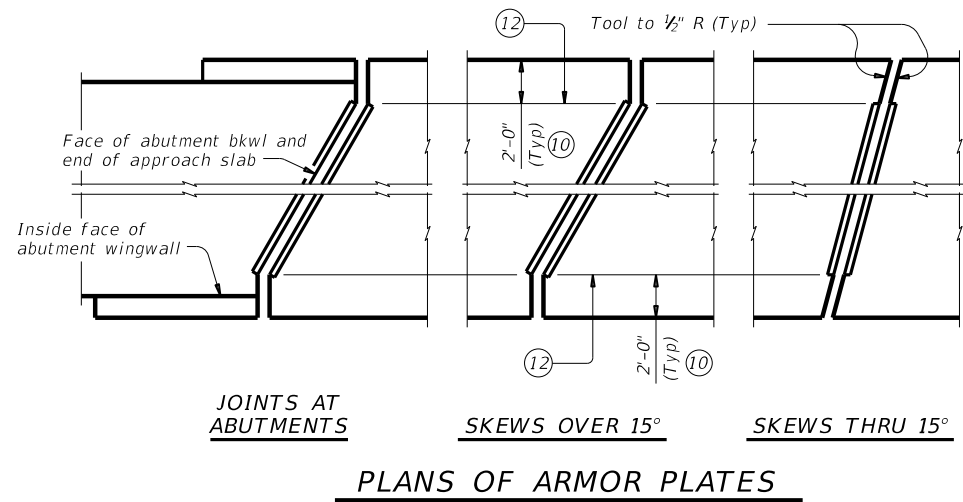
SHEET 2 OF 2

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	49	

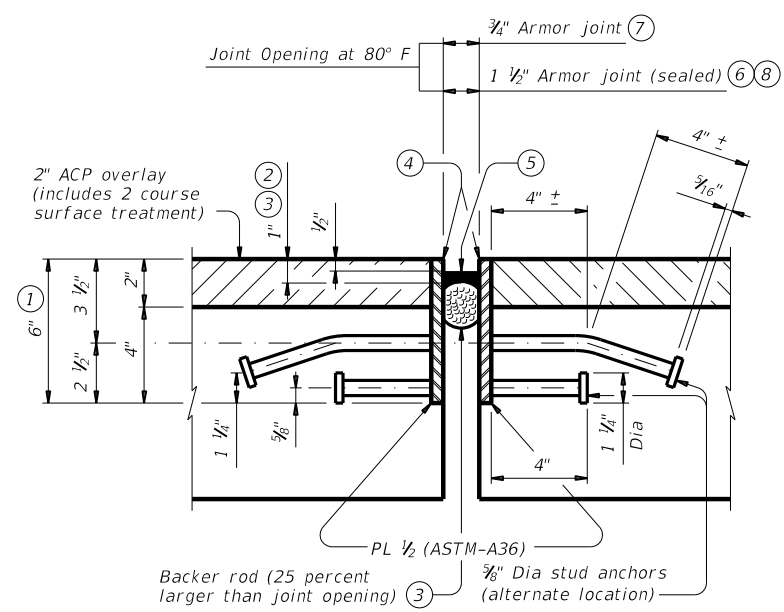
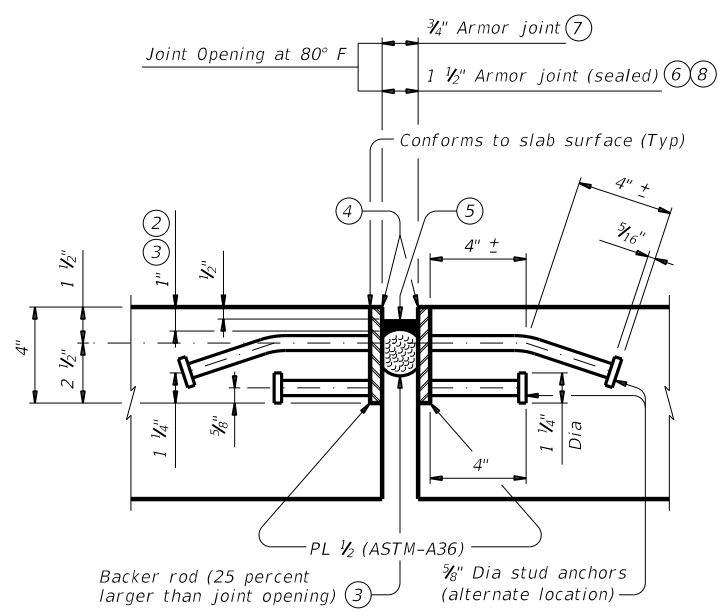


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- ① Adjust 6" plate height for overlay thicknesses other than the 2" shown. Adjust weight by 1.70 plf for each 1/2" variation in thickness.
- ② Do not paint top 1/2" of plate if using sealed armor joint.
- ③ Set top of backer rod 1" below top of armor 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.



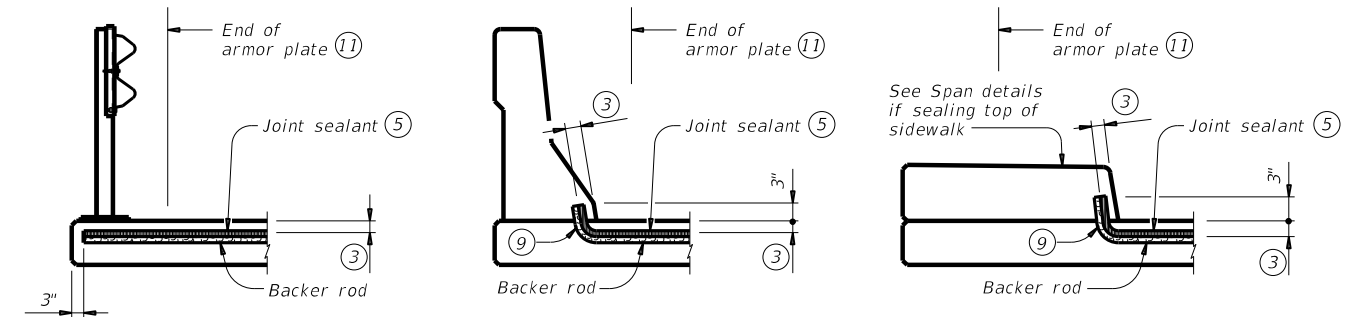
**ARMOR JOINT SECTIONS**  
 Showing Armor Joint (Sealed)

**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.

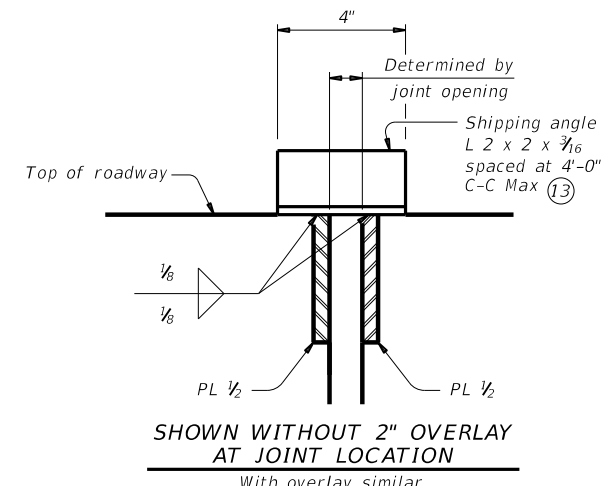
**CONSTRUCTION NOTES:**  
 Secure armor joints in position and place to proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for Armor Joint. Remove shipping 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 3/8" ( 3/4" opening movement and 5/8" 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



**JOINT SEALANT TERMINATION DETAILS**  
 Armor joint (sealed) only. Armor plate is not shown for clarity.



**Texas Department of Transportation**      **Bridge Division Standard**

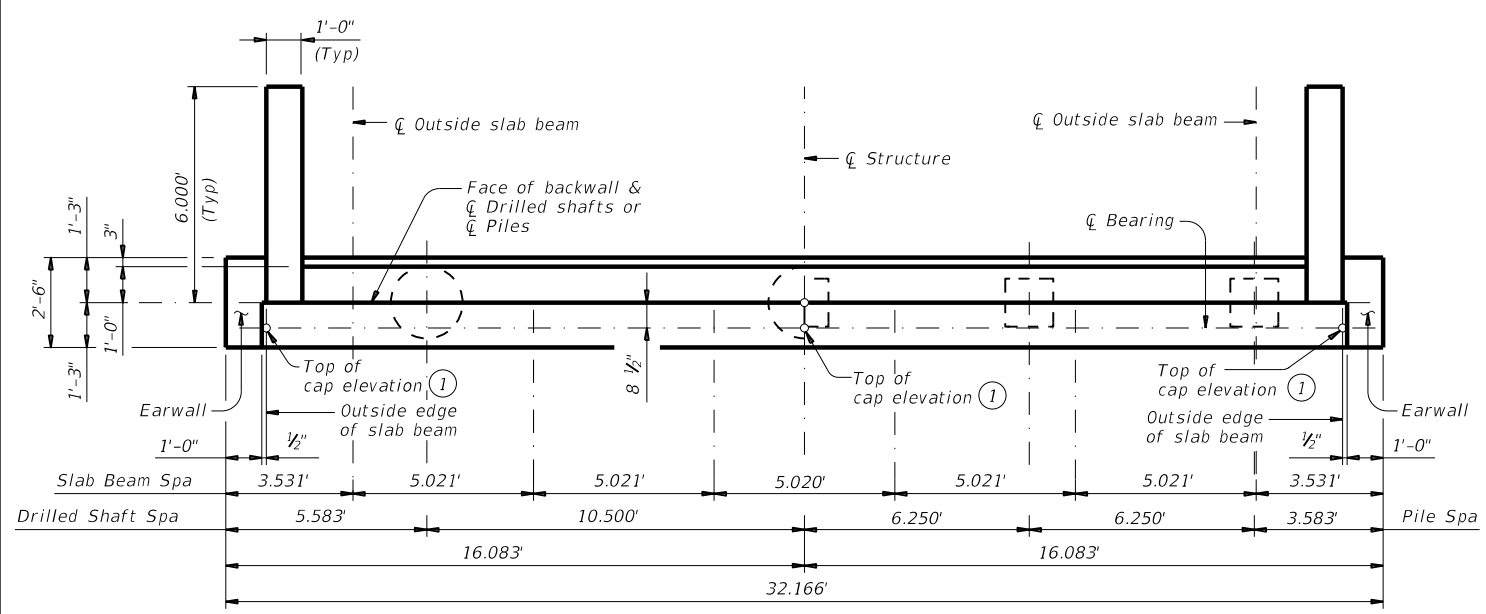
**ARMOR JOINT DETAILS**

**AJ**

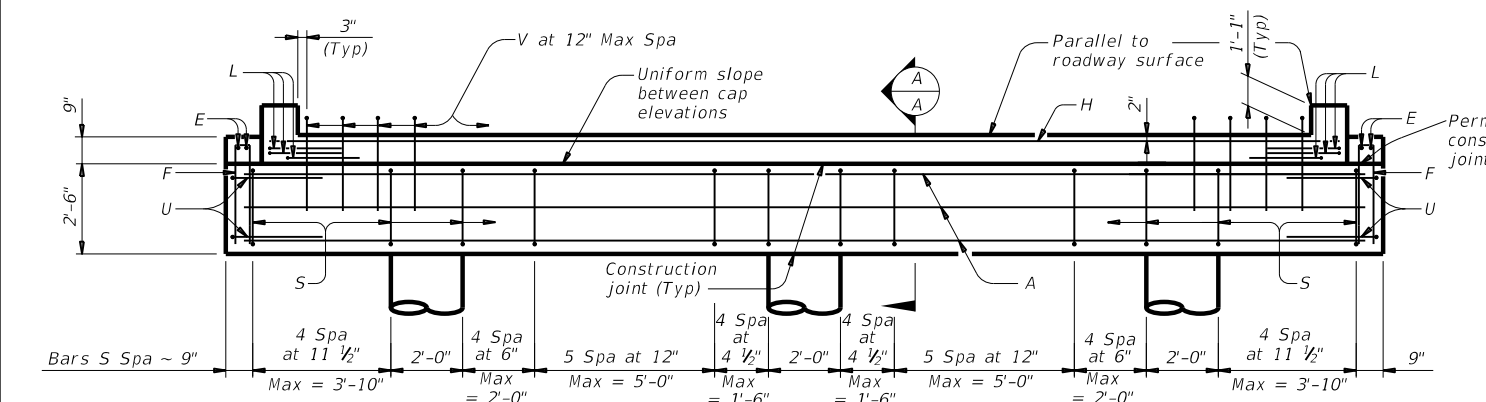
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©TxDOT	April 2019	CONTRACT	SECTION	JOB
REVISIONS	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	50	

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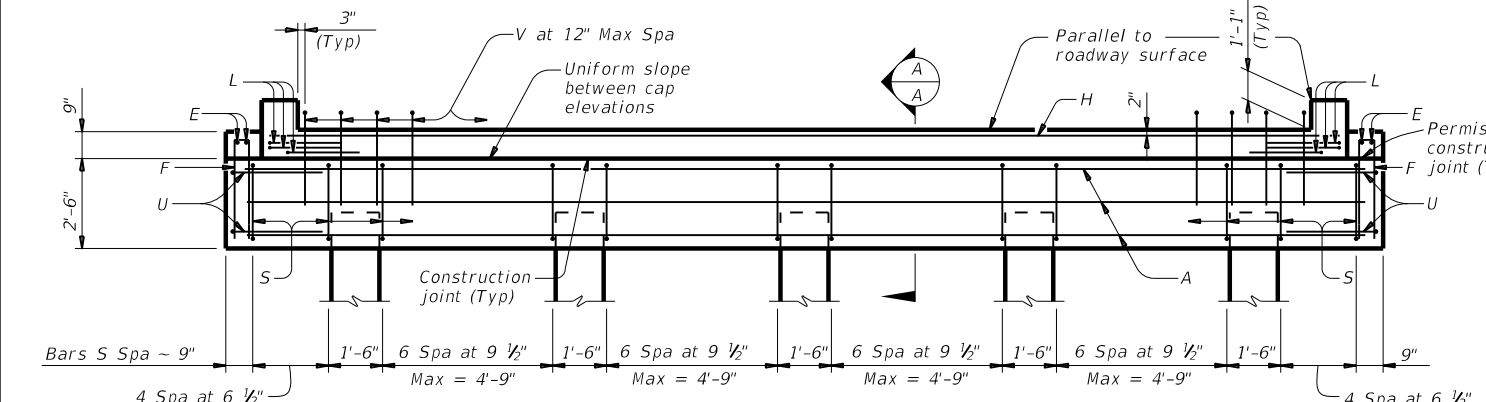
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**PLAN**  
 SHOWING DRILLED SHAFTS      SHOWING PILES

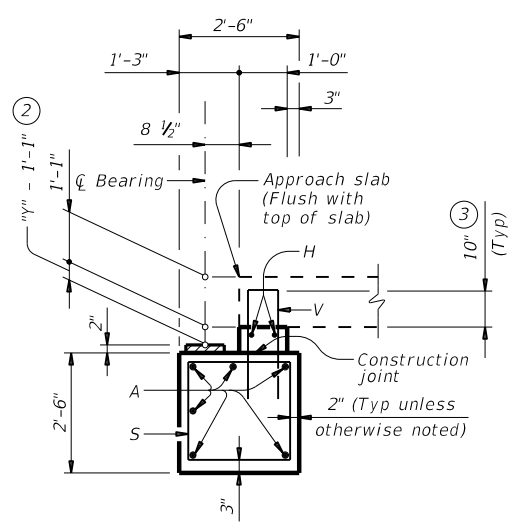
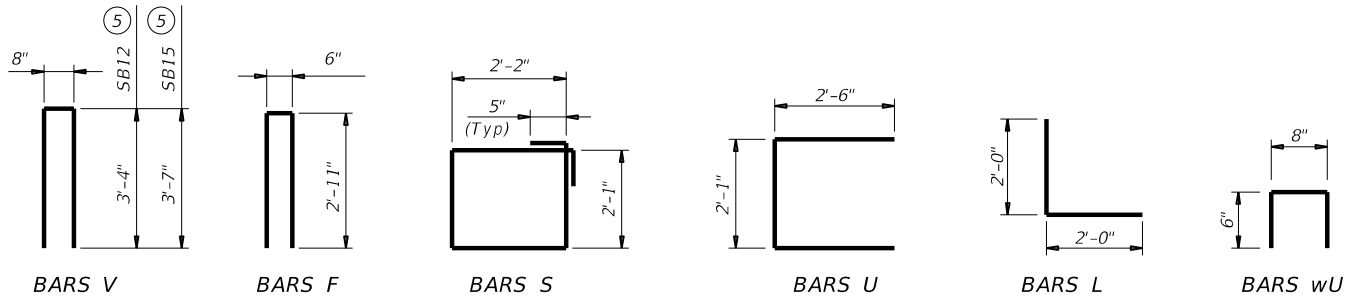


**ELEVATION ~ DRILLED SHAFT ABUTMENT**



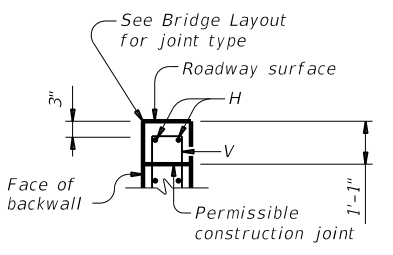
**ELEVATION ~ PILING ABUTMENT**

Note: For piles larger than 16", adjust Bars S spacing as required to avoid piles.



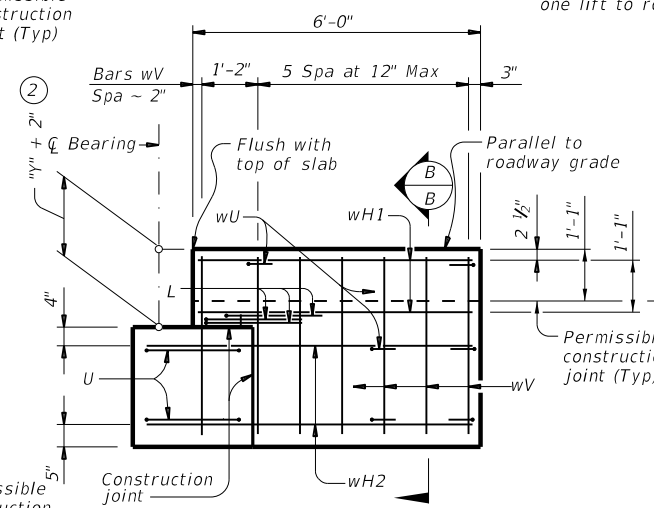
**SECTION A-A**  
 (With Approach Slab)

Note: At Contractor's option, backwall may be cast with approach slab.

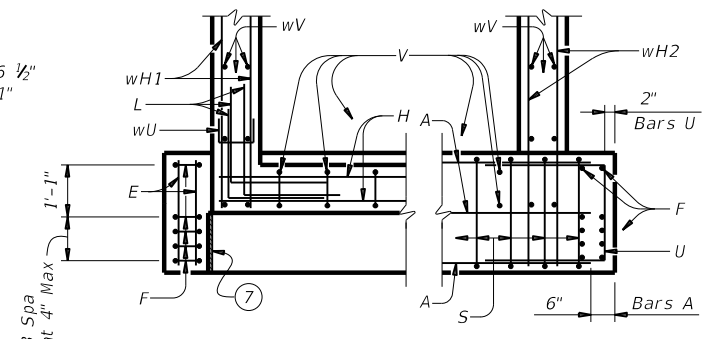


**BACKWALL DETAIL**  
 (Without Approach Slab)

Note: At Contractor's option, backwall may be cast in one lift to roadway surface.



**WINGWALL ELEVATION**  
 (Earwall not shown for clarity.)



**BACKWALL      CAP**  
**CORNER DETAILS**

**FOUNDATION LOADS**

Span Length	Drilled Shaft Loads		Vertical Pile Loads	
	5SB12	5SB15	5SB12	5SB15
Ft	Tons/DS	Tons/Pile		
25	42	44	25	27
30	46	50	28	30
35	51	55	31	33
40	55	60	33	36
45		64		39
50		69		42

**TABLE OF ESTIMATED QUANTITIES**

Bar	No.	Size	Length (5)		Weight (5)	
			5SB12	5SB15	5SB12	5SB15
A	6	#11	31'-2"	31'-2"	994	994
E	4	#4	2'-2"	2'-2"	6	6
F	10	#4	6'-4"	6'-4"	43	43
H	2	#5	29'-9"	29'-9"	62	62
L	6	#6	4'-0"	4'-0"	36	36
S	38	#4	9'-4"	9'-4"	237	237
U	4	#6	7'-1"	7'-1"	43	43
V	29	#5	7'-4"	7'-10"	222	237
wH1	8	#6	5'-8"	5'-8"	68	68
wH2	8	#6	6'-11"	6'-11"	83	83
wU	12	#4	1'-8"	1'-8"	14	14
wV	28	#5	3'-10"	4'-1"	112	119
Reinforcing Steel			Lb		1,920	1,942
CI "C" Conc (Abut)			CY		9.9	10.3

- ① Top of cap elevations are based on section depths shown on Span Details.
- ② See Span Details for "Y".
- ③ Increase as required to maintain 3" from finished grade.
- ④ See Bridge Layout to determine if approach slab is present.
- ⑤ See Bridge Layout for beam type used in the superstructure.
- ⑥ Quantities shown are for one abutment only (with approach slab). Without approach slab, add 1.1 CY Class "C" concrete and 62 Lb reinforcing steel for 2 additional Bars H.
- ⑦ 1/2" preformed bituminous fiber material between slab beam and earwall. Bond to earwall with an approved adhesive. Cast inside face of earwall perpendicular to cap. (Typ)

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Designed for a normal embankment header slope of 3:1 and a maximum span length of 50 feet.  
 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 SPSB-28 only.

**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.

HL93 LOADING

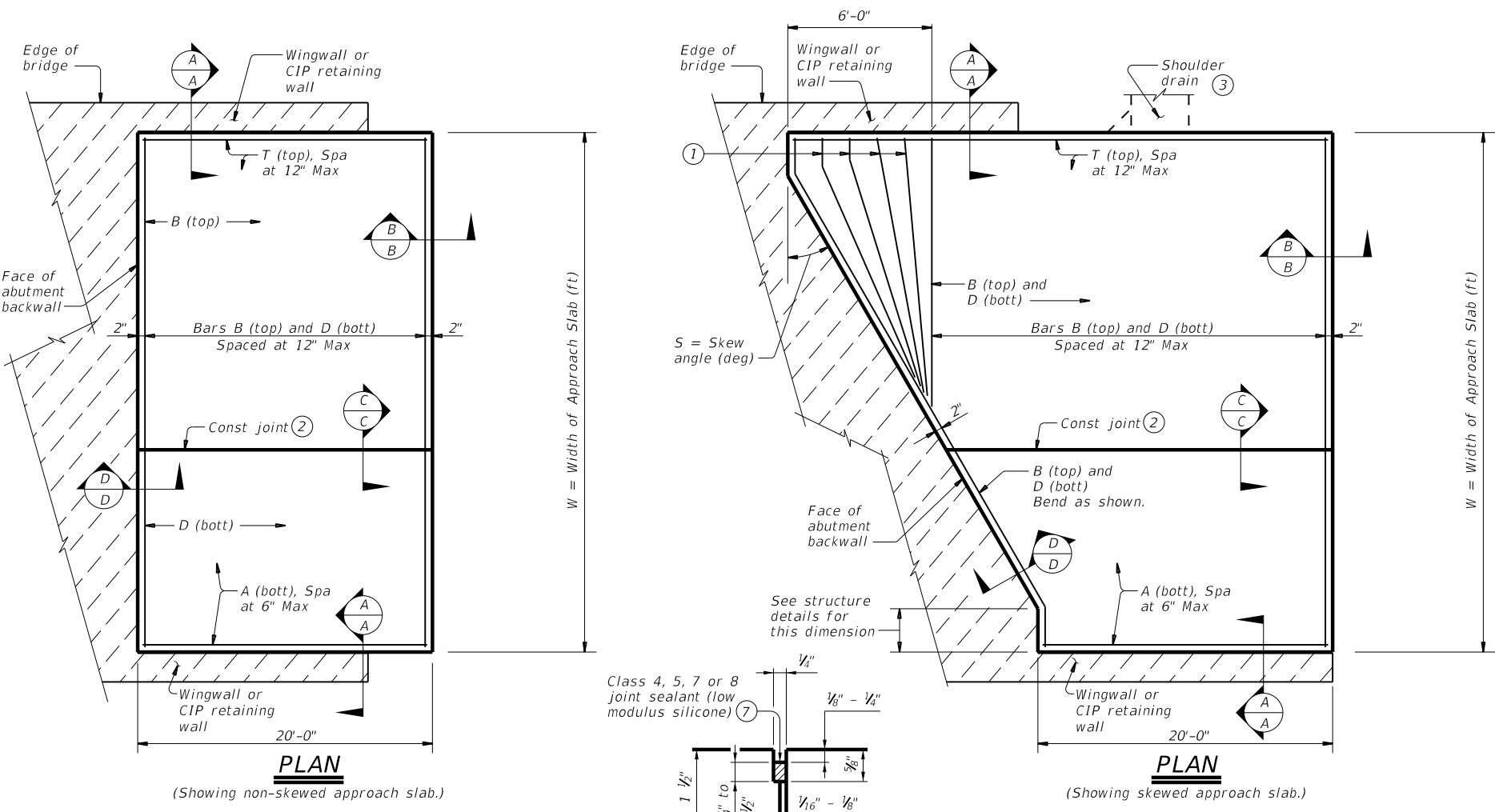
Texas Department of Transportation

**ABUTMENTS**  
**PRESTR CONCRETE SLAB BEAM**  
**28' ROADWAY**  
**APSB-28**

FILE: psbste13-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
REVISIONS	CONTRACT	SECTION	JOB	HIGHWAY
0914	05	174	CR 452	
DIST	COUNTY	SHEET NO.		
AUS	WILLIAMSON	51		

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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

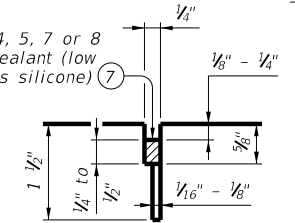
Volume of Appr Slab Conc (CY) = 0.802W + 0.02W<sup>2</sup> Tan S

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 1/2" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

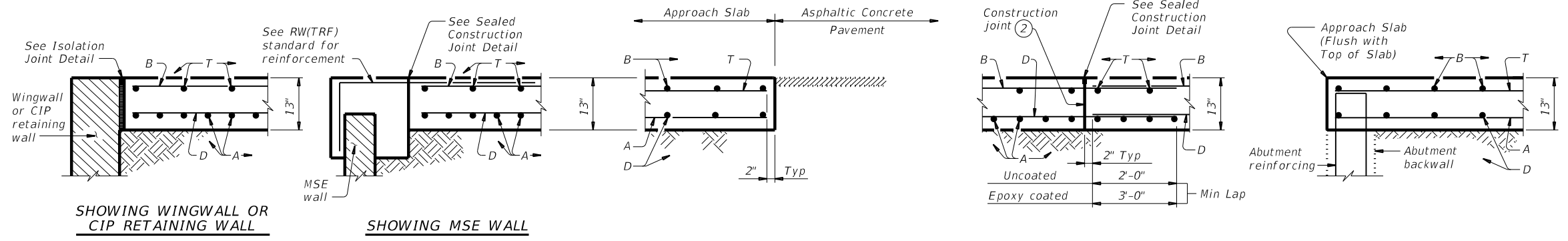
**LONGITUDINAL SAW CUT JOINT DETAIL**



**GENERAL NOTES:**

Construct approach slab in accordance with Item 422. Provide Class "S" concrete with a minimum compressive strength of 4,000 psi. Provide Grade 60 reinforcing steel. Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 1/2" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 1/2" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.) 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.

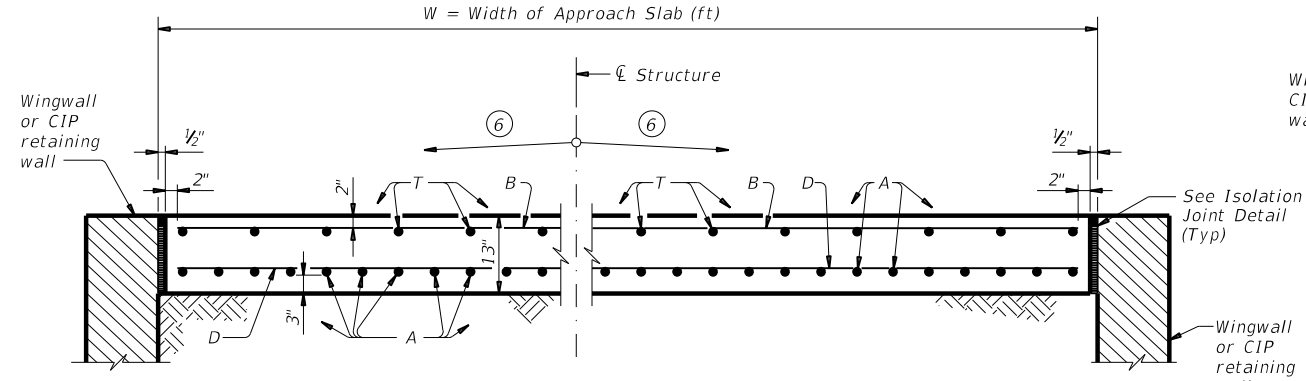


**SECTION A-A**

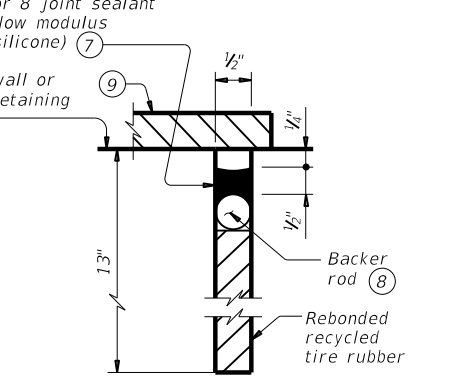
**SECTION B-B**

**SECTION C-C** ⑤

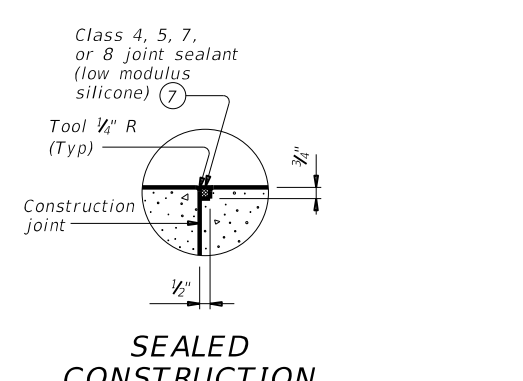
**SECTION D-D**



**TYPICAL TRANSVERSE SECTION**



**ISOLATION JOINT DETAIL**



**SEALED CONSTRUCTION JOINT DETAIL**

**Texas Department of Transportation** Bridge Division Standard

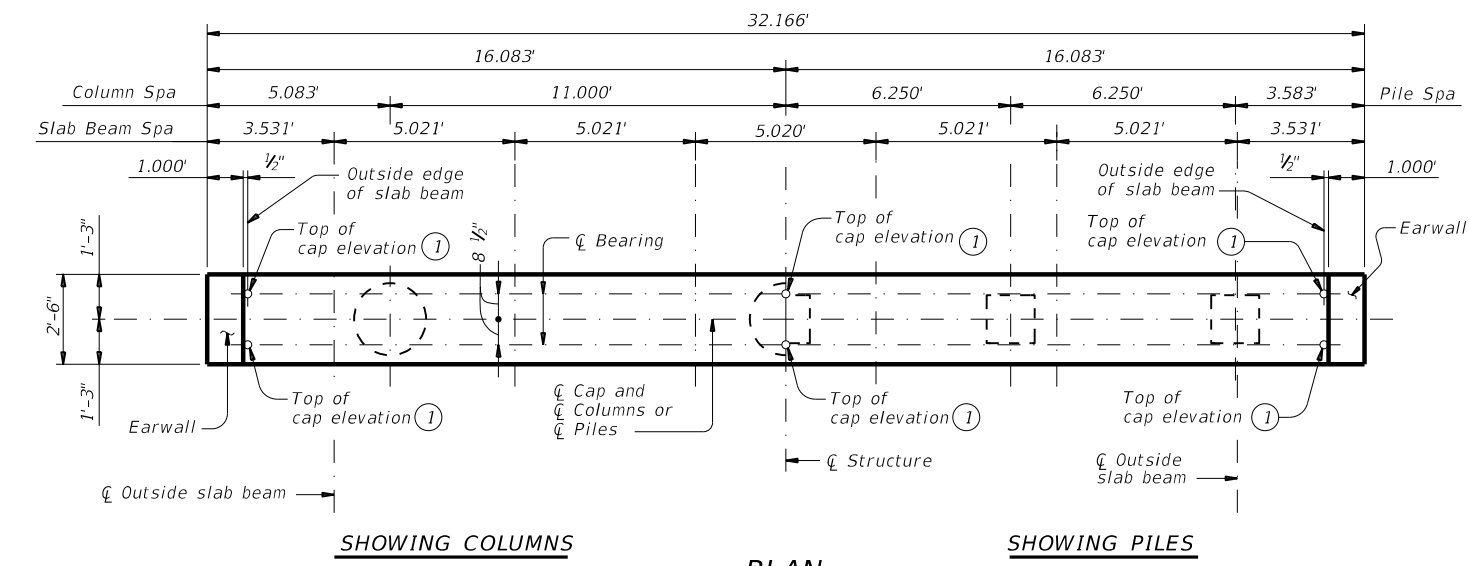
**BRIDGE APPROACH SLAB ASPHALTIC CONCRETE PAVEMENT**

**BAS-A**

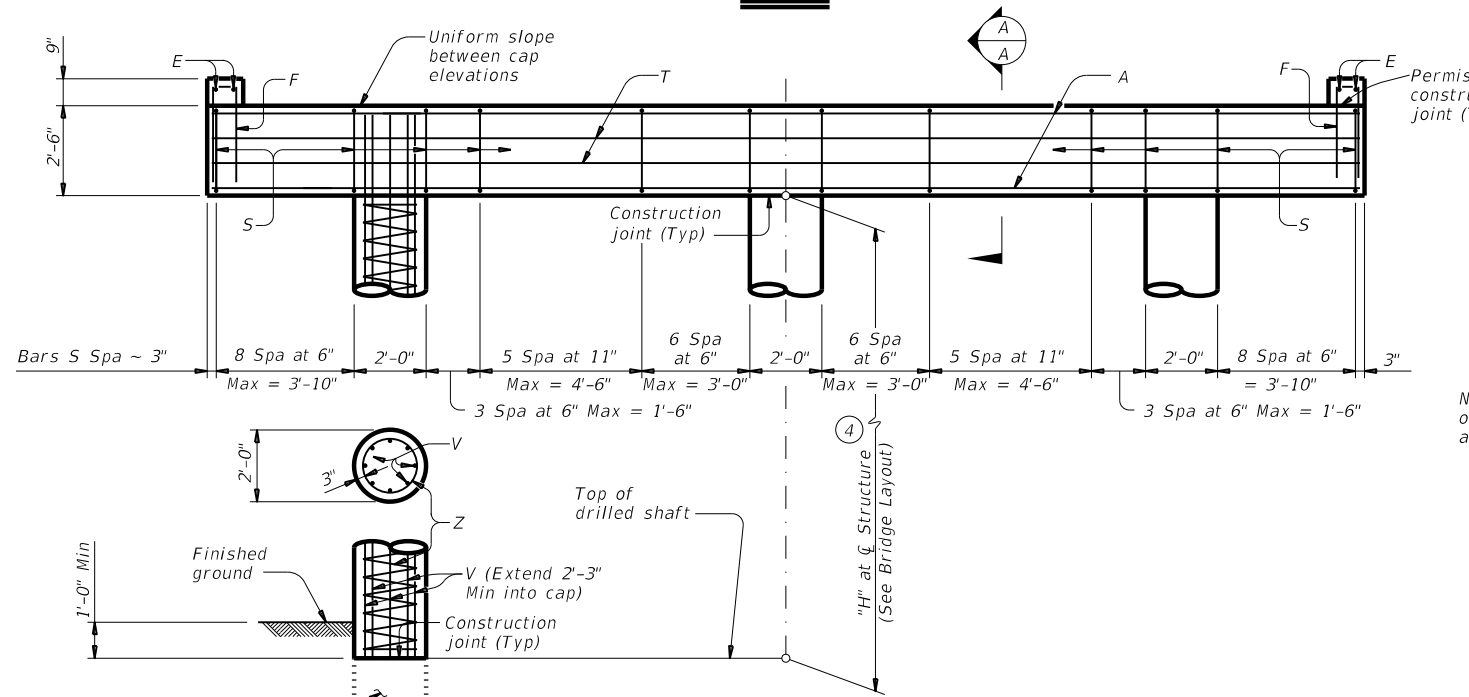
FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
02-20: Removed stress relieving pad.	DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	52		

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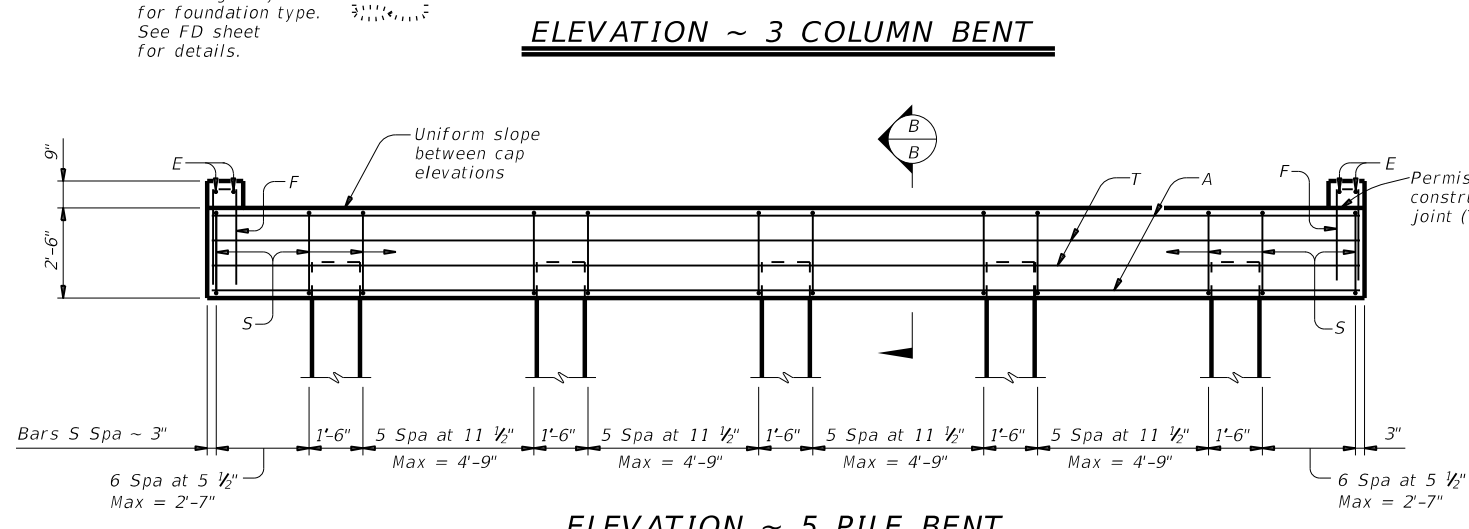
DATE/TIME 3:35:00 PM  
 FILE: D:\CS\M\15092\psbste24-17.dgn



SHOWING COLUMNS                      SHOWING PILES



ELEVATION ~ 3 COLUMN BENT



ELEVATION ~ 5 PILE BENT

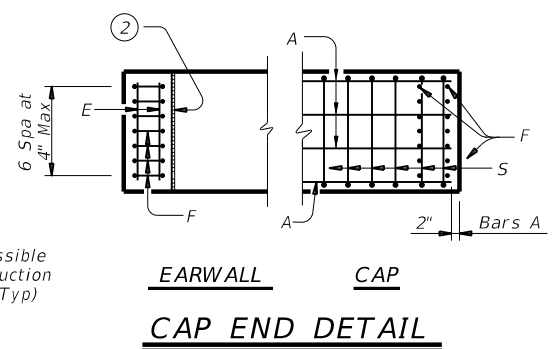
Note: For piles larger than 16", adjust Bars S spacing as required to avoid piles.

FOUNDATION LOADS				
Average Span Length	Drilled Shaft Loads (5)		Vertical Pile Loads	
	5SB12	5SB15	5SB12	5SB15
Ft				
25	62	67	37	40
30	72	78	43	47
35	80	87	48	52
40	88	96	53	57
45		104		63
50		113		68

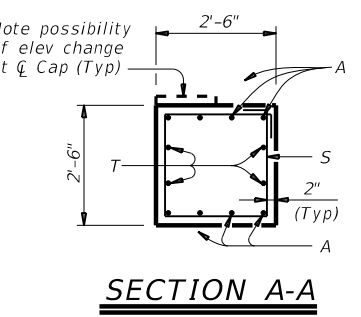
TABLE OF ESTIMATED QUANTITIES (3)					
3 COLUMN BENT					
Bar	No.	Size	Length	Weight	
A	8	#11	31'-10"	1,353	
E	4	#4	2'-2"	6	
F	14	#4	6'-6"	61	
S	48	#5	9'-8"	484	
T	4	#5	31'-10"	133	
V	24	#7	26'-3"	1,288	
Z	3	#3	242'-2"	273	
Reinforcing Steel				Lb	3,598
Cl "C" Conc (Cap)				CY	7.6
Cl "C" Conc (Col)				CY	8.4

TABLE OF ESTIMATED QUANTITIES					
5 PILE BENT					
Bar	No.	Size	Length	Weight	
A	5	#11	31'-10"	846	
E	4	#4	2'-2"	6	
F	14	#4	6'-6"	61	
S	38	#5	9'-8"	383	
T	4	#5	31'-10"	133	
Reinforcing Steel				Lb	1,429
Cl "C" Conc (Cap)				CY	7.6

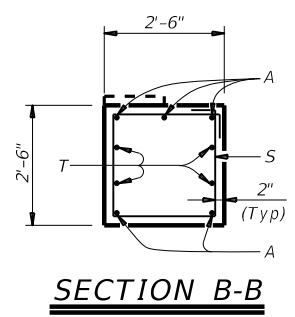
TABLE OF MAXIMUM ALLOWABLE EXPOSED PILE HEIGHTS AND PILE LOADS (4)			
Pile Type		Max Ht	Max Load
Concrete	Steel	Ft	Tons/Pile
16" Sq	HP14x73	16	75
18" Sq	HP14x117 (6)	20	90



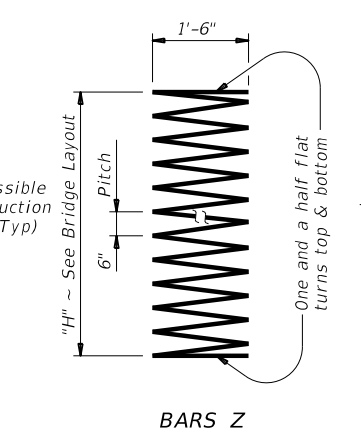
EARWALL CAP CAP END DETAIL



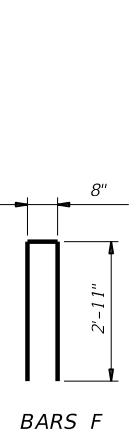
SECTION A-A



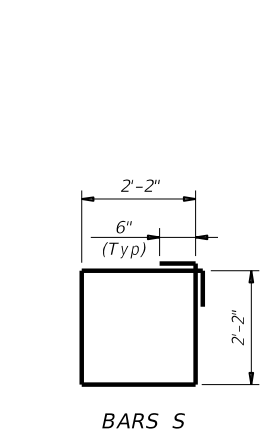
SECTION B-B



BARS Z



BARS F



BARS S

- Top of cap elevations are based on section depths shown on Span Details.
- 1/2" preformed bituminous fiber material between slab beam and earwall. Bond to earwall with an approved adhesive. Cast inside face of earwall perpendicular to cap. (Typ)
- Quantities shown are based on an "H" value of 24 feet. For each linear foot variation in "H" value, make the following adjustments:  
 Bars V length, 1'-0"  
 Bars Z length, 9'-6"  
 Reinforcing Steel, 60 Lb  
 Class "C" conc (column), 0.35 CY
- This standard may not be used for "H" heights exceeding 24 feet or exposed pile heights exceeding the values shown in the table. In areas of very soft soil or where scour is anticipated, allowable "H" heights or exposed pile heights must be evaluated by the Engineer prior to the use of this standard.
- Foundation Loads based on "H" = 24 feet.
- When HP14x117 steel piling is specified in the plans, the Contractor has the option of furnishing either HP14x117 or HP16x101 steel piling.

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Bent selected must be based on the average span length rounded up to the next 5-foot increment.  
 For pile bents supporting unequal spans, the shorter span cannot be less than 80 percent of the longer span.  
 See Bridge Layout for foundation type, size, and length.  
 See Common Foundation Details (FD) standard sheet for all foundation details and notes.  
 These bent details do not support the use of multi-pile footings shown on the FD standard.  
 These bent details may be used with standard SPSB-28 only.

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

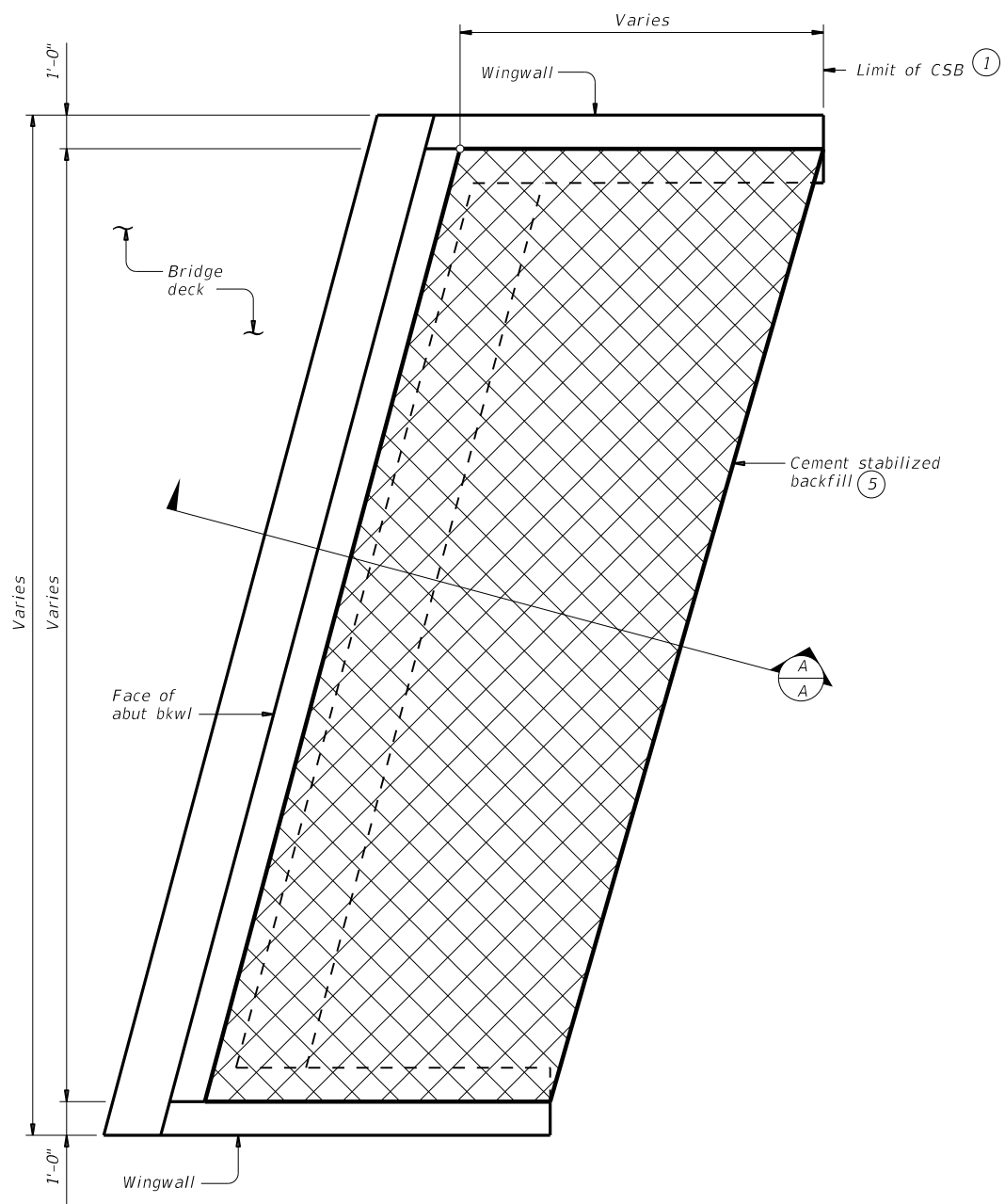
**MATERIAL NOTES:**  
 Provide Class C concrete (f'c = 3,600 psi).  
 Provide Class C (HPC) concrete if shown elsewhere in the plans.  
 Provide Grade 60 reinforcing steel.

HL93 LOADING

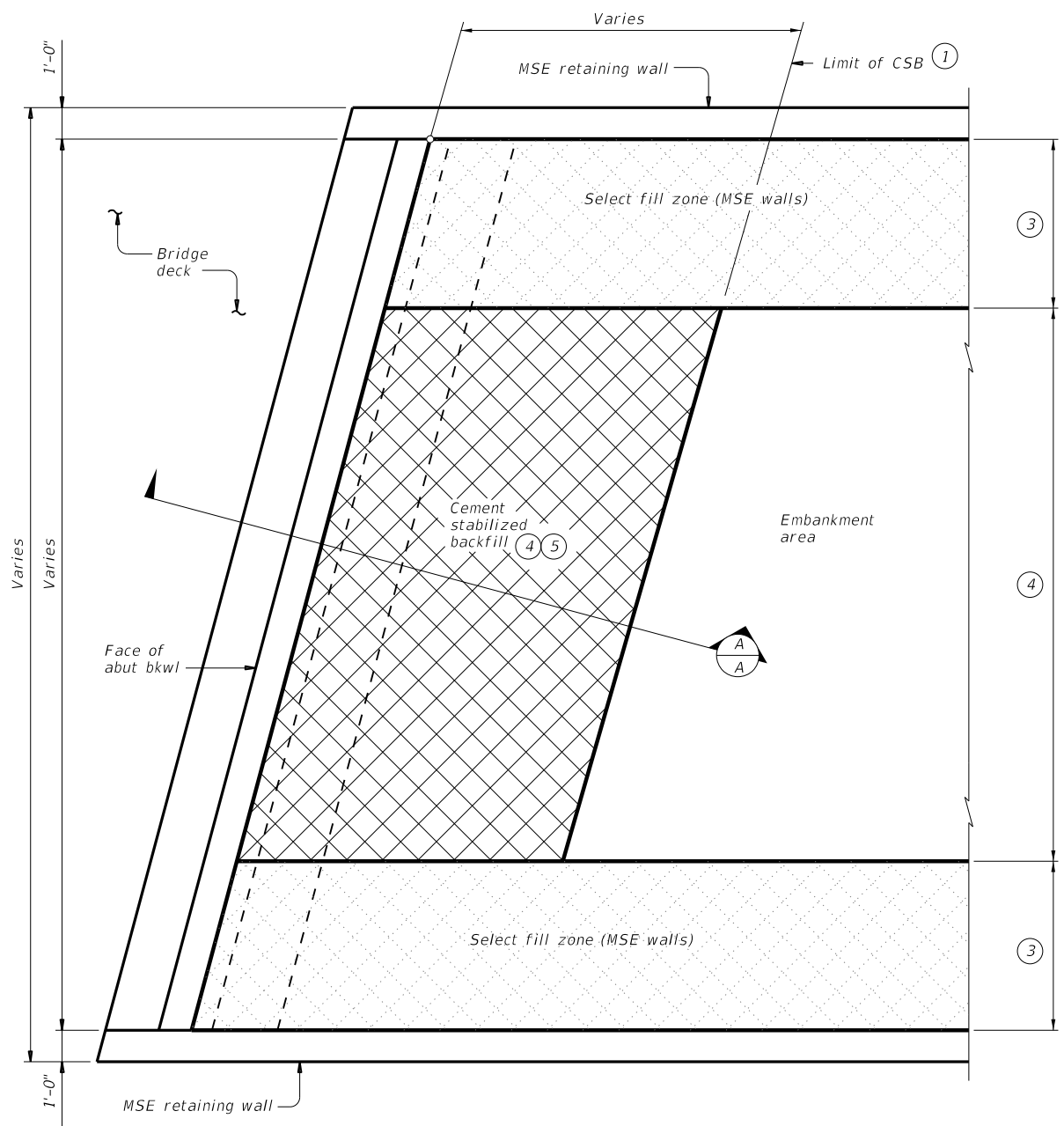
Texas Department of Transportation		Bridge Division Standard	
<b>INTERIOR BENTS</b>			
<b>PRESTR CONCRETE SLAB BEAM</b>			
<b>28' ROADWAY</b>			
<b>BPSB-28</b>			
FILE: psbste24-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
©TxDOT	REVISIONS	CONTRACT NO. 0914 05	JOB NO. 174
		COUNTY	SHEET NO.
		AUS	WILLIAMSON 53

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DATE/TIME: 3:35:06 PM  
 FILE: CSABSTE1-20.dgn



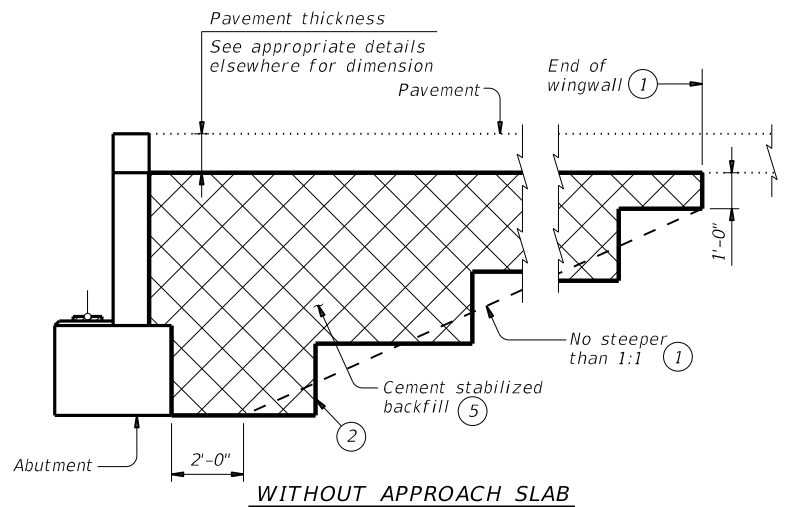
**OPTION 1 ~ PLAN WITH WINGWALLS**  
 Cast-in-place retaining walls similar.



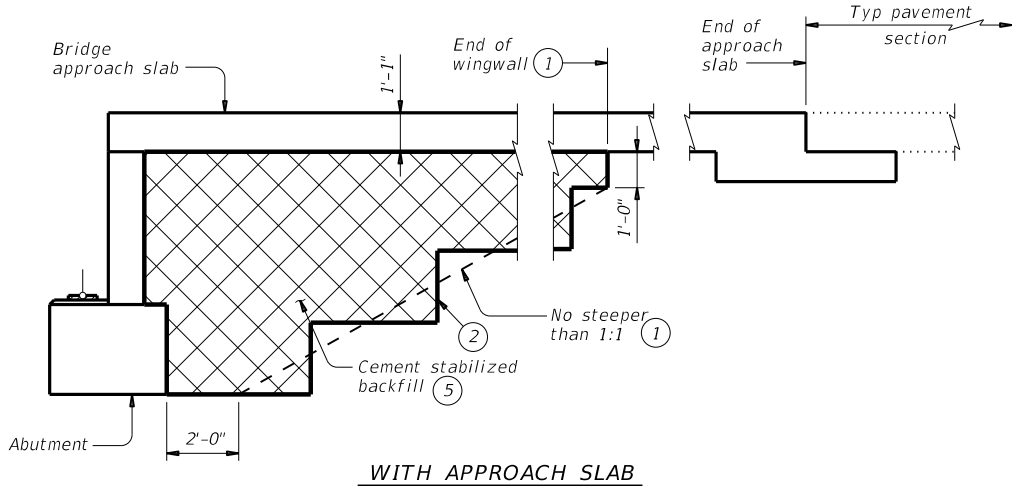
**OPTION 1 ~ PLAN WITH MSE RETAINING WALLS**

- 1 Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.
- 2 Bench backfill as shown with 12" (approximate) bench depths.
- 3 Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.
- 4 When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.
- 5 If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
  - a) If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the flowable fill; and
  - b) Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

**GENERAL NOTES:**  
 See the Bridge Layout for selected Option. Option 2 is intended for new construction requiring high plasticity embankment fill with a plasticity index (PI) greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays. Option 1 is intended for construction only requiring PI controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment.  
 Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.  
 If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments.  
 Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.  
 These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.



**WITHOUT APPROACH SLAB**



**SECTION A-A**

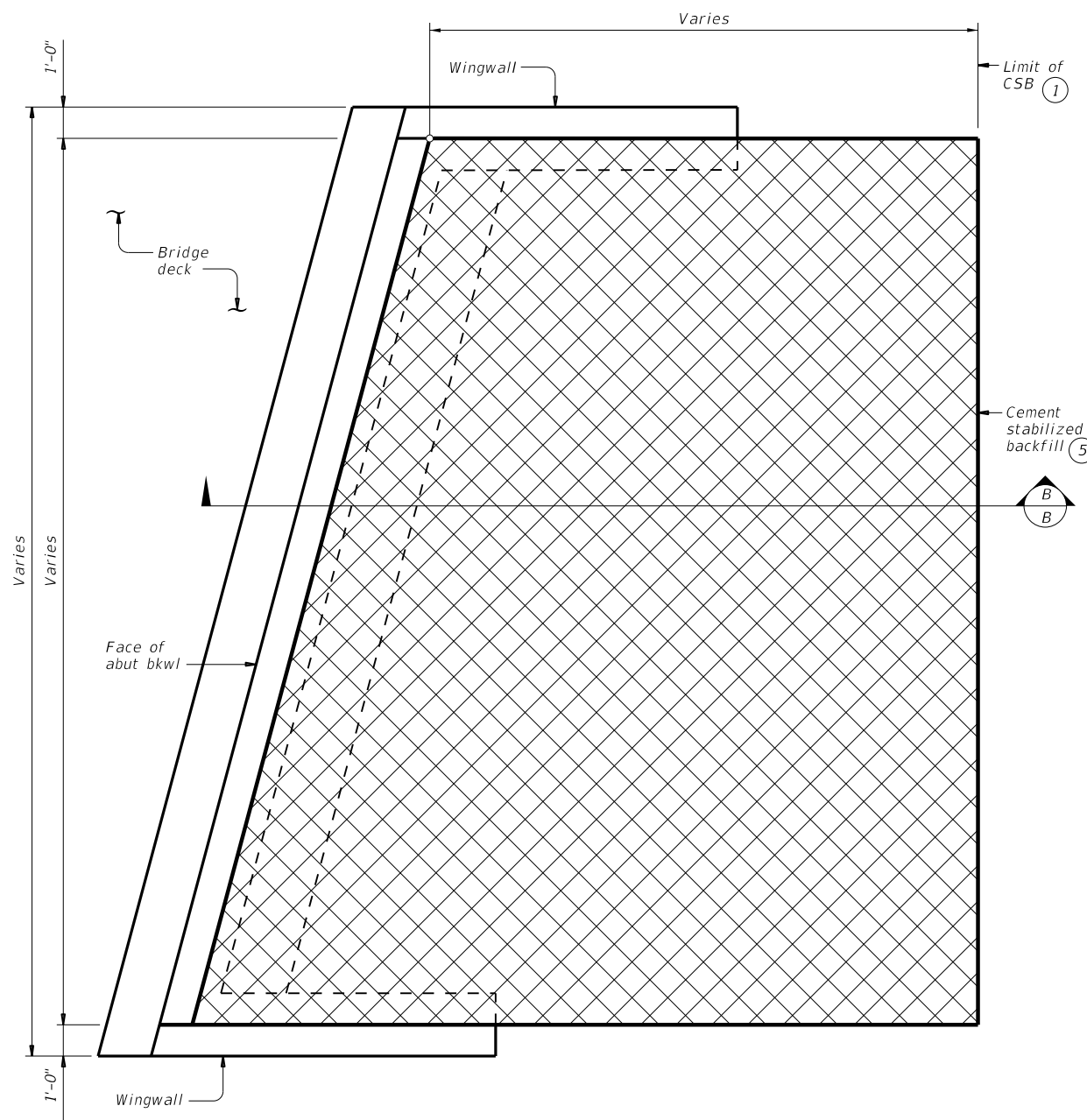
**WITH APPROACH SLAB**  
 (Showing BAS-C, BAS-A similar.)

		<b>Bridge Division Standard</b>	
<b>CEMENT STABILIZED ABUTMENT BACKFILL BRIDGE ABUTMENT</b>			
<b>CSAB</b>			
FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
©TxDOT	APRIL 2019	CONTRACT NO. 0914 05	JOB NO. 174
REVISIONS		COUNTY	HIGHWAY
02-20: Added Option 2.		AUS	WILLIAMSON
			SHEET NO. 54



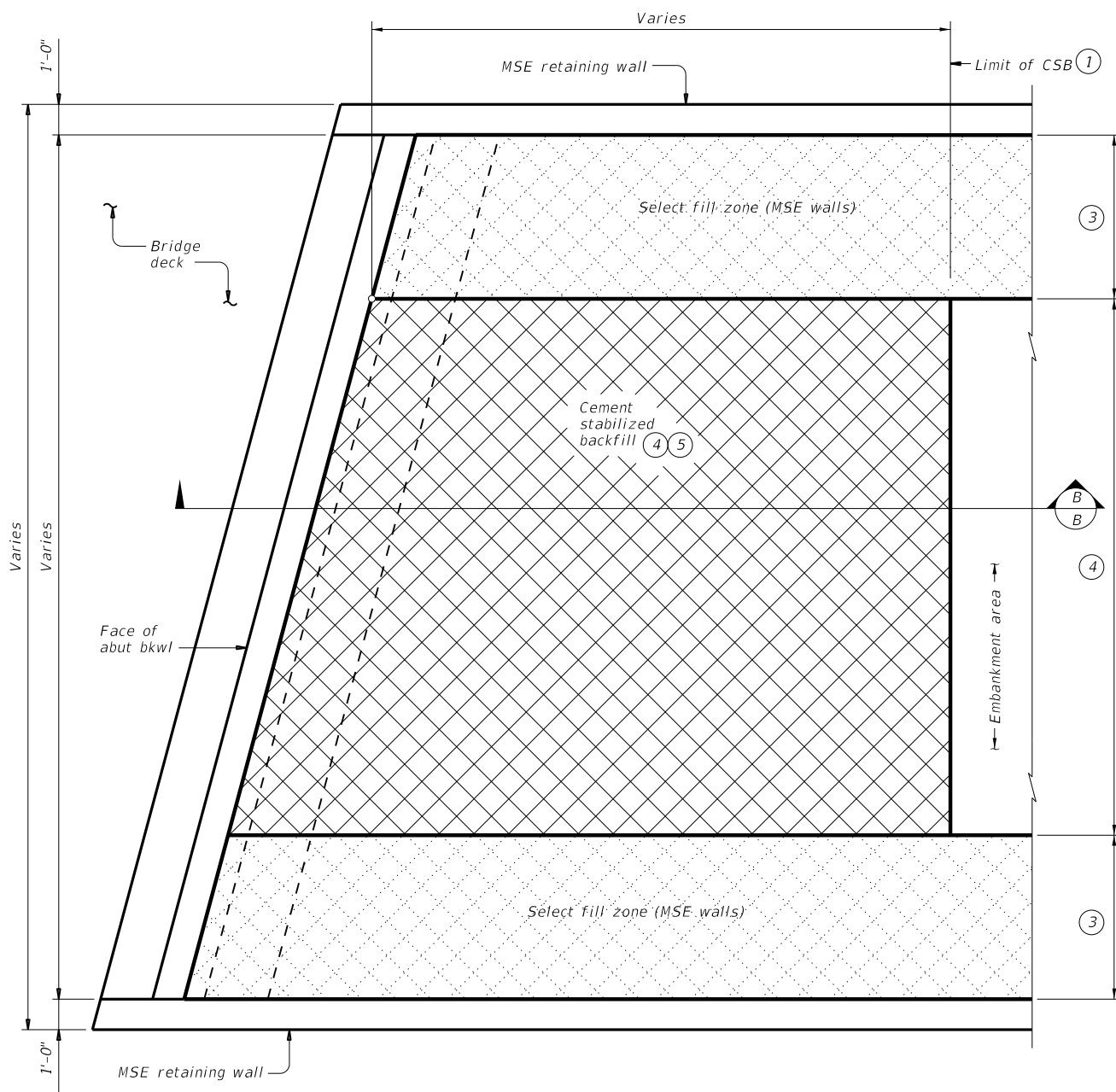
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DATE/TIME 3:35:06 PM  
 FILE: D:\CSAB\15092\csabst1-20.dgn



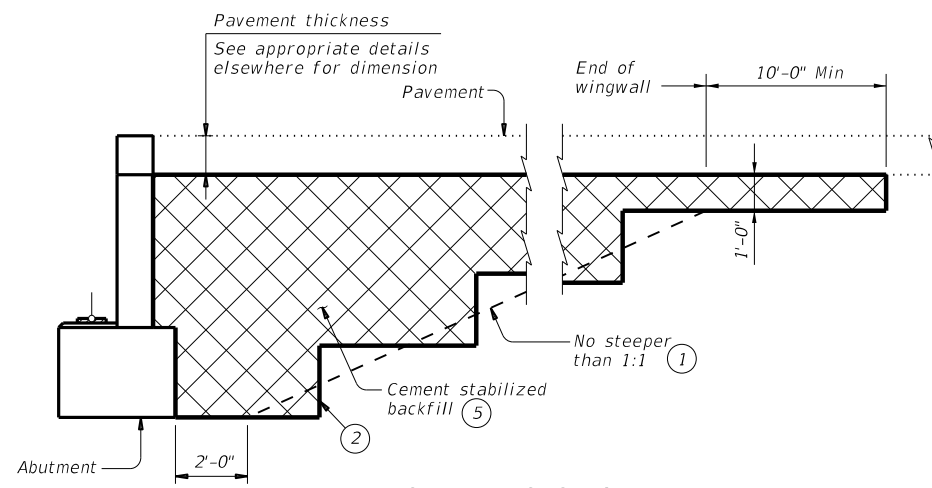
**OPTION 2 ~ PLAN WITH WINGWALLS**

Cast-in-place retaining walls similar.

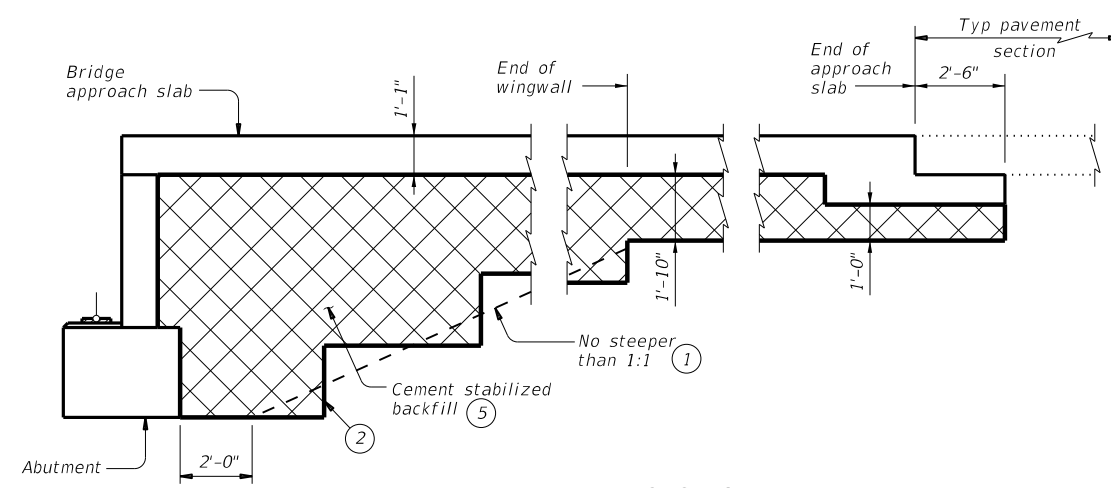


**OPTION 2 ~ PLAN WITH MSE RETAINING WALLS**

- ① Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.
- ② Bench backfill as shown with 12" (approximate) bench depths.
- ③ Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.
- ④ When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.
- ⑤ If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
  - a). If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
  - b). Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).



**WITHOUT APPROACH SLAB**



**SECTION B-B**

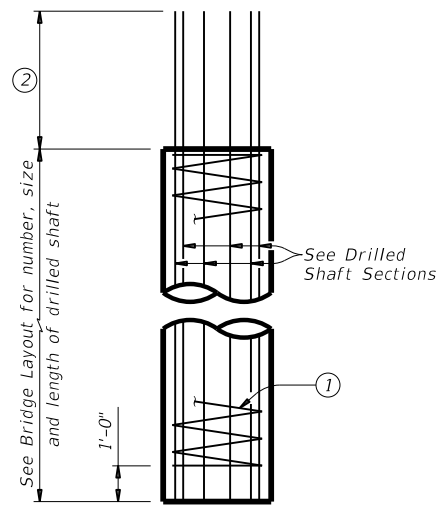
**WITH APPROACH SLAB**  
 (Showing BAS-C, BAS-A similar.)

SHEET 2 OF 2

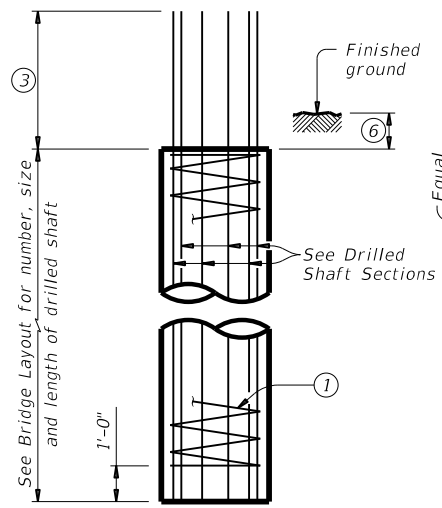
		<b>Bridge Division Standard</b>	
<b>CEMENT STABILIZED ABUTMENT BACKFILL BRIDGE ABUTMENT</b>			
<b>CSAB</b>			
FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
©TxDOT April 2019	CONT	SECT	JOB
REVISIONS	0914	05	174
02-20: Added Option 2.	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	55

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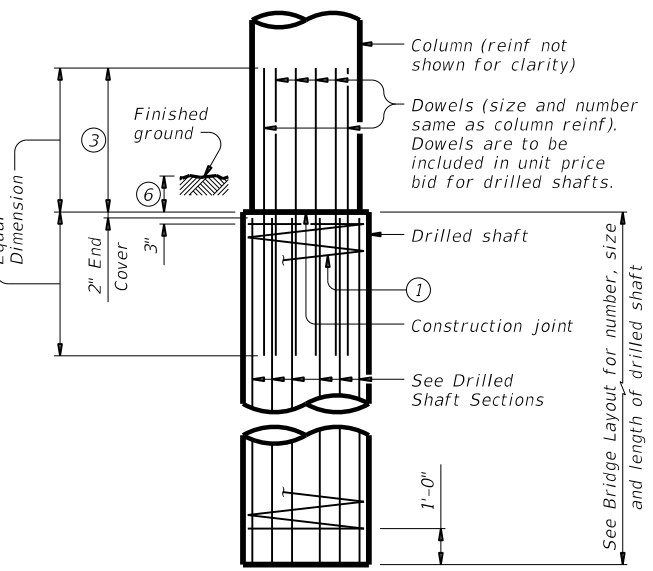
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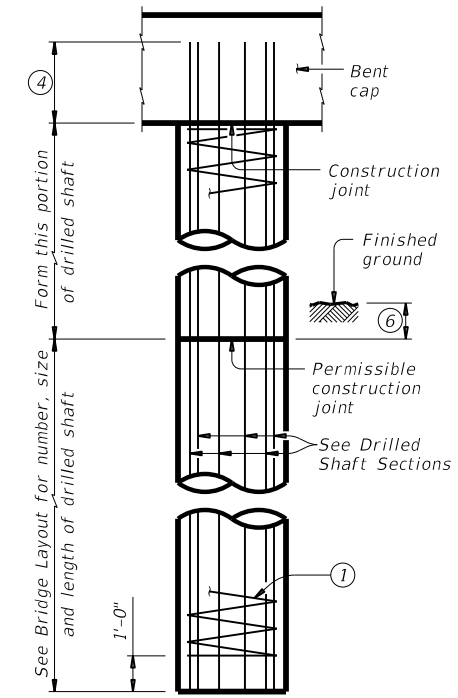
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



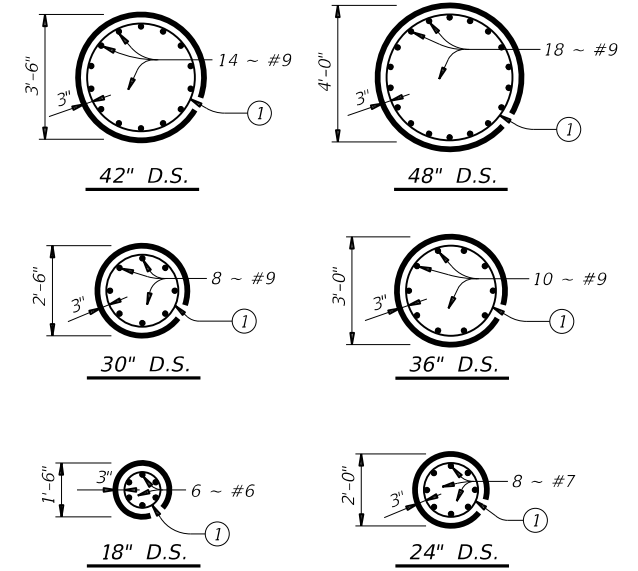
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL

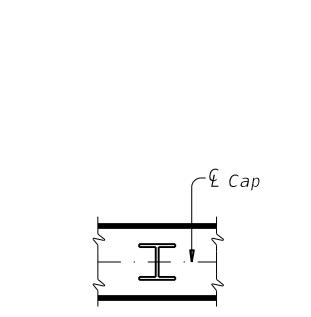


DRILLED SHAFT SECTIONS

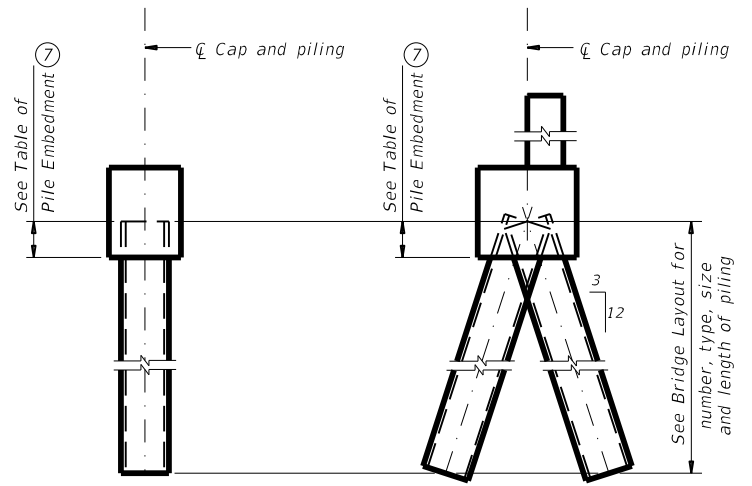
**DRILLED SHAFT DETAILS**

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.

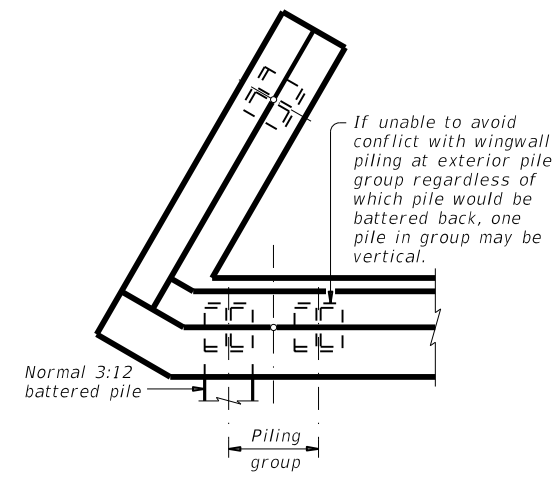


ORIENTATION OF STEEL H-PIILING



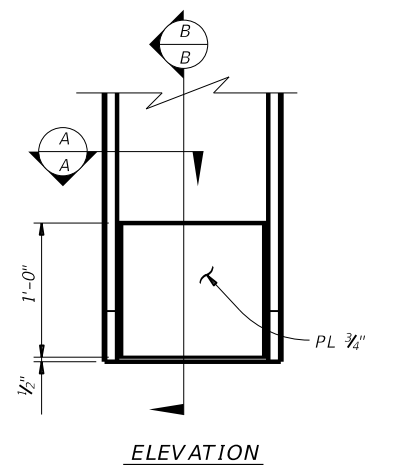
VERTICAL PILE BATTERED PILE

**PIILING DETAILS**  
(Concrete or steel H)

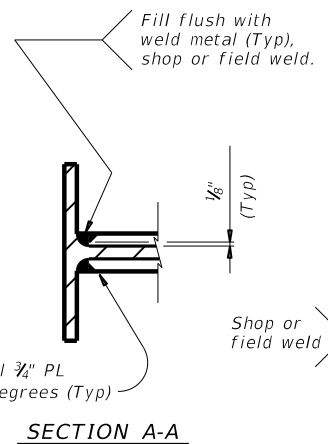


DETAIL "A"  
(Showing plan view of a 30° skewed abutment)

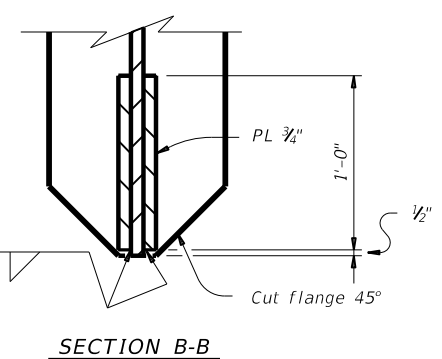
- ① #3 spiral at 6" pitch (one and a half flat turns top and bottom).
- ② Min extension into supported element:  
#6 Bars = 1'-11"  
#7 Bars = 2'-0"  
#9 Bars = 2'-3"
- ③ Min lap with column reinf:  
#7 Bars = 2'-11"  
#9 Bars = 3'-9"  
#11 Bars = 4'-8"
- ④ Min extension into supported element:  
#6 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.



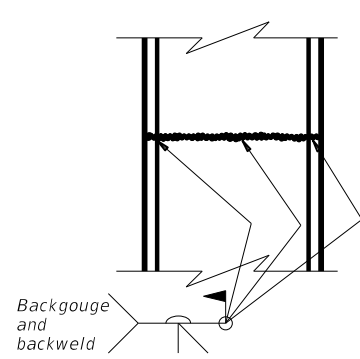
ELEVATION



SECTION A-A

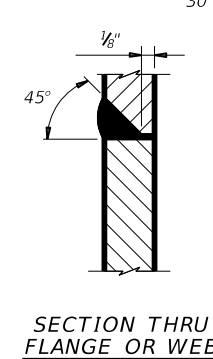


SECTION B-B



STEEL H-PILE SPLICE DETAIL

Use when required.



SECTION THRU FLANGE OR WEB

**STEEL H-PILE TIP REINFORCEMENT**

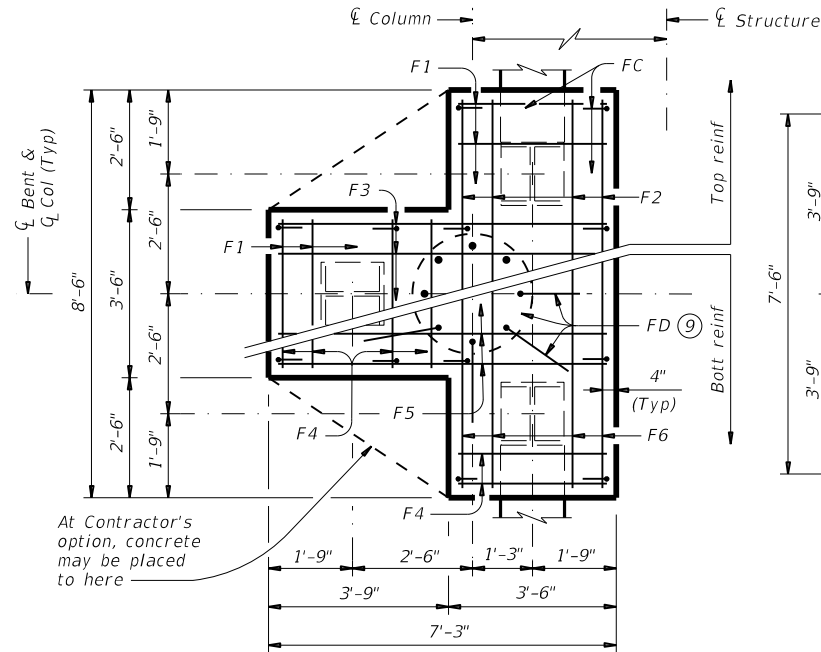
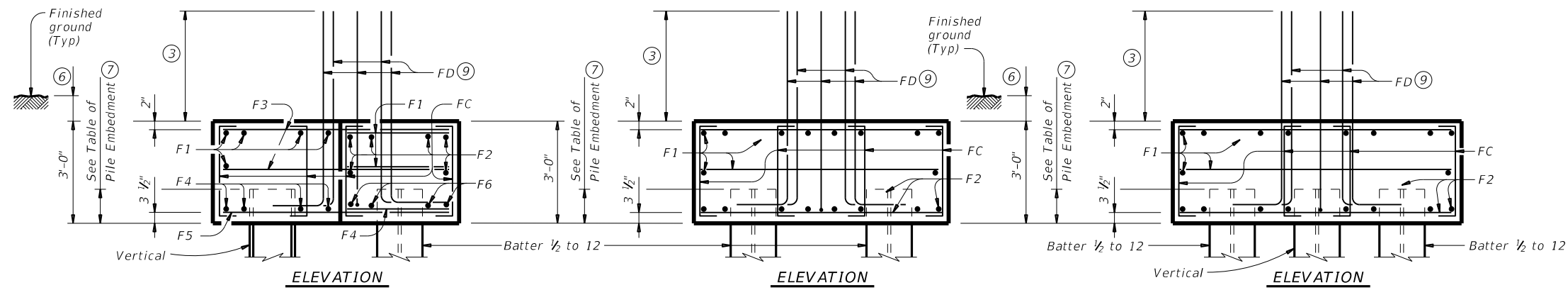
See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.

SHEET 1 OF 2

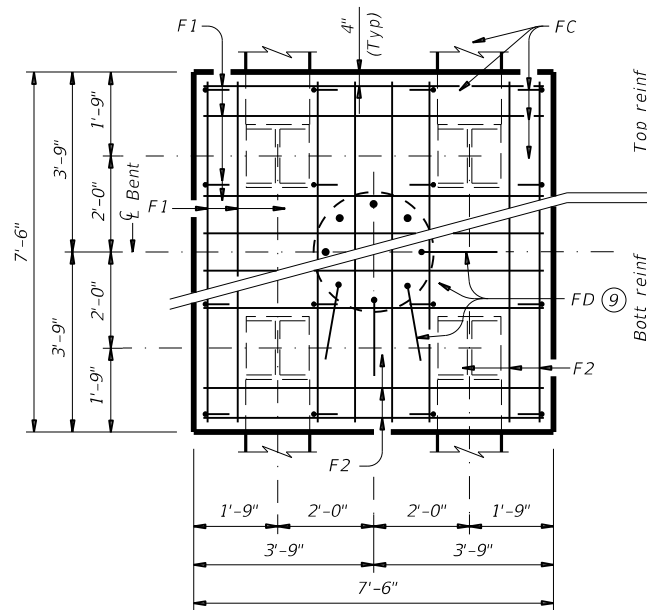
		Bridge Division Standard	
<b>COMMON FOUNDATION DETAILS</b>			
<b>FD</b>			
FILE: fdstd01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT	REVISIONS	CONTRACT	HIGHWAY
01-20: Added #11 bars to the FD bars.	0914 05	174	CR 452
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	56	

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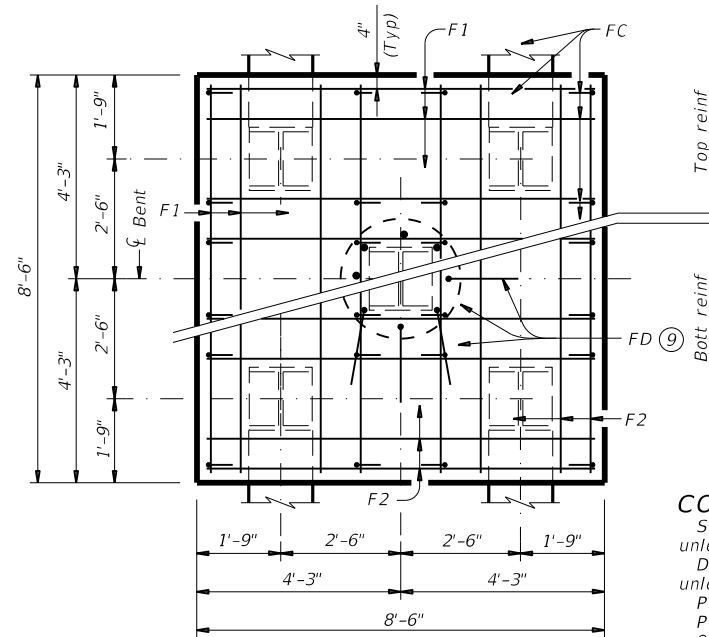
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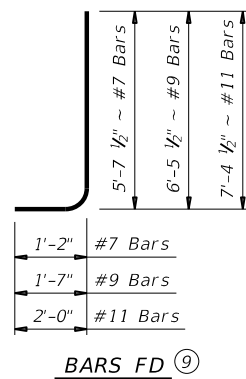
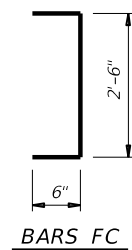
**THREE PILE FOOTING**<sup>⑧</sup>  
 For 36" Dia and smaller columns.



**FOUR PILE FOOTING**<sup>⑧</sup>  
 For 42" Dia and smaller columns.



**FIVE PILE FOOTING**<sup>⑧</sup>  
 For 42" Dia and smaller columns.



- 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 <sup>⑩</sup>	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 <sup>⑩</sup>	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 <sup>⑩</sup>	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:

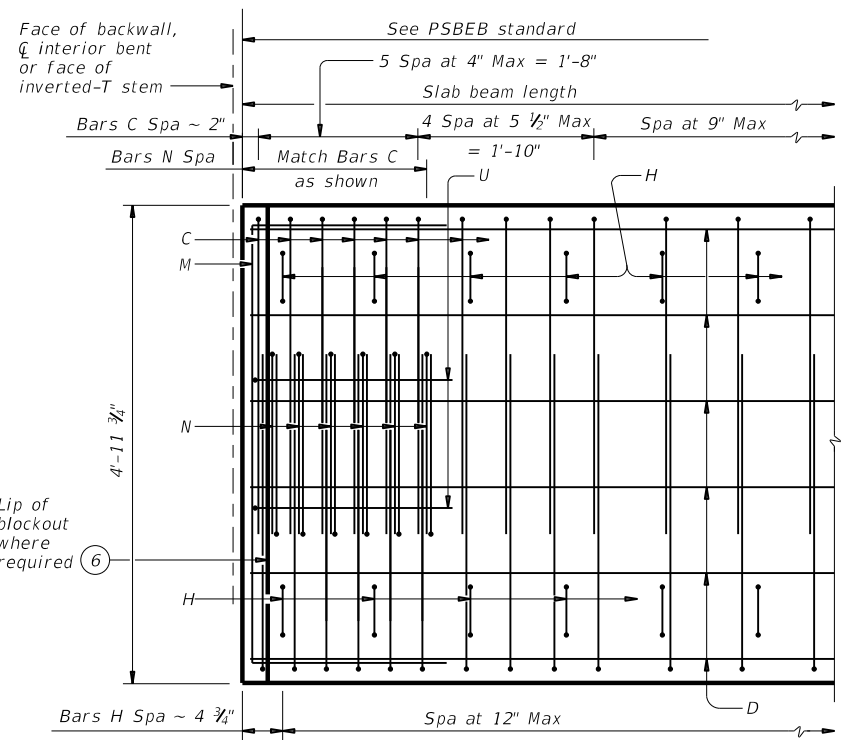
- 72 Tons/Pile with 24" Dia Columns
- 80 Tons/Pile with 30" Dia Columns
- 100 Tons/Pile with 36" Dia Columns
- 120 Tons/Pile with 42" Dia Columns

SHEET 2 OF 2

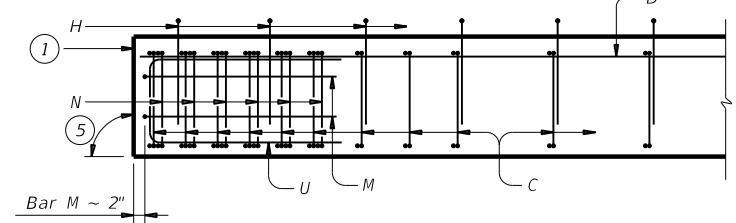
		<b>Bridge Division Standard</b>	
<h2>COMMON FOUNDATION DETAILS</h2>			
<h3>FD</h3>			
FILE: fdstd01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT April 2019	CONT	SECT	JOB
REVISIONS	0914	05	174
01-20: Added #11 bars to the FD bars.	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	57

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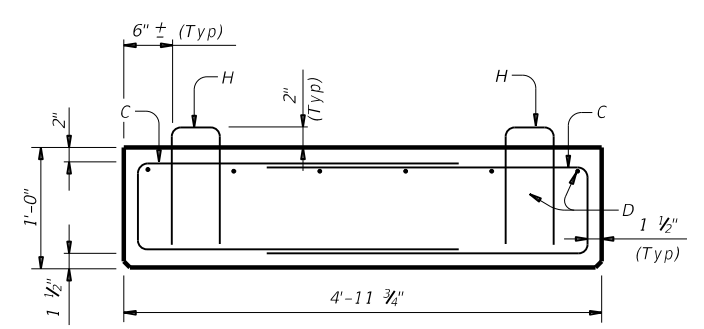
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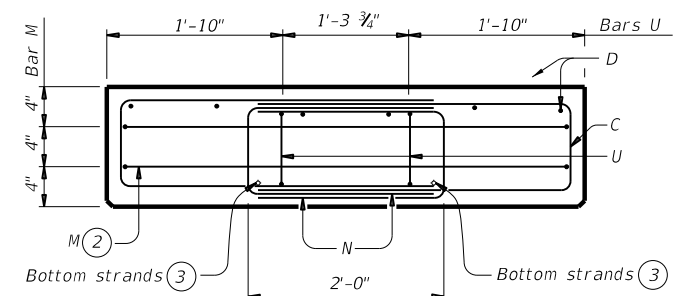
**PART PLAN**



**ELEVATION**

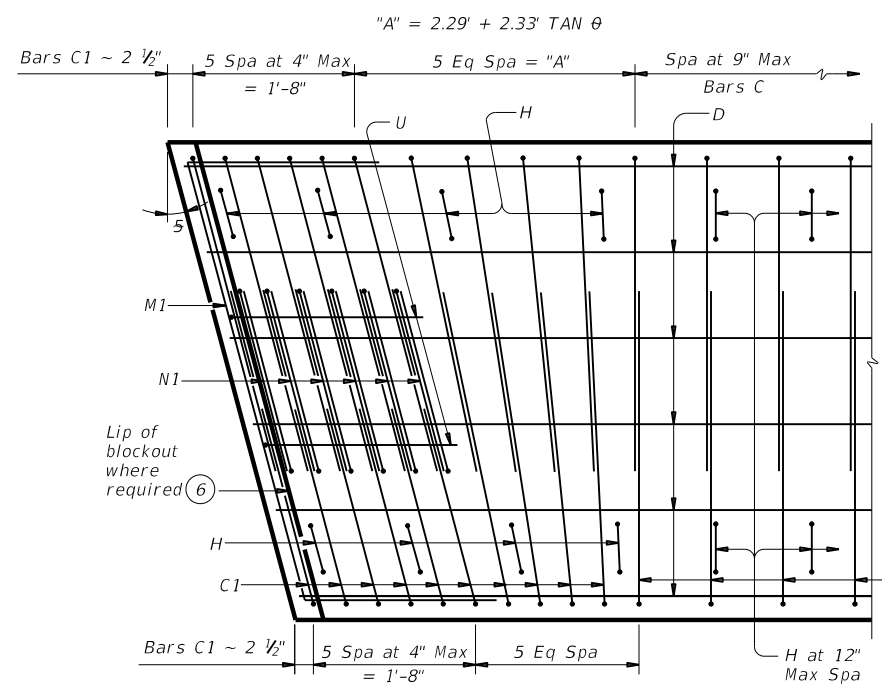


**SECTION**



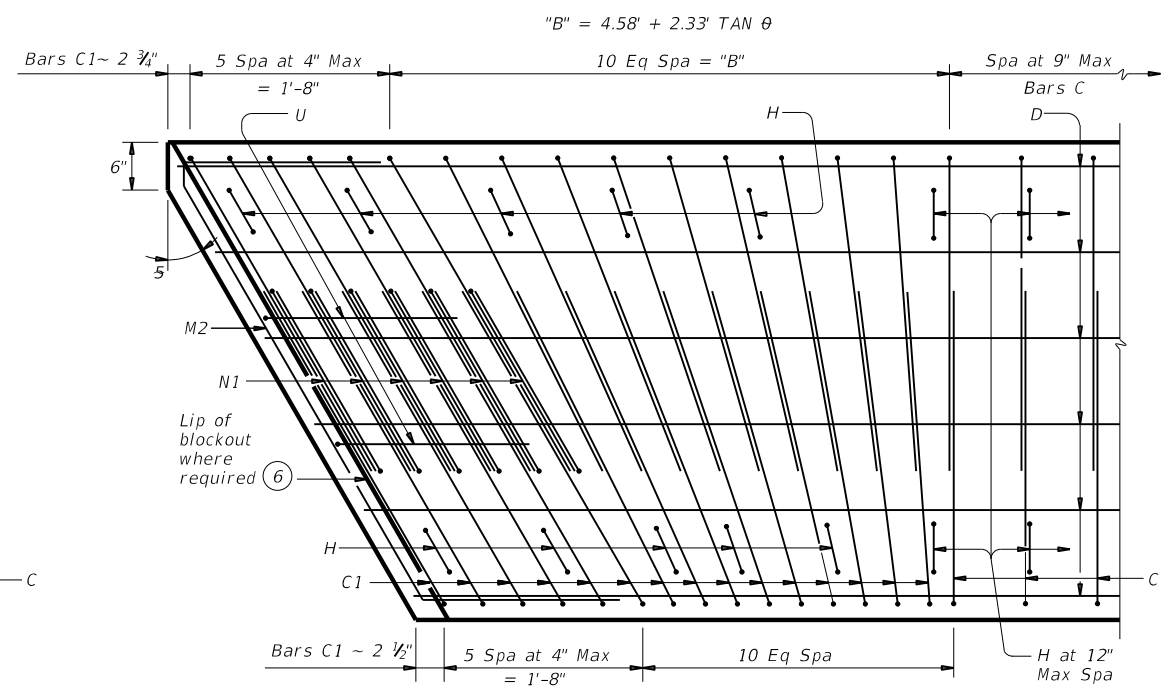
**END MAT REINFORCING**

Bars H not shown for clarity.



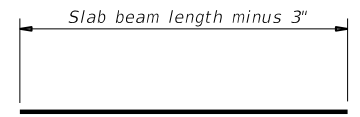
**PART SKEW PLAN**

(Showing θ over 0° to 15° Skew)

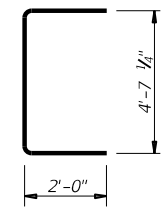


**PART SKEW PLAN**

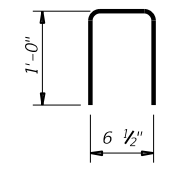
(Showing θ over 15° to 30° Skew)



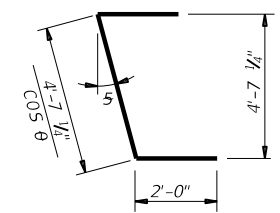
**BARS D(#6)**



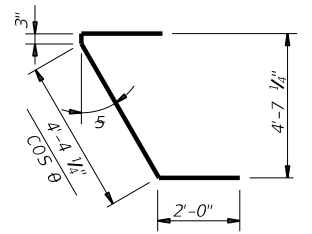
**BARS M(#4)**



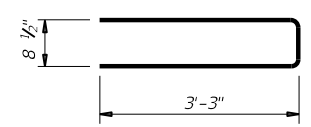
**BARS H(#4)**



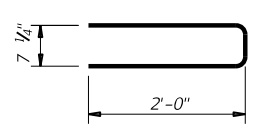
**BARS M1(#4)**



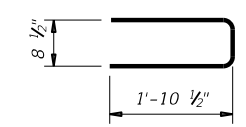
**BARS M2(#4)**



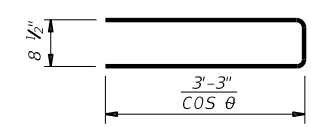
**BARS C(#4)**



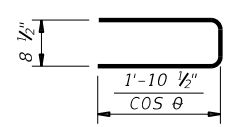
**BARS U(#5)**



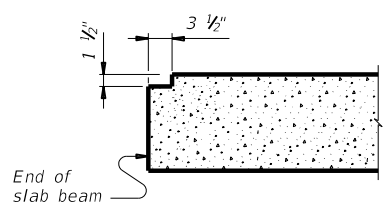
**BARS N(#4)**



**BARS C1(#4)**



**BARS N1(#4)**



**ELEVATION OF BLOCKOUT**

BEAM PROPERTIES		
Area	in <sup>2</sup>	717.0
Y top	in	6.00
Y bott	in	6.00
I	in <sup>4</sup>	8,604
Weight	lb/ft	747

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Provide Class H concrete. Provide Class H (HPC) if shown elsewhere in the plans.  
 Provide Grade 60 reinforcing steel.  
 An equal area of welded wire reinforcement (WWR) (ASTM 1064) may be substituted for bars C and D if approved by the Engineer.  
 These details can be used for any skew angle up to a maximum of 30 degrees.  
 Chamfer all exposed corners 3/4" or round to a 3/4" radius.  
 Details are drawn showing right forward skew. See Bridge Layout for actual direction.

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

- ① See End Mat Reinforcing detail.
- ② Adjust bars M vertically to avoid strands.
- ③ See sheet PSBND or PSBSD for strand locations.
- ④ Assumes 150 pcf weight density of concrete.
- ⑤ 90° at conventional interior bents. End of beam must be vertical at abutment backwall and inverted-T stem.
- ⑥ Blockout required at armor joint (AJ) and sealed expansion joint (SEJ) locations to accommodate joint anchorage.

HL93 LOADING

Texas Department of Transportation  
 Bridge Division Standard

## PRESTRESSED CONCRETE SLAB BEAM DETAILS

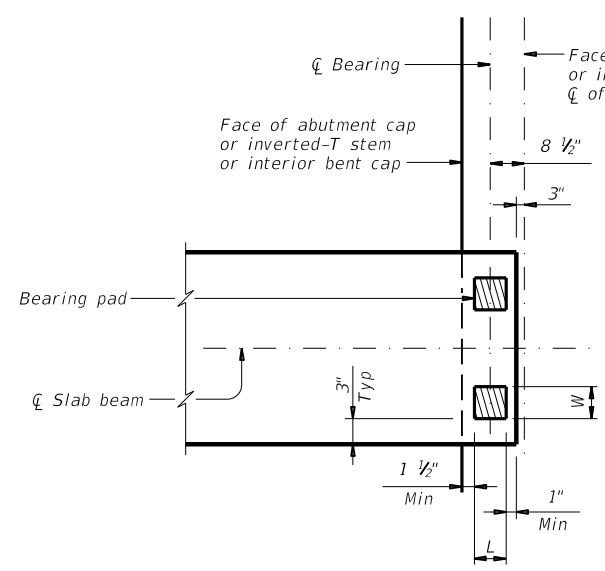
(TYPE 5SB12)

### PSB-5SB12

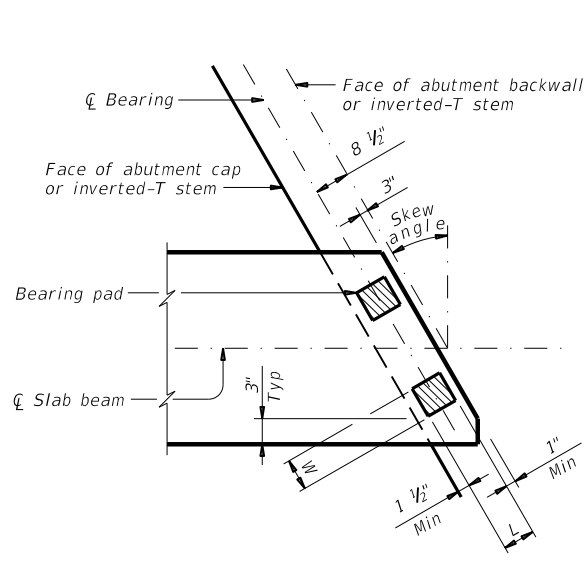
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©TxDOT January 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
DIST	COUNTY	SHEET NO.		
AUS	WILLIAMSON	58		

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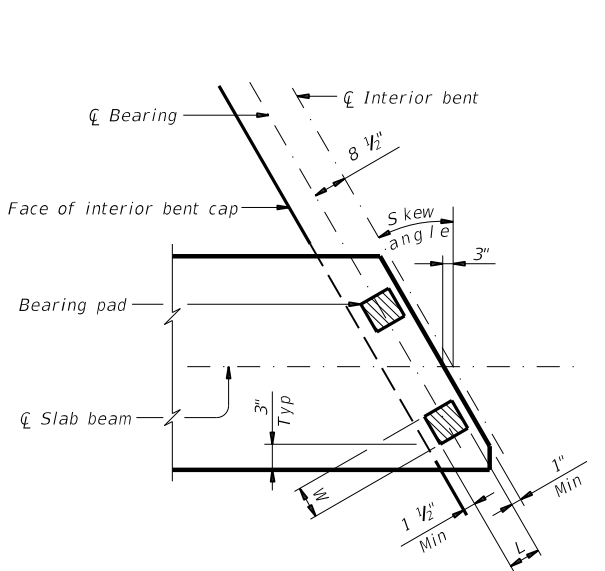
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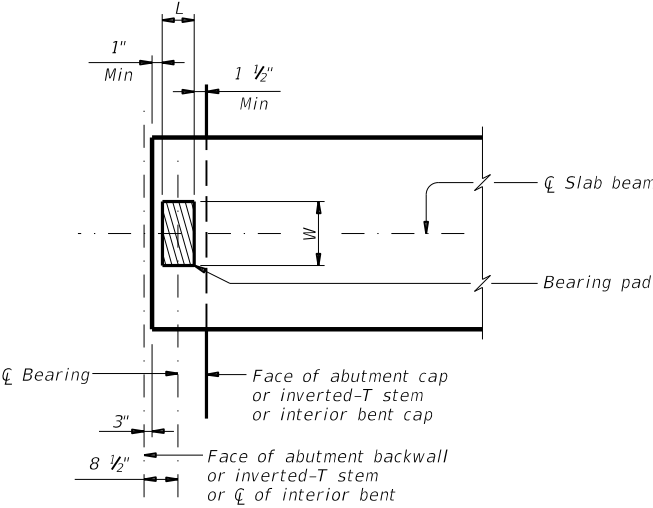
**TWO-PAD DETAIL PLAN**  
 (At abutment or inverted-T cap or at interior bent)



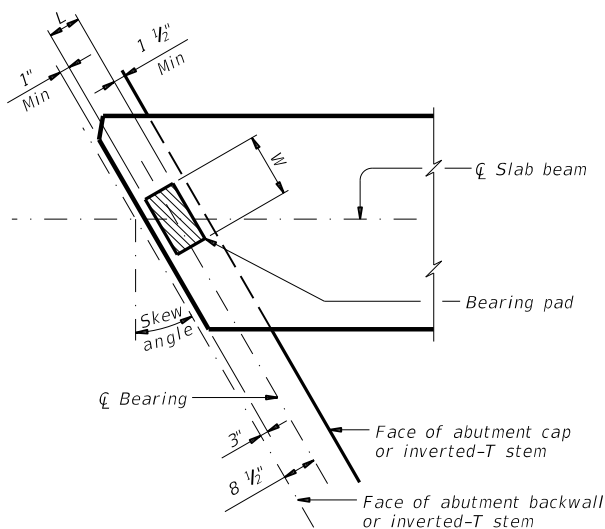
**TWO-PAD DETAIL SKEW PLAN**  
 (At abutment or inverted-T cap)



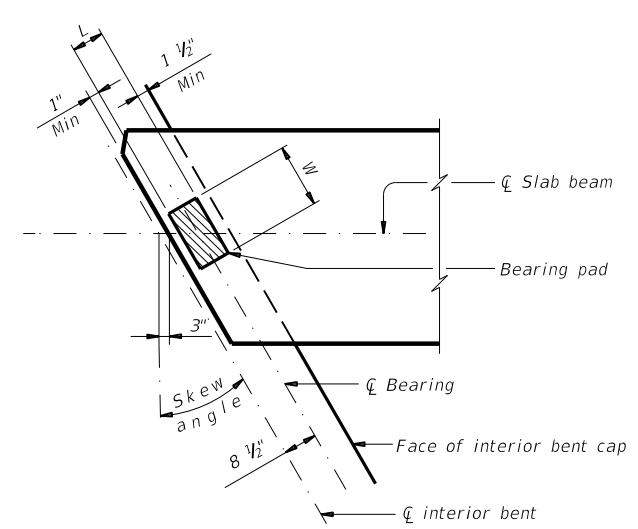
**TWO-PAD DETAIL SKEW PLAN**  
 (At interior bent)



**ONE-PAD DETAIL PLAN**  
 (At abutment or inverted-T cap or at interior bent)



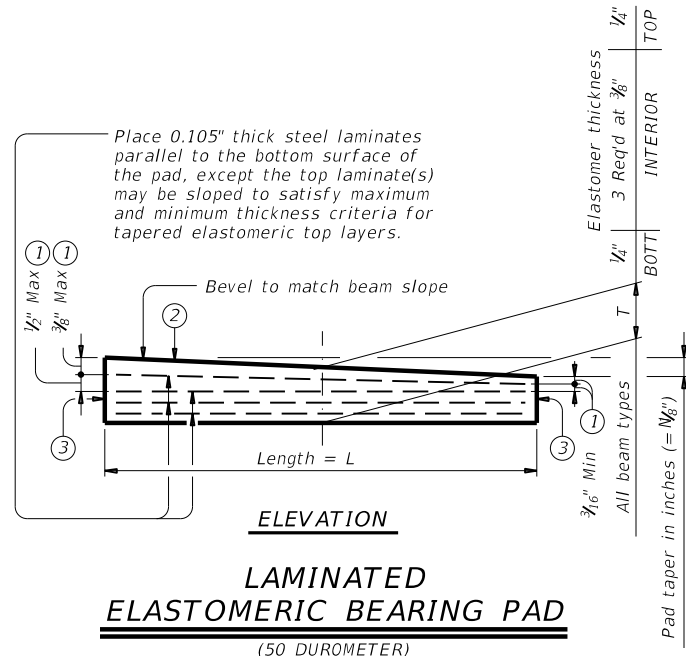
**ONE-PAD DETAIL SKEW PLAN**  
 (At abutment or inverted-T cap)



**ONE-PAD DETAIL SKEW PLAN**  
 (At interior bent)

**ELASTOMERIC BEARING PAD PLACEMENT AND BEAM END DIAGRAMS**

Place one bearing pad at forward station beam end.  
 Place two bearing pads at back station beam end.



- Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.
- 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 beam slope by more than  $(\frac{0.0625}{Length})$  IN/IN.
- Locate permanent mark here.

**TABLE OF BEARING PAD DIMENSIONS (ALL PRESTR CONC SLAB BM TYPES)**

One-Pad (Ty SB1-"N") (2)			Two-Pad (Ty SB2-"N") (2)		
W	L	T	W	L	T
14"	7"	2"	7"	7"	2"

Pad sizes shown are applicable for the following conditions:

- All one, two and three span units where the minimum span length is not less than 25' and the maximum span is not more than 50'.
- Skews less than or equal to 30°.

**GENERAL NOTES:**  
 These details accommodate skew angles up to 30°.  
 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 must be included in unit price bid for "Prestressed Concrete Slab Beams".

HL93 LOADING

Texas Department of Transportation  
 Bridge Division Standard

**ELASTOMERIC BEARING AND BEAM END DETAILS**

PRESTR CONCRETE SLAB BEAM

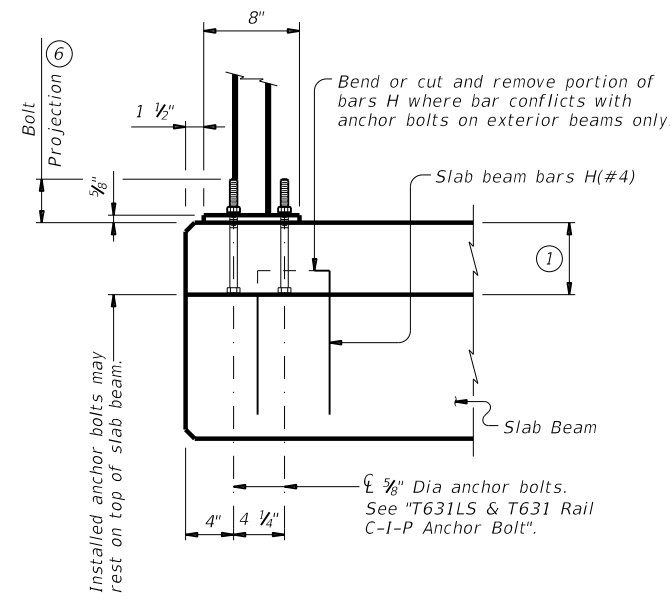
**PSBEB**

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©TxDOT January 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
DIST	COUNTY		SHEET NO.	
AUS	WILLIAMSON		59	

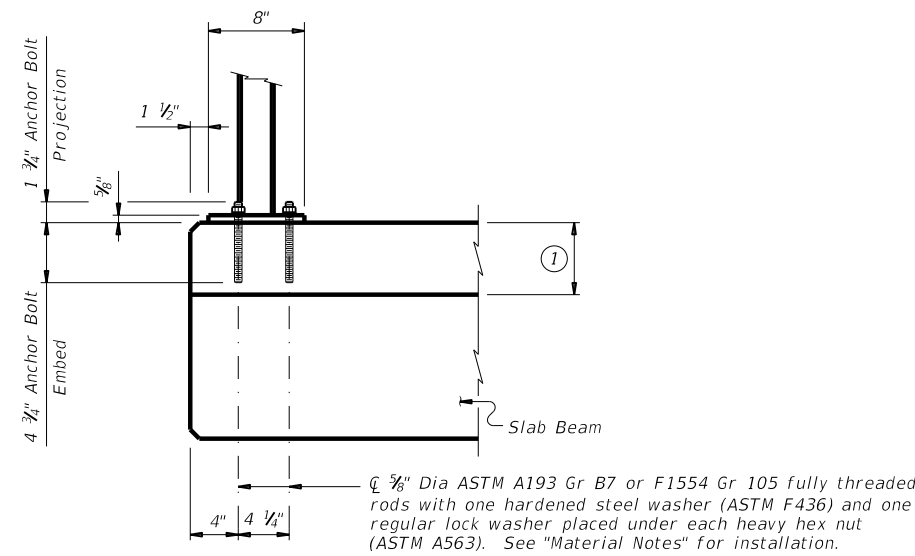


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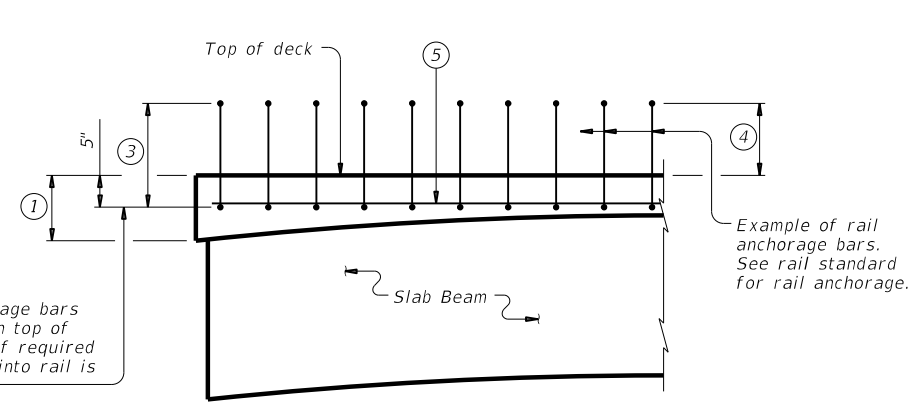


**CAST-IN-PLACE ANCHORAGE OPTION**

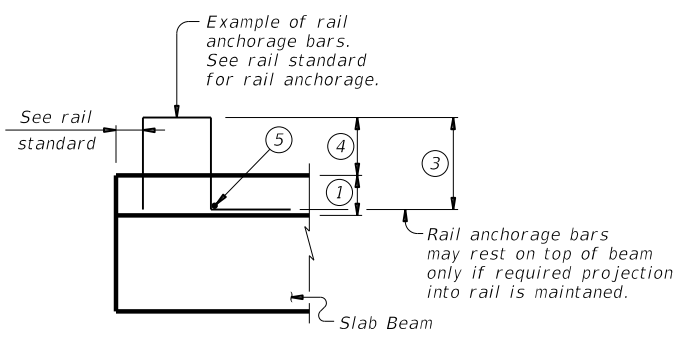


**ADHESIVE ANCHORAGE OPTION**

**T631LS & T631 RAIL ANCHORAGE PLACEMENT (2)(7)**



**PART SPAN ELEVATION**

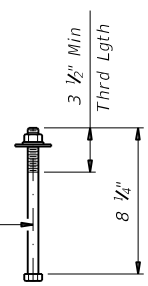


**SECTION**

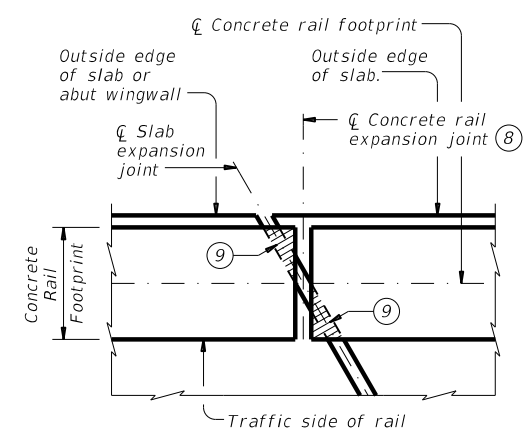
**TYPICAL CONCRETE RAIL ANCHORAGE**

(Showing typical concrete rail anchorage)

3/8" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563).



**T631LS & T631 RAIL C-I-P ANCHOR BOLT**



**PLAN OF CONCRETE RAILS AT EXPANSION JOINTS**

- ① Cast-in-place slab thickness varies due to beam camber (5" minimum).
- ② Replace cast-in-place anchor bolts shown on T631LS and T631 Rail standard with an adhesive anchor system or cast-in-place anchor bolts shown on this sheet.
- ③ Bar length shown on rail standard, minus 1 1/4". Adjust bar length for a raised sidewalk.
- ④ See rail standard for projection from finished grade or top of sidewalk.
- ⑤ Place additional (#5) longitudinal bar.
- ⑥ Excess bolt length has been provided to accommodate a variable slab thickness due to beam camber. If slab thickness on span details exceed 7", bolt length must be increased accordingly. After posts have been set and bolts tightened, bolt projection above nuts of more than 1/2" must be cut off and painted with two coats of zinc-rich paint conforming to the Item 445 "Galvanizing".
- ⑦ Distance from end of top outside edge of slab to center of first bolt group can not be less than 9", except: 15° Skew: 1'-0" (acute corner only) 30° Skew: 1'-3" (acute corner only)
- ⑧ Location of rail expansion joint must be at the intersection of slab expansion joint, rail footprint and perpendicular to slab outside edge.
- ⑨ Cross-hatched area must have 1/2" preformed bituminous fiber material under concrete rail, as shown.

**CONSTRUCTION NOTES:**

Rail anchorage bars may be field bent as required to clear rail reinforcing or provide minimum cover shown on standard rail detail sheets.  
 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.

**MATERIAL NOTES:**

Galvanize all steel components of steel rail system.  
 Provide Grade 60 reinforcing steel.  
 Cast-in-place anchorage system for T631LS and T631 Rail must be 3/8" Dia heavy hex head anchor bolts (ASTM F3125 Gr 325 or A449) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed anchor bolts 4 1/2" minimum.  
 Adhesive anchors for T631LS and T631 Rail must be 3/8" 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 3/4". 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."  
 Epoxy coat or galvanize reinforcing steel shown on this standard if rail reinforcement is epoxy coated or galvanized.

**GENERAL NOTES:**

Designed in accordance with AASHTO LRFD Bridge Design Specifications.  
 This standard is for use with structures with a 5" minimum cast-in-place concrete slab.  
 This standard may require modification for interior rails. This standard does not apply to median barriers.  
 This standard does not provide details for Type T221P, T224, T80HT, T80SS, C412, PR11, PR22 and PR3 rails on slab beam bridges.  
 See rail standards for approved speed restrictions, notes and details not shown.

Cover dimensions are clear dimensions, unless noted otherwise.

		<b>Bridge Division Standard</b>	
<h2>RAIL ANCHORAGE DETAILS</h2>			
<h3>PRESTR CONCRETE SLAB BEAMS</h3>			
<h4>PSBRA</h4>			
FILE: psbste07-18.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT January 2017	CONTRACT	SECTION	HIGHWAY
REVISIONS	0914	05	174 CR 452
03-18: Updated adhesive anchor notes.	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	60

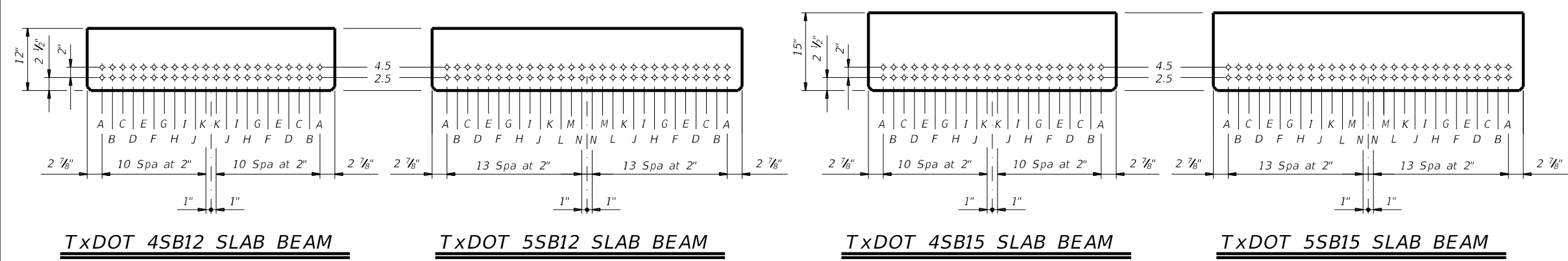
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STRUCTURE	DESIGNED BEAMS (STRAIGHT STRANDS)																			OPTIONAL DESIGN					LOAD RATING FACTORS			
	SPAN LENGTH (ft)	BEAM NO.	BEAM TYPE	PRESTRESSING STRANDS							DEBONDED STRANDS PER ROW					CONCRETE		DESIGN LOAD COMP STRESS (TOP $\epsilon$ ) (SERVICE I) fct (ksi)	DESIGN LOAD TENSILE STRESS (BOT $\epsilon$ ) (SERVICE III) fcb (ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR		STRENGTH I		SERVICE III			
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" $\bar{c}$ (in)	"e" END (in)	TOT NO. DEB	DIST FROM BOTTOM (in)	NO. OF STRANDS		NUMBER OF STRANDS DEBONDED TO (ft from end)							RELEASE STRGTH $f'_{ci}$ (ksi)	MINIMUM 28 DAY COMP STRGTH $f'_c$ (ksi)	②		Inv	Opr	Inv	
												TOTAL	DE-BONDED	3	6	9	12						15	Moment				Shear
24' ROADWAY SB12 BEAM	25	ALL	5SB12		8	0.6	270	3.50	3.50	5	2.5	8	5	5	5	5	5	4.000	5.000	0.914	-1.217	448	0.450	0.450	1.40	1.82	1.71	
	30	ALL	5SB12		10	0.6	270	3.50	3.50	5	2.5	10	5	5	5	5	5	4.000	5.000	1.292	-1.685	530	0.450	0.450	1.25	1.62	1.29	
	35	ALL	5SB12		14	0.6	270	3.50	3.50	5	2.5	14	5	5	5	5	5	4.000	5.000	1.730	-2.219	675	0.450	0.450	1.33	1.73	1.23	
	40	ALL	5SB12		18	0.6	270	3.50	3.50	5	2.5	18	5	5	5	5	5	4.000	5.000	2.218	-2.796	820	0.440	0.440	1.34	1.74	1.12	
24' ROADWAY SB15 BEAM	25	ALL	5SB15		8	0.6	270	5.00	5.00	5	2.5	8	5	5	5	5	5	4.000	5.000	0.725	-0.897	551	0.450	0.450	1.77	2.29	2.41	
	30	ALL	5SB15		8	0.6	270	5.00	5.00	5	2.5	8	5	5	5	5	5	4.000	5.000	1.020	-1.244	574	0.450	0.450	1.23	1.59	1.45	
	35	ALL	5SB15		10	0.6	270	5.00	5.00	5	2.5	10	5	5	5	5	5	4.000	5.000	1.361	-1.640	708	0.450	0.450	1.15	1.49	1.14	
	40	ALL	5SB15		14	0.6	270	5.00	5.00	5	2.5	14	5	5	5	5	5	4.000	5.000	1.739	-2.068	864	0.440	0.440	1.32	1.71	1.19	
	45	ALL	5SB15		18	0.6	270	5.00	5.00	2	2.5	18	2	2	5	5	5	4.000	5.000	2.179	-2.574	1054	0.440	0.440	1.34	1.73	1.08	
50	ALL	5SB15		24	0.6	270	5.00	5.00	8	2.5	24	8	4	4	5	5	4.000	5.000	2.680	-3.153	1276	0.440	0.440	1.33	1.72	1.11		
28' ROADWAY SB12 BEAM	25	ALL	5SB12		8	0.6	270	3.50	3.50	5	2.5	8	5	5	5	5	5	4.000	5.000	0.903	-1.184	444	0.430	0.430	1.47	1.91	1.80	
	30	ALL	5SB12		10	0.6	270	3.50	3.50	5	2.5	10	5	5	5	5	5	4.000	5.000	1.276	-1.639	508	0.430	0.430	1.32	1.71	1.37	
	35	ALL	5SB12		12	0.6	270	3.50	3.50	5	2.5	12	5	5	5	5	5	4.000	5.000	1.708	-2.159	647	0.430	0.430	1.18	1.53	1.02	
	40	ALL	5SB12		18	0.6	270	3.50	3.50	5	2.5	18	5	5	5	5	5	4.000	5.000	2.200	-2.744	799	0.430	0.430	1.37	1.78	1.17	
28' ROADWAY SB15 BEAM	25	ALL	5SB15		8	0.6	270	5.00	5.00	5	2.5	8	5	5	5	5	5	4.000	5.000	0.716	-0.874	529	0.430	0.430	1.85	2.40	2.53	
	30	ALL	5SB15		8	0.6	270	5.00	5.00	5	2.5	8	5	5	5	5	5	4.000	5.000	1.007	-1.212	570	0.430	0.430	1.29	1.67	1.53	
	35	ALL	5SB15		10	0.6	270	5.00	5.00	5	2.5	10	5	5	5	5	5	4.000	5.000	1.343	-1.598	680	0.430	0.430	1.21	1.57	1.22	
	40	ALL	5SB15		14	0.6	270	5.00	5.00	5	2.5	14	5	5	5	5	5	4.000	5.000	1.725	-2.032	842	0.430	0.430	1.36	1.76	1.24	
	45	ALL	5SB15		18	0.6	270	5.00	5.00	2	2.5	18	2	2	5	5	5	4.000	5.000	2.149	-2.508	1013	0.420	0.420	1.41	1.82	1.16	
50	ALL	5SB15		22	0.6	270	5.00	5.00	6	2.5	22	6	4	2	5	5	4.000	5.000	2.643	-3.073	1227	0.420	0.420	1.33	1.72	1.01		
30' ROADWAY SB12 BEAM	25	ALL	4SB12		6	0.6	270	3.50	3.50	5	2.5	6	5	5	5	5	5	4.000	5.000	0.904	-1.187	341	0.340	0.340	1.38	1.79	1.67	
	30	ALL	4SB12		8	0.6	270	3.50	3.50	5	2.5	8	5	5	5	5	5	4.000	5.000	1.277	-1.646	407	0.340	0.340	1.32	1.71	1.37	
	35	ALL	4SB12		10	0.6	270	3.50	3.50	5	2.5	10	5	5	5	5	5	4.000	5.000	1.711	-2.169	518	0.340	0.340	1.24	1.60	1.08	
	40	ALL	4SB12		14	0.6	270	3.50	3.50	5	2.5	14	5	5	5	5	5	4.000	5.000	2.205	-2.758	640	0.340	0.340	1.34	1.73	1.11	
30' ROADWAY SB15 BEAM	25	ALL	4SB15		6	0.6	270	5.00	5.00	5	2.5	6	5	5	5	5	5	4.000	5.000	0.723	-0.888	431	0.350	0.350	1.69	2.19	2.32	
	30	ALL	4SB15		6	0.6	270	5.00	5.00	5	2.5	6	5	5	5	5	5	4.000	5.000	1.017	-1.231	438	0.350	0.350	1.16	1.50	1.37	
	35	ALL	4SB15		8	0.6	270	5.00	5.00	5	2.5	8	5	5	5	5	5	4.000	5.000	1.346	-1.605	545	0.340	0.340	1.21	1.57	1.21	
	40	ALL	4SB15		12	0.6	270	5.00	5.00	5	2.5	12	5	5	5	5	5	4.000	5.000	1.729	-2.043	675	0.340	0.340	1.47	1.91	1.38	
	45	ALL	4SB15		14	0.6	270	5.00	5.00	2	2.5	14	2	2	5	5	5	4.000	5.000	2.166	-2.542	823	0.340	0.340	1.33	1.73	1.06	
50	ALL	4SB15		18	0.6	270	5.00	5.00	4	2.5	18	4	2	2	5	5	4.000	5.000	2.665	-3.115	998	0.340	0.340	1.32	1.71	1.02		

① Based on the following allowable stresses (ksi):  
 Compression = 0.65  $f'_{ci}$   
 Tension = 0.24  $\sqrt{f'_{ci}}$   
 Optional designs must likewise conform.  
 ② Portion of full HL93.

**DESIGN NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation. Prestress losses for the designed beams 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. Use low relaxation strands, each pretensioned to 75 percent of fpu. Full-length debonded strands are not permitted in positions "A" and "B". Strand debonding must comply with Item 424.4.2.2.4. When shown on this sheet, the Fabricator has the option of furnishing either the designed beam or an approved optional beam design. All optional design submittals and shop drawings must be signed, sealed and dated by a Professional Engineer registered in the State of Texas. Locate strands for the designed beam as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5". Place strands within a row as follows:  
 1) Locate a strand in each "A" position.  
 2) Place strand symmetrically about vertical centerline of beam.  
 3) Space strands as equally as possible across the entire width. Do not debond strands in position "A". Distribute debonded strands symmetrically about the vertical centerline. Increase debonded lengths working outward, with debonding staggered in each row.



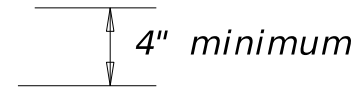
HL93 LOADING

		<b>Bridge Division Standard</b>	
<b>PRESTRESSED CONCRETE SLAB BEAM STD DESIGNS (TY SB12 OR SB15)</b> <b>24', 28' &amp; 30' ROADWAY</b> <b>PSBSD</b>			
FILE: psbsts08-21.dgn	DN: SRW	CK: BMP	DW: SFS
©TxDOT January 2017	CONT	SECT	HIGHWAY
REVISIONS	0914	05	174
1-21: Added load rating.	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	61

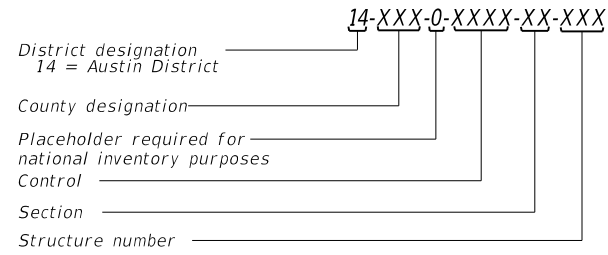
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# 14-XXX-0-XXXX-XX-XXX

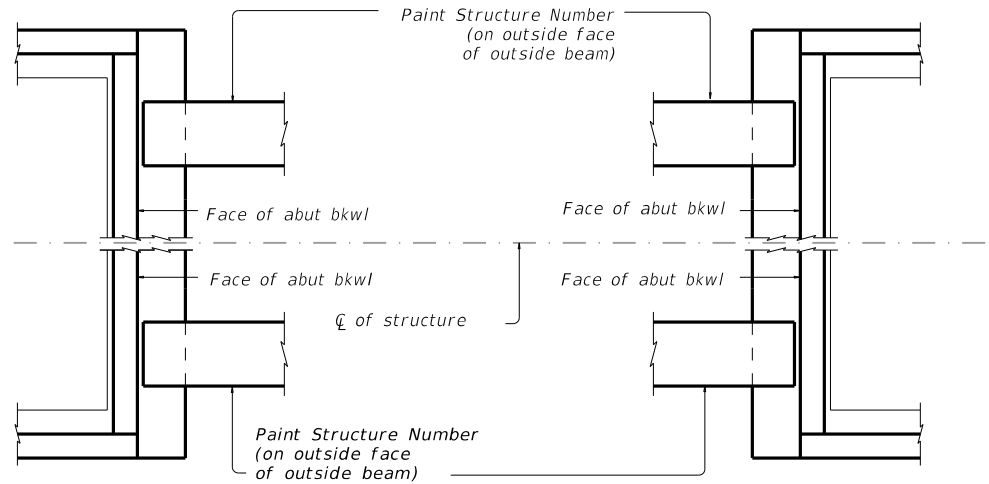
District designation      County designation      Placeholder      Control      Section      Structure number



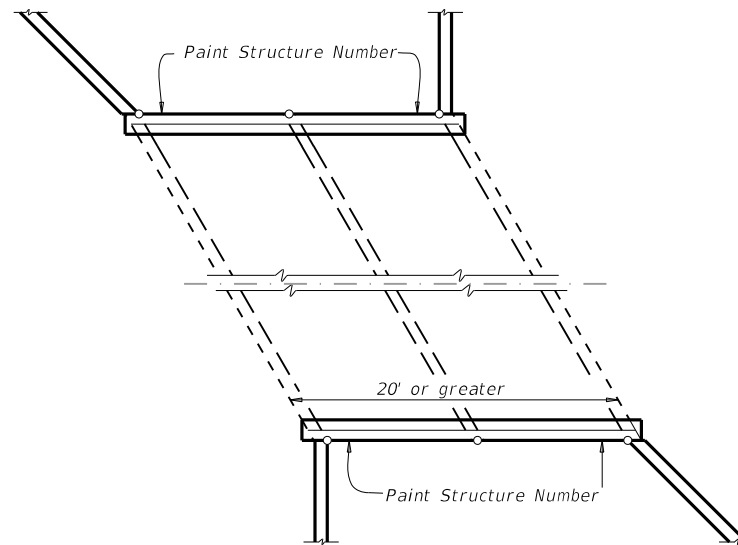
### PAINTED STRUCTURE NUMBER LEGEND



- 011 = Bastrop
- 016 = Blanco
- 027 = Burnet
- 028 = Caldwell
- 087 = Gillespie
- 106 = Hays
- 144 = Lee
- 150 = Llano
- 157 = Mason
- 227 = Travis
- 246 = Williamson



AT BRIDGE LOCATIONS



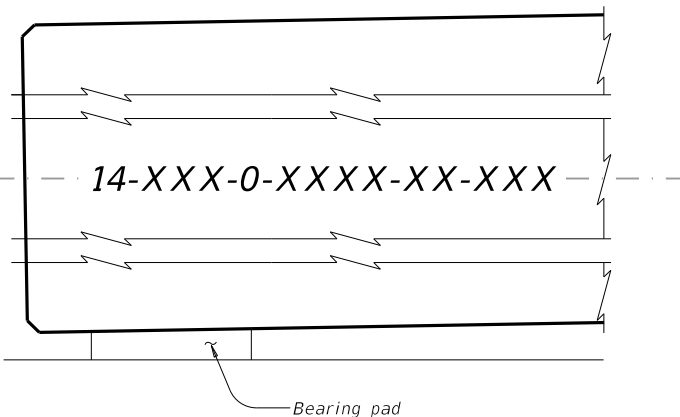
AT CULVERT LOCATIONS

#### GENERAL NOTES:

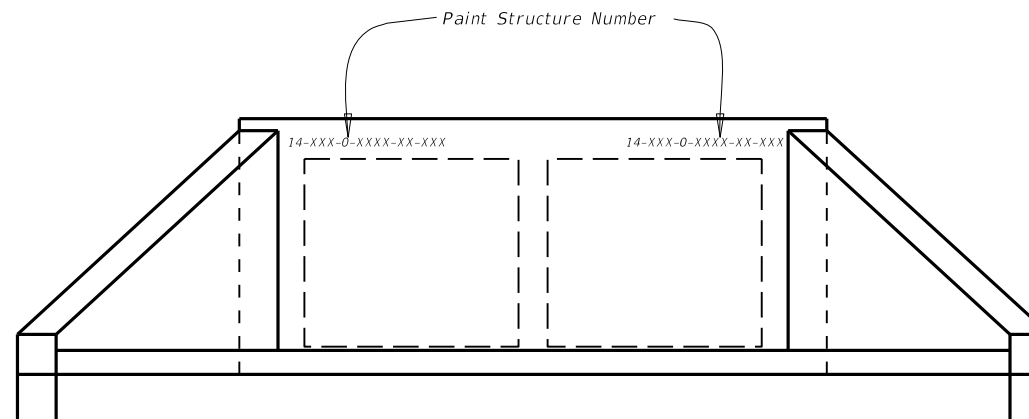
Permanently mark each structure with the painted structure number in accordance with the plans.  
 Each Structure shall have 4 (four) Structure numbers painted per structure.  
 Painting structure number work will not be measured or paid for directly but will be considered subsidiary to other pertinent items.

#### MATERIAL:

Provide black, lead free, CFC free, and CFHC free paint that is water proof, weather resistant, and dries instantly on all surfaces without smearing, smudging, or rippling



ELEVATION VIEW DETAIL



ELEVATION VIEW DETAIL

DATE: 11/3/2022 3:35:38 PM  
FILE: c:\pw\knl\d0215092\psn-19.dgn



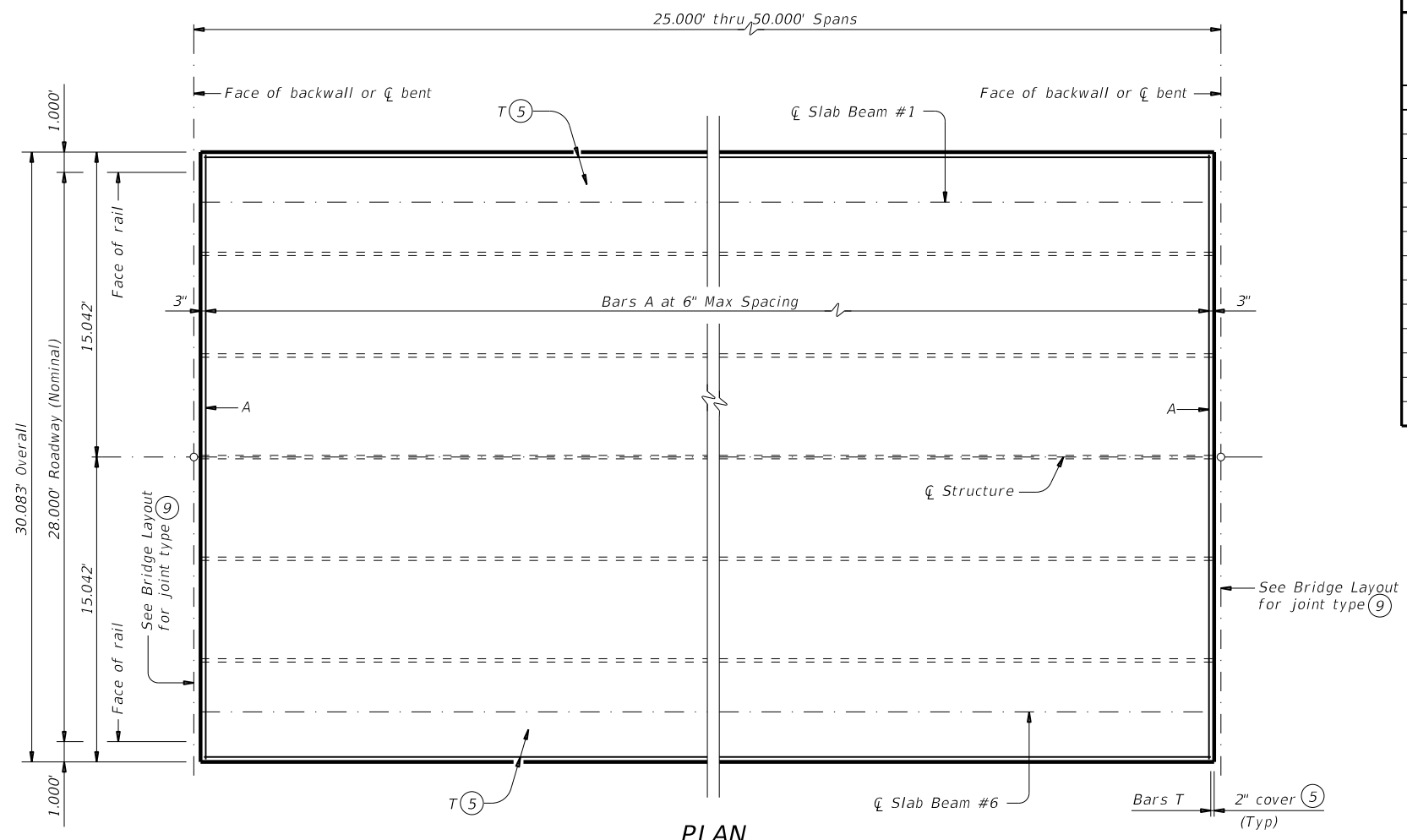
## PAINTING STRUCTURE NUMBERS

PSN-19 (AUS)

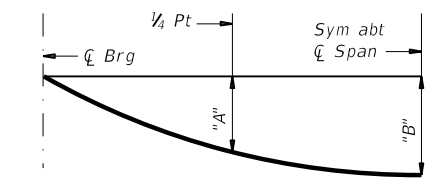
©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	62	

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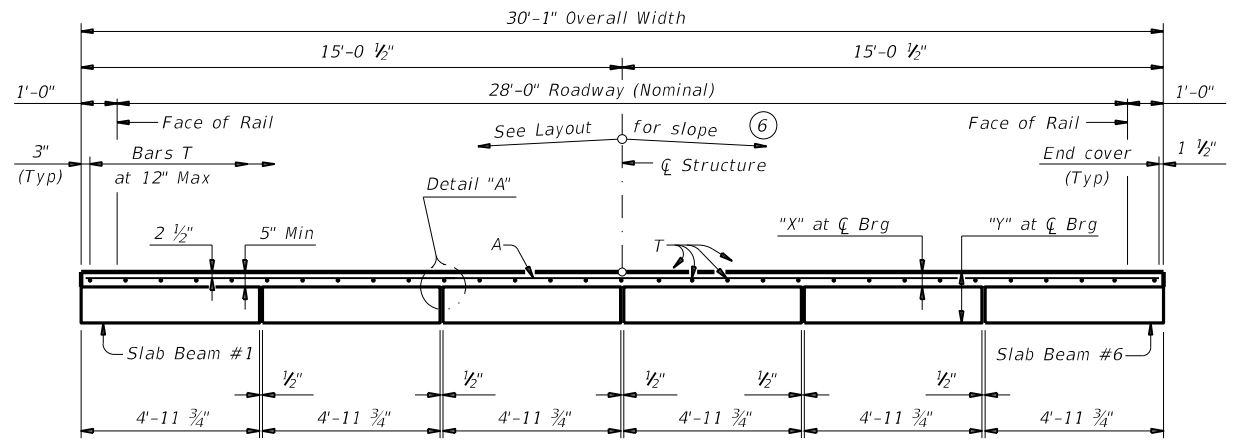
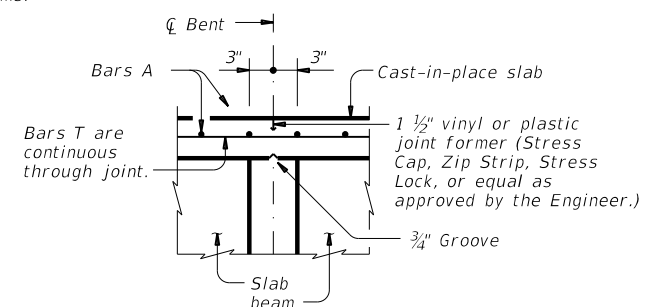
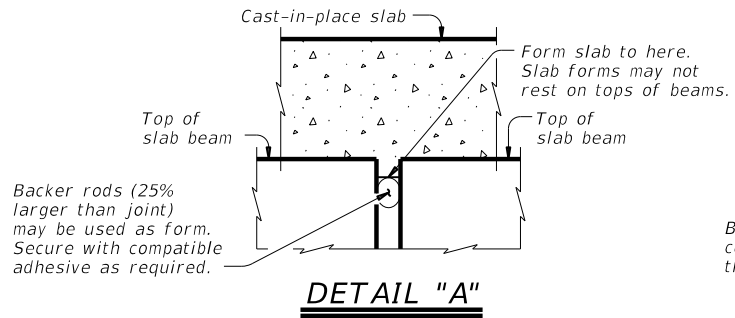


Span Length	Beam Type	Dead Load Deflection		Section Depths (3)	
		"A"	"B"	"X"	"Y"
Ft	(1)	Ft	Ft	In	Ft/In
25	5SB12	0.003	0.005	5 1/4"	1'-5 1/4"
30	5SB12	0.007	0.010	5 1/2"	1'-5 1/2"
35	5SB12	0.014	0.020	6"	1'-6"
40	5SB12	0.025	0.035	6 1/2"	1'-6 1/2"
25	5SB15	0.002	0.003	5 1/4"	1'-8 1/4"
30	5SB15	0.004	0.005	5 1/2"	1'-8 1/2"
35	5SB15	0.007	0.010	5 1/2"	1'-8 1/2"
40	5SB15	0.013	0.018	5 3/4"	1'-8 3/4"
45	5SB15	0.021	0.029	6 1/4"	1'-9 1/4"
50	5SB15	0.032	0.045	6 3/4"	1'-9 3/4"

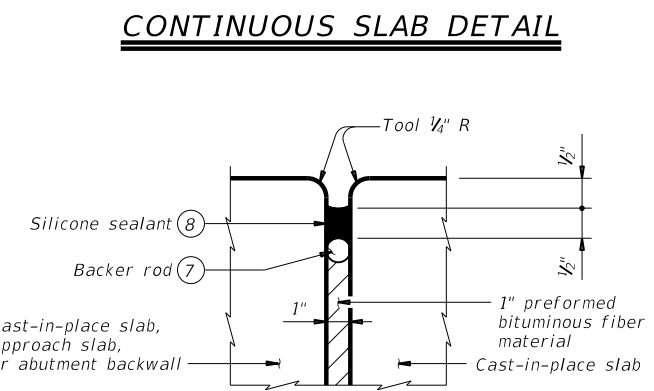


**DEAD LOAD DEFLECTION DIAGRAM**  
 NOTE: Deflections shown are due to concrete slab only ( $E_c = 5,000$  ksi). Calculated deflections shown are theoretical and actual dimensions may vary. Adjust based on field verification.

BAR	SIZE
A	#5
T	#4



TYPICAL TRANSVERSE SECTION



TYPE A JOINT DETAIL (9)

SPAN LENGTH	REINF CONCRETE SLAB (SLAB BEAM)	PRESTR CONC SLAB BEAM (5SB12 OR 5SB15) (1)			TOTAL REINF STEEL (2)
		ABUT TO INT BT	INT BT TO INT BT	ABUT TO ABUT	
Ft	SF	LF (4)	LF (4)	LF (4)	Lb
25	752	147.00	147.00	147.00	2,110
30	903	177.00	177.00	177.00	2,530
35	1,053	207.00	207.00	207.00	2,950
40	1,203	237.00	237.00	237.00	3,370
45	1,354	267.00	267.00	267.00	3,790
50	1,504	297.00	297.00	297.00	4,210

- See Bridge Layout for beam type used in the superstructure. These standards do not provide for the use of both SB12 and SB15 beams within the same structure.
- Reinforcing steel weight is calculated using an approximate factor of 2.8 Lbs/SF.
- Based on theoretical beam camber, dead load deflections of 5" cast-in-place concrete slab and a constant grade. The Contractor will adjust these values for any vertical curve.
- Fabricator will adjust beam lengths for beam slopes as required.
- Where slab is continuous over Interior Bents, Bars T are continuous through Joint. See "Continuous Slab Detail".
- This standard does not provide for changes in roadway cross-slopes within the structure.
- 1 1/4" 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.
- 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.
- See Bridge Layout for expansion joint locations. If using Type A expansion joints, the maximum distance between joints is 100 feet. Type A joints are subsidiary to Item 422, "Concrete Superstructures".

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. Two- or three-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet. See applicable rail details for rail anchorage in slab. This standard does not support the use of transition bents.

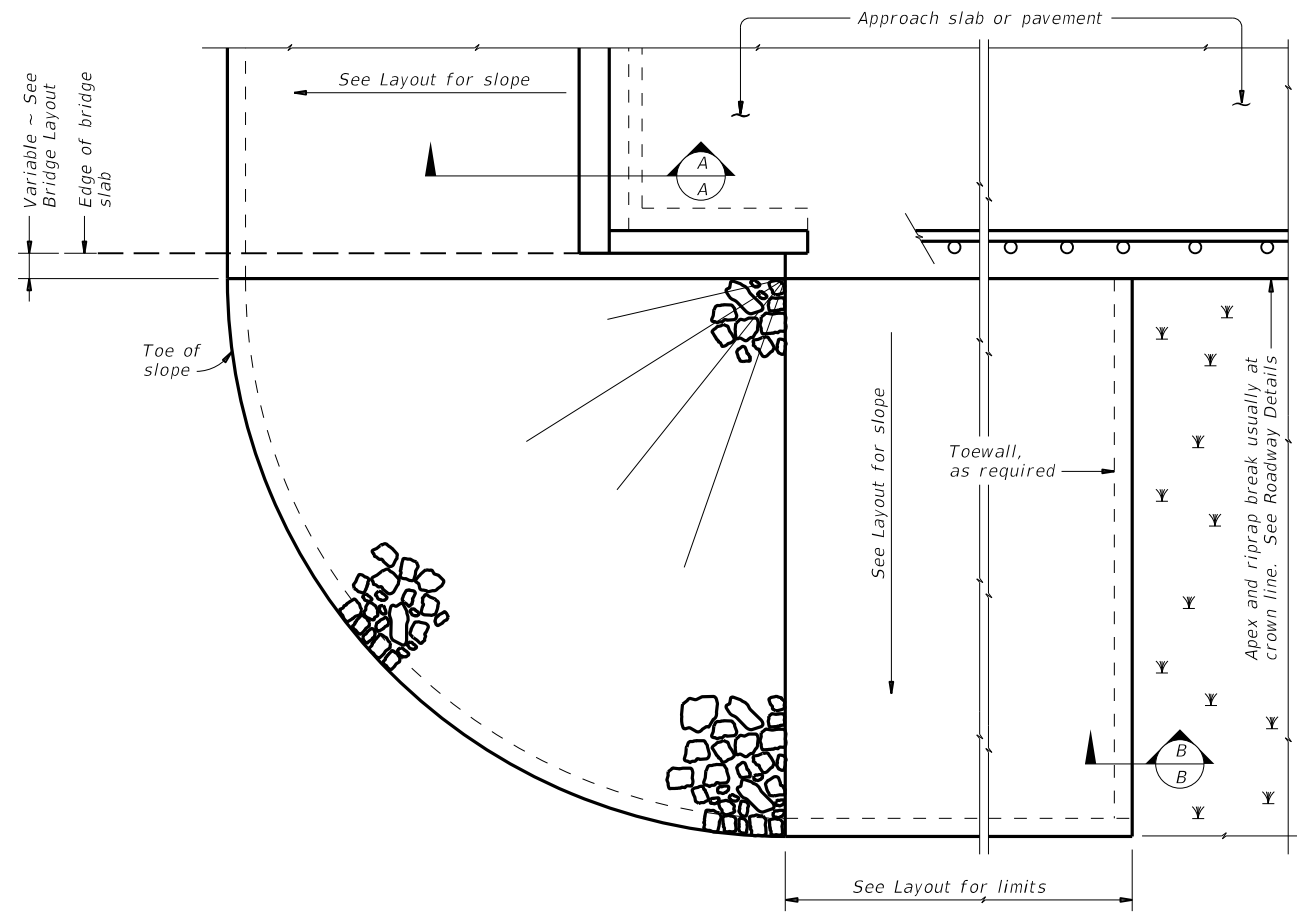
Cover dimensions are clear dimensions, unless noted otherwise.

**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"  
 ~ #5 = 2'-0"  
 Epoxy coated ~ #4 = 2'-5"  
 ~ #5 = 3'-0"  
 Deformed welded wire reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A or T unless noted otherwise.

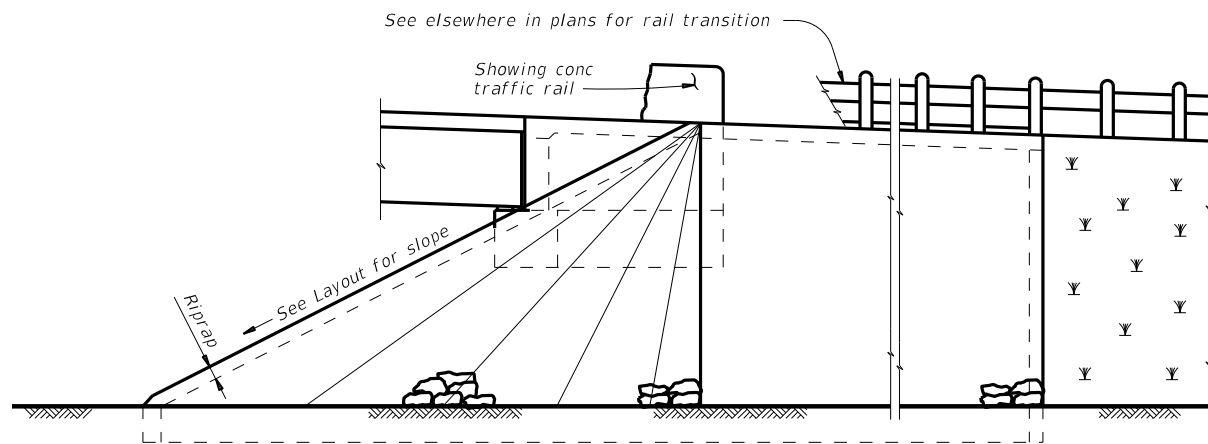
		<b>Bridge Division Standard</b>	
<b>PRESTRESSED CONCRETE SLAB BEAM SPANS (TY SB12 OR SB15) 28' ROADWAY</b>			
<b>SPSB-28</b>			
FILE: psbste33-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
© TxDOT January 2017	CONTRACT	SECTION	JOB
	0914	05	174
	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	63

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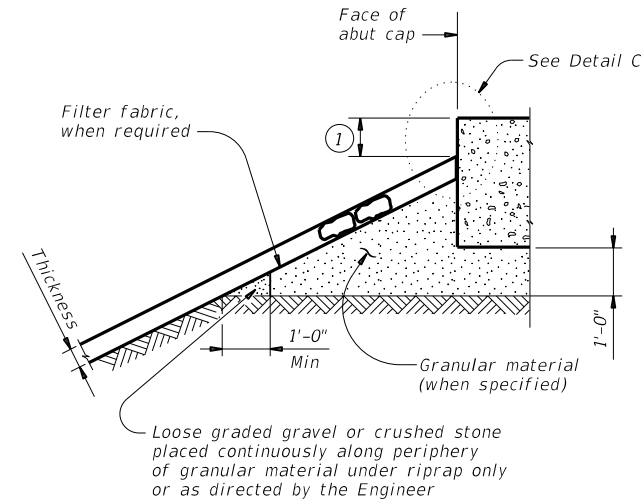
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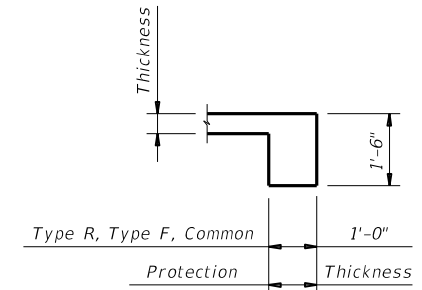
**PLAN**



**ELEVATION**

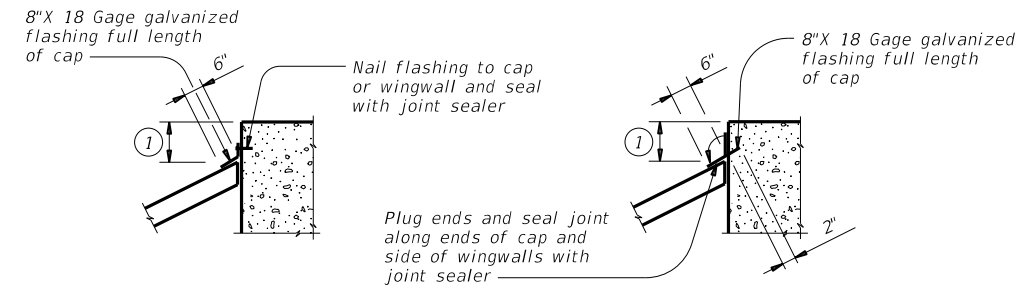


**SECTION A-A AT CAP**



**SECTION B-B**

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



**CAP OPTION A**

**CAP OPTION B**

**DETAIL C**

① Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

**GENERAL NOTES:**

Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.  
 See elsewhere in plans for locations and details of shoulder drains.

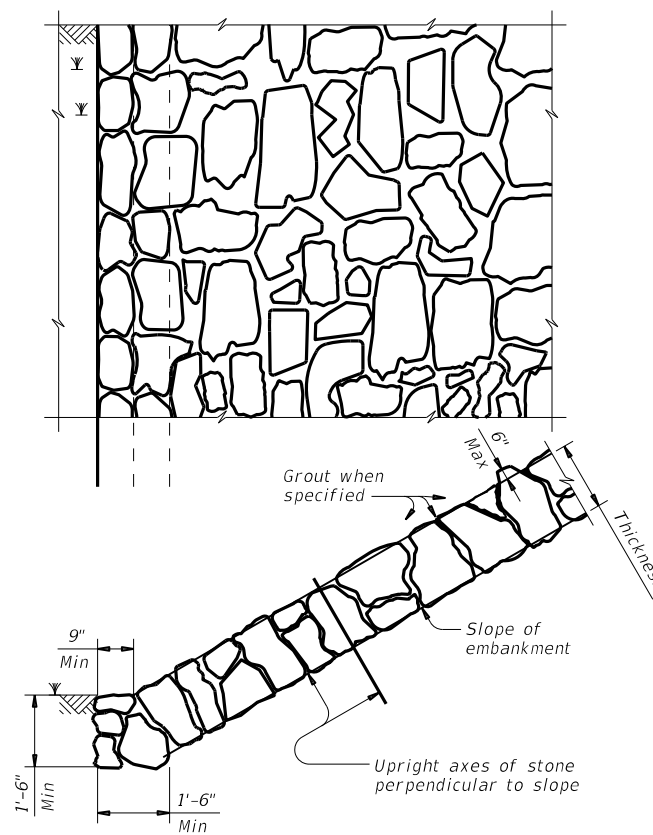
SHEET 1 OF 2

					<b>Bridge Division Standard</b>
<h1>STONE RIPRAP</h1>					
<h2>SRR</h2>					
FILE: srstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES	
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0914	05	174	CR 452	
DIST	COUNTY		SHEET NO.		
AUS	WILLIAMSON		64		

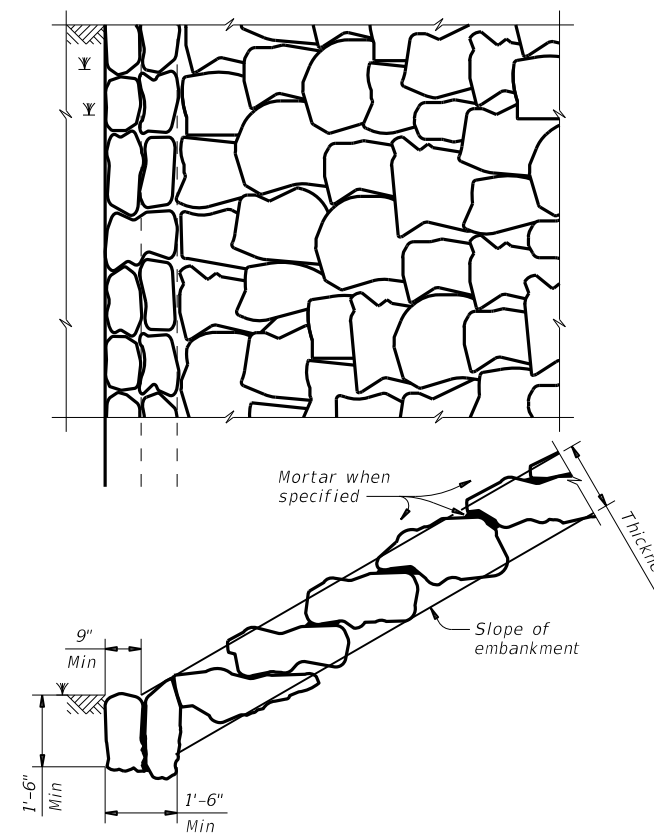


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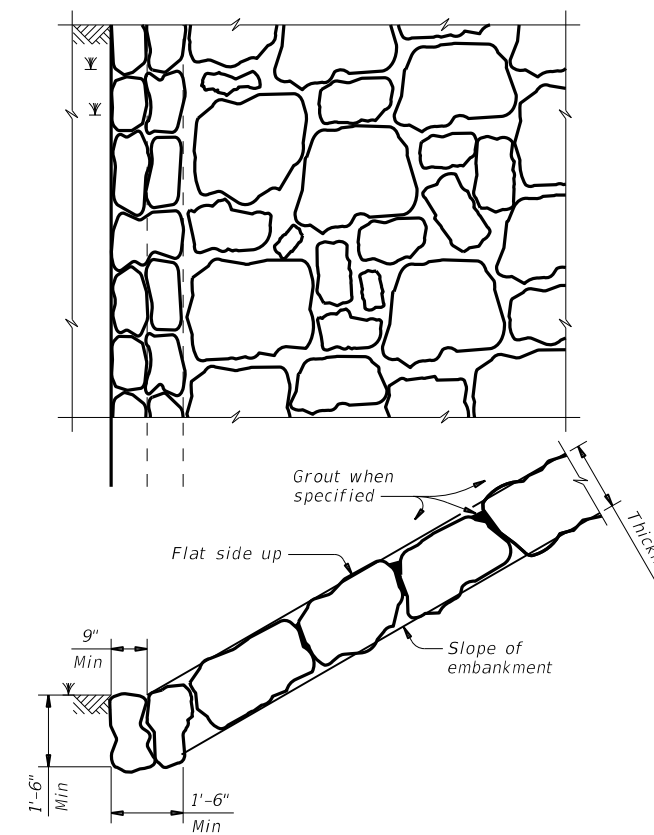
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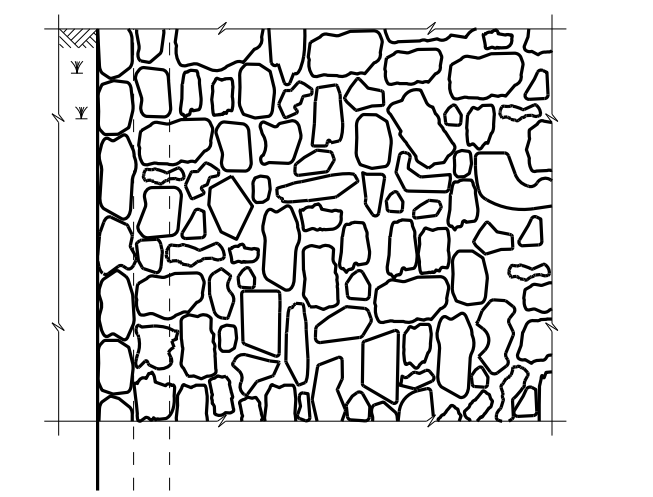
**FIGURE 1 ~ TYPE R STONE RIPRAP**  
 dry or grouted



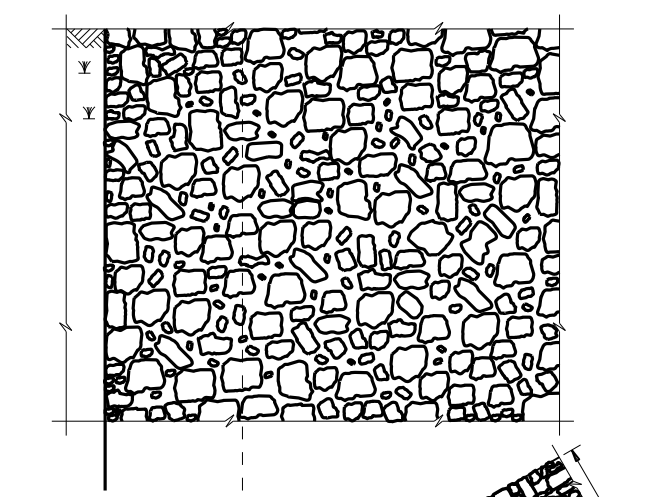
**FIGURE 2 ~ TYPE F STONE RIPRAP**  
 dry or mortared



**FIGURE 3 ~ TYPE F STONE RIPRAP**  
 grouted

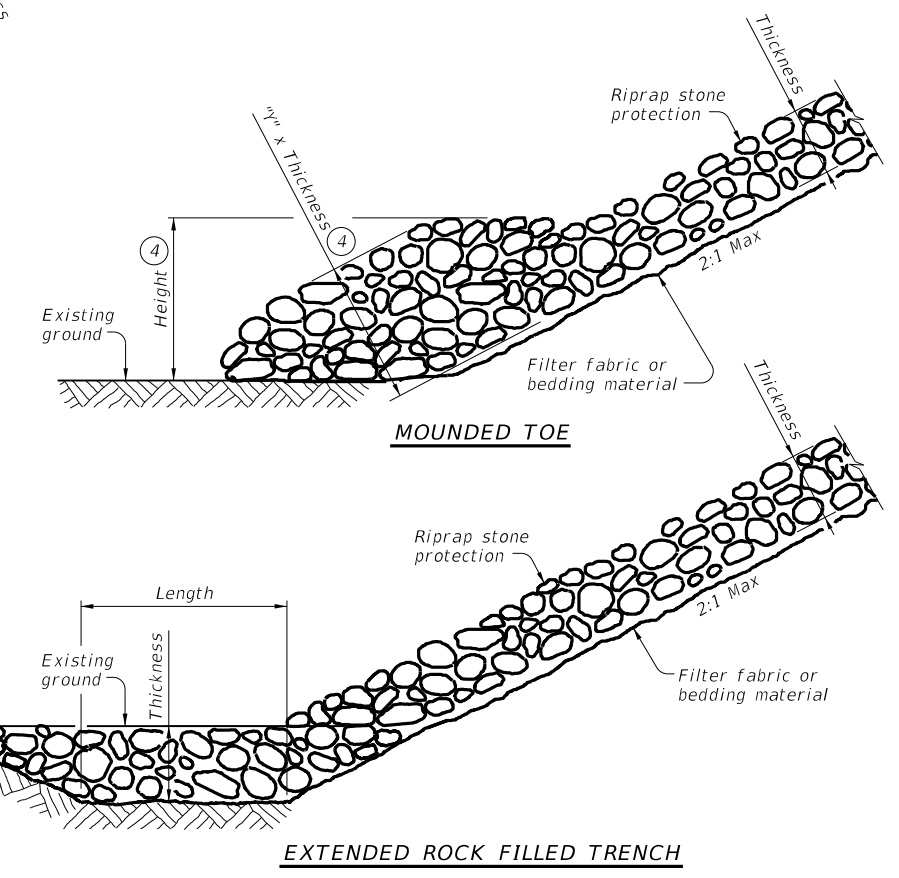


**FIGURE 4 ~ COMMON STONE RIPRAP**  
 dry or grouted



**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.



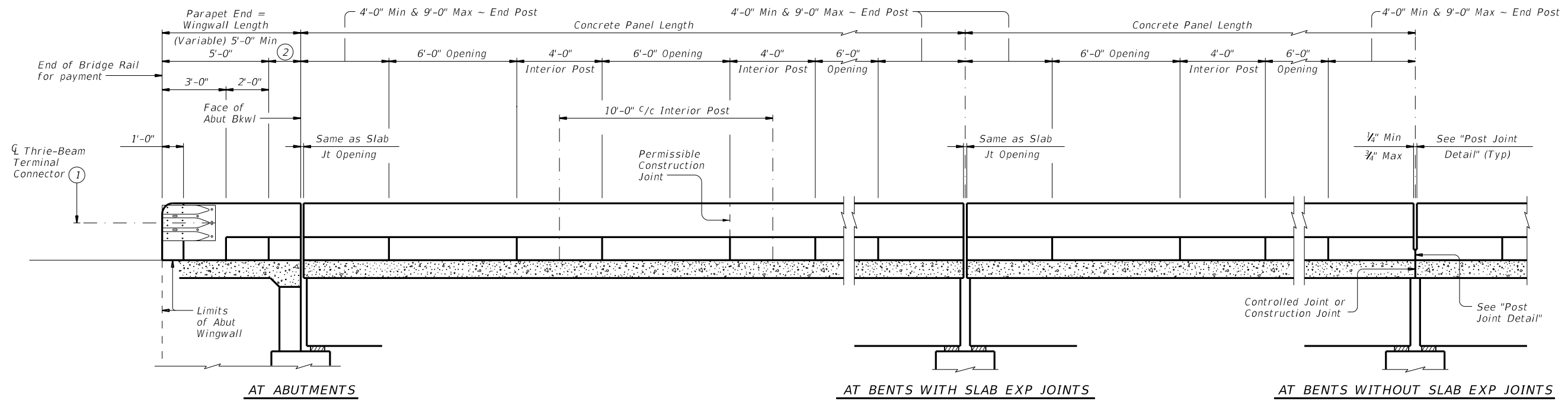
**PROTECTION STONE RIPRAP TOE OPTIONS (5)**

SHEET 2 OF 2

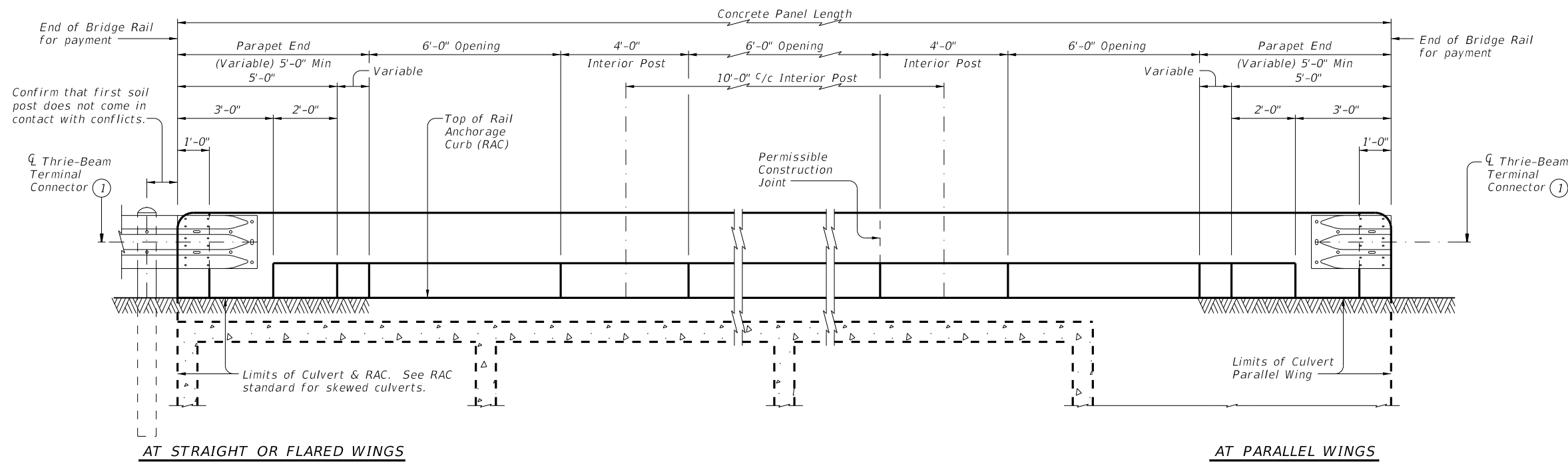
		Bridge Division Standard	
<h2>STONE RIPRAP</h2>			
<h3>SRR</h3>			
FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH
©TxDOT April 2019	CONT SECT	JOB	HIGHWAY
REVISIONS	0914 05	174	CR 452
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	65	

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**ROADWAY ELEVATION OF RAIL ON BRIDGE**



**ROADWAY ELEVATION OF RAIL ON BOX CULVERTS**

Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown. Vertical joints in concrete rail are not required, unless shown elsewhere.

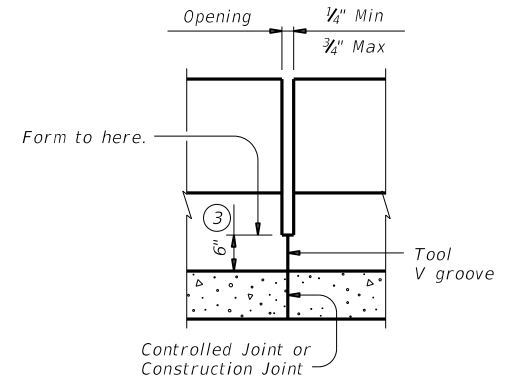
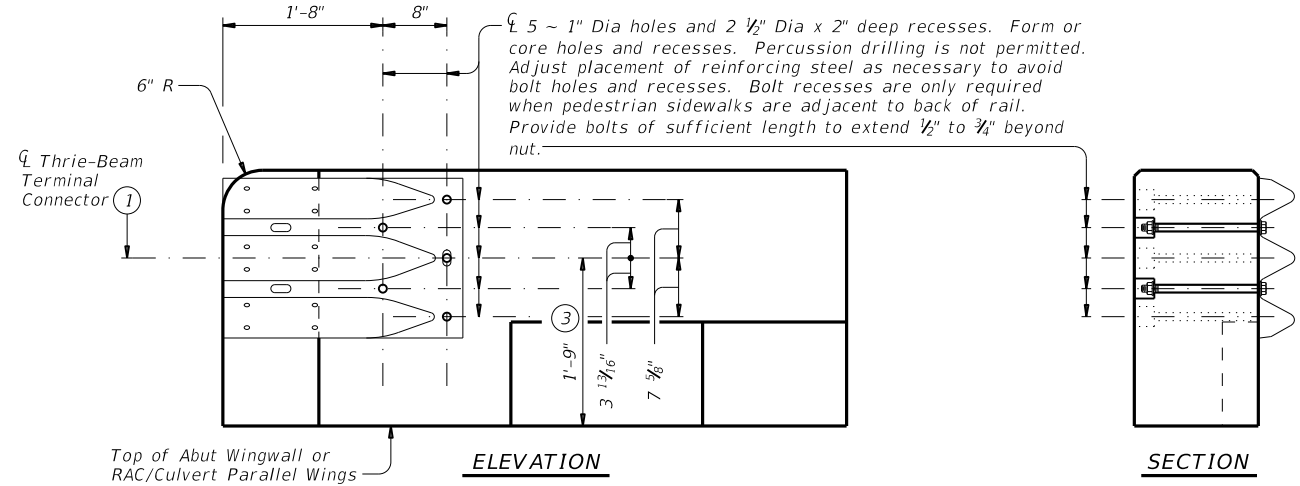
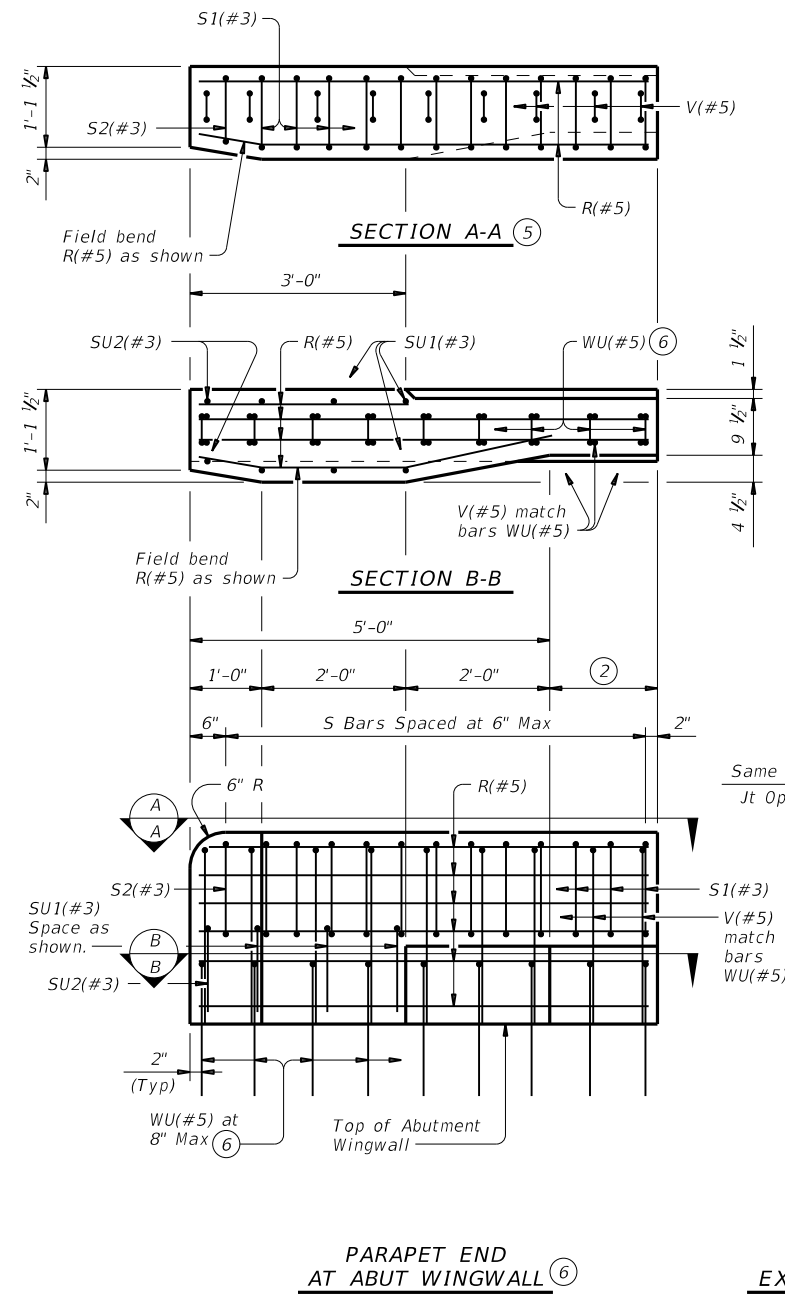
- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Wingwall Length minus 5'-0" (Varies)

SHEET 1 OF 3

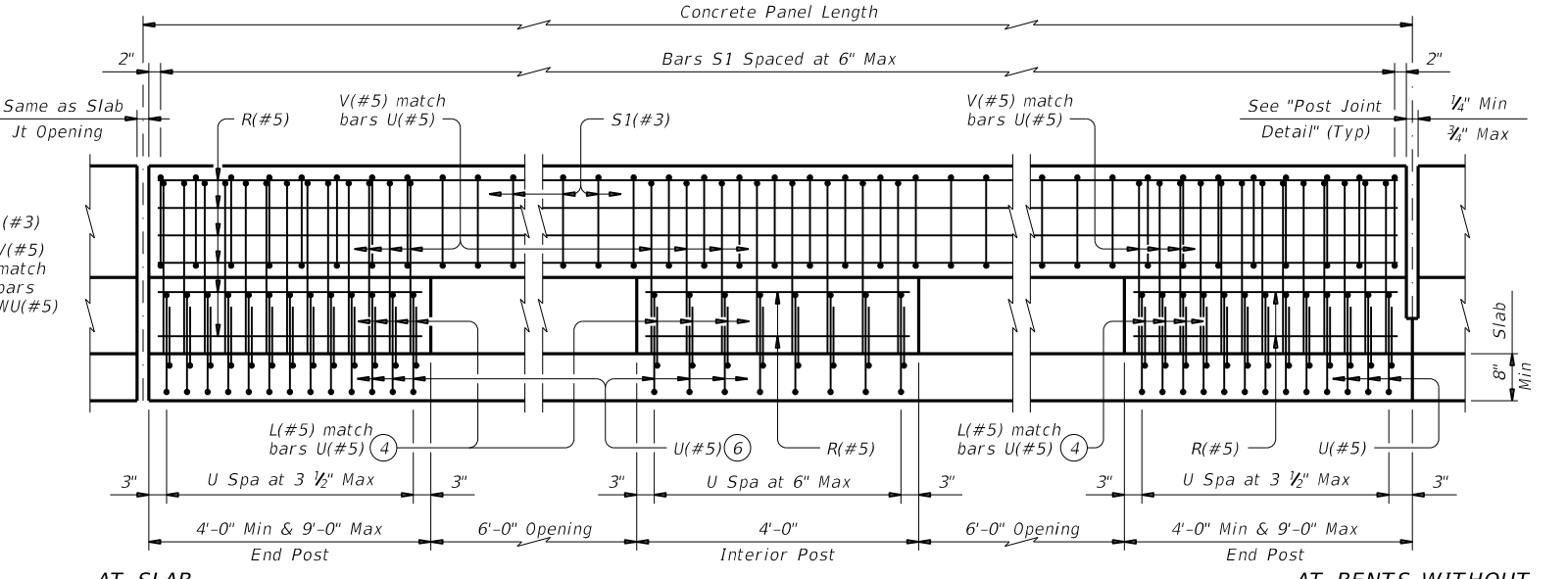
				<b>Bridge Division Standard</b>	
<h2>TRAFFIC RAIL</h2>					
<h3>TYPE T223</h3>					
FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES	
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0914	05	174	CR 452	
	DIST	COUNTY	SHEET NO.		
	AUS	WILLIAMSON	66		

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DATE: 11/13/2022 3:35:54 PM  
 FILE: c:\pwworking\dot15092\1std005-19.dgn



**POST JOINT DETAIL**  
 Provide at all interior bents without slab expansion joints.



**ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT**  
 Showing rail on slab. Rail on box culvert similar.

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑤ Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.
- ⑥ Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

SHEET 2 OF 3

Texas Department of Transportation Bridge Division Standard

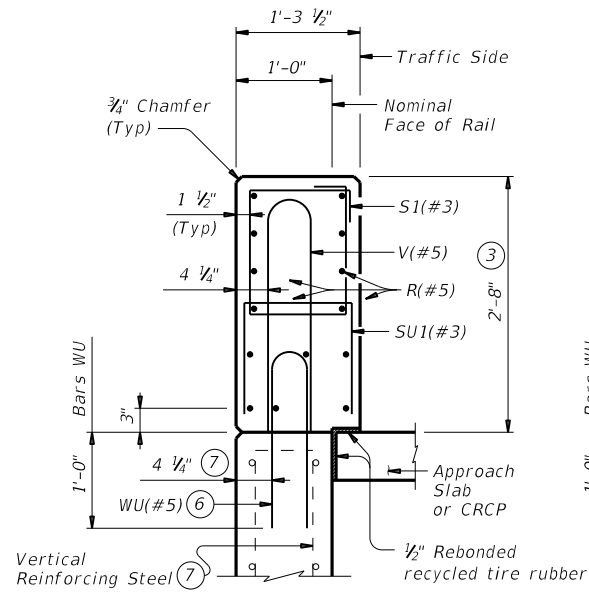
**TRAFFIC RAIL**

**TYPE T223**

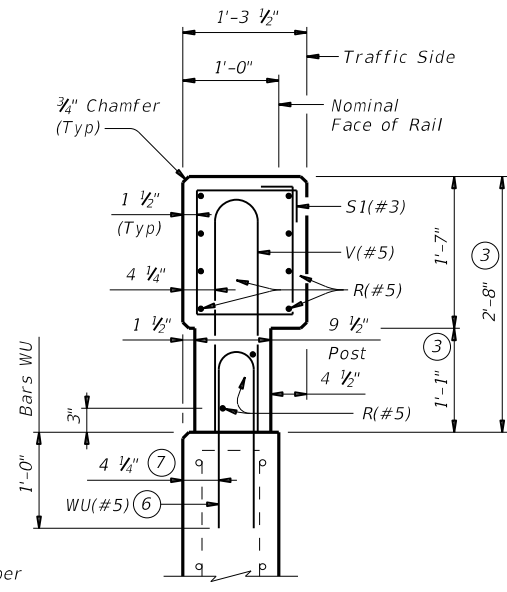
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©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	67	

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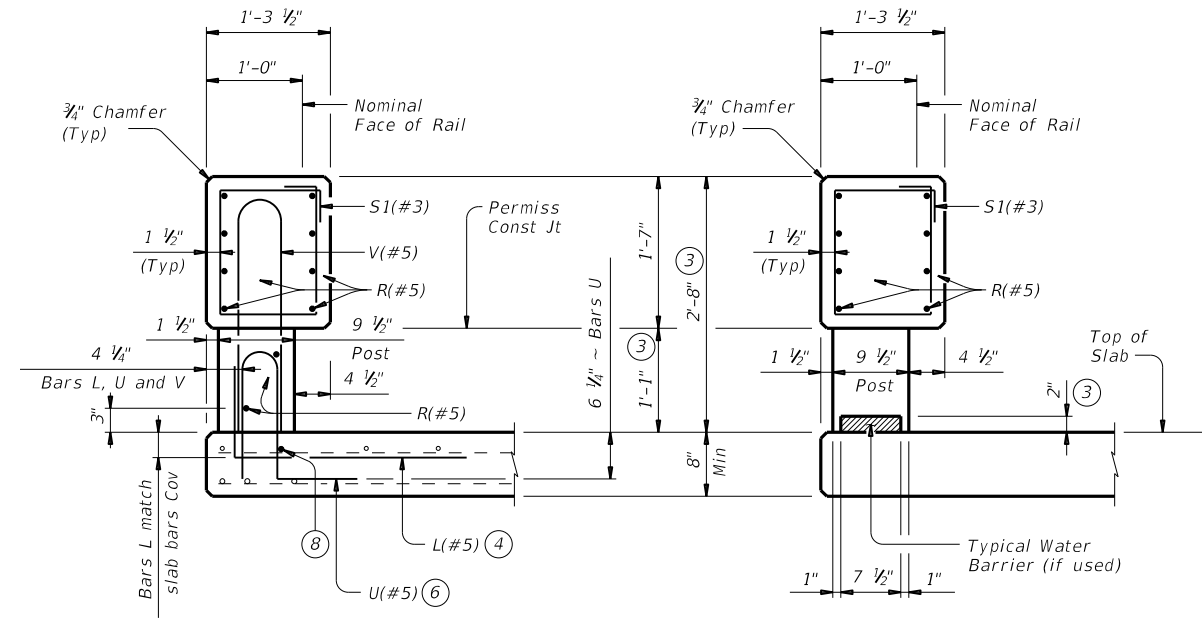
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**SECTION C-C  
ON ABUTMENT WINGWALLS  
OR CIP RETAINING WALLS**

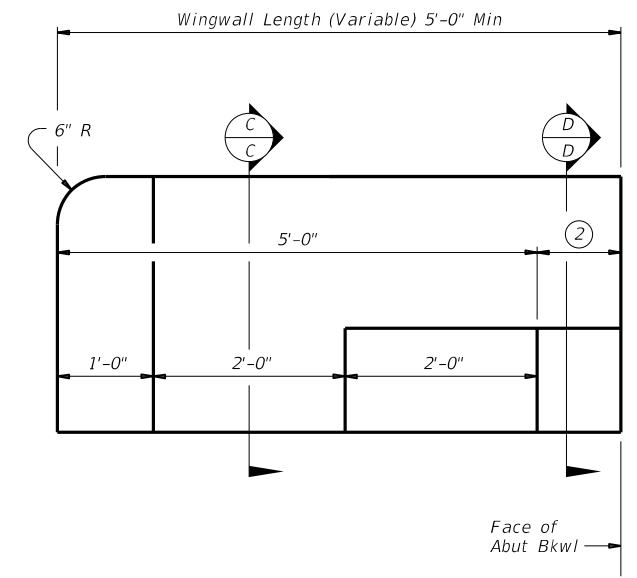


**SECTION D-D  
ON ABUTMENT WINGWALLS  
OR CIP RETAINING WALLS**



**AT POST  
ON BRIDGE SLAB**

**AT OPENING  
ON BRIDGE SLAB**



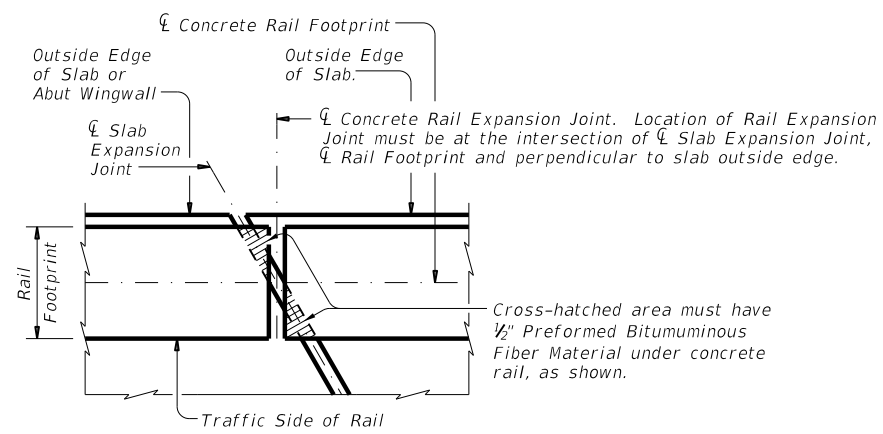
**ELEVATION AT  
ABUTMENT WINGWALL**

Box culvert parallel wings or rail anchorage curb similar.

**SECTIONS THRU RAIL**

Sections on box culverts similar.

- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑥ Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.
- ⑦ When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.
- ⑧ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑨ At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 1/4" above the roadway surface without overlay.



**PLAN OF RAIL AT EXPANSION JOINTS**

Example showing Slab Expansion Joints without breakbacks.

**CONSTRUCTION NOTES:**

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.  
 Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.  
 Chamfer all exposed corners.

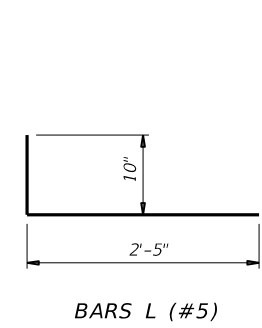
**MATERIAL NOTES:**

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.  
 Provide Grade 60 reinforcing steel.  
 Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.  
 Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.  
 Provide bar laps, where required, as follows:  
 Uncoated or galvanized ~ #5 = 2'-0"  
 Epoxy coated ~ #5 = 3'-0"

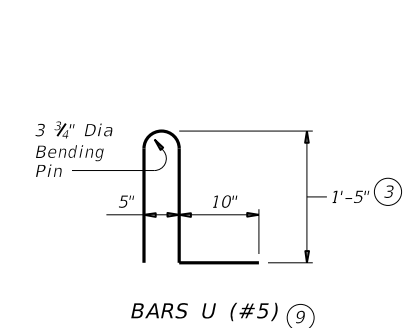
**GENERAL NOTES:**

This rail has been evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can be used for speeds of 45 mph and less.  
 Do not use this railing on bridges with expansion joints providing more than 5" movement.  
 Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.  
 Shop drawings are not required for this rail.  
 Average weight of railing with no overlay is 358 plf.

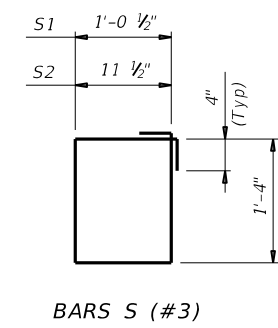
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



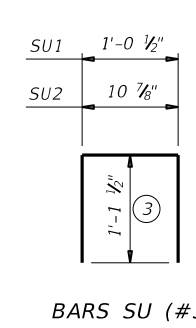
**BARS L (#5)**



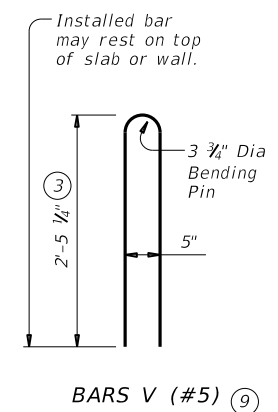
**BARS U (#5) ⑨**



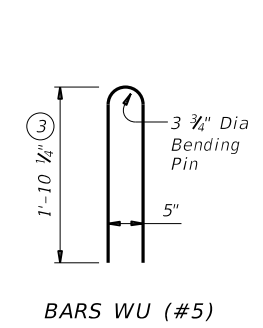
**BARS S (#3)**



**BARS SU (#3)**



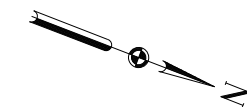
**BARS V (#5) ⑨**



**BARS WU (#5)**

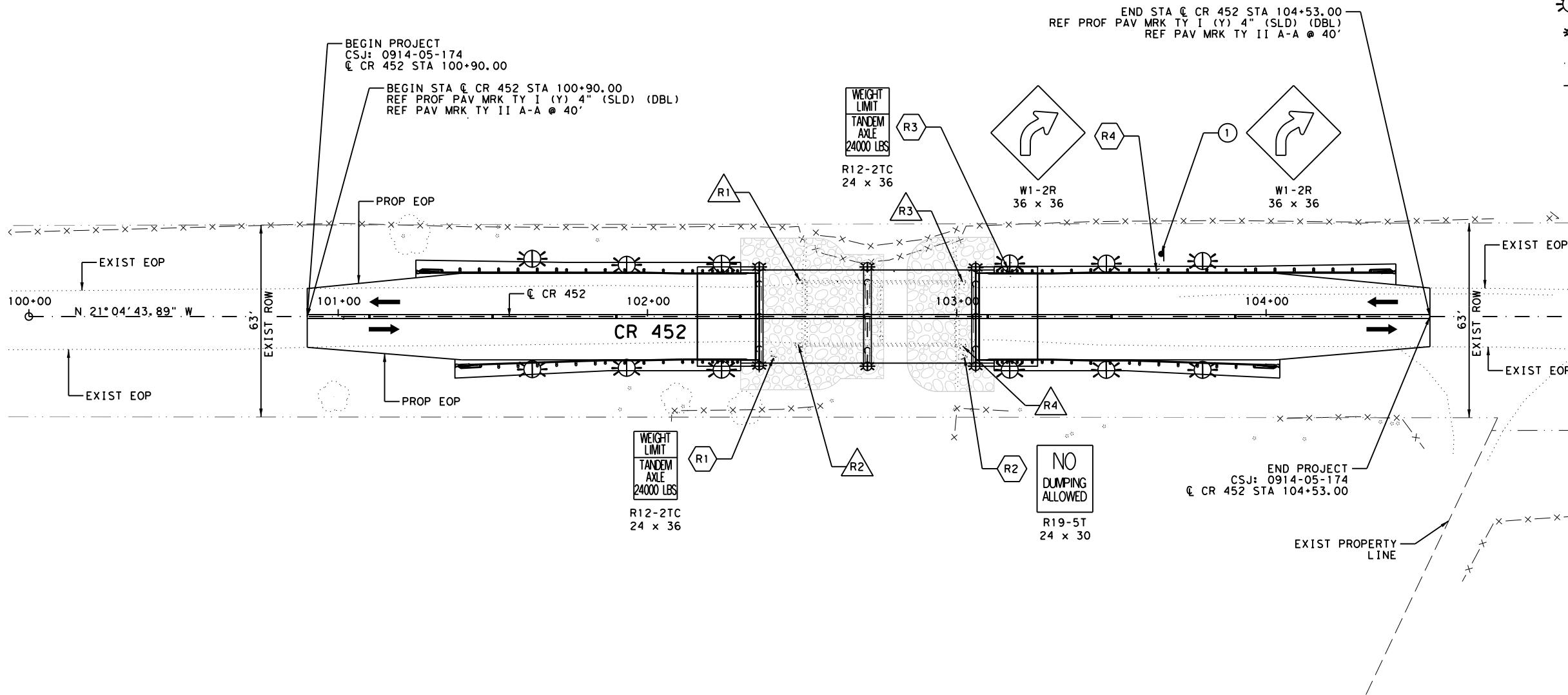
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<h1>TRAFFIC RAIL</h1>			
<h2>TYPE T223</h2>			
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©TxDOT September 2019	CONT	SECT	JOB
REVISIONS	0914	05	174
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	68	

FILENAME: pw:\kh-pw\ben\kimley.com\kh-pw-01\Documents\01 Active Projects\TX-AUS-069284003 - Williamson County Bridges\DesignData\4 - Design\Plan Set\8. Traffic\CR452\CR 452 SPMD.dgn  
 PLOTTED: 11/3/2022 3:36:02 PM



**LEGEND**

- ⊕ PROPOSED SMALL SIGN
- ⊕ R# EXIST SIGN TO BE REMOVED
- ⊕ R# OBJECT MARKER TO BE REMOVED
- ➔ DIRECTION OF TRAFFIC
- ⊕ DEL ASSM (D-SW) SZ (BRF) (GF-2) (B1)
- ⊕ DEL ASSM (D-SW) SZ (BRF) CTB (B1)
- ⊕ EXISTING SIGN
- ⊕ PROPOSED SIGN
- ⊕ EXISTING OBJECT MARKER



*TJN*  
 11/3/2022  
  
 TREY NEAL  
 106194  
 LICENSED PROFESSIONAL ENGINEER

**Kimley»Horn** F-928

Texas Department of Transportation

**CR 452 AT BRANCH OF MUSTANG CREEK  
 SIGNING, PAVEMENT MARKING, AND DELINEATION LAYOUT**

SHEET 1 OF 1



©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	69



# SUMMARY OF SMALL SIGNS

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DATE: 11/23/2022 3:36:07 PM  
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PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN 	DIMENSIONS	FLAT ALUMINUM (TYPE A) X	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)			BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)  TY = TYPE TY N TY S		
							POST TYPE	POSTS	ANCHOR TYPE		MOUNTING DESIGNATION	
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic		PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels
1	1	W1-2R		36 x 36	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:  
<http://www.txdot.gov/>

- NOTE:**
1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
  2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS) Standard Sheet.
  3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

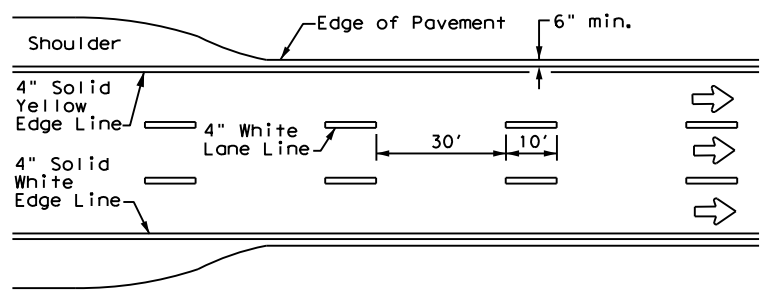


## SUMMARY OF SMALL SIGNS

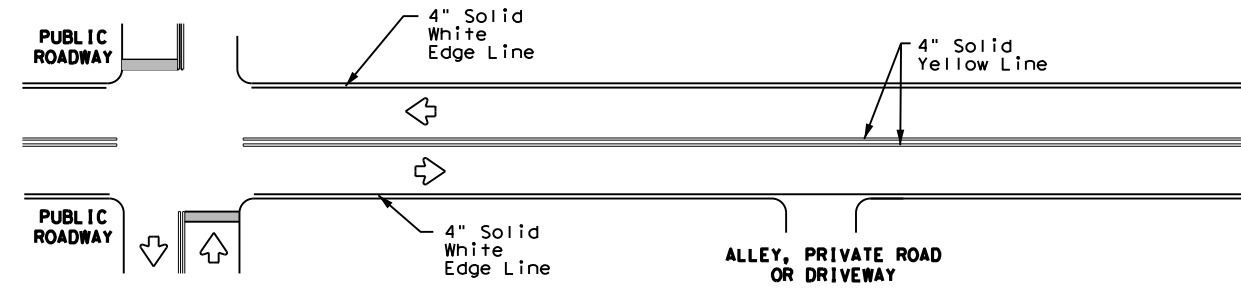
### SOSS

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© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
4-16	DIST	COUNTY	SHEET NO.	
8-16	AUS	WILLIAMSON		70

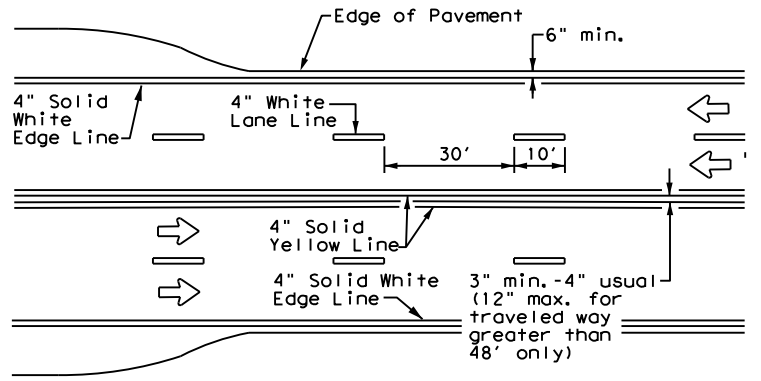
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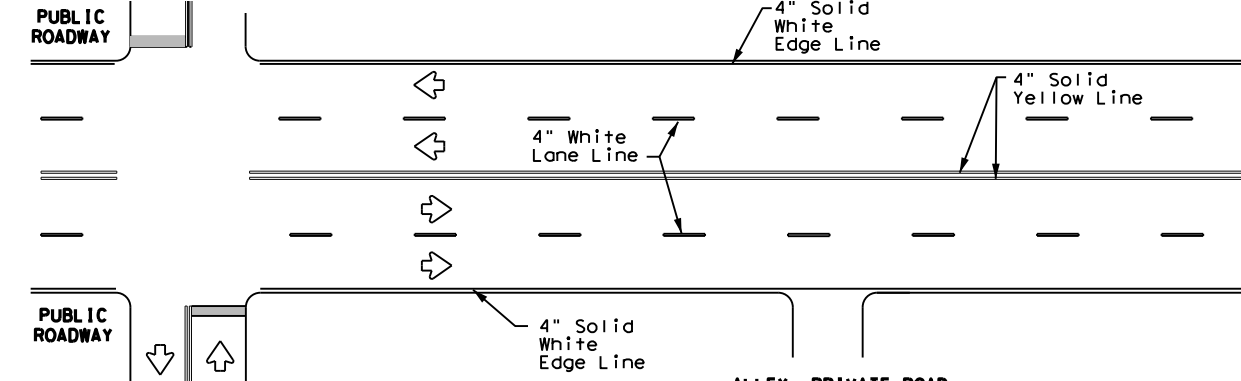
**EDGE LINE AND LANE LINES  
ONE-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**



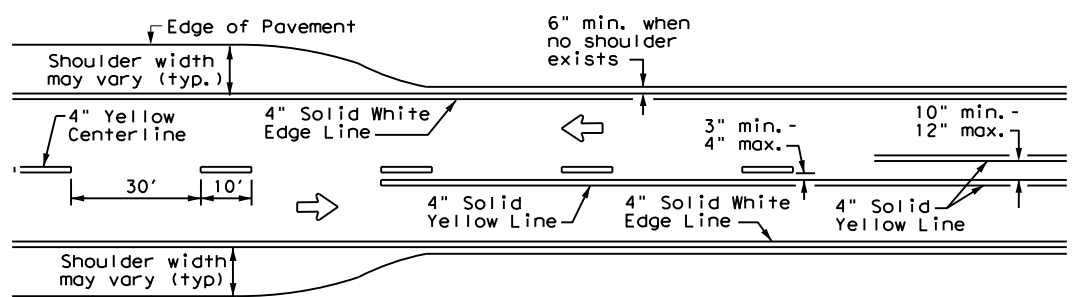
**TYPICAL TWO-LANE, TWO-WAY PAVEMENT  
MARKINGS THROUGH INTERSECTIONS**



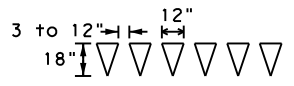
**CENTERLINE AND LANE LINES  
FOUR LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**



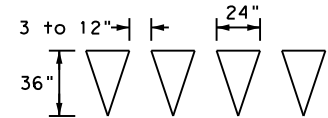
**TYPICAL MULTI-LANE, TWO-WAY PAVEMENT  
MARKINGS THROUGH INTERSECTIONS**



**TWO LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**

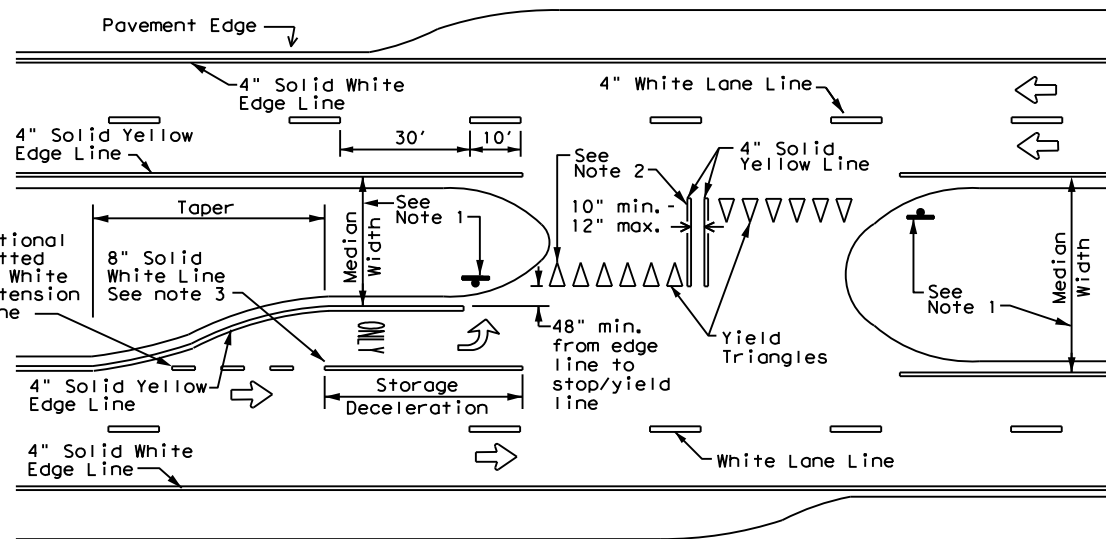


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

**YIELD LINES**



**FOUR LANE DIVIDED ROADWAY CROSSOVERS**

**NOTES**

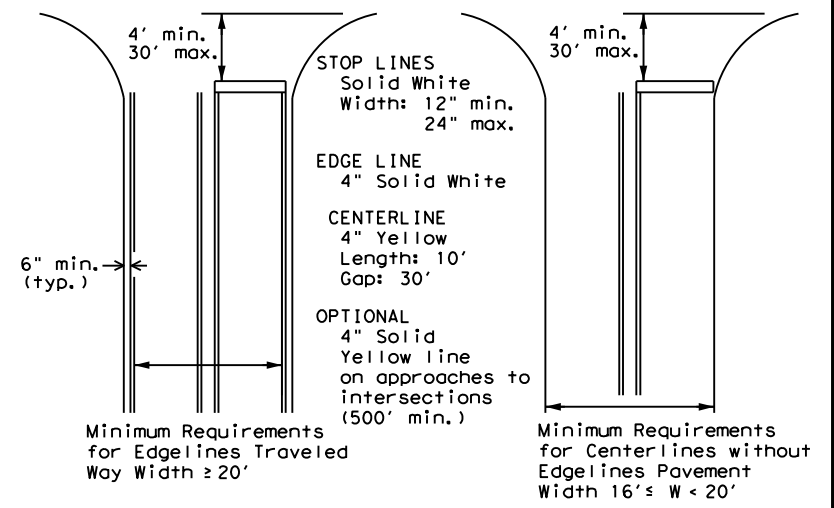
- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.
- 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 triangles shall only be used with yield signs.
- 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**

- Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed 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.
- 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



**TYPICAL STANDARD  
PAVEMENT MARKINGS**

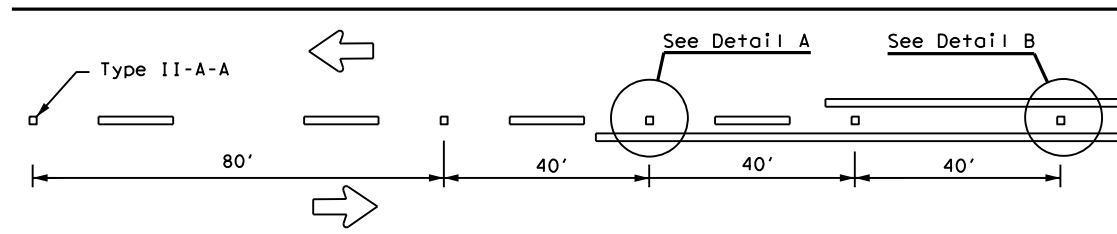
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8-00 6-20	AUS	WILLIAMSON	71	

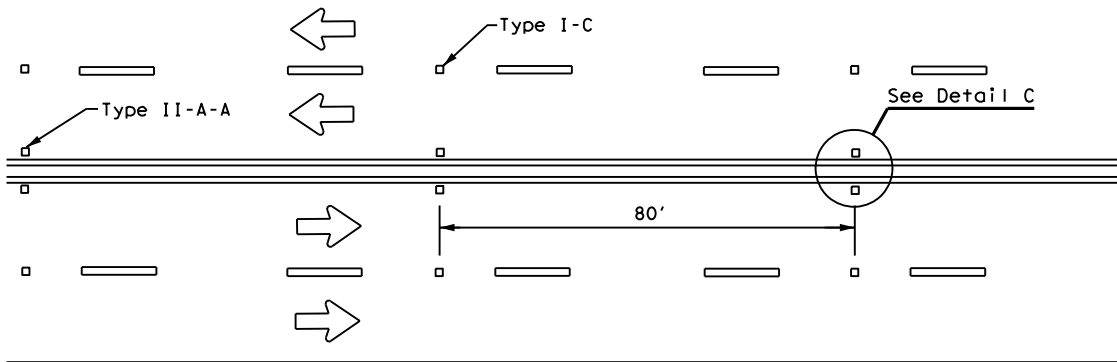
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# REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

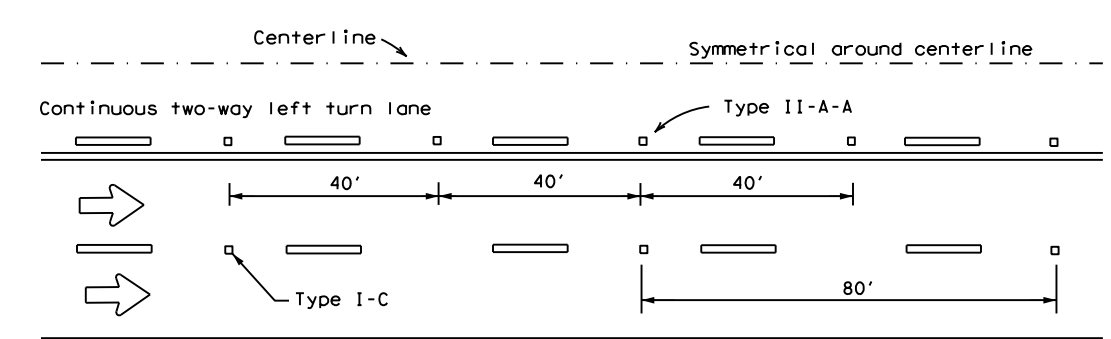
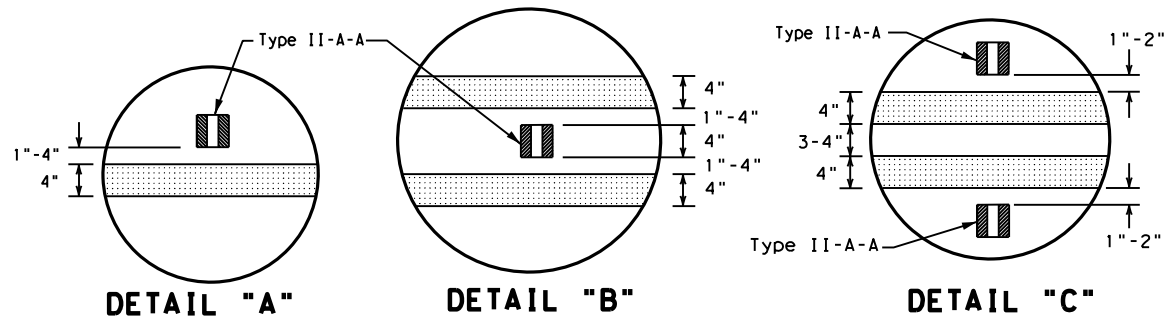
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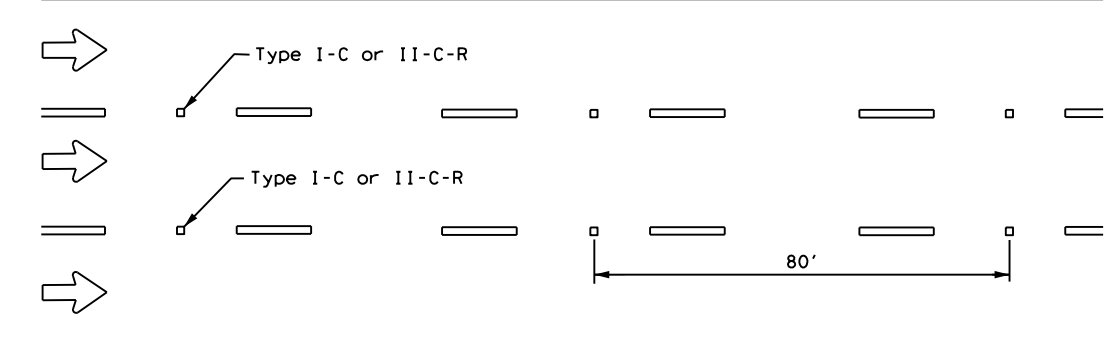
**CENTERLINE FOR ALL TWO LANE ROADWAYS**



**CENTERLINE & LANE LINES  
FOR FOUR LANE TWO-WAY HIGHWAYS**



**CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE**

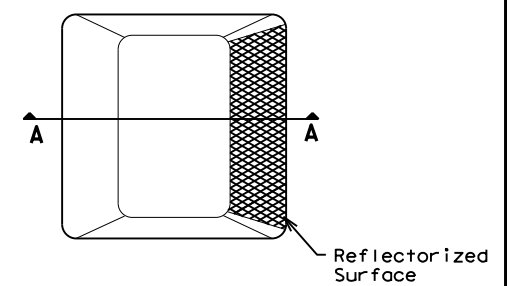


**LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)**

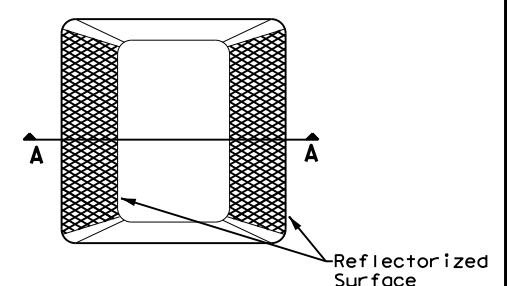
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

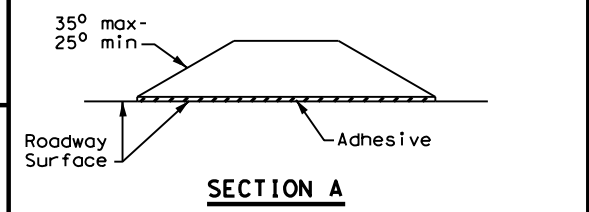
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



**Type I (Top View)**



**Type II (Top View)**



**RAISED PAVEMENT MARKERS**

**GENERAL NOTES**

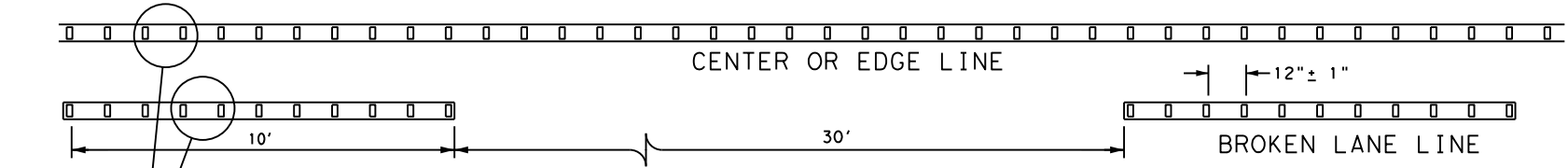
- All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
- On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.



## POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2) - 20

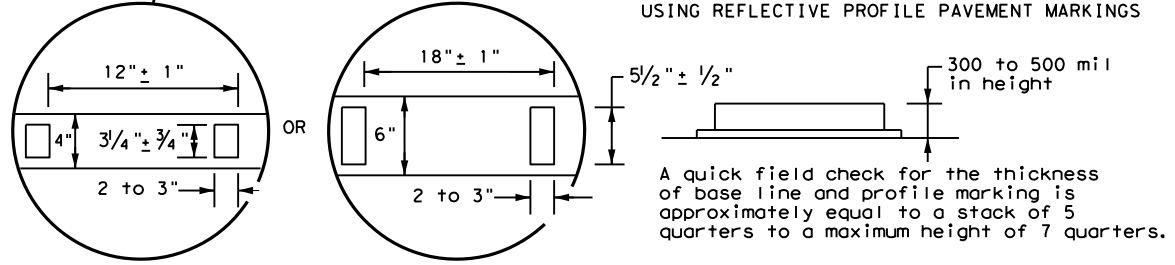
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4-92 2-10 REVISIONS	0914	05	174	CR 452
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8-00 6-20	AUS	WILLIAMSON	72	

DATE: DATE/TIME 3:36:17 PM  
FILE: DOCUMENT NAME 15097.pn2-20.dgn



**REFLECTORIZED PROFILE  
PATTERN DETAIL**

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



**NOTE**  
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

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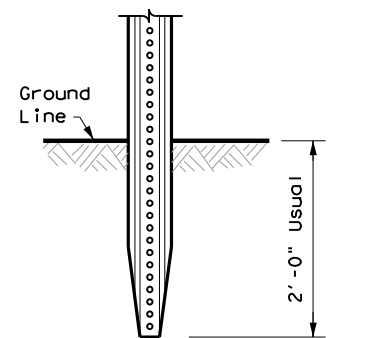
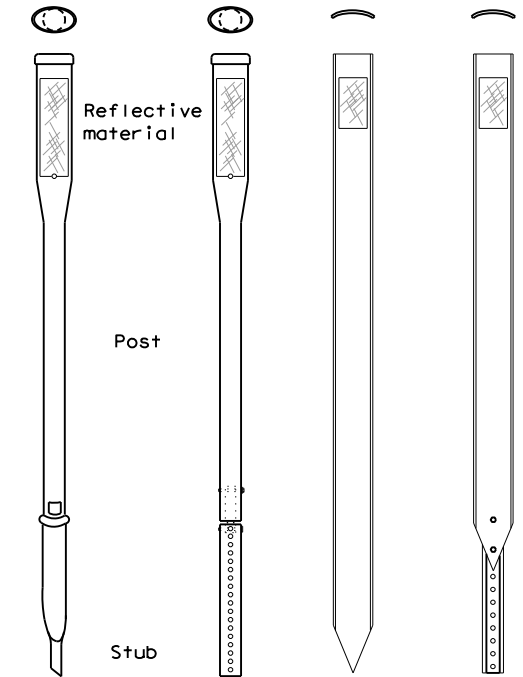
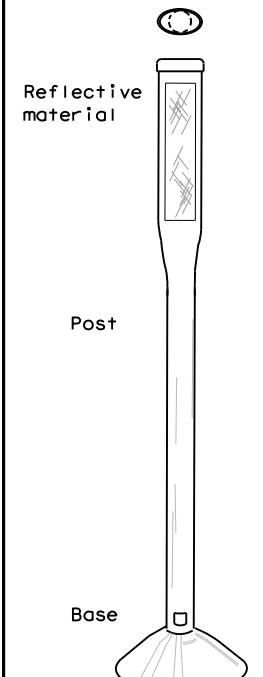
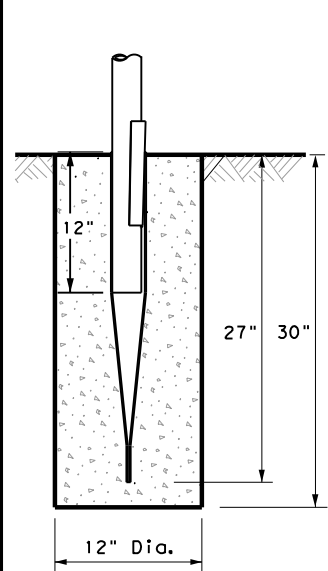
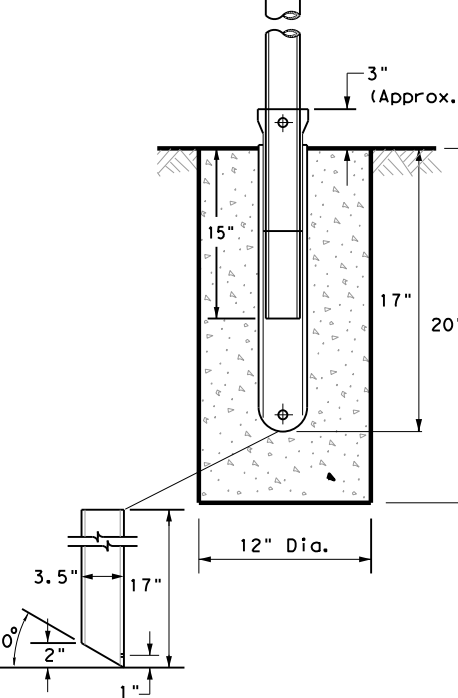
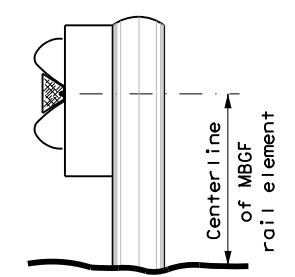
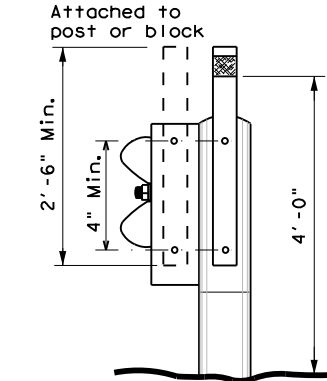
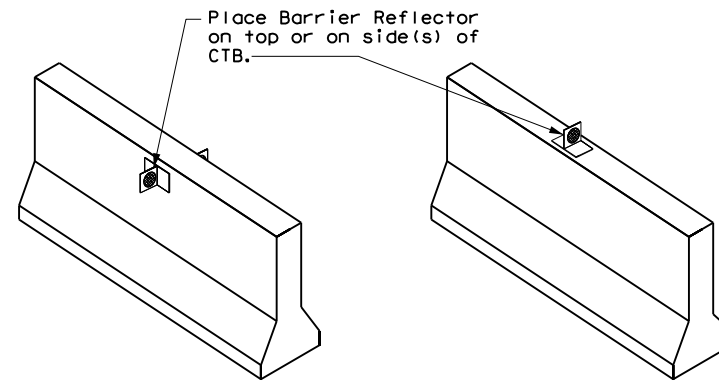
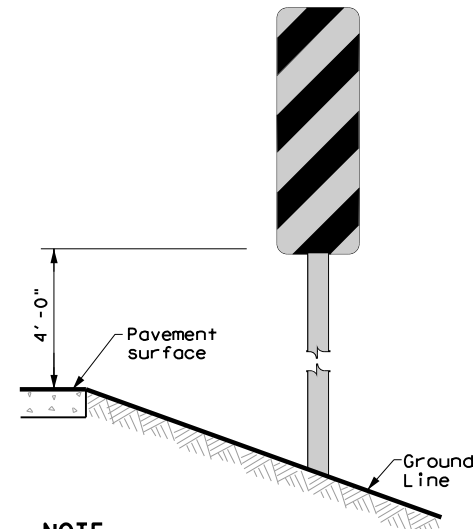
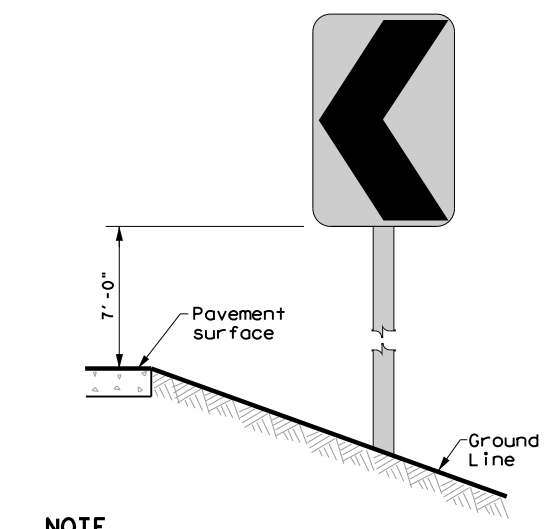
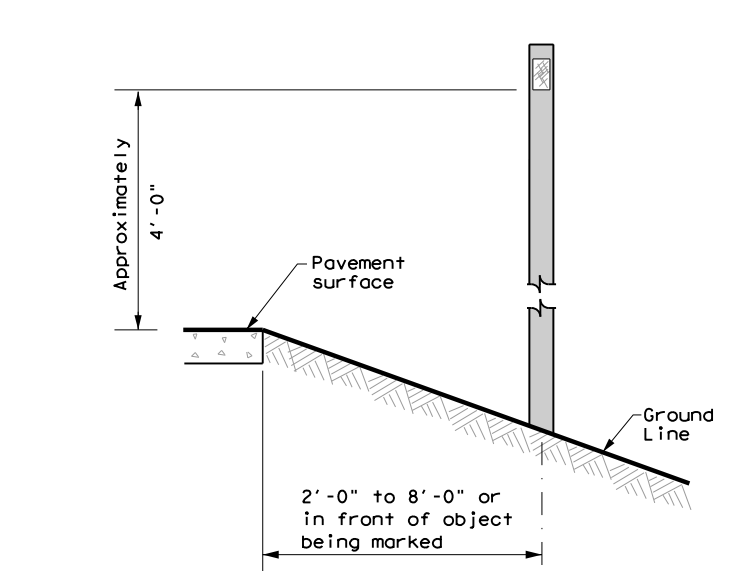

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS				DELINEATORS				D & OM DESCRIPTIVE CODES	
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	DEVICE	SINGLE	DOUBLE	INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX (XX)	
								NUMBER OF REFLECTORS S = Single D = Double COLOR OF REFLECTORS W = White Y = Yellow R = Red REFLECTOR 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	
SHEETING: Yellow, White or Red Type B or C reflective sheeting				SHEETING: Yellow, White or Red Type B or C Reflective Sheeting				DIRECTION: If Required BI = Bi-Directional BR = Bi-Directional with red on back	
POST TYPE: WC, YFLX, WFLX				MOUNT TYPE: GND, SRF				INSTL OM ASSM (OM-XX) (XXXX)XXX (XX)	

OBJECT MARKERS								D & OM DESCRIPTIVE CODES			
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)	INSTL OM ASSM (OM-XX) (XXXX)XXX (XX)		
		OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4	TYPE OF OBJECT MARKER 1, 2, 3, or 4 NUMBER OF REFLECTORS OR DIRECTION X = 3-Size 2 reflector unit (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	
SHEETING: Yellow-Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting		SHEETING: Yellow - Type B or C Sheeting			SHEETING: Alternating acrylic black and retroreflective yellow - Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting			SHEETING: Red -Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting		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	
POST TYPE: TWT		POST TYPE: WC			POST TYPE: WFLX			POST TYPE: TWT		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.	
MOUNT TYPE: WAS, WAP		MOUNT TYPE: GND			MOUNT TYPE: GND, SRF			MOUNT TYPE: WAS, WAP		Texas Department of Transportation Traffic Safety Division Standard	

BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW		NOTE:		
DEVICE	GF1	GF2	CTB	W1-8				W1-6		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.	
SHEETING: Yellow, White, Red			SIZE (W x L)	18" x 24" (Conventional)	24" x 30" (Conventional Oversize)	30" x 36" (Expressway)	36" x 48" (Freeway)	SIZE (W x L)	48" x 24" (Conventional)		60" x 30" (Expressway & Freeway)
NOTE: 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.			MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only		MOUNTING HEIGHT	7'-0"		
NOTE: 1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.			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).								
DEPARTMENTAL MATERIAL SPECIFICATIONS			FILE: dom1-20.dgn DNE: TxDOT CK: TxDOT DW: TxDOT CR: TxDOT © TxDOT August 2004 REVISIONS: 0914 05 174 CR 452 10-09 3-15 4-10 7-20 DIST: COUNTY SHEET NO. AUS WILLIAMSON 73								

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POST TYPE AND SUPPORT FOUNDATION DETAILS				TYPE OF BARRIER MOUNTS		
WING CHANNEL (WC)	FLEXIBLE POSTS (YFLX, WFLX)		WEDGE ANCHOR SYSTEMS		GUARD FENCE ATTACHMENT	
GND	GND	SRF	WAS	WAP	GF 1	
 <p style="text-align: center;">2'-0" Usual</p>						
	EMBEDDED	SURFACE MOUNT	STEEL	PLASTIC	CONCRETE TRAFFIC BARRIER (CTB)	
<b>NOTES</b> 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.	<b>NOTES</b> 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.		<b>NOTE</b> 1. Install per manufacturer's recommendations.			
TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS		CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN		DELINEATORS AND TYPE 2 OBJECT MARKERS		
						
<b>NOTE</b> 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)		<b>NOTE</b> 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.		<b>NOTE</b> See general notes 1, 2 and 3.		
<b>GENERAL NOTES</b> 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.						
 <span style="float: right;">Traffic Safety Division Standard</span>						
<h2 style="margin: 0;">DELINEATOR &amp; OBJECT MARKER INSTALLATION</h2> <h3 style="margin: 0;">D &amp; OM(2)-20</h3>						
<small>FILE: dom2-20.dgn</small>		<small>DN: TxDOT</small>		<small>CK: TxDOT</small>		
<small>© TxDOT August 2004</small>		<small>CON: 0914</small>		<small>SECT: 05</small>		
<small>10-09 3-15</small>		<small>174</small>		<small>CR 452</small>		
<small>4-10 7-20</small>		<small>AUS</small>		<small>WILLIAMSON</small>		
				<small>SHEET NO. 74</small>		

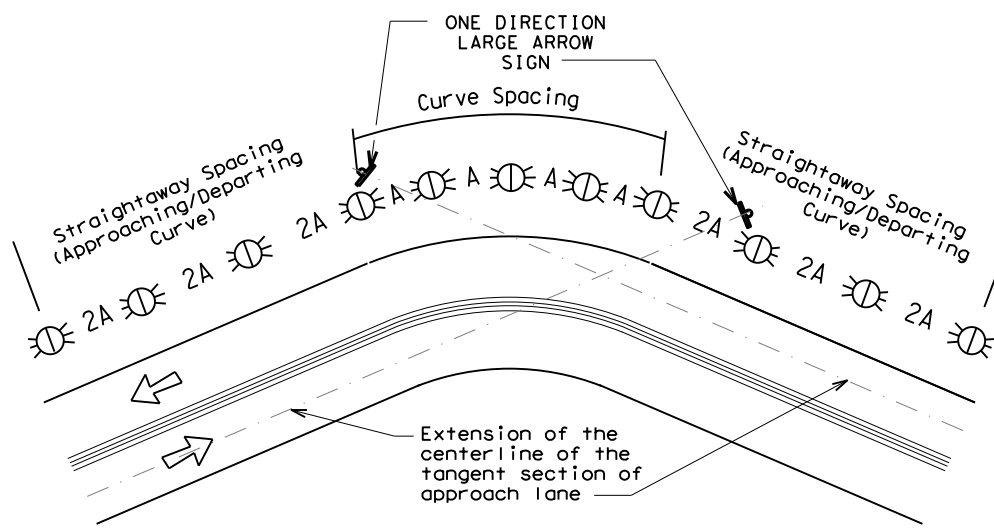


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### MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

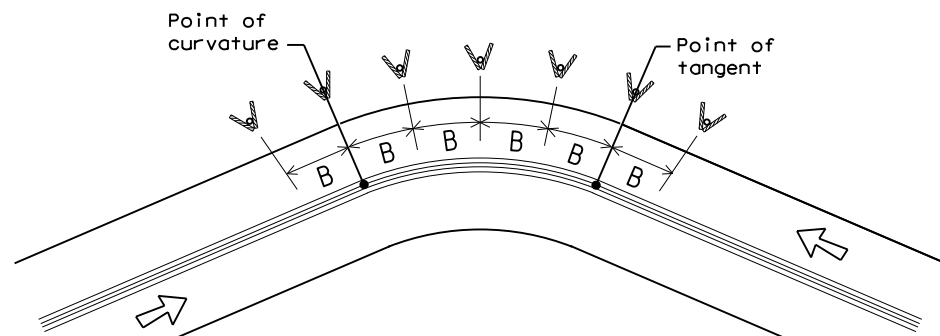
### SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



**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**

- 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.
- Barrier reflectors may be used to replace required delineators.
- Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

**LEGEND**

	Bi-directional Delineator
	Delineator
	Sign



## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

### D & OM(3)-20

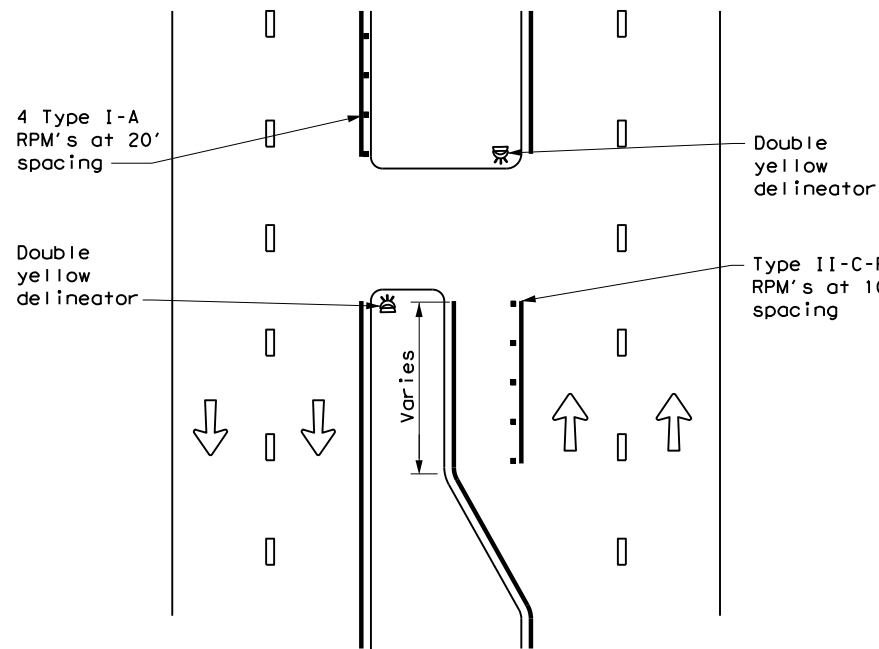
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© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
3-15 8-15	DIST	COUNTY	SHEET NO.	
8-15 7-20	AUS	WILLIAMSON	75	

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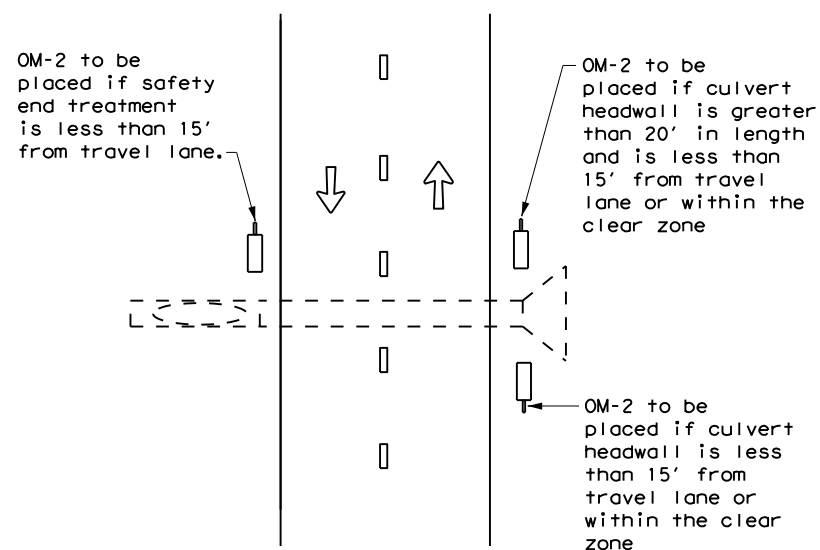
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**CROSSOVERS**



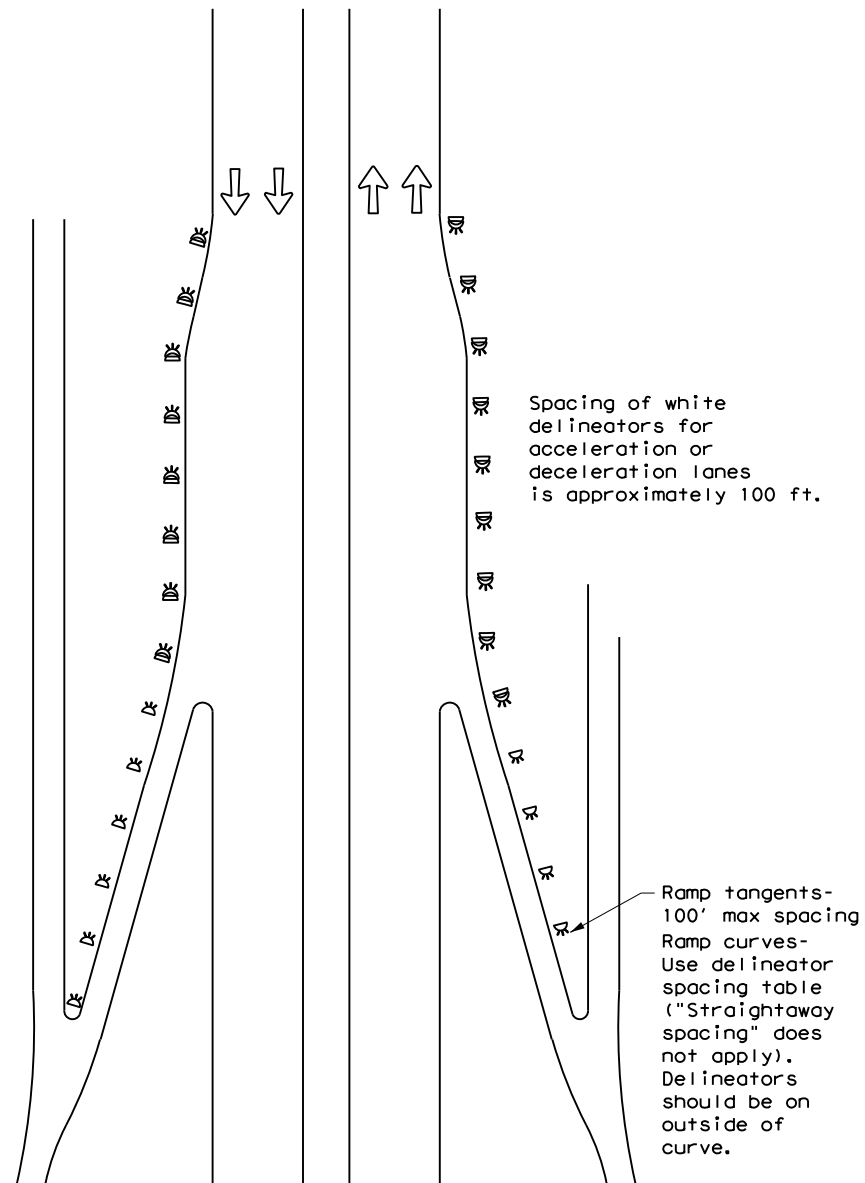
**DETAIL 1**

**FOR CULVERTS WITHOUT MBGF**



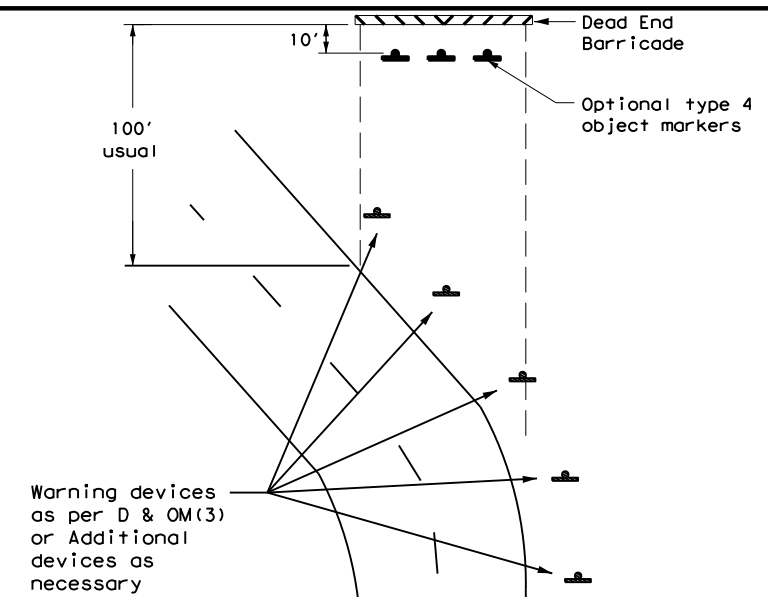
**DETAIL 2**

**FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES**



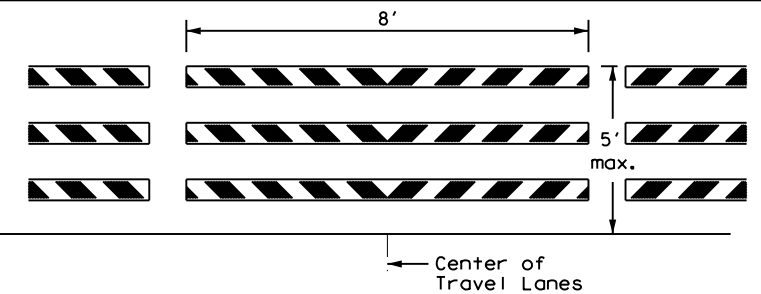
**DETAIL 3**

**TYPICAL APPLICATION OF DEAD END BARRICADE**



**DETAIL 4**

**TYPICAL DEAD END BARRICADE INSTALLATION**



**NOTES**

- Barricade striping shall be red and white reflective sheeting for all permanent road closures.
- Barricade striping is red and white sloping toward the center of the roadway.
- Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

**DETAIL 5**

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

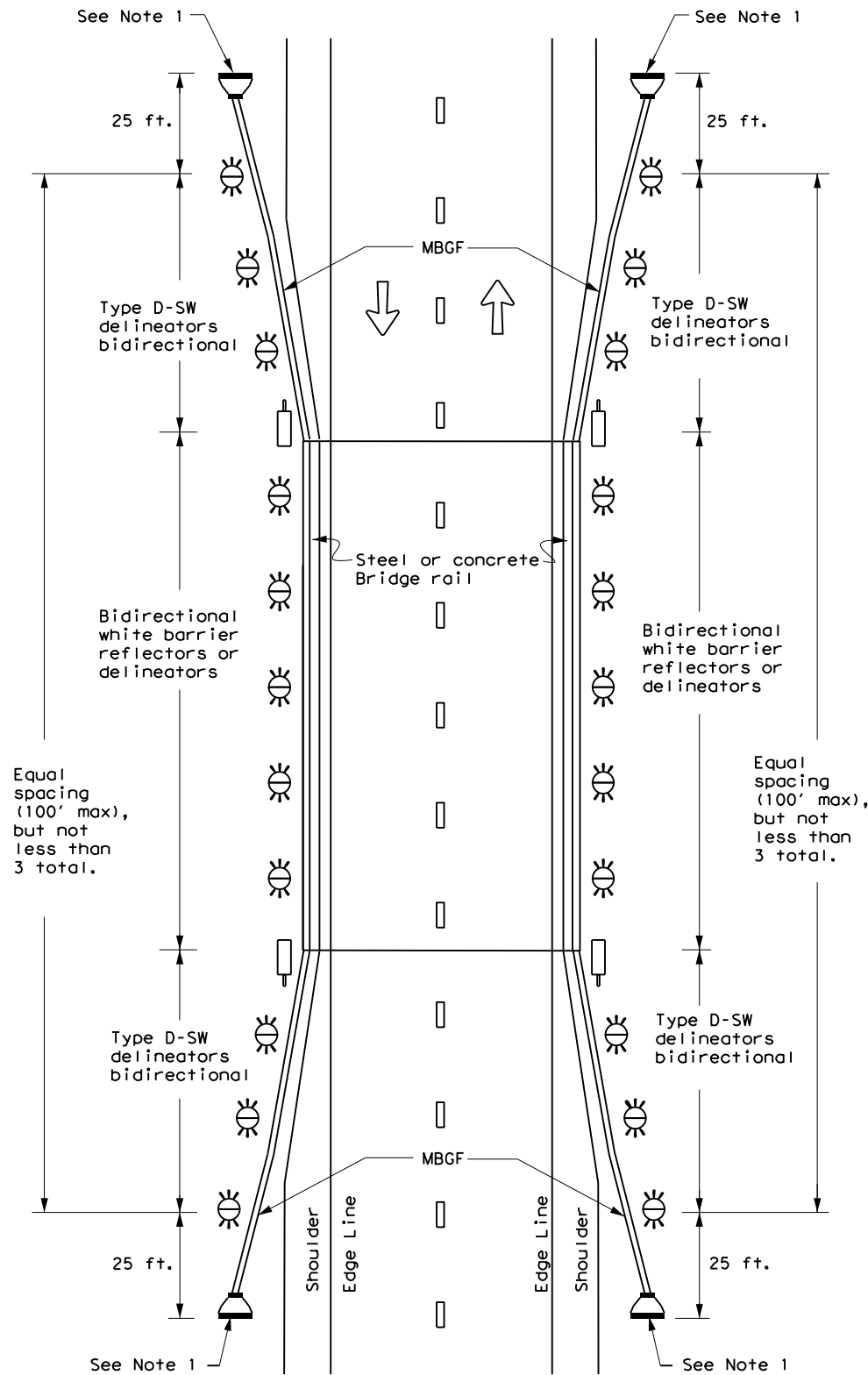


**DELINEATOR & OBJECT MARKER PLACEMENT DETAILS**

**D & OM(4) -20**

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	OW: TXDOT	CR: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
3-15	DIST	COUNTY	SHEET NO.	
7-20	AUS	WILLIAMSON	76	

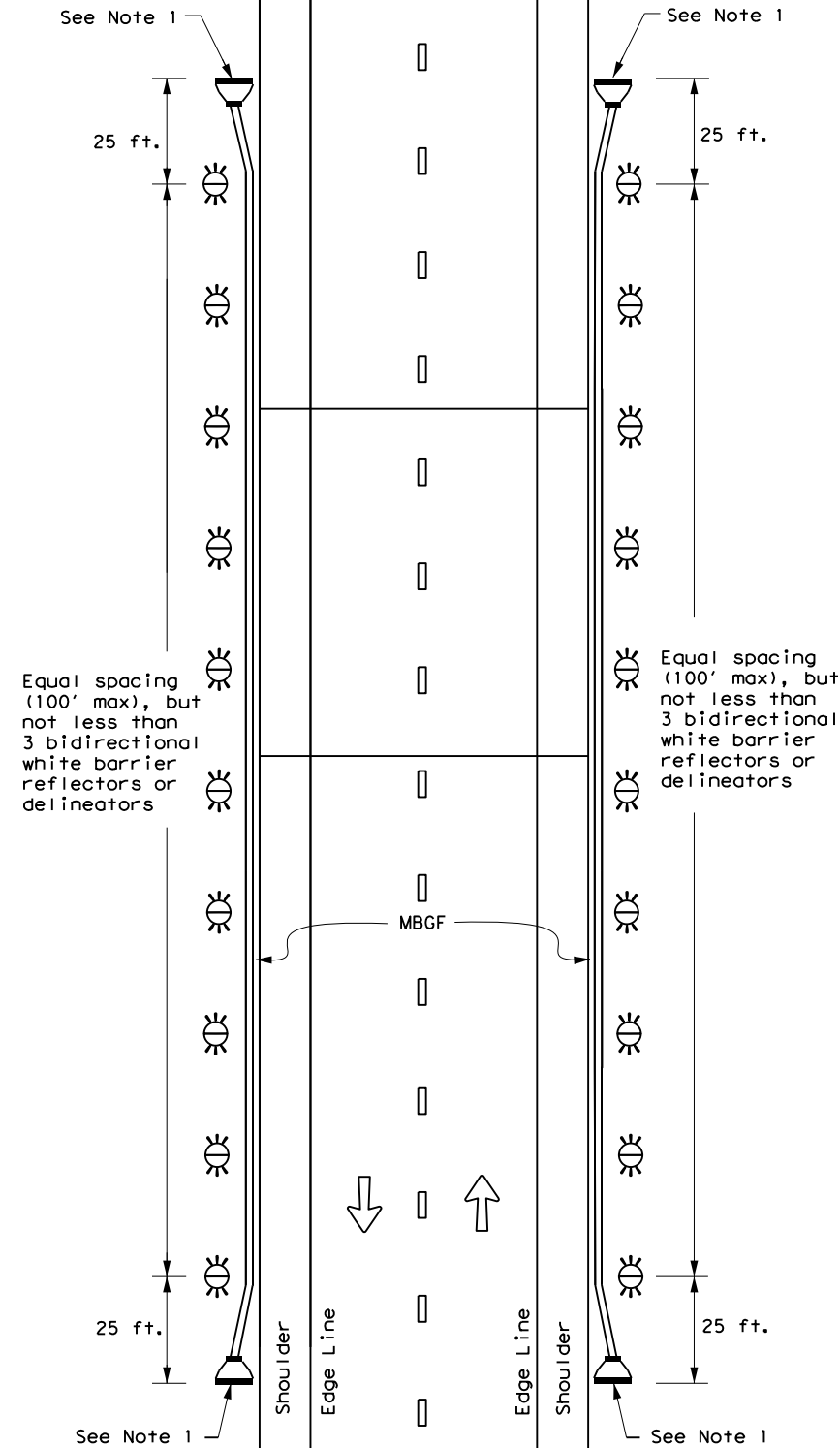
**TWO-WAY, TWO LANE ROADWAY  
WITH REDUCED WIDTH APPROACH RAIL**



**NOTE:**

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

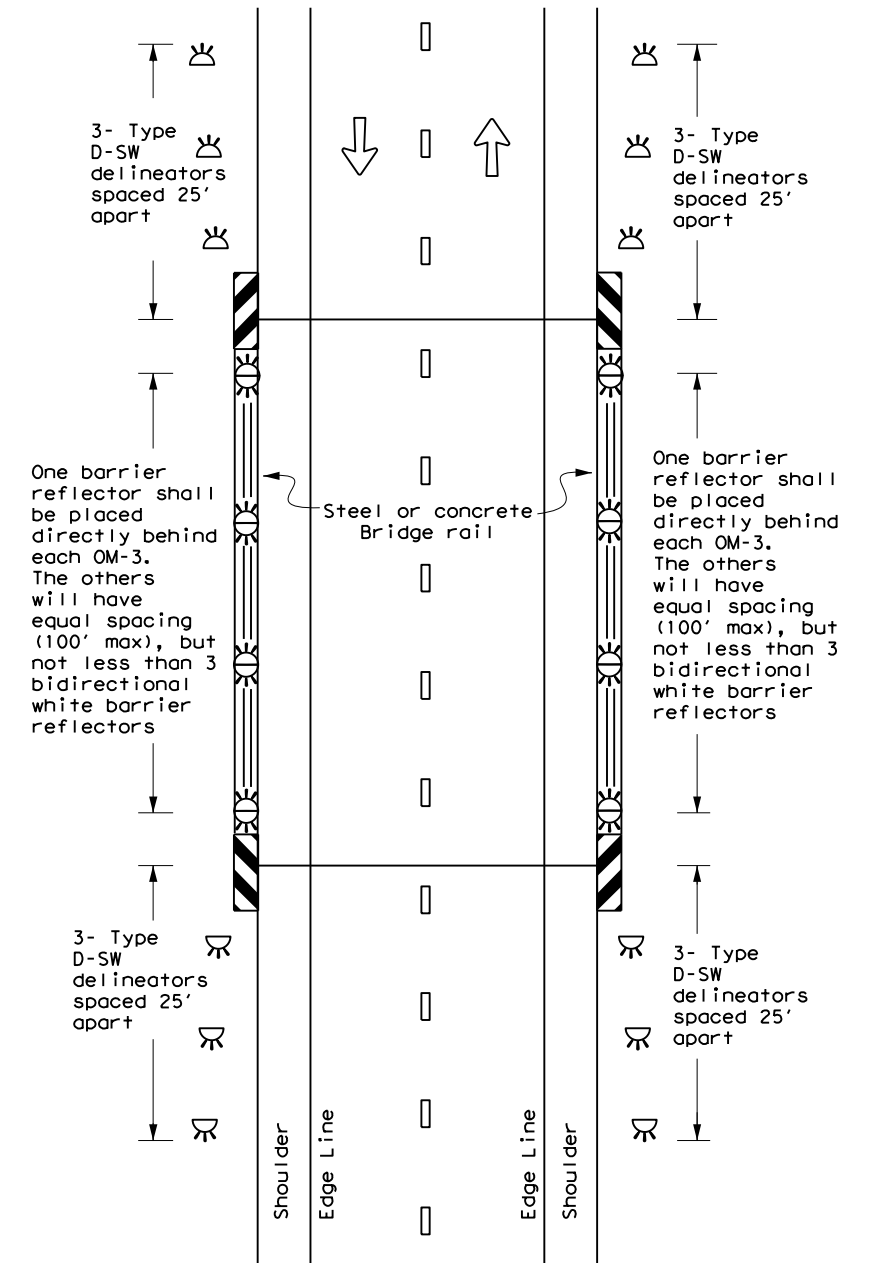
**TWO-WAY, TWO LANE ROADWAY  
WITH METAL BEAM GUARD FENCE (MBGF)**



**NOTE:**

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

**TWO-WAY, TWO LANE ROADWAY  
BRIDGE WITH NO APPROACH RAIL**



**LEGEND**

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow



**DELINEATOR &  
OBJECT MARKER  
PLACEMENT DETAILS**

**D & OM(5) - 20**

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
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REVISIONS	0914	05	174	CR 452
7-20	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	77	

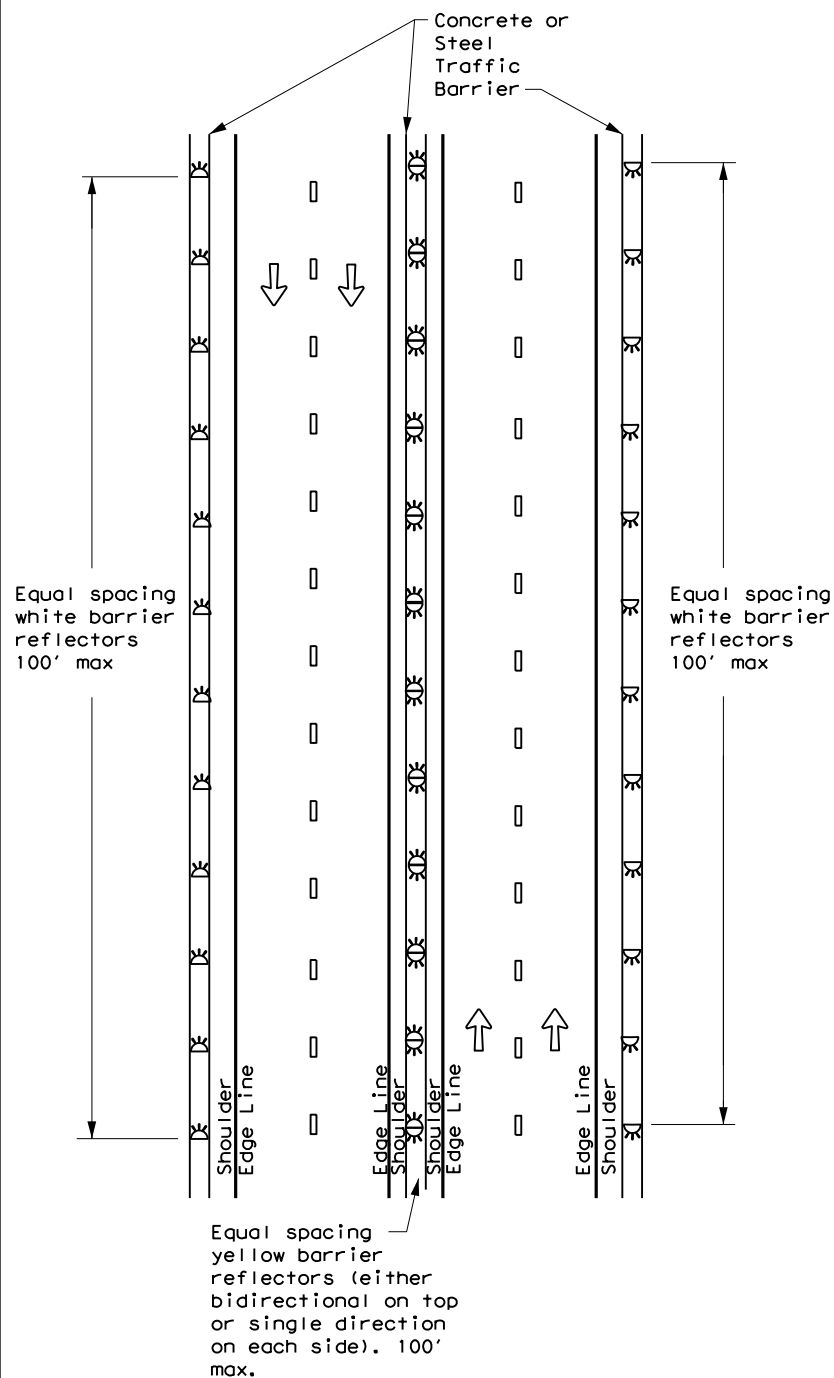
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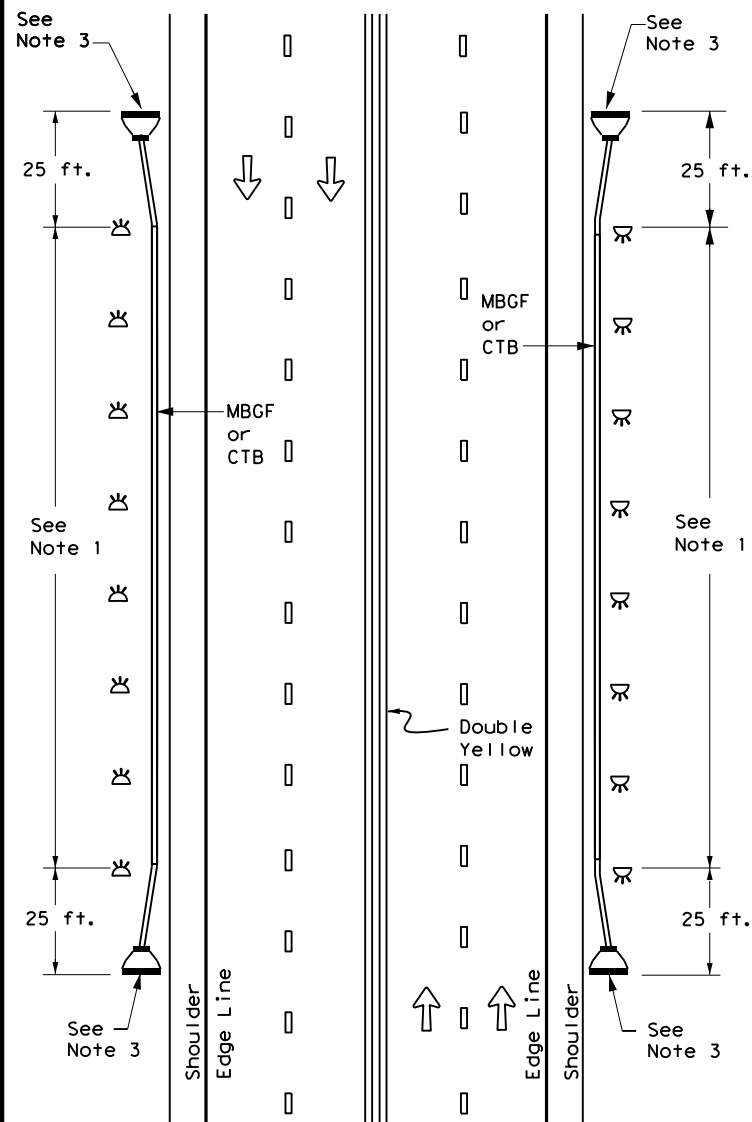
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DATE: 08/20/15 3:36:49 PM  
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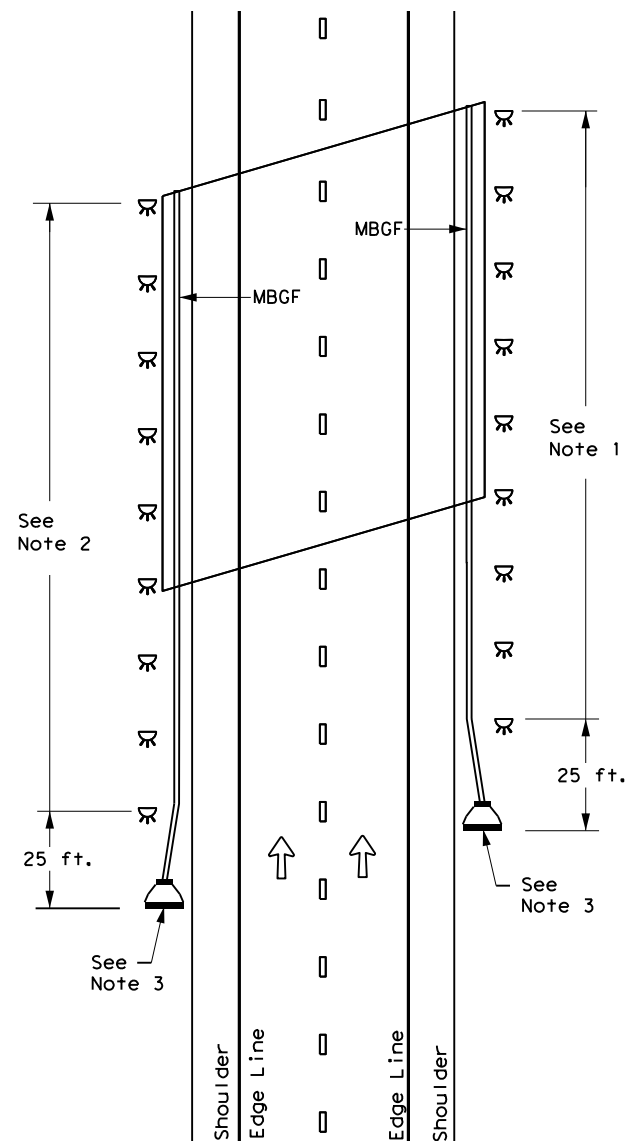
### CONTINUOUS CONCRETE OR STEEL BARRIER



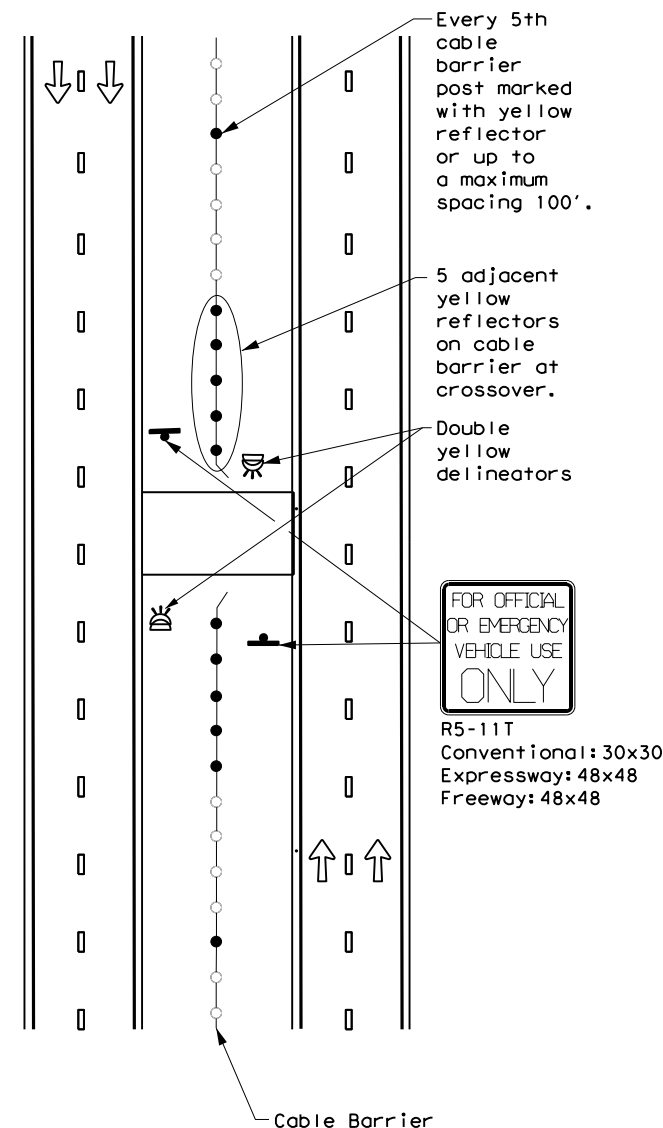
### MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



### DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



### EMERGENCY CROSSOVER



#### NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuous Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

#### LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow



## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

### D & OM(6)-20

FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	05	174	CR 452
7-20	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	78	

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## SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

### Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))  
 TWT = Thin-Walled Tubing (see SMD(TWT))  
 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))  
 S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

### Number of Posts (1 or 2)

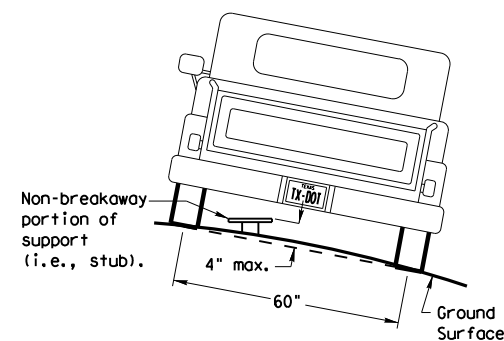
### Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))  
 UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))  
 WS = Wedge Anchor Steel - (see SMD(TWT))  
 WP = Wedge Anchor Plastic (see SMD(TWT))  
 SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))  
 SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

### Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))  
 T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))  
 U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))  
 IF REQUIRED  
 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))  
 BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))  
 WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))  
 EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

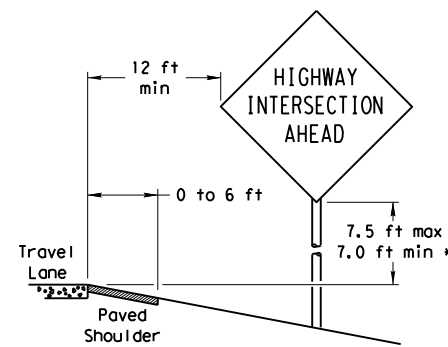
## REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

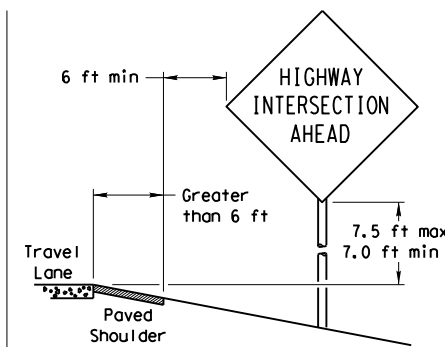
## SIGN LOCATION

### PAVED SHOULDERS



#### LESS THAN 6 FT. WIDE

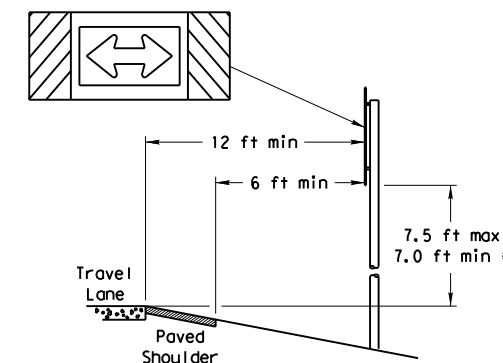
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



#### GREATER THAN 6 FT. WIDE

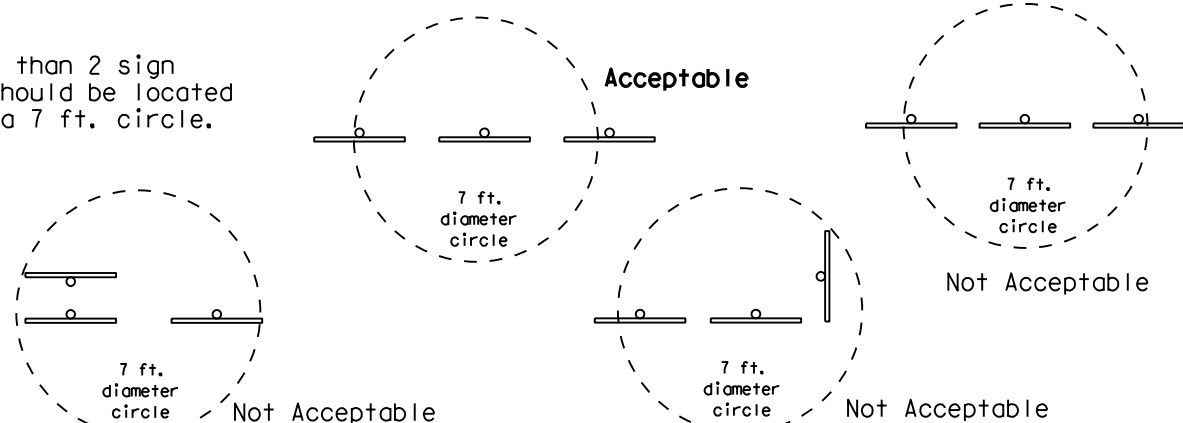
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

### T-INTERSECTION

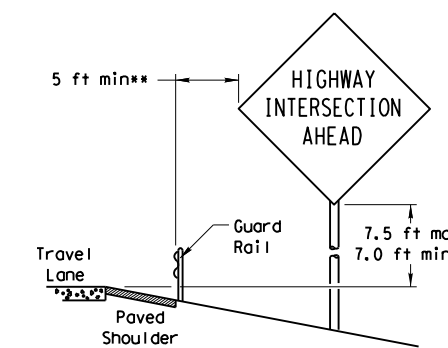


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

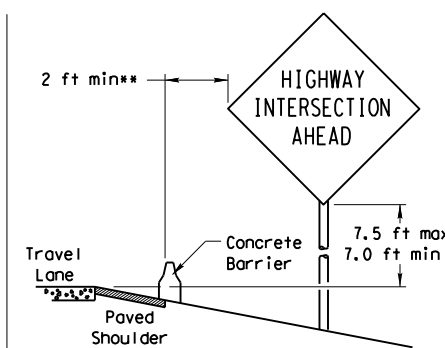
No more than 2 sign posts should be located within a 7 ft. circle.



### BEHIND BARRIER



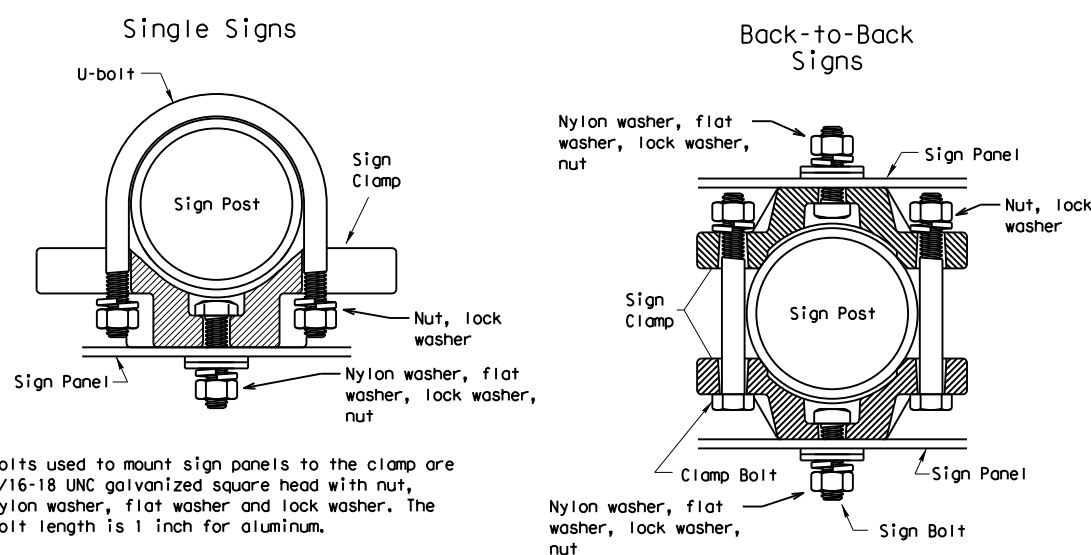
#### BEHIND GUARDRAIL



#### BEHIND CONCRETE BARRIER

\*\*Sign clearance based on distance required for proper guard rail or concrete barrier performance.

## TYPICAL SIGN ATTACHMENT DETAIL



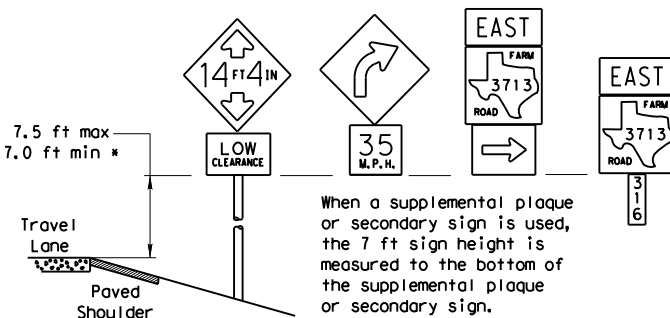
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

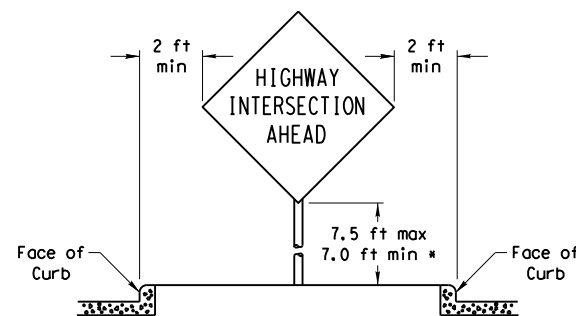
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

### SIGNS WITH PLAQUES

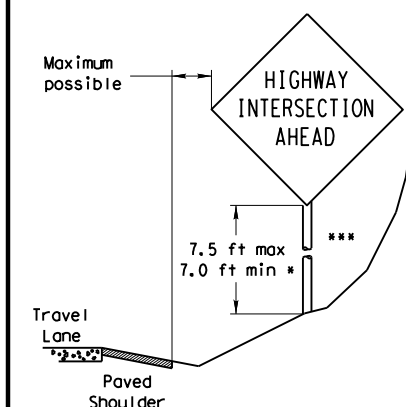


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

### CURB & GUTTER OR RAISED ISLAND



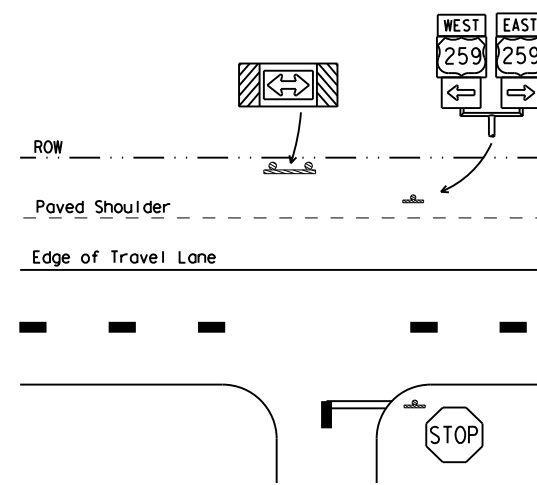
### RESTRICTED RIGHT-OF-WAY (When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

\*\*\* Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.



\* Signs shall be mounted using the following condition that results in the greatest sign elevation:

- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:  
<http://www.txdot.gov/publications/traffic.htm>

Texas Department of Transportation  
 Traffic Operations Division

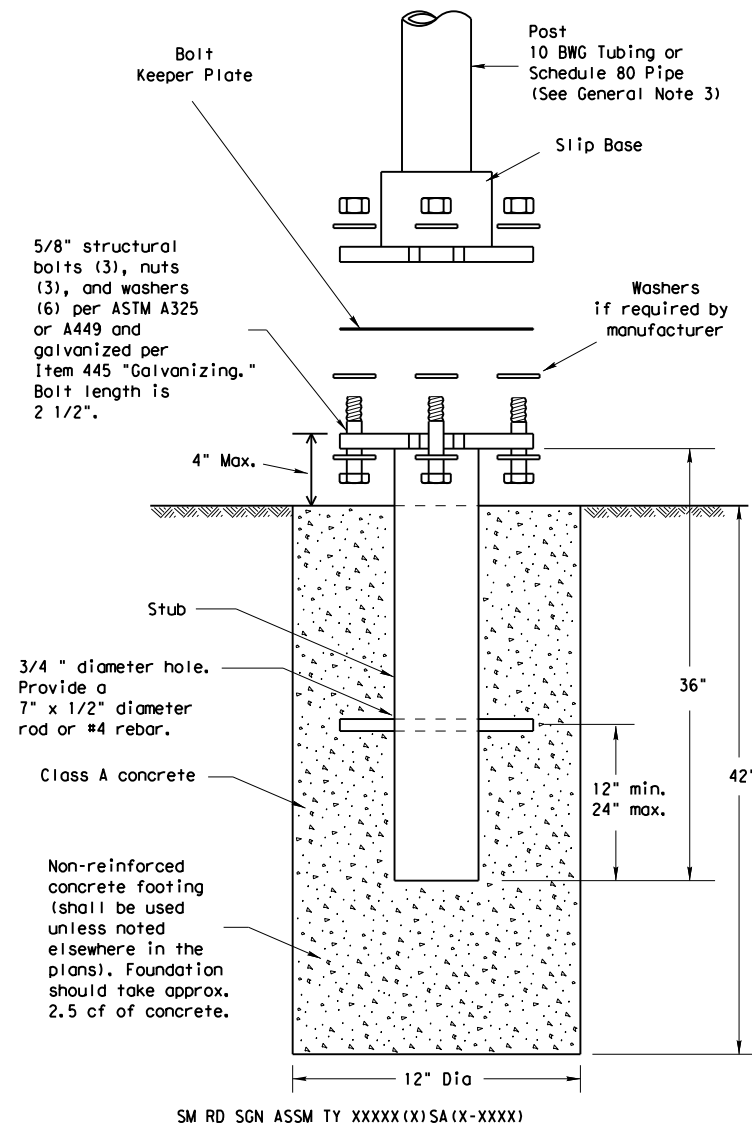
## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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		DIST. AUS	COUNTY WILLIAMSON	SHEET NO. 79

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## TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



### NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. [http://www.txdot.gov/business/producer\\_list.htm](http://www.txdot.gov/business/producer_list.htm) The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

### GENERAL NOTES:

- Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
- Material used as post with this system shall conform to the following specifications:
  - 10 BWG Tubing (2.875" outside diameter)
    - 0.134" nominal wall thickness
    - Seamless or electric-resistance welded steel tubing or pipe
    - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
    - Other steels may be used if they meet the following:
      - 55,000 PSI minimum yield strength
      - 70,000 PSI minimum tensile strength
      - 20% minimum elongation in 2"
    - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
    - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
    - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
  - Schedule 80 Pipe (2.875" outside diameter)
    - 0.276" nominal wall thickness
    - Steel tubing per ASTM A500 Gr C
    - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
      - 46,000 PSI minimum yield strength
      - 62,000 PSI minimum tensile strength
      - 21% minimum elongation in 2"
    - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
    - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
    - Galvanization per ASTM A123
- See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

### ASSEMBLY PROCEDURE

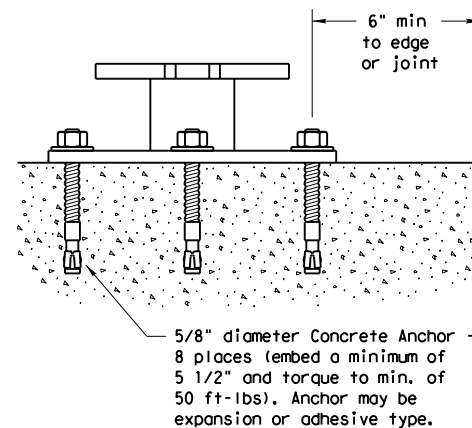
#### Foundation

- Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
- The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
- Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

#### Support

- Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
- Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

### CONCRETE ANCHOR



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

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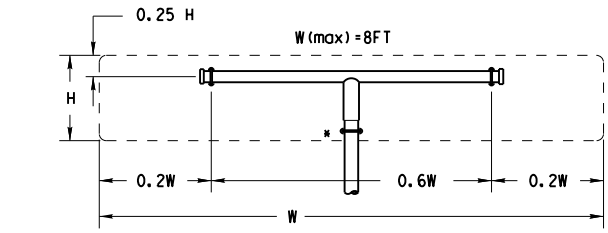
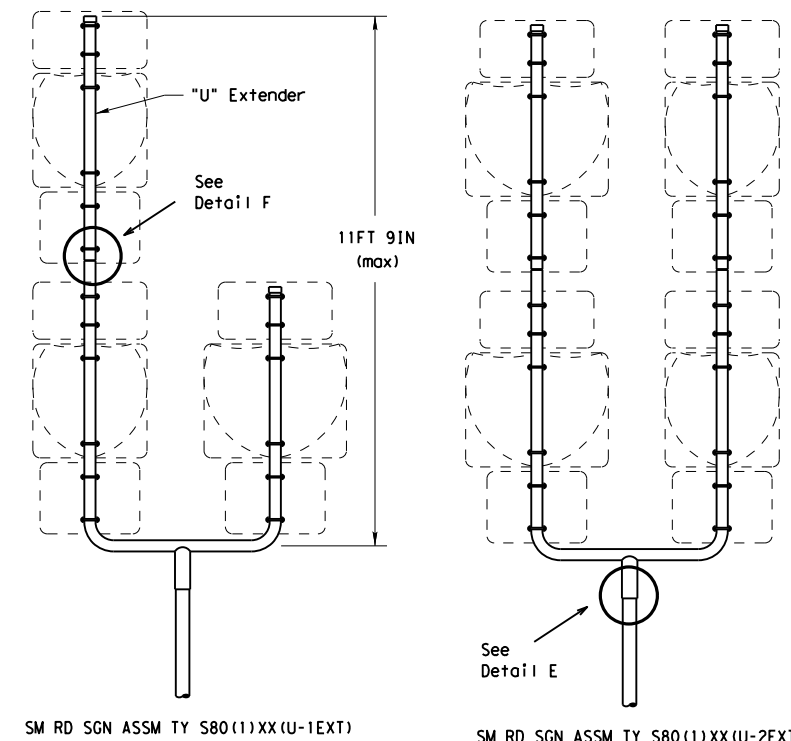
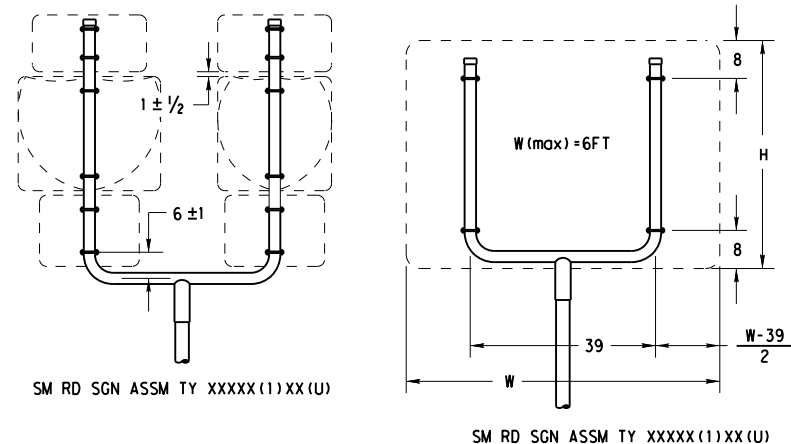
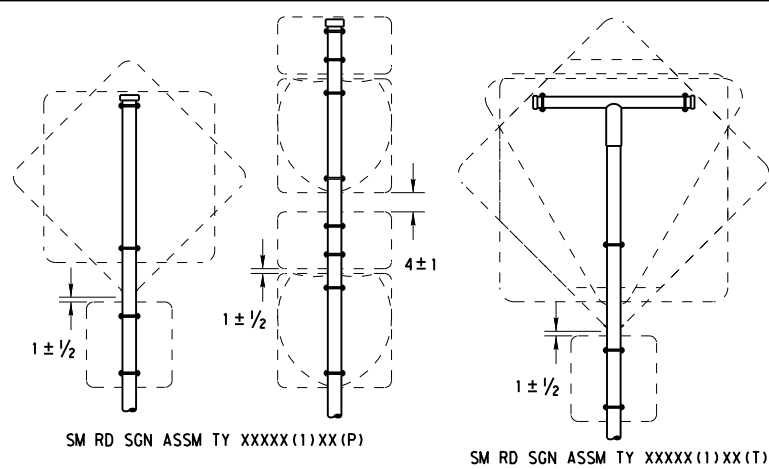
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<b>9-08</b>	REVISIONS				
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AUS	WILLIAMSON		<b>80</b>		



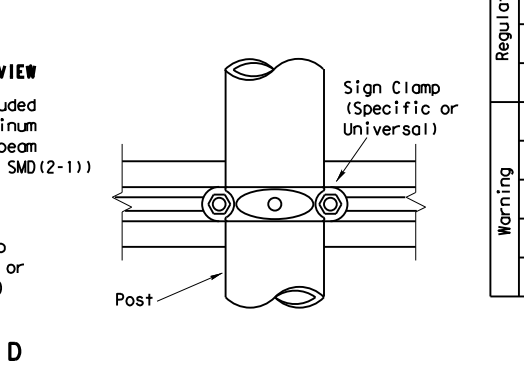
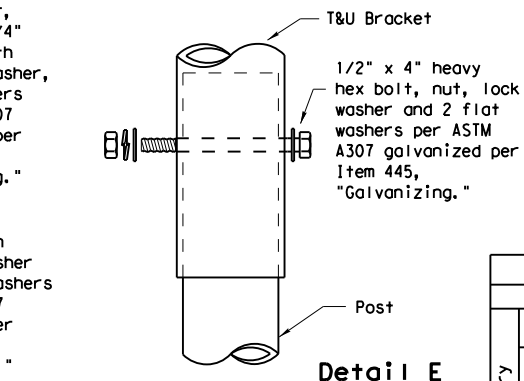
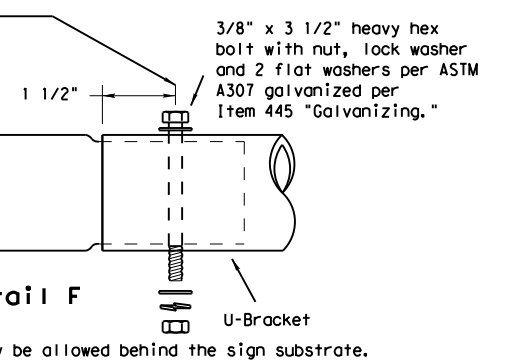
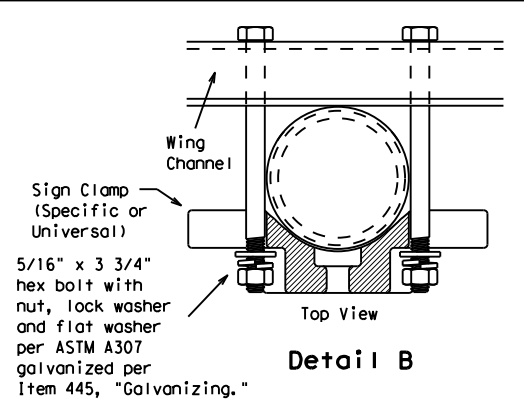
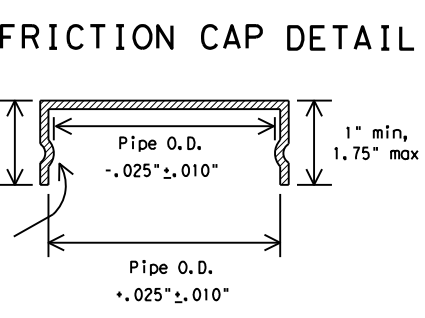
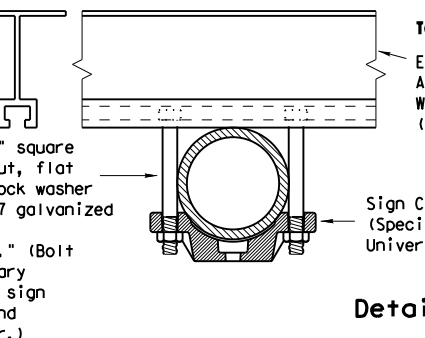
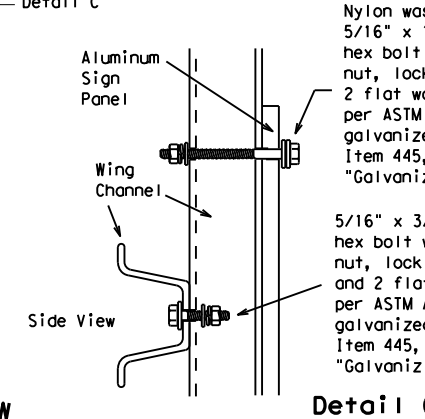
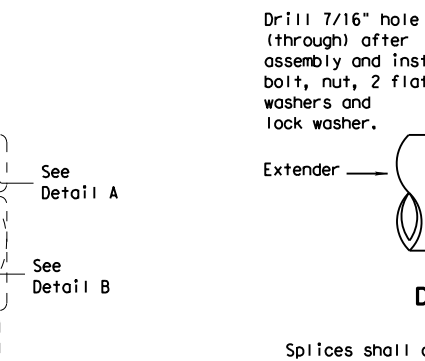
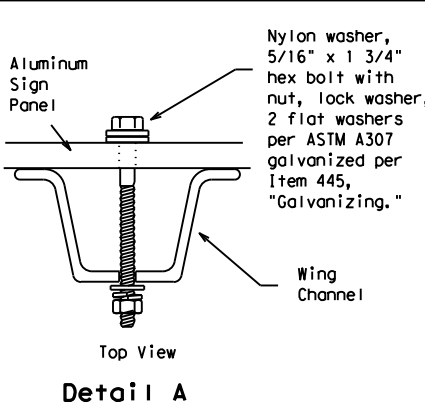
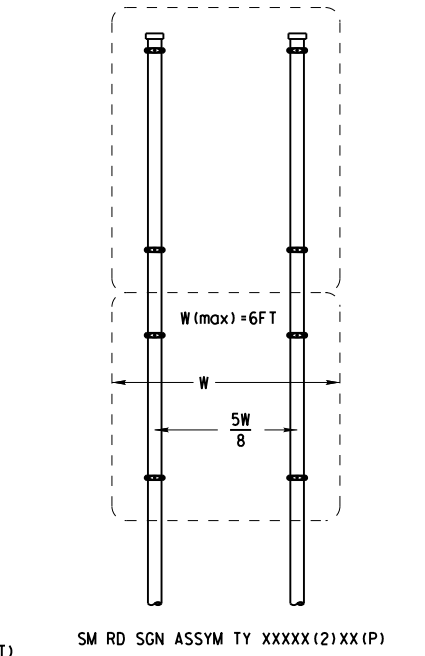
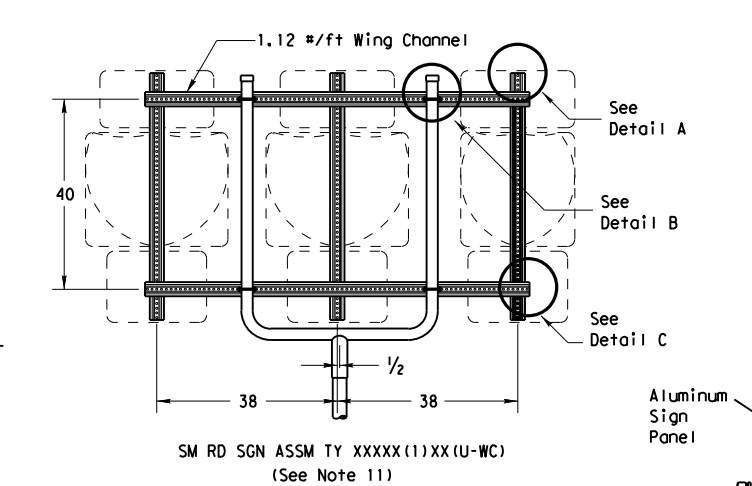
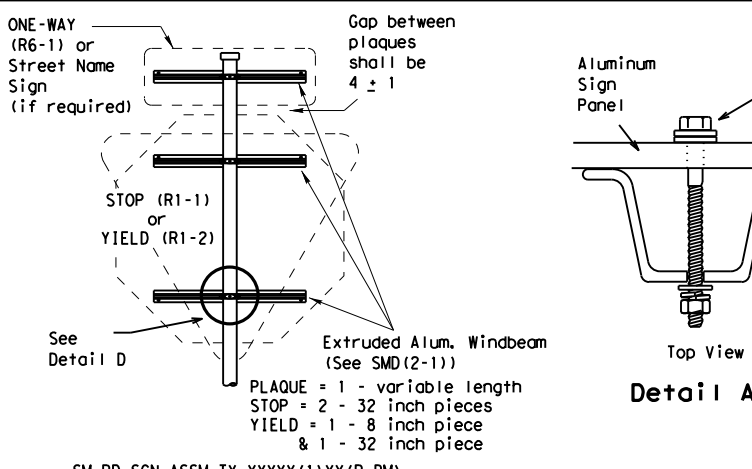
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All dimensions are in english unless detailed otherwise.



GENERAL NOTES:

- | SIGN SUPPORT | # OF POSTS | MAX. SIGN AREA |
|--------------|------------|----------------|
| 10 BWG       | 1          | 16 SF          |
| 10 BWG       | 2          | 32 SF          |
| Sch 80       | 1          | 32 SF          |
| Sch 80       | 2          | 64 SF          |
- The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
- When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
- Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
- Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
- Post open ends shall be fitted with Friction Caps.
- Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT		
SIGN DESCRIPTION	SUPPORT	
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
Warning	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)



SIGN MOUNTING DETAILS  
SMALL ROADSIDE SIGNS  
TRIANGULAR SLIPBASE SYSTEM  
SMD(SLIP-2)-08

Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes. The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture. Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

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REVISIONS		CONTRACT	SECTION	JOB	HIGHWAY		
9-08		0914	05	174	CR 452		
		COUNTY		SHEET NO.			
		AUS		WILLIAMSON 81			



**STORMWATER POLLUTION PREVENTION PLAN (SWP3):**

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept at the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans, and the project's environmental permits, issues, and commitments (EPICs).

**1.0 SITE/PROJECT DESCRIPTION**

**1.1 PROJECT CONTROL SECTION JOB (CSJ):**

0914-05-174

**1.2 PROJECT LIMITS:**

From: \_\_\_\_\_ CR 452 AT BRANCH OF MUSTANG CREEK \_\_\_\_\_

To: \_\_\_\_\_ STR# 14-246-0-AA04-13-001 \_\_\_\_\_

**1.3 PROJECT COORDINATES:**

BEGIN: (Lat)\_\_\_N 30.540859,(Long)\_\_\_W 97.392861 \_\_\_\_\_

END: (Lat)\_\_\_N 30.541798,(Long)\_\_\_W 97.393248 \_\_\_\_\_

**1.4 TOTAL PROJECT AREA (Acres):** \_\_\_\_\_ **0.52** \_\_\_\_\_

**1.5 TOTAL AREA TO BE DISTURBED (Acres):** \_\_\_\_\_ **0.40** \_\_\_\_\_

**1.6 NATURE OF CONSTRUCTION ACTIVITY:**

BRIDGE REPLACEMENT

**1.7 MAJOR SOIL TYPES:**

Soil Type	Description
FERRIS-HEIDEN COMPLEX 5 TO 15% SLOPES	45.7% MODERATELY ERODED
TINN CLAY 0 TO 1% SLOPES	54.3% FREQUENTLY FLOODED

**1.8 PROJECT SPECIFIC LOCATIONS (PSLs):**

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- PSLs determined during preconstruction meeting
- PSLs determined during construction
- No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

**1.9 CONSTRUCTION ACTIVITIES:**

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.3.)

- Mobilization
- Install sediment and erosion controls
- Blade existing topsoil into windrows, prep ROW, clear and grub
- Remove existing pavement
- Grading operations, excavation, and embankment
- Excavate and prepare subgrade for proposed pavement widening
- Remove existing culverts, safety end treatments (SETs)
- Remove existing metal beam guard fence (MBGF), bridge rail
- Install proposed pavement per plans
- Install culverts, culvert extensions, SETs
- Install mow strip, MBGF, bridge rail
- Place flex base
- Rework slopes, grade ditches
- Blade windrowed material back across slopes
- Revegetation of unpaved areas
- Achieve site stabilization and remove sediment and erosion control measures

Other: \_\_\_\_\_

Other: \_\_\_\_\_

Other: \_\_\_\_\_

**1.10 POTENTIAL POLLUTANTS AND SOURCES:**

- Sediment laden stormwater from stormwater conveyance over disturbed area
- Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- Solvents, paints, adhesives, etc. from various construction activities
- Transported soils from offsite vehicle tracking
- Construction debris and waste from various construction activities
- Contaminated water from excavation or dewatering pump-out water
- Sanitary waste from onsite restroom facilities
- Trash from various construction activities/receptacles
- Long-term stockpiles of material and waste
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.11 RECEIVING WATERS:**

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody

\* Add (\*) for impaired waterbodies with pollutant in ( ).

**1.12 ROLES AND RESPONSIBILITIES: TxDOT**

- Development of plans and specifications
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR**

- Day To Day Operational Control
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)**



FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6	BR 2020(731)			83
STATE	STATE DIST.	COUNTY		
TEXAS	AUS	WILLIAMSON		
CONT.	SECT.	JOB	HIGHWAY NO.	
0914	05	174	CR 452	

**STORMWATER POLLUTION PREVENTION PLAN (SWP3):**

**2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE**

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

**2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:**

**T / P**

- Protection of Existing Vegetation
- Vegetated Buffer Zones
- Soil Retention Blankets
- Geotextiles
- Mulching/ Hydromulching
- Soil Surface Treatments
- Temporary Seeding
- Permanent Planting, Sodding or Seeding
- Biodegradable Erosion Control Logs
- Rock Filter Dams/ Rock Check Dams
- Vertical Tracking
- Interceptor Swale
- Riprap
- Diversion Dike
- Temporary Pipe Slope Drain
- Embankment for Erosion Control
- Paved Flumes
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.2 SEDIMENT CONTROL BMPs:**

**T / P**

- Biodegradable Erosion Control Logs
- Dewatering Controls
- Inlet Protection
- Rock Filter Dams/ Rock Check Dams
- Sandbag Berms
- Sediment Control Fence
- Stabilized Construction Exit
- Floating Turbidity Barrier
- Vegetated Buffer Zones
- Vegetated Filter Strips
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

**2.3 PERMANENT CONTROLS:**

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

**2.4 OFFSITE VEHICLE TRACKING CONTROLS:**

- Excess dirt/mud on road removed daily
- Haul roads dampened for dust control
- Loaded haul trucks to be covered with tarpaulin
- Stabilized construction exit
- Other: \_\_\_\_\_

Other: \_\_\_\_\_

Other: \_\_\_\_\_

Other: \_\_\_\_\_

\_\_\_\_\_

**2.5 POLLUTION PREVENTION MEASURES:**

- Chemical Management
- Concrete and Materials Waste Management
- Debris and Trash Management
- Dust Control
- Sanitary Facilities
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.6 VEGETATED BUFFER ZONES:**

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

**2.7 ALLOWABLE NON-STORMWATER DISCHARGES:**

- Fire hydrant flushings
- Irrigation drainage
- Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- Potable water sources
- Springs
- Uncontaminated groundwater
- Water used to wash vehicles or control dust
- Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

**2.8 INSPECTIONS:**

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3 .

**2.9 MAINTENANCE:**

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3.

**STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)**



FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	BR 2020 (731)		83A
STATE	STATE DIST.	COUNTY	
TEXAS	AUS	WILLIAMSON	
CONT.	SECT.	JOB	HIGHWAY NO.
0914	05	174	CR 452

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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. BRANCH OF MUSTANG CREEK - NWP #14
- 2.
- 3.
- 4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

**Best Management Practices:**

Erosion	Sedimentation	Post-Construction TSS
<input checked="" type="checkbox"/> Temporary Vegetation	<input checked="" type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input checked="" type="checkbox"/> Blankets/Matting	<input checked="" type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Vegetation Lined Ditches
	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	<input type="checkbox"/> Grassy Swales

**III. CULTURAL RESOURCES**

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- No Action Required  Required Action

Action No.

- 1.
- 2.
- 3.
- 4.

**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. Comply with Executive Order 13112 on Invasive Species if and when applicable.
2. See the special provisions for vegetation in Item 7 of the general notes.
3. See the special provisions for water quality in Item 7 of the general notes.
- 4.

**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. See the special provisions for terrestrial amphibians and reptiles in Item 7 of the general notes.
2. See the special provisions for aquatic amphibians and reptiles in Item 7 of the general notes.
- 3.
- 4.

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.
- 2.
- 3.


**VII. OTHER ENVIRONMENTAL ISSUES**

(includes regional issues such as Edwards Aquifer District, etc.)

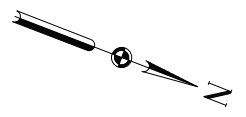
- No Action Required  Required Action

Action No.

1. The project is located in a Federal Emergency Management Agency mapped floodplain. Notify the local floodplain administrator as necessary and comply with all applicable rules and regulations regarding hydraulic design of the project.
- 2.
- 3.

 <b>Texas Department of Transportation</b>		<b>Design Division Standard</b>		
<h2 style="margin: 0;">ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS</h2> <h1 style="margin: 0;">EPIC</h1>				
FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
12-12-2011 (DS) REVISIONS	0914	05	174	CR 452
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.	AUS	WILLIAMSON	84	

FILENAME: pw:\kh-pw-bent\kimley-horn\Documents\01 Active Projects\TX-AUS-069284003 - Williamson County Bridges\DesignData\4 - Design\Plan Set\10. Environmental\CR452 SW3P.dgn  
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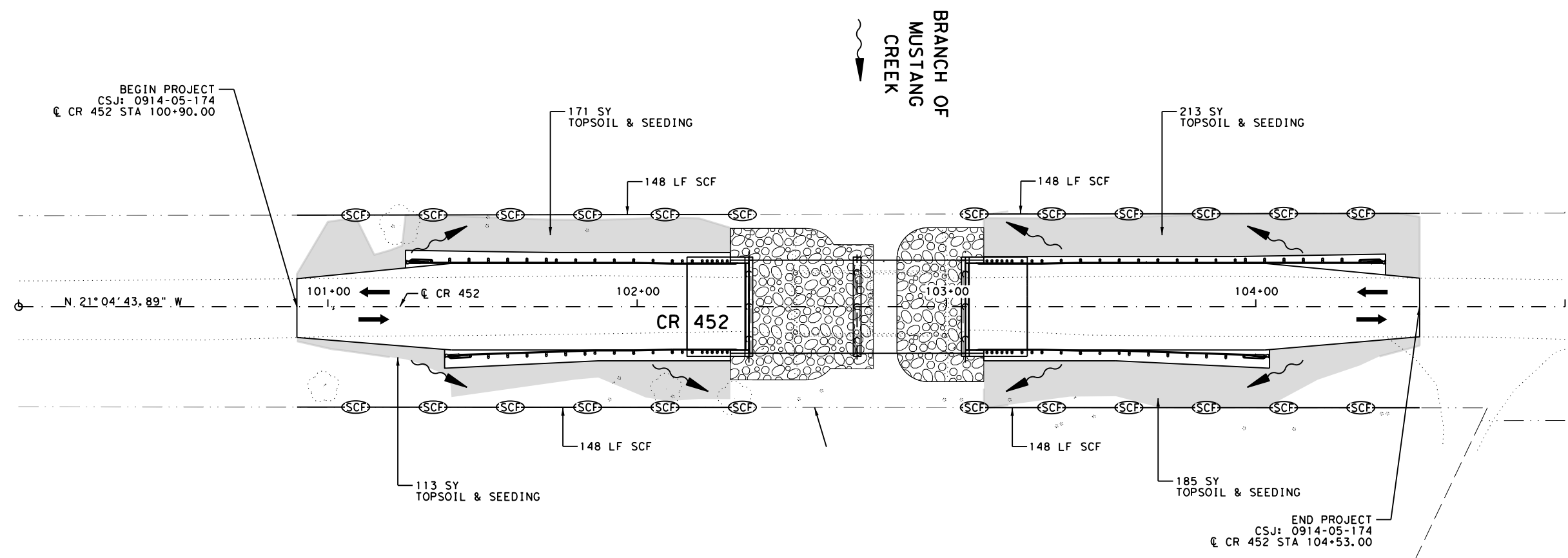
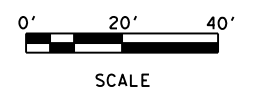


**LEGEND**

- TEMPORARY SEDIMENT CONTROL FENCE
- FLOW DIRECTION
- PROPOSED SOIL RETENTION BLANKETS, TOPSOIL & SEEDING
- TRAFFIC DIRECTION
- PROPOSED RIPRAP

**NOTES:**

1. ALL SW3P MEASURES ARE TO BE PLACED WITHIN TXDOT RIGHT OF WAY AND AS SHOWN IN STANDARDS EC (1) - EC (2).
2. ONCE INSTALLED, SILT FENCE SHALL REMAIN IN PLACE THROUGHOUT ALL PHASES OF CONSTRUCTION, OR AS DIRECTED.



*TJN*  
 11/3/2022  
  
 TREY NEAL  
 106194  
 LICENSED PROFESSIONAL ENGINEER

**Kimley»Horn** F-928

Texas Department of Transportation

**CR 452 AT BRANCH OF MUSTANG CREEK  
 EROSION CONTROL LAYOUT**

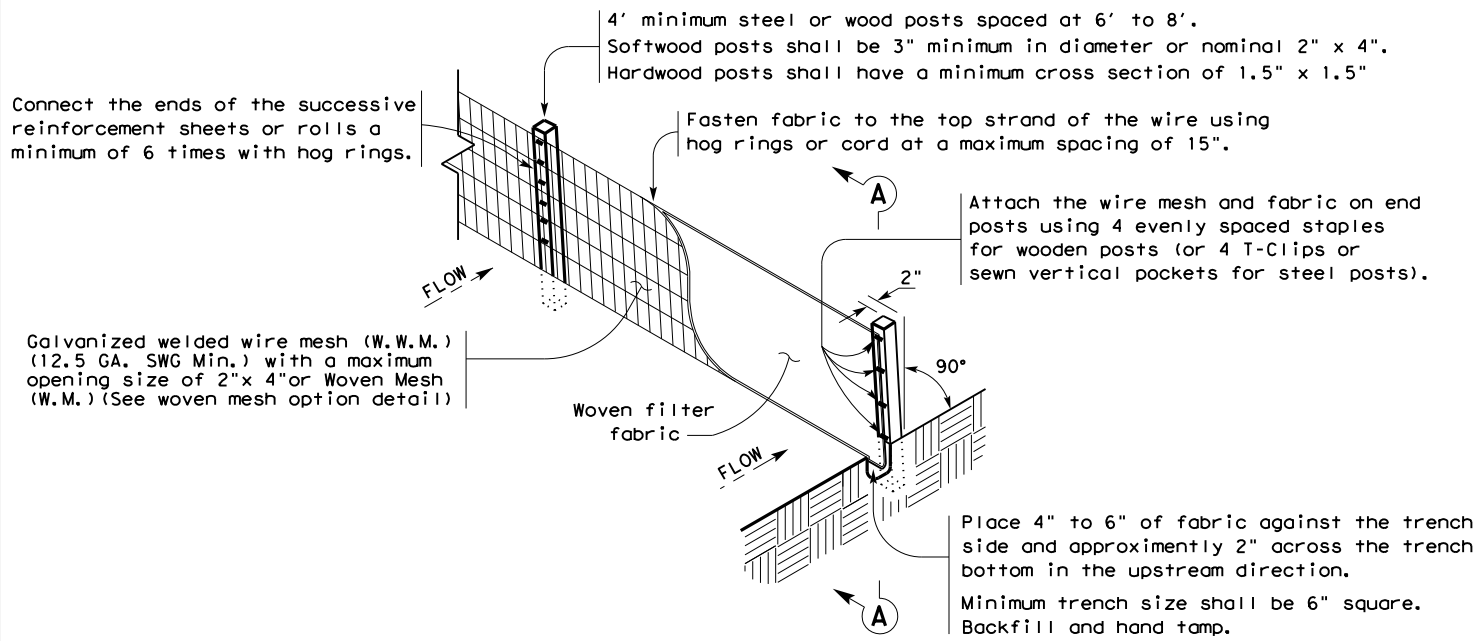
SHEET 1 OF 1

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
	0914	05	174	CR 452
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		85



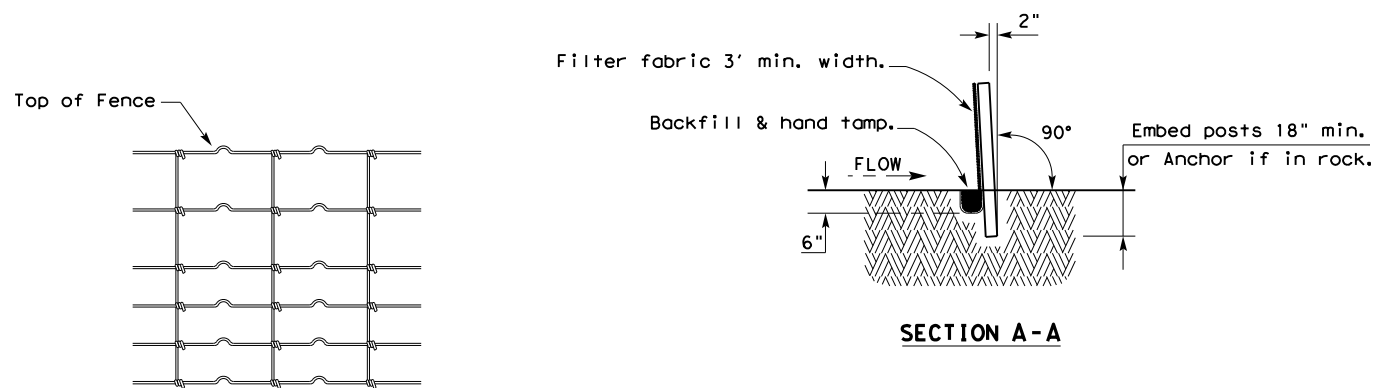
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**TEMPORARY SEDIMENT CONTROL FENCE**

SCF



**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<sup>2</sup>. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

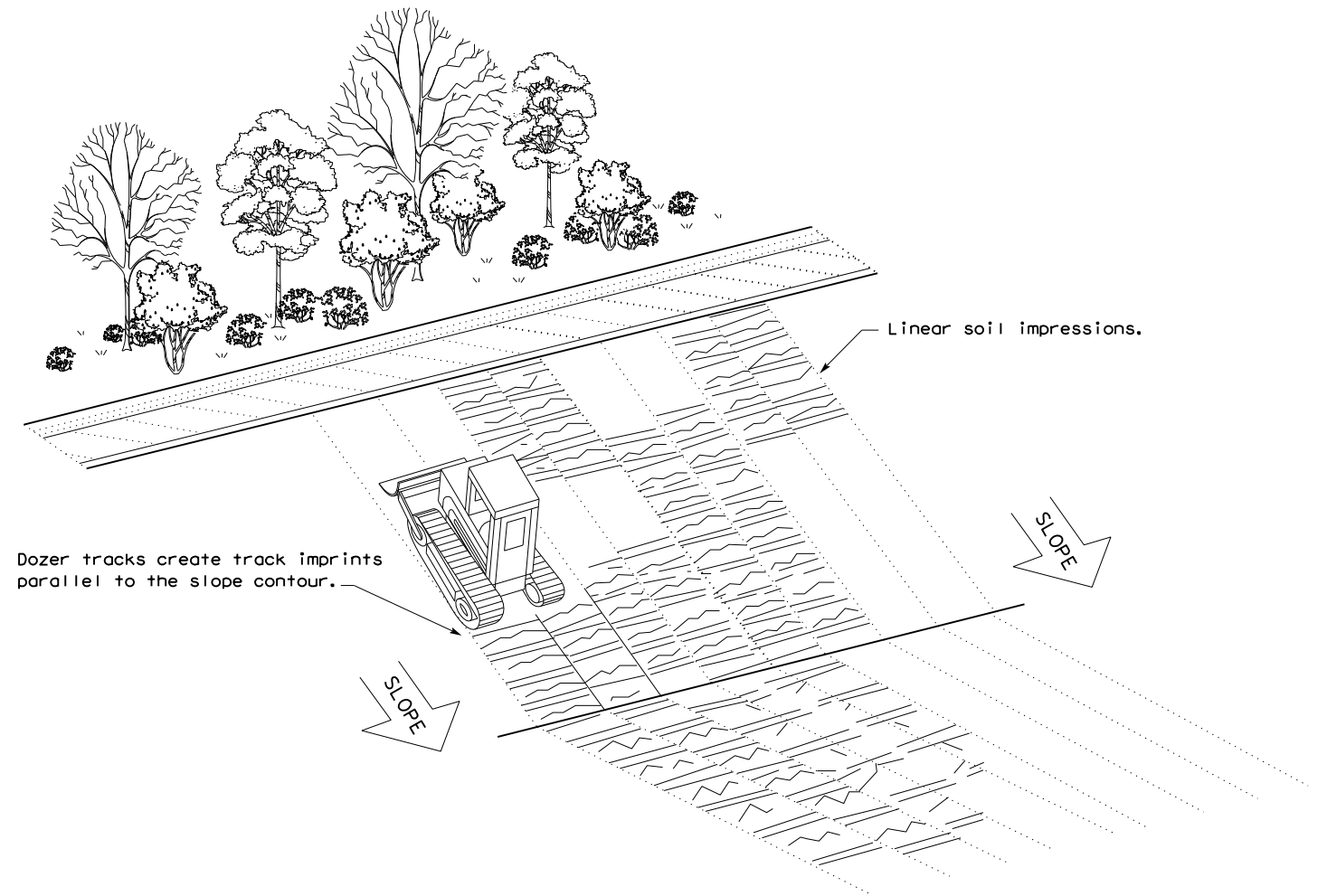
**LEGEND**

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 continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.

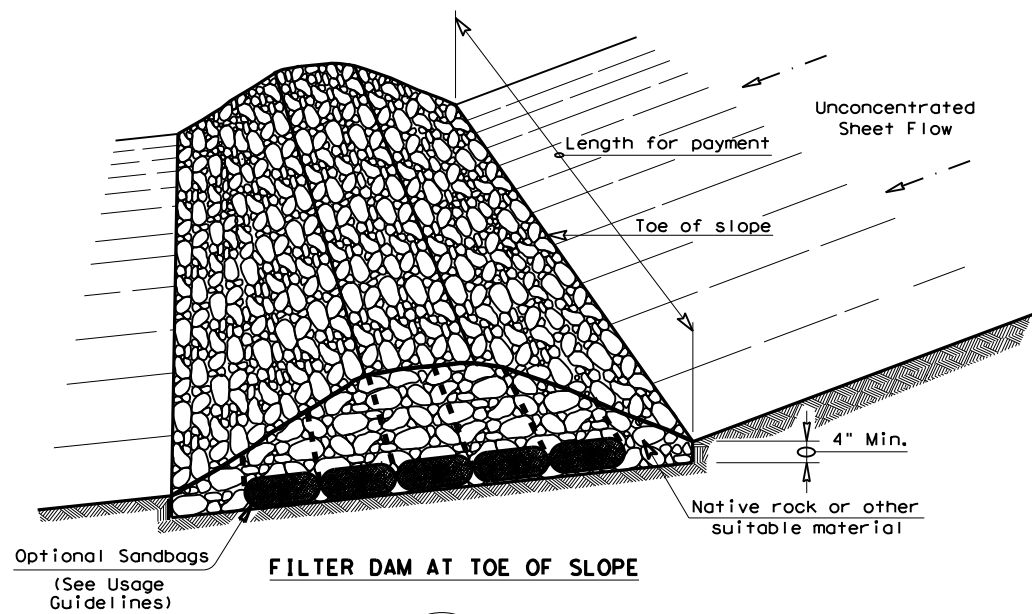


**VERTICAL TRACKING**

				Design Division Standard	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE &amp; VERTICAL TRACKING</b> <b>EC(1) - 16</b>					
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0914	05	174	CR 452	
	DIST	COUNTY		SHEET NO.	
	AUS	WILLIAMSON		86	

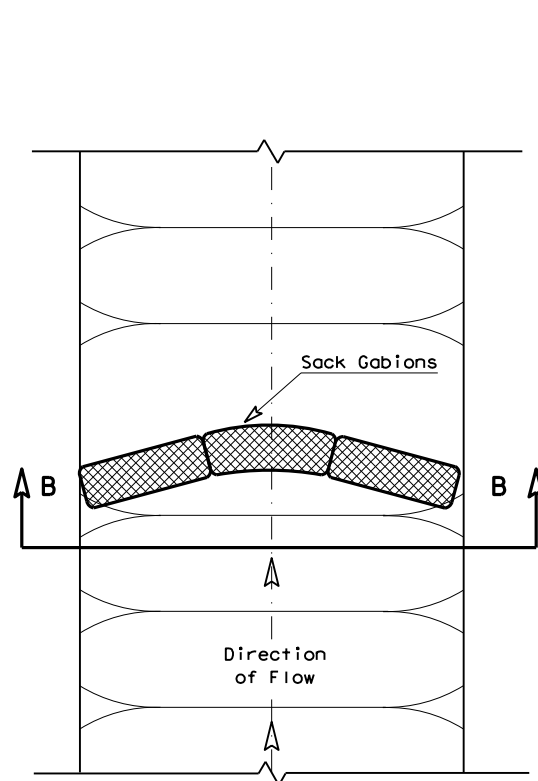
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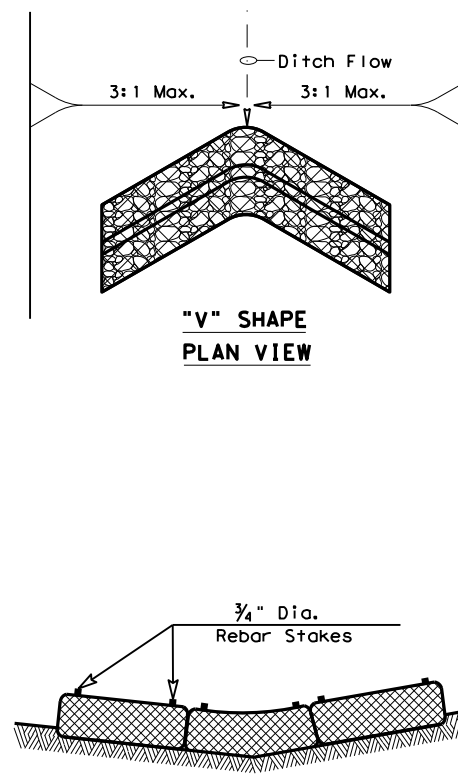


**FILTER DAM AT TOE OF SLOPE**

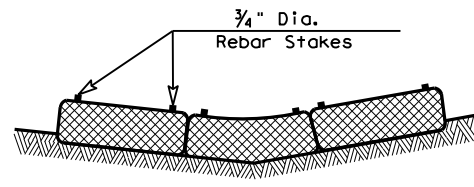
(RFD1)



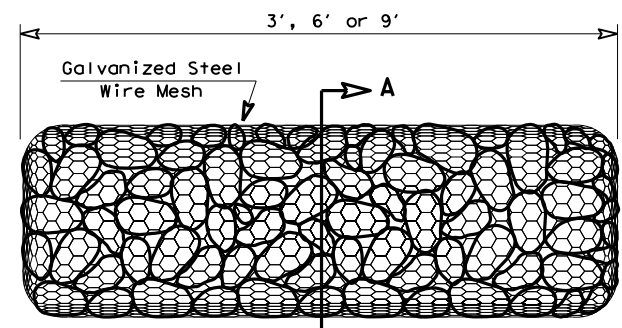
**PLAN VIEW**



**"V" SHAPE PLAN VIEW**

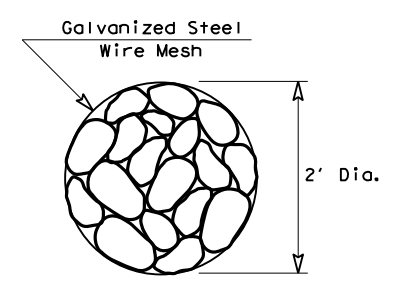


**SECTION B-B**

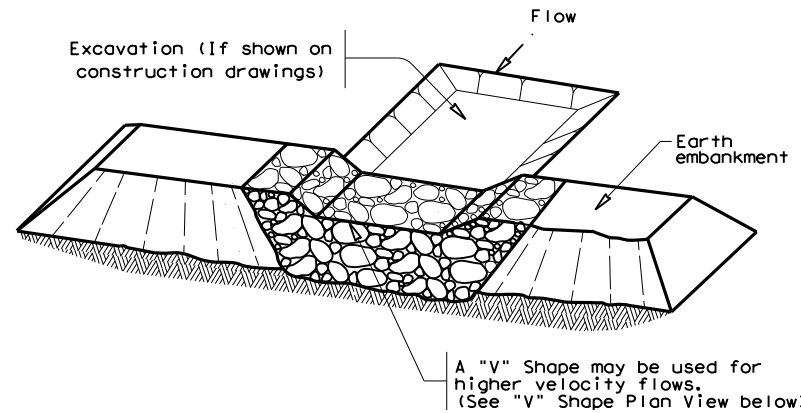


**TYPE 4 (SACK GABIONS)**

(RFD4)

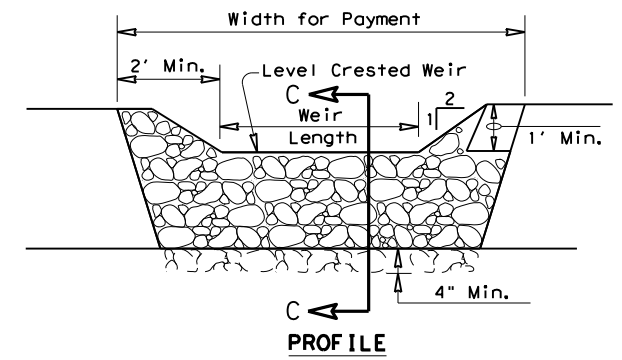


**SECTION A-A**

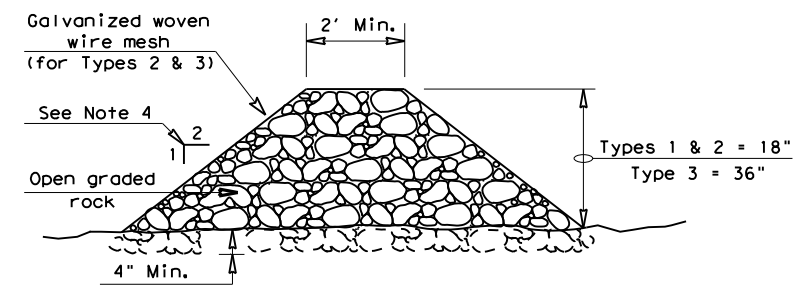


**FILTER DAM AT SEDIMENT TRAP**

(RFD1) OR (RFD2)



**PROFILE**



**SECTION C-C**

**ROCK FILTER DAM USAGE GUIDELINES**

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT<sup>2</sup> of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

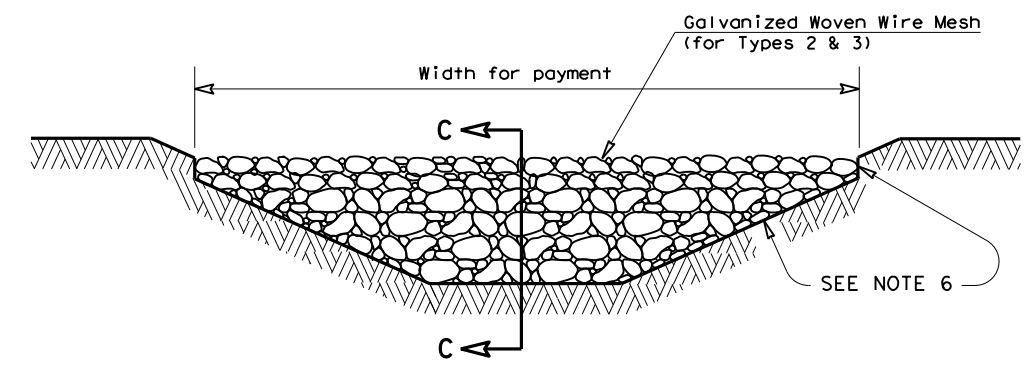
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximately 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



**FILTER DAM AT CHANNEL SECTIONS**

(RFD1) OR (RFD2) OR (RFD3)

**GENERAL NOTES**

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with 3/4" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4".
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.

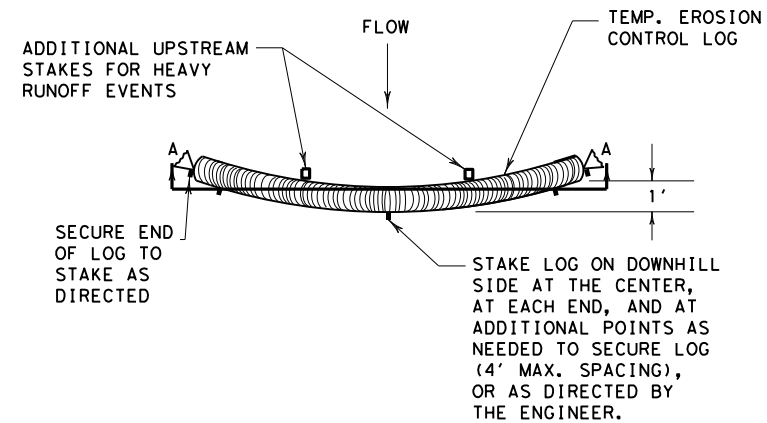
**PLAN SHEET LEGEND**

- Type 1 Rock Filter Dam (RFD1)
- Type 2 Rock Filter Dam (RFD2)
- Type 3 Rock Filter Dam (RFD3)
- Type 4 Rock Filter Dam (RFD4)

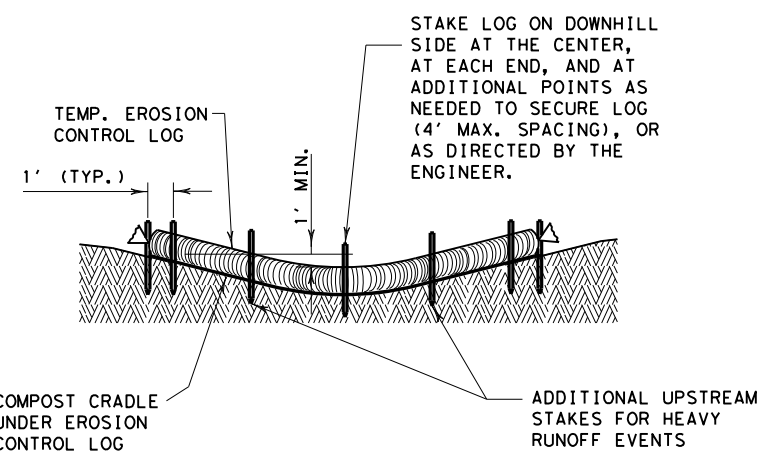
		<b>Design Division Standard</b>	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>ROCK FILTER DAMS</b> <b>EC(2) - 16</b>			
FILE: ec216	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT: 0914	SECT: 05	JOB: 174
REVISIONS	DIST: AUS	COUNTY: WILLIAMSON	SHEET NO.: 87

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PLAN VIEW

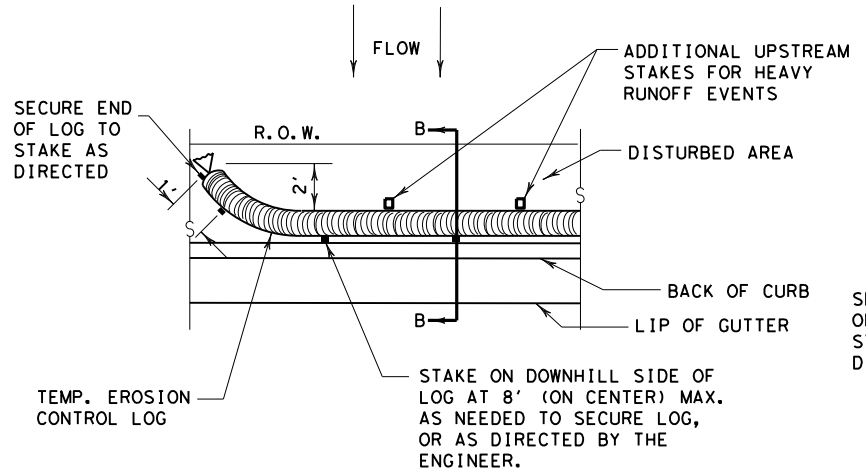


SECTION A-A  
 EROSION CONTROL LOG DAM

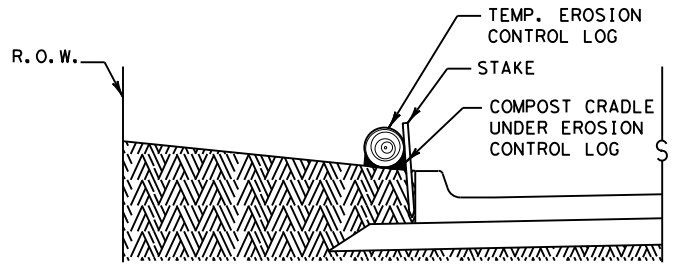
CL-D

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

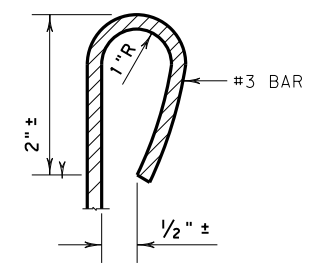


PLAN VIEW

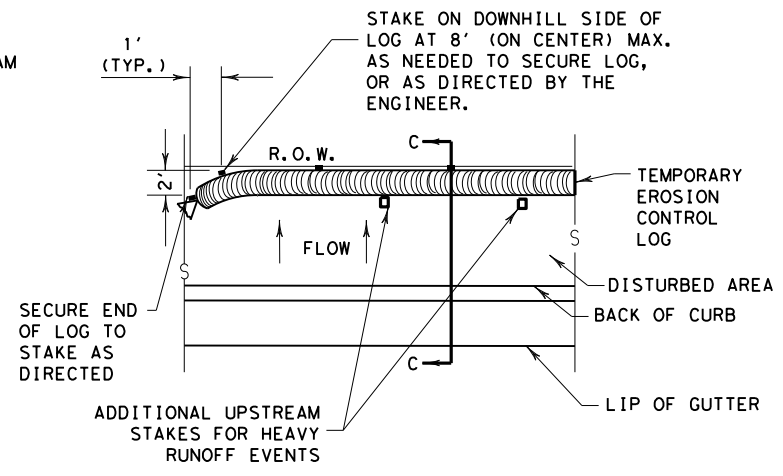


SECTION B-B  
 EROSION CONTROL LOG AT BACK OF CURB

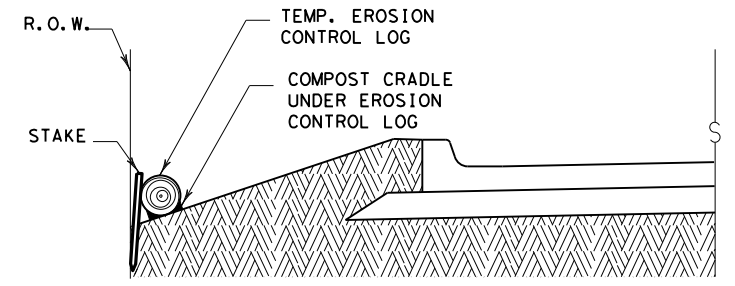
CL-BOC



REBAR STAKE DETAIL



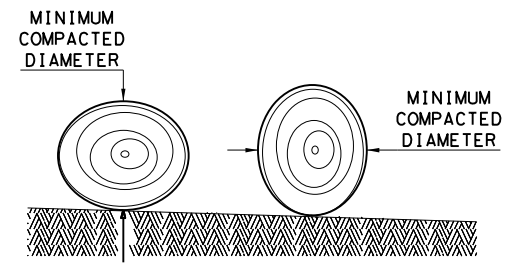
PLAN VIEW



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

**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.

GENERAL NOTES:

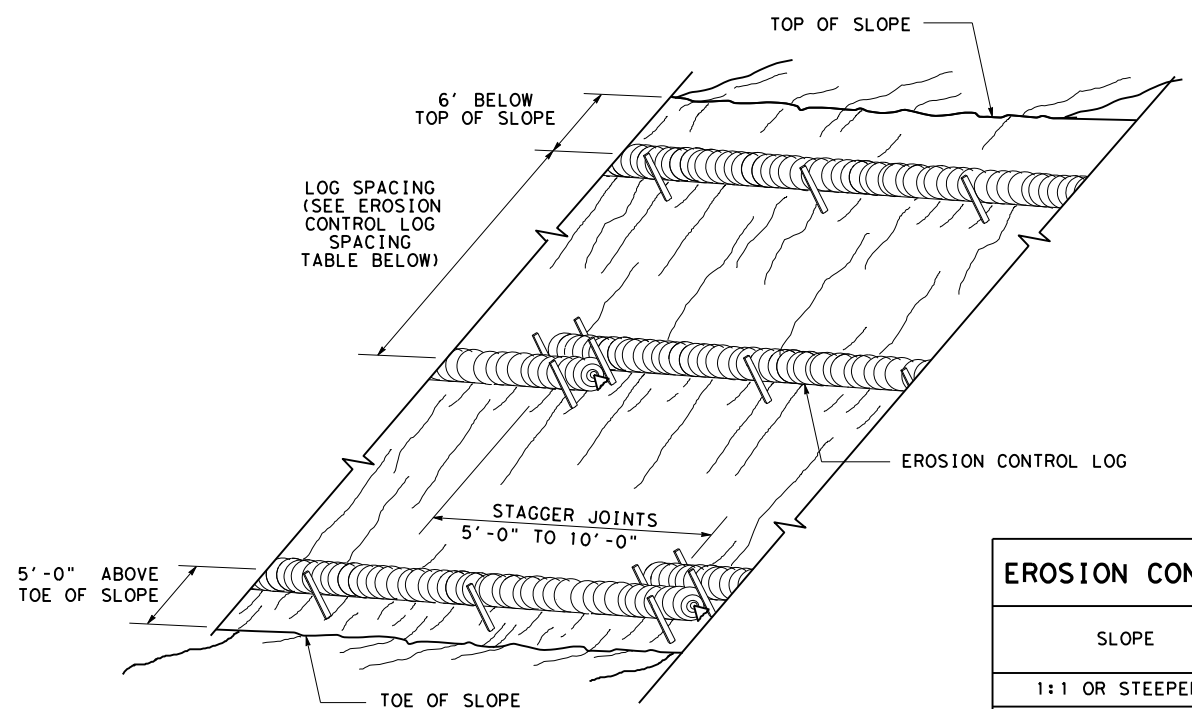
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE 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.

SHEET 1 OF 3

		<i>Design Division Standard</i>	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>EROSION CONTROL LOG</b> <b>EC (9) - 16</b>			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT: 0914	SECT: 05	JOB: 174
REVISIONS	DIST: AUS		COUNTY: WILLIAMSON
			SHEET NO.: 88

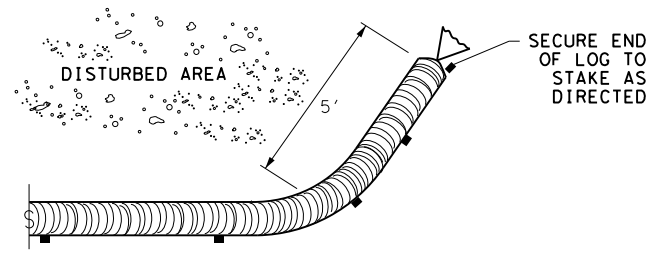
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DATE: 11/3/2022  
 FILE: c:\pwworking\kh1\d0215090\ec916.dgn



**EROSION CONTROL LOGS ON SLOPES  
 STAKE AND TRENCHING ANCHORING**

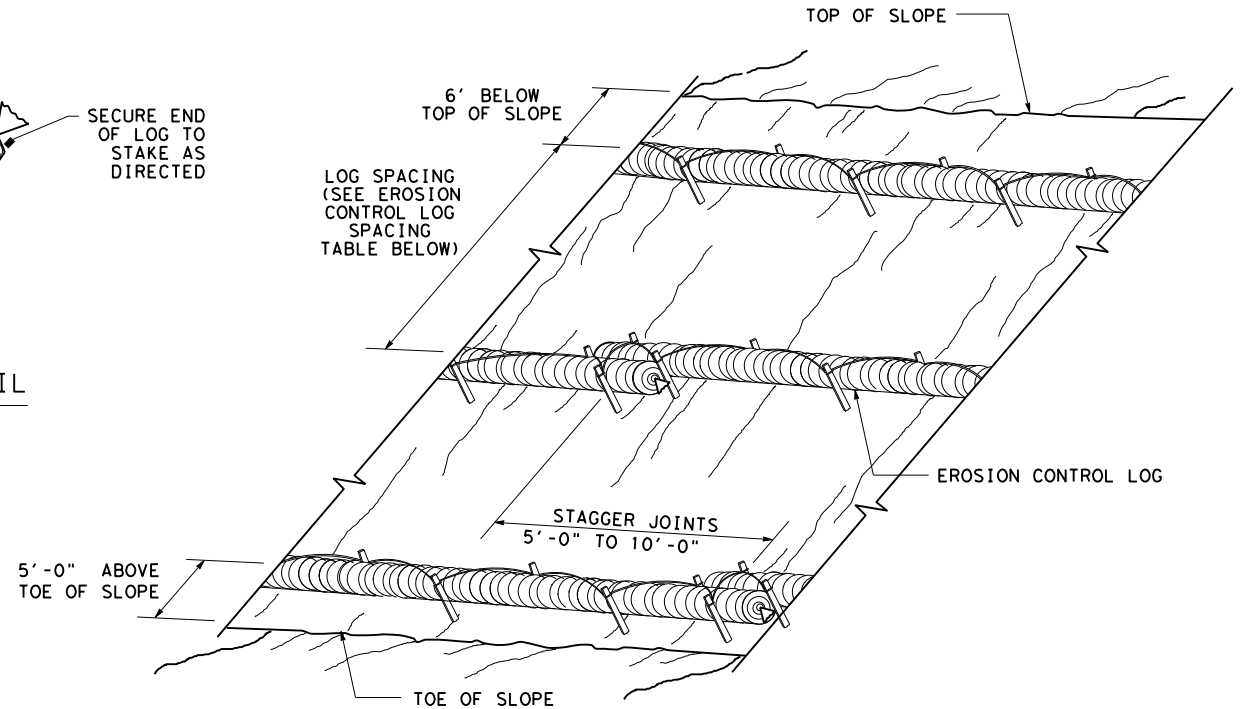
CL-SST



**END SECTION RAP DETAIL**

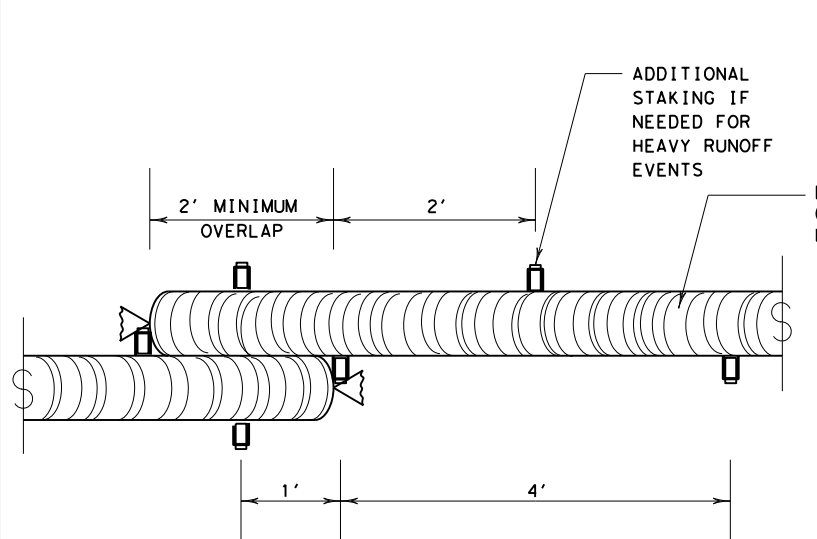
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

\* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:  
 SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;  
 HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



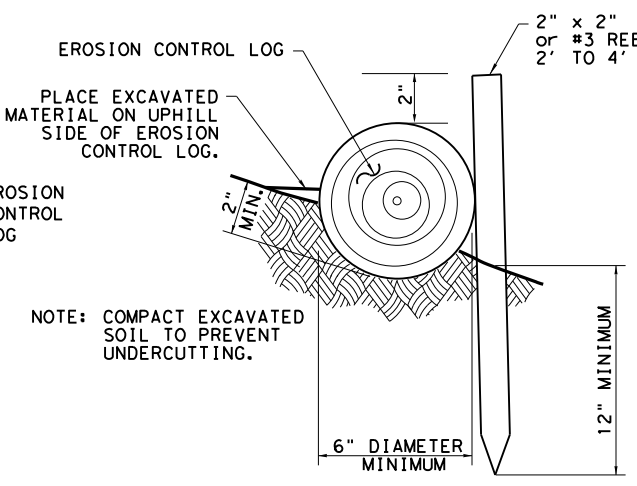
**EROSION CONTROL LOGS ON SLOPES  
 STAKE AND LASHING ANCHORING**

CL-SSL

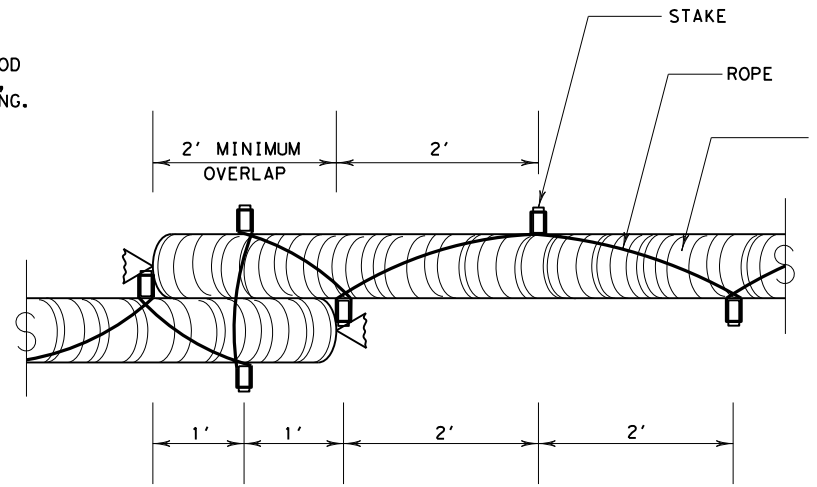


**STAKE AND TRENCHING ANCHORING DETAIL**

CL-SST

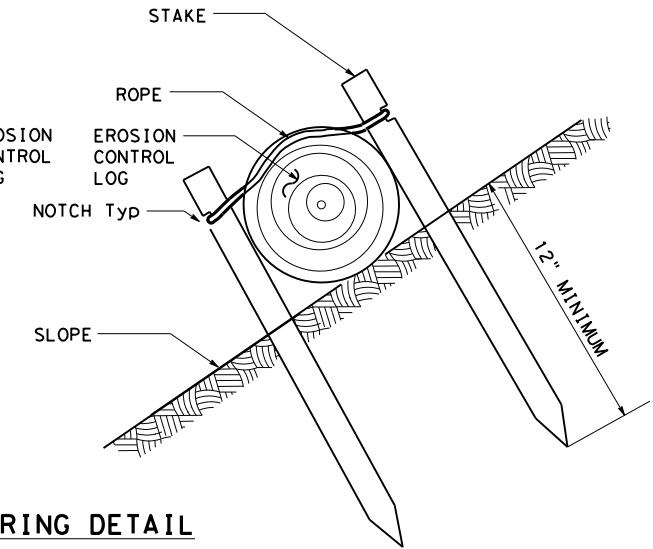


NOTE: COMPACT EXCAVATED SOIL TO PREVENT UNDERCUTTING.



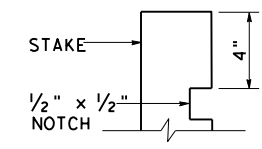
**STAKE AND LASHING ANCHORING DETAIL**

CL-SSL



LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"

**TRENCH DEPTH TABLE**



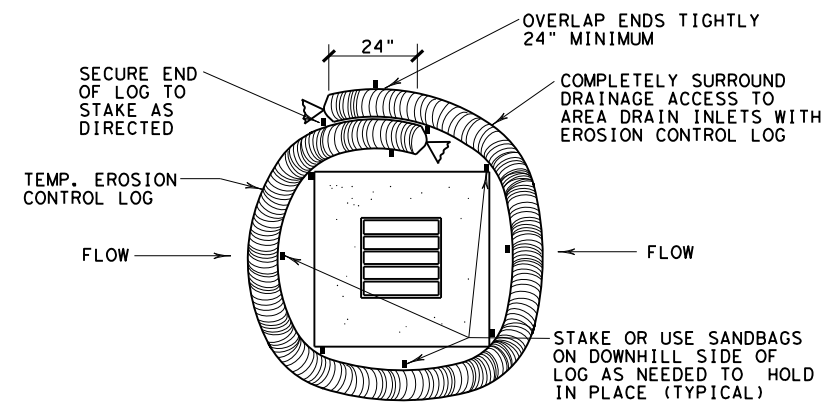
**STAKE NOTCH DETAIL**

SHEET 2 OF 3

		Design Division Standard	
<b>TEMPORARY EROSION,          SEDIMENT AND WATER          POLLUTION CONTROL MEASURES          EROSION CONTROL LOG          EC (9) - 16</b>			
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT SECT	JOB	HIGHWAY
REVISIONS	0914 05	174	CR 452
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	89	

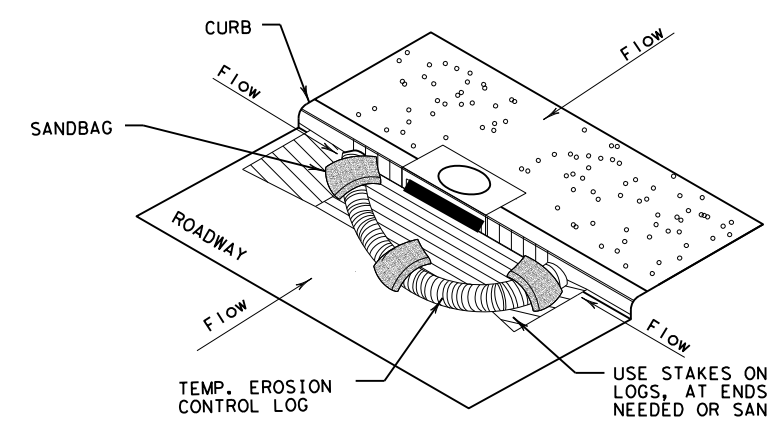
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DATE: 11/3/2022  
 FILE: c:\pw\khi\d0215090\ec916.dgn



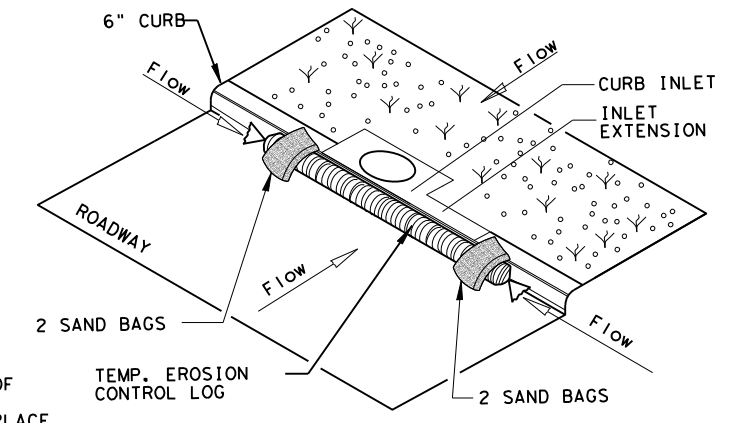
**EROSION CONTROL LOG AT DROP INLET**

CL-DI



**EROSION CONTROL LOG AT CURB INLET**

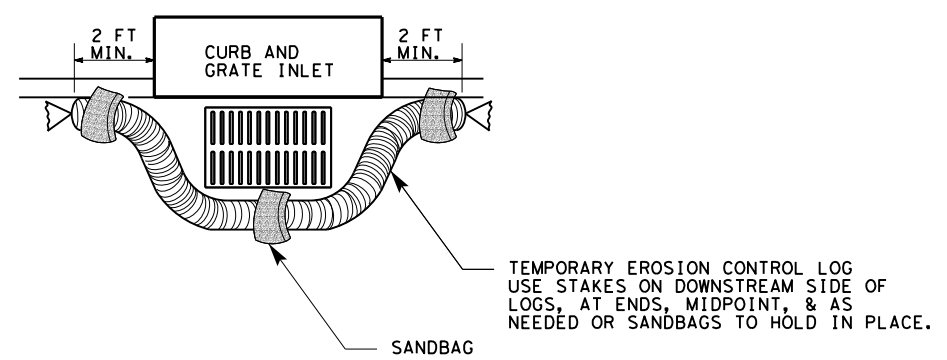
CL-CI



**EROSION CONTROL LOG AT CURB INLET**

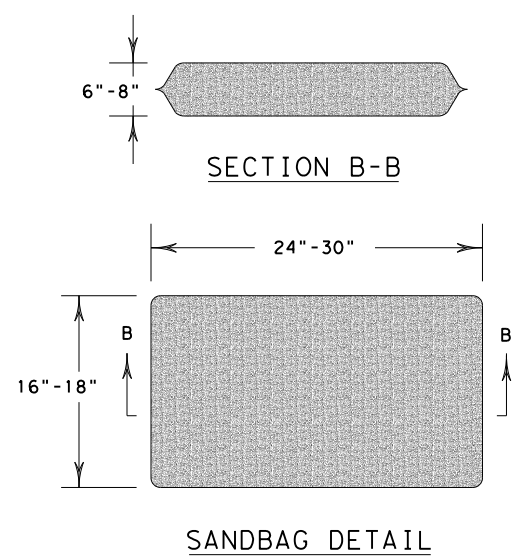
CL-CI

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



SHEET 3 OF 3

		<i>Design Division Standard</i>	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>EROSION CONTROL LOG</b> <b>EC (9) - 16</b>			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
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REVISIONS	0914	05	174
DIST	COUNTY		SHEET NO.
AUS	WILLIAMSON		90