

# STATE OF TEXAS DEPARTMENT OF TRANSPORTATION

## PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NUMBER  
F 2023(988)  
STATE PROJECT NUMBER  
CSJ: 0113-07-072

LIMITS: US 290 AT TRAUTWEIN RD.

FOR THE CONSTRUCTION OF: INTERSECTION AND OPERATIONAL IMPROVEMENTS  
CONSISTING OF: INTERSECTION IMPROVEMENTS

HAYS COUNTY  
US 290

NET LENGTH OF ROADWAY = 1,282.73 FT=0.243 MILES  
NET LENGTH OF BRIDGE = 0.00 FT (0.000 MILES)  
NET LENGTH OF PROJECT = 1870.44 FT (0.354 MILES)

FED. RD. DIST. NO.	STATE AID PROJECT NO.	SHEET NO.
6	F 2023(988)	1
STATE	STATE DIST.	COUNTY
TX	AUS	HAYS
CONT.	SECT.	JOB HIGHWAY NO.
0113	07	072 US 290

US 290  
DESIGN SPEED = 50 MPH  
ADT = 32,841 (2023)  
ADT = 41,380 (2043)

### 100% SUBMITTAL

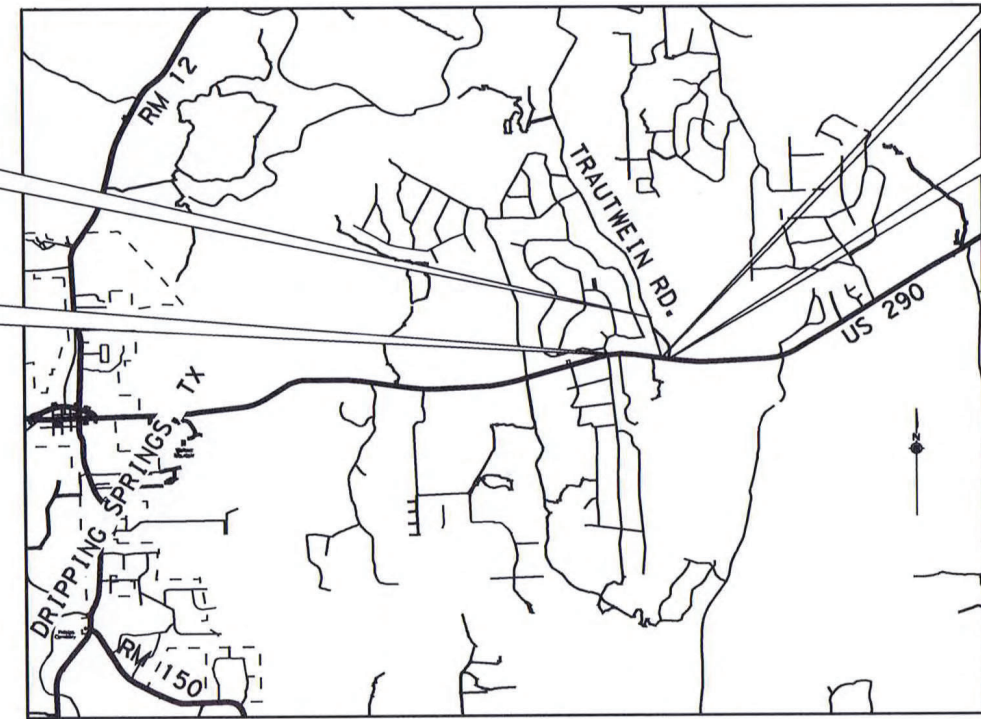
DATE: 4/13/2023

BEGIN PROJECT  
CSJ: 0113-07-072  
STA. 13+75.00 (TRAUT)  
REF MRKR: 560  
DFO: 3.792

BEGIN PROJECT  
CSJ: 0113-07-072  
STA. 208+75.00 (US 290)  
REF MRKR: 560  
MILE PT: 560+0.072  
DFO: 100.257

END PROJECT  
CSJ: 0113-07-072  
STA. 19+62.71 (TRAUT)  
REF MRKR: 560  
DFO: 3.903

END PROJECT  
CSJ: 0113-07-072  
STA. 221+57.73 (US 290)  
REF MRKR: 560  
MILE PT: 560+0.252  
DFO: 100.437



VICINITY MAP  
N.T.S.



APPROVED BY:  
HAYS COUNTY

*[Signature]* 4/14/2023  
DATE

COMMISSIONER WALT SMITH  
HAYS COUNTY COMMISSIONER, PRECINCT 4

SUBMITTED FOR LETTING:

DocuSigned by:  
*[Signature]*  
4/25/2023

AREA ENGINEER

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

\_\_\_\_\_  
AREA ENGINEER

\_\_\_\_\_  
DATE

EXCEPTIONS: NONE  
EQUATIONS: NONE  
RAILROAD CROSSINGS: NONE  
WATERSHED: ONION CREEK  
AREA OF DISTURBANCE: 0.968 AC

SUBMITTED FOR LETTING: 4/14/2023

DocuSigned by:  
*[Signature]*  
4/25/2023

DISTRICT DESIGN ENGINEER

RECOMMENDED FOR LETTING:

DocuSigned by:  
*[Signature]*  
4/25/2023

DISTRICT DESIGN ENGINEER

REGISTERED ACCESSIBILITY SPECIALIST (RAS) 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).

**wsb** WSB & ASSOCIATES, INC.  
FIRM # 16849



CORRECT: 4/13/2023

*[Signature]*  
CONSULTANT ENG. (TBPE FIRM REG. F-16849)

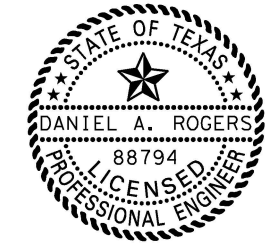
APPROVED FOR LETTING:

DocuSigned by:  
*[Signature]*  
4/27/2023

DIRECTOR OF TRANSPORTATION  
PLANNING & DEVELOPMENT

INDEX OF SHEETS

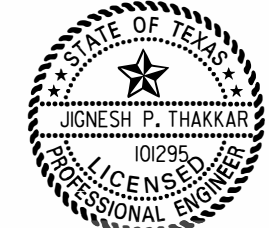
THE STANDARD SHEETS IDENTIFIED WITH "+" HAVE BEEN SELECTED BY ME OR UNDER MY SUPERVISION AND ARE APPLICABLE TO THIS PROJECT.



*Daniel A. Rogers*

DANIAL A. ROGERS, P.E. 4/11/2023  
DATE

THE STANDARD SHEETS IDENTIFIED WITH "\*" HAVE BEEN SELECTED BY ME OR UNDER MY SUPERVISION AND ARE APPLICABLE TO THIS PROJECT.




*Jignesh P. Thakkar*


JIGNESH P. THAKKAR, P.E. 4/11/2023  
DATE

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**HAYS COUNTY**

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**WSB & ASSOCIATES, INC.**  
FIRM # 16849

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**US 290 AT  
TRAUTWEIN ROAD  
INDEX OF SHEETS**

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DATE: 4/11/2023		SHEET 1 OF 1	
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07 072	US 290	2

Filename: ...\\P1an\016874-000\*IND01\*IT.dgn  
 Date: 4/11/2023



**GENERAL NOTES: Version: March 31, 2023**

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
3076	<b>Dense-Graded Hot-Mix Asphalt and Superpave</b>	110 LB/SY/IN
3079	<b>Permeable Friction Course (PFC)</b>	90.0 LB/SY/IN
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

**The following standard detail sheet or sheets have been modified:**

**Modified Standards  
RW (CB) – MOD**

**GENERAL**

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

South Austin [Mark.Baumann@txdot.gov](mailto:Mark.Baumann@txdot.gov)  
South Austin [Shane.Swimm@txdot.gov](mailto:Shane.Swimm@txdot.gov)

Questions and requests 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.

Contact the supervisor for the passenger facility at Capital Metro and request the relocation of Capital Metro signs. Contact the supervisor at (512) 385-0190.

Equip all construction equipment used in roadway work with highly visible omnidirectional flashing warning lights.

Intelligent Transportation Systems (ITS) Infrastructure may exist within the limits of this project and that the system must remain operational throughout construction. The exact location of ITS Infrastructure is not known. Contact the TxDOT Area Engineer's or Inspection Team's Office for the location(s) at least 72 hours before commencing any work that might affect present ITS Infrastructure. In the event of system damage, notify TxDOT/CTECC at (512) 974-0883 within one hour of occurrence. Refer to Item 6000 for additional details.

Two abandoned buried fiber optic lines are located within project limits. One line is approximately 193' and one is approximately 190'. Additional details are provided on utility layout sheets in plans.

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

Construct all manholes/valves to final pavement elevations prior to the placement of final surface. If the manholes/valves are going to be exposed to traffic, place temporary asphalt around the manhole/valve to provide a 50:1 taper. The asphalt taper is subsidiary to the ACP work.

Keep the roadway free of debris and sediment caused by construction activities. Dispose of all material in accordance with federal, state, and local regulations. This work is subsidiary.

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.

#### ITEM 5 – CONTROL OF THE WORK

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

Provide a 72 hour advance email notice to [AUS\\_Locate@TxDOT.gov](mailto:AUS_Locate@TxDOT.gov) to request illumination, traffic signal, ITS, or toll equipment utility locates. Provide [AUS\\_Locate@TxDOT.gov](mailto:AUS_Locate@TxDOT.gov) an electronic pdf of as-builts within 21 calendar days of illumination, traffic signal, ITS, or toll equipment being placed into operation. As-built shall include GPS coordinates of manholes and junction boxes. Include final version of RFI's and revised plan sheets.

#### 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/business/resources/highway/bridge/shop-drawing-submittal-cycle.html). 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.

#### Thermoplastic Pipe Alternate Proposals

When a reinforced concrete or corrugated metal pipe is included in the plans, a thermoplastic polypropylene pipe alternate may be submitted in a 2-phase process. 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.

Phase 1 submit an official request to TxDOT PM with a summary of proposed locations, max depth of placement for each location, cover depth, and pipe diameters. TxDOT goal is to review and respond within 10 days. Phase 1 approval does not guarantee Phase 2 approval.

Phase 2 submit the following documents with all documents signed and sealed by a licensed Engineer in the state of Texas. 1-Provide a redline or revised set of drainage plans reflecting the revised locations. 2-Provide certification that the use of the alternate pipe and proposed bedding are adequate for the proposed application, depth, etc. 3-Provide a completed thermoplastic pipe installation drawing using the following,

<https://ftp.txdot.gov/pub/txdot/brg/thermoplastic-pipe-installation-drawing.pdf>  
<https://ftp.txdot.gov/pub/txdot/brg/thermoplastic-pipe-installation-drawing.dgn>

For all uses of thermoplastic pipe as an alternate, furnish, install, and inspect the thermoplastic pipe in accordance with SS4216 or latest thermoplastic pipe special specification at time of letting. Minimum values, such as cover depth, required by the specification, installation drawing, etc. will not be waived. Use granular backfill unless flowable fill or CSB is required by the alternate design. Backfill locations shown in the bid plans using flowable fill or CSB must use the backfill per the bid plans.

#### Electronic Shop Drawing Submittals.

Submit electronic shop drawing submittals according to the current [Guide to Electronic Shop Drawing Submittal](http://www.txdot.gov/business/resources/highway/bridge/shop-drawing-submittal-cycle.html), <https://www.txdot.gov/business/resources/highway/bridge/shop-drawing-submittal-cycle.html>. Pre-approved producers can be found online at <https://www.txdot.gov/business/resources/materials/material-producer-list.html>. 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

South Austin      [Mark.Baumann@txdot.gov](mailto:Mark.Baumann@txdot.gov)      [AUS\\_SA-ShopReview@txdot.gov](mailto:AUS_SA-ShopReview@txdot.gov)

#### Alignment and Profile.

Unless shown in the plans, profile and alignment data for roadways being overlaid or widened are for design verification only. Provide survey and construct the roadway in accordance with the typical section. Bid items and data may be provided to adjust cross slope and super elevations.

#### ITEM 6 - CONTROL OF MATERIALS

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

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 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. [Buy America material classification sheet \(txdot.gov\)](http://www.txdot.gov/business/resources/materials/material-producer-list.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.

No significant traffic generator events identified.



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.

#### **PSL in Edwards Aquifer Recharge and Contributing Zone.**

Obtain written approval from the Engineer for all on or off right of way PSLs not specifically addressed in the plans. Provide a signed sketch of the location 30 business days prior to use of the PSL. Include a list of materials, equipment and portable facilities that will be stored at the PSL. TxDOT will coordinate with the necessary agencies. Approval of the PSL is not guaranteed. Un approved PSL is not a compensable impact.

#### **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.

#### **Law Enforcement Personnel.**

Submit charge summary and invoices using the Department forms.

Patrol vehicles must be clearly marked to correspond with the officer's agency and equipped with appropriate lights to identify them as law enforcement. For patrol vehicles not owned by a law enforcement agency, markings will be retroreflective and legible from 100 ft. from both sides and the rear of the vehicle. Lights will be high intensity and visible from all angles.

No payment will be made for law enforcement personnel needed for moving equipment or payment for drive time to/from the event site. A minimum number of hours is not guaranteed. Payment is for work performed. If the Contractor has a field office, provide an office location for a supervisory officer when event requires a supervising officer. This work is subsidiary.

A maximum combined rate of \$70 per hour for the law enforcement personnel and the patrol vehicle will be allowed. Any scheduling fee is subsidiary per Standard Specification 502.4.2.

Cancel law enforcement personnel when the event is canceled. Cancellation, minimums or "show up" fees will not be paid when cancellation is made 12 hours prior to beginning of the event. Failure to cancel within 12 hours will not be cause for payment for cancellation, minimums, or "show up" time. Payment of actual "show up" time to the event site due to cancellation will be on a case-by-case basis at a maximum of 2 hours per officer.

Alterations to the cancellation and maximum rate must be approved by the Engineer or pre-determined by official policy of the officers governing authority.

#### **ITEM 8 – PROSECUTION AND PROGRESS**

The sequence of work shown on the plans demonstrates a volume of work available in each phase of construction that will ensure the Contractor is not impacted by the unclear ROW, railroad, and utilities. A deviation from the sequence of work shown on the plans must be approved by the Engineer.

Electronic versions of schedules will be saved in Primavera P6 format.

Working days will be charged in accordance with 8.3.1.4, "Standard Workweek."

Special Provision 008-002 has been included to amend Standard Article 8.1 to extend the begin work date due to anticipated lead time in acquiring signal poles.

A CPM schedule in Primavera format and a PSSR is required. Use software fully compatible with Primavera P6.

**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.

**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.

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 204 – SPRINKLING**

Apply water for dust control as directed. When dust control is not being maintained, cease operations until dust control is maintained. Consider subsidiary to the pertinent Items.

**ITEM 216 - PROOF ROLLING**

Correct and perform “Proof Rolling” retest at the Contractor’s expense, to the satisfaction of the Engineer, when initial “Proof Rolling” yields a failing result.

**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.

**ITEM 300s – SURFACE COURSES AND PAVEMENTS**

Asphalt season is May 1 thru September 15. Emulsified Asphalt season is April 1 thru October 15. The latest work start date for asphalt season is August 1.

If an under seal is not provided, furnish a tack coat. Apply tack coat at 0.08 GAL/SY (residual). Apply non-tracking tack coat using manufacturer recommend rates.

**ITEM 310 – PRIME COAT**

Apply blotter material to all driveways and intersections. This work is subsidiary.

When Multi Option is allowed, provide MC 30, EC 30 or AE-P. MC 30 is not allowed in Travis County.

Rolling to ensure penetration is required.

**ITEM 320 - EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT**

Use of motor grader is allowed for placement of mixtures greater than 10 inches from the riding surface, when hot-mix is used in lieu of flexible base, or as allowed.

**ITEM 354 - PLANING AND TEXTURING PAVEMENT**

Contractor retains ownership of salvaged materials.

Unless shown on the plans, mill and resurface the work area during each shift on roadways with ADT greater than 20,000 or if milling will expose the flex base or subgrade per the typical section. Unless shown on the plans, mill and resurface a work area within 5 days for roadways with ADT 20,000 or less.

Taper permanent transverse faces 50 ft. per 1 in. Taper temporary transverse faces 25 ft. per 1 in. Taper permanent longitudinal faces 6 ft. per 1 in. HMA may be used as temporary tapers. Provide minimum 1 in. butt joints at bridge ends and paving ends. This work is subsidiary.

Milled surfaces directly covered by a mat thickness of 1 in. or less shall produce a milled texture with a ridge to valley depth (RVD) no greater than 0.25 in. (6.5 mm).

**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 work day.

**ITEM 420 – CONCRETE SUBSTRUCTURES**

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

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.

**ITEM 423 - RETAINING WALLS**

Mow strip shall be 2 ft. wide unless otherwise shown on the plans. Immediately backfill the face of the retaining wall after the wall height gets above the finish grade in front of the wall. Retaining wall coping gap from the face of the wall panel to the inside face of coping shall not be more than 1.5 in.

Provide a sample for approval of the surface finish prior to beginning fascia work and precast operations. Unless otherwise shown on the plans, the wall fascia shall receive an ashlar stone finish. This work is subsidiary.

**Type BS backfill will use modified gradation limits as shown below.**

Type	Sieve Size	Percent Retained
BS MOD	3 in.	0
	No. 4	85-100

Contractor to identify Prefabricated Modular Block Wall supplier from list of TxDOT approved providers. Supplier to provide shop drawings including cap details for review and approval prior to construction.

**ITEM 427 - SURFACE FINISHES FOR CONCRETE**

Provide a rub finish to Surface Area I.

Color coatings may be applied using concrete paint or opaque sealer.

**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 467 - SAFETY END TREATMENT**

Field adjust pipe end to maintain the necessary slope. Field cutting of pipe end is allowed. Coat all metal field cuts or exposed reinforcement with asphalt paint.

For all Type II SETs, provide riprap apron shown in the cast-in-place standards and precast riprap detail standard. This work is subsidiary.

Cast-in-place or precast will be allowed unless stated otherwise.

**ITEM 474 - LINEAR DRAINS**

Provide reformed circumferential corrugation ends if helical corrugated pipe is furnished.

Provide continuous draw openings in slotted drain pipes.

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

Table 1

Roadway	Limits	Allowable Closure Time
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

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.

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.

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) and Ty III barricades, on top of foundations that have protruding studs. This work is subsidiary.

Vertical panels used on roadways with speed limit 55mph or greater must be round in shape or have a self-righting mechanism. The "flat" or "oblong" shaped vertical panels are not allowed.

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.

For non-site specific signal projects, 2 months of barricades will be paid per work order location.

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

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

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

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.

#### **ITEM 530 – INTERSECTIONS, DRIVEWAYS, AND TURNOUTS**

Notify property owners at least 48 hr. before beginning work on their driveway. Provide a list of each notification and contact before each closure. Only close driveways for reconstruction if duration and alternate access are approved. Install and maintain material across a work zone as temporary access. This work is subsidiary.

For ACP or SURF TREAT, the pavement structure will match the adjacent roadway unless detailed on the plans. HMA, including surface, may use a maximum allowable quantity of 40% RAP and 5% RAS for private driveways, public driveways for 2-lane roadways or smaller, and turnouts. Blending of 2 or more sources is allowed.

For CONC, the pavement structure will be 6 in. thick and have 3 in. flexible base bedding unless detailed on the plans.

#### **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 560 – MAILBOX ASSEMBLIES**

Before Trautwein Road closure, contractor to identify temporary mailbox location that is acceptable to USPS and landowner of tract on northwest corner of Trautwein Rd/US 290 intersection. Contractor to relocate/install mailbox at this location prior to Trautwein Road closure and maintain this interim mailbox location until permanent mailbox location is complete and accessible to the landowner. These efforts are subsidiary to item 560.

#### **ITEMS 600s & 6000s – ITS, TOLLING, LIGHTING, SIGNING, MARKINGS, AND SIGNALS**

*(Blind Note: Include these notes when 600 or 6000 Items are used.)*

Meet the requirements of the NEC, Texas MUTCD, TxDOT standards, and TxDOT Standard Specifications. Notify the Engineer if existing elements to remain do not meet code or specification.

Contractor shall provide all service, equipment and material required to provide a functional item and interface with existing equipment and software.

For signal shop contact Charles Vaughn Jr ([Charles.Vaughn@txdot.gov](mailto:Charles.Vaughn@txdot.gov)) and Robert Bolin ([Robert.Bolin@txdot.gov](mailto:Robert.Bolin@txdot.gov))

Use the TxDOT provided form to submit an electrical, illumination, and signal checklist prior to request for signal activation or a punch list.

Provide a 7-day advance email notice to the Engineer to request illumination or traffic signal punch list inspection.

Provide a 14-day advance email notice to the Engineer with signal technician contact information and signal locations prior to working or assuming operations of illumination or traffic signal.

Provide a 60-day advance email notice to the Engineer to request signal timing if timing is not provided in the plans.

Prior to relief of maintenance, a 30-day Test Period is required for signals and ITS equipment in accordance with Item 680.3.1.8. Response time to reported trouble calls shall be less than 2 hours. Complete repairs within 24 hours. Notify the Engineer and maintain a logbook in the controller cabinet of each trouble call. Do not clear the error log in the conflict monitor without approval.

Maintain the existing ITS equipment and HUB buildings operational during construction. ITS downtime is allowed from 12A to 4A. Downtime is restricted to one time per HUB or equipment.

Stakes or other physical method shall be installed to hold down conduit prior to placement of concrete/flow fill encasement.

Minimum distance between HDPE joints will be 200 ft.

#### **ITEM 618 - CONDUIT**

Shift the locations of conduit and ground boxes to accommodate field conditions. Install conduit not exceeding 2 feet in any direction from a straight line. Install conduit at a minimum depth of 2 ft. below finished grade. Installation of the conduit by jacking or boring method will be at a depth of at least 1 ft. below subgrade.

Install a high tension, non-metallic pull rope in all empty conduit runs. This work is subsidiary. Use a coring device, not a hammer drill, when drilling holes through concrete structures.

Structurally mounted junction boxes will be as shown on the plans. When used for traffic signal installations, these boxes will be 12" x 12" x 8". This work is subsidiary.

For underground conduit, smooth wall schedule 40 equivalent HDPE can be substituted for schedule 40 PVC. Schedule 80 bore can be replaced with a schedule 40 equivalent HDPE carrier pipe of adequate size to carry the proposed conduits. HDPE must transition to RMC/PVC per ED (11)-14.

When using existing conduit, ensure that all conduits have bushings and cleaned of dirt, mud, grease, and other debris. Re-strap existing or relocated conduit per the specification. This work is subsidiary.

Abandoned underground conduit must have all conductors removed.

#### **ITEM 620 - ELECTRICAL CONDUCTORS**

Provide 10 amp time delay fuses.

For Flashing Beacons (Item 685) and Pedestal Poles (Item 687), provide single-pole breakaway disconnects.

Install a minimum size 8 AWG equipment grounding conductor (EGC) in all conduits including loop detectors and traffic signal cables. Payment and the size of the EGC will be in accordance with standard ED (3)-14 note 12.

Permanently mark "Illumination" on the luminaire conductors installed inside a traffic signal pole. Make the marks easily visible from the hand hole.



**ITEM 624 – GROUND BOXES**

Aggregate for fill under the box will be crushed, have a maximum size of 2 in., minimum size of ½ in., and requirements per Item 302 are waived.

**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 662 - WORK ZONE PAVEMENT MARKINGS**

Notify the Engineer at least 24 hours in advance of work for this item. Maintain removable and short-term markings daily. Remove within 48 hours after permanent striping has been completed.

Item 668 is not allowed for use as Item 662.

Roadways with existing profile pavement markings or rumble strips must supplement work zone solid lines with traffic buttons spaced at 12 in. Traffic buttons used to supplement the work zone markings will be paid by the each in addition to the work zone item.

**ITEM 666 - RETROREFLECTORIZED PAVEMENT MARKINGS**

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

The center-to-center width for double yellow solid stripes must be 18 in. for all roadways.

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 677 - ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS**

Dispose of removed materials and debris at locations off the right of way.

Elimination using a pavement marking will not be allowed in lieu of methods listed in specification.

Strip seal is only method allowed on seal coat surface unless project includes placement of a new surface. If total quantity of removal on a seal coat surface is less than 2000 ft., elimination using a pavement marking is allowed if a test section is approved by the Engineer. Test section shall demonstrate the thermo marking color matches the existing pavement color.

Remove pavement markings outside the limits of the new surface by a blasting method.

Use a TRAIL or a non-retroreflective paint to cover stripe remnants that remain after elimination.

The test requirements for these materials are waived. The paint color shall be adjusted to resemble the existing pavement color. Installation and maintenance is subsidiary.

**ITEM 680 - HIGHWAY TRAFFIC SIGNALS**

For traffic signal head installation use Austin District MAD-14 detail.

Luminaire arms shall be aligned with the signal head support. If multiple signal head supports, the luminaire arm shall be aligned with the support over the higher volume roadway.

Install 250W EQ LED illumination fixtures as shown in the plans. Test in accordance with Item 616. This work is subsidiary.

Furnish all materials and install signs mounted on the traffic signal wire, traffic signal poles, mast arms, and pedestal pole assemblies. Remove all conflicting signs and sign foundations when signal is placed into operation. This work is subsidiary.

Use a Vulcan swinger sign mounting bracket or equivalent for all signs mounted on span wires.

Place the traffic signal into operation after the traffic signal and installation of striping have been completed. The timing Engineer will be present to program the controller and assist with detection setup. Have a qualified technician and a representative from the controller supplier on the project site to place the traffic signals in operation.

**ITEM 682 – VEHICLE AND PEDESTRIAN SIGNAL HEADS**

Install signal head attachments so the wiring to each passes from the signal pole through the attachment hardware to the signal head. Use UV rated tie wraps.

Traffic signal heads will be aluminum unless otherwise shown on the plans. Back plates will be black aluminum with reflective borders.

Provide louvers, which have five vanes with a black finish on inside surfaces when required. Fasten a hardware cloth screen, securely, with 5/8" or smaller mesh size to the front face of each louver to prevent bird nesting.

Use the four-point mounting system (TY A) for signal heads, except in cases of skewed or vertical heads when (TY B) will be used.

**ITEM 684 – TRAFFIC SIGNAL CABLES**

For Type A cables, cables meeting the requirements of IMSA 19-1 can be substituted for IMSA 20-1. For all types of cables, an increase of one size larger wire diameter and thickness can be

substituted for plan size without additional cost to the Department. For example, 12 AWG can be substituted for 14 AWG.

For each cable run, coil an extra 2 ft. of cable in each steel pole and 5 ft. in the controller cabinet. Provide a separate multi-conductor signal cable (14 AWG) inside pedestal poles and mast-arm signal poles from the terminal strip to each signal head as shown on the plans.

**ITEM 686 - TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL)**

Provide and install damping plates on all mast arms 40 ft. or greater. For mast arms less than 40 ft., refer to SMA and DMA vibration notes for guidance. This work is subsidiary.

When luminaires are installed on mast arm poles, install a separate terminal strip in the signal pole access compartment. Provide a 10-amp time-delay fuse for traffic signal poles with luminaires.

**ITEM 3076 - HOT-MIX ASPHALT PAVEMENT**

Use of motor grader is allowed to construct level-up course up to the bottom of the final lift of level-up. The final lift of level-up shall be constructed utilizing a pavement machine.

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

Remove and dispose of off the ROW the audible/profile markings, reflectorized markings, and raised markers.

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.

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 3079 - PERMEABLE FRICTION COURSE (PFC)**

For SAC A, blending SAC B aggregate with an RSSM greater than the SAC A rating or 10, whichever is greater, is prohibited.

The use of RAP is prohibited.

Submit the A-R binder design to the District Laboratory for approval.

Permeability test shall not exceed 20 seconds.

Install a butt joint when the edge is adjacent to a driveway or intersection. The taper for the butt joint shall be 24H:1V beyond the normal edge line of the PFC. This work is subsidiary.

**ITEM 3084 – BONDING COURSE**

The minimum application rates are listed in Table BC. Miscellaneous Tack is allowed for use with dense-graded Type B HMA. If a tack bid item is not provided, use bonding course item.



The target shear bond strengths are listed in Table BCS. The informational test cores shall be taken once a shift for first 5 lots of placement or a change to placement method of bonding course, bonding material, or hot mix material. The remaining informational test cores shall be taken once every 3 lots for surface mix. Informational tests are not required for non-surface mix beyond the first 5 lots unless there is a change to placement method of bonding course, bonding material, or hot mix material. Results from these informational tests will not be used for specification compliance.

Table BC

Material	Minimum Application Rate (gal. per square yard)
TRAIL – Emulsified Asphalt	0.06
TRAIL – Hot Asphalt	0.12
Spray Applied Underseal Membrane	0.10

Table BCS (For Informational Tests)

Material	Target Shear Bond Strength (Tex-249-F psi)
SMA – Stone-Matrix Asphalt	60.0
PFC – Permeable Friction Course	N/A
All Other Materials	40.0

**ITEM 3085 – UNDERSEAL COURSE**

No emulsified asphalt material allowed under PFC or SMA, except for use with Item 316, on roadways with ADT greater than 100,000.

The minimum application rates are listed in Table UC. The target shear bond strengths are listed in Table UCS. The informational test cores shall be taken once a shift for first 5 lots of placement or a change to placement method of bonding course, bonding material, or hot mix material. The remaining informational test cores shall be taken once every 3 lots for surface mix. Informational tests are not required for non-surface mix beyond the first 5 lots unless there is a change to placement method of bonding course, bonding material, or hot mix material. Results from these informational tests will not be used for specification compliance.

Table UC

Material	Minimum Application Rate (mat >1” gal. per square yard)	Minimum Application Rate (mat <= 1” gal. per square yard)
TRAIL – Hot Asphalt	0.15	0.10
Spray Applied Underseal Membrane	0.15	0.15
Seal Coat – Tier II emulsion	0.25	0.25
Seal Coat – Tier II asphalt	0.23	0.23

Table UCS

Material	Minimum Shear Strength (psi)
SMA – Stone-Matrix Asphalt	60.0
PFC – Permeable Friction Course	40.0
All Other Materials	40.0

**ITEM 6001 – PORTABLE CHANGEABLE MESSAGE SIGN**

Provide 2 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”.

**ITEM 6185 – TRUCK MOUNTED ATTENUATOR AND TRAILER ATTENUATOR**

The TMA/TA used for installation/removal of traffic control for a work area will be subsidiary to the TMA/TA used to perform the work.

The contractor will be responsible for determining if one or more operations will be ongoing at the same time to determine the total number of TMA/TA required for the work. TMA/TAs paid by the day is full compensation for all worksite locations during an entire day.

TMA/TAs used to protect damaged attenuators will be paid by the day using the force account item for the repair.

**ITEM 6292 – RADAR VEHICLE DETECTION SYSTEM (RVDS) FOR SIGNALIZED INTERSECTION CONTROL**

Provide and install Radar Vehicle Detection System (RVDS) and communication cable as directed by the Engineer. Place the radar detector communication cable in continuous and separate runs from each RVDS to the controller. For each cable terminating at the controller cabinet, provide an extra 5-ft length when installing the cable into the controller. Provide a Serial to Ethernet convertor for each RVDS system. Consider the costs associated with the above work subsidiary to the pertinent Items.

Install the RVDS detection zones as directed. Have qualified personnel on site at the time of the signal turn-on to assist with the installation of detection zones.

Provide a set-up system. Load required set-up software for up to 15 of the District Signal Shop’s computers and provide all necessary licensing or provide two setups (or upload/download) devices per contract.

If the RVDS locations shown in the plans do not allow for proper sight of the proposed detection zones, relocate the devices as needed and as directed. This labor and material cost will not be paid separately but is subsidiary to this Item.

**ITEM 680 - HIGHWAY TRAFFIC SIGNALS**

The list of material below is for the Contractor's information only and is subsidiary. It is the responsibility of the Contractor to verify all items and quantities listed below.

<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>
40 FT TIMBER POLE (CLASS 2)	EA	X
8 FT LUMINAIRE ARM	EA	4
CABLE STRAPS	EA	X
3/8" ZINC-COATED STRANDED STEEL CABLE	LF	X
1/4" ZINC-COATED STRANDED STEEL CABLE	LF	X
GROUND ANCHORS	EA	X
YELLOW PLASTIC GUY GUARD	EA	X
DOUBLE EYE ANCHOR ROD	EA	X
5/8" X 8' COPPERCLAD GROUND ROD W/CLAMP	EA	X
1 INCH RM CONDUIT (PHONE LINE)	LF	X
1 1/2" WEATHERHEAD	EA	X
2 INCH WEATHERHEAD	EA	X
3 INCH WEATHERHEAD	EA	X
250W LED LUMINAIRE	EA	4
8 PHASE NEMA CONTROLLER COMPLETE W/ CABINET AND ACCESSORIES	EA	X
ON-STREET ARTERIAL MASTER CONTROLLER UNIT	EA	X
2-CHANNEL DETECTOR CARDS	EA	X
INSTALL OPTICOM EQUIPMENT (INTERSECTION)	LS	X

INTERSECTION DISPLAY BOARD	EA	X
DIAL-UP COMMUNICATIONS MODEM/PHONE LINE	EA	X
REGULATORY SIGN PANEL (R10-12, ETC)	EA	X
SINGLE STREET NAME SIGN PANEL	EA	1
DUAL STREET NAME SIGN PANEL	EA	X
REMOVE EXISTING STOP SIGN PANEL	EA	X
CONCRETE PAD (8' X 9' X 6", Class B)	SF	X



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0113-07-072

DISTRICT Austin  
HIGHWAY US 290

COUNTY Hays

CONTROL SECTION JOB				0113-07-072		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00063898			
COUNTY				Hays			
HIGHWAY				US 290			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	100-6002	PREPARING ROW	STA	15.000		15.000	
	104-6009	REMOVING CONC (RIPRAP)	SY	106.000		106.000	
	104-6022	REMOVING CONC (CURB AND GUTTER)	LF	38.000		38.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)	LF	188.000		188.000	
	105-6030	REMOVING STAB BASE & ASPH PAV (8"-14")	SY	2,210.000		2,210.000	
	110-6001	EXCAVATION (ROADWAY)	CY	4,721.000		4,721.000	
	132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	488.000		488.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	3,518.000		3,518.000	
	164-6035	DRILL SEEDING (PERM) (RURAL) (CLAY)	SY	3,518.000		3,518.000	
	164-6071	BROADCAST SEED (TEMP)(WARM OR COOL)	SY	3,518.000		3,518.000	
	166-6002	FERTILIZER	TON	0.220		0.220	
	168-6001	VEGETATIVE WATERING	MG	106.000		106.000	
	169-6001	SOIL RETENTION BLANKETS (CL 1) (TY A)	SY	3,518.000		3,518.000	
	247-6366	FL BS (CMP IN PLC)(TY A GR 5)(FNAL POS)	CY	1,319.000		1,319.000	
	310-6001	PRIME COAT (MULTI OPTION)	GAL	678.000		678.000	
	354-6003	PLAN & TEXT ASPH CONC PAV(0" TO 3")	SY	3,335.000		3,335.000	
	416-6031	DRILL SHAFT (TRF SIG POLE) (30 IN)	LF	12.000		12.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	14.000		14.000	
	416-6034	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF	44.000		44.000	
	423-6004	RETAINING WALL (CONC BLOCK)	SF	4,151.000		4,151.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	60.000		60.000	
	432-6044	RIPRAP (CONC)(FLUME)	CY	24.600		24.600	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	2.900		2.900	
	450-6042	RAIL (TY PR1)	LF	515.000		515.000	
	474-6001	SLOT DRAIN (GAL STL) (12 IN)	LF	60.000		60.000	
	496-6007	REMOV STR (PIPE)	LF	365.000		365.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	7.000		7.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	100.000		100.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	100.000		100.000	
	530-6005	DRIVEWAYS (ACP)	SY	247.000		247.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	188.000		188.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	163.000		163.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	1.000		1.000	
	544-6004	GDRAIL END TRT(INST)(WOOD POST)(TY I)	EA	1.000		1.000	
	560-6001	MAILBOX INSTALL-S (TWG-POST) TY 1	EA	2.000		2.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	75.000		75.000	



DISTRICT	COUNTY	CCSJ	SHEET
Austin	Hays	0113-07-072	4



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0113-07-072

DISTRICT Austin  
HIGHWAY US 290

COUNTY Hays

CONTROL SECTION JOB				0113-07-072		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00063898			
COUNTY				Hays			
HIGHWAY				US 290			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	335.000		335.000	
	618-6053	CONDT (PVC) (SCH 80) (3")	LF	840.000		840.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	380.000		380.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF	1,550.000		1,550.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	1,800.000		1,800.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	85.000		85.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	170.000		170.000	
	624-6009	GROUND BOX TY D (162922)	EA	3.000		3.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	7.000		7.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	2.000		2.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	6.000		6.000	
	662-6001	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	LF	398.000		398.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	1,590.000		1,590.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	1,526.000		1,526.000	
	662-6056	WK ZN PAV MRK REMOV (TRAF BTN) TY W	EA	1,590.000		1,590.000	
	662-6058	WK ZN PAV MRK REMOV (TRAF BTN) TY Y	EA	1,590.000		1,590.000	
	666-6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF	76.000		76.000	
	666-6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	862.000		862.000	
	666-6047	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	LF	96.000		96.000	
	666-6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	4.000		4.000	
	666-6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	4.000		4.000	
	666-6104	REFL PAV MRK TY I (W)(BIKE ARW)(090MIL)	EA	2.000		2.000	
	666-6110	REFL PAV MRK TY I(W)(BIKE SYML)(090MIL)	EA	2.000		2.000	
	666-6171	REFL PAV MRK TY II (W) 6" (BRK)	LF	199.000		199.000	
	666-6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	3,071.000		3,071.000	
	666-6176	REFL PAV MRK TY II (W) 8" (DOT)	LF	76.000		76.000	
	666-6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	862.000		862.000	
	666-6182	REFL PAV MRK TY II (W) 24" (SLD)	LF	96.000		96.000	
	666-6184	REFL PAV MRK TY II (W) (ARROW)	EA	4.000		4.000	
	666-6192	REFL PAV MRK TY II (W) (WORD)	EA	4.000		4.000	
	666-6200	REFL PAV MRK TY II (W) (BIKE ARROW)	EA	2.000		2.000	
	666-6202	REFL PAV MRK TY II (W) (BIKE SYMBOL)	EA	2.000		2.000	
	666-6208	REFL PAV MRK TY II (Y) 6" (BRK)	LF	102.000		102.000	
	666-6210	REFL PAV MRK TY II (Y) 6" (SLD)	LF	2,046.000		2,046.000	
	666-6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	199.000		199.000	
	666-6308	RE PM W/RET REQ TY I (W)6"(SLD)(090MIL)	LF	3,071.000		3,071.000	
	666-6317	RE PM W/RET REQ TY I (Y)6"(BRK)(090MIL)	LF	102.000		102.000	

DISTRICT	COUNTY	CCSJ	SHEET
Austin	Hays	0113-07-072	4A





# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0113-07-072

DISTRICT Austin  
HIGHWAY US 290

COUNTY Hays

CONTROL SECTION JOB				0113-07-072		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00063898			
COUNTY				Hays			
HIGHWAY				US 290			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	666-6320	RE PM W/RET REQ TY I (Y)6"(SLD)(090MIL)	LF	4,092.000		4,092.000	
	672-6007	REFL PAV MRKR TY I-C	EA	62.000		62.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	40.000		40.000	
	680-6002	INSTALL HWY TRF SIG (ISOLATED)	EA	1.000		1.000	
	680-6004	REMOVING TRAFFIC SIGNALS	EA	1.000		1.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	12.000		12.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	2.000		2.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	12.000		12.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	4.000		4.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	12.000		12.000	
	682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	2.000		2.000	
	682-6049	BACKPLATE W/REFL BRDR(4 SEC)	EA	2.000		2.000	
	682-6060	BACKPLATE W/REFL BRDR(3 SEC)	EA	12.000		12.000	
	684-6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF	2,415.000		2,415.000	
	684-6033	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	LF	440.000		440.000	
	686-6027	INS TRF SIG PL AM(S)1 ARM(24')LUM	EA	1.000		1.000	
	686-6043	INS TRF SIG PL AM(S)1 ARM(40')LUM	EA	1.000		1.000	
	686-6059	INS TRF SIG PL AM(S)1 ARM(55')LUM	EA	2.000		2.000	
	3076-6003	D-GR HMA TY-B PG64-22 (EXEMPT)	TON	260.000		260.000	
	3076-6004	D-GR HMA TY-B PG64-22 (LEVEL-UP)	TON	866.000		866.000	
	3076-6031	D-GR HMA TY-C PG76-22	TON	272.000		272.000	
	3076-6072	D-GR HMA TY-D PG 76-22 (EXEMPT)	TON	574.000		574.000	
	3079-6011	PFC-C PG76-22 SAC-A	TON	297.000		297.000	
	3084-6001	BONDING COURSE	GAL	1,039.000		1,039.000	
	3085-6001	UNDERSEAL COURSE	GAL	418.000		418.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	200.000		200.000	
	6185-6002	TMA (STATIONARY)	DAY	20.000		20.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	160.000		160.000	
	6292-6001	RVDS(PRESENCE DETECTION ONLY)	EA	2.000		2.000	
	7251-6001	Subsurface Util Locate (Outside Rdbed)	EA	5.000		5.000	
18		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	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	



CONTROLLING PROJECT ID 0113-07-072

DISTRICT Austin  
HIGHWAY US 290

# Estimate & Quantity Sheet

COUNTY Hays

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	4.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	12.000	
	682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	2.000	
	682-6049	BACKPLATE W/REFL BRDR(4 SEC)	EA	2.000	
	682-6060	BACKPLATE W/REFL BRDR(3 SEC)	EA	12.000	
	684-6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF	2,415.000	
	684-6033	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	LF	440.000	
	686-6027	INS TRF SIG PL AM(S)1 ARM(24')LUM	EA	1.000	
	686-6043	INS TRF SIG PL AM(S)1 ARM(40')LUM	EA	1.000	
	686-6059	INS TRF SIG PL AM(S)1 ARM(55')LUM	EA	2.000	
	3076-6003	D-GR HMA TY-B PG64-22 (EXEMPT)	TON	260.000	
	3076-6004	D-GR HMA TY-B PG64-22 (LEVEL-UP)	TON	866.000	
	3076-6031	D-GR HMA TY-C PG76-22	TON	272.000	
	3076-6072	D-GR HMA TY-D PG 76-22 (EXEMPT)	TON	574.000	
	3079-6011	PFC-C PG76-22 SAC-A	TON	297.000	
	3084-6001	BONDING COURSE	GAL	1,039.000	
	3085-6001	UNDERSEAL COURSE	GAL	418.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	200.000	
	6185-6002	TMA (STATIONARY)	DAY	20.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	160.000	
	6292-6001	RVDS(PRESENCE DETECTION ONLY)	EA	2.000	
	7251-6001	Subsurface Util Locate (Outside Rdbed)	EA	5.000	
18		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000	


SUMMARY OF ROADWAY ITEMS																
LOCATION	100 6002	104 6009	104 6022	104 6054	105 6030	110 6001	132 6003	247 6366	310 6001	354 6003	432 6002	432 6045	474 6001	496 6007	530 6005	540 6001
	PREPARING ROW	REMOVING CONC (RIPRAP)	REMOVING CONC (CURB AND GUTTER)	REMOVING CONCRETE(MOW STRIP)	REMOVING STAB BASE & ASPH PAV (8"-14")	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(ORD COMP)(TY B)	FL BS (CMP IN PLC)(TY A GR 5)(FNAL POS)	PRIME COAT (MULTI OPTION)	PLAN & TEXT ASPH CONC PAV(0" TO 3")	RIPRAP (CONC)(5 IN)	RIPRAP (MOW STRIP)(4 IN)	SLOT DRAIN (GAL STL) (12 IN)	REMOV STR (PIPE)	DRIVEWAYS (ACP)	MTL W-BEAM GD FEN (TIM POST)
	STA	SY	LF	LF	SY	CY	CY	CY	GAL	SY	CY	CY	LF	LF	SY	LF
P&P SHEET 1 & 2 (US 290)	10			188	620	644	487	403	207	3335		2.9				188
P&P SHEET 3 (TRAUTWEIN RD)	5	106	38		1590	4077	1	916	471		60		60	365	247	
<b>PROJECT TOTALS</b>	<b>15</b>	<b>106</b>	<b>38</b>	<b>188</b>	<b>2210</b>	<b>4721</b>	<b>488</b>	<b>1319</b>	<b>678</b>	<b>3335</b>	<b>60</b>	<b>2.9</b>	<b>60</b>	<b>365</b>	<b>247</b>	<b>188</b>

SUMMARY OF ROADWAY ITEMS (CONT.)												
LOCATION	542 6001	542 6002	544 6004	560 6001	3076 6003	3076 6004	3076 6031	3076 6072	3079 6011	3084 6001	3085 6001	7251 6001
	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	GDRAIL END TRT(INST)(WOOD PCST)(TY I)	MAILBOX INSTALLS (TWG-POST) TY 1	D-GR HMA TY-B PG64-22 (EXEMPT)	D-GR HMA TY-B PG76-22 (LEVEL-UP)	D-GR HMA TY-C PG76-22	D-GR HMA TY-D PG76-22 (EXEMPT)	PFC-C PG76-22 SAC-A	BONDING COURSE	UNDERSEAL COURSE	SUBSURFACE UTIL LOCATE (OUTSIDE RDBED)
	LF	EA	EA	EA	TON	TON	TON	TON	TON	GAL	GAL	EA
P&P SHEET 1 & 2 (US 290)	163	1	1	1	260	866		306	297	616	418	5
P&P SHEET 3 (TRAUTWEIN RD)				1			272	268		423		
<b>PROJECT TOTALS</b>	<b>163</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>260</b>	<b>866</b>	<b>272</b>	<b>574</b>	<b>297</b>	<b>1039</b>	<b>418</b>	<b>5</b>


SUMMARY OF RETAINING WALL ITEMS			
LOCATION	423 6004	432 6044	450 6042
	RETAINING WALL (CONC BLOCK)	RIPRAP (CONC)(FLUME)	RAIL (TY PR1)
	SF	CY	LF
WALL A	300	2.77	58
WALL B	1825	9.70	203
WALL C	610	4.78	100
WALL D	1416	7.37	154
<b>PROJECT TOTALS</b>	<b>4151</b>	<b>24.62</b>	<b>515</b>

SUMMARY OF PAVEMENT MARKING ITEMS													
LOCATION	666 6029	666 6035	666 6047	666 6053	666 6077	666 6104	666 6110	666 6171	666 6174	666 6176	666 6178	666 6182	
	REFL PAV MRK TY I (W)8"(DOT)(090 MIL)	REFL PAV MRK TY I (W)8"(SLD)(090 MIL)	REFL PAV MRK TY I (W)24"(SLD)(090 MIL)	REFL PAV MRK TY I (W)(ARROW)(090 MIL)	REFL PAV MRK TY I (W)(WORD)(090 MIL)	REFL PAV MRK TY I (W)(BIKE ARW)(090 MIL)	REFL PAV MRK TY I (W)(BIKE SYML)(090 MIL)	REFL PAV MRK TY II (W) 6" (BRK)	REFL PAV MRK TY II (W) 6" (SLD)	REFL PAV MRK TY II (W) 8" (DOT)	REFL PAV MRK TY II (W) 8" (SLD)	REFL PAV MRK TY II (W) 24" (SLD)	
	LF	LF	LF	EA	EA	EA	EA	LF	LF	LF	LF	LF	
SHEET 1 OF 2	76	839	68	4	4	2	2	199	1863	76	839	68	
SHEET 2 OF 2		23	28						1208		23	28	
<b>PROJECT TOTALS</b>	<b>76</b>	<b>862</b>	<b>96</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>2</b>	<b>199</b>	<b>3071</b>	<b>76</b>	<b>862</b>	<b>96</b>	

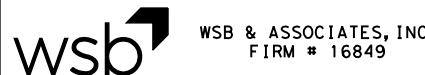
SUMMARY OF PAVEMENT MARKING ITEMS													
LOCATION	666 6184	666 6192	666 6200	666 6202	666 6208	666 6210	666 6305	666 6308	666 6317	666 6320	672 6007	672 6009	
	REFL PAV MRK TY II (W) (ARROW)	REFL PAV MRK TY II (W) (WORD)	REFL PAV MRK TY II (W) (BIKE ARROW)	REFL PAV MRK TY II (W) (BIKE SYMBOL)	REFL PAV MRK TY II (Y) 6" (BRK)	REFL PAV MRK TY II (Y) 6" (SLD)	RE PM W/RET REQ TY I (W)6"(BRK)(090 MIL)	RE PM W/RET REQ TY I (W)6"(SLD)(090 MIL)	RE PM W/RET REQ TY I (Y)6"(BRK)(090 MIL)	RE PM W/RET REQ TY I (Y)6"(SLD)(090 MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	
	EA	EA	EA	EA	LF	LF	LF	LF	LF	LF	EA	EA	
SHEET 1 OF 2	4	4	2	2	102	892	199	1863	102	892	62	12	
SHEET 2 OF 2						1154		1208		1154		28	
<b>PROJECT TOTALS</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>2</b>	<b>102</b>	<b>2046</b>	<b>199</b>	<b>3071</b>	<b>102</b>	<b>2046</b>	<b>62</b>	<b>40</b>	



**Texas Department of Transportation**



**HAYS COUNTY**



**wsb & ASSOCIATES, INC.**  
FIRM # 16849

US 290 AT  
TRAUTWEIN ROAD  
SUMMARY OF  
QUANTITIES

DATE: 4/11/2023			SHEET 1 OF 2	
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT.	SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07	072	US 290	5

SUMMARY OF SIGNING ITEMS			
LOCATION	644	644	644
	6001	6004	6076
	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	REMOVE SM RD SN SUP&AM
	EA	EA	EA
SS SHEET 1	3	2	3
SS SHEET 2	4		3
<b>PROJECT TOTALS</b>	<b>7</b>	<b>2</b>	<b>6</b>

SUMMARY OF EROSION CONTROL ITEMS								
LOCATION	160	164	164	166	168	169	506	506
	6003	6035	6071	6002	6001	6001	6040	6043
	FURNISHING AND PLACING TOPSOIL (4")	DRILL SEEDING (PERM) (RURAL) (CLAY)	BROADCAST SEED (TEMP)(WARM OR COOL)	FERTILIZER	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY A)	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	SY	TON	MG	SY	LF	LF
SHEET 1	3518	3518	3518	0.22	106	3518	100	100
<b>PROJECT TOTALS</b>	<b>3518</b>	<b>3518</b>	<b>3518</b>	<b>0.22</b>	<b>106</b>	<b>3518</b>	<b>100</b>	<b>100</b>

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS								
LOCATION	662	662	662	662	662	6001	6185	6185
	6001	6004	6034	6056	6058	6001	6002	6003
	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK REMOV (TRAF BTN) TY W	WK ZN PAV MRK REMOV (TRAF BTN) TY Y	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	LF	LF	LF	EA	EA	DAY	DAY	HR
PROJECT WIDE	398	1590	1526	1590	1590	200	20	160
<b>PROJECT TOTALS</b>	<b>398</b>	<b>1590</b>	<b>1526</b>	<b>1590</b>	<b>1590</b>	<b>200</b>	<b>20</b>	<b>160</b>

SUMMARY OF TRAFFIC SIGNAL ITEMS															
LOCATION	416	416	416	618	618	618	618	620	620	620	620	624	680	680	
	6031	6032	6034	6046	6047	6053	6054	6007	6008	6009	6010	6009	6002	6004	
	DRILL SHAFT (TRF SIG POLE) (30 IN)	DRILL SHAFT (TRF SIG POLE) (36 IN)	DRILL SHAFT (TRF SIG POLE) (48 IN)	CONDT (PVC) (SCH 80) (2")	CONDT (PVC) (SCH 80) (2") (BORE)	CONDT (PVC) (SCH 80) (3")	CONDT (PVC) (SCH 80) (3") (BORE)	ELEC CONDR (NO.8) BARE	ELEC CONDR (NO.8) INSULATED	ELEC CONDR (NO.6) BARE	ELEC CONDR (NO.6) INSULATED	GROUND BOX TY D (162922)	INSTALL HWY TRF SIG (ISOLATED)	REMOVING TRAFFIC SIGNALS	
	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	
US 290 AT TRAUTWEIN	12	14	44	75	335	840	380	1550	1800	85	170	3	1	1	
<b>PROJECT TOTALS</b>	<b>12</b>	<b>14</b>	<b>44</b>	<b>75</b>	<b>335</b>	<b>840</b>	<b>380</b>	<b>1550</b>	<b>1800</b>	<b>85</b>	<b>170</b>	<b>3</b>	<b>1</b>	<b>1</b>	

SUMMARY OF TRAFFIC SIGNAL ITEMS															
LOCATION	682	682	682	682	682	682	682	682	684	684	686	686	686	6292	
	6001	6002	6003	6004	6005	6006	6049	6060	6031	6033	6027	6043	6059	6001	
	VEH SIG SEC (12")LED(GRN)	VEH SIG SEC (12")LED(GRN ARW)	VEH SIG SEC (12")LED(YEL)	VEH SIG SEC (12")LED(YEL ARW)	VEH SIG SEC (12")LED(RED)	VEH SIG SEC (12")LED(RED ARW)	BACKPLATE W/REFL BRDR(4 SEC)	BACKPLATE W/REFL BRDR(3 SEC)	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	INS TRF SIG PL AM(S)1 ARM(24')LUM	INS TRF SIG PL AM(S)1 ARM(40')LUM	INS TRF SIG PL AM(S)1 ARM(55')LUM	RVDS(PRESENCE DETECTION ONLY)	
	EA	EA	EA	EA	EA	EA	EA	EA	LF	LF	EA	EA	EA	EA	
US 290 AT TRAUTWEIN	12	2	12	4	12	2	2	12	2415	440	1	1	2	1	
<b>PROJECT TOTALS</b>	<b>12</b>	<b>2</b>	<b>12</b>	<b>4</b>	<b>12</b>	<b>2</b>	<b>2</b>	<b>12</b>	<b>2415</b>	<b>440</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	



**US 290 AT TRAUTWEIN ROAD**  
**SUMMARY OF QUANTITIES**

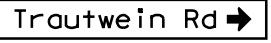


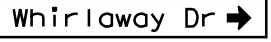


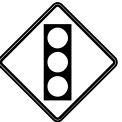
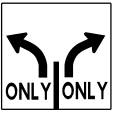

DATE: 4/11/2023			SHEET 2 OF 2		
STATE	STATE DIST. NO.	COUNTY			
TEXAS	14	HAYS			
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.		
0113	07	072	US 290	6	

Filename: \\PIan\016874-000\*QTY02\*.t.dgn  
Date: 4/11/2023



# SUMMARY OF SMALL SIGNS

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.

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)				BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)	
							POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION		
										PREFABRICATED		1EXT or 2EXT = # of Ext
1	1	D1-1		108x18	X		10BWG	1	SA	T		
1	2	W3-3		30x30	X		10BWG	1	SA	P		
1	3	R3-7R		30x30	X		10BWG	1	SA	P		
1	4	D1-1		108x18	X		10BWG	1	SA	T		
1	5	R4-4		30x36	X		10BWG	1	SA	P		
2	1	M1-5		24x24	X		10BWG	1	SA	P		
2	2	W3-3		30x30	X		10BWG	1	SA	P		
2	3	R3-8LR		30x30	X		10BWG	1	SA	P		
2	4	R4-1		24x30	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:**
- 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.
  - For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS) Standard Sheet.
  - For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).
  - Required signs shall be placed in accordance with Standard Sheets BC(1)-14 thru BC(12)-14 and the "Texas Manual On Uniform Traffic Control Devices".

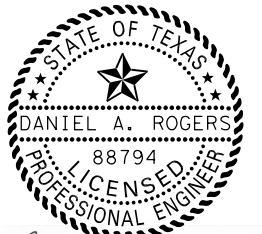
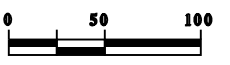
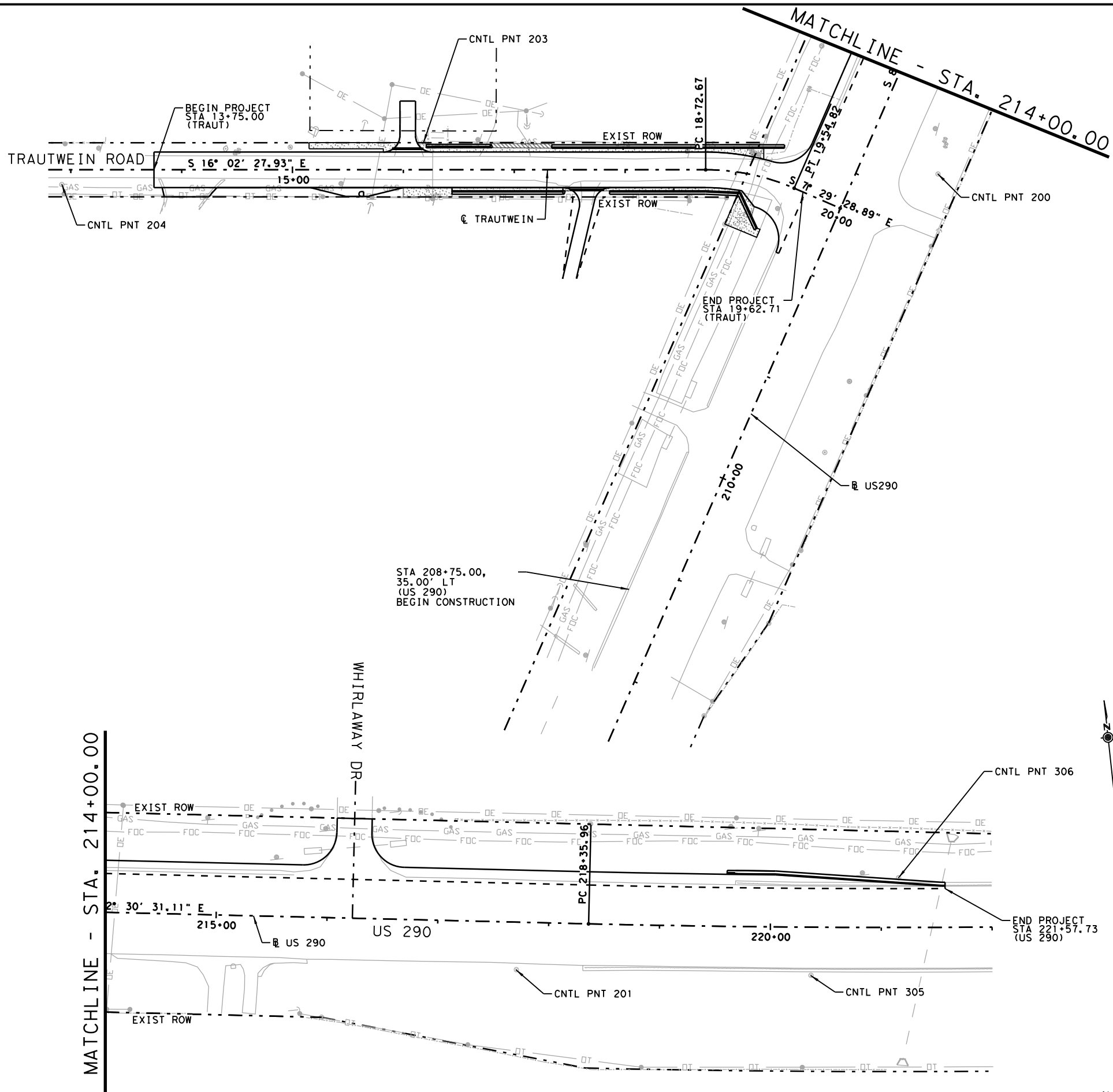


## SUMMARY OF SMALL SIGNS

### SOSS

FILE:	DN:	CK:	DW:	CK:
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US 290
	DIST	COUNTY	SHEET NO.	
	14	HAYS	7	

HORIZONTAL AND VERTICAL CONTROL DATA							
POINT	CENTERLINE	STATION	OFFSET	X	Y	ELEV	DESCRIPTION
CNTL PNT 204	TRAUT	12+91.91	13.30' RT	2280371.8	13985848.95	1,267.72'	IRON ROD SET
CNTL PNT 203	TRAUT	16+18.27	24.81' LT	2280498.59	13985545.82	1,273.56'	IRON ROD SET
CNTL PNT 200	US290	213+29.25	68.25' RT	2280599.35	13985091.98	1,253.50'	IRON ROD SET
CNTL PNT 201	US290	217+71.88	42.85' RT	2281041.51	13985059.46	1,251.32'	IRON ROD SET
CNTL PNT 305	US290	220+36.89	43.38' RT	2281305.17	13985026.04	1,248.97'	COTTON GIN SPINDLE SET
CNTL PNT 306	US290	221+15.69	44.83' LT	2281393.16	13985105.09	1,245.84'	80D NAIL SET



*Daniel G. Rogers*

4/11/2023



**HAYS COUNTY**

**wsb** WSB & ASSOCIATES, INC.  
FIRM # 16849

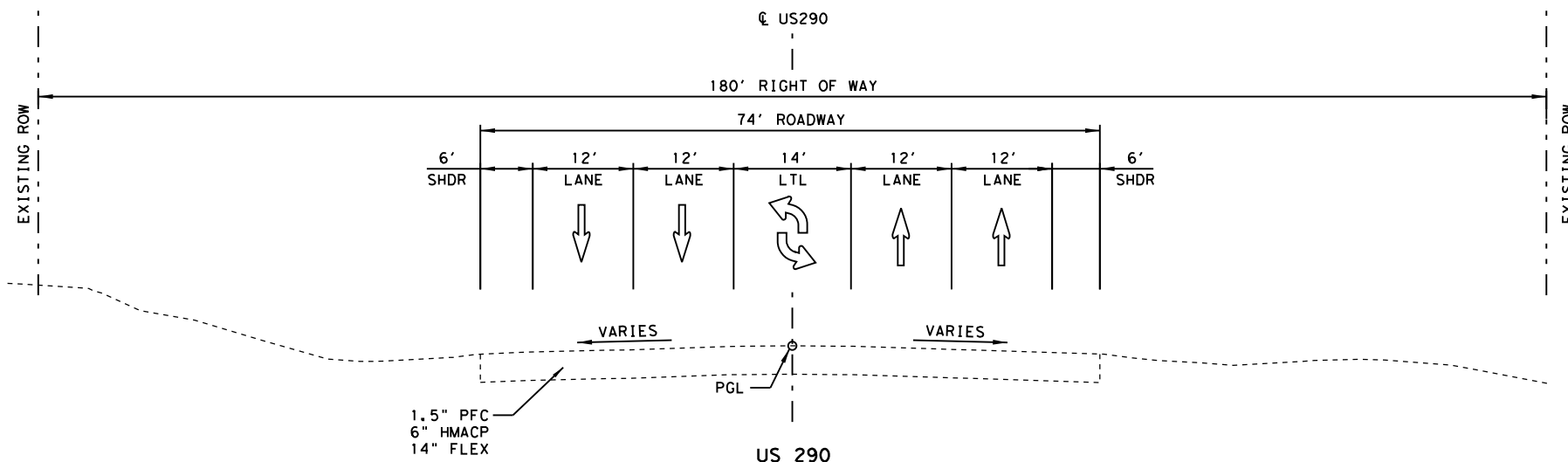
**US 290 AT  
TRAUTWEIN ROAD  
PROJECT LAYOUT**

DATE: 4/11/2023		SHEET 1 OF 1		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07	072	US 290	8

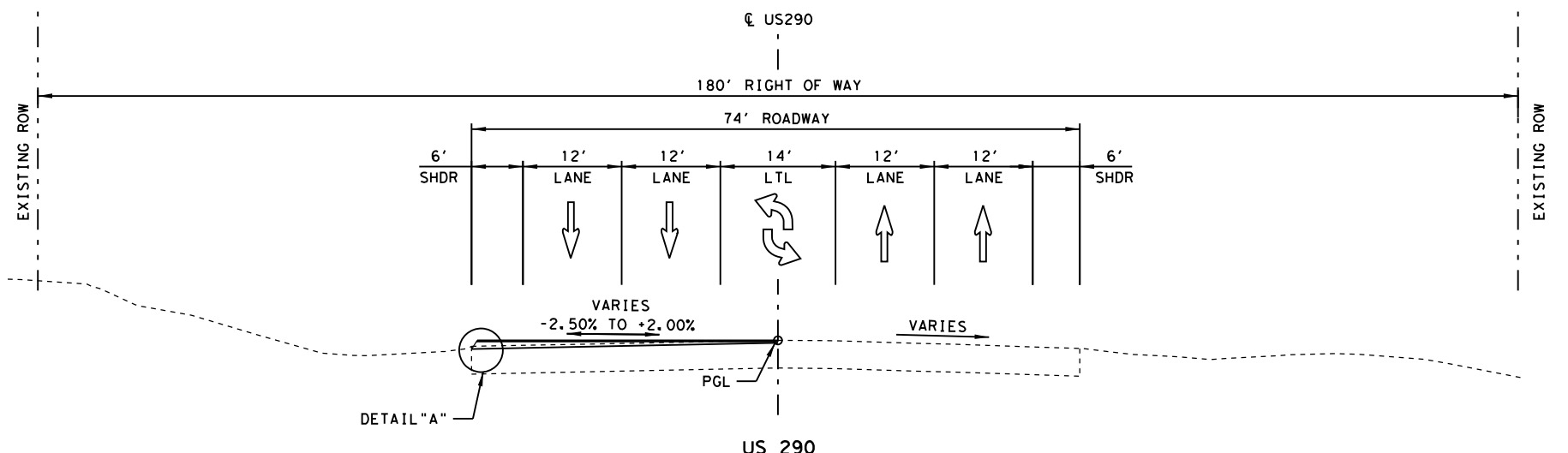
ALL BEARINGS ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM NAD83 SOUTH CENTRAL ZONE (4204). ALL DISTANCES AND COORDINATES ARE SURFACE COORDINATE VALUES AND CAN BE ADJUSTED TO GRID COORDINATES WITH THE COMBINED SCALE FACTOR 1.00008.

Filename: ... \Cad\Plan\016874-000\p101.t.dgn  
Date: 4/11/2023

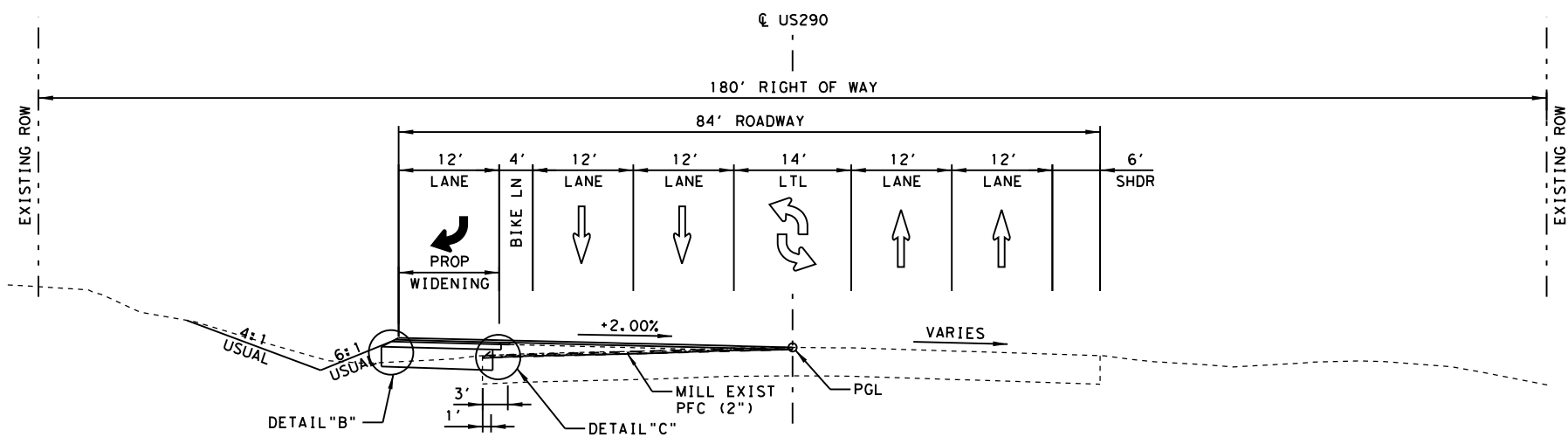
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Date: 4/11/2023



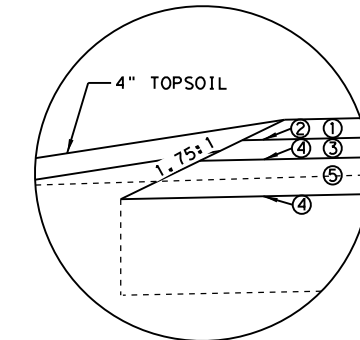
EXISTING TYPICAL SECTION  
FROM STA 208+75.00 TO STA 221+57.73



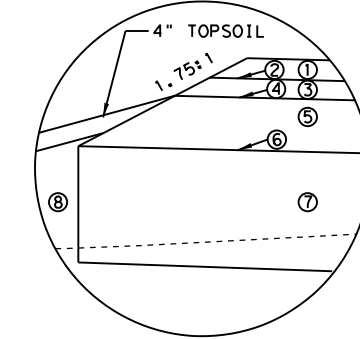
PROPOSED TYPICAL SECTION  
FROM STA 208+75.00 TO STA 212+05.00



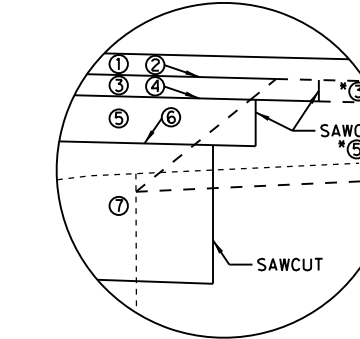
PROPOSED TYPICAL SECTION  
FROM STA 212+05.00 TO STA 213+10.00



DETAIL "A"



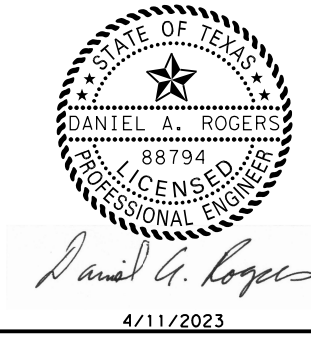
DETAIL "B"



DETAIL "C"  
\*PLACED DURING TCP

- ① 1.5" PFC
- ② UNDERSEAL COURSE
- ③ 1.5" D-GR HMA (TY D)
- ④ BONDING COURSE
- ⑤ 4" D-GR HMA (TY B)
- ⑥ PRIME COAT
- ⑦ 14" FLEX BASE (3 EQUAL LIFTS)
- ⑧ EMBANKMENT TY B

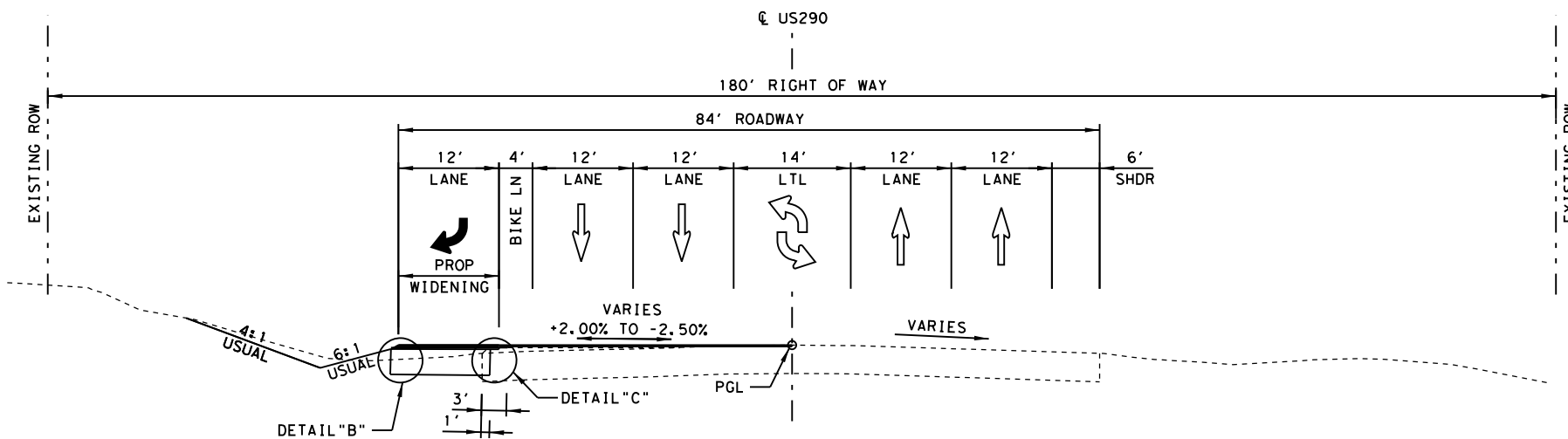
NOTES:  
1. MILL 2" MIN ALONG INSIDE EDGE



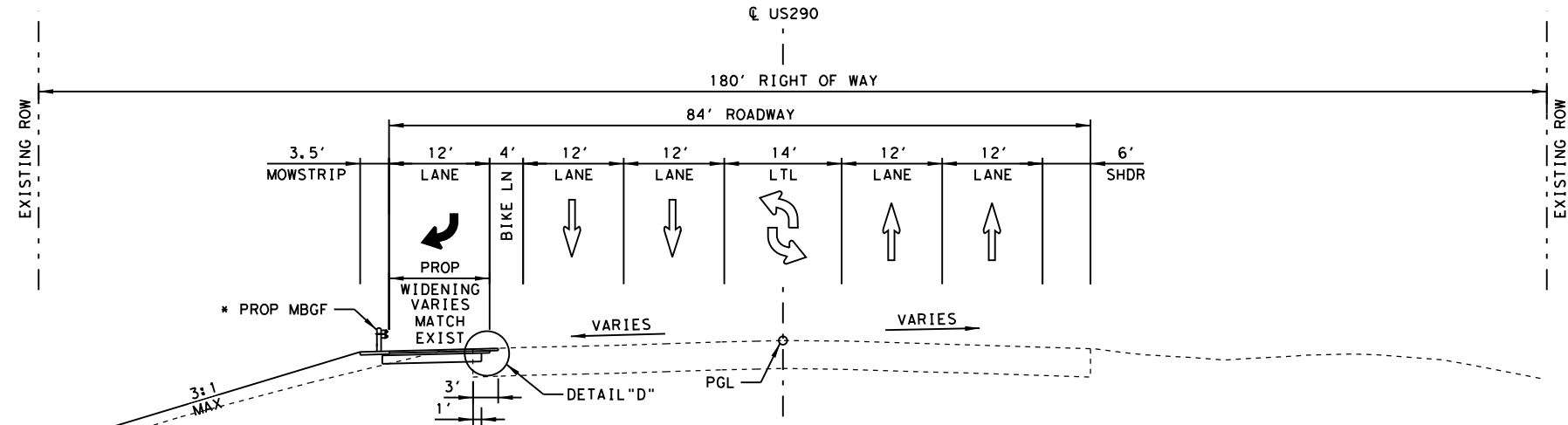
US 290 AT  
TRAUTWEIN ROAD  
TYPICAL SECTIONS

DATE: 4/11/2023		SHEET 1 OF 3		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07 072	US 290	9	

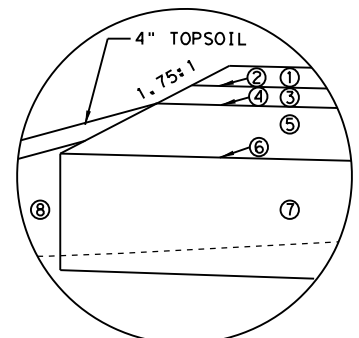
N. T. S.



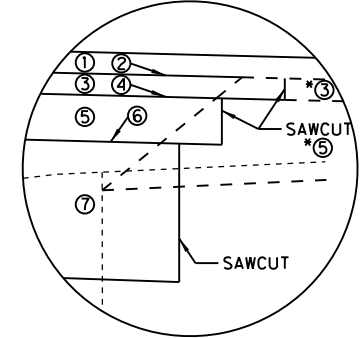
US 290  
PROPOSED TYPICAL SECTION  
FROM STA 213+10.00 TO STA 216+70.00



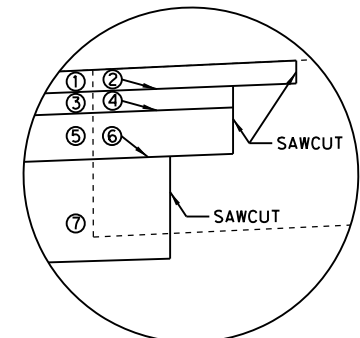
US 290  
PROPOSED TYPICAL SECTION  
FROM STA 216+70.00 TO STA 221+57.73  
\* STA 219+ 60.40 - STA 221+57.73



DETAIL "B"



DETAIL "C"  
\*PLACED DURING TCP



DETAIL "D"

- ① 1.5" PFC
- ② UNDERSEAL COURSE
- ③ 1.5" D-GR HMA (TY D)
- ④ BONDING COURSE
- ⑤ 4" D-GR HMA (TY B)
- ⑥ PRIME COAT
- ⑦ 14" FLEX BASE (3 EQUAL LIFTS)
- ⑧ EMBANKMENT TY B

N. T. S.

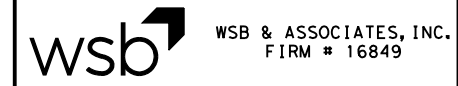


*Daniel A. Rogers*

4/11/2023



HAYS COUNTY

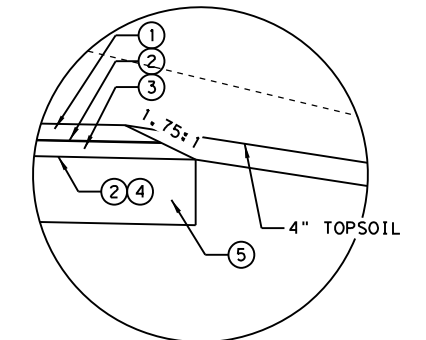


US 290 AT  
TRAUTWEIN ROAD  
TYPICAL SECTIONS

DATE: 4/11/2023		SHEET 2 OF 3		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07 072	US 290	10	

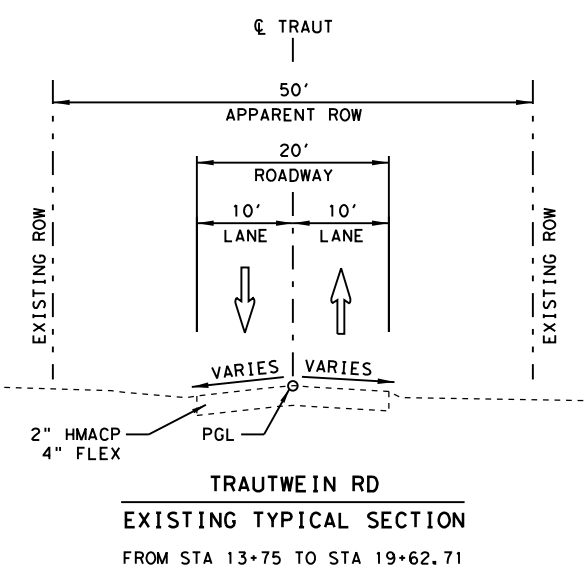
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 Date: 4/11/2023



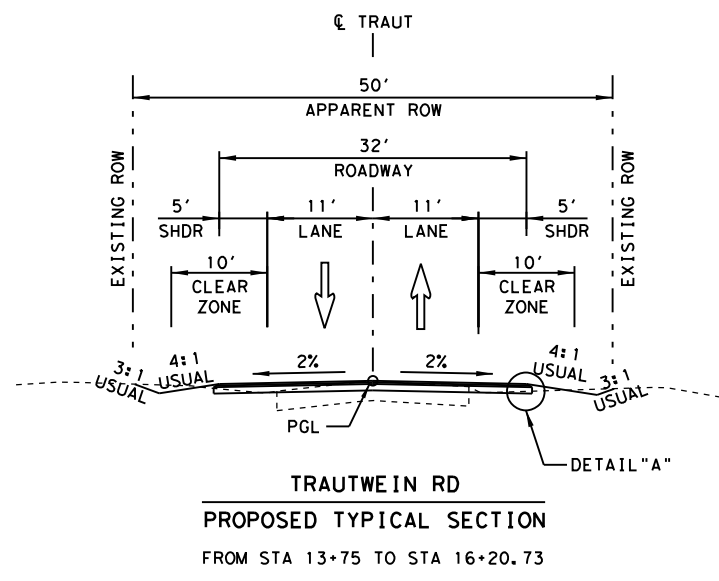


DETAIL "A"

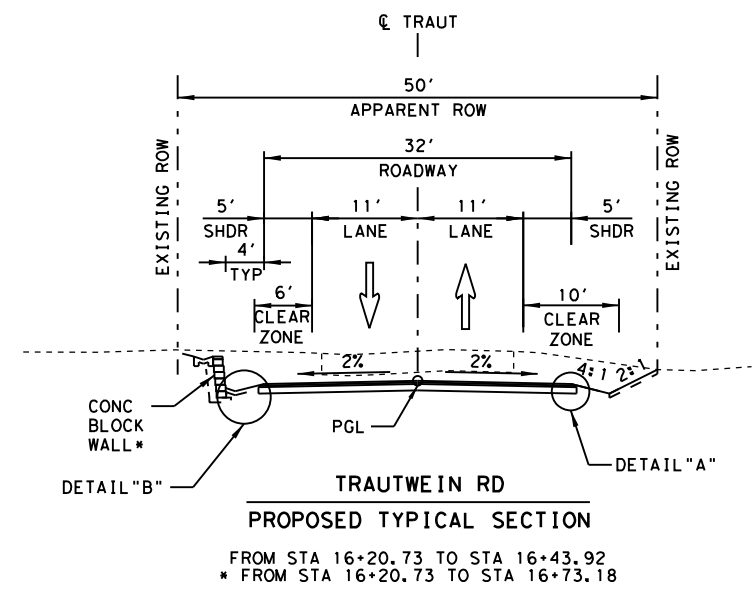
- ① 2" D-GR HMA (TY D)
- ② BONDING COURSE
- ③ 2" D-GR HMA (TY C)
- ④ PRIME COAT
- ⑤ 14" FLEX BASE (3 EQUAL LIFTS)



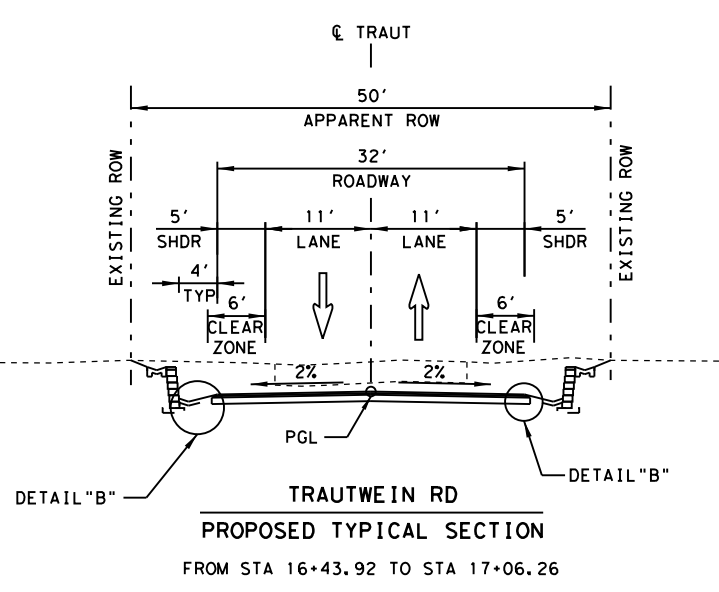
TRAUTWEIN RD  
EXISTING TYPICAL SECTION  
FROM STA 13+75 TO STA 19+62.71



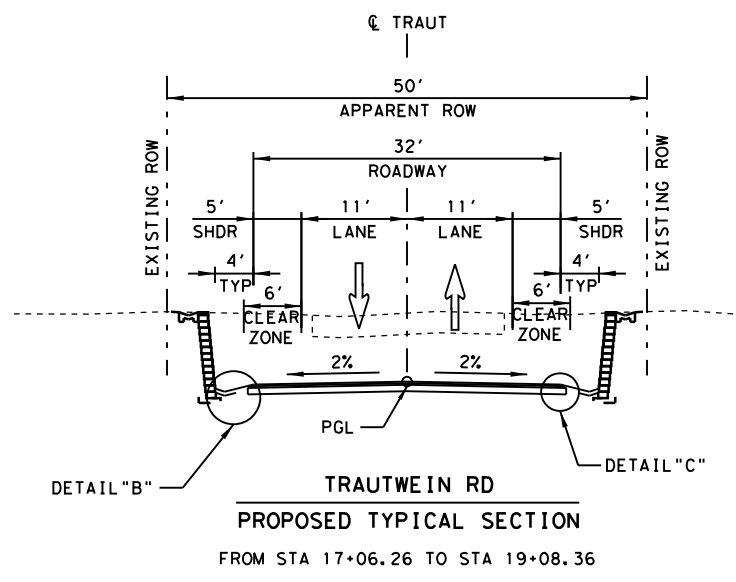
TRAUTWEIN RD  
PROPOSED TYPICAL SECTION  
FROM STA 13+75 TO STA 16+20.73



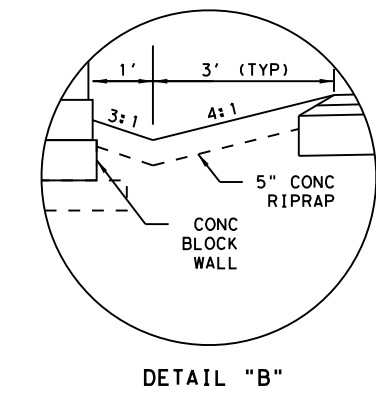
TRAUTWEIN RD  
PROPOSED TYPICAL SECTION  
FROM STA 16+20.73 TO STA 16+43.92  
\* FROM STA 16+20.73 TO STA 16+73.18



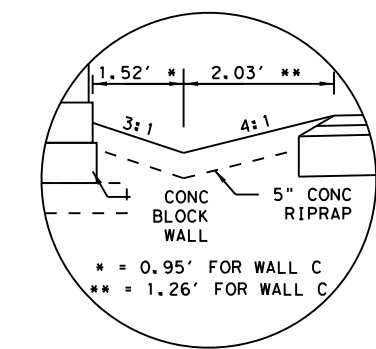
TRAUTWEIN RD  
PROPOSED TYPICAL SECTION  
FROM STA 16+43.92 TO STA 17+06.26



TRAUTWEIN RD  
PROPOSED TYPICAL SECTION  
FROM STA 17+06.26 TO STA 19+08.36



DETAIL "B"



DETAIL "C"

STATE OF TEXAS  
DANIEL A. ROGERS  
88794  
LICENSED PROFESSIONAL ENGINEER  
*Daniel A. Rogers*  
4/11/2023

Texas Department of Transportation

HAYS COUNTY

wsb WSB & ASSOCIATES, INC.  
FIRM # 16849

US 290 AT  
TRAUTWEIN ROAD  
TYPICAL SECTIONS

DATE: 4/11/2023		SHEET 3 OF 3		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07	072	US 290	11

N. T. S.

File name: \\... \Cad\p\lan\016874-000\*TS02-T.dgn  
 Date: 4/11/2023

GENERAL NOTES

1. THE CONTRACTOR MAY PROPOSE/RECOMMEND SIGNED AND SEALED MODIFICATIONS BY A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS TO THE SEQUENCE OF WORK FOR CONSIDERATION BY THE ENGINEER. ANY MAJOR RECOMMENDED MODIFICATION TO THE SEQUENCE OF WORK BY THE CONTRACTOR SHALL INCLUDE ANY CHANGES TO THE VARIOUS PAY ITEMS, IMPACT TO TRAFFIC, AND EFFECT ON OVERALL PROJECT IN TIME AND COST, ETC. THE CONTRACTOR CANNOT PROCEED WITH ANY CONSTRUCTION OPERATIONS BASED ON A REVISED PHASE/SEQUENCE OF WORK UNTIL THE CONTRACTOR OBTAINS WRITTEN APPROVAL FROM THE ENGINEER.
2. THE PROVISIONS FOR ROUTING TRAFFIC DURING CONSTRUCTION AND THE SEQUENCE OF CONSTRUCTION OPERATIONS SHALL BE IN GENERAL COMFORMITY WITH THE DETAILS SHOWN ON THE PLANS. ALL TRAFFIC HANDLING SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF THE T.M.U.T.C.D. AND APPLICABLE TXDOT TCP AND WORK ZONE STANDARDS THROUGHOUT THE DURATION OF THE CONSTRUCTION OF THE PROJECT.
3. THE SPACING OF SIGNS MAY BE MODIFIED TO MEET TRAFFIC CONDITIONS AS DIRECTED.
4. CONTRACTOR TO COORDINATE WITH ADJACENT PROPERTIES OWNERS THROUGHOUT CONSTRUCTION TO MAINTAIN ACCESS TO DRIVEWAYS. THIS WORK WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.
5. COVER OR REMOVE ALL CONFLICTING SIGNS.
6. INCORPORATE AND MAINTAIN A 3H:1V SAFETY WEDGE INTO THE PROPOSED CONSTRUCTION FOR ANY ROADWAY EDGE OF 2 INCHES OR GREATER.
7. THE CONTRACTOR IS REQUIRED TO PROVIDE AND MAINTAIN POSITIVE DRAINAGE THROUGHOUT THE PROJECT.
8. DO NOT LEAVE CONSTRUCTION WARNING SIGNS ON ANY AREA WHICH CONSTRUCTION OPERATIONS ARE NOT BEING CARRIED OUT.
9. NO EQUIPMENT, STOCKPILED MATERIAL, ETC. SHALL BE PERMITTED TO REMAIN WITHIN 30' OF THE EXISTING EDGE OF PAVEMENT AFTER WORKING HOURS.

TCP SEQUENCE OF WORK

PHASE 1a:

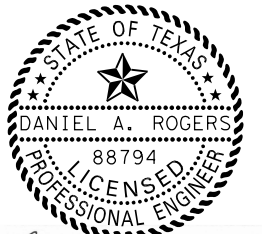
1. INSTALL ADVANCE WARNING SIGNS AND BARRICADES IN ACCORDANCE WITH BC (BARRICADE & CONSTRUCTION) AND WZ (WORK ZONE) STANDARDS.
2. INSTALL ALL EROSION CONTROL DEVICES. THIS WORK MUST BE DONE BEFORE ANY CLEARING OR CONSTRUCTION CAN TAKE PLACE AND MUST BE APPROVED BEFORE ANY FURTHER WORK CAN BEGIN.
3. INSTALL DETOUR PER DETOUR PLAN SHEET AND CLOSE TRAFFIC ON TRAUTWEIN AT US 290.
4. BEGIN CONSTRUCTION OF RETAINING WALLS AND RECONSTRUCTION OF ROADWAY SECTION ALONG TRAUTWEIN.

PHASE 1b:

1. CONTINUE CONSTRUCTION OF RETAINING WALLS AND RECONSTRUCTION OF ROADWAY SECTION ALONG TRAUTWEIN.
2. DURING OFF-PEAK HOURS (8PM - 5AM), SHIFT ALL TRAFFIC TO EB 290 PER TCP(2-5)-18.
3. MILL 3' OFF EXISTING SURFACE. PROVIDE A TAPERED EDGE ALONG TRANSITIONS.
4. PLACE TY-B HMA PER PLANS TO REVISE CROSS SLOPE. PLACE 1.5" TY-D HMA PER PLANS.
5. PLACE WORK ZONE PAVEMENT MARKINGS AND REOPEN LANES TO ORIGINAL CONFIGURATION, DETOUR REMAINS IN PLACE.

PHASE 1c:

1. CONTINUE CONSTRUCTION OF RETAINING WALLS AND RECONSTRUCTION OF ROADWAY SECTION ALONG TRAUTWEIN.
2. USING TxDOT STANDARD TCP(2-1)-18, CONVENTIONAL ROAD SHOULDER WORK, CONSTRUCT WIDENING OF US 290 AND CONNECTION WITH TRAUTWEIN.
3. PLACE PERMANENT SIGNING AND STRIPING AND OPEN ALL ROADWAYS TO TRAFFIC.
4. PERFORM PROJECT CLEAN UP AND REMOVE ALL TRAFFIC CONTROL DEVICES.

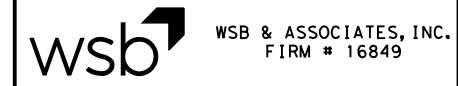


*Daniel A. Rogers*

4/11/2023



**HAYS COUNTY**



WSB & ASSOCIATES, INC.  
FIRM # 16849

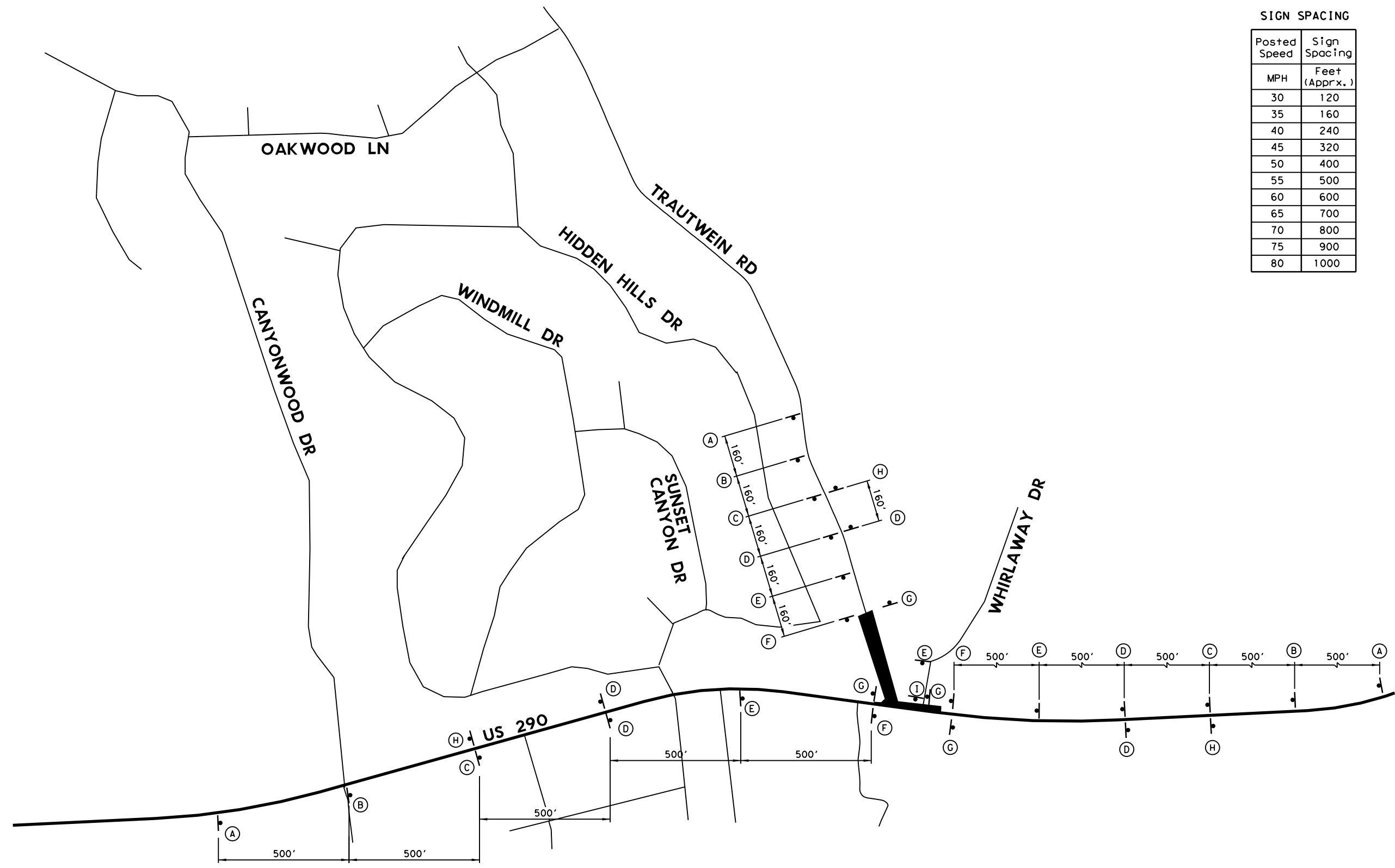
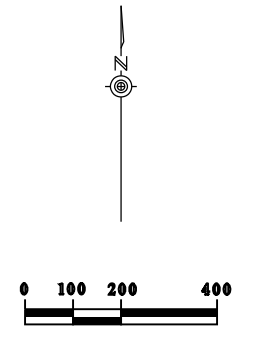
**US 290 AT  
TRAUTWEIN ROAD  
TRAFFIC CONTROL  
PLAN NARRATIVE**

DATE: 4/11/2023				SHEET 1 OF 1	
STATE	STATE DIST. NO.	COUNTY			
TEXAS	14	HAYS			
CONT.	SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07	072	US 290	12	

File name: \\... \PIan\016874-000\*TC-NARR\*T.dgn  
 Date: 4/11/2023

**SIGN SPACING**

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



4/11/2023



**US 290 AT  
TRAUTWEIN ROAD  
TRAFFIC CONTROL PLAN  
ADVANCE WARNING SIGNS**






DATE: 4/11/2023		SHEET 1 OF 1		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07 072	US 290	13	

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 Date: 4/11/2023

<b>(A)</b>  R20-3T 48" x 42"	<b>(B)</b>  G20-10T 60" x 48"	<b>(C)</b>  G20-9TP 24" x 24"  R20-5T 24" x 30"  R20-5aTP 24" x 12"	<b>(D)</b>  R2-1 24" x 36"	<b>(E)</b>  CW20-1D 48" x 48"	<b>(F)</b>  G20-5T 48" x 24"  G20-6T 48" x 30"	<b>(G)</b>  G20-2 48" x 24"	<b>(H)</b>  G20-2bT 48" x 24"	<b>(I)</b>  G20-1aT 72" x 36"
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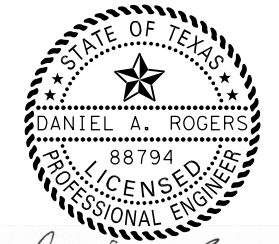


**LEGEND**

-  CONSTRUCTION SIGN
-  BARRICADE TYPE III
-  DIRECTION OF TRAFFIC
-  STATIC MESSAGE SIGN
-  CONSTRUCTION AREA

**NOTES:**

1. MAINTAIN ACCESS TO ALL DRIVEWAYS.
2. CONTRACTOR TO COORDINATE WITH CHARLES VAUGHAN JR., PHONE 512-832-7000 OF THE TxDOT AUSTIN DISTRICT TRAFFIC SIGNAL SHOP AND COORDINATE US 290/CANYONWOOD DR. TRAFFIC SIGNAL TIMING REVISIONS A MINIMUM OF THREE WEEKS PRIOR TO TRAUTWEIN RD. CLOSURE.



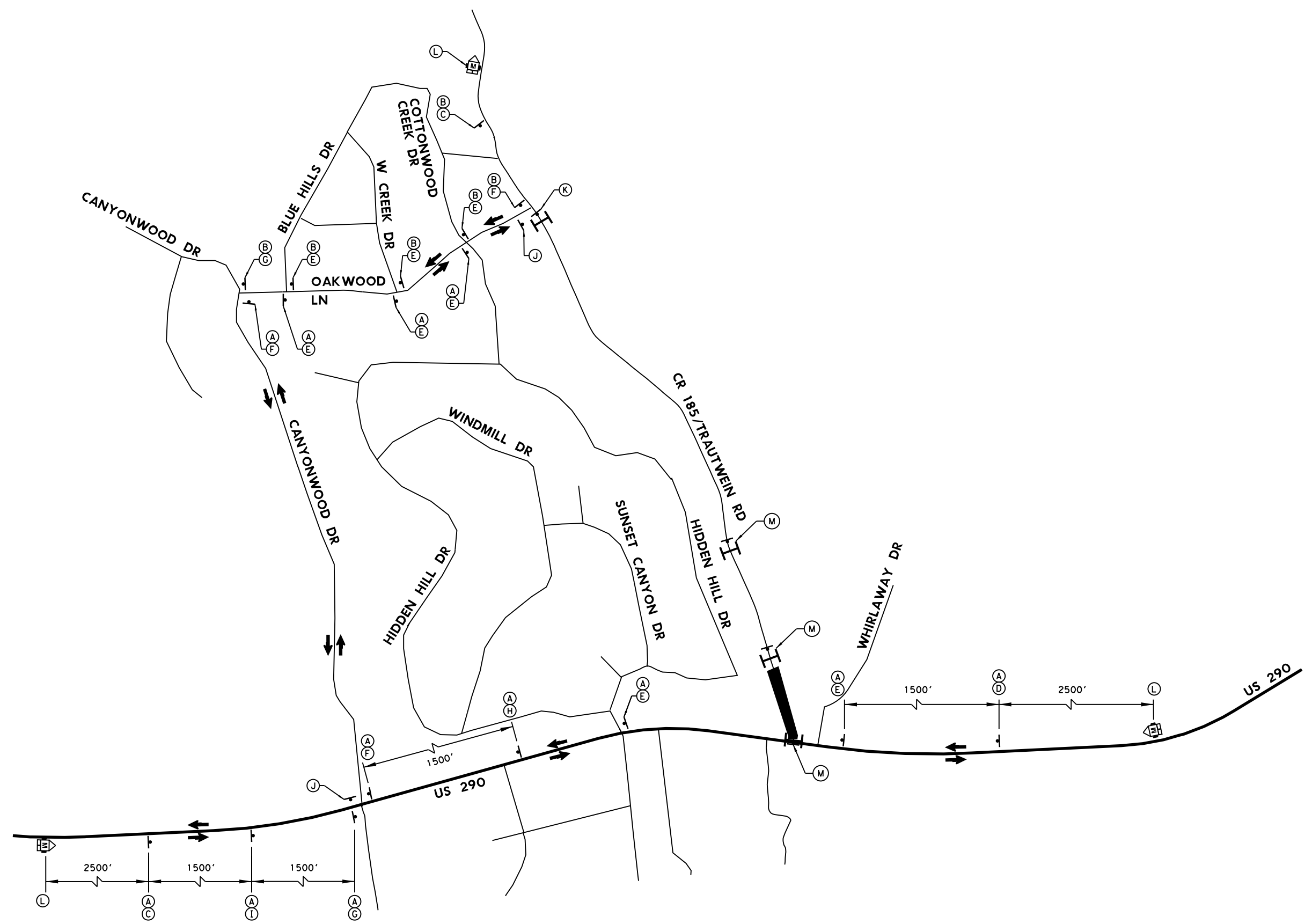
*Daniel A. Rogers*

4/11/2023











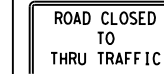
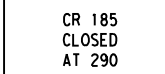




**US 290 AT  
TRAUTWEIN ROAD  
TRAFFIC CONTROL PLAN  
PHASE I  
DETOUR PLAN**

DATE: 4/11/2023		SHEET: OF 1	
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07	072	US 290 14

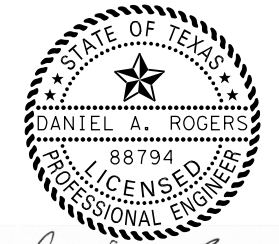
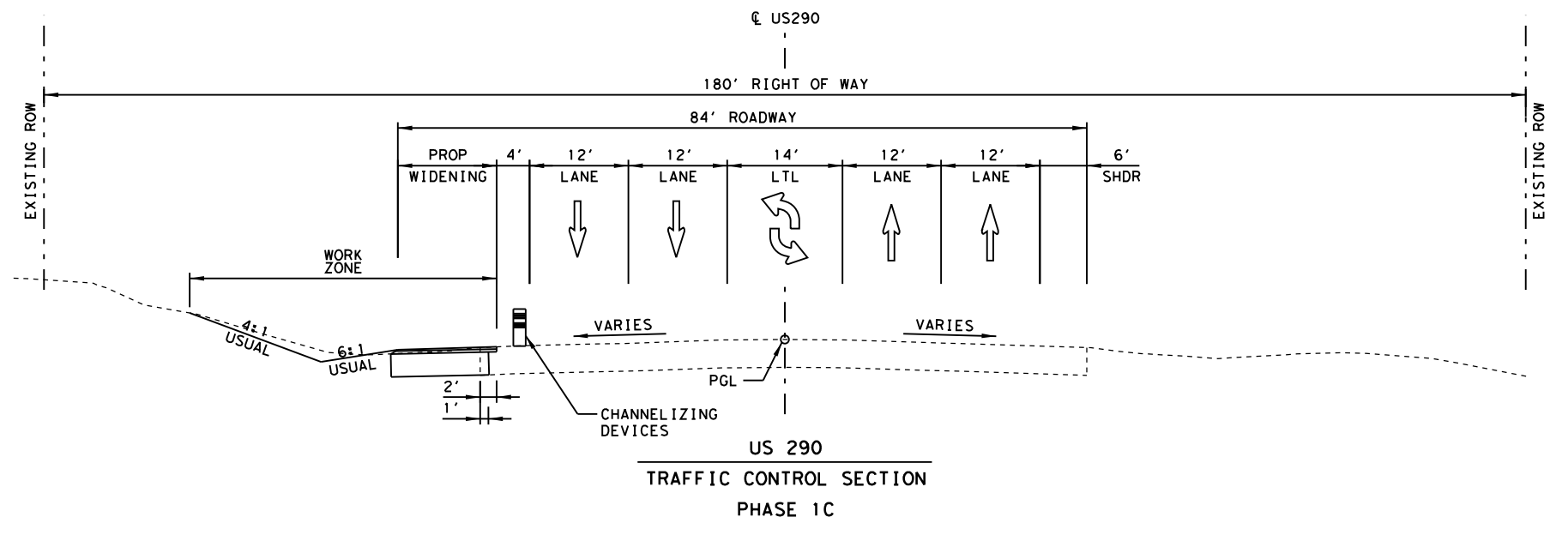
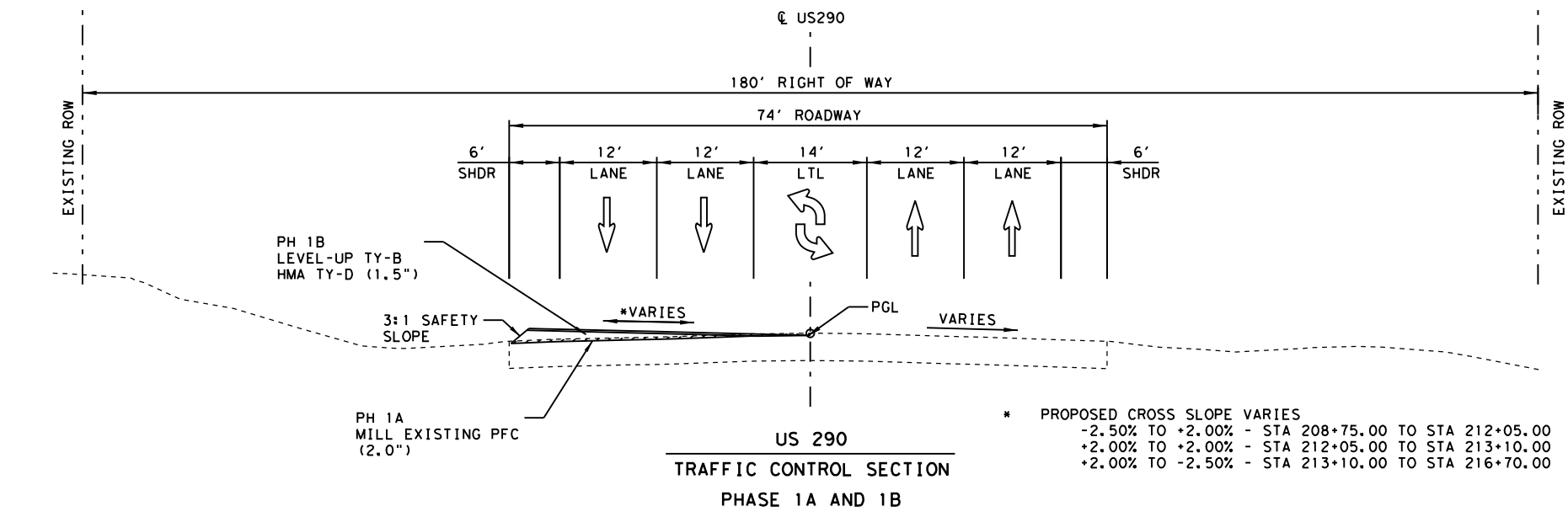


SCALE: NOT TO SCALE

A	B	C	D	E	F	G	H	I	J	K	L	M	
 M1-5 24"x24"	 M1-4 30"x24"	 CW20-2A 36"x36"	 CW20-2D 36"x36"	 M4-9S 30"x24"	 M4-9R 30"x24"	 M4-9L 30"x24"	 M4-9AR 30"x24"	 M4-9AL 30"x24"	 M4-8G 30"x24"	 R11-4 60"x30"	 PHASE 1	 PHASE 2	 R11-2 48"x30"

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 Date: 4/11/2023





*Daniel A. Rogers*

4/11/2023

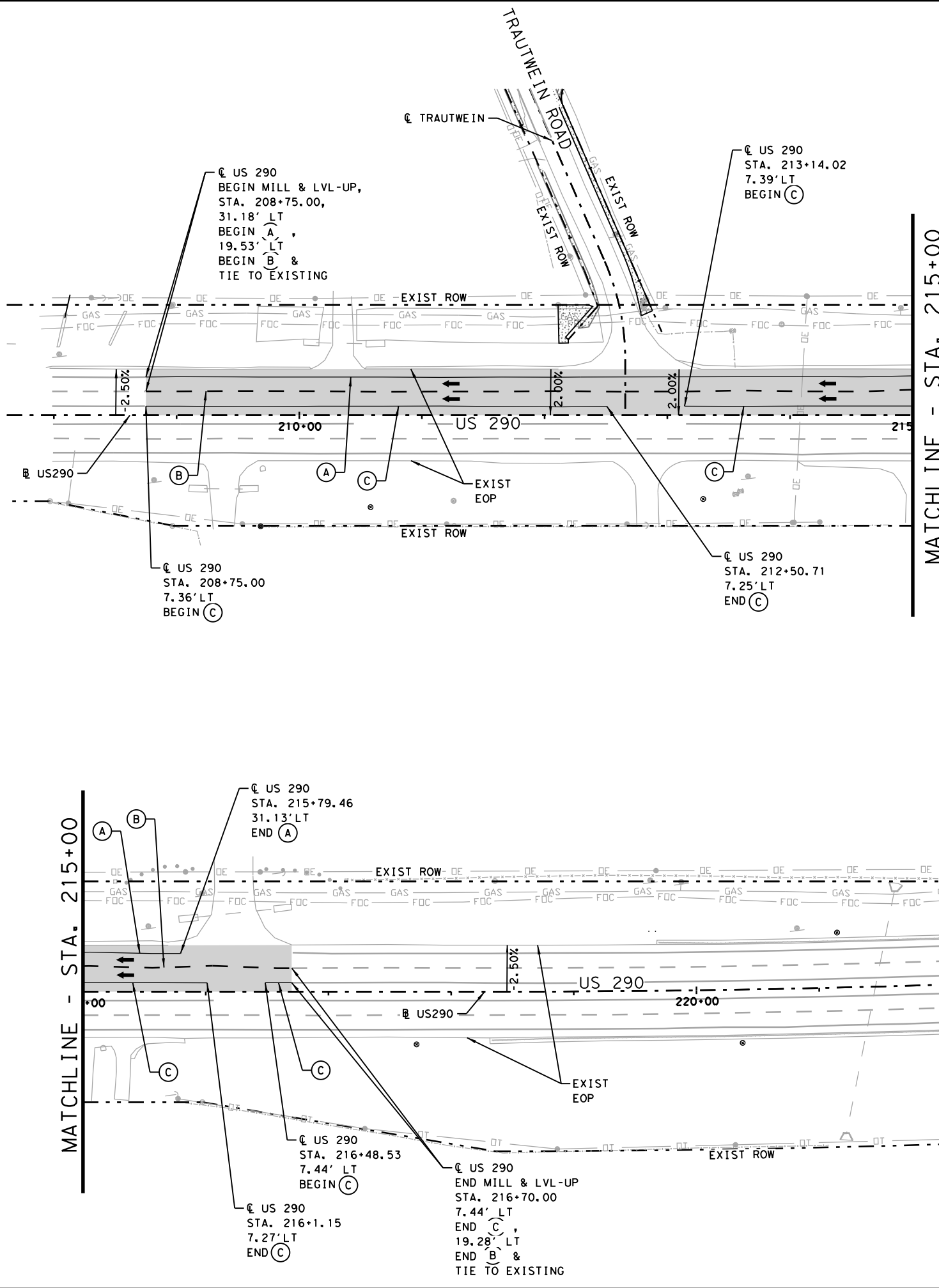


**US 290 AT  
 TRAUTWEIN ROAD  
 TRAFFIC CONTROL PLAN  
 TYPICAL SECTIONS**

DATE: 4/11/2023		SHEET 1 OF 1		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07	072	US 290	15

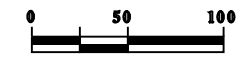
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Date: 4/11/2023



SUMMARY OF WORK ZONE PAVEMENT MARKINGS

ITEM 662			
WKZN PVMK NON-REMOVE			
	(A)	(B)	(C)
	4" WHITE SLD	4" WHITE BRK	4" YELLOW SLD
	LF	LF	LF
PHASE 1a	795	199	763
PHASE 1b	795	199	763



LEGEND

- LIMITS OF MILLING & LEVEL-UP
- DIRECTION OF TRAFFIC
- WRK ZN PAV MRK (W) (4") (SLD) (NON-REMOV)
- WRK ZN PAV MRK (W) (4") (BRK) (NON-REMOV)
- WRK ZN PAV MRK (Y) (4") (SLD) (NON-REMOV)

NOTES:

1. REFER TO EXISTING UTILITY SHEET FOR UTILITY LOCATIONS.
2. REMOVE EXISTING ROADWAY WITHIN LIMITS OF PROPOSED PAVEMENT STRUCTURE.
3. CONTRACTOR TO REMOVE 365 LF WATER LINE PRIOR TO RETAINING WALL CONSTRUCTION.
4. CONTRACTOR TO ENSURE ACCESS TO WHIRLWAY DR. DURING CONSTRUCTION.



*Daniel A. Rogers*

4/11/2023



HAYS COUNTY



US 290 AT  
TRAUTWEIN ROAD  
TRAFFIC CONTROL PLAN  
PHASE I

DATE: 4/11/2023		SHEET OF 1		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07 072	US 290	16	

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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).

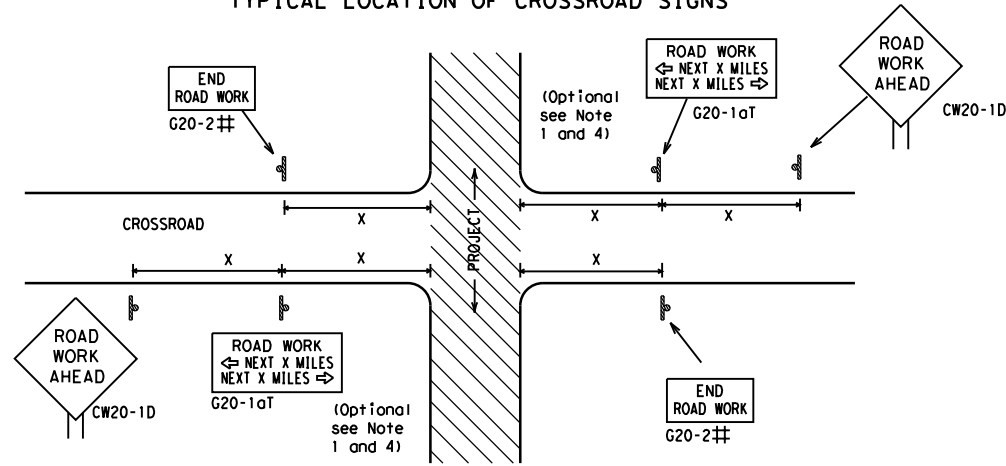
THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT <a href="http://www.txdot.gov">http://www.txdot.gov</a>
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY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

 Texas Department of Transportation		Traffic Safety Division Standard	
<b>BARRICADE AND CONSTRUCTION          GENERAL NOTES          AND REQUIREMENTS</b>			
<b>BC (1) - 21</b>			
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT November 2002	CONT	SECT	JOB
	0113	07	072
	DIST	COUNTY	SHEET NO.
4-03 7-13			
9-07 8-14			
5-10 5-21	14	HAYS	17

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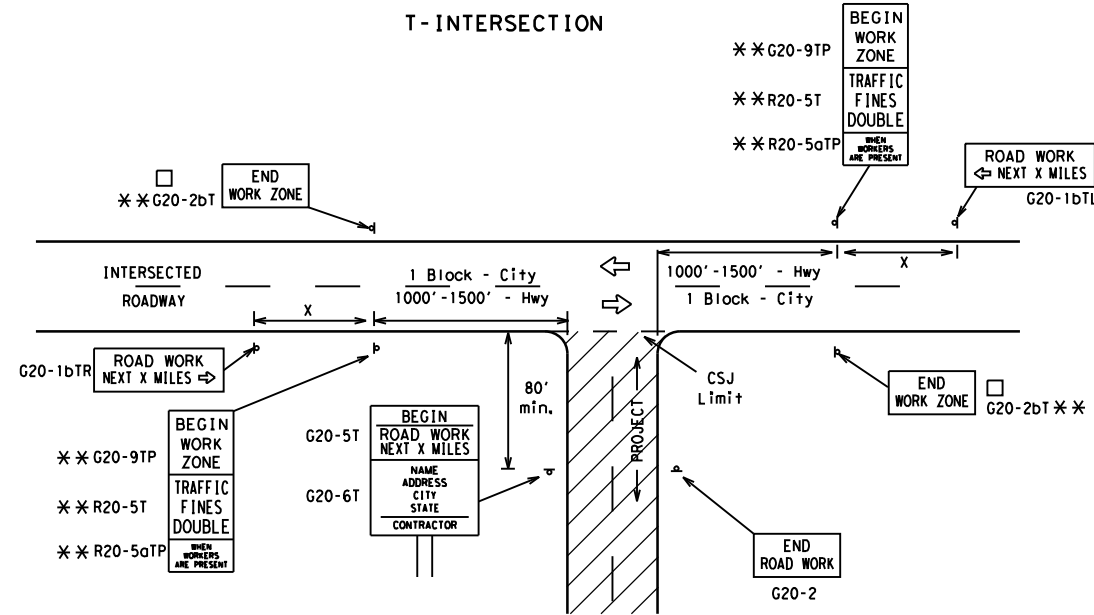
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ## 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" "ROAD WORK NEXT X MILES" (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	48" x 48"	48" x 48"	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>
			*	* <sup>3</sup>

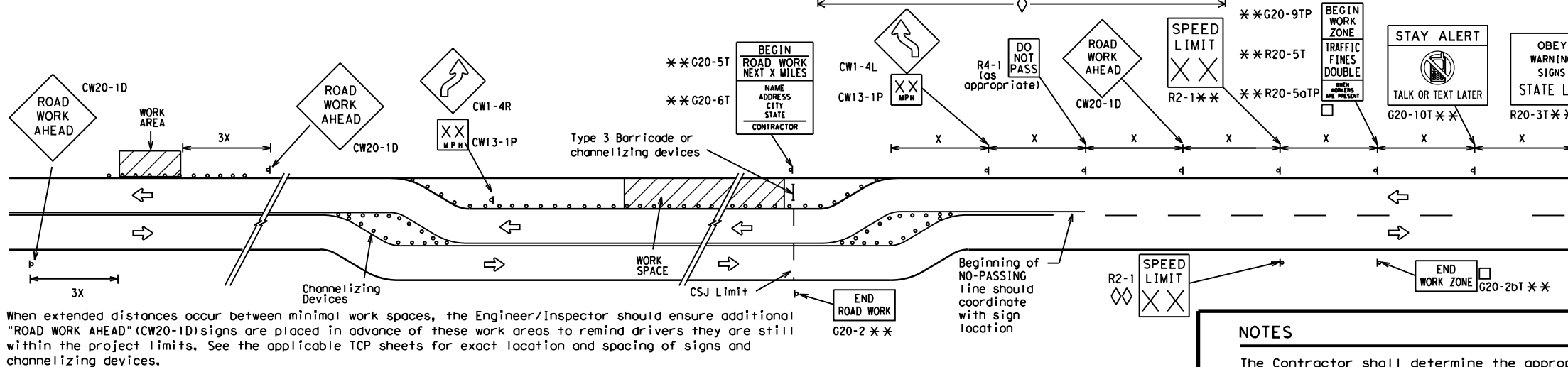
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

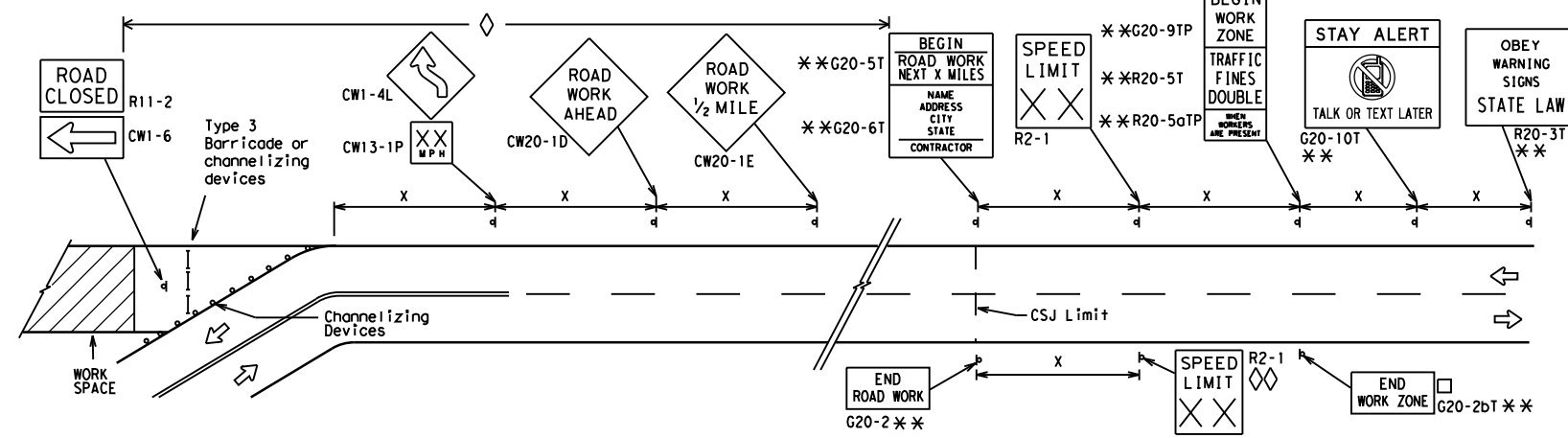
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be 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

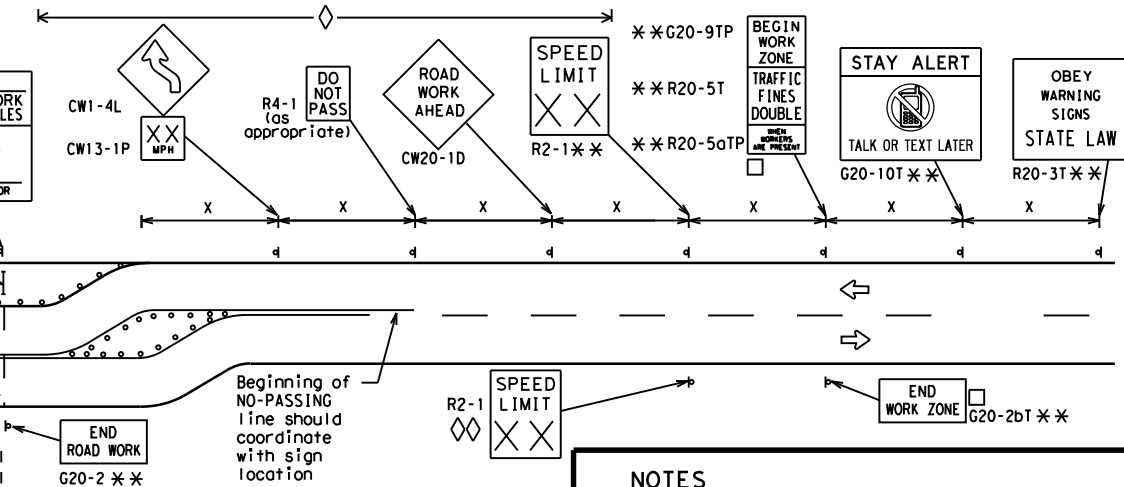


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

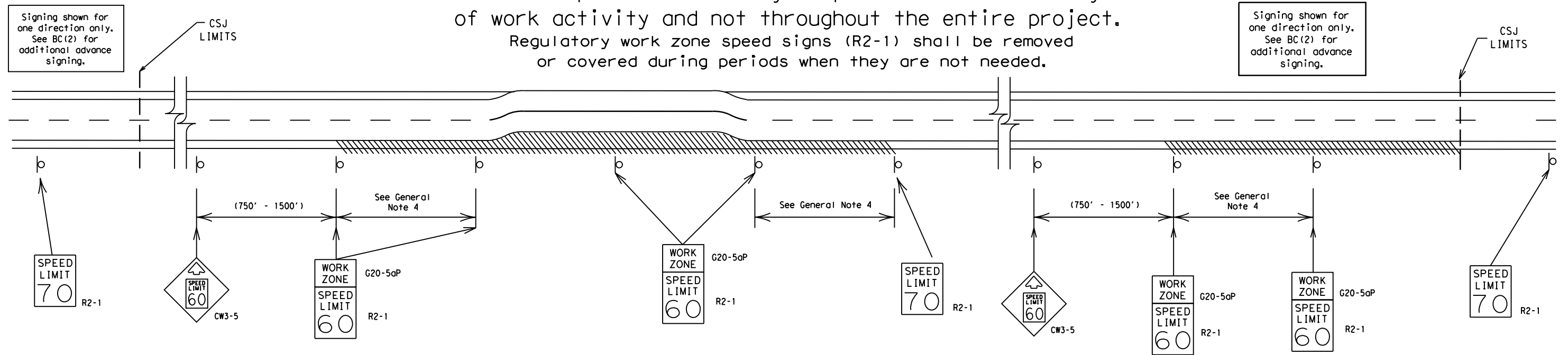
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	14	HAYS	18	

# 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.

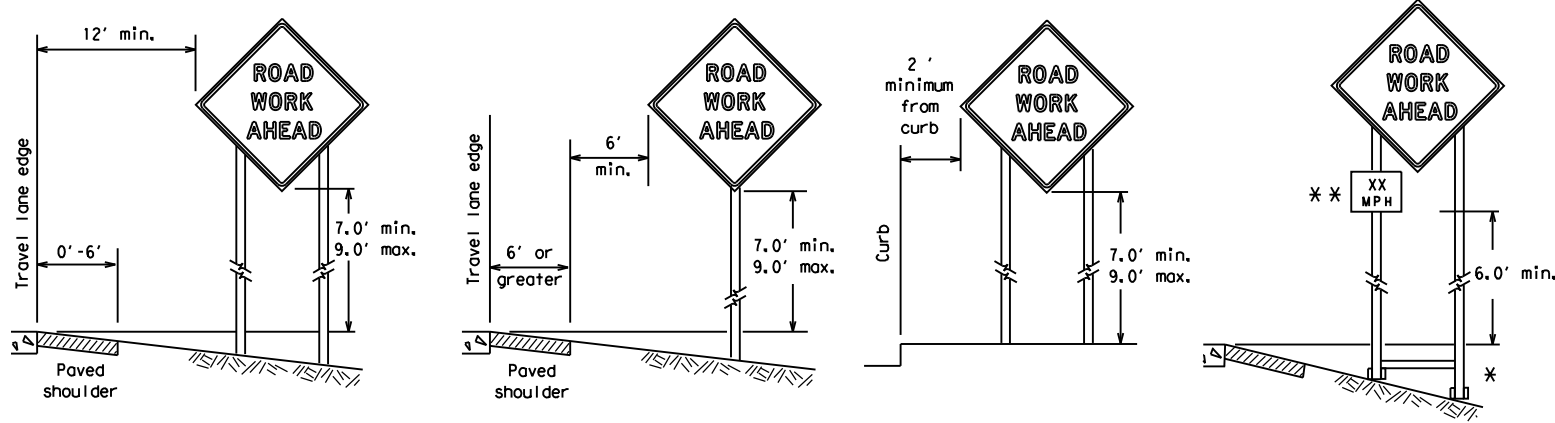
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SHEET 3 OF 12

<h2>BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT</h2>			
<h3>BC (3) - 21</h3>			
FILE:	bc-21.dgn	DN: TxDOT	CK: TxDOT
© TxDOT	November 2002	CON: 0113	SECT: 07
REVISIONS		JOB: 072	HIGHWAY: US290
9-07	8-14	DIST: 14	COUNTY: HAYS
7-13	5-21		SHEET NO.: 19

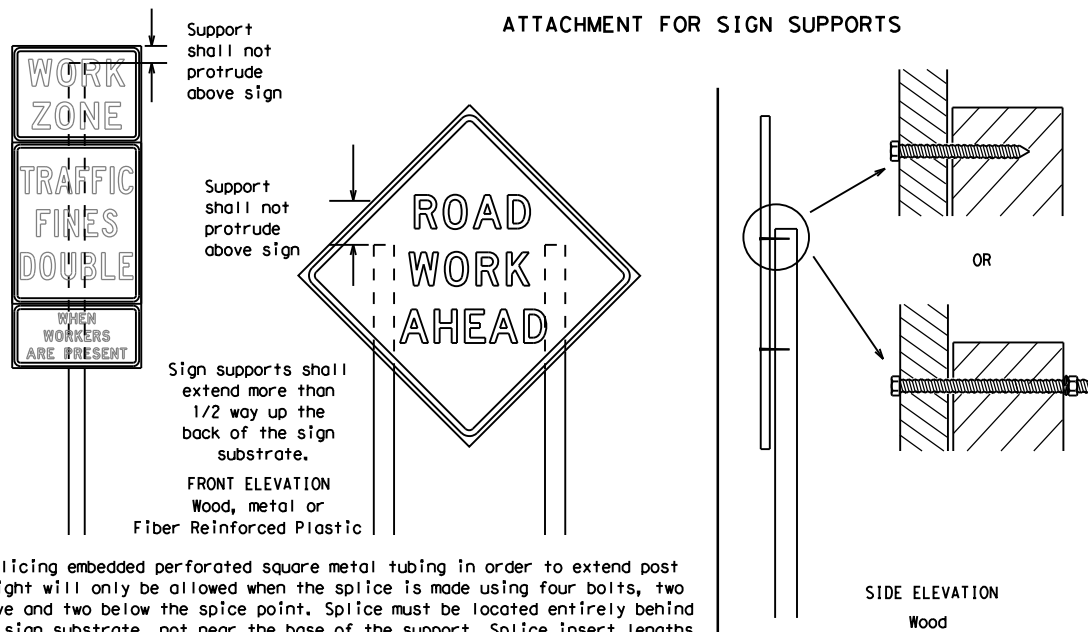
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

ATTACHMENT FOR SIGN SUPPORTS



Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the 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.

GENERAL NOTES FOR WORK ZONE SIGNS

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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)

- 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.
  - Long-term stationary - work that occupies a location more than 3 days.
  - 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.
  - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
  - Short, duration - work that occupies a location up to 1 hour.
  - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

- 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.
- 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.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- 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.
- 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

- 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

- 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.
- "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
- 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

- 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).
- White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
- 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

- 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

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

SIGN SUPPORT WEIGHTS

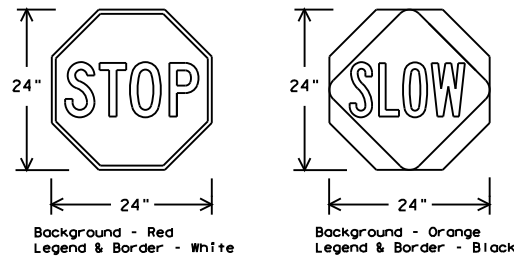
- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
- 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.
- 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.
- 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.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

- 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.

STOP/SLOW PADDLES

- STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
- STOP/SLOW paddles shall be retroreflectized when used at night.
- STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
- 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

- 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.
- 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.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- 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.
- 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.
- 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.



BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 21

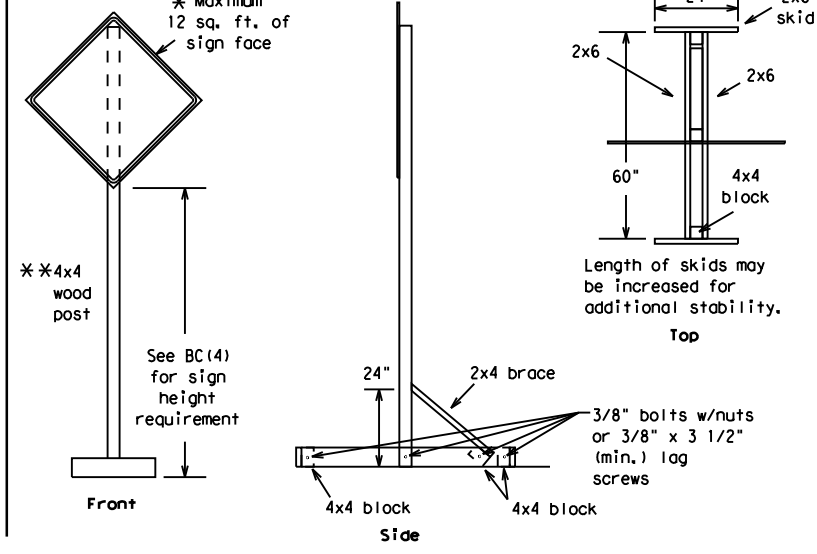
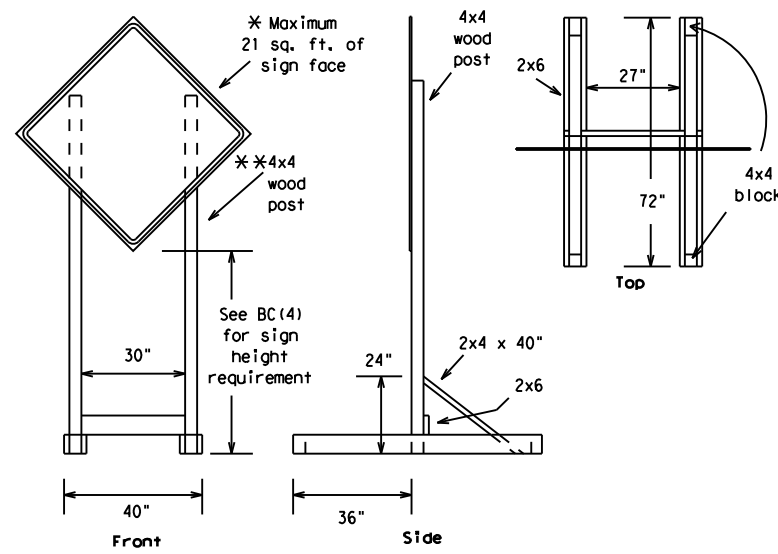
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	14	HAYS	20	

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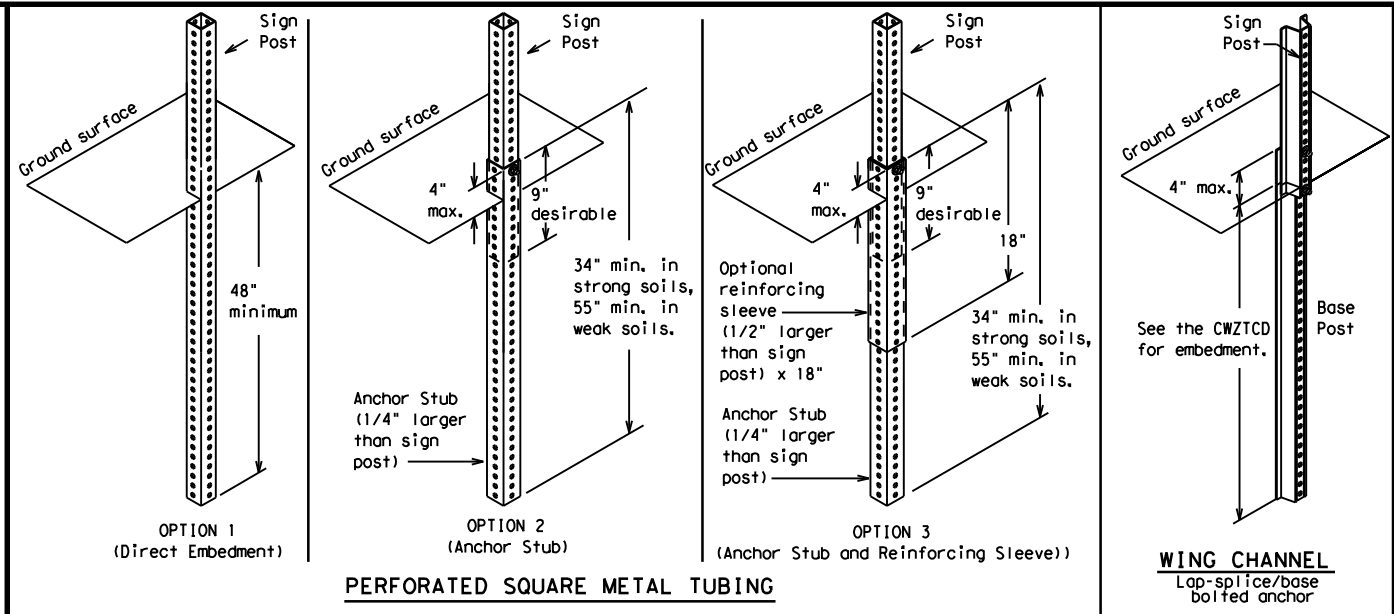


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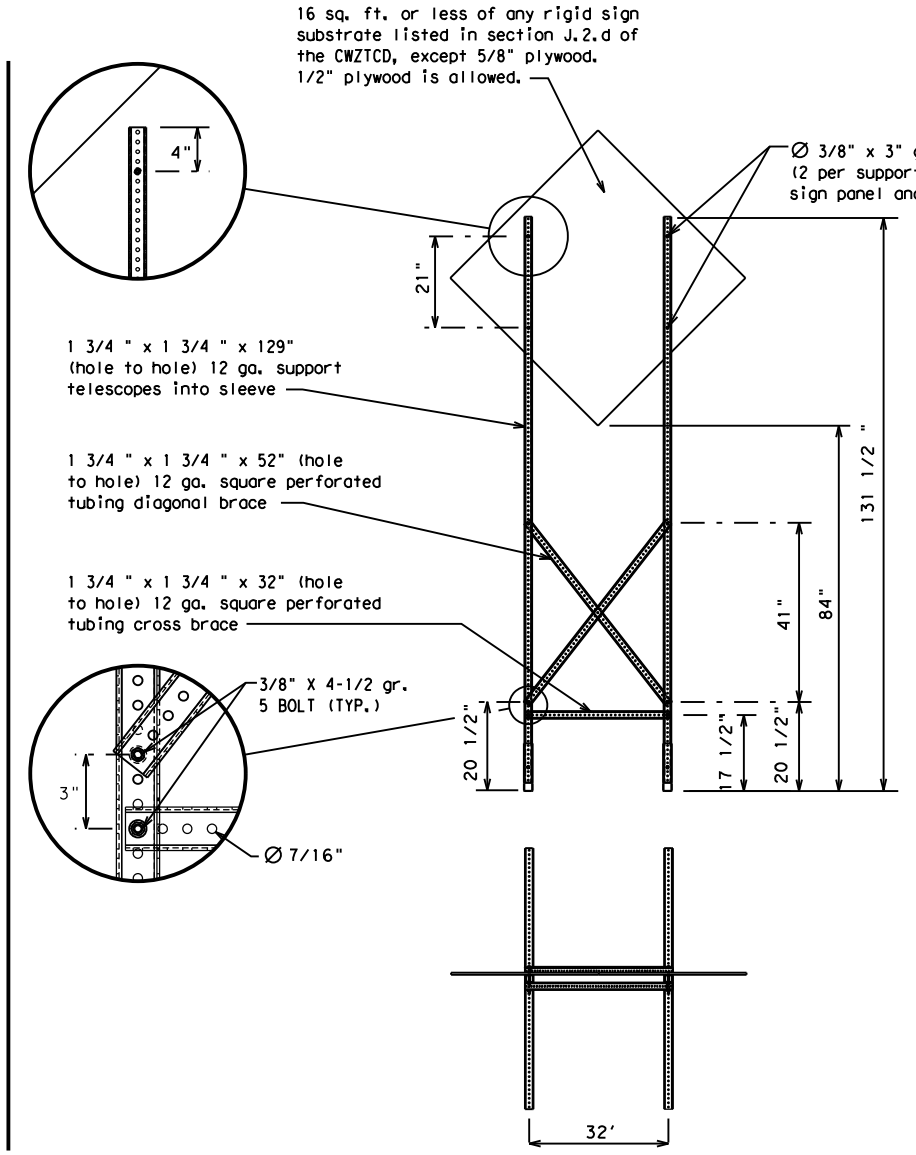
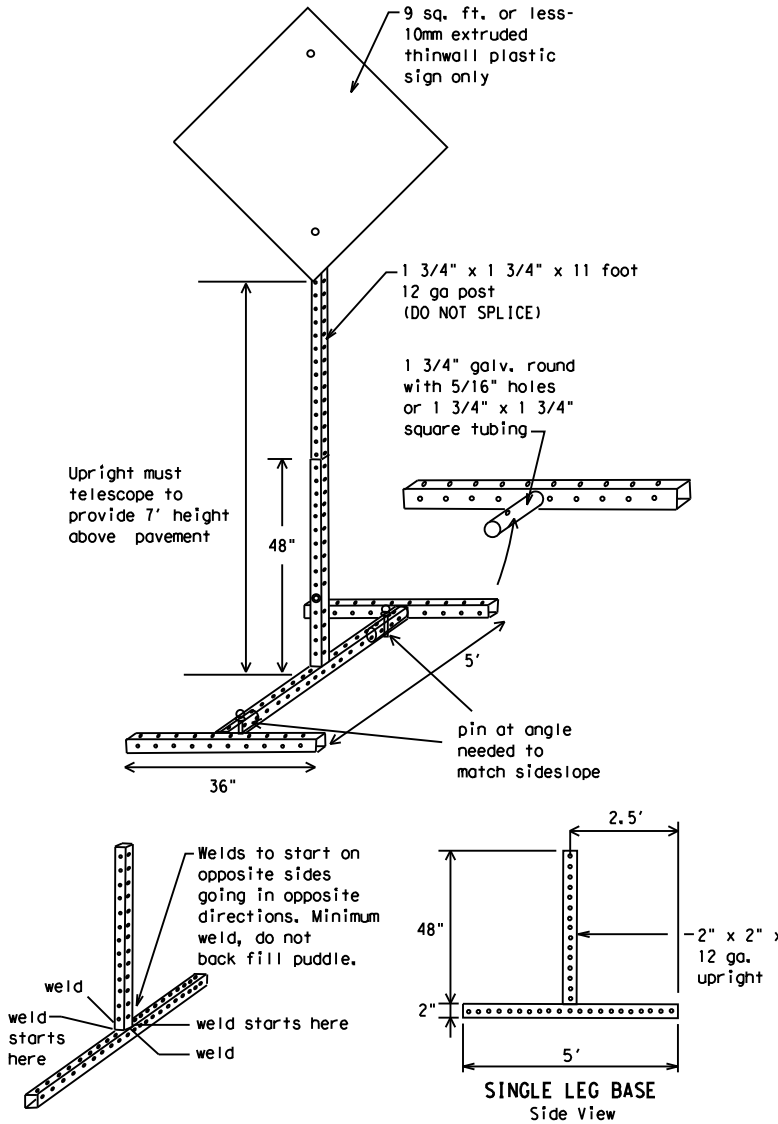
### SKID MOUNTED WOOD SIGN SUPPORTS

\* 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" bolts with nuts or 3/8" x 3 1/2" 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

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REVISIONS	0113	07	072	US290
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	14	HAYS	21	

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

# 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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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
Hour(s)	HR, HRS	Time Minutes	TIME MIN
Information	INFO	Upper Level	UPR LEVEL
It Is	ITS	Vehicles (s)	VEH, VEHS
Junction	JCT	Warning	WARN
Left	LFT	Wednesday	WED
Left Lane	LFT LN	Weight Limit	WT LIMIT
Lane Closed	LN CLOSED	West	W
Lower Level	LWR LEVEL	Westbound	(route) W
Maintenance	MAINT	Wet Pavement	WET PVMT
		Will Not	WONT

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



## BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

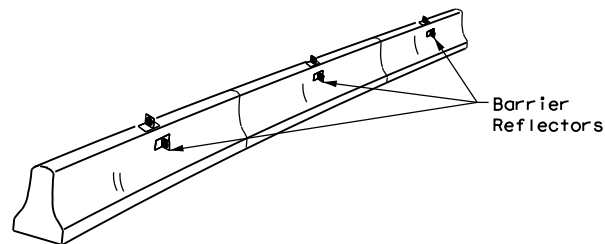
BC (6) - 21

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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	14	HAYS	22	

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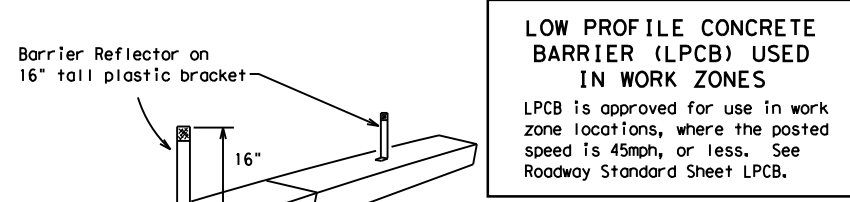
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



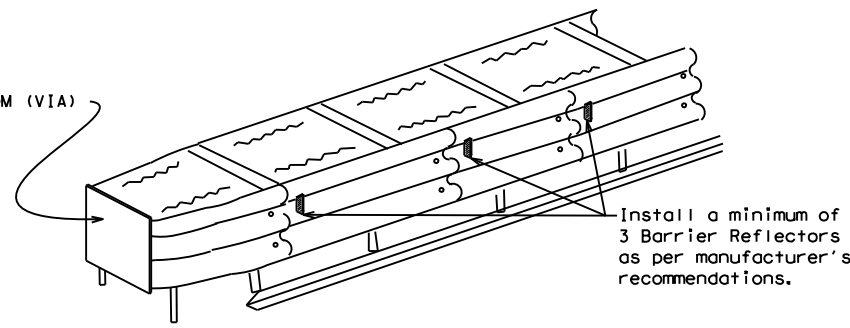
**CONCRETE TRAFFIC BARRIER (CTB)**

- 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.



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

**LOW PROFILE CONCRETE BARRIER (LPCB)**



**DELINEATION OF END TREATMENTS**  
**END TREATMENTS FOR CTB'S USED IN WORK ZONES**  
 End treatments used on CTB's in work zones shall meet the 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**

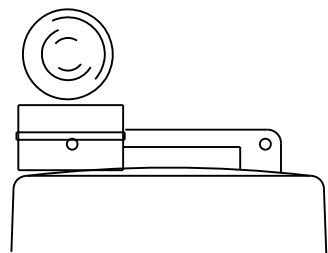
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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>PL</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.

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

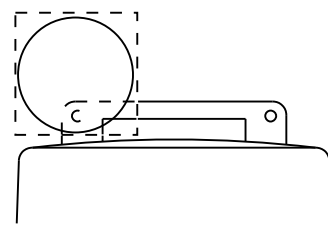
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing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



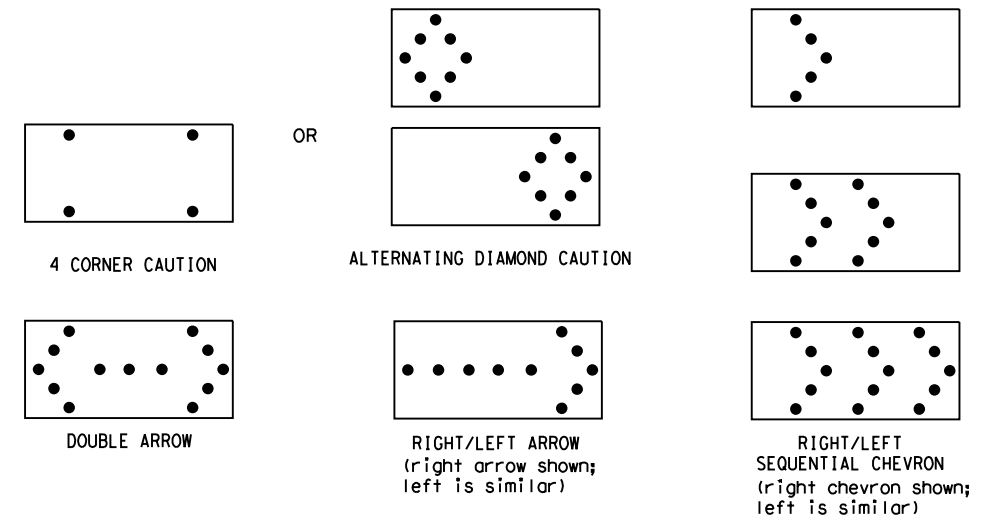
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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

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	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	14	HAYS	23	

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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:

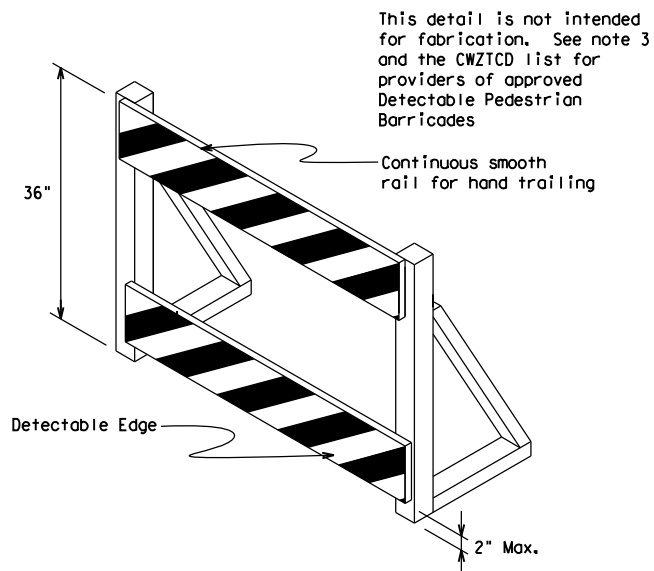
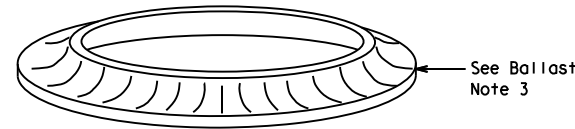
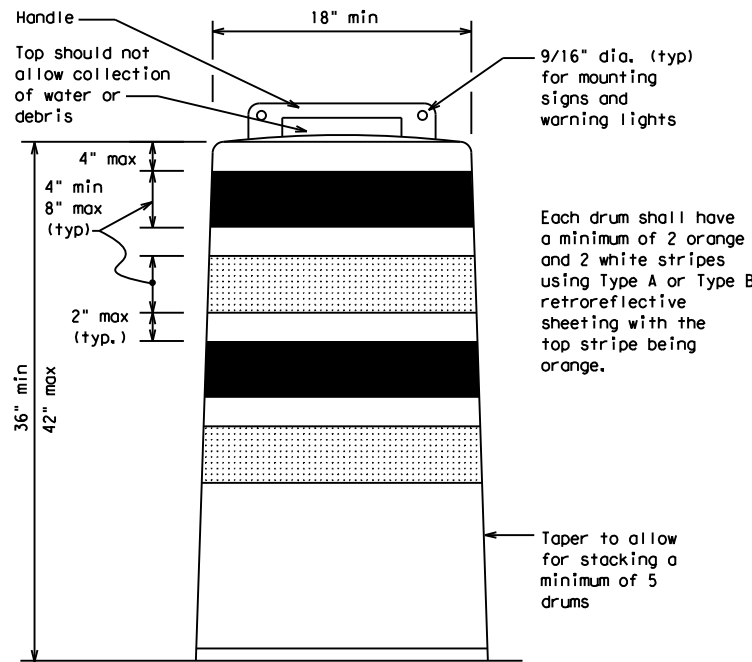
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

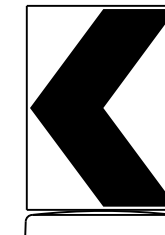
**BALLAST**

- 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.

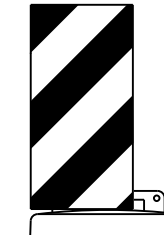


**DETECTABLE PEDESTRIAN BARRICADES**

- 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

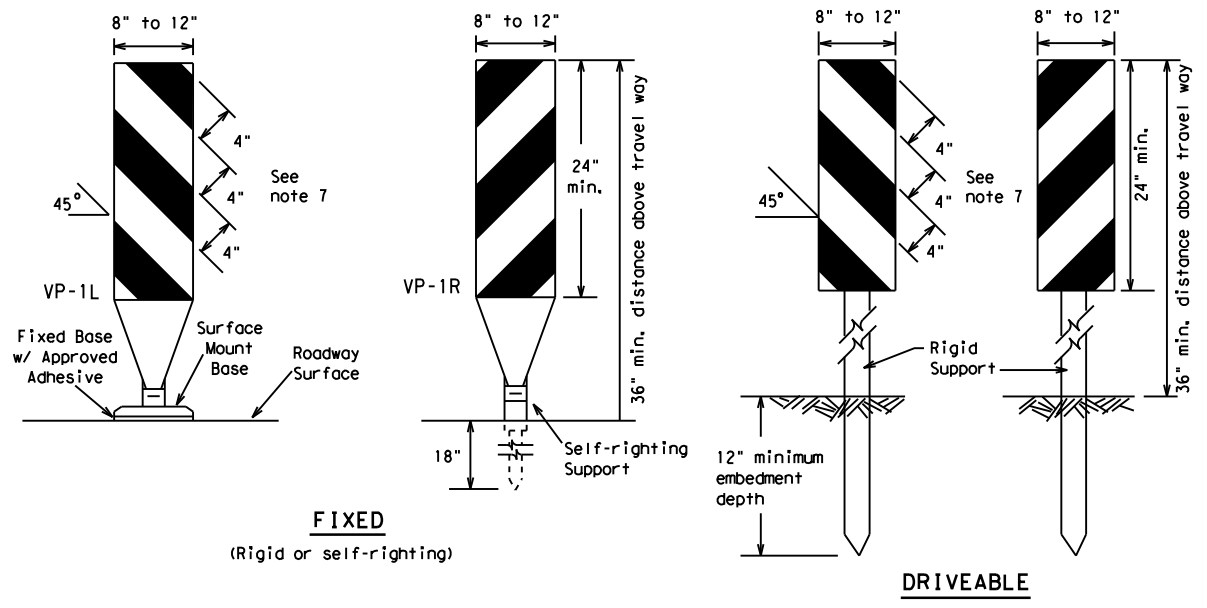


**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (8) - 21**

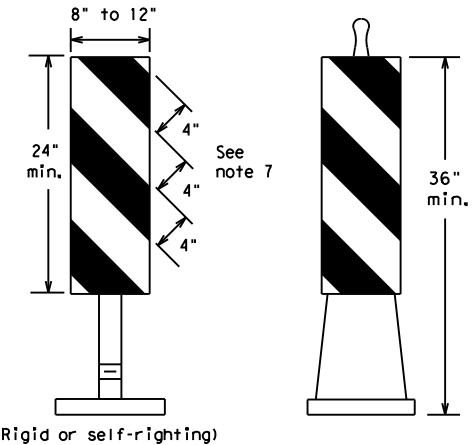
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**FIXED**  
(Rigid or self-righting)

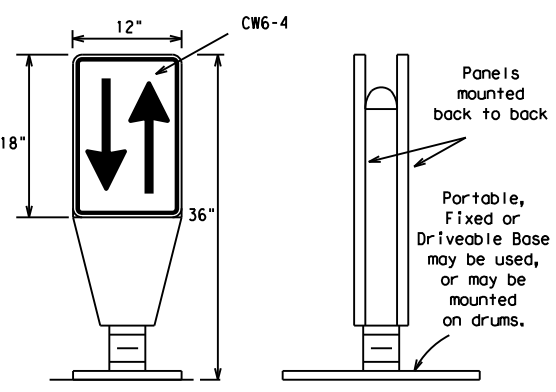
**DRIVEABLE**



**PORTABLE**

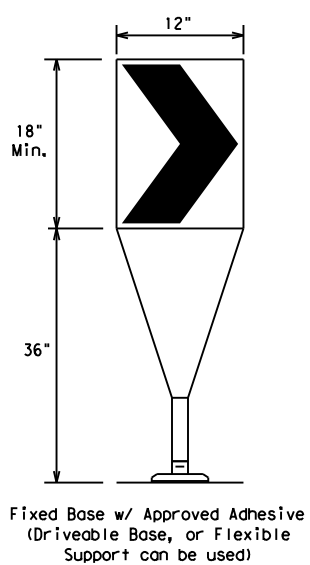
**VERTICAL PANELS (VPs)**

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



**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

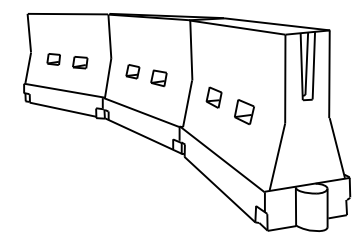
1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The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



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

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

**CHEVRONS**



**LONGITUDINAL CHANNELIZING DEVICES (LCD)**

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

**WATER BALLASTED SYSTEMS USED AS BARRIERS**

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

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

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

**GENERAL NOTES**

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.

Posted Speed	Formula	Minimum Desirable Taper Lengths * *			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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7-13 5-21	14	HAYS	25	

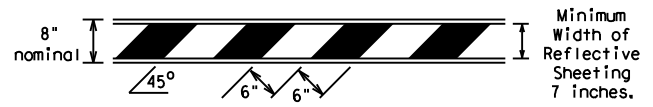
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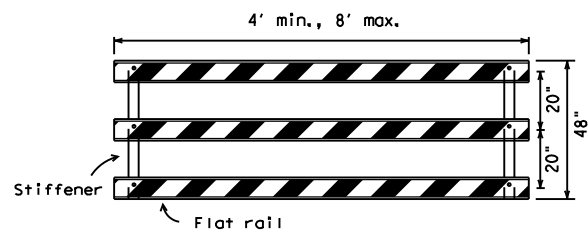
**TYPE 3 BARRICADES**

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.

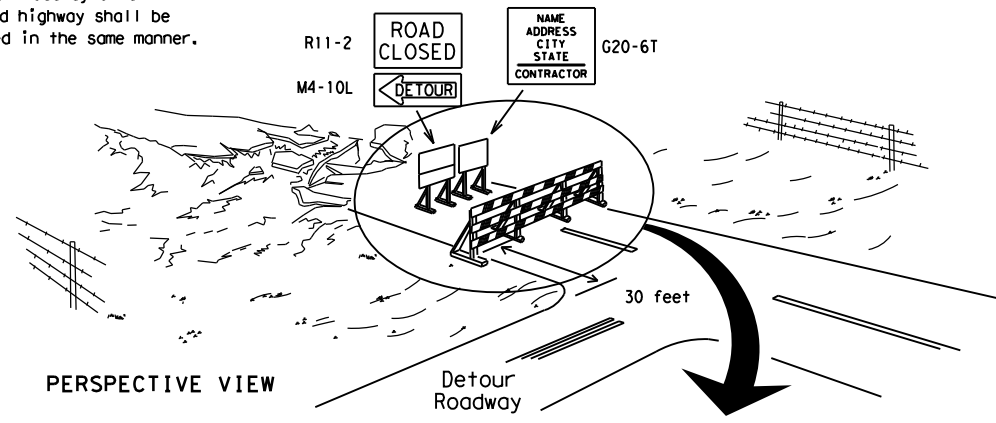


**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



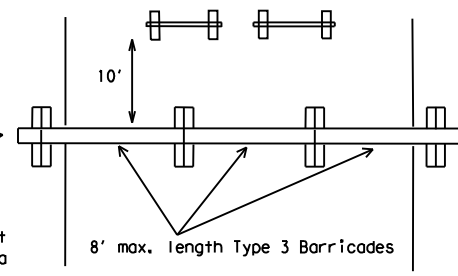
**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

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



PERSPECTIVE VIEW

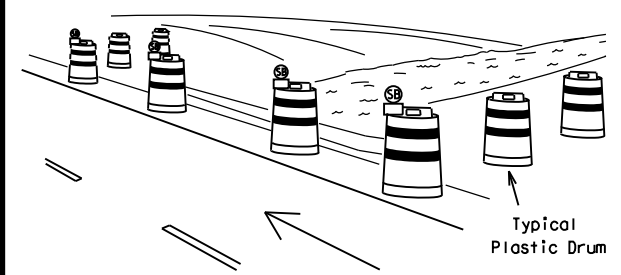
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



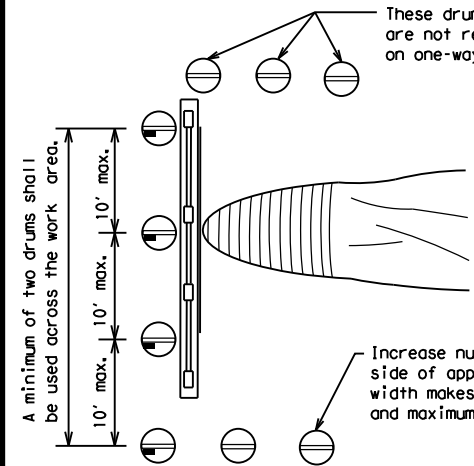
PLAN VIEW

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

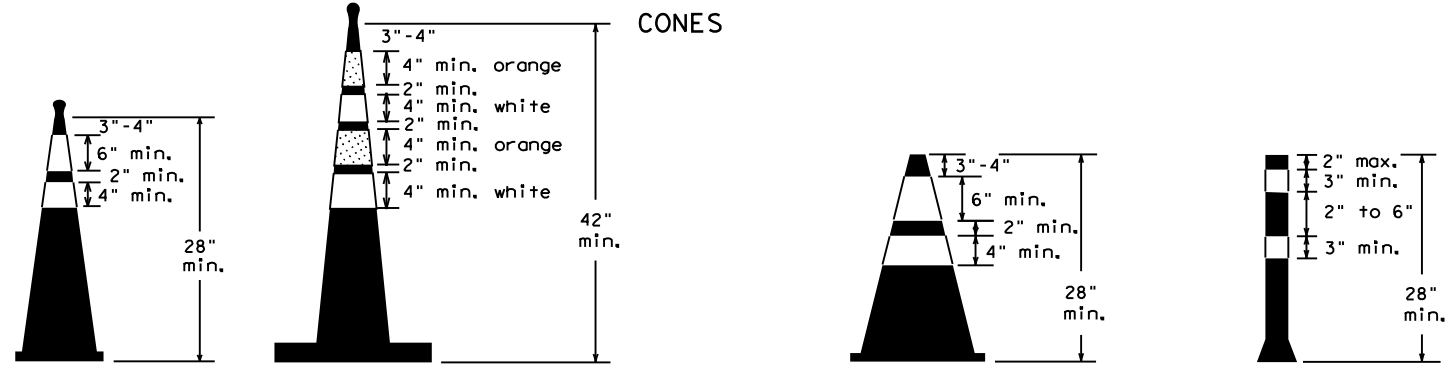


PLAN VIEW

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

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



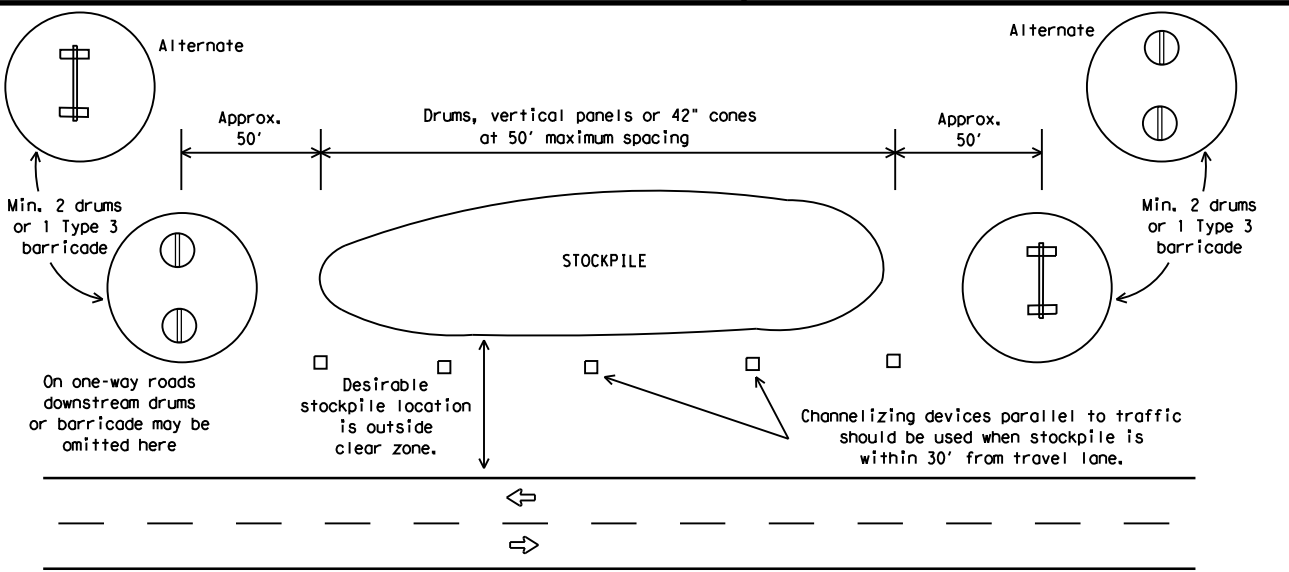
Two-Piece cones

One-Piece cones

Tubular Marker

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

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



**TRAFFIC CONTROL FOR MATERIAL STOCKPILES**

**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (10) - 21**

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	14	HAYS	26	

DATE: 4/11/2023 3:46:06 PM  
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## 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.

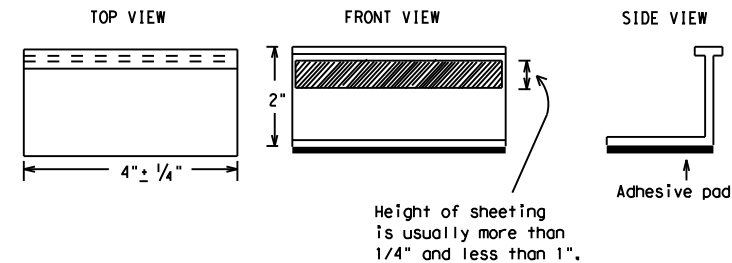
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- 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).

SHEET 11 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

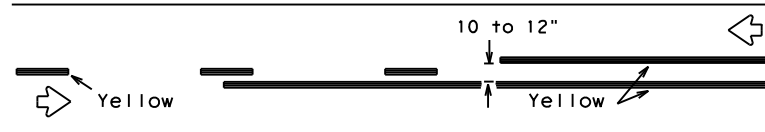
**BC(11)-21**

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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
2-98 9-07 5-21	DIST	COUNTY	SHEET NO.	
1-02 7-13	14	HAYS	27	
11-02 8-14				

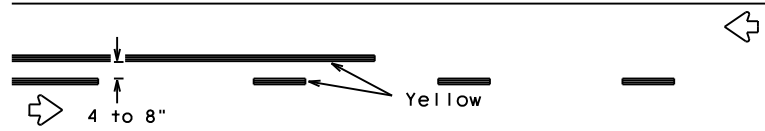
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## PAVEMENT MARKING PATTERNS

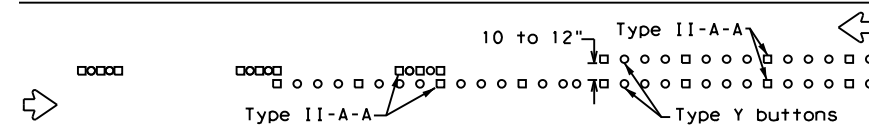


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

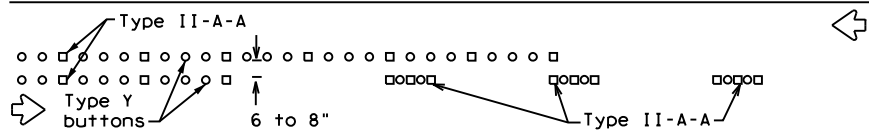


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.

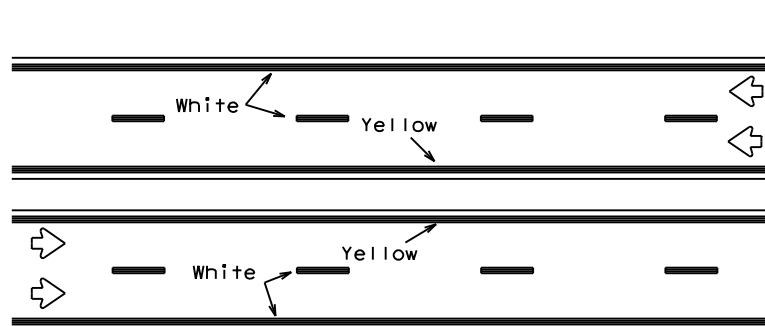


RAISED PAVEMENT MARKERS - PATTERN A



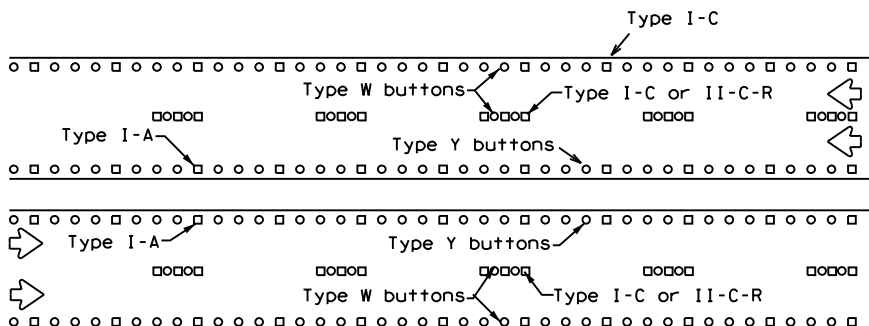
RAISED PAVEMENT MARKERS - PATTERN B

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



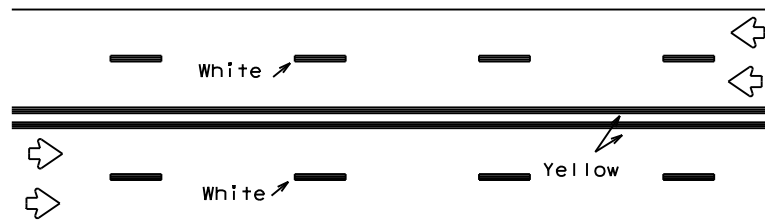
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



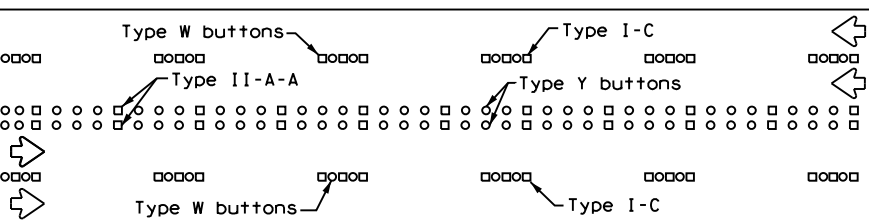
RAISED PAVEMENT MARKERS

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



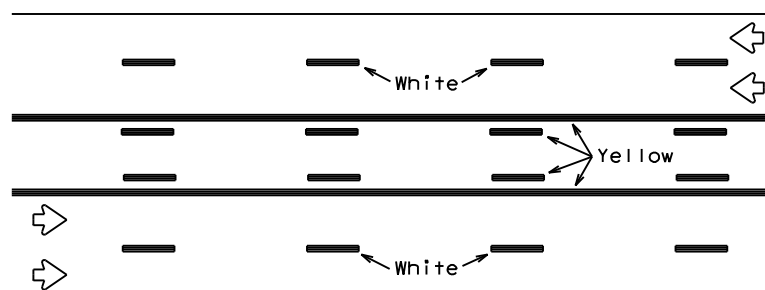
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



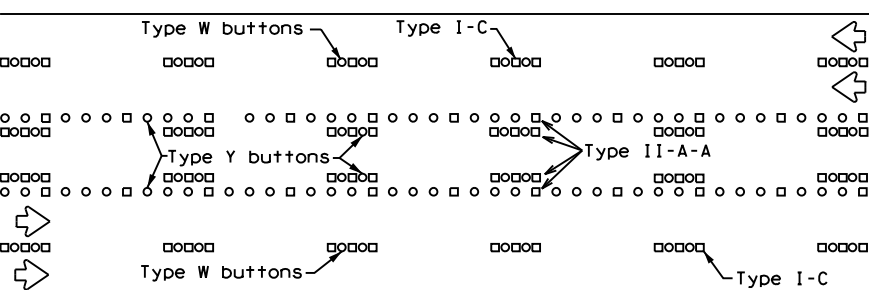
RAISED PAVEMENT MARKERS

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

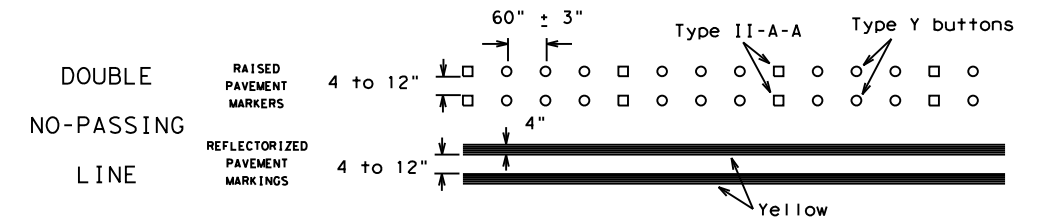
Prefabricated markings may be substituted for reflectORIZED pavement markings.



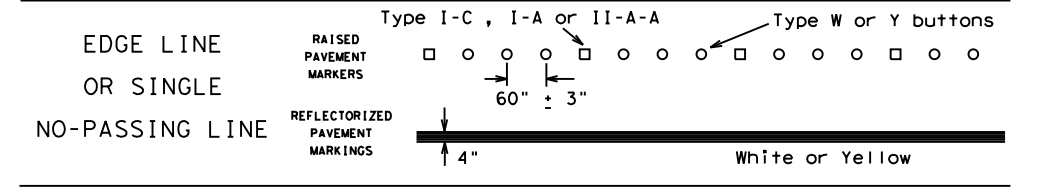
RAISED PAVEMENT MARKERS

## TWO-WAY LEFT TURN LANE

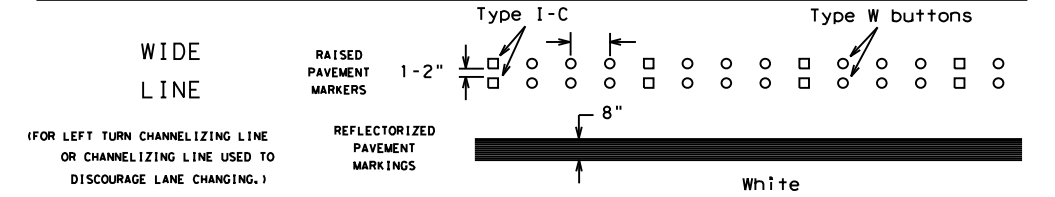
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



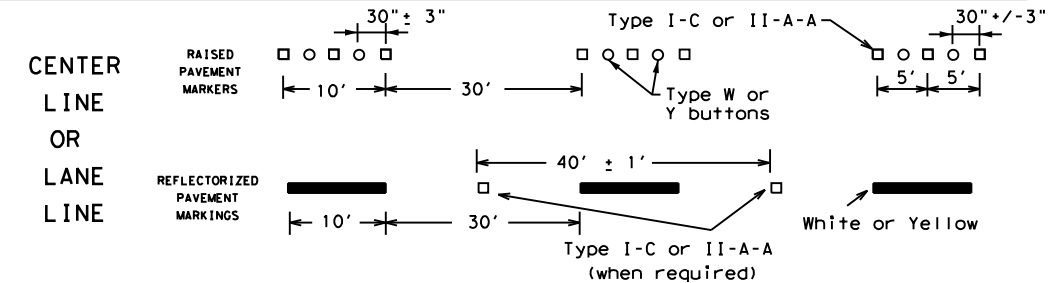
### SOLID LINES



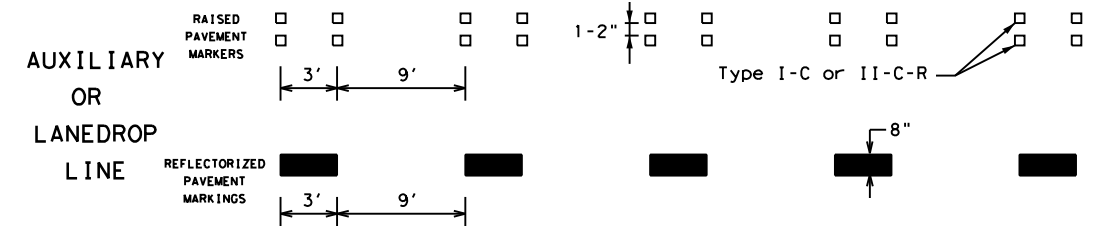
### WIDE LINE



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

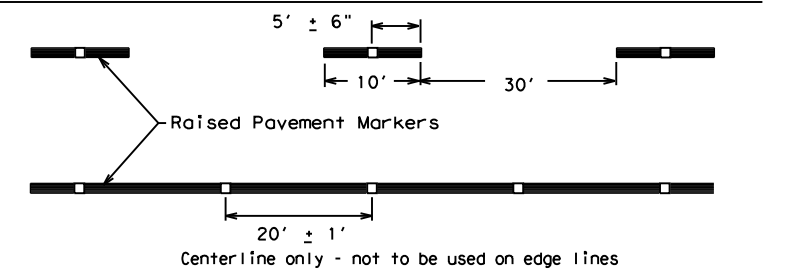


### BROKEN LINES



### 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

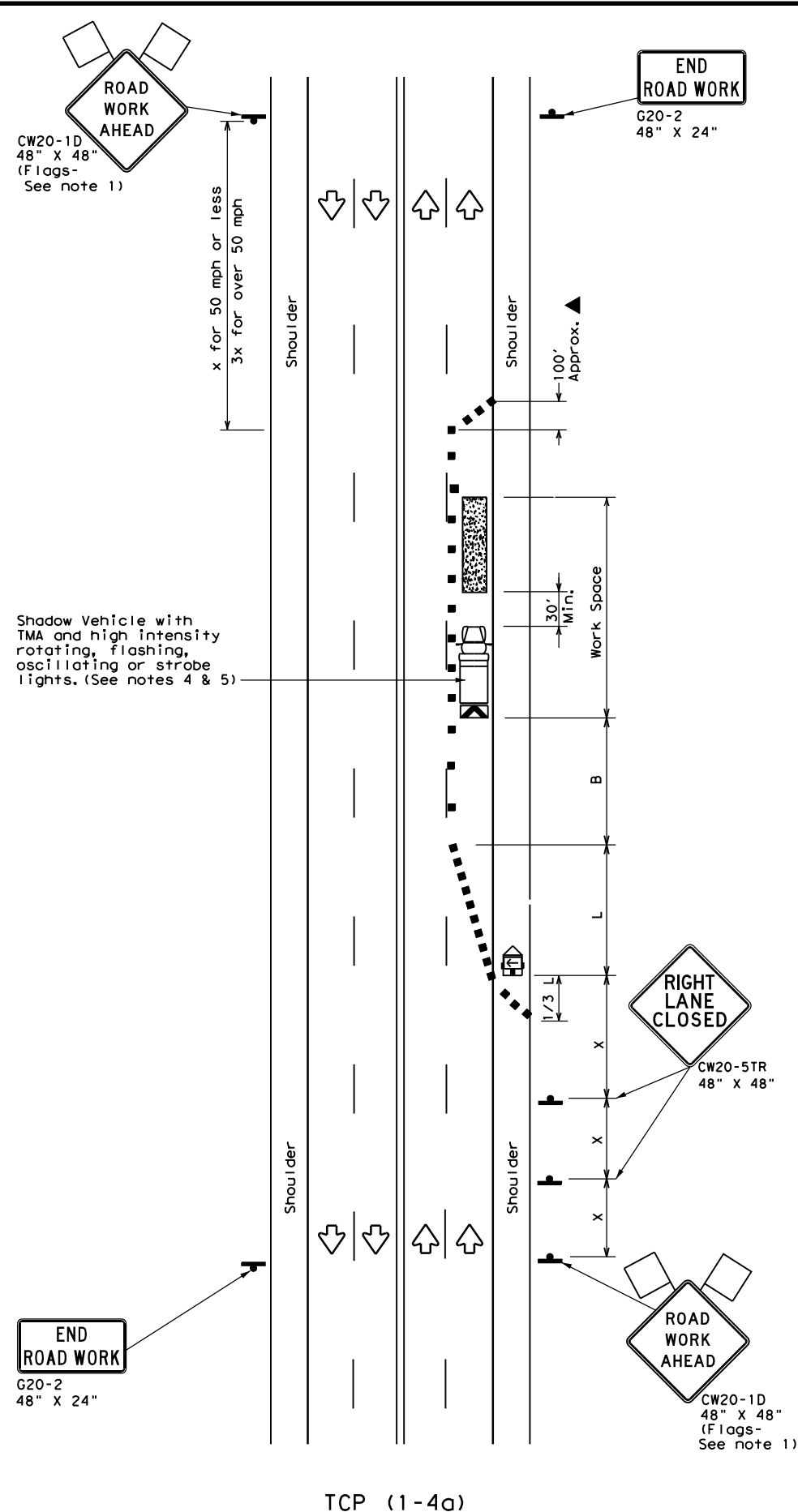
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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
1-97 9-07 5-21	DIST	COUNTY	SHEET NO.	
2-98 7-13	14	HAYS	28	
11-02 8-14				

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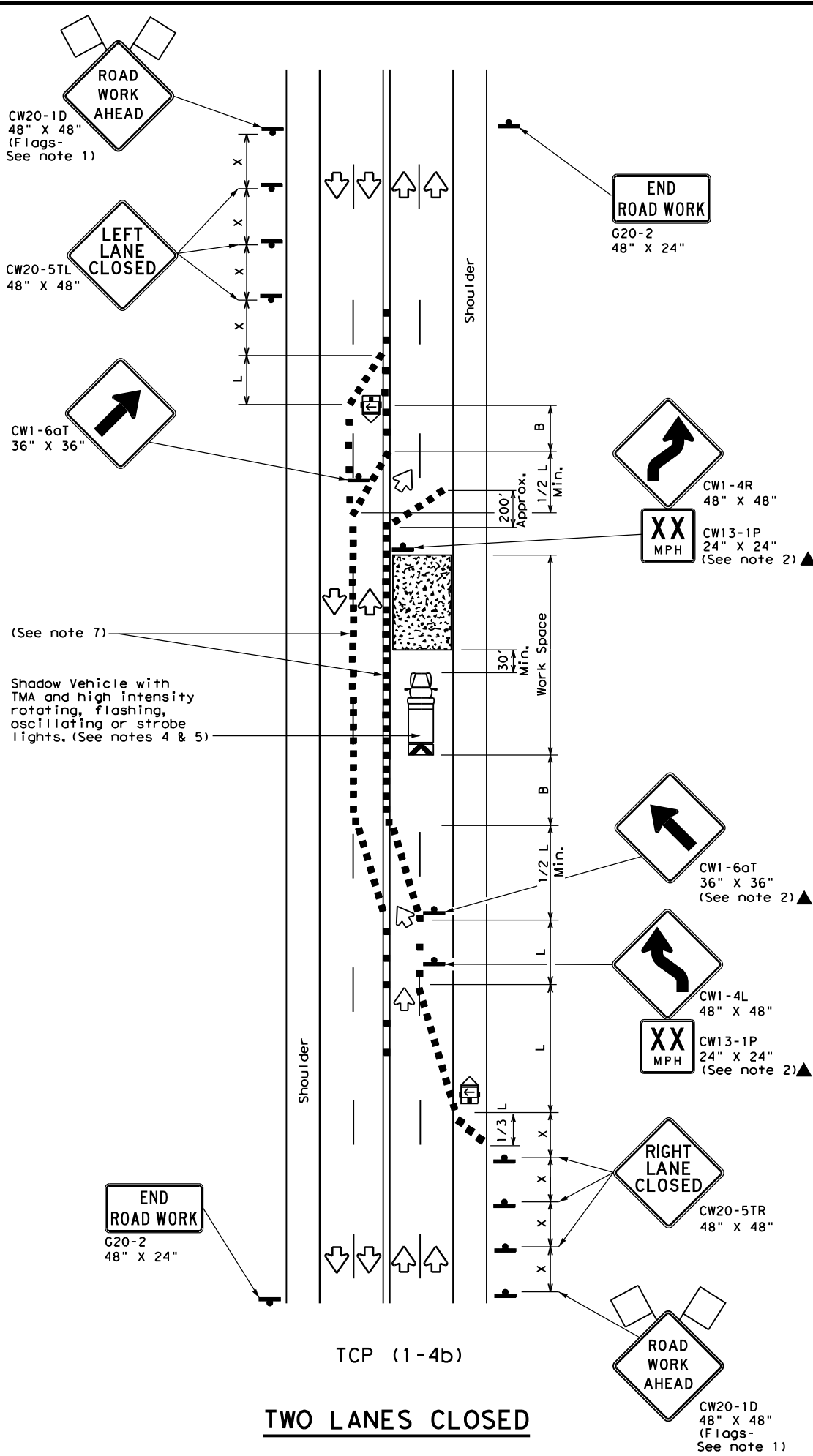
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TCP (1-4a)  
**ONE LANE CLOSED**



TCP (1-4b)  
**TWO LANES CLOSED**

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

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

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

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

**GENERAL NOTES**

- Flags attached to signs where shown are REQUIRED.
- All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
- The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
- A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
- Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

**TCP (1-4a)**

- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.

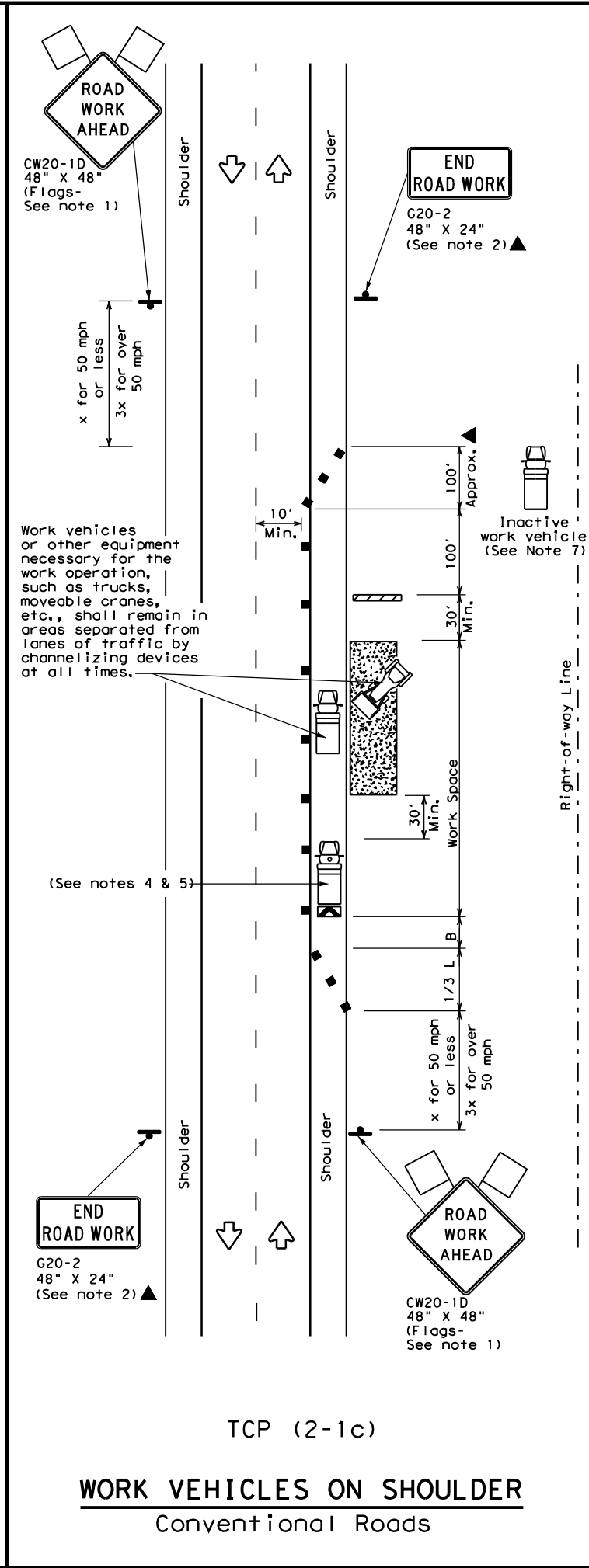
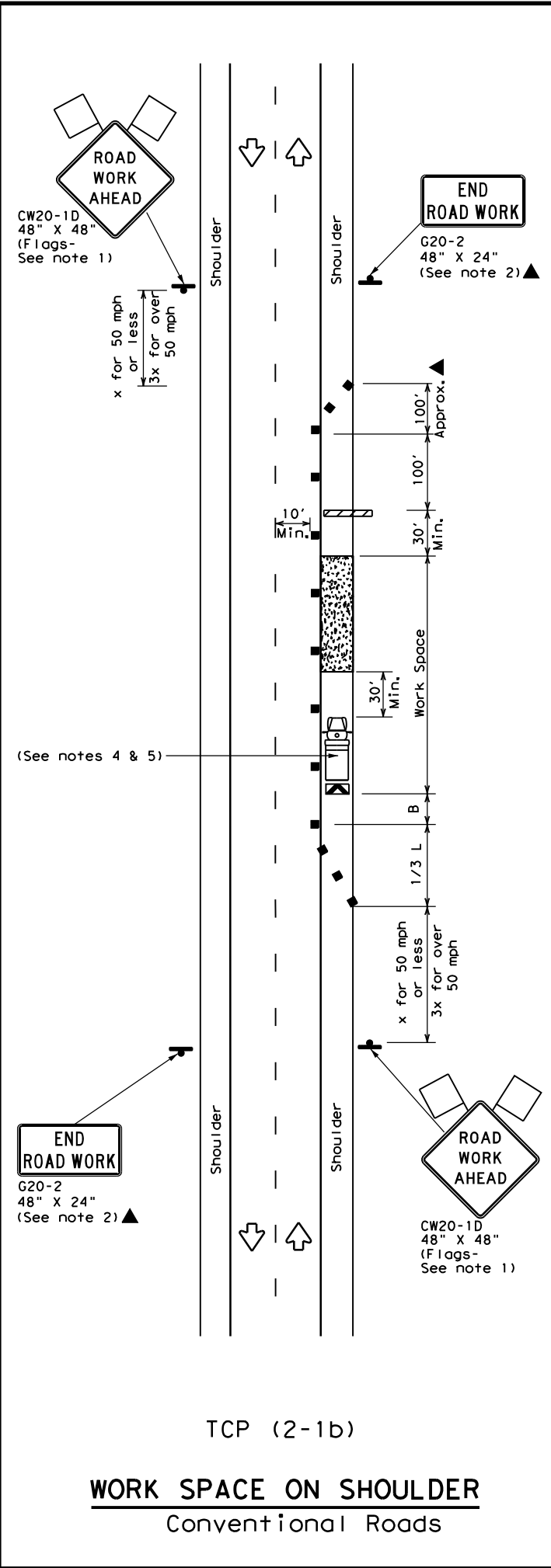
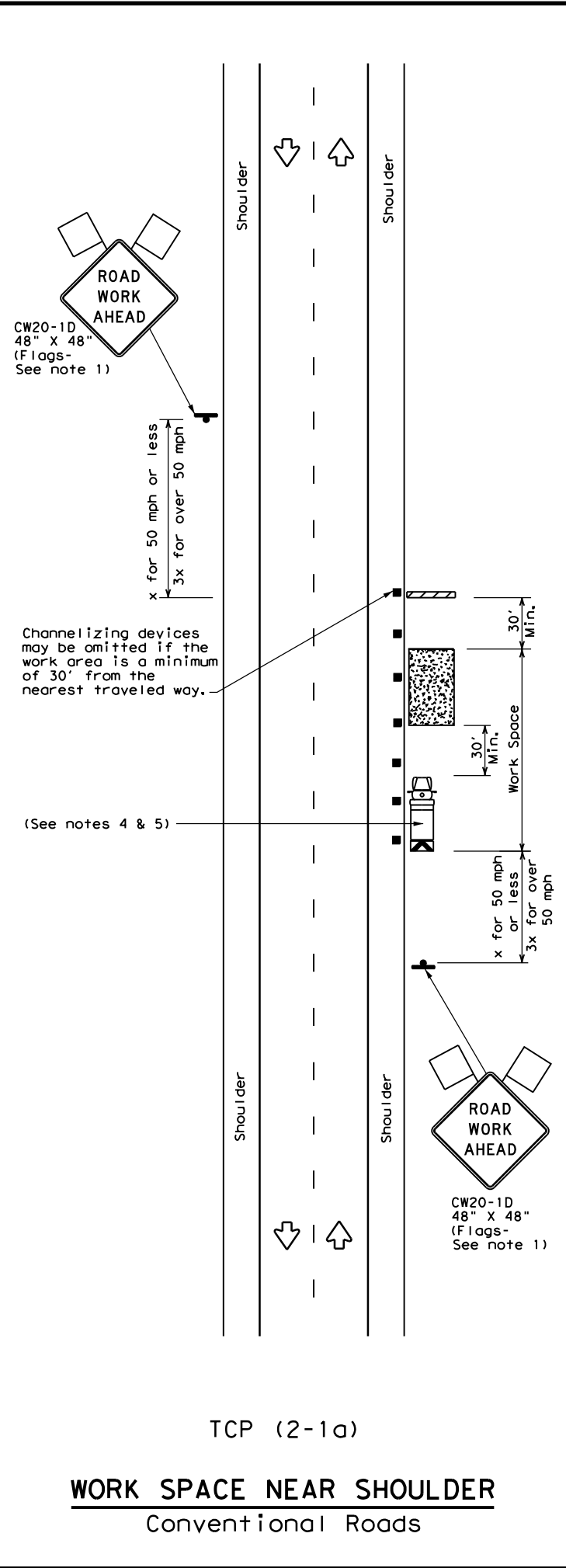
**TCP (1-4b)**

- Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

		Traffic Operations Division Standard	
<b>TRAFFIC CONTROL PLAN</b> <b>LANE CLOSURES ON MULTILANE</b> <b>CONVENTIONAL ROADS</b>			
<b>TCP (1-4) - 18</b>			
FILE:	tcp1-4-18.dgn	DN:	CK:
© TxDOT	December 1985	CONT	SECT
REVISIONS		0113	07
2-94	4-98	JOB	HIGHWAY
8-95	2-12	DIST	COUNTY
1-97	2-18	14	HAYS
SHEET NO.			29

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

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

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

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

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

Texas Department of Transportation  
 Traffic Operations Division Standard

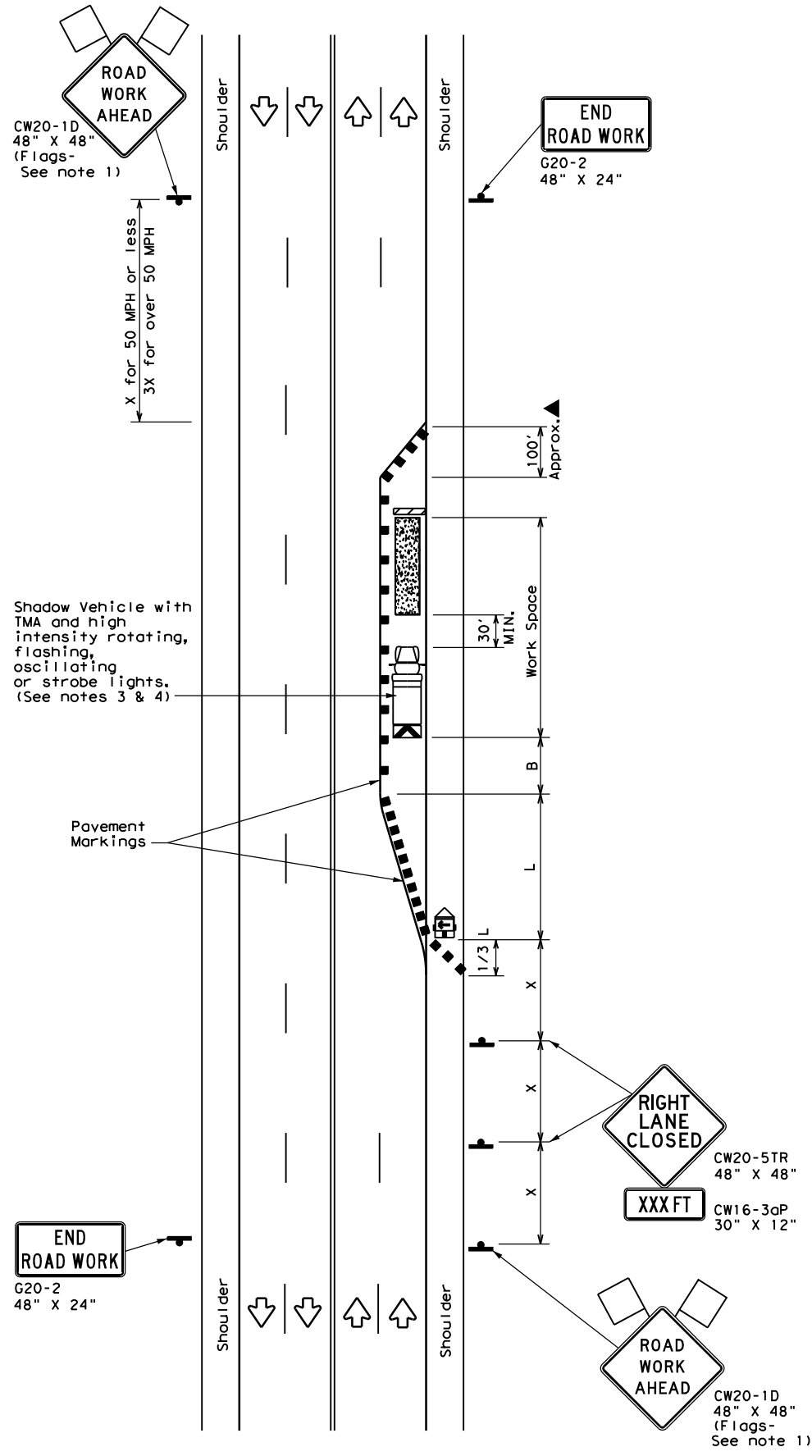
**TRAFFIC CONTROL PLAN**  
**CONVENTIONAL ROAD**  
**SHOULDER WORK**

**TCP (2-1) - 18**

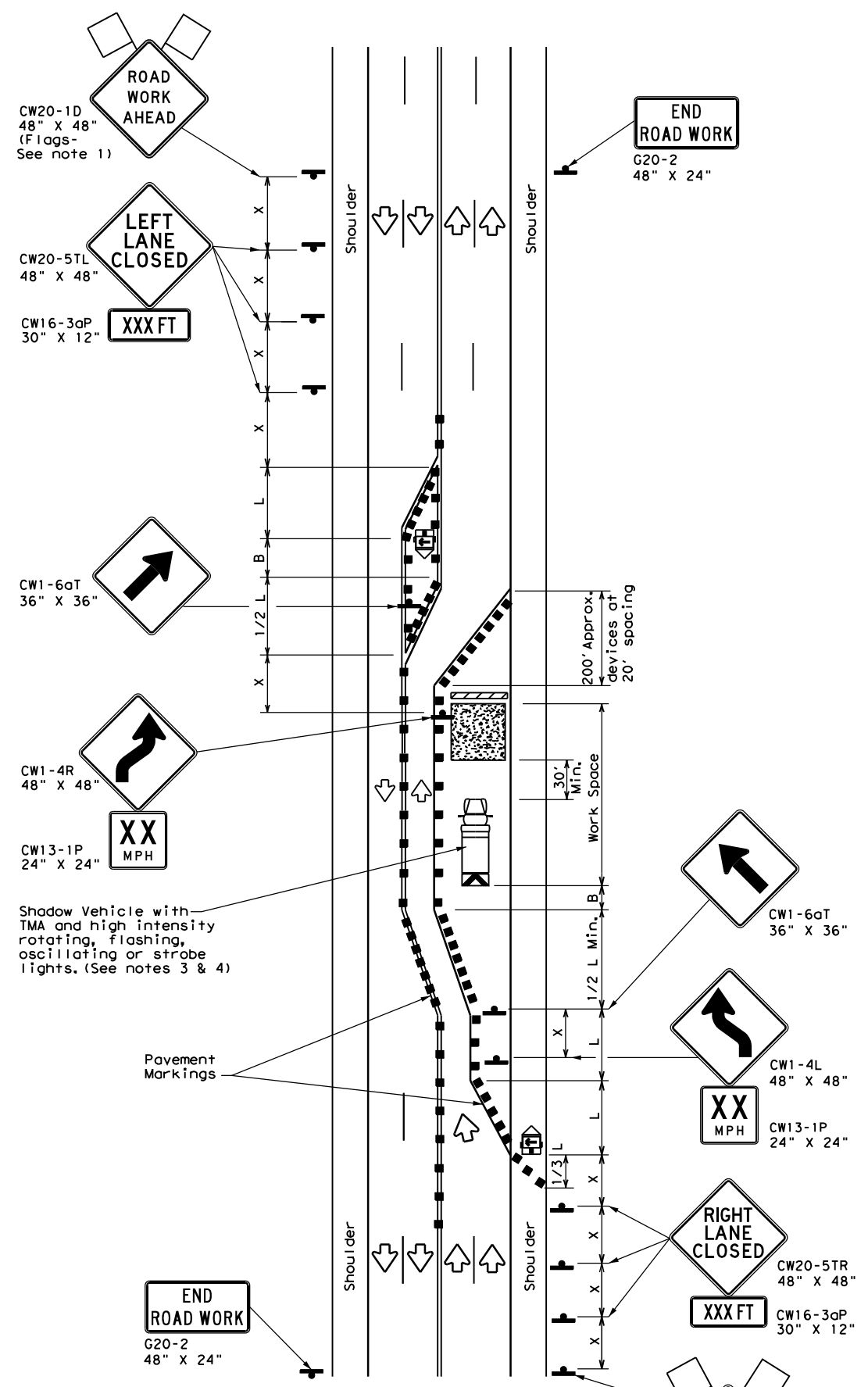
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© TxDOT December 1985	CONT SECT	JOB	HIGHWAY
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2-94 4-98			
8-95 2-12			
1-97 2-18	14	HAYS	SHEET NO. 30

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TCP (2-5a)  
**ONE LANE CLOSED**



TCP (2-5b)  
**TWO LANES CLOSED**

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

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

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

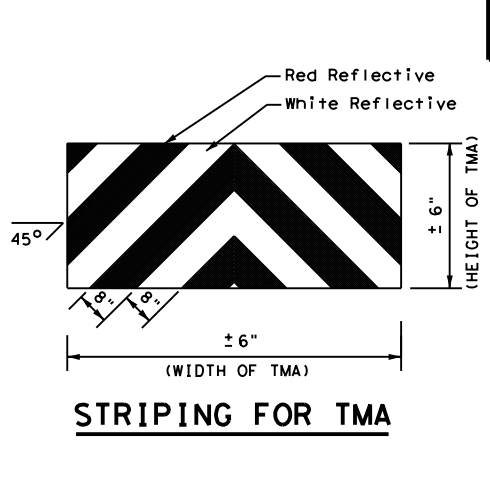
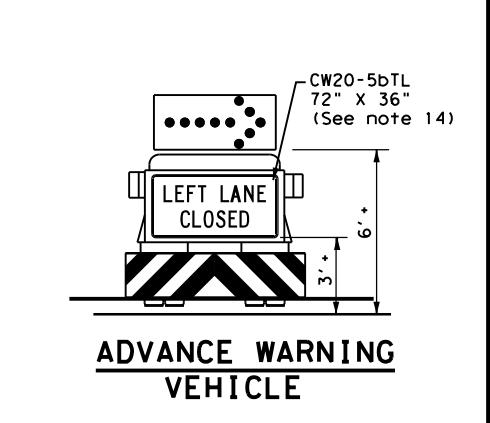
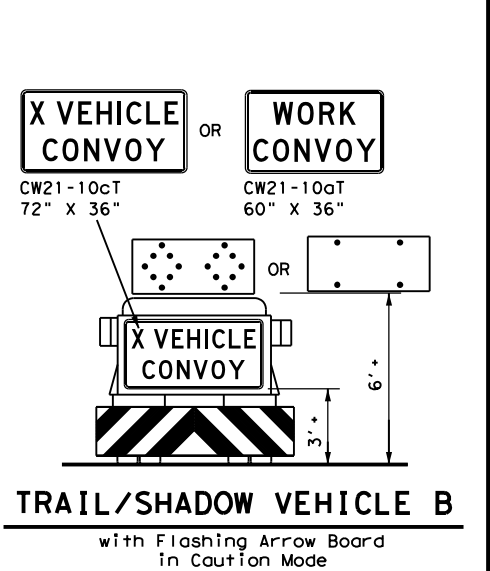
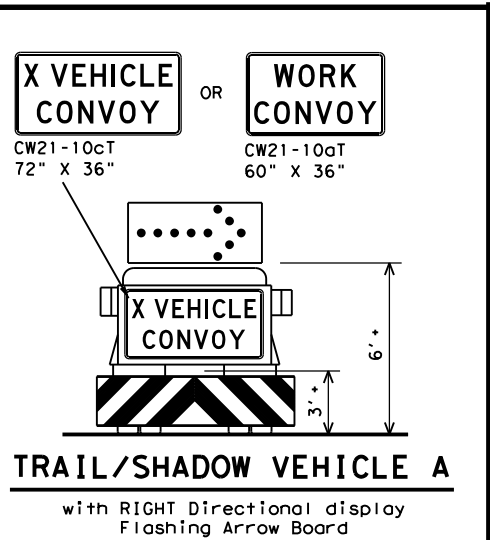
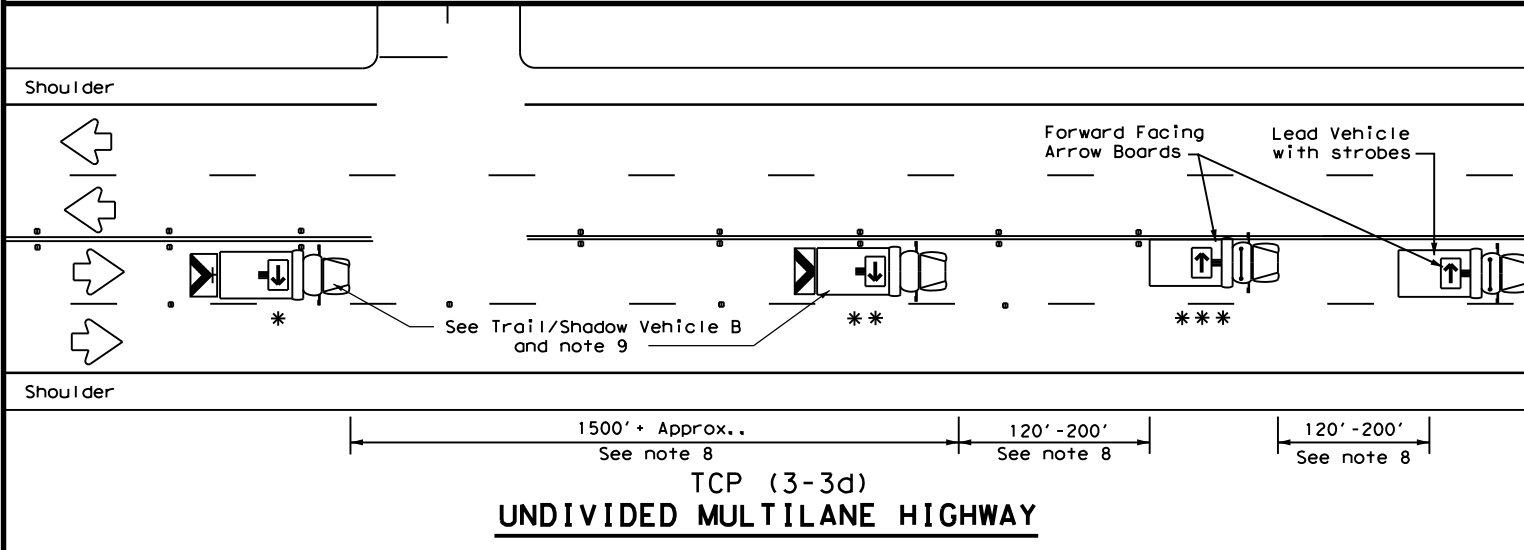
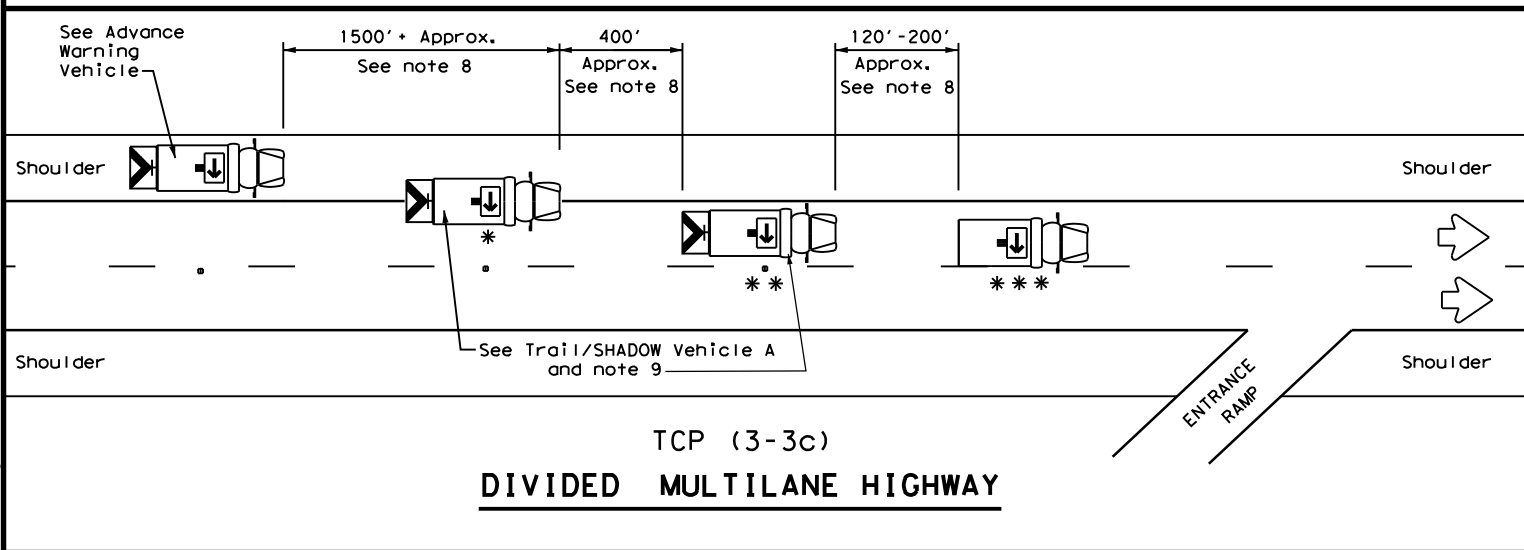
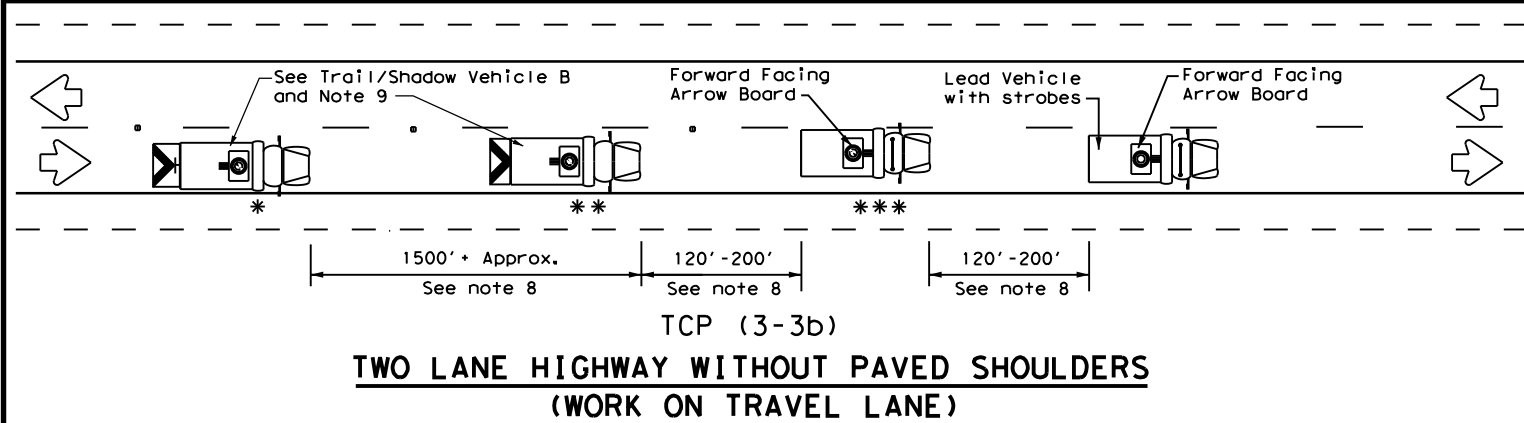
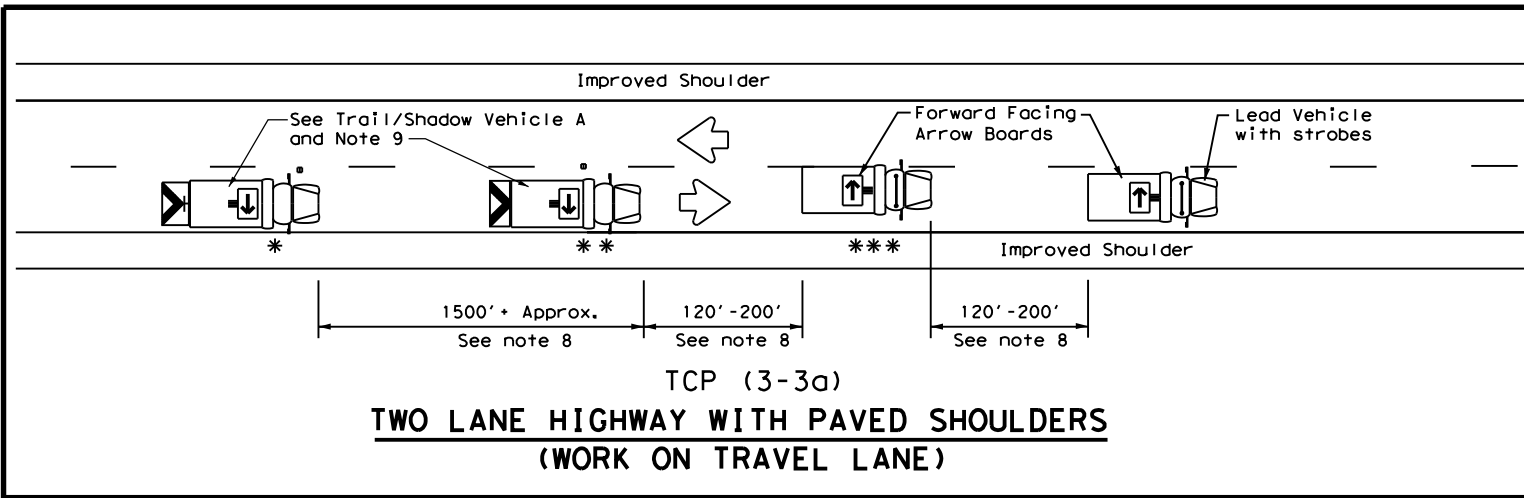
TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
			✓	✓

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
  - Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.
  - The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.
- TCP (2-5a)**
- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic, with the arrow board placed in the closed lane near the end of the merging taper.
- TCP (2-5b)**
- Conflicting pavement markings shall be removed for long-term projects.

		Traffic Operations Division Standard	
<b>TRAFFIC CONTROL PLAN</b>			
<b>LONG TERM LANE CLOSURES</b>			
<b>MULTILANE CONVENTIONAL RDS.</b>			
<b>TCP (2-5) - 18</b>			
FILE: tcp2-5-18.dgn	DN:	CK:	DW:
© TxDOT December 1985	CON:	SECT:	JOB:
REVISIONS	0113	07	072
8-95 2-12	DIST:	COUNTY:	SHEET NO.
1-97 3-03	14	HAYS	31
4-98 2-18			

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

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

**GENERAL NOTES**

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

Texas Department of Transportation

Traffic Operations Division Standard

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

FILE:	tcp3-3.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	September 1987	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0113	07	072	US290				
2-94	4-98								
8-95	7-13								
1-97	7-14	DIST	COUNTY	SHEET NO.					
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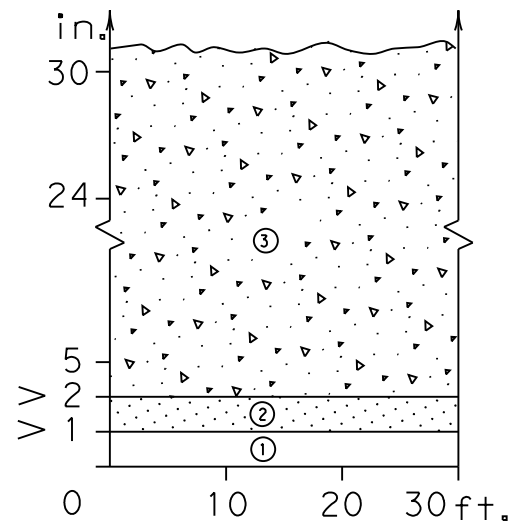


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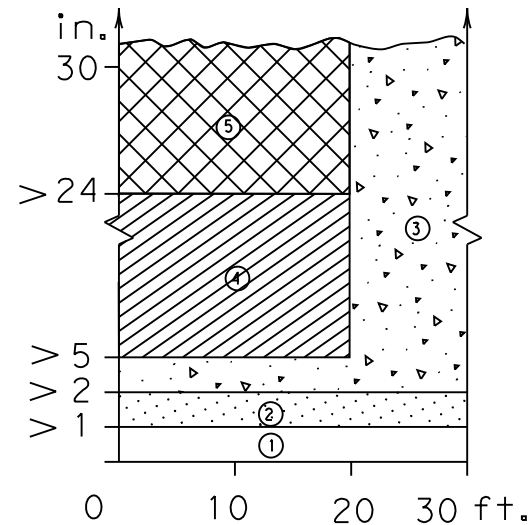
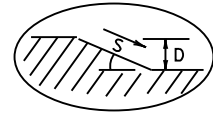
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### DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

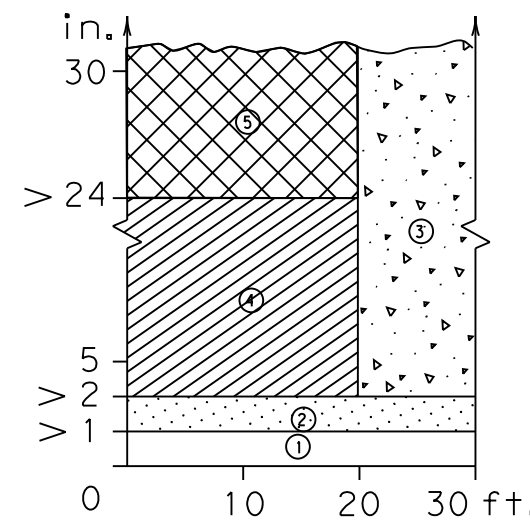
Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet



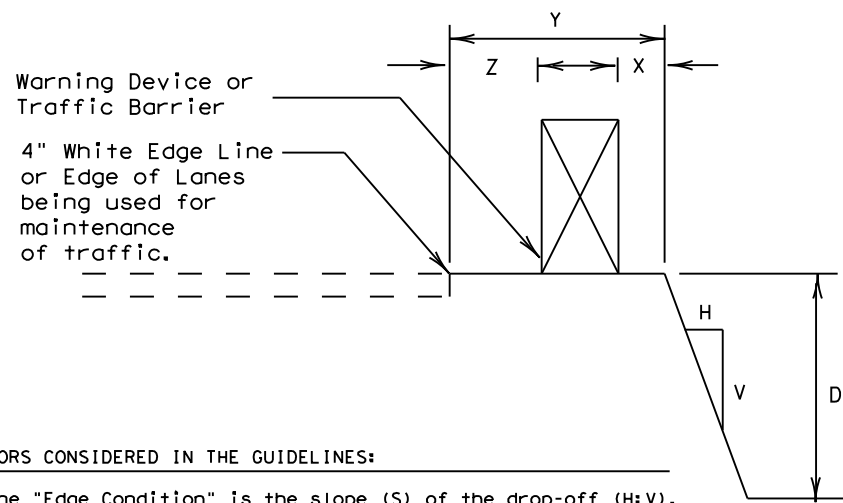
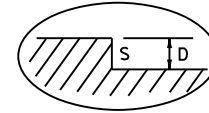
Edge Condition I  
 $S = (3:1)$  (or flatter)



Edge Condition II  
 $S = ((2.99):1)$  to  $(1:1)$



Edge Condition III  
 $S$  is steeper than  $(1:1)$



**FACTORS CONSIDERED IN THE GUIDELINES:**

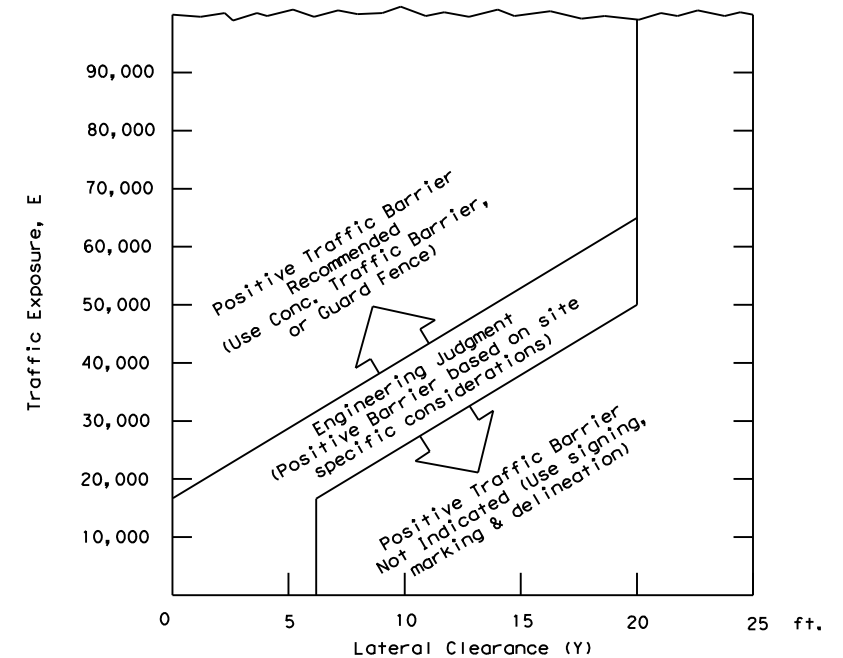
- The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height" is the depth of the drop-off "D".
- Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.
- In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.
- The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.
- If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

Zone	Treatment Types Guidelines:
①	No treatment.
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a "Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW 8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change the edge slope to that of the preferable Edge Condition I.
⑤	Check indications (Figure-1) for positive barrier. Where positive barrier is not indicated, the treatment shown above for Zone- 4 may be used after consideration of other applicable factors.

**Edge Condition Notes:**

- Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.
- Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1 to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exceeds 24 inches, the possibility for rollover is greater in most vehicles.
- Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.
- Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

**FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 ( [Cross-hatched symbol] )**



- $E = ADT \times T$   
 Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.
- Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.
- An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exists parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's on-line manuals.

Engineer's Seal  
  
 Daniel A. Rogers  
 Date 4/11/2023

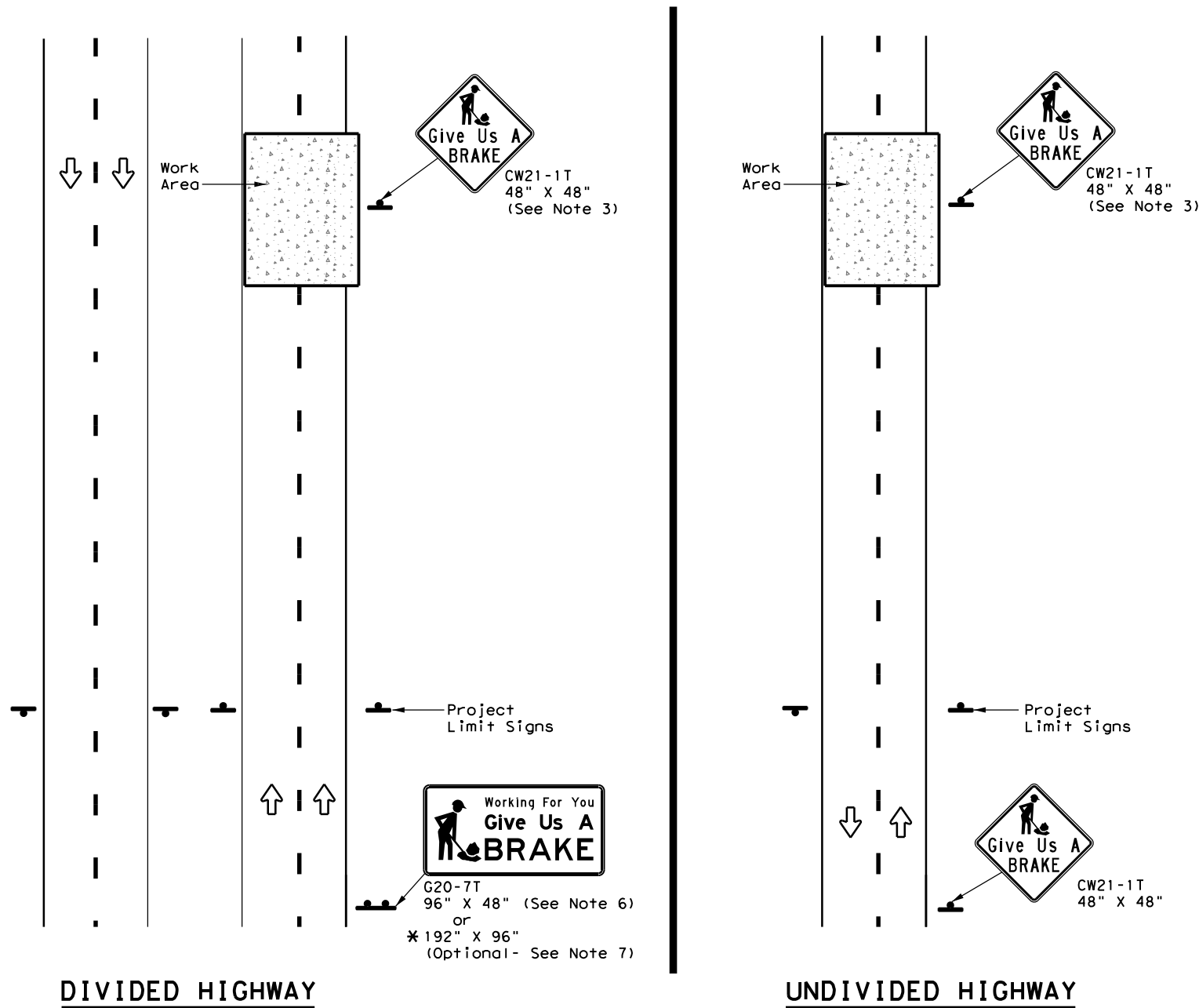
Texas Department of Transportation  
 Traffic Operations Division

## TREATMENT FOR VARIOUS EDGE CONDITIONS

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REVISIONS					
03-01	0113	07	072	US290	
08-01 correct typos		DIST	COUNTY	SHEET NO.	
		14	HAYS	33	

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\* When the optional larger WORKING FOR YOU GIVE US A BRAKE (G20-7T) 192" x 96" sign is required, the locations shall be noted elsewhere in the plans.

**SUMMARY OF LARGE SIGNS**

BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL		DRILLED SHAFT
						Size	(LF)	
							① ②	24" DIA. (LF)
Orange	G20-7T		96" X 48"	Type B <sub>FL</sub> or C <sub>FL</sub>	32	▲	▲ ▲	▲
Orange	G20-7T		192" X 96"	Type B <sub>FL</sub> or C <sub>FL</sub>	128	W8x18	16 17	12

▲ See Note 6 Below

**LEGEND**

	Sign
	Large Sign
	Traffic Flow

**DEPARTMENTAL MATERIAL SPECIFICATIONS**

PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B <sub>FL</sub> OR TYPE C <sub>FL</sub>
BLACK	LEGEND & BORDERS	NON-REFLECTIVE ACRYLIC FILM

**GENERAL NOTES**

- See BC and SMD sheets for additional sign support details.
- Sign locations shall be approved by the Engineer.
- For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
- Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
- Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
- The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
- The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:  
 Item 636 - Aluminum Signs  
 Item 647 - Large Roadside Sign Supports and Assemblies.  
 Item 416 - Drilled Shaft Foundations
- 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.

Texas Department of Transportation

Traffic Operations Division Standard

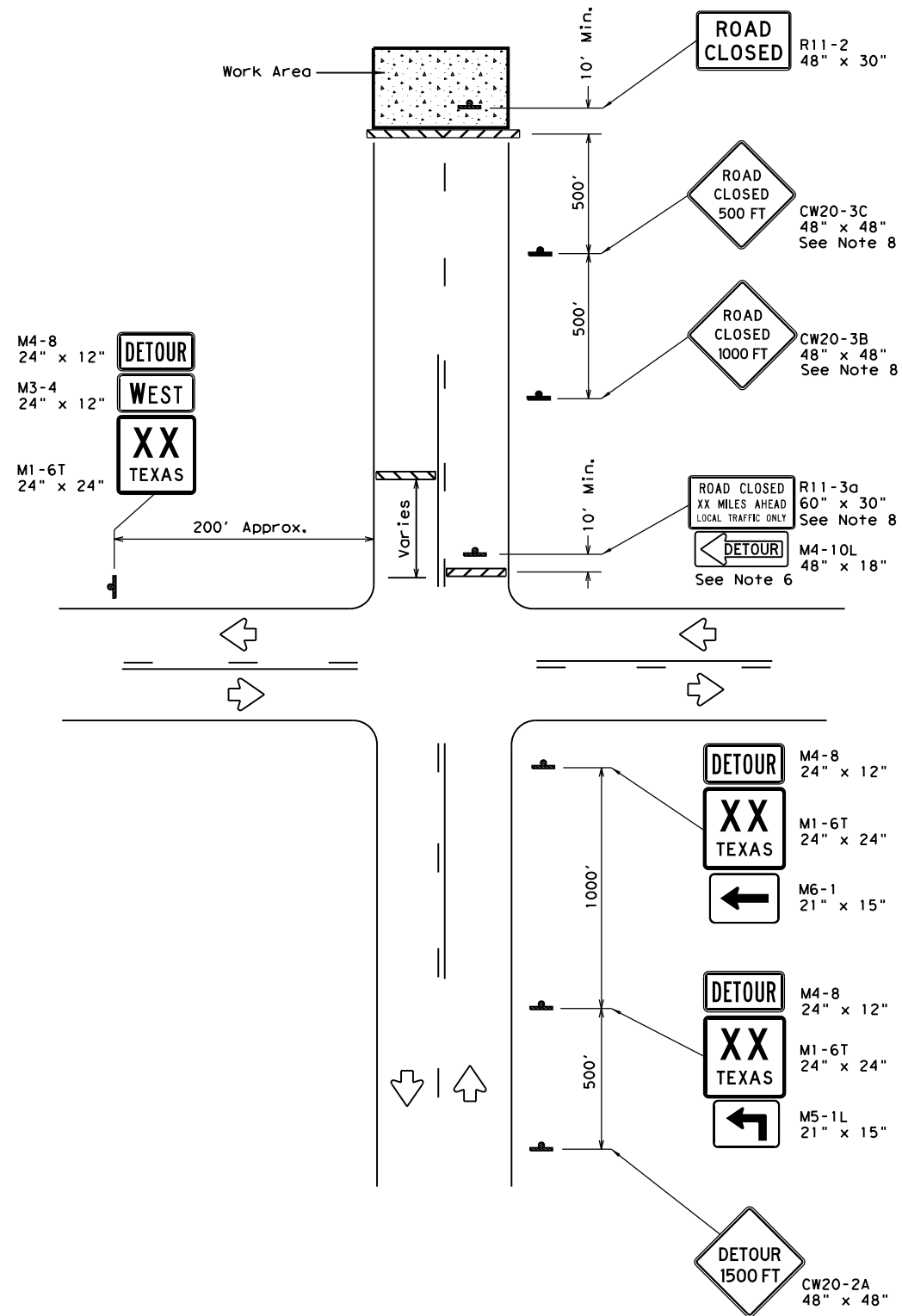
**WORK ZONE  
 "GIVE US A BRAKE"  
 SIGNS**

**WZ (BRK) - 13**

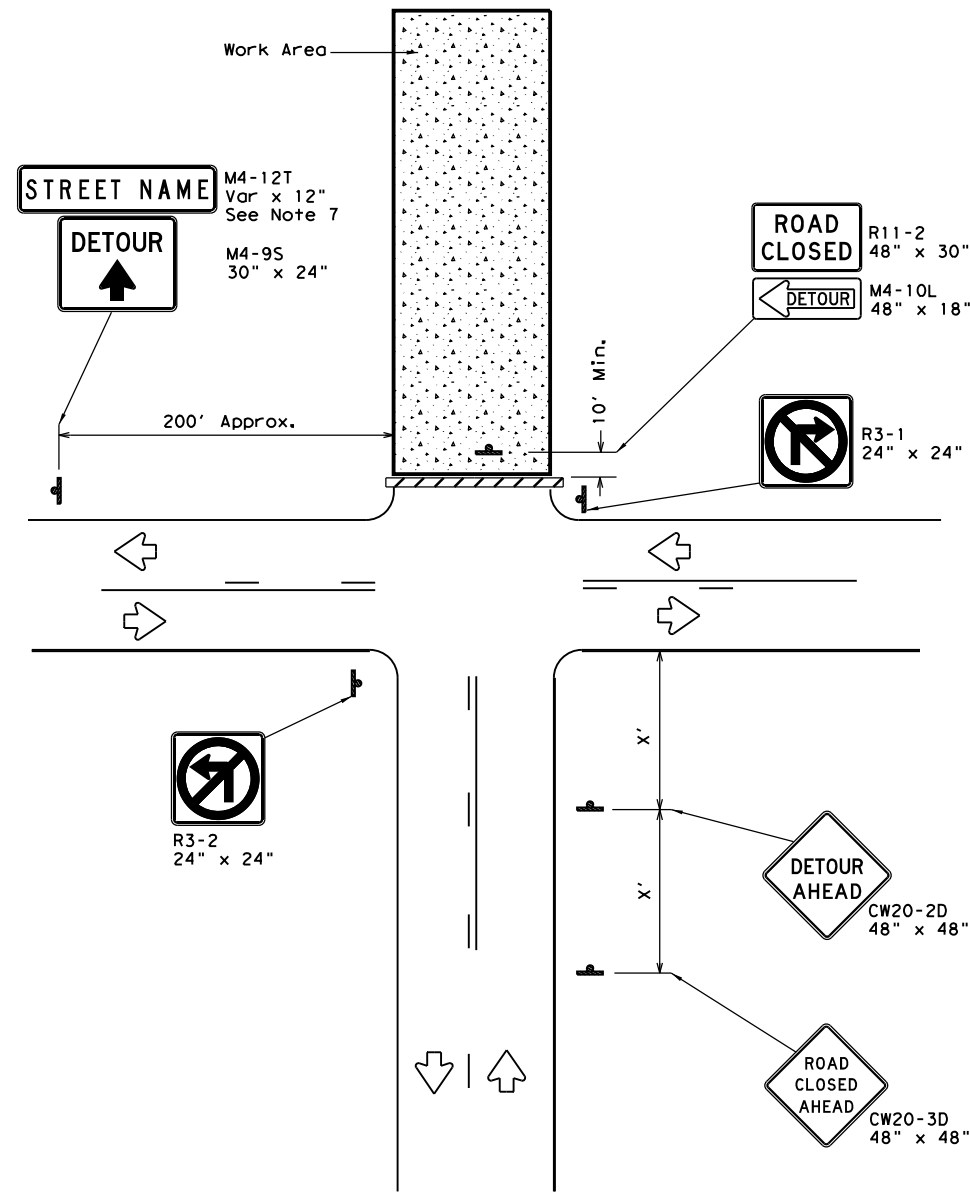
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© TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
6-96 5-98 7-13	DIST	COUNTY	SHEET NO.	
8-96 3-03	14	HAYS	34	

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



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

LEGEND	
	Type 3 Barricade
	Sign

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

\* Conventional Roads Only

**GENERAL NOTES**

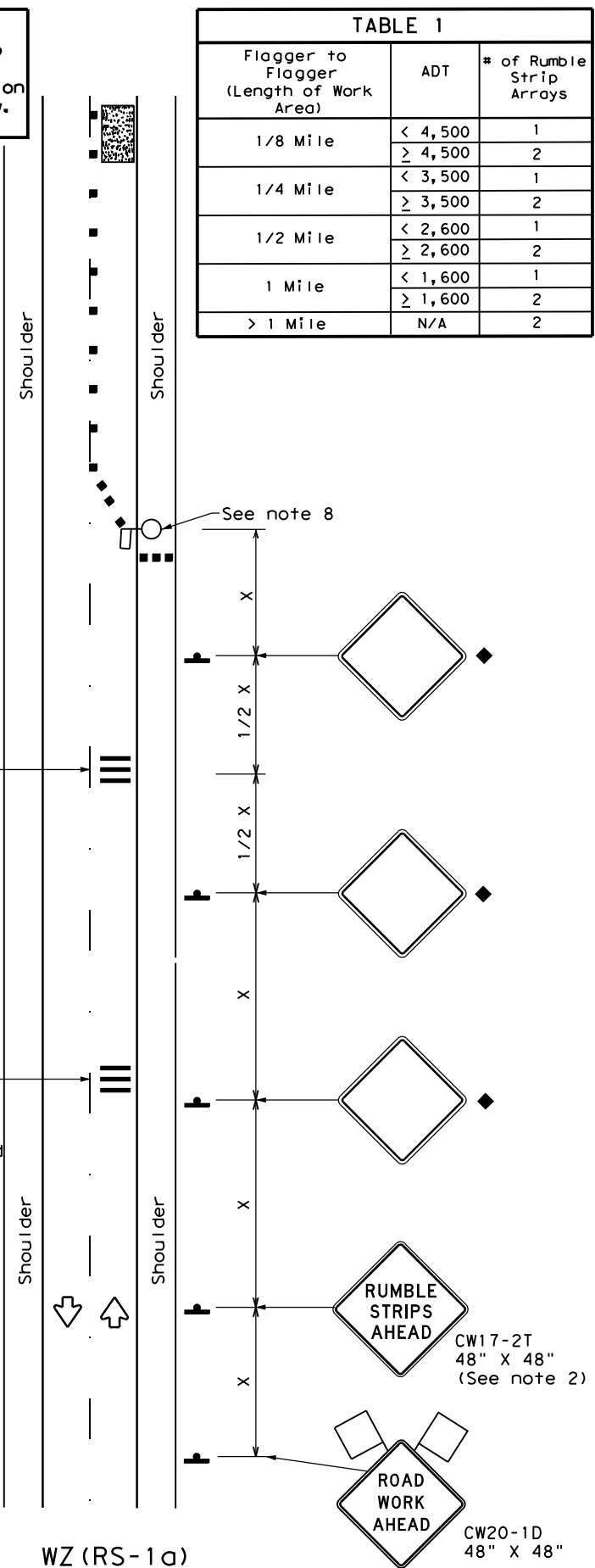
1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices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

		Traffic Operations Division Standard	
<b>WORK ZONE ROAD CLOSURE DETAILS</b>			
<b>WZ (RCD) - 13</b>			
FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT August 1995	CONT	SECT	JOB
REVISIONS	0113	07	072
1-97 4-98 7-13	DIST	COUNTY	SHEET NO.
2-98 3-03	14	HAYS	35

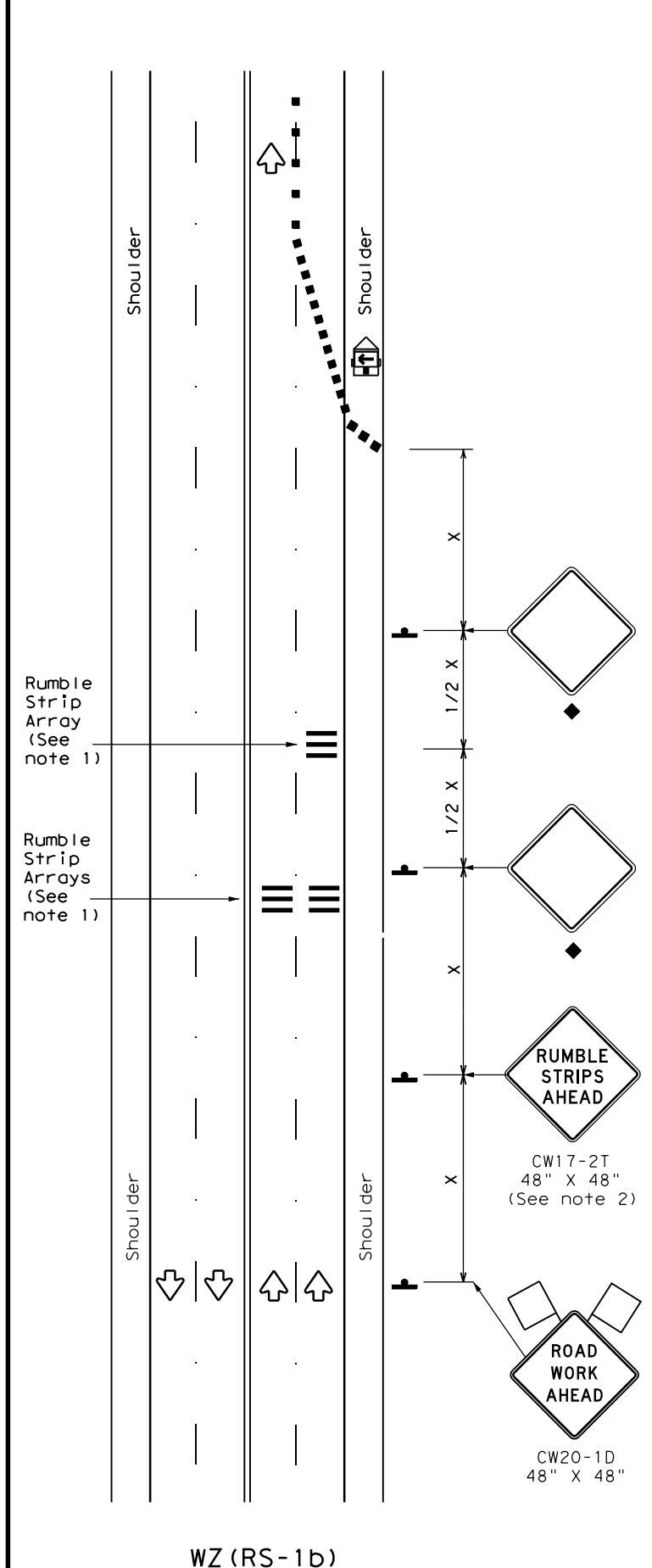
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Warning sign and rumble strip sequence in opposite direction is same as below.

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



**RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION**



**RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY**

**GENERAL NOTES**

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

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

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

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

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

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

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

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

Texas Department of Transportation  
 Traffic Safety Division Standard

## TEMPORARY RUMBLE STRIPS

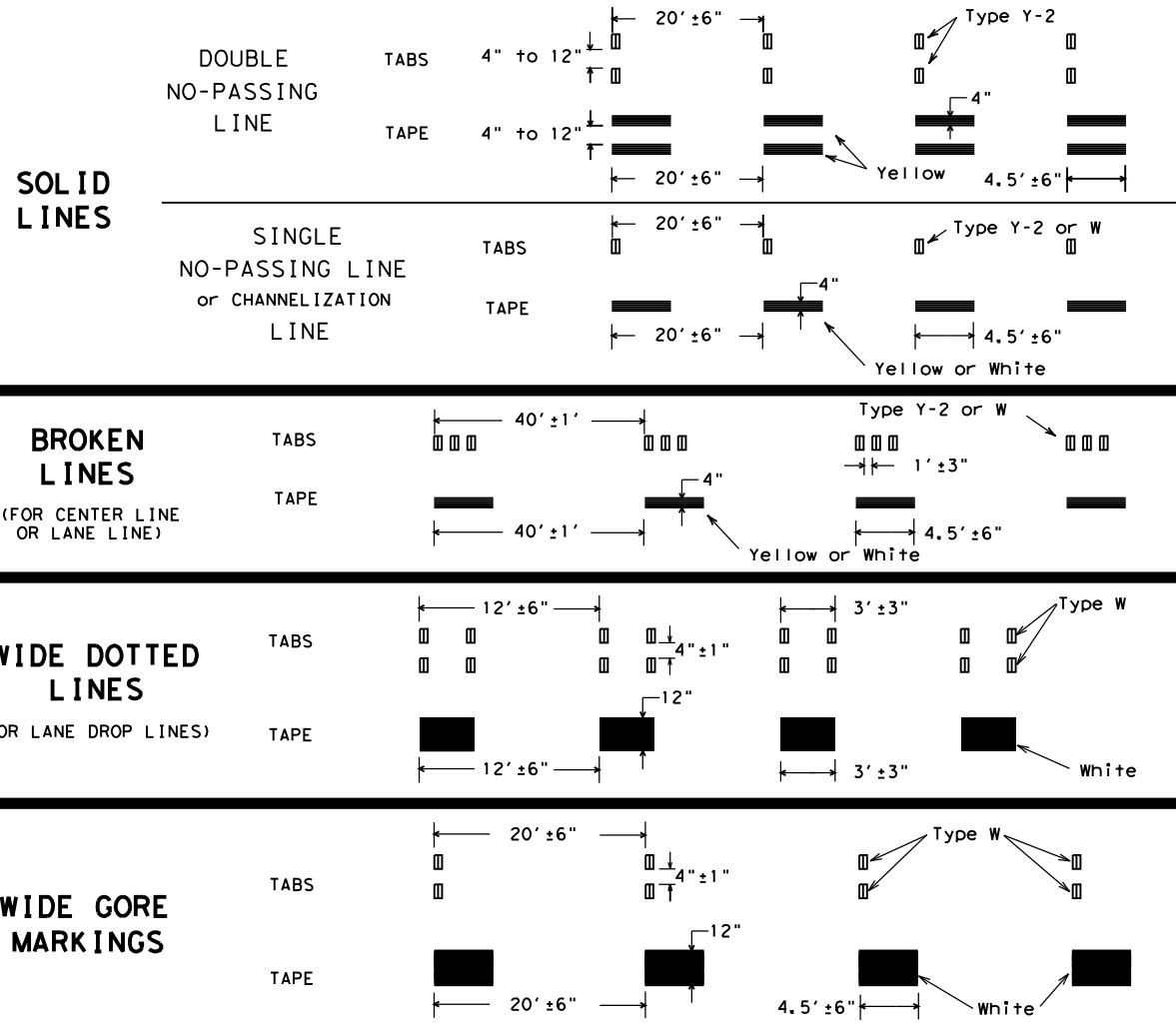
### WZ (RS) - 22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
2-14 1-22	DIST	COUNTY	SHEET NO.	
4-16	14	HAYS	36	

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DATE: 4/11/2023 3:46:34 PM  
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## WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



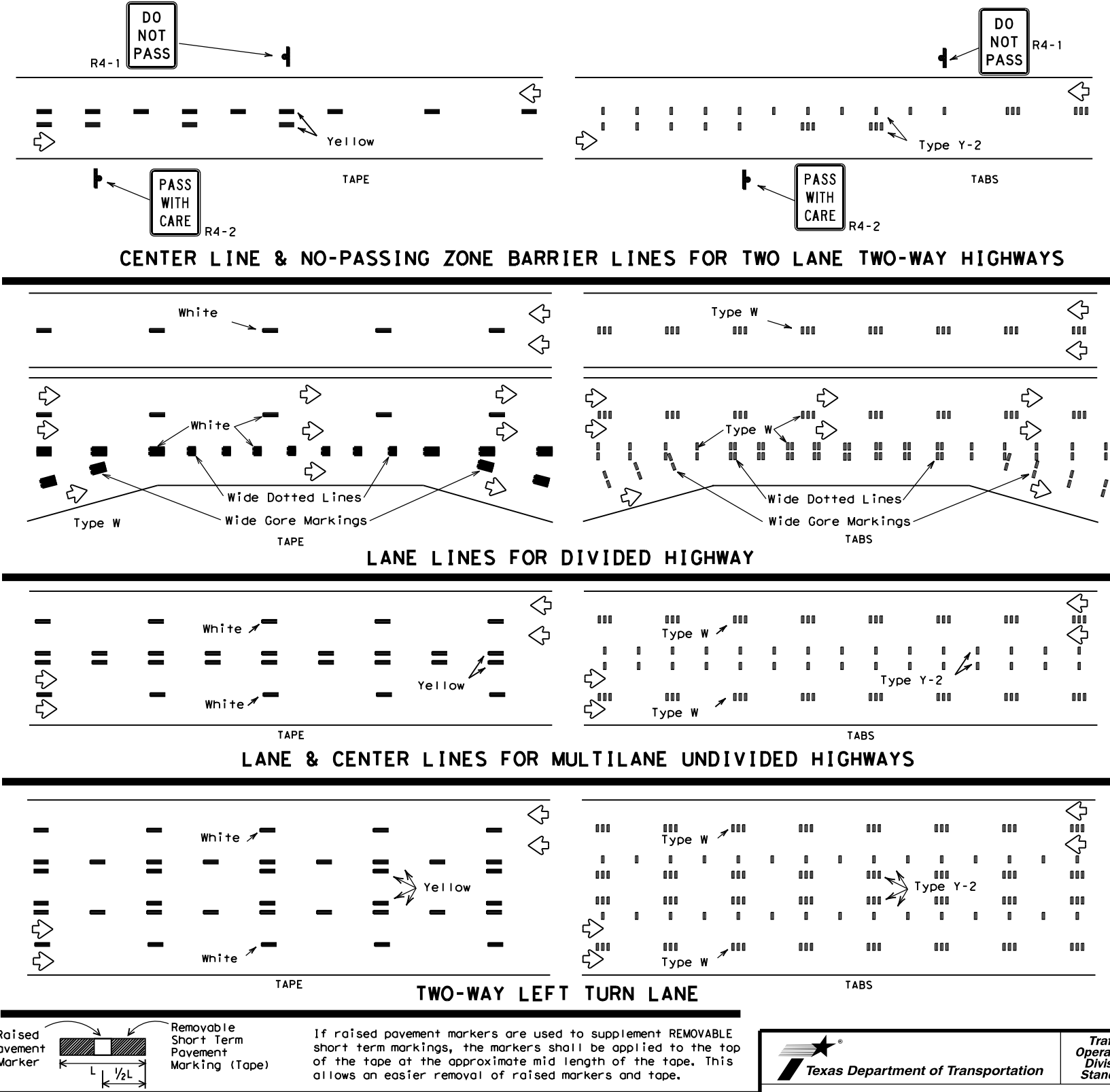
### NOTES:

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

### TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

## WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



### PREFABRICATED PAVEMENT MARKINGS

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

### RAISED PAVEMENT MARKERS

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

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

- DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:  
[http://www.txdot.gov/business/contractors\\_consultants/material\\_specifications/default.htm](http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm)



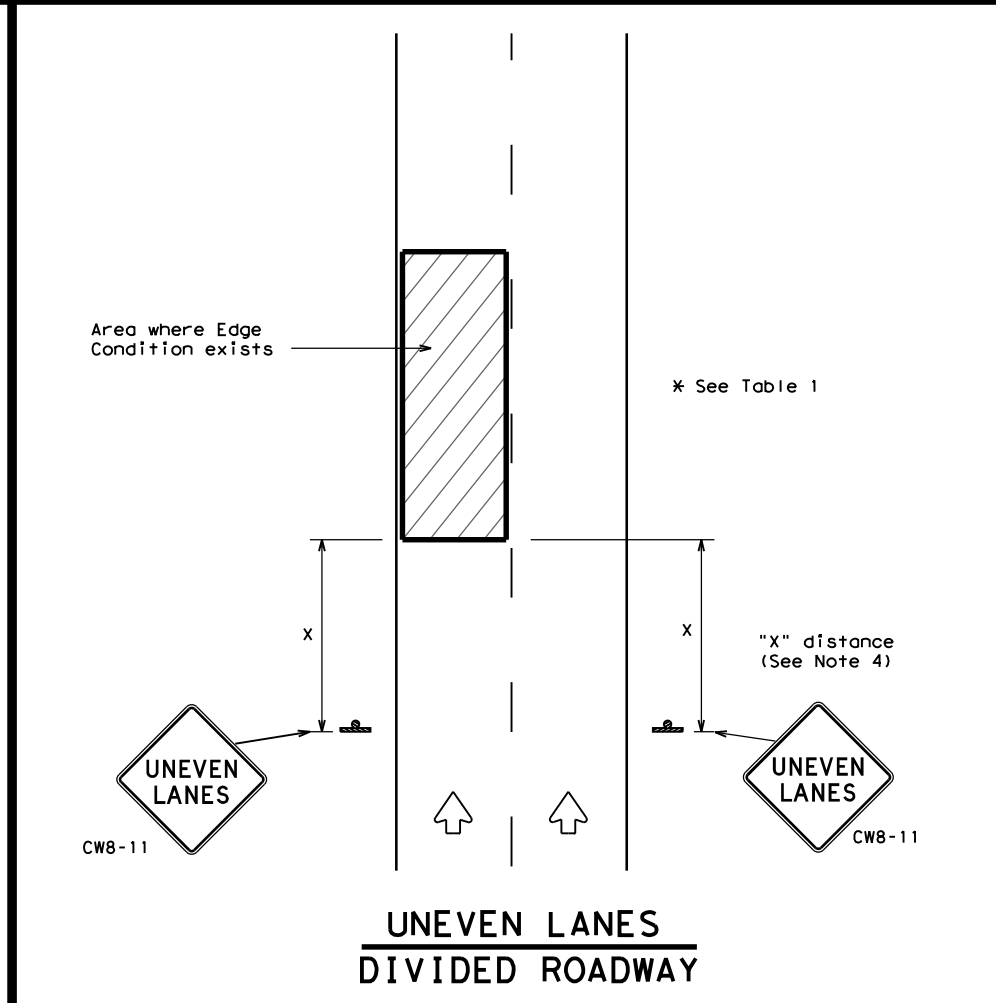
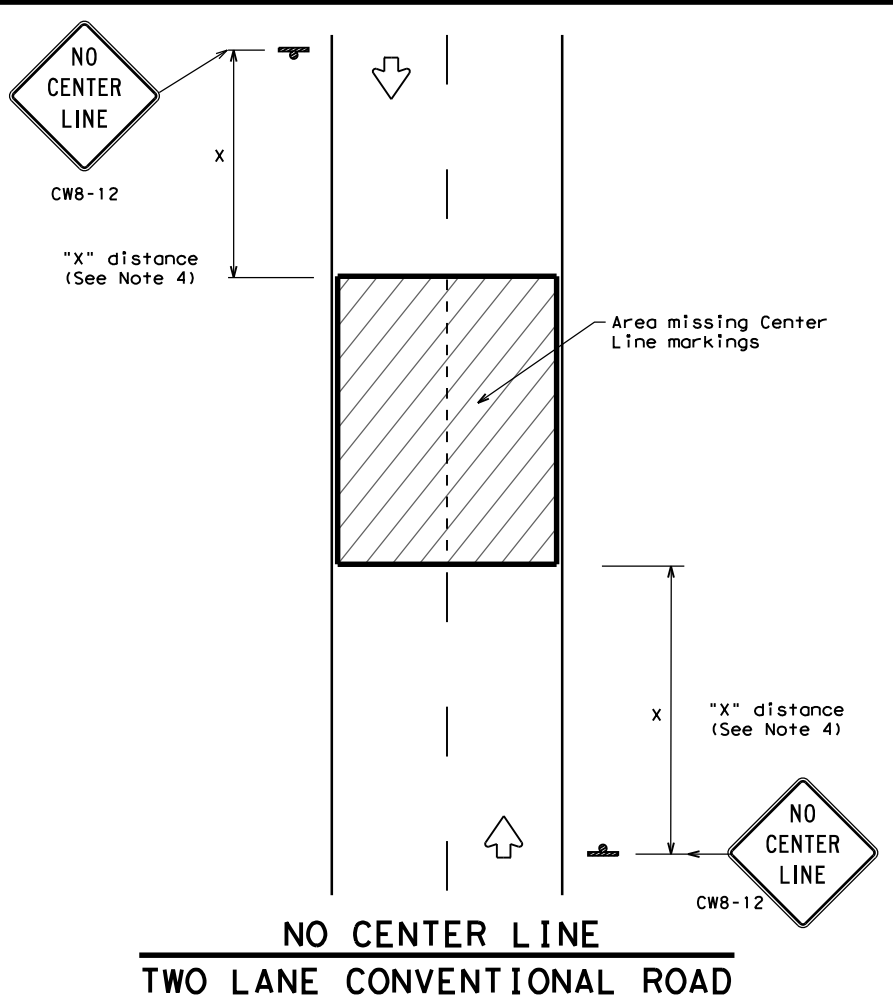
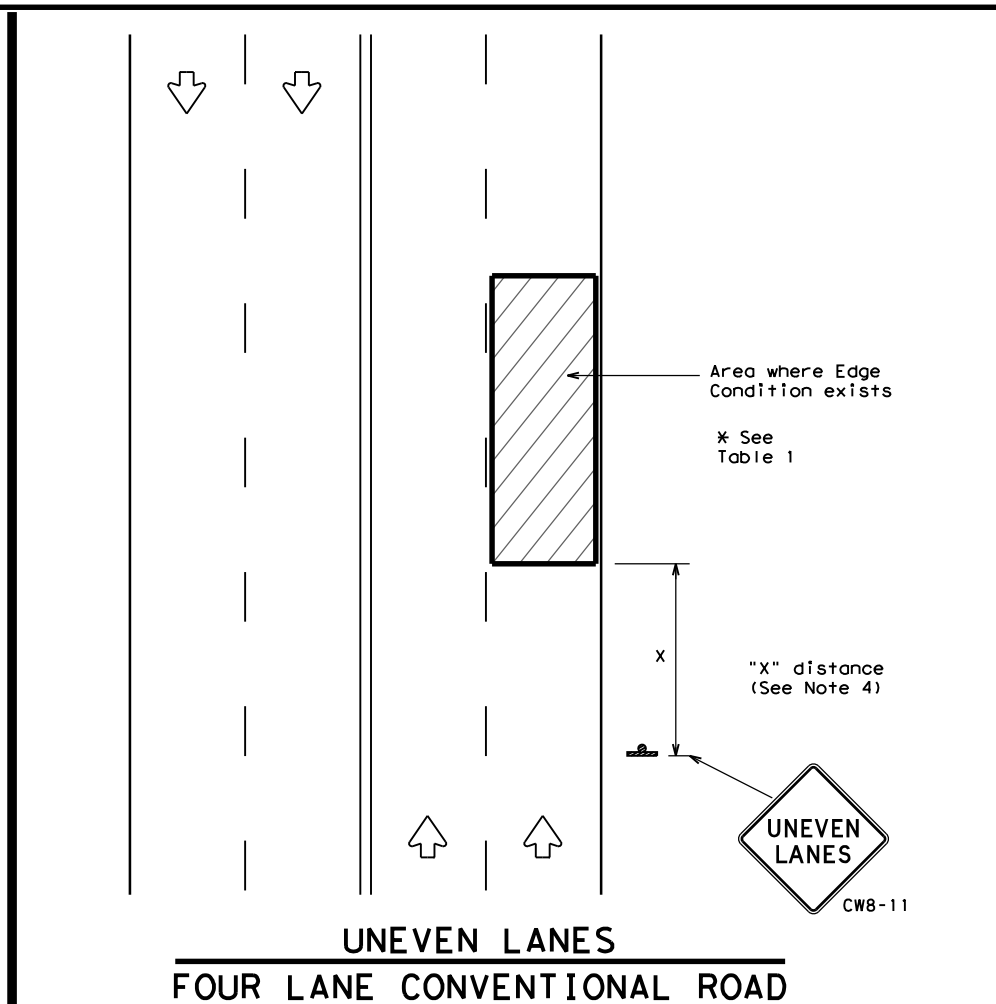
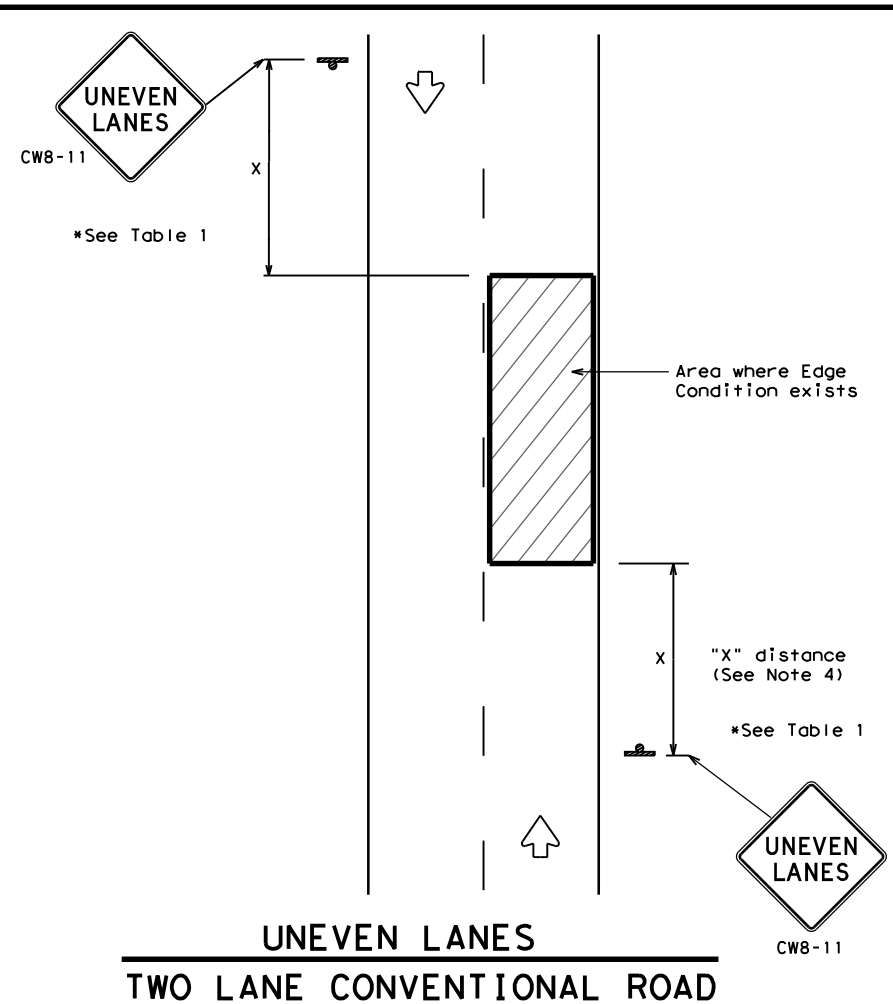
## WORK ZONE SHORT TERM PAVEMENT MARKINGS

### WZ (STPM) - 13

FILE:	wzstpm-13.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	April 1992	CONT	0113	SECT	07	JOB	072	HIGHWAY	US290
REVISIONS		DIST	14	COUNTY	HAYS	SHEET NO.	37		

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 FILE: K:\016874-000\Cad\Plan\STANDARDS\1 - TCP\WZUL-13.dgn



DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B <sub>FL</sub> OR TYPE C <sub>FL</sub> SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

**GENERAL NOTES**

- If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
- UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
- NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
- Signs shall be spaced at the distances recommended as per BC standards.
- Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
- Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
- Short term markings shall not be used to simulate edge lines.
- All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

Edge Condition	Edge Height (D)	* Warning Devices
①	Less than or equal to: 1/4" (maximum-planing) 1/2" (typical-overlay)	Sign: CW8-11
②	Less than or equal to 3"	Sign: CW8-11
③	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

**TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.**

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"



**SIGNING FOR UNEVEN LANES**

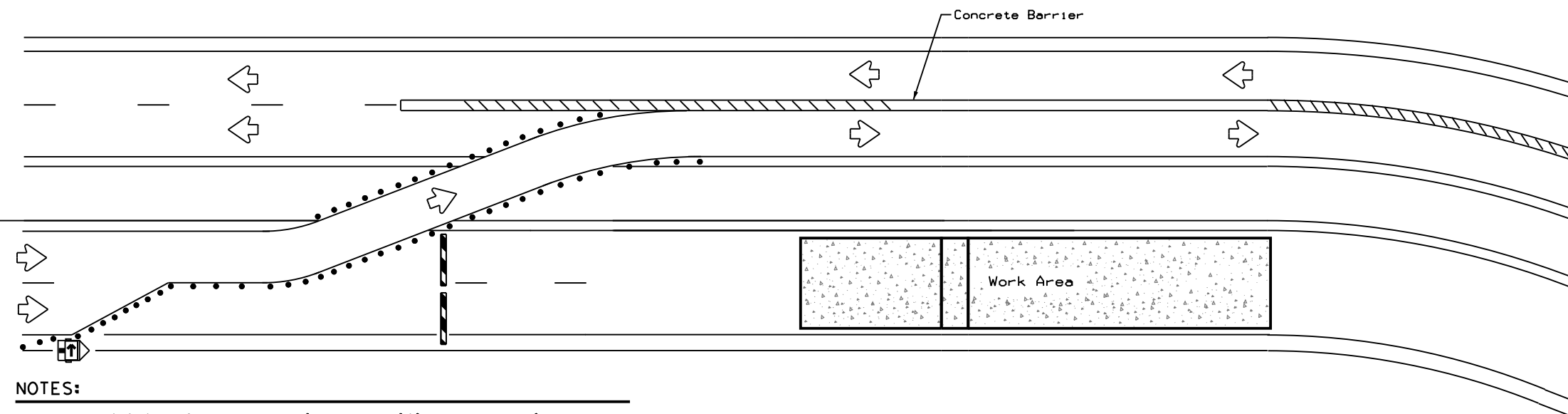
**WZ (UL) - 13**

FILE: WZUL-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
8-95 2-98 7-13	DIST	COUNTY	SHEET NO.	
1-97 3-03	14	HAYS	38	



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**NOTES:**

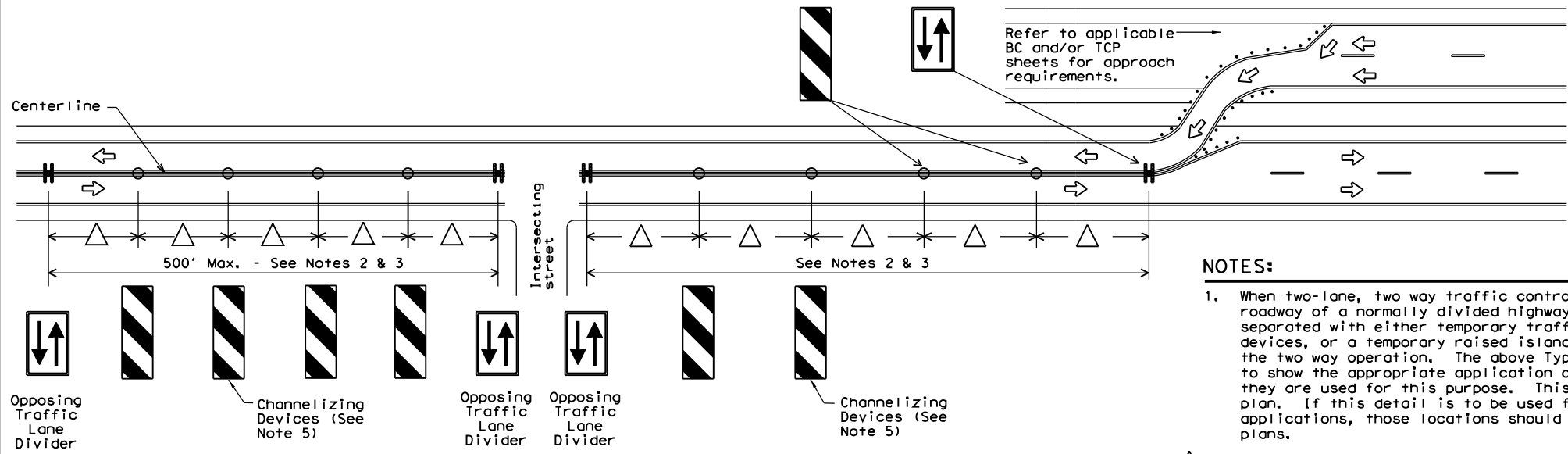
1. Length of Safety Glare screen will be specified elsewhere in the plans.
2. The cumulative nominal length of the modular safety glare screen units shall equal the length of the individual sections of temporary concrete traffic barrier on which they are installed so the joint between barrier sections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

**BARRIER DELINEATION WITH MODULAR GLARE SCREENS**

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

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

Only pre-qualified products shall be used. A copy of the Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:  
<http://www.txdot.gov/business/resources/producer-list.html>



**NOTES:**

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.
2. Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.
3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

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



**TRAFFIC CONTROL PLAN TYPICAL DETAILS**

**WZ(TD) - 17**

FILE:	wztd-17.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	February 1998	CONT	SECT	JOB	HIGHWAY				
4-98	2-17	0113	07	072	US290				
3-03		DIST	COUNTY	SHEET NO.					
7-13		14	HAYS	39					

**ROADWAY ALIGNMENTS**

Beginning chain US290 description  
 Point T2901 N 13,985,332.9574 E 2,279,290.3467 Sta 200+00.00  
 Course from T2901 to PC T290CL1 S 82° 30' 31.11" E Dist 1,835.9603

Curve Data  
 Curve T290CL1  
 P.I. Station = 227+21.48 N 13,984,978.1404 E 2,281,988.5937  
 Delta = 8° 50' 15.34" (LT)  
 Degree = 0° 30' 00.00"  
 Tangent = 885.5157  
 Length = 1,767.5188  
 Radius = 11,459.1556  
 External = 34.1636  
 Long Chord = 1,765.7671  
 Mid. Ord. = 34.0620  
 P.C. Station = 218+35.96 N 13,985,093.5910 E 2,281,110.6362  
 P.T. Station = 236+03.48 N 13,984,998.9448 E 2,282,873.8650  
 C.C. = N 13,996,454.9374 E 2,282,604.6427  
 Back = S 82° 30' 31.11" E  
 Ahead = N 88° 39' 13.55" E  
 Chord Bear = S 86° 55' 38.78" E

Ending chain US290 description  
 Beginning chain TRAUT description  
 Point T100 N 13,985,872.3113 E 2,280,378.9116 Sta 12+71.42  
 Course from T100 to PC TRAUT1 S 16° 02' 27.93" E Dist 601.2499

Curve Data  
 Curve TRAUT1  
 P.I. Station = 19+14.33 N 13,985,254.4348 E 2,280,556.5645  
 Delta = 23° 31' 56.82" (RT)  
 Degree = 28° 38' 52.40"  
 Tangent = 41.6592  
 Length = 82.1437  
 Radius = 200.0000  
 External = 4.2926  
 Long Chord = 81.5676  
 Mid. Ord. = 4.2024  
 P.C. Station = 18+72.67 N 13,985,294.4719 E 2,280,545.0530  
 P.T. Station = 19+54.82 N 13,985,213.1312 E 2,280,551.1331  
 C.C. = N 13,985,239.2065 E 2,280,352.8402  
 Back = S 16° 02' 27.93" E  
 Ahead = S 7° 29' 28.89" W  
 Chord Bear = S 4° 16' 29.52" E

Course from PT TRAUT1 to T102 S 7° 29' 28.89" W Dist 45.1826  
 Point T102 N 13,985,168.3343 E 2,280,545.2424 Sta 20+00.00  
 Ending chain TRAUT description  
 Beginning chain WHIRL description  
 Point WHIRL1 N 13,985,121.3693 E 2,280,899.3928 Sta 10+00.00  
 Course from WHIRL1 to WHIRL2 N 7° 29' 28.89" E Dist 164.4785  
 Point WHIRL2 N 13,985,284.4440 E 2,280,920.8370 Sta 11+64.48  
 Ending chain WHIRL description

**DRIVEWAY ALIGNMENTS**

Beginning chain DRVWY2 description  
 Point DRVWY201 N 13,985,465.2276 E 2,280,495.9570 Sta 1+00.00  
 Course from DRVWY201 to DRVWY202 N 73° 57' 32.07" E Dist 150.0000  
 Point DRVWY202 N 13,985,506.6766 E 2,280,640.1166 Sta 2+50.00  
 Ending chain DRVWY2 description

Beginning chain DRVWY3 description  
 Point DRVWY301 N 13,985,384.8310 E 2,280,405.0835 Sta 3+00.00  
 Course from DRVWY301 to DRVWY302 N 87° 08' 14.21" E Dist 139.9987  
 Point DRVWY302 N 13,985,391.8229 E 2,280,544.9075 Sta 4+40.00  
 Ending chain DRVWY3 description

**RETAINING WALL ALIGNMENTS**

Beginning chain RWA description  
 Point RWA1 N 13,985,542.1320 E 2,280,494.6556 Sta 1+00.00  
 Course from RWA1 to RWA2 S 16° 02' 27.93" E Dist 57.6025  
 Point RWA2 N 13,985,486.7724 E 2,280,510.5727 Sta 1+57.60  
 Ending chain RWA description

<\* 2 DESCRIBE CHAIN RWB  
 Chain RWB contains:  
 RWB1 RWB2  
 Beginning chain RWB description  
 Point RWB1 N 13,985,433.2069 E 2,280,525.5057 Sta 1+44.00  
 Course from RWB1 to RWB2 S 16° 02' 27.93" E Dist 209.9602  
 Point RWB2 N 13,985,231.4218 E 2,280,583.5233 Sta 3+53.96  
 Ending chain RWB description

<\* 3 DESCRIBE CHAIN RWC  
 Chain RWC contains:  
 RWC01 RWC02  
 Beginning chain RWC description  
 Point RWC01 N 13,985,509.0685 E 2,280,463.5820 Sta 1+00.00  
 Course from RWC01 to RWC02 S 16° 02' 27.93" E Dist 100.0000  
 Point RWC02 N 13,985,412.9621 E 2,280,491.2147 Sta 2+00.00  
 Ending chain RWC description

<\* 4 DESCRIBE CHAIN RWD  
 Chain RWD contains:  
 RWD01 RWD02 RWD03 RWD04  
 Beginning chain RWD description  
 Point RWD01 N 13,985,412.9621 E 2,280,491.2147 Sta 2+00.00  
 Course from RWD01 to RWD02 S 16° 02' 27.93" E Dist 128.7537  
 Point RWD02 N 13,985,289.2217 E 2,280,526.7928 Sta 3+28.75  
 Course from RWD02 to RWD03 S 13° 12' 14.31" E Dist 31.6045  
 Point RWD03 N 13,985,258.4527 E 2,280,534.0118 Sta 3+60.36  
 Course from RWD03 to RWD04 S 48° 59' 45.90" W Dist 35.4759  
 Point RWD04 N 13,985,235.1766 E 2,280,507.2394 Sta 3+95.83  
 Ending chain RWD description



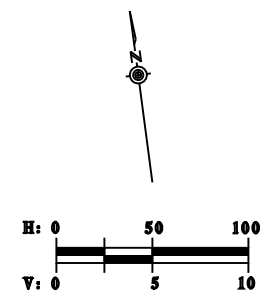
*Daniel A. Rogers*  
 4/11/2023



**US 290 AT  
 TRAUTWEIN ROAD  
 HORIZONTAL  
 ALIGNMENT DATA**

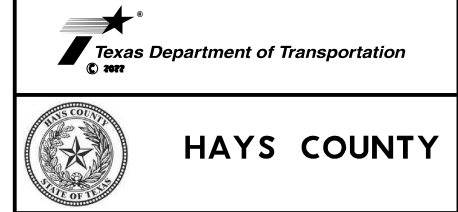
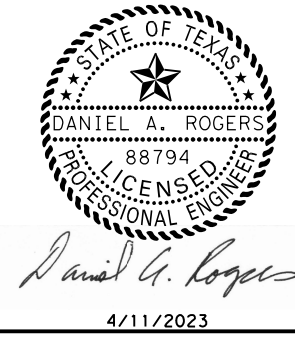
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TEXAS	14	HAYS		
CONT.	SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07	072	US 290	40

File name: \\... \Plan\016874-000\had01\*1.dgn  
 Date: 4/11/2023



**LEGEND**  
 [Shaded Area] LIMITS OF MILLING & LEVEL-UP  
 [Arrow] DIRECTION OF TRAFFIC

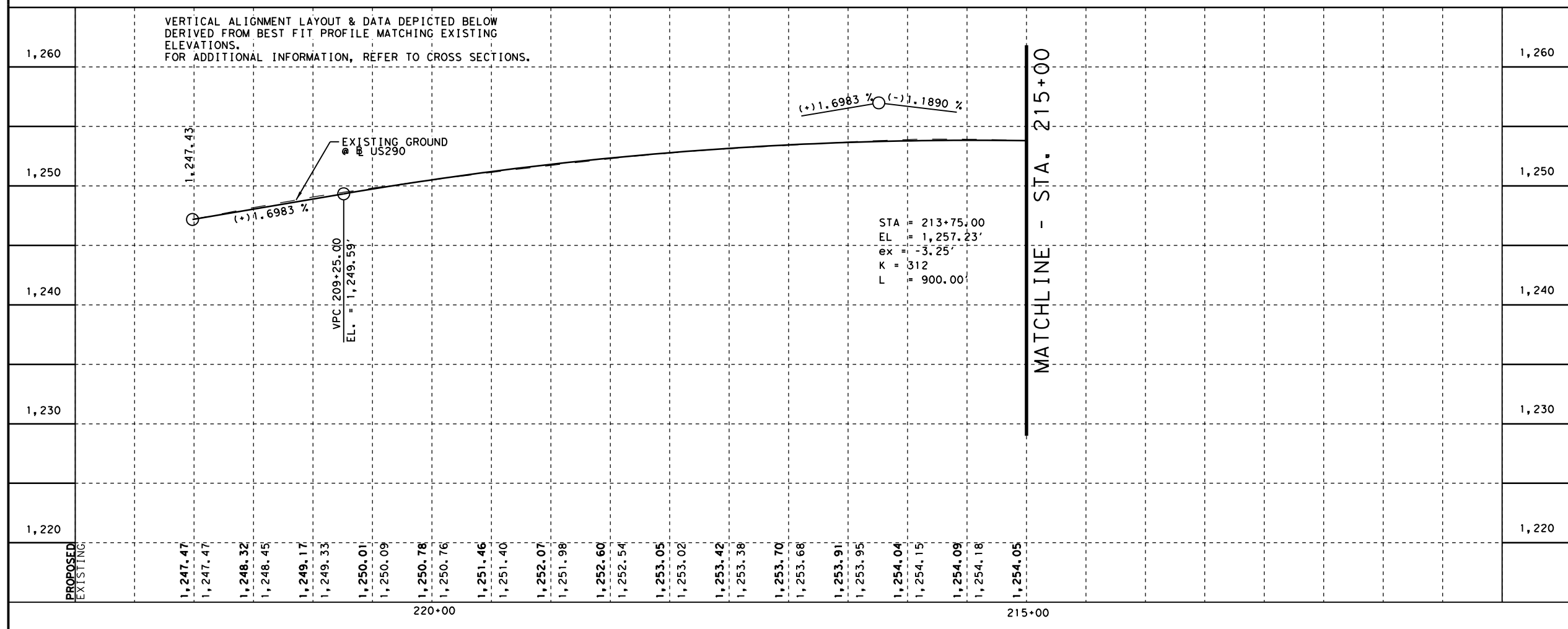
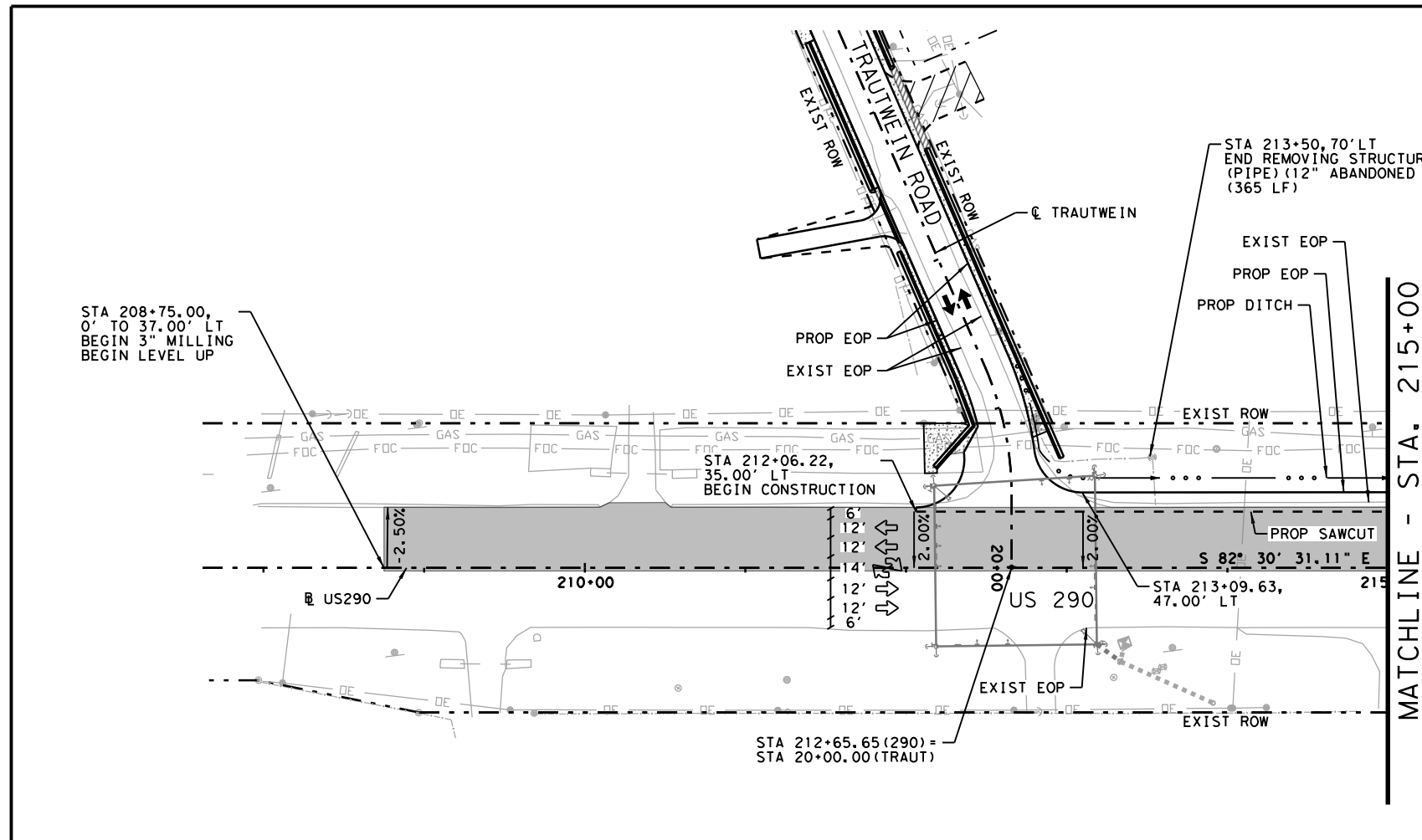
- NOTES:**
- REFER TO EXISTING UTILITY SHEET FOR UTILITY LOCATIONS.
  - REMOVE EXISTING ROADWAY WITHIN LIMITS OF PROPOSED PAVEMENT STRUCTURE.
  - CONTRACTOR TO REMOVE 365 LF WATER LINE PRIOR TO RETAINING WALL CONSTRUCTION.
  - CONTRACTOR TO ENSURE ACCESS TO WHIRLWAY DR. DURING CONSTRUCTION.



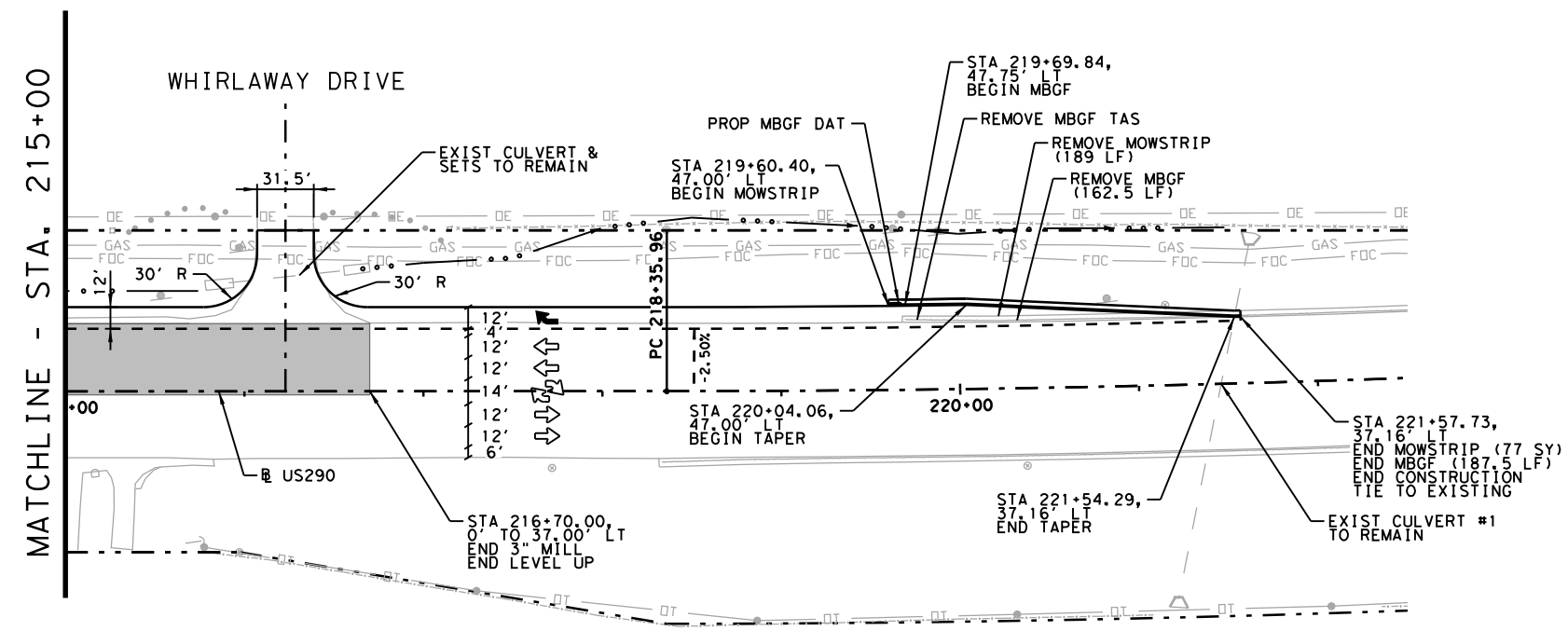
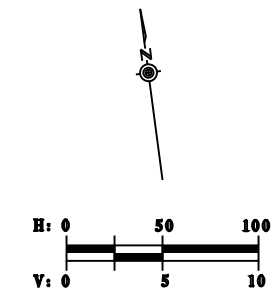
**wsb** WSB & ASSOCIATES, INC.  
 FIRM # 16849

**US 290 AT  
 TRAUTWEIN ROAD  
 PLAN & PROFILE**

DATE: 4/11/2023		SHEET 1 OF 3	
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07 072	US 290	41

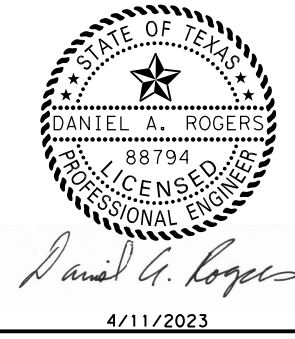


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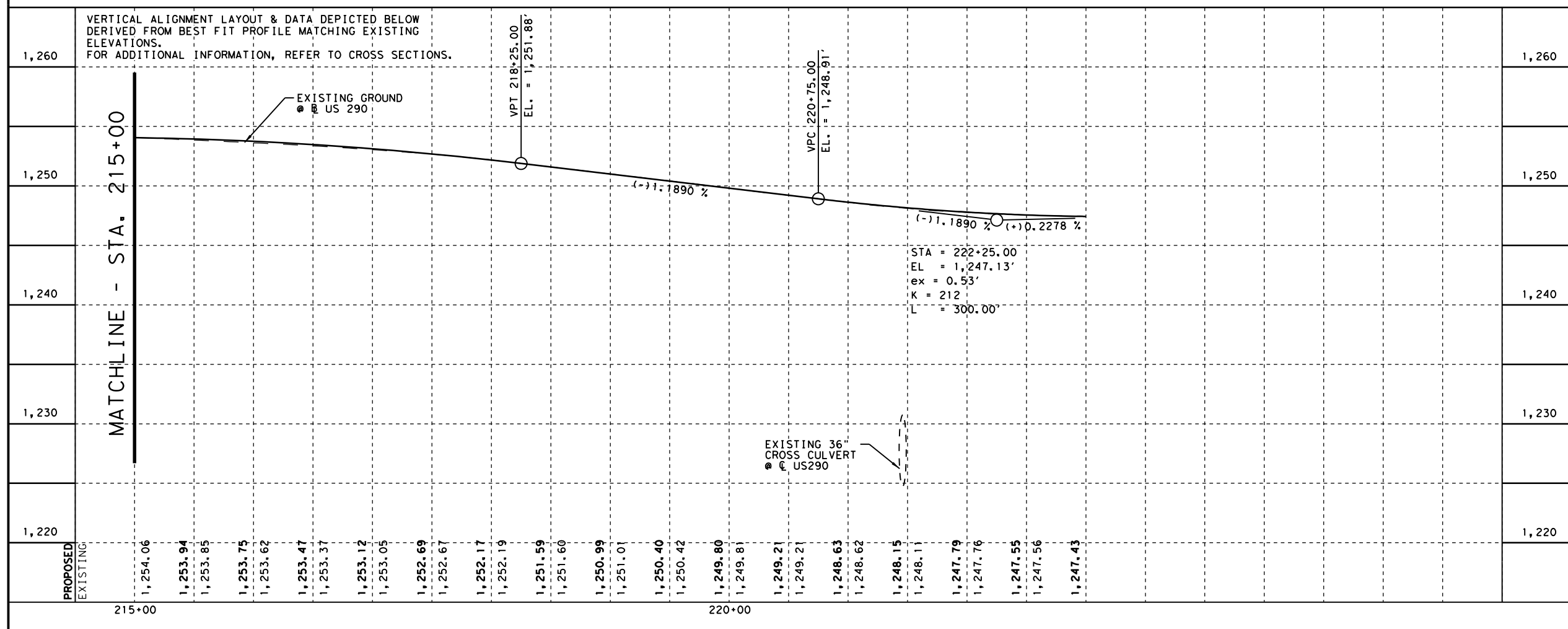
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- LIMITS OF MILLING & LEVEL-UP
  - DIRECTION OF TRAFFIC

- NOTES:**
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  2. REMOVE EXISTING ROADWAY WITHIN LIMITS OF PROPOSED PAVEMENT STRUCTURE.
  3. CONTRACTOR TO REMOVE 365 LF WATER LINE PRIOR TO RETAINING WALL CONSTRUCTION.
  4. CONTRACTOR TO ENSURE ACCESS TO WHIRLWAY DR. DURING CONSTRUCTION.

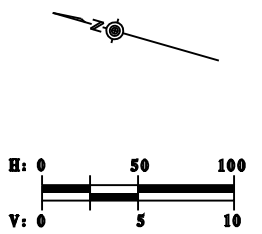
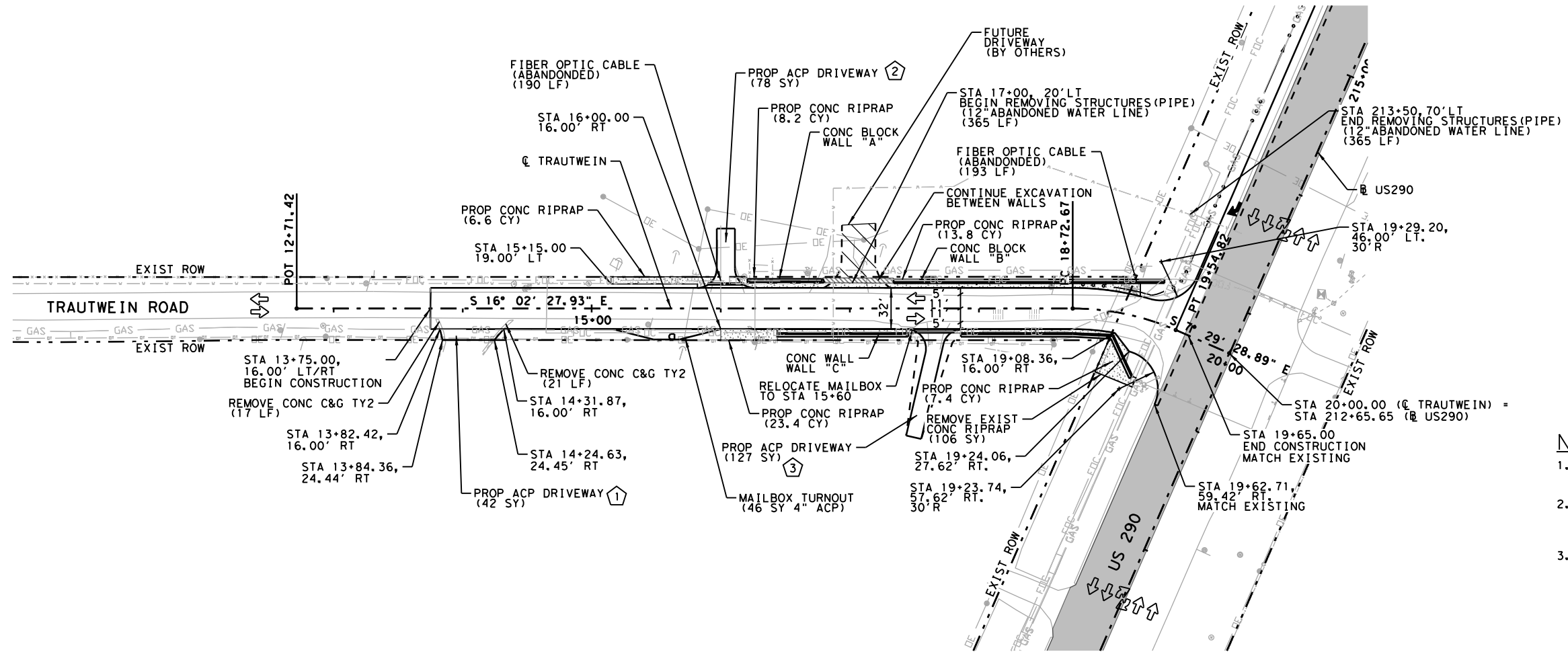


**US 290 AT  
TRAUTWEIN ROAD  
PLAN & PROFILE**

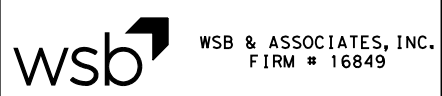
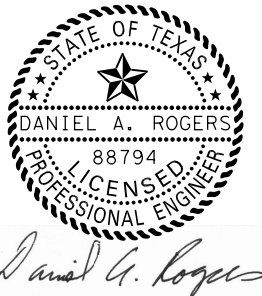
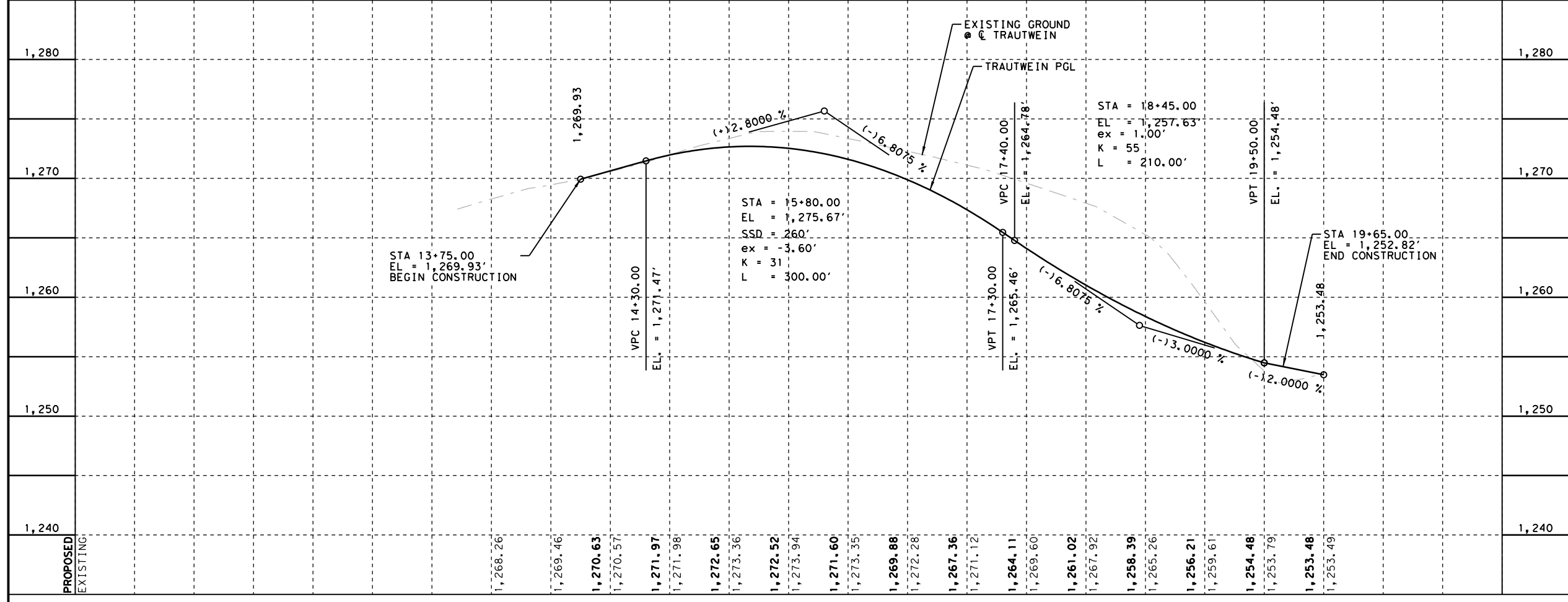
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0113	07 072	US 290	42



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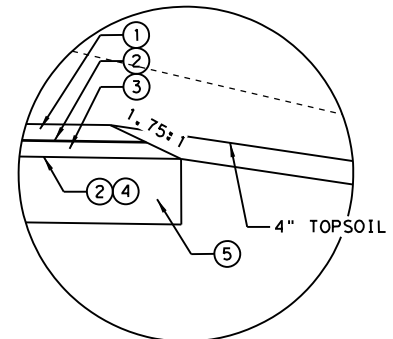
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  3. CONTRACTOR TO REMOVE 365 LF WATER LINE PRIOR TO RETAINING WALL CONSTRUCTION.



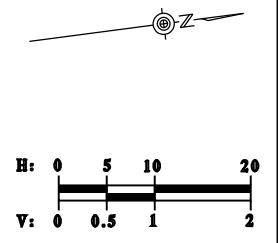
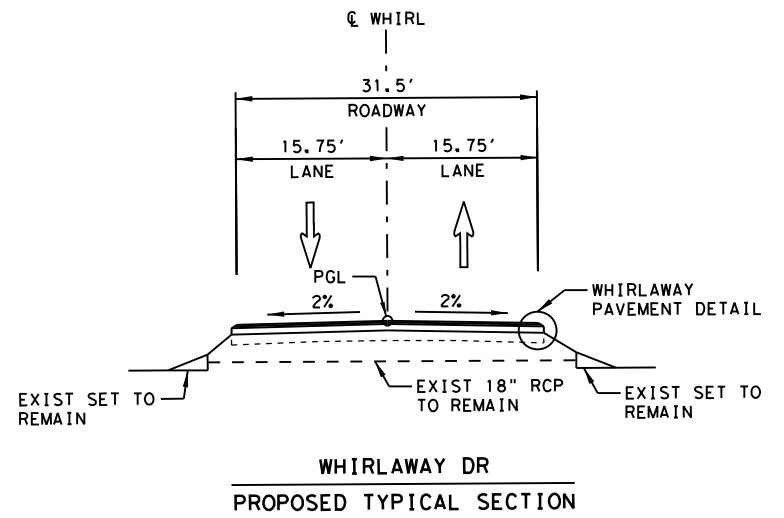
**US 290 AT  
TRAUTWEIN ROAD  
PLAN & PROFILE**

DATE: 4/13/2023		SHEET 3 OF 3	
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07 072	US 290	43

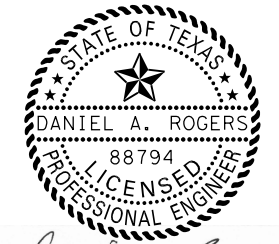
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 Date: 4/13/2023



- WHIRLWAY PAVEMENT DETAIL**
- ① 2" D-GR HMA (TY D)
  - ② BONDING COURSE
  - ③ 2" D-GR HMA (TY C)
  - ④ PRIME COAT
  - ⑤ 14" FLEX BASE (3 EQUAL LIFTS)



- NOTES:**
1. REFER TO EXISTING UTILITY SHEET FOR UTILITY LOCATIONS.
  2. REMOVE EXISTING ROADWAY WITHIN LIMITS OF PROPOSED PAVEMENT STRUCTURE.
  3. CONTRACTOR TO REMOVE 365 LF WATER LINE PRIOR TO RETAINING WALL CONSTRUCTION.
  4. CONTRACTOR TO ENSURE ACCESS TO WHIRLWAY DR. DURING CONSTRUCTION.



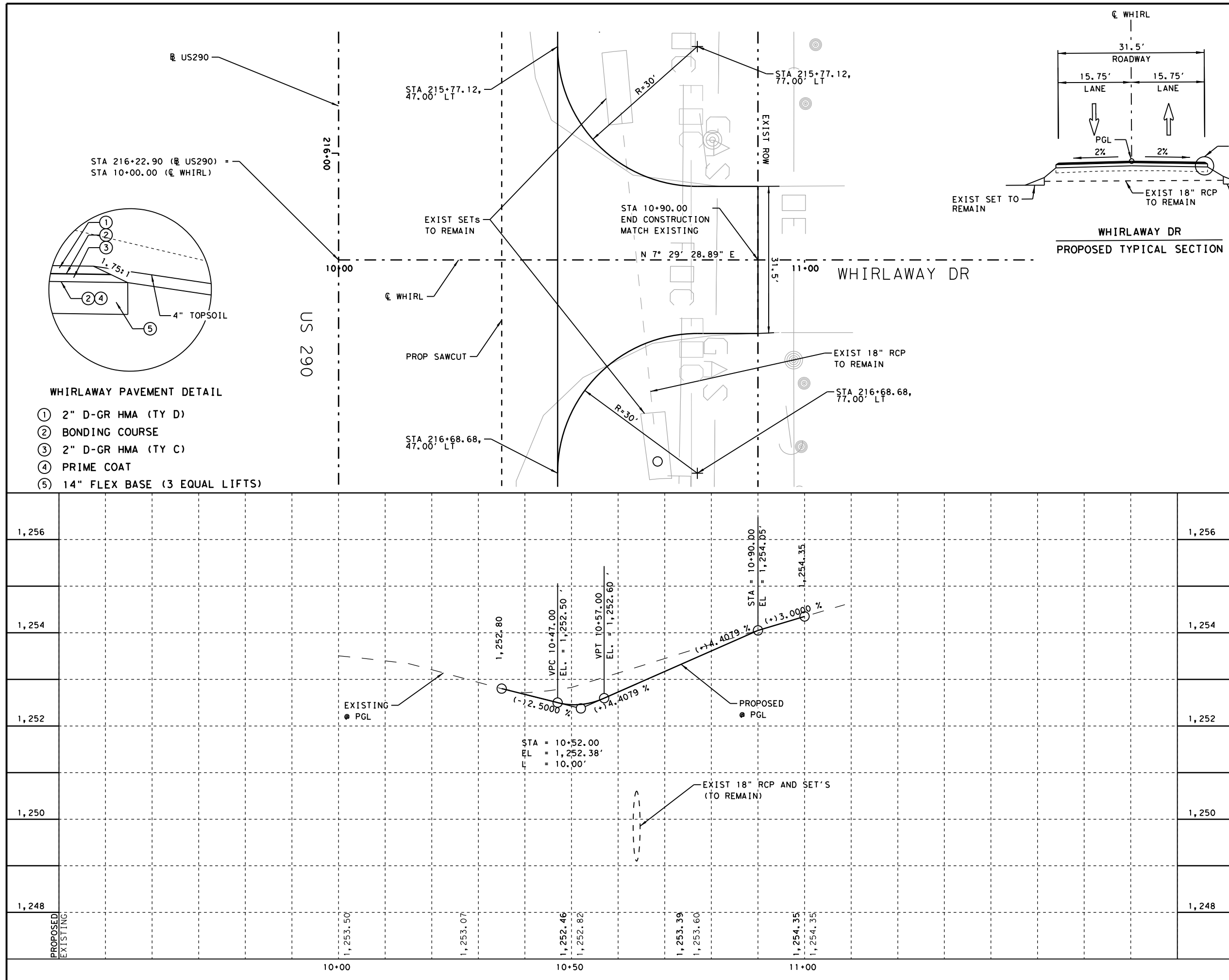
*Daniel A. Rogers*  
4/11/2023



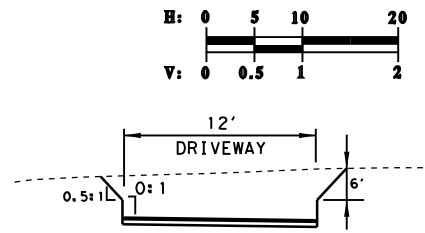
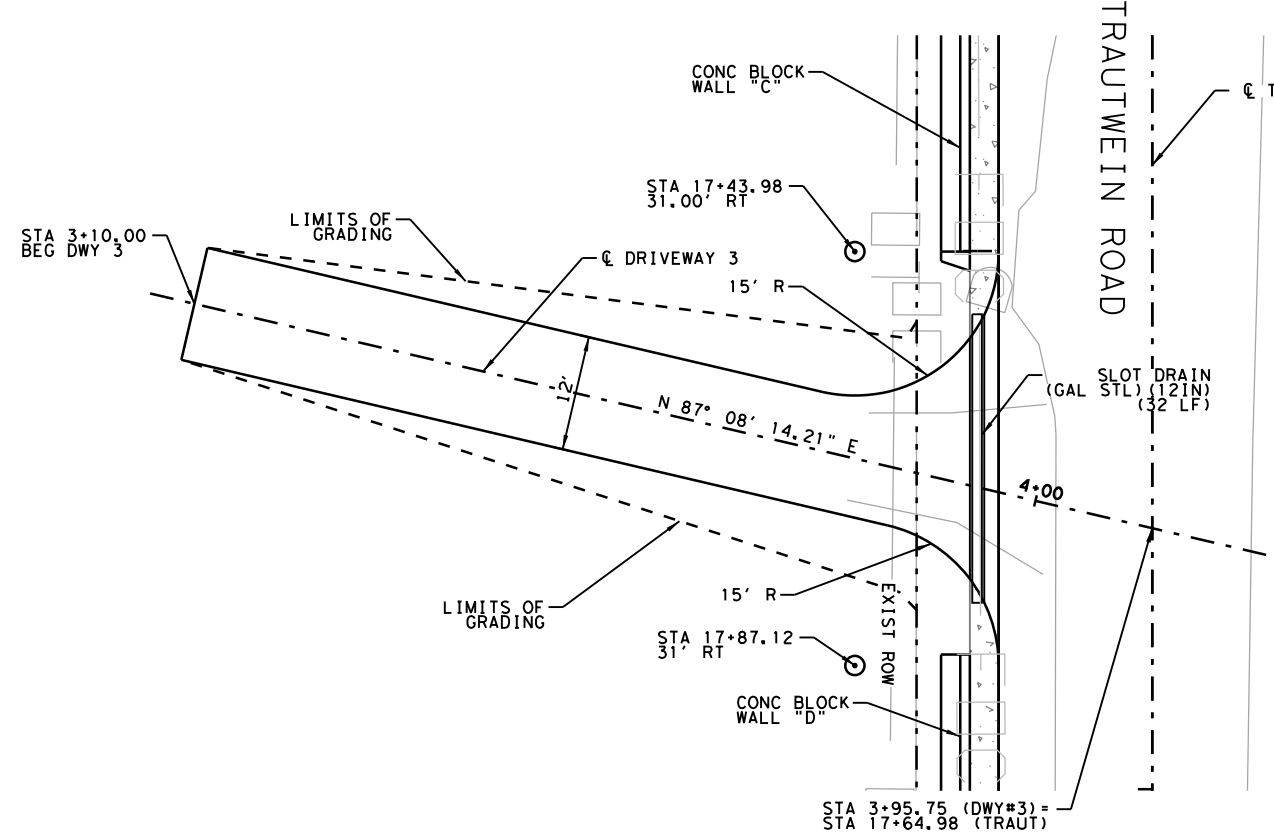
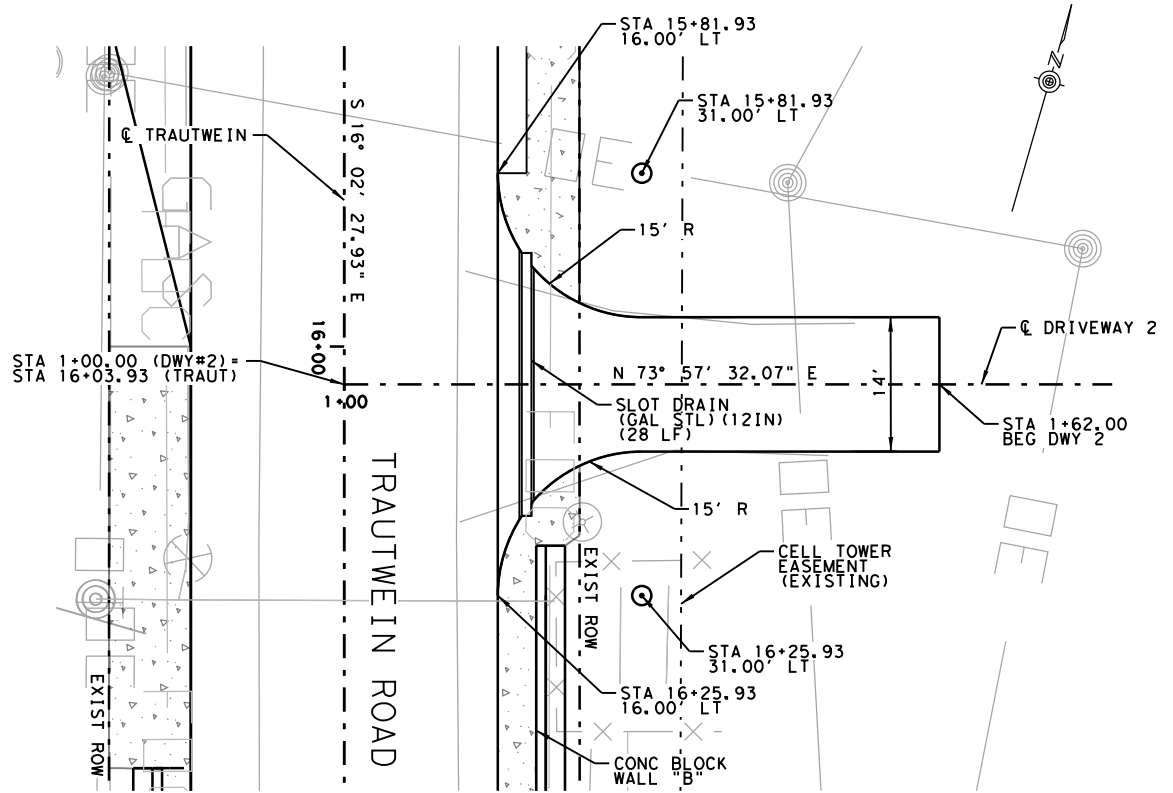
**wsb** WSB & ASSOCIATES, INC.  
FIRM # 16849

**US 290 AT  
TRAUTWEIN ROAD  
DRIVEWAY  
PLAN & PROFILE**

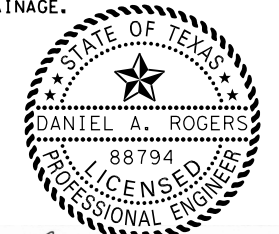
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STATE	STATE DIST. NO.	COUNTY	
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CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07 072	US 290	44



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Date: 4/11/2023



- NOTES:**
1. REFER TO EXISTING UTILITY SHEET FOR UTILITY LOCATIONS.
  2. REMOVE EXISTING ROADWAY WITHIN LIMITS OF PROPOSED PAVEMENT STRUCTURE.
  3. BASED ON RKCI (GEOTECH ENGINEER) RECOMMENDATIONS FROM 07-15-2022, THE NATIVE LIMESTONE MATERIAL CAN BE CUT AT 1:0 SLOPE WITH THE TOP 1-2 FEET SOIL OVERBURDEN CUT BACK AT 0.75 :1 SLOPE.
  4. FORM RIPRAP DITCH AT ENDS OF SLOT DRAINS TO ENSURE POSITIVE DRAINAGE.



*Daniel A. Rogers*

4/11/2023

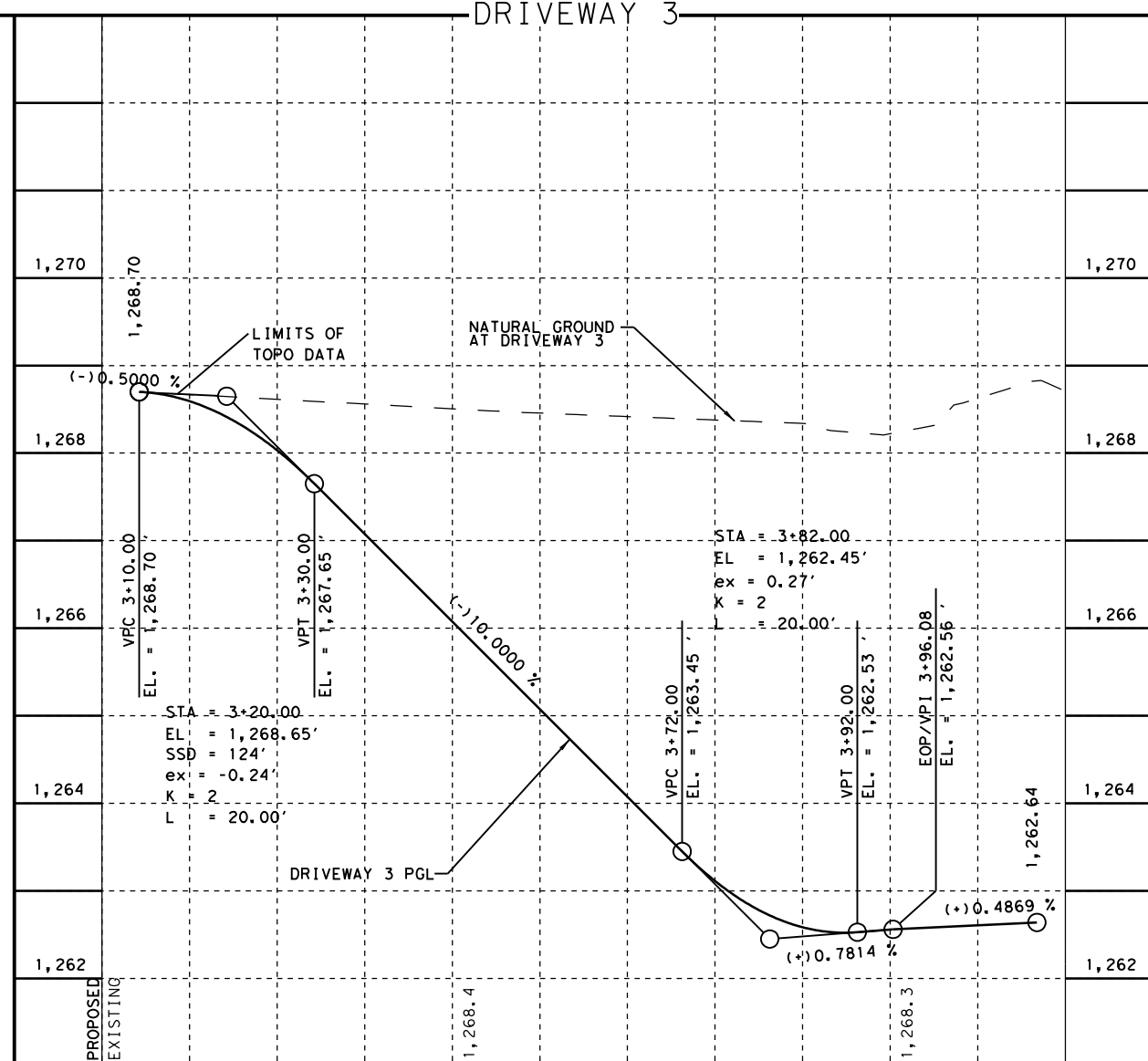
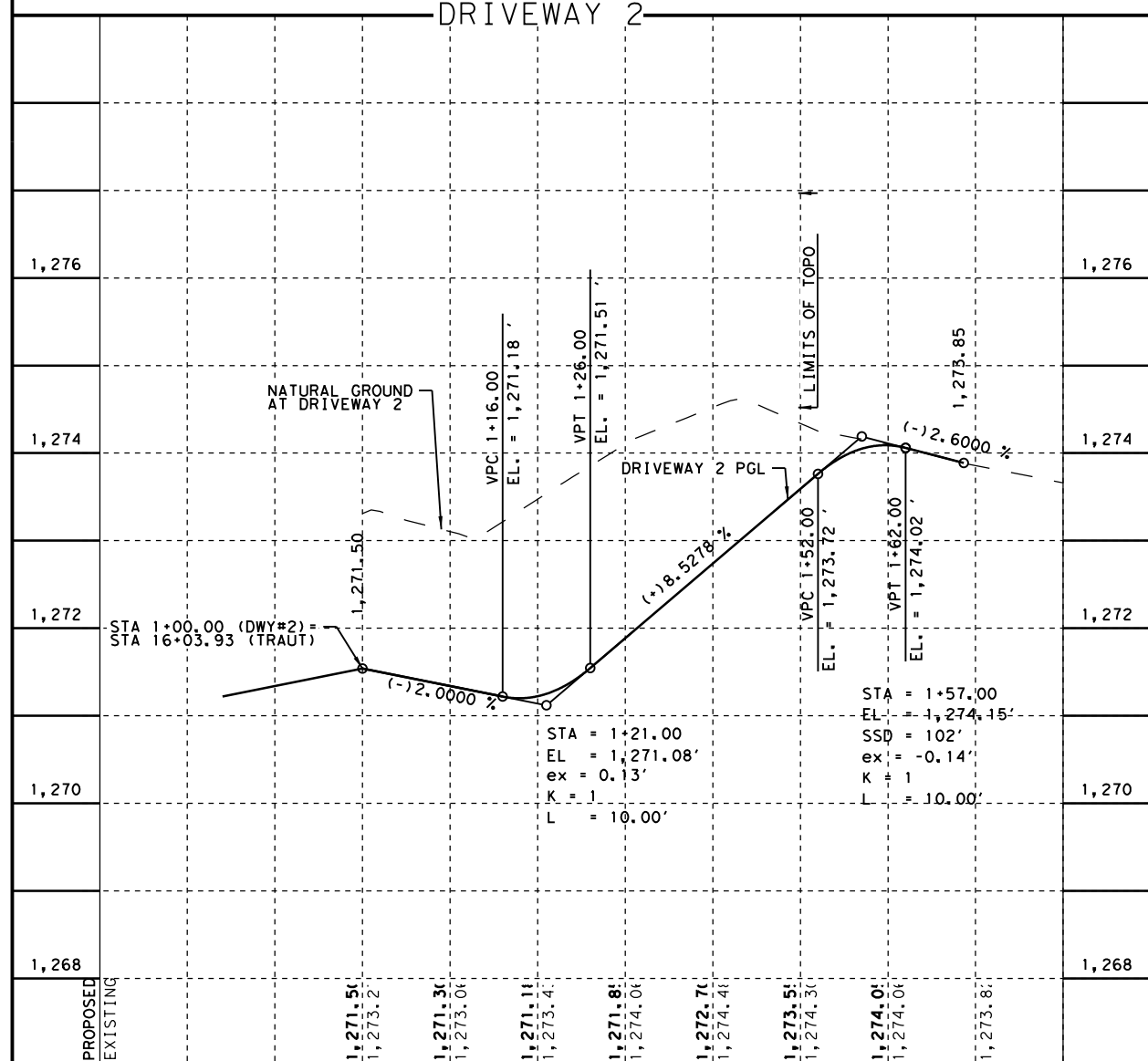


**HAYS COUNTY**



**US 290 AT  
TRAUTWEIN ROAD  
DRIVEWAY  
PLAN & PROFILE**

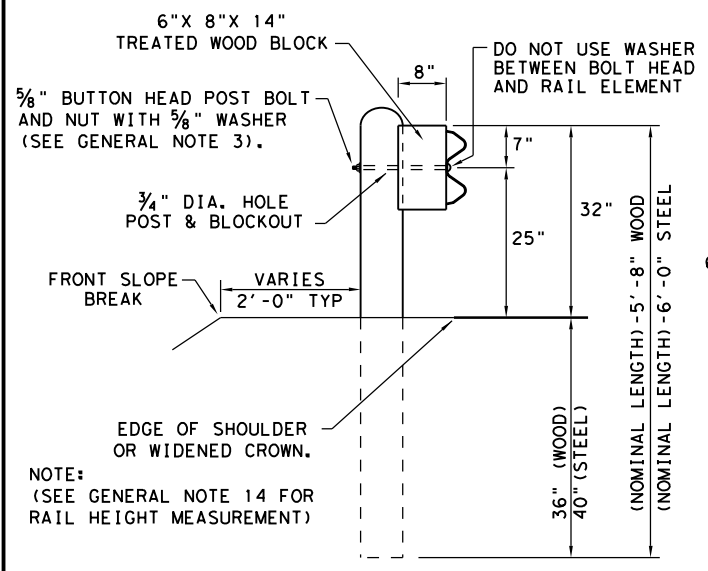
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CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07 072	US 290	45



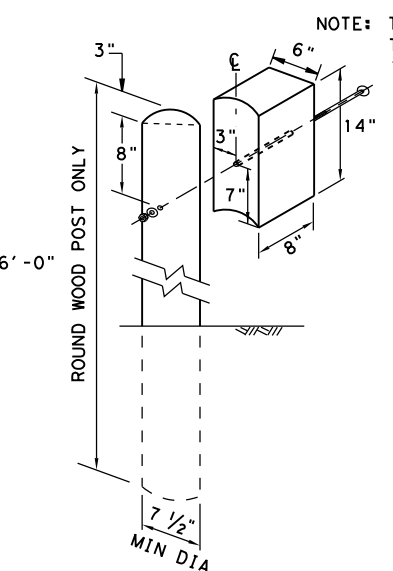
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Date: 4/11/2023



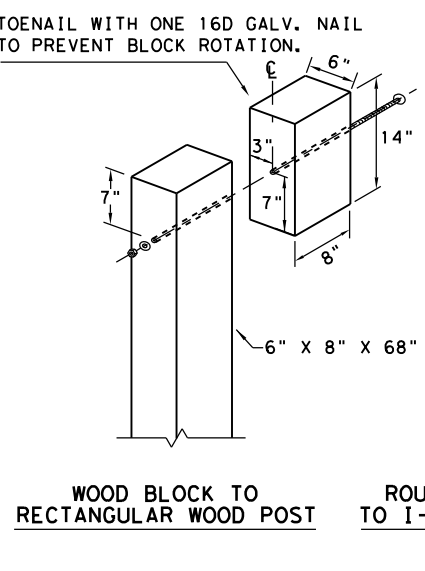
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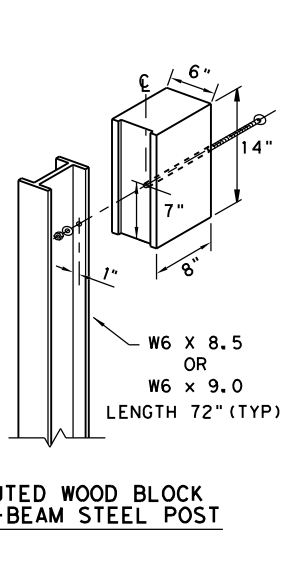
**TYPICAL POST PLACEMENT**



**WOOD BLOCK TO ROUND WOOD POST**



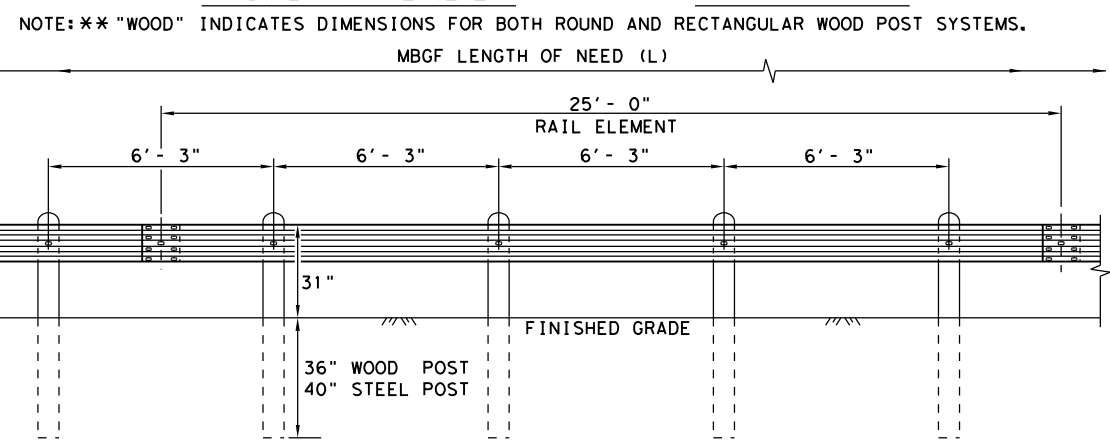
**WOOD BLOCK TO RECTANGULAR WOOD POST**



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

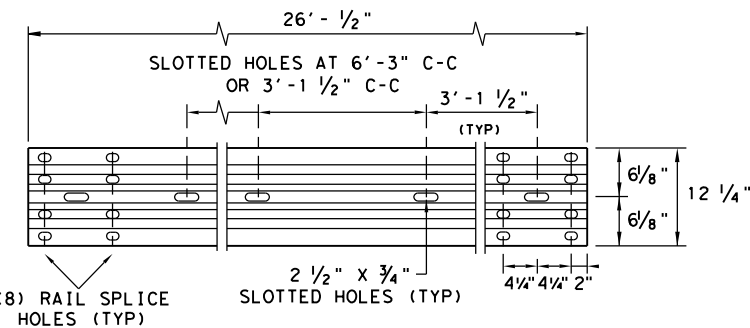
**GENERAL NOTES**

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 5/8" 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.



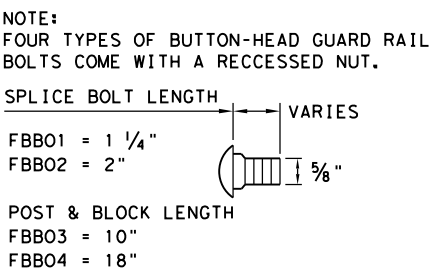
**ELEVATION MID-SPAN RAIL SPLICE**

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



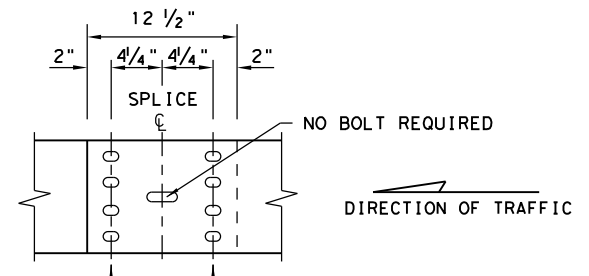
**ELEVATION 25'-0" (NOM.) W-BEAM SECTION**

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



**BUTTON HEAD BOLT**

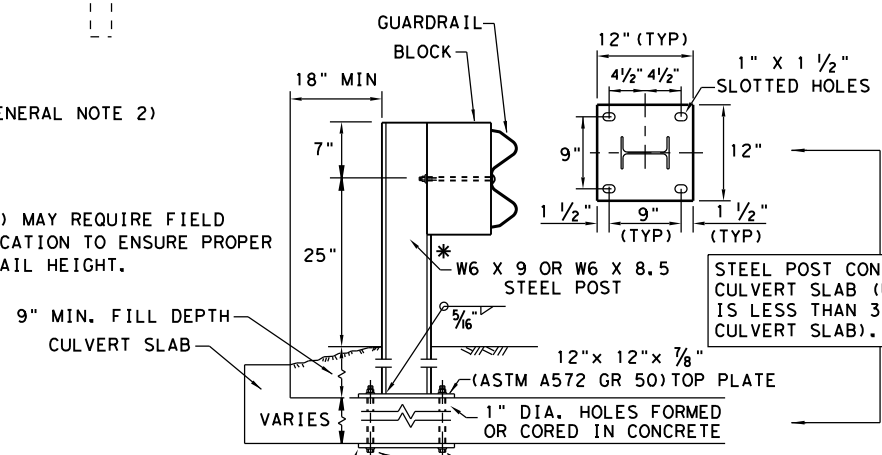
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



**MID-SPAN RAIL SPLICE DETAIL**

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

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



**LOW FILL CULVERT POST**

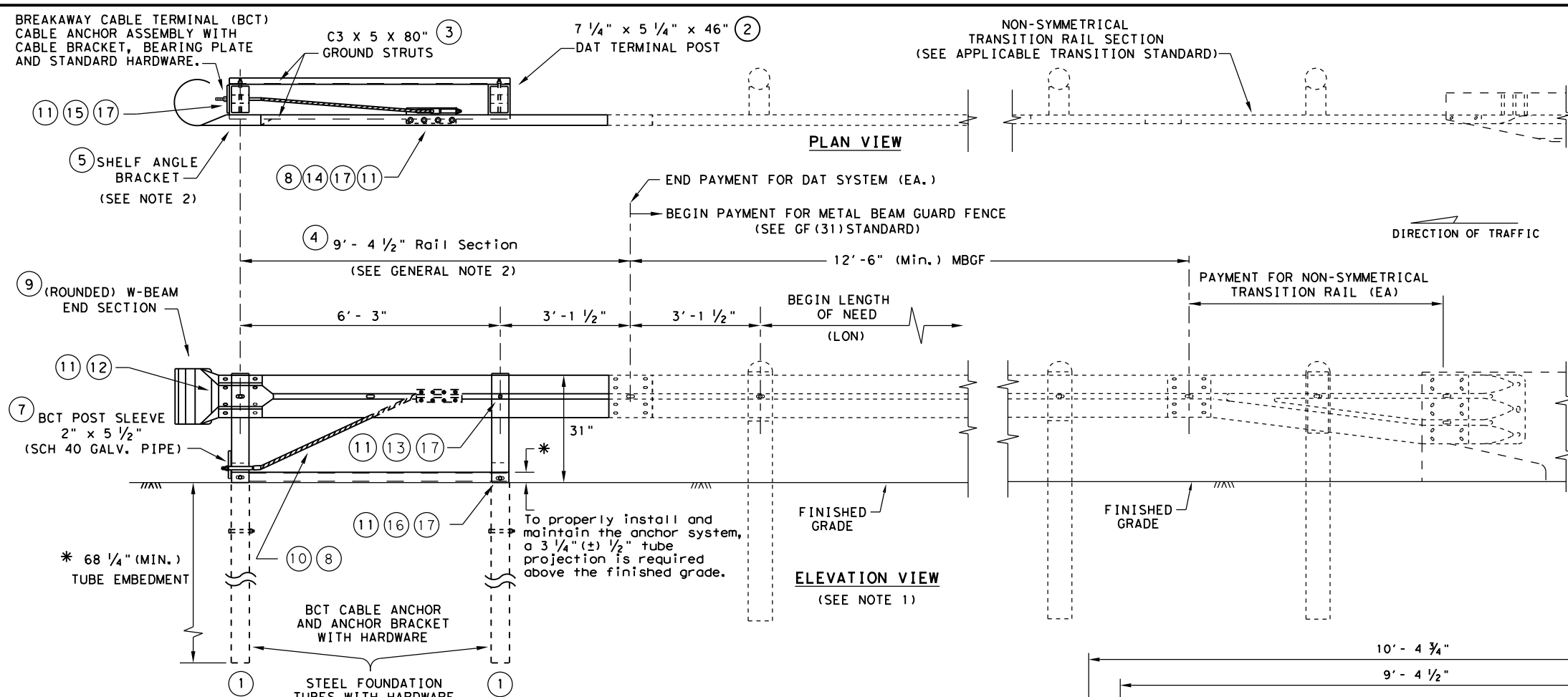
NOTE: TWO INSTALLATION OPTIONS.

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.

		<b>Design Division Standard</b>	
<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
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB
REVISIONS	0113	07	072
	DIST	COUNTY	SHEET NO.
	14	HAYS	46

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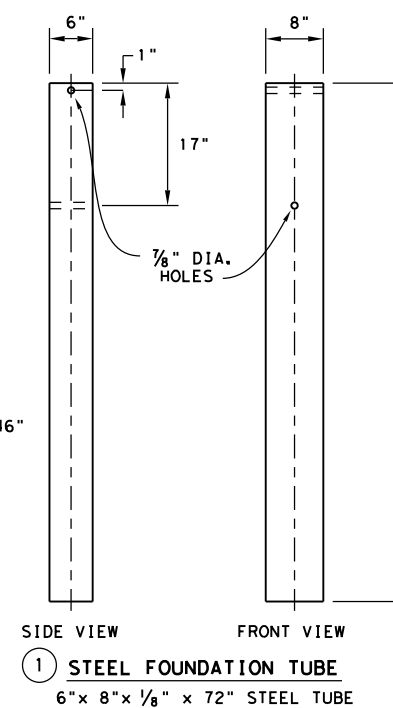
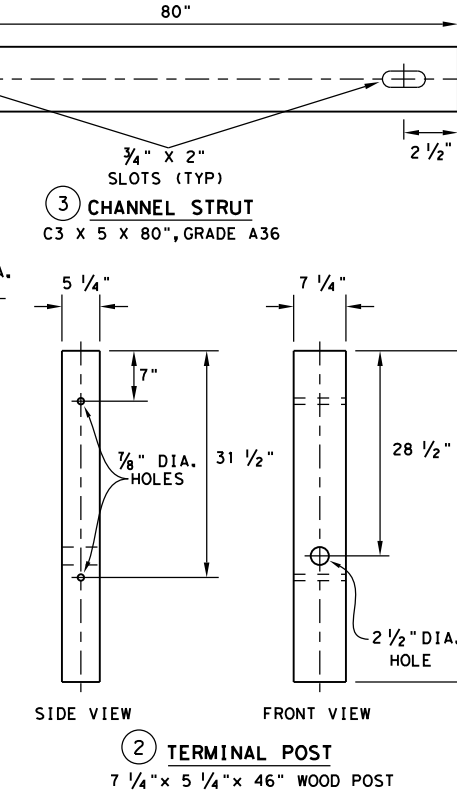
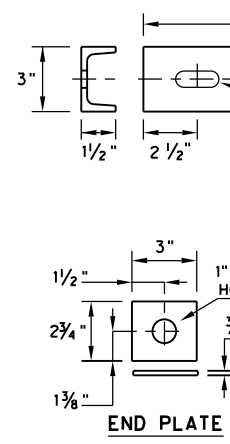
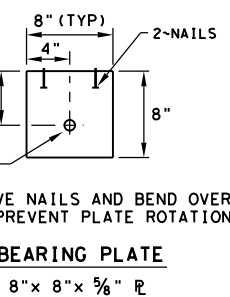
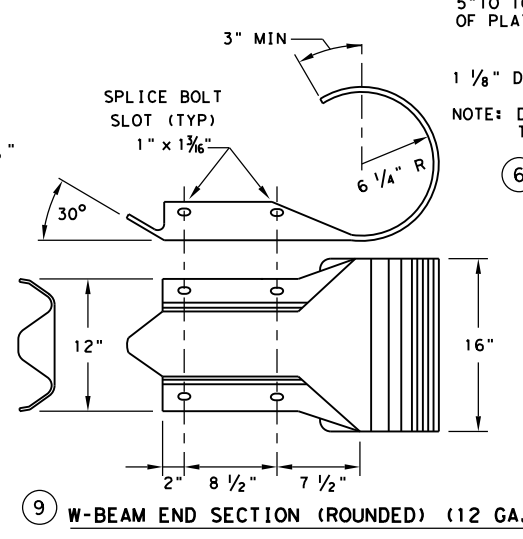
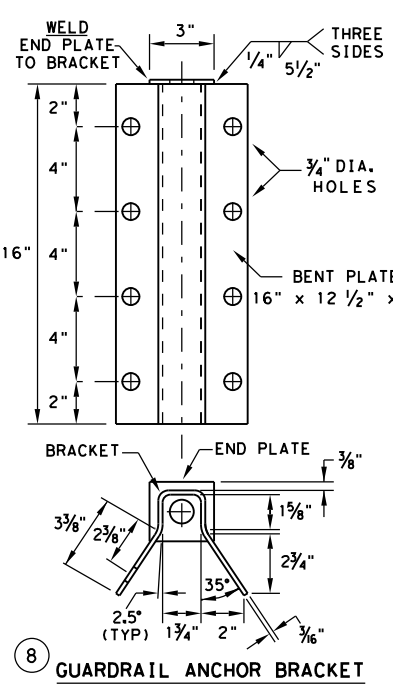
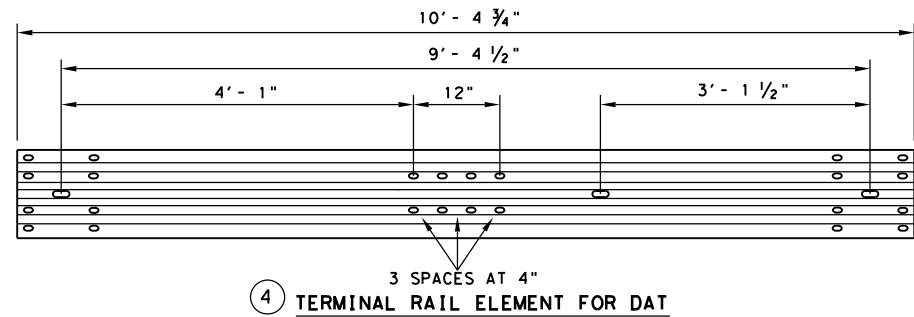


**DOWNSTREAM ANCHOR TERMINAL (DAT)**  
 NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

- GENERAL NOTES**
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
  2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
  3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 3 3/4" ABOVE THE FINISHED GRADE.
  4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
  5. REFER TO GF (31) SHEET FOR TERMINAL CONNECTION DETAILS.

**MOW STRIP INSTALLATION**  
 IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(DAT) PARTS LIST	QTY
1	STEEL FOUNDATION TUBE	2
2	DAT TERMINAL POST	2
3	CHANNEL STRUT	2
4	TERMINAL RAIL ELEMENT	1
5	SHELF ANGLE BRACKET	1
6	BCT BEARING PLATE	1
7	BCT POST SLEEVE	1
8	GUARDRAIL ANCHOR BRACKET	1
9	(ROUNDED) W-BEAM END SECTION	1
10	BCT CABLE ANCHOR	1
11	RECESSED NUT, GUARDRAIL	20
12	1 1/4" BUTTON HEAD BOLT	4
13	10" BUTTON HEAD BOLT	2
14	5/8" X 2" HEX HEAD BOLT	8
15	5/8" X 8" HEX HEAD BOLT	4
16	5/8" X 10" HEX HEAD BOLT	2
17	5/8" FLAT WASHER	18



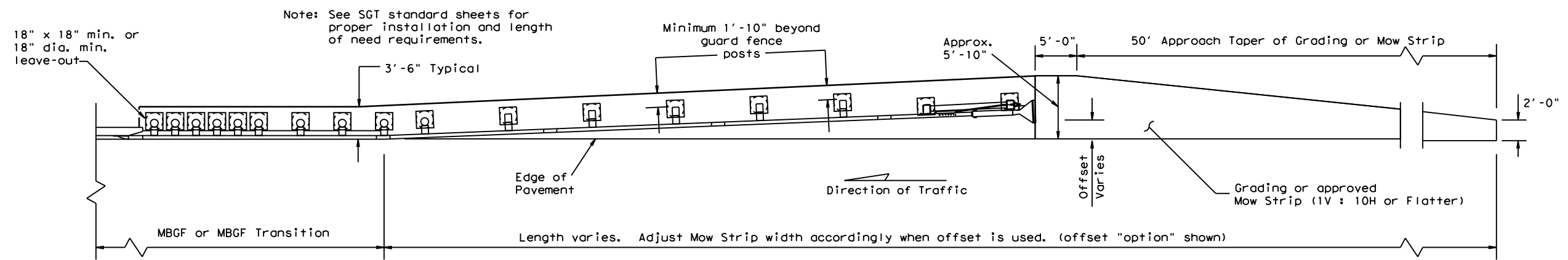
Design Division Standard  
**METAL BEAM GUARD FENCE (DOWNSTREAM ANCHOR TERMINAL) TL-3 MASH COMPLIANT GF (31) DAT-19**

FILE: gf31dat19.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2019 REVISIONS	CONT: 0113	SECT: 07	JOB: 072	HIGHWAY: US290
	DIST: 14	COUNTY: HAYS	SHEET NO.: 47	

DATE: 4/11/2023  
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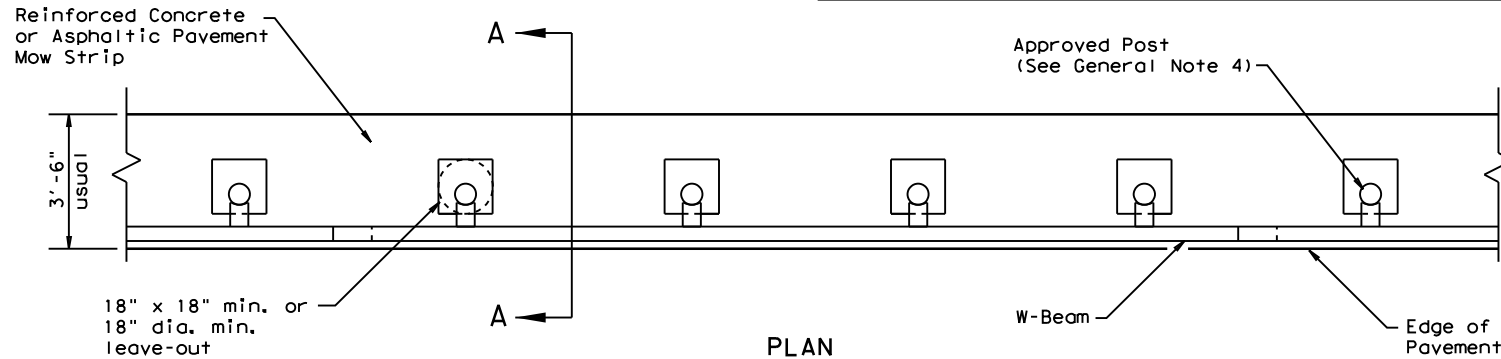
DATE: 4/11/2023  
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Note: See SGT standard sheets for proper installation and length of need requirements.

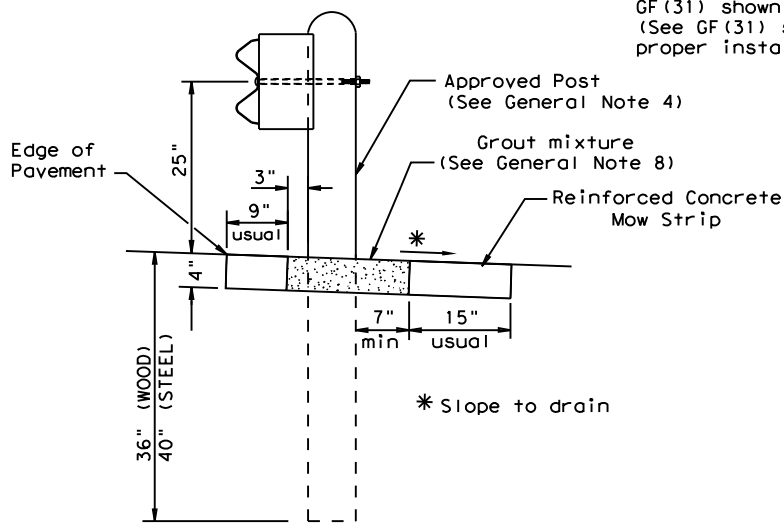
**GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS**

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.



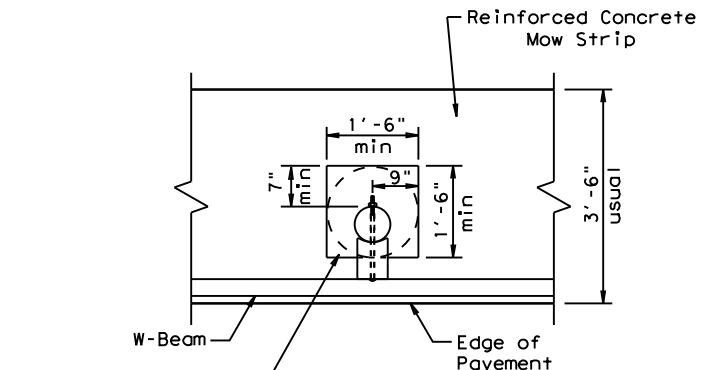
**PLAN**

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



**SECTION A-A**

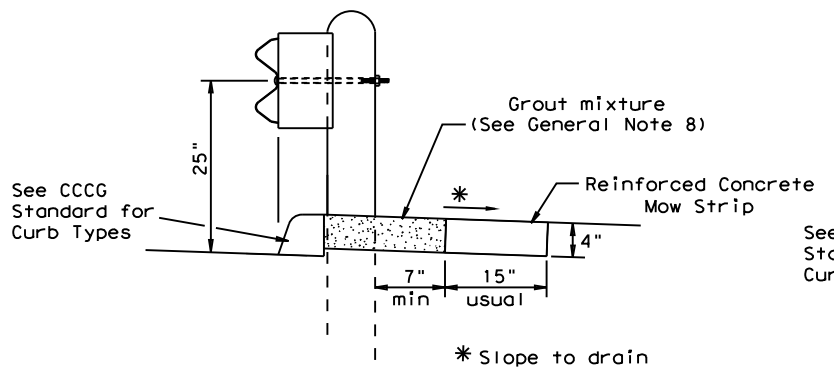
Typical



**MOW STRIP DETAIL**

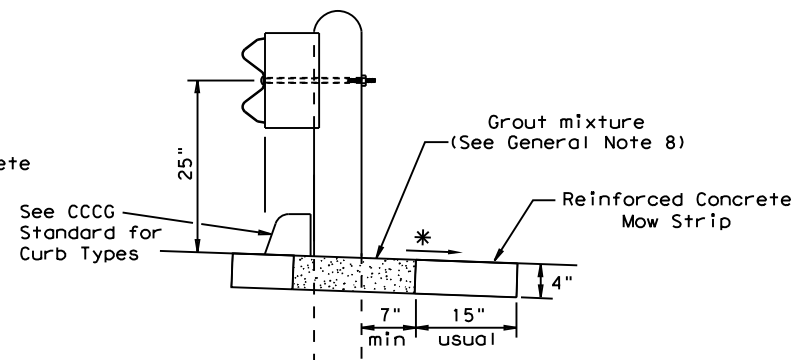
Reinforced Concrete Mow Strip with 18\"/>

- 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 I or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.



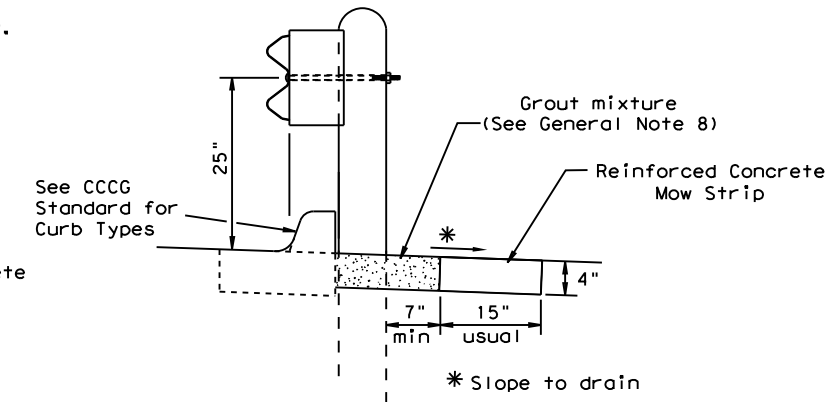
**CURB OPTION (1)**

This option will increase the post embedment throughout the system.



**CURB OPTION (2)**

Curb shown on top of mow strip



**CURB OPTION (3)**

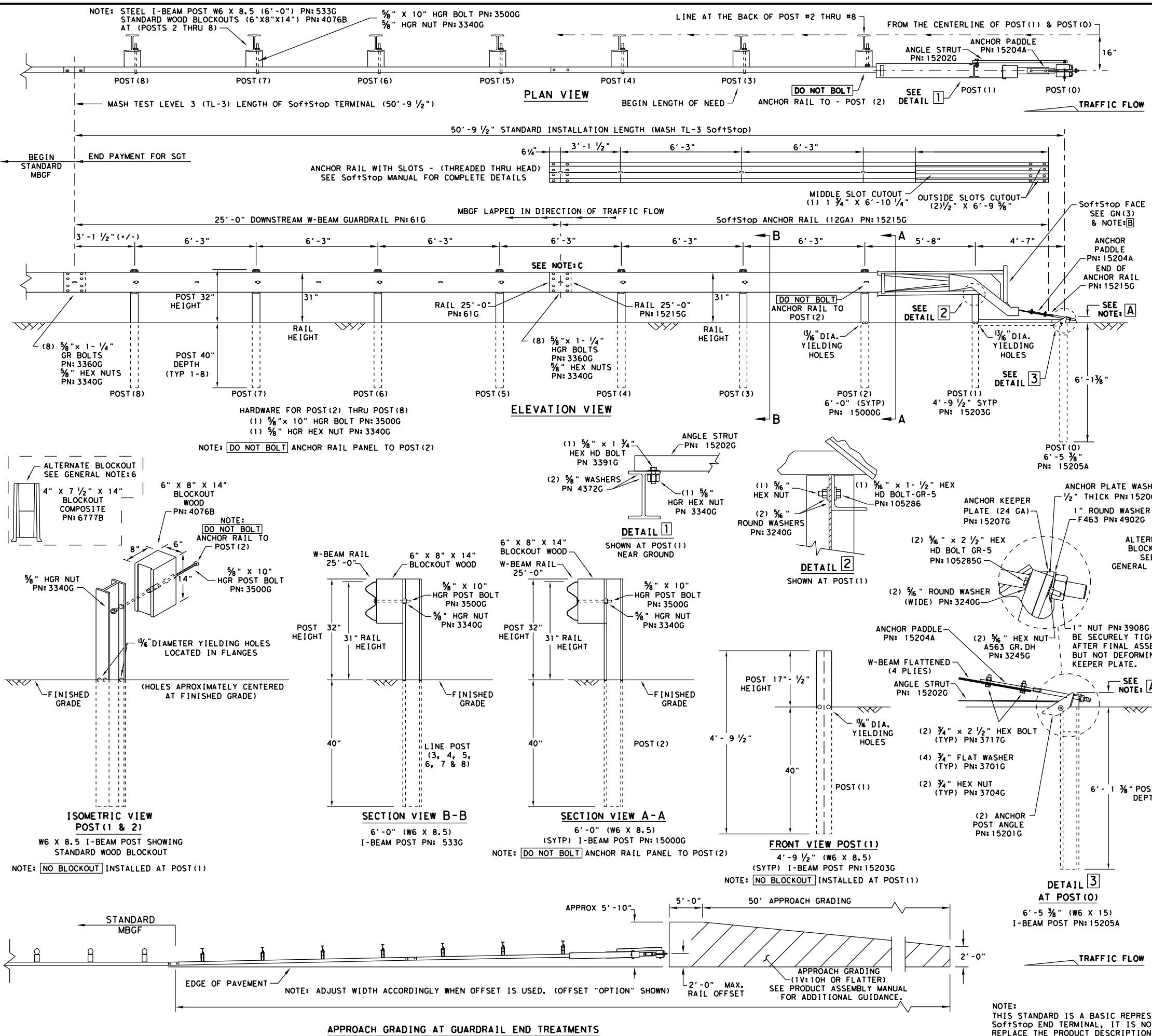
Design Division Standard

**METAL BEAM GUARD FENCE (MOW STRIP)**  
**TL-3 MASH COMPLIANT**  
**GF(31)MS-19**

FILE: gf31ms19.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
	DIST	COUNTY	SHEET NO.	
	14	HAYS	48	

DATE: 4/11/2023  
 FILE: K:\011573-000\Cad\Plan\STANDARDS\2 - ROADWAY\sgt10s3116.dgn

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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 PADDLER
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

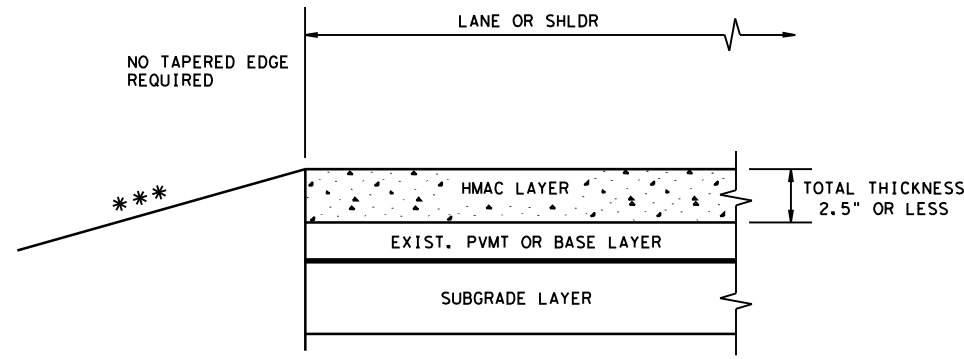
**TRINITY HIGHWAY  
 SOFTSTOP END TERMINAL  
 MASH - TL-3  
 SGT (10S) 31-16**

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
	DIST	COUNTY		SHEET NO.
	14	HAYS		49

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

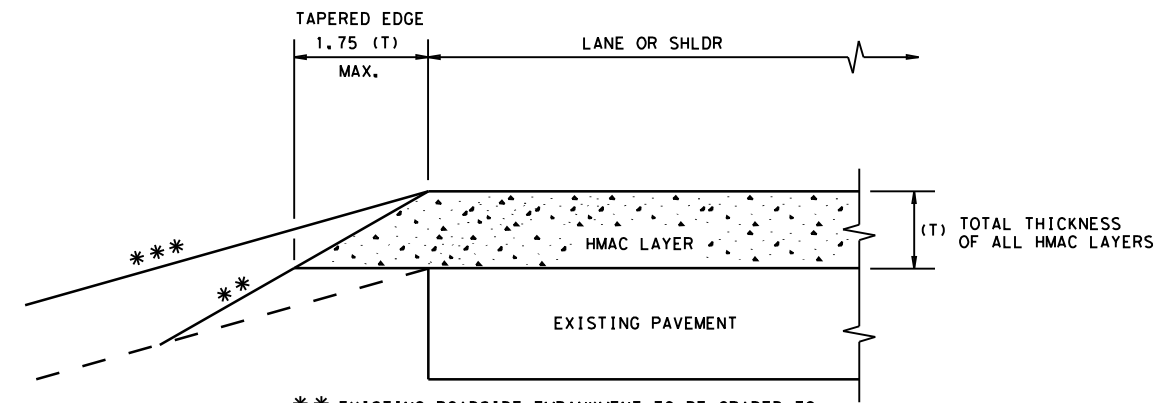
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 4/11/2023  
 FILE: K:\011573-000\Cad\Plan\STANDARDS\2 - ROADWAY\tehmoc11.dgn



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

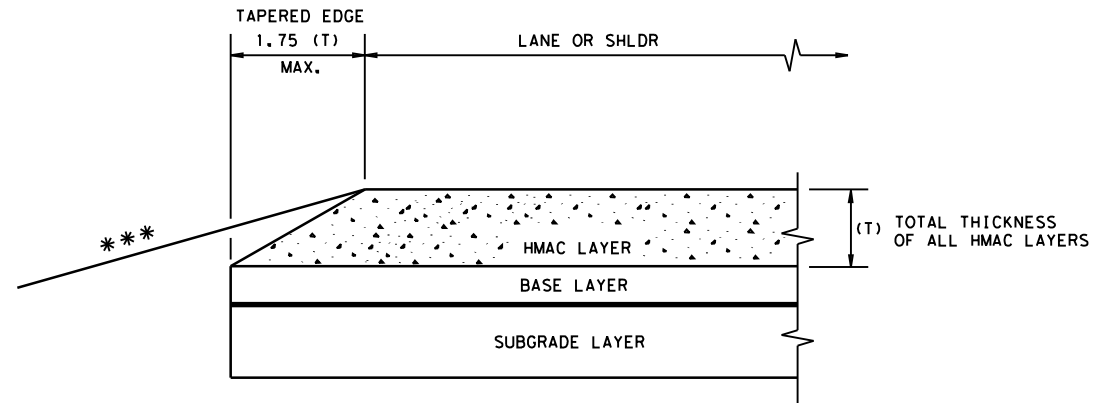
**CONDITION - 1**  
 THIN HMAC SURFACES OR HMAC OVERLAY  
 WITH THICKNESS OF 2.5" OR LESS



\*\* 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.

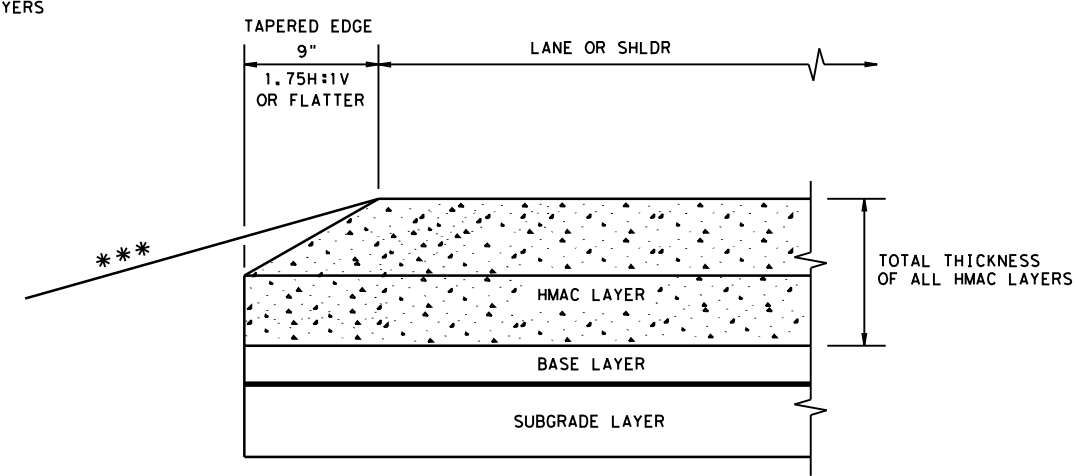
\*\*\* SEE TYPICAL SECTION FOR ROADSIDE DETAILS

**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

(NOT TO SCALE)

**GENERAL NOTES**

- 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".
- FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
- PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
- THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
- 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.
- STANDARD ONLY APPLIES TO RM 2243.

Texas Department of Transportation *Design Division Standard*

**TAPERED EDGE DETAILS  
 HMAC PAVEMENT**

**TE (HMAC) - 11**

FILE: tehmoc11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
	DIST	COUNTY	SHEET NO.	
	14	HAYS	50	

HYDROLOGIC - HYDRAULIC DESIGN  
 NOAA ATLAS 14, VOLUME 11  
 RATIONAL METHOD  
 IDF LOCATION -US 290 & CR 185 INT.

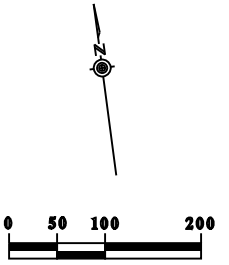
36" CULVERT  
 DESIGN EVENT - 25 YR  
 EXISTING CONDITIONS Q25 = 80.1 CFS  
 PROPOSED CONDITIONS Q25 = 80.5 CFS

25-YEAR EVENT HEADWATER ELEV.  
 EXISTING CONDITIONS = 1237.70  
 PROPOSED CONDITIONS = 1237.76

100-YEAR FLOW RATES  
 EXISTING CONDITIONS = 104.1 CFS  
 PROPOSED CONDITIONS = 104.5 CFS

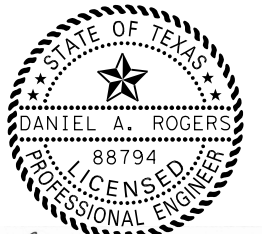
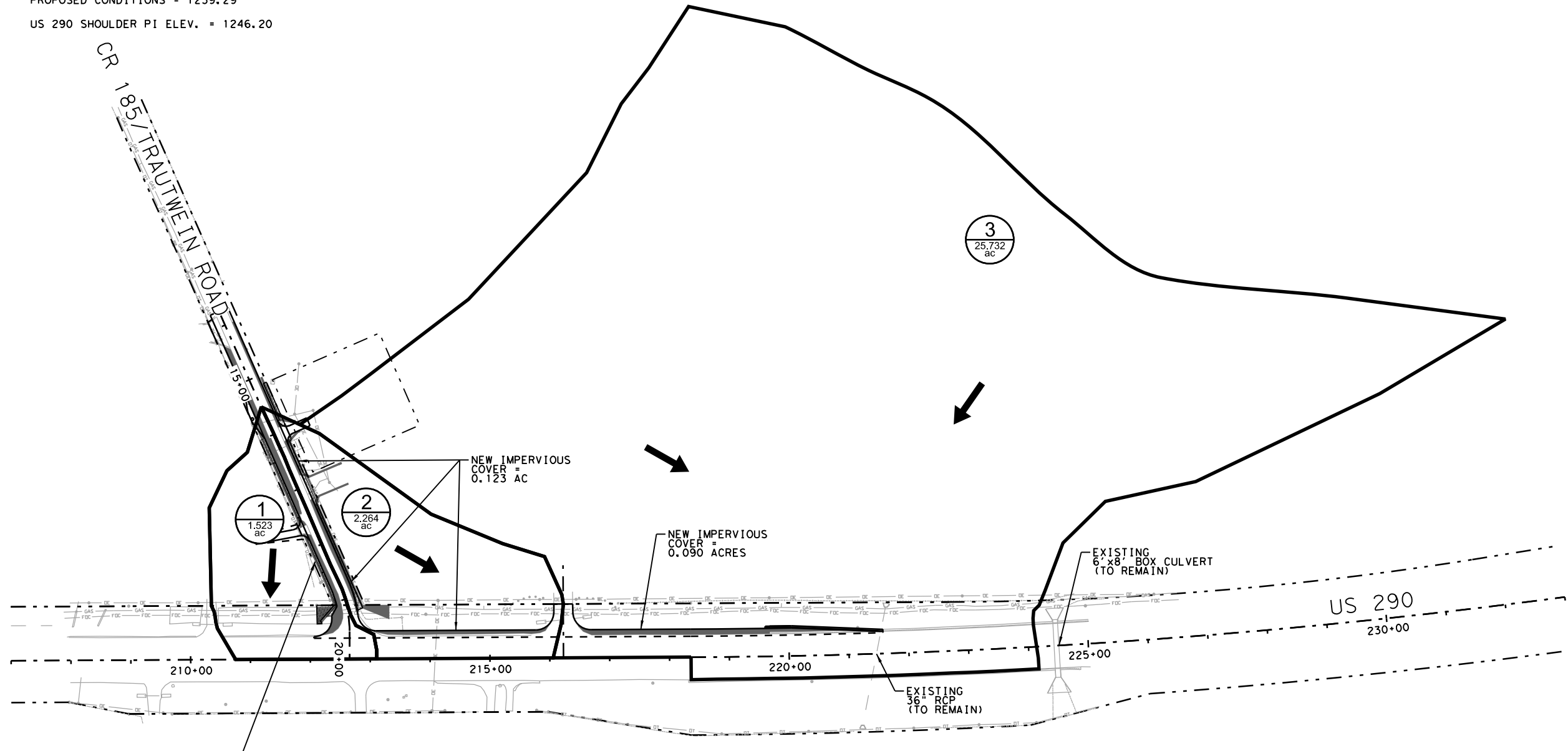
100-YEAR EVENT HEADWATER ELEV.  
 EXISTING CONDITIONS = 1239.28  
 PROPOSED CONDITIONS = 1239.29

US 290 SHOULDER PI ELEV. = 1246.20



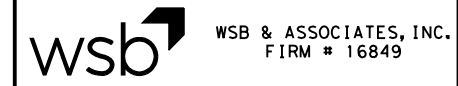
LEGEND

- CULVERT DRAINAGE AREA  
DRAINAGE AREA (ACRES)
- FLOW DIRECTION
- DRAINAGE AREA BOUNDARY



*Daniel A. Rogers*

4/11/2023

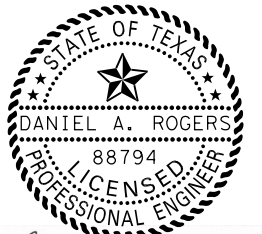
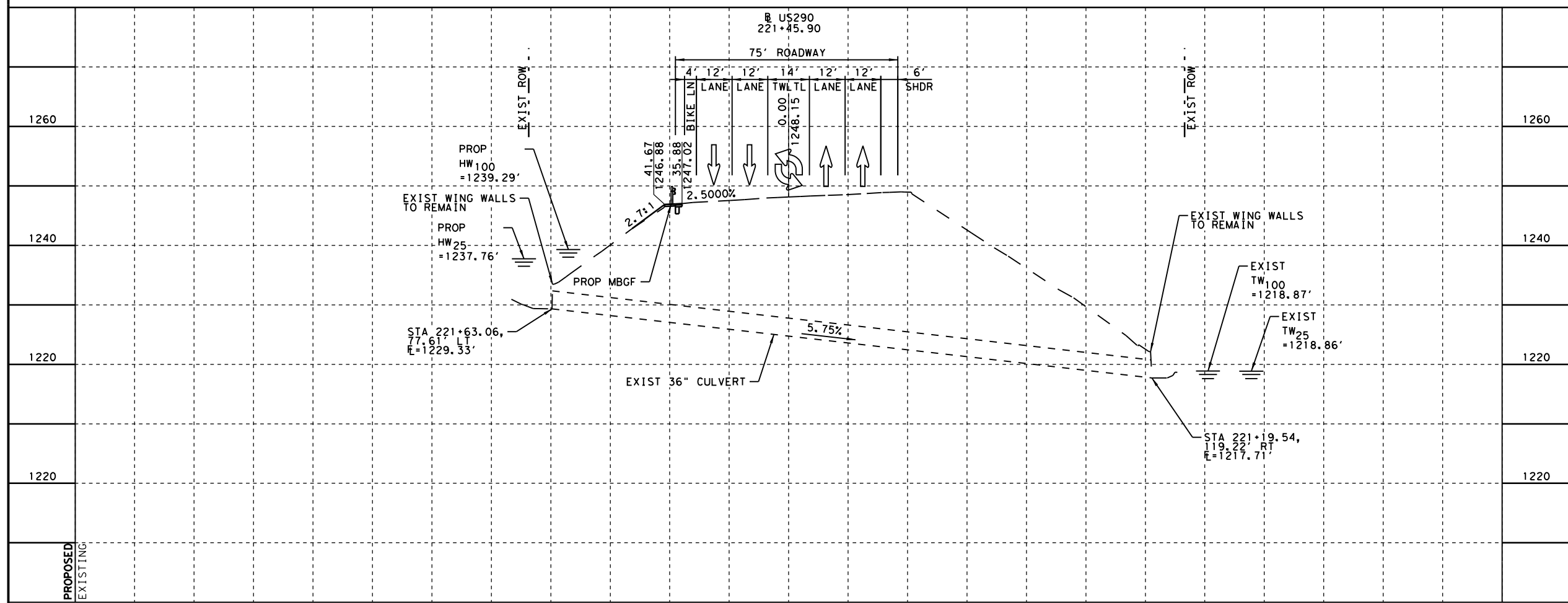
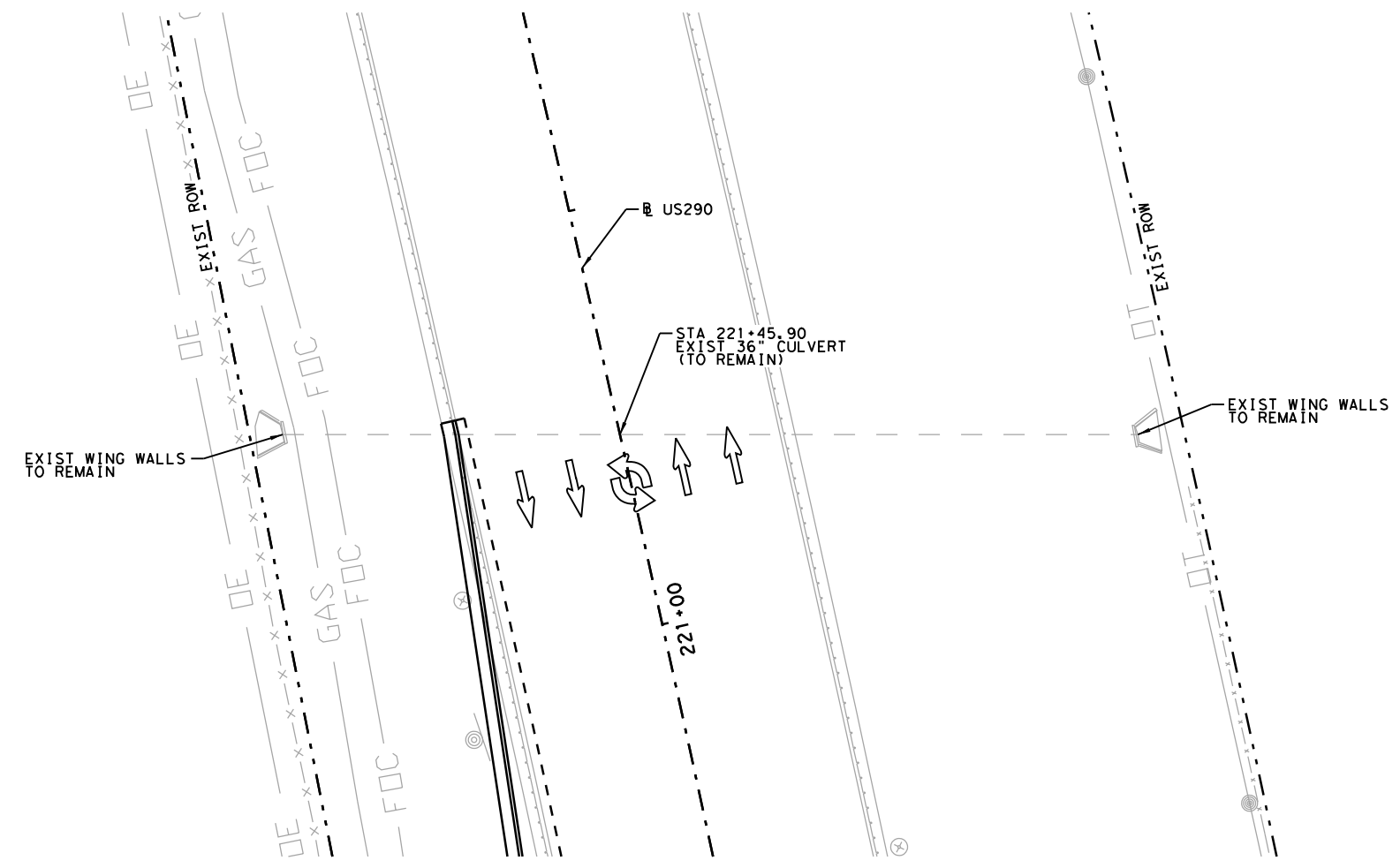
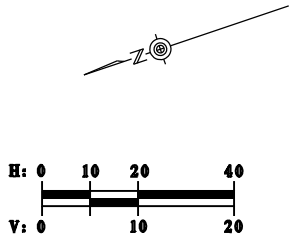


**US 290 AT  
 TRAUTWEIN ROAD  
 DRAINAGE AREA MAP**

NOTE:  
 NEW IMPERVIOUS AREA - PROJECT TOTAL - 0.320 ACRES

DATE: 4/11/2023		SHEET 1 OF 1		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07 072	US 290	51	

File name: ... \Cad\Plan\016874-000\da01\*.t.dgn  
 Date: 4/11/2023



*Daniel G. Lopez*

4/11/2023



**HAYS COUNTY**

**wsb** WSB & ASSOCIATES, INC.  
FIRM # 16849

**US 290 AT  
TRAUTWEIN ROAD  
CULVERT #1  
PLAN & PROFILE**

DATE: 4/11/2023		SHEET 1 OF 1	
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07 072	US 290	52

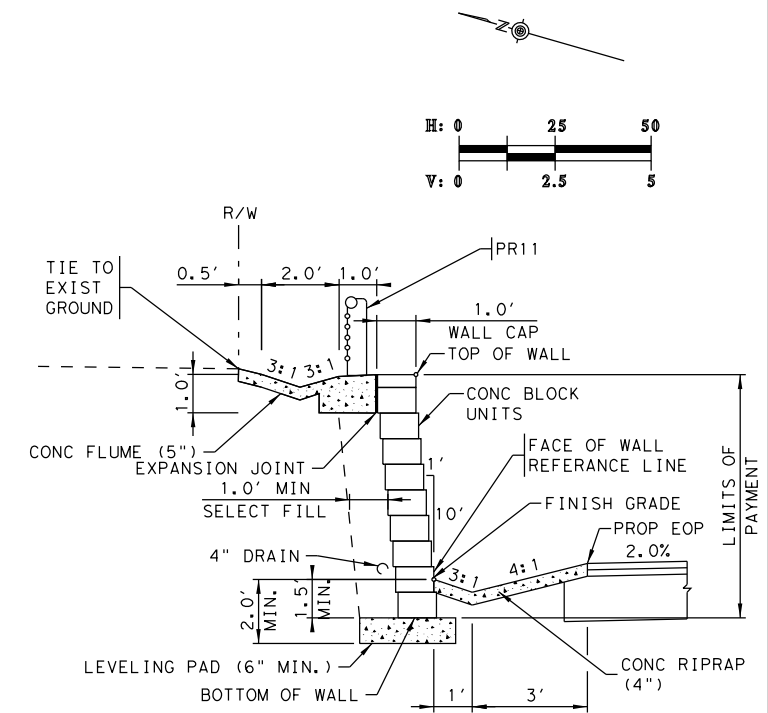
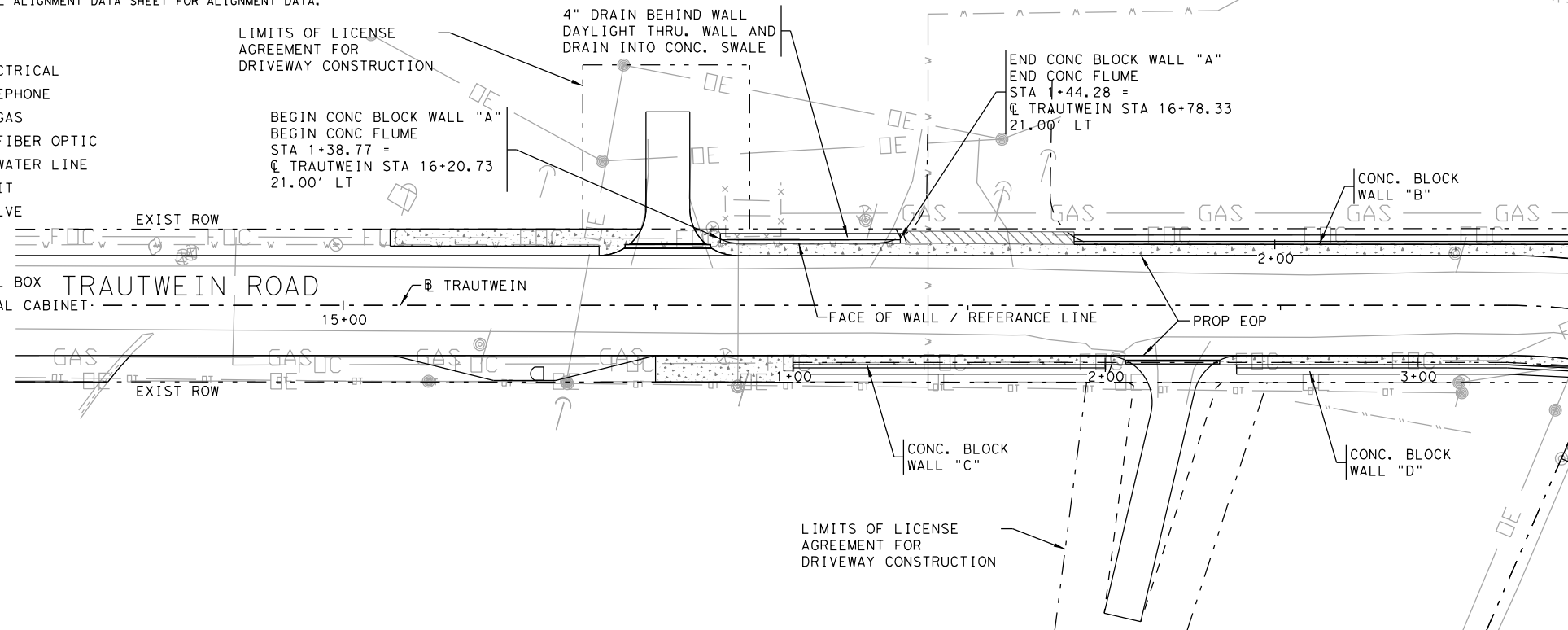
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Date: 4/11/2023



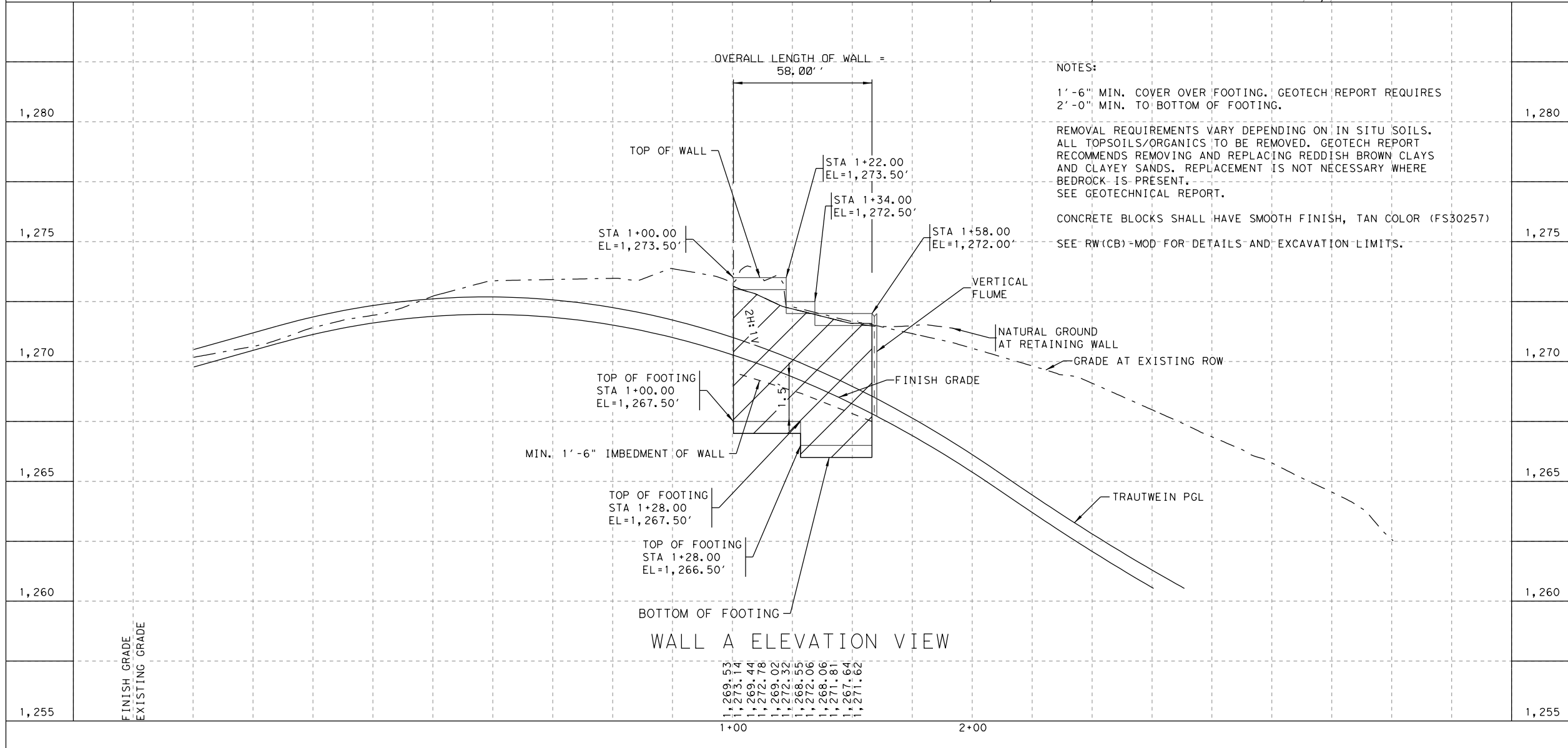
NOTE: REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR ALIGNMENT DATA.

LEGEND

- OE — OVERHEAD ELECTRICAL
- OT — OVERHEAD TELEPHONE
- GAS — UNDERGROUND GAS
- FOC — UNDERGROUND FIBER OPTIC
- W — UNDERGROUND WATER LINE
- BURIED CONDUIT
- ⊗ WATER/GAS VALVE
- ⊙ WATER METER
- ⊕ HYDRANT
- ⊞ ELECTRIC PULL BOX
- ⊠ TRAFFIC SIGNAL CABINET
- ⊡ GROUND BOX



CONC BLOCK RETAINING WALL TYPICAL SECTION  
NOT TO SCALE



NOTES:  
 1'-6" MIN. COVER OVER FOOTING. GEOTECH REPORT REQUIRES 2'-0" MIN. TO BOTTOM OF FOOTING.  
 REMOVAL REQUIREMENTS VARY DEPENDING ON IN SITU SOILS. ALL TOPSOILS/ORGANICS TO BE REMOVED. GEOTECH REPORT RECOMMENDS REMOVING AND REPLACING REDDISH BROWN CLAYS AND CLAYEY SANDS. REPLACEMENT IS NOT NECESSARY WHERE BEDROCK IS PRESENT. SEE GEOTECHNICAL REPORT.  
 CONCRETE BLOCKS SHALL HAVE SMOOTH FINISH, TAN COLOR (FS30257)  
 SEE RW(CB)-MOD FOR DETAILS AND EXCAVATION LIMITS.



Texas Department of Transportation  
 HAYS COUNTY

wsb WSB & ASSOCIATES, INC.  
 FIRM # 16849

US 290 AT  
 TRAUTWEIN ROAD  
 CONCRETE BLOCK  
 WALL "A"

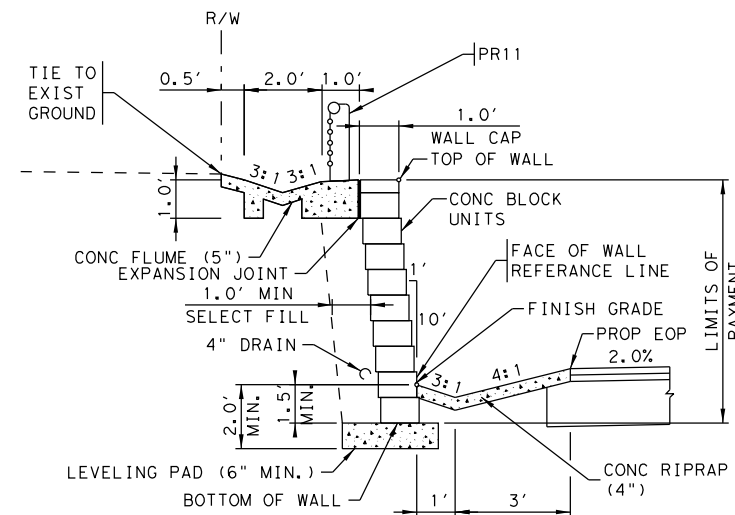
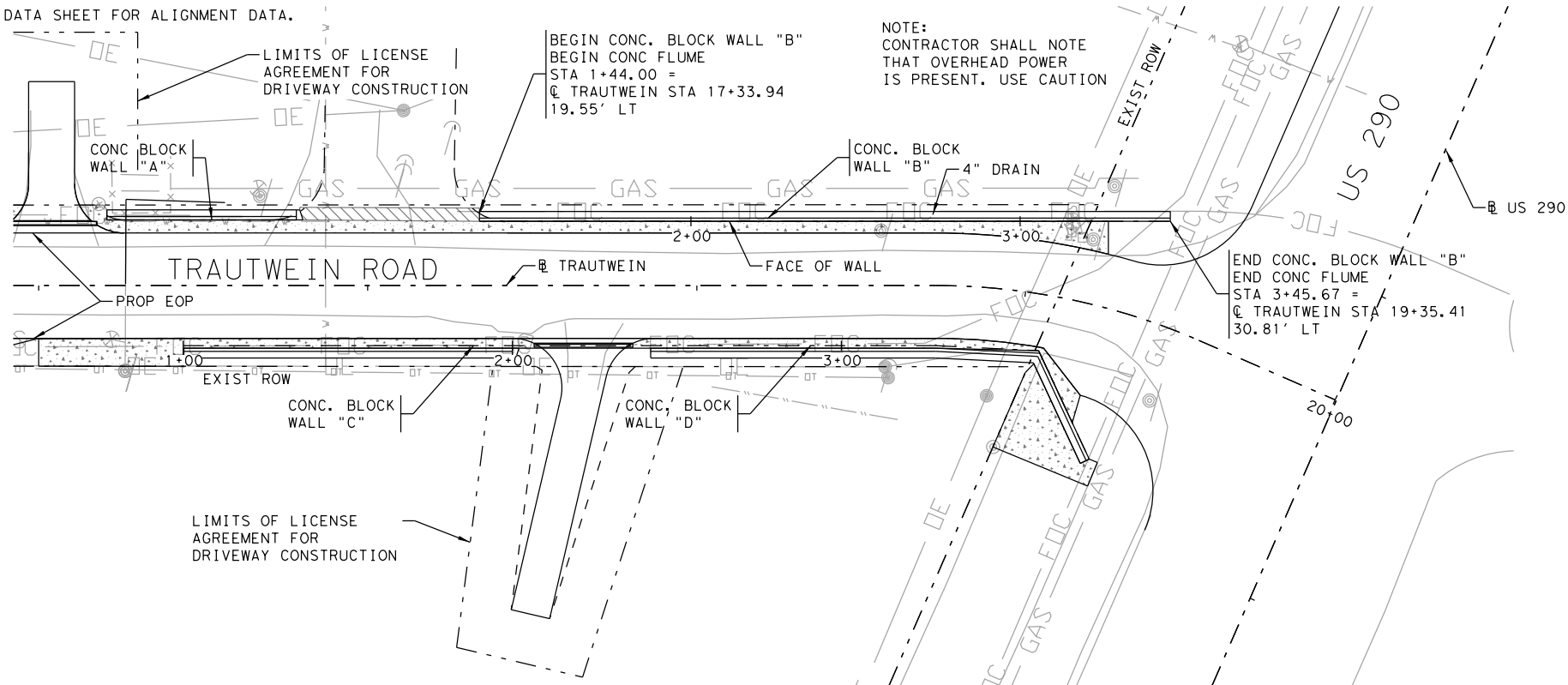
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STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07	072	US 290	53

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 Date: 4/13/2023

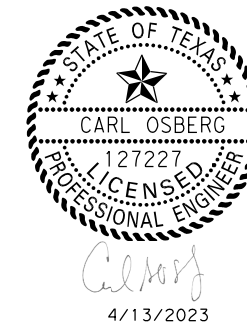
NOTE: REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR ALIGNMENT DATA.

LEGEND

- OE — OVERHEAD ELECTRICAL
- OT — OVERHEAD TELEPHONE
- GAS — UNDERGROUND GAS
- FOC — UNDERGROUND FIBER OPTIC
- W — UNDERGROUND WATER
- B — BURIED CONDUIT
- ⊗ — WATER/GAS VALVE
- ⊙ — WATER METER
- ⊕ — HYDRANT
- ⊞ — ELECTRIC PULL BOX
- ⊠ — TRAFFIC SIGNAL CABINET
- ⊡ — GROUND BOX



CONC BLOCK RETAINING WALL TYPICAL SECTION  
NOT TO SCALE



4/13/2023

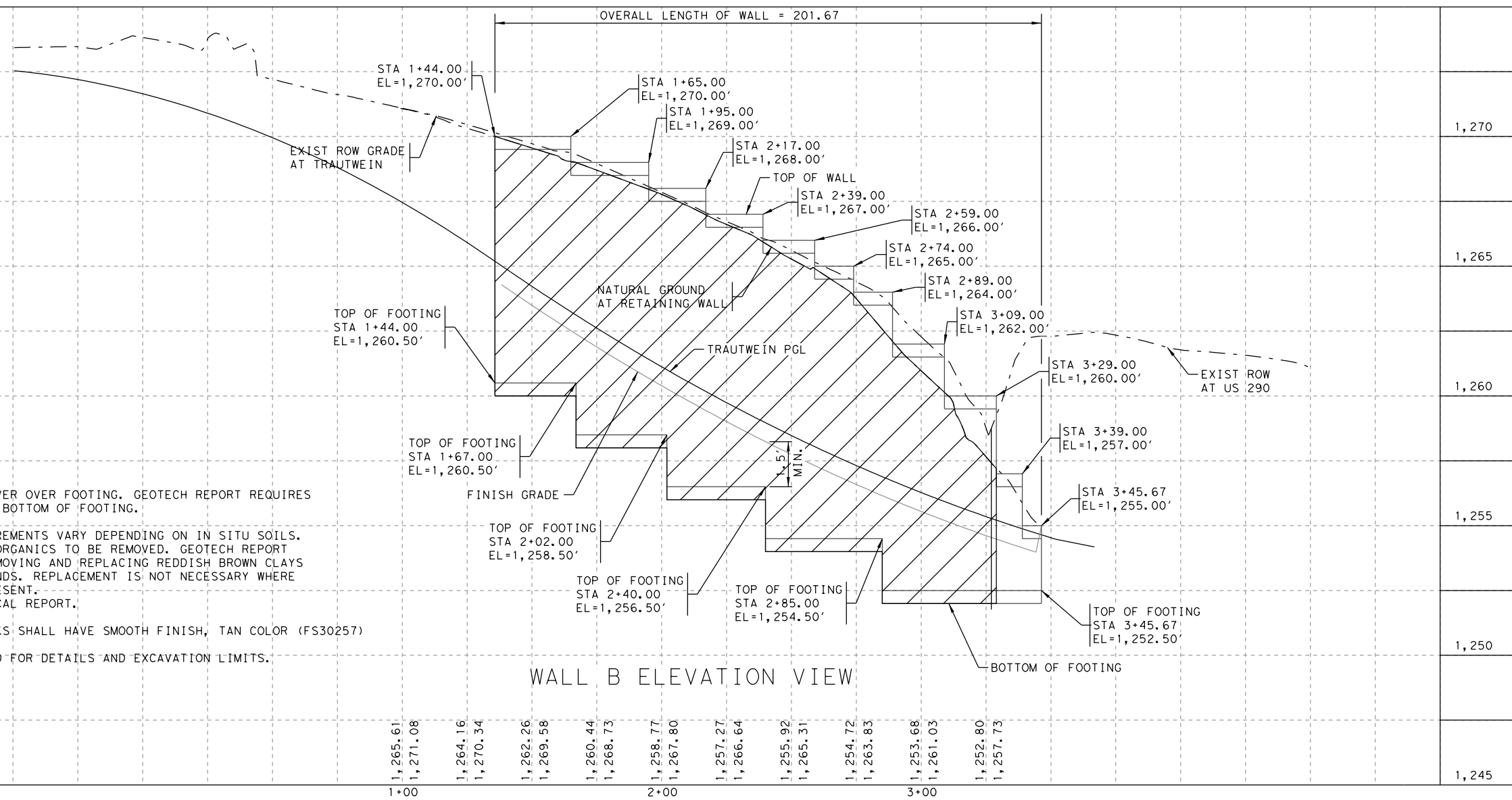


HAYS COUNTY

wsb WSB & ASSOCIATES, INC.  
FIRM # 16849

US 290 AT  
TRAUTWEIN ROAD  
CONCRETE BLOCK  
WALL "B"

DATE: 4/13/2023		SHEET 1 OF 1	
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07	072 US 290	54



WALL B ELEVATION VIEW

NOTES:  
1'-6" MIN. COVER OVER FOOTING. GEOTECH REPORT REQUIRES 2'-0" MIN. TO BOTTOM OF FOOTING.  
REMOVAL REQUIREMENTS VARY DEPENDING ON IN SITU SOILS. ALL TOPSOILS/ORGANICS TO BE REMOVED. GEOTECH REPORT RECOMMENDS REMOVING AND REPLACING REDDISH BROWN CLAYS AND CLAYEY SANDS. REPLACEMENT IS NOT NECESSARY WHERE BEDROCK IS PRESENT. SEE GEOTECHNICAL REPORT.  
CONCRETE BLOCKS SHALL HAVE SMOOTH FINISH, TAN COLOR (FS30257)  
SEE RW(CB)-MOD FOR DETAILS AND EXCAVATION LIMITS.

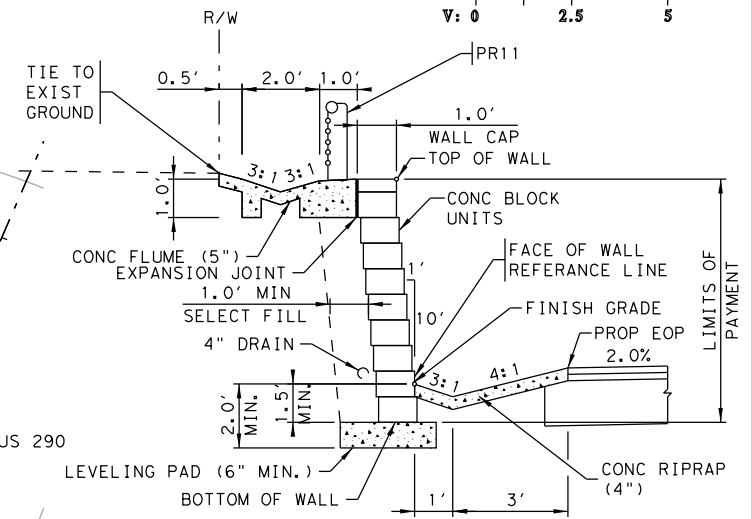
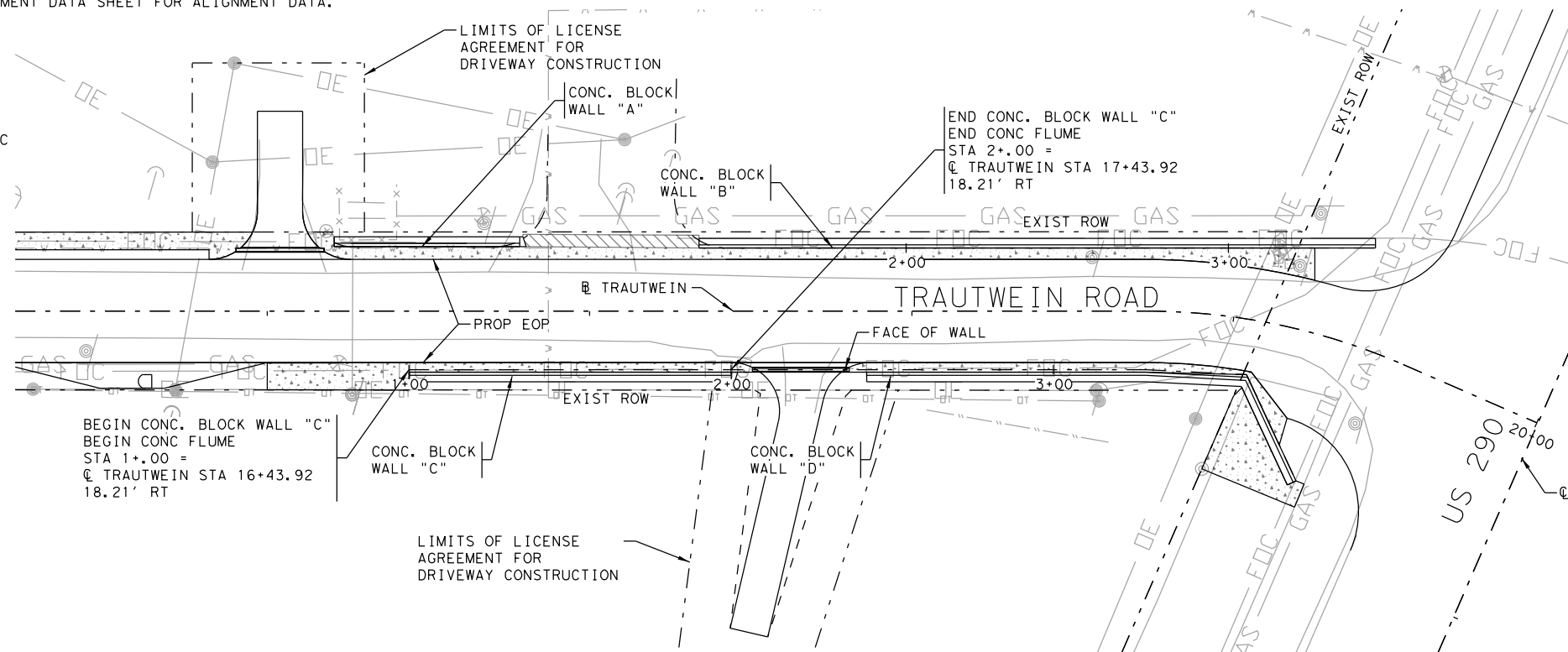
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Date: 4/13/2023

NOTE: REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR ALIGNMENT DATA.

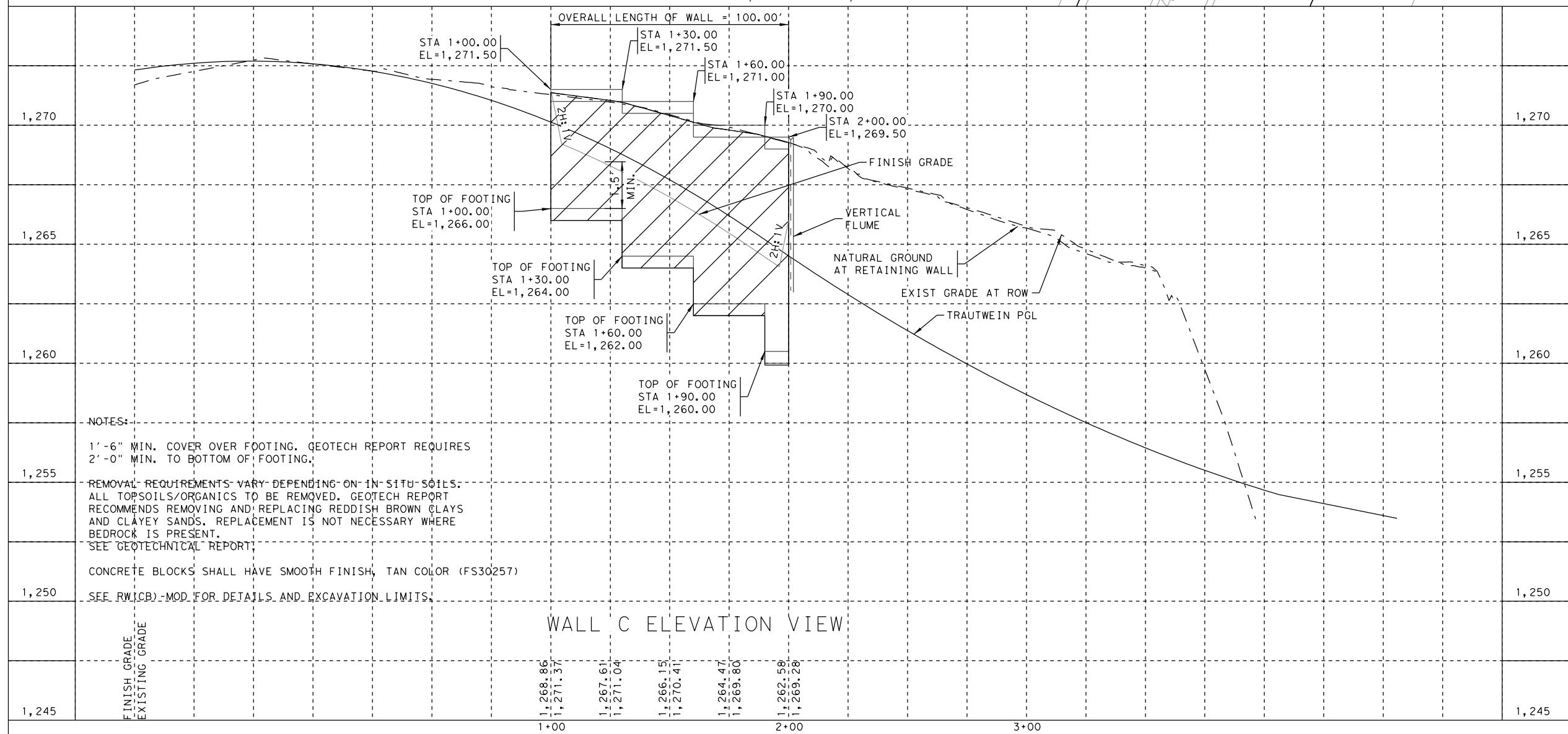
LEGEND

- OE — OVERHEAD ELECTRICAL
- OT — OVERHEAD TELEPHONE
- GAS — UNDERGROUND GAS
- FOC — UNDERGROUND FIBER OPTIC
- W — UNDERGROUND WATER LINE
- — BURIED CONDUIT
- ⊗ WATER/GAS VALVE
- ⊙ WATER METER
- ⊙ HYDRANT
- ⊙ ELECTRIC PULL BOX
- ⊙ TRAFFIC SIGNAL CABINET
- ⊙ GROUND BOX

NOTE:  
CONTRACTOR SHALL NOTE  
THAT OVERHEAD POWER  
IS PRESENT. USE CAUTION



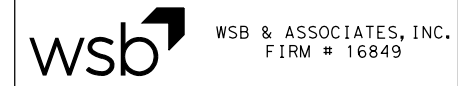
CONC BLOCK RETAINING WALL TYPICAL SECTION  
NOT TO SCALE



WALL C ELEVATION VIEW



4/13/2023



US 290 AT  
TRAUTWEIN ROAD  
CONCRETE BLOCK  
WALL "C"

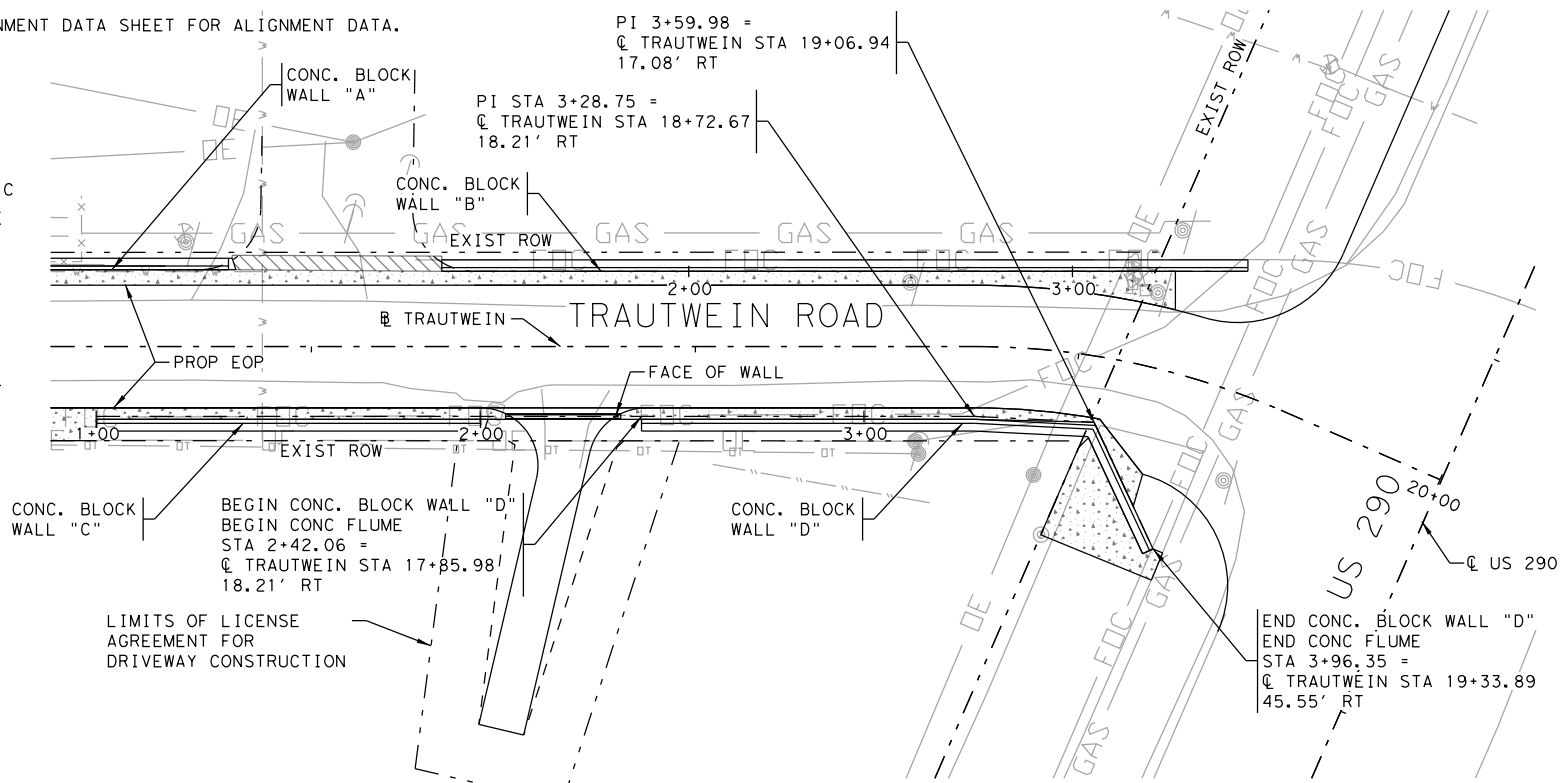
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STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07	072	US 290	55

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 Date: 4/13/2023

NOTE: REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR ALIGNMENT DATA.

LEGEND

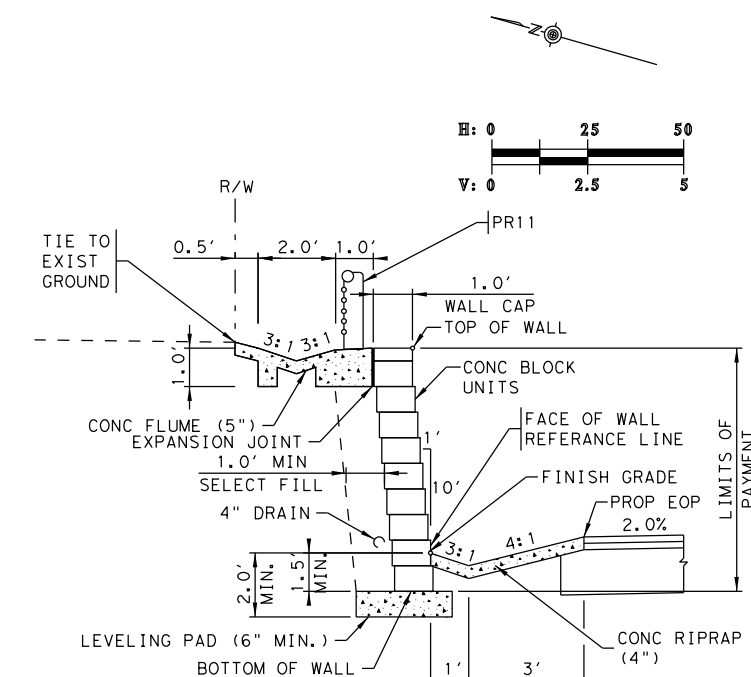
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- OT — OVERHEAD TELEPHONE
- GAS — UNDERGROUND GAS
- FOC — UNDERGROUND FIBER OPTIC
- W — UNDERGROUND WATER LINE
- — BURIED CONDUIT
- ⊕ — WATER/GAS VALVE
- ⊕ — WATER METER
- ⊕ — HYDRANT
- ⊕ — ELECTRIC PULL BOX
- ⊕ — TRAFFIC SIGNAL CABINET
- ⊕ — GROUND BOX



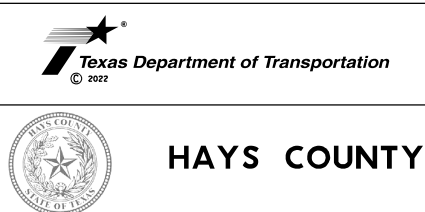
NOTE:  
CONTRACTOR SHALL NOTE  
THAT OVERHEAD POWER  
IS PRESENT. USE CAUTION

LIMITS OF LICENSE  
AGREEMENT FOR  
DRIVEWAY CONSTRUCTION

END CONC. BLOCK WALL "D"  
END CONC FLUME  
STA 3+96.35 =  
☉ TRAUTWEIN STA 19+33.89  
45.55' RT



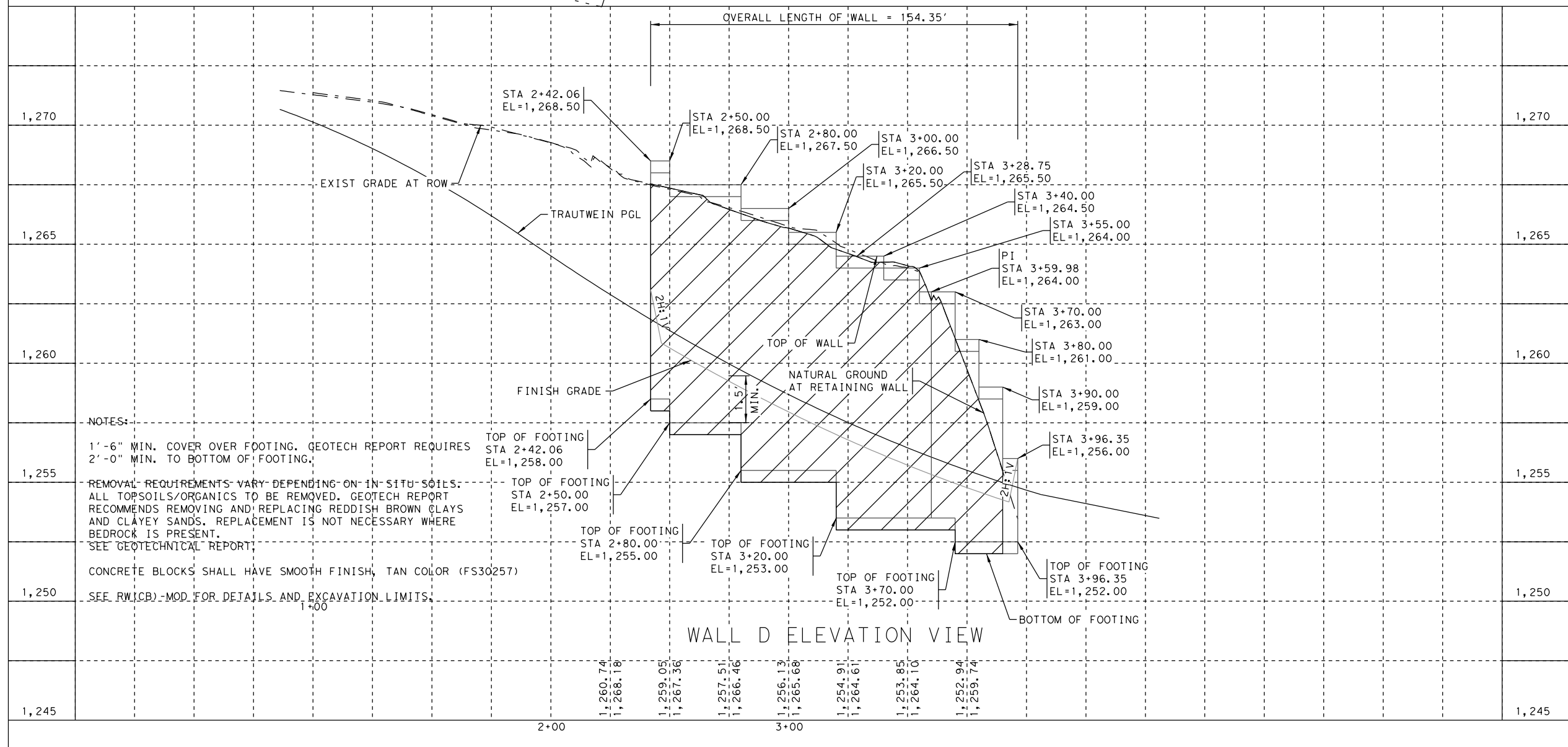
CONC BLOCK RETAINING  
WALL TYPICAL SECTION  
NOT TO SCALE

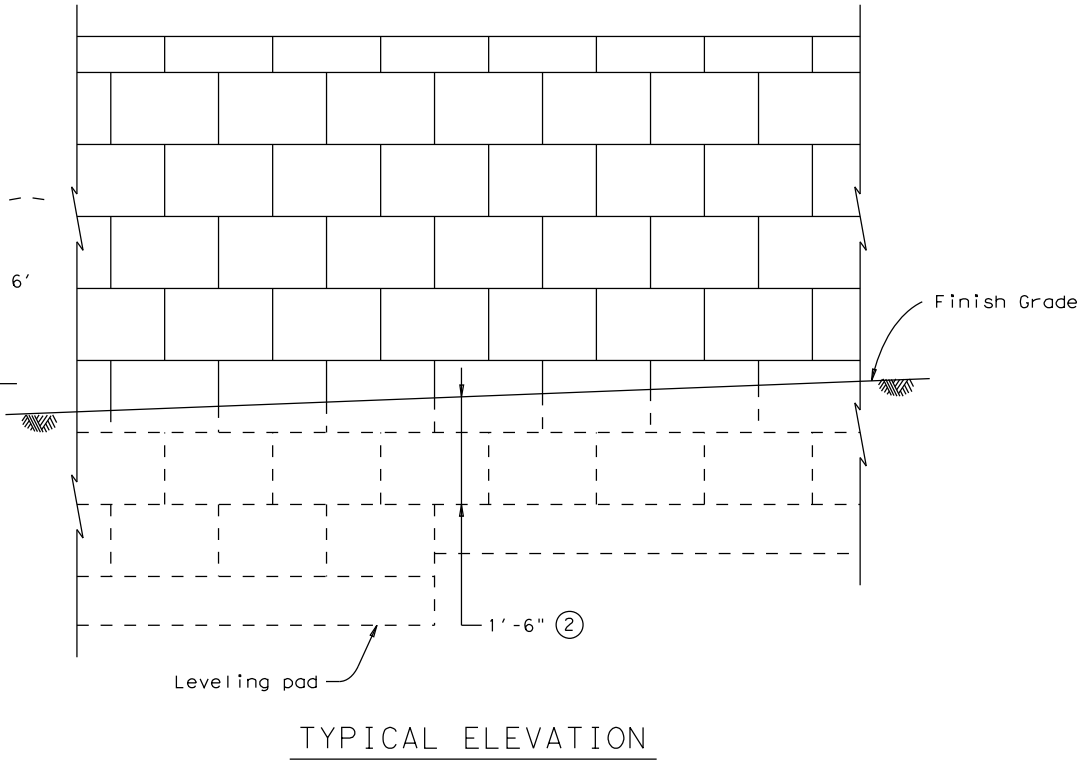
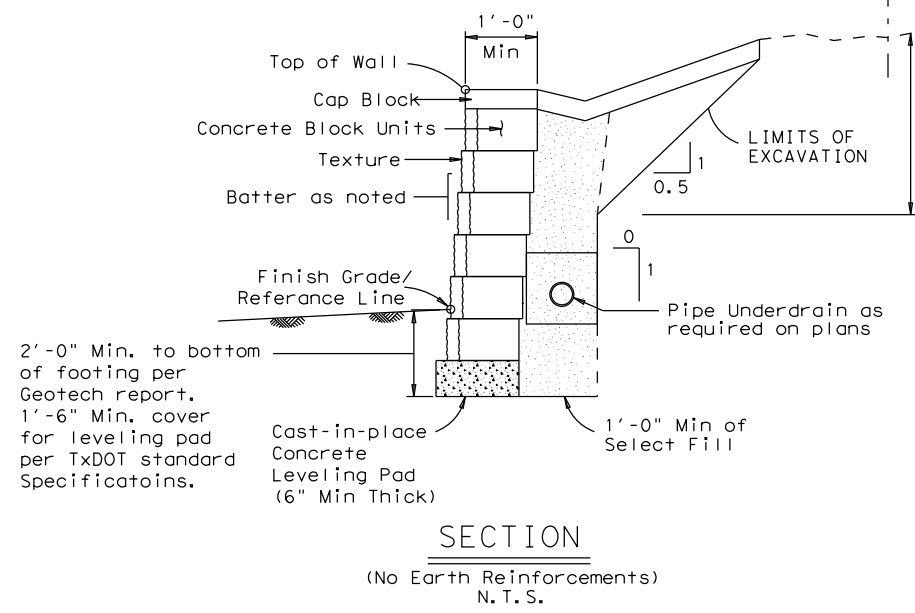


US 290 AT  
TRAUTWEIN ROAD  
CONCRETE BLOCK  
WALL "D"

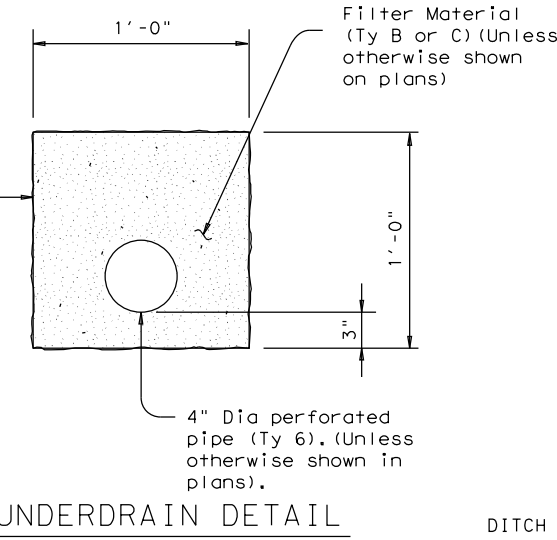
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STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07 072	US 290	56

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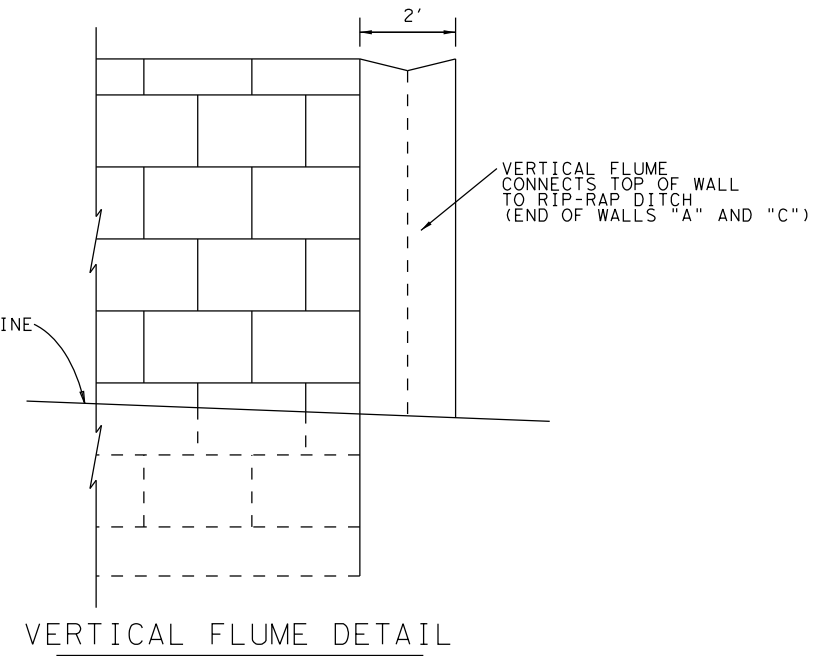




Note:  
Color and Texture to match Drilled Shaft Walls.



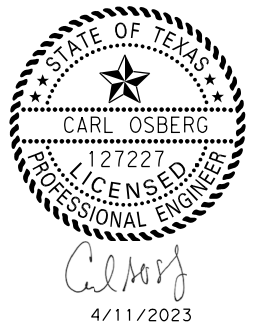
- ① For systems utilizing continuous structural pins passing thru a minimum of 3 block layers, the minimum block depth shall be 8". The maximum vertical spacing of primary reinforcement on these systems shall be 24", and intermediate reinforcement will not be required.
- ② Unless noted elsewhere in the plans, 1'-6" minimum cover shall be provided from the top of leveling pad to finish grade.
- ③ For walls which are designated as landscape walls and are less than 6' tall, the following modifications to the design criteria will be allowed:  
 Factor of safety in sliding > 1.2.  
 Factor of safety in overturning > 1.5.  
 Connection strength factor of safety of 1.0 at 3/4" strain.  
 Minimum earth reinforcement length of 4'.  
 The above modified criteria does not apply to walls over 6' tall regardless of designation.



**EARTH REINFORCEMENTS:**  
 Walls may be constructed without earth reinforcements if all stability criteria are met with the blocks alone. If all stability criteria are not satisfied, earth reinforcements shall be provided.  
 The long term design strength (LTDS) of earth reinforcement shall be calculated in accordance with current AASHTO Standard and Interim Specifications.  
 Soil-geogrid pullout coefficient values shall be determined in accordance with Geosynthetics Research Institute (GRI) Method GG-5, "Guidelines for Evaluating Geogrid Pullout".  
 For the combination of concrete block and geogrid chosen, connection strength data shall be provided. The allowable connection load shall be limited to the connection strength developed at 3/4" displacement, divided by a 1.5 safety factor. ③  
 For internal stability calculations, the failure plane will be assumed to originate at the back of the concrete blocks.  
 The factor of safety against pullout of the earth reinforcements shall be determined from test data evaluated at 3/4" strain.  
 The maximum vertical spacing of primary earth reinforcement layers shall be 40 inches. ①  
 The minimum length of primary earth reinforcements shall be 8 feet, measured from the front of the blocks. ③  
 A layer of intermediate reinforcement shall be provided between primary reinforcements when the spacing between primary layers exceeds twice the horizontal depth of the concrete block unit. Intermediate reinforcement shall have a minimum length of 4 feet, and shall provide local stability for the concrete block units. ①

**STABILITY CRITERIA:**  
 Factor of safety in sliding along the base of the structure shall be greater than or equal to 1.5. ③  
 Factor of safety in overturning shall be greater than or equal to 2.0. ③  
 The base pressure resultant shall fall within the middle third of the retaining wall.

**DESIGN PARAMETERS:**  
 Structure shall be based on the following design parameters:  
 Random Backfill: Unit weight = 120 pcf.  
 (Embankment or Existing Soils) / = 30° c = 0 psf  
 Select Backfill: Unit weight = 120 pcf  
 / = 34° c = 0 psf



Texas Department of Transportation  
 HAYS COUNTY  
 wsb WSB & ASSOCIATES, INC. FIRM # 16849

US 290 AT TRAUTWEIN ROAD  
 CONCRETE BLOCK RETAINING WALL  
 RW(CB) - MOD

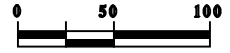
DATE: 4/11/2023		SHEET 1 OF 1	
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07	072	US 290 57

**GENERAL NOTES:**  
 Sections and Typical Elevation shown are for informational purposes only. Specific geometry is to be determined based on wall layouts and other plan information.  
 Unless otherwise shown in the plans, wall batter shall be a maximum of 3" per foot. Blocks shall be placed horizontally, and a positive means of obtaining batter such as pins, keyways, or concrete lips shall be provided.  
 Concrete Blocks shall have Smooth Finish, Tan Color (FS 30257). Contractor shall submit color/texture samples to the Owner and Engineer for approval.

Filename: ... \Plan\016874-000\*ret07\*1.dgn  
 Date: 4/11/2023

SUMMARY OF SIGNING AND PAVEMENT MARKINGS

ITEM 666 REFLECTIVE PAVEMENT MARKINGS TY I & II										ITEM 672 RAISED PAVEMENT MARKERS		
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(L)	(M)	(J)	(K)
6" WHITE SLD	8" WHITE SLD	24" WHITE SLD	8" WHITE DOT	6" WHITE BRK	6" YELLOW SLD	6" YELLOW BRK	ARROW WHITE	WORD WHITE	BIKE ARROW WHITE	BIKE SYMBOL WHITE	CL B REFL TY I-C	CL B REFL TY II-A-A
LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA
1863	839	68	76	199	892	102	4	4	2	2	62	12

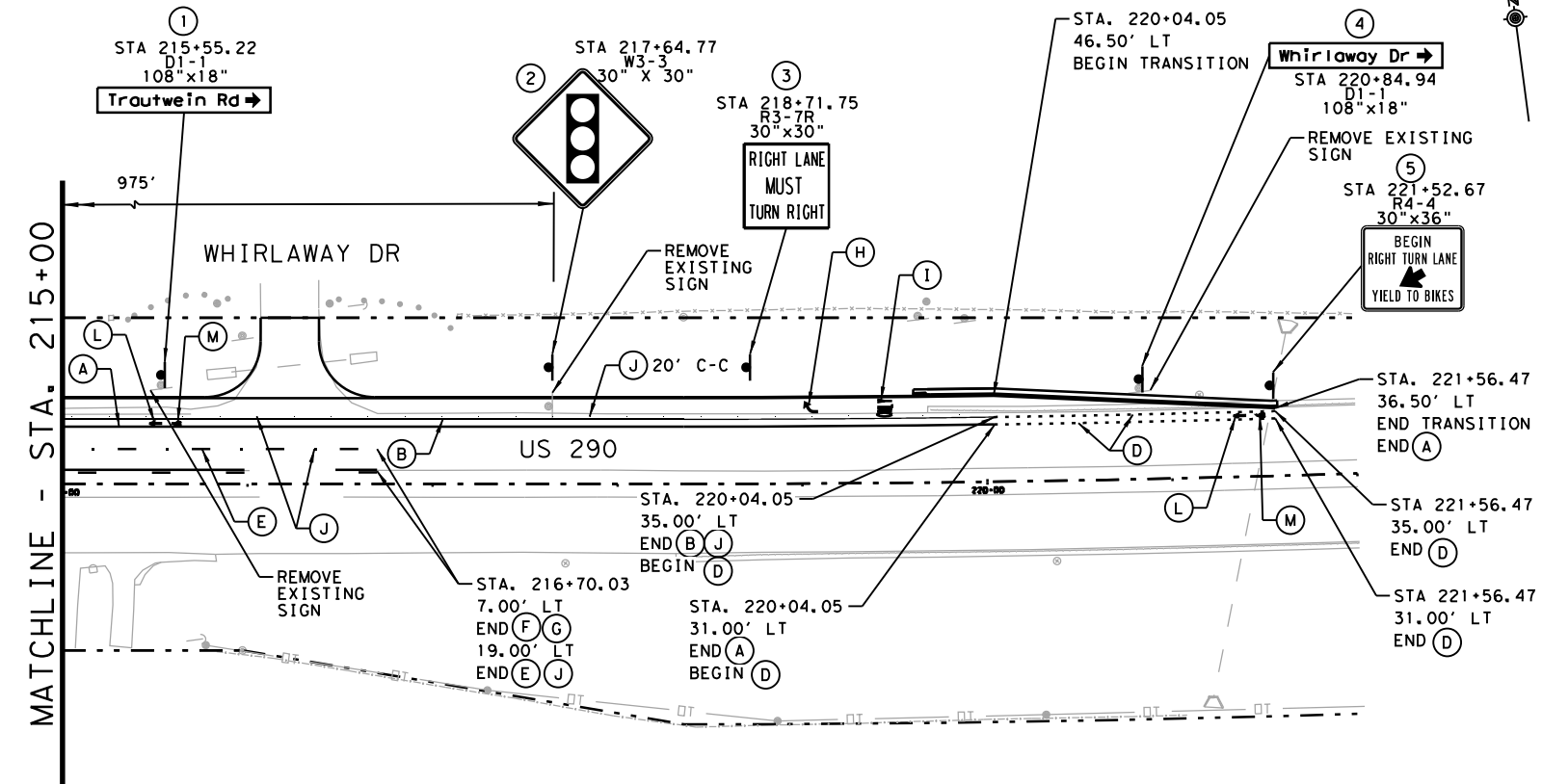
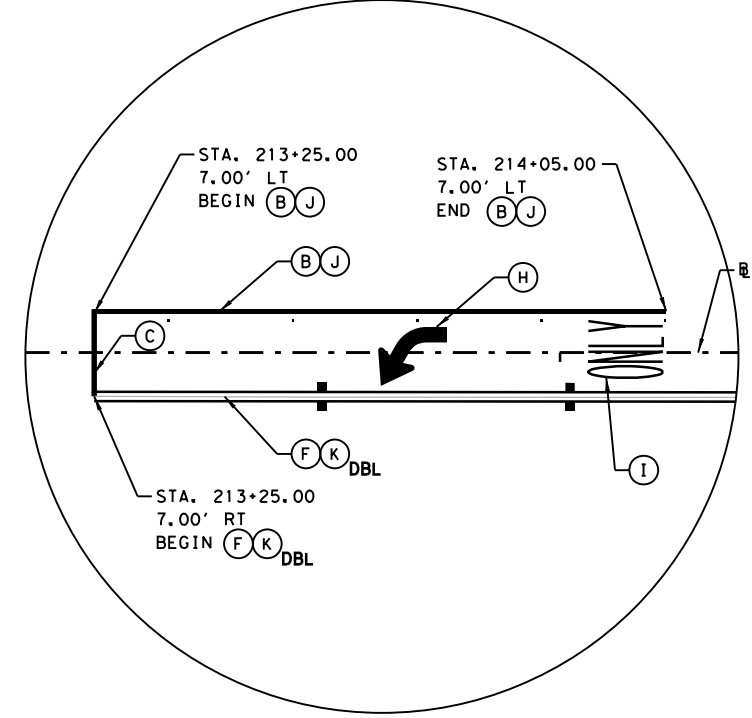
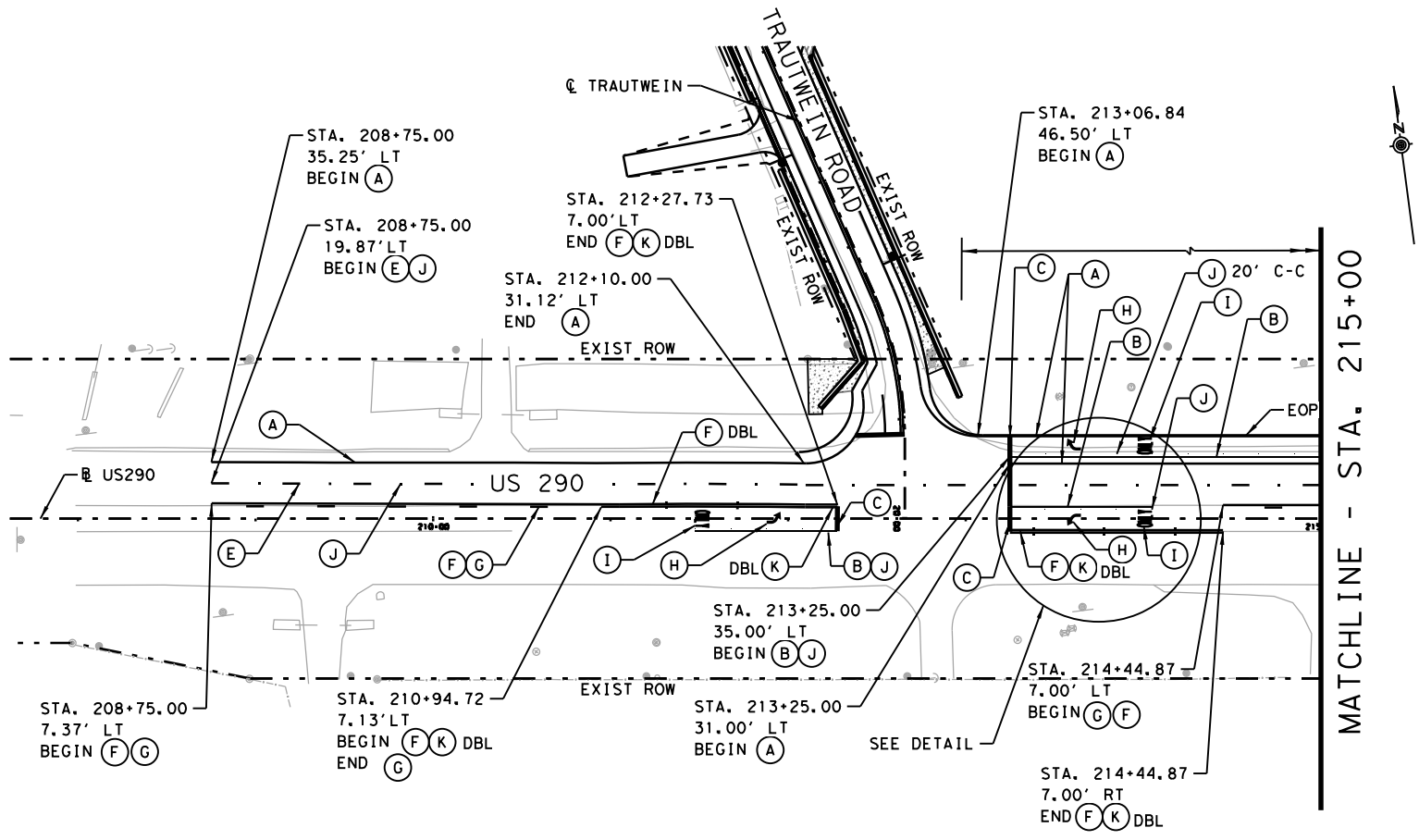


SIGNING, STRIPING, AND DELINEATION LEGEND	
	PROPOSED SIGN ASSEMBLY
	EXISTING SIGN ASSEMBLY
	DELINEATOR ASSEMBLY
	OBJECT MARKER ASSEMBLY

NOTE: SYMBOLS NOT TO SCALE

LEGEND

- (A) REFL PAV MRK TY I (W) 6" (SLD)
- (B) REFL PAV MRK TY I (W) 8" (SLD)
- (C) REFL PAV MRK TY I (W) 24" (SLD)
- (D) REFL PAV MRK TY I (W) 8" (DOT)
- (E) REFL PAV MRK TY I (W) 6" (BRK)
- (F) REFL PAV MRK TY I (Y) 6" (SLD)
- (G) REFL PAV MRK TY I (Y) 6" (BRK)
- (H) REFL PAV MRK TY I (W) (ARROW)
- (I) REFL PAV MRK TY I (W) (WORD)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-A-A
- (L) REFL PAV MRK TY I (W) (BIKE ARROW)
- (M) REFL PAV MRK TY I (W) (BIKE SYML)



*Daniel G. Rogers*

4/11/2023



HAYS COUNTY

**wsb** WSB & ASSOCIATES, INC.  
FIRM # 16849

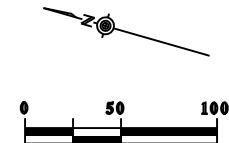
**US 290 AT  
TRAUTWEIN ROAD  
SIGNING & PAVEMENT  
MARKING PLAN**

NOTES:

1. THE LOCATION AND ORIENTATION OF PROPOSED SIGNS, PAVEMENT MARKINGS, DELINEATORS, AND OBJECT MARKERS SHALL BE IN ACCORDANCE WITH THE STANDARD DETAILS INCLUDED IN THESE PLANS AND THE TEXAS MUTCD.

DATE: 4/11/2023		SHEET 1 OF 2	
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07	072	US 290 58

File name: \\... \Cad\Plan\016874-000\*ss01\*1.dgn  
 Date: 4/11/2023



**LEGEND**

- (A) REFL PAV MRK TY I (W) 6" (SLD)
- (B) REFL PAV MRK TY I (W) 8" (SLD)
- (C) REFL PAV MRK TY I (W) 24" (SLD)
- (D) REFL PAV MRK TY I (W) 8" (DOT)
- (E) REFL PAV MRK TY I (W) 6" (BRK)
- (F) REFL PAV MRK TY I (Y) 6" (SLD)
- (G) REFL PAV MRK TY I (Y) 6" (BRK)
- (H) REFL PAV MRK TY I (W) (ARROW)
- (I) REFL PAV MRK TY I (W) (WORD)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-A-A
- (L) REFL PAV MRK TY I (W) (BIKE ARROW)
- (M) REFL PAV MRK TY I (W) (BIKE SYML)

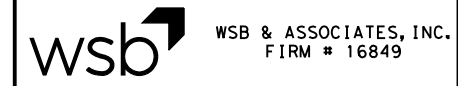


*Daniel G. Rogers*

4/11/2023

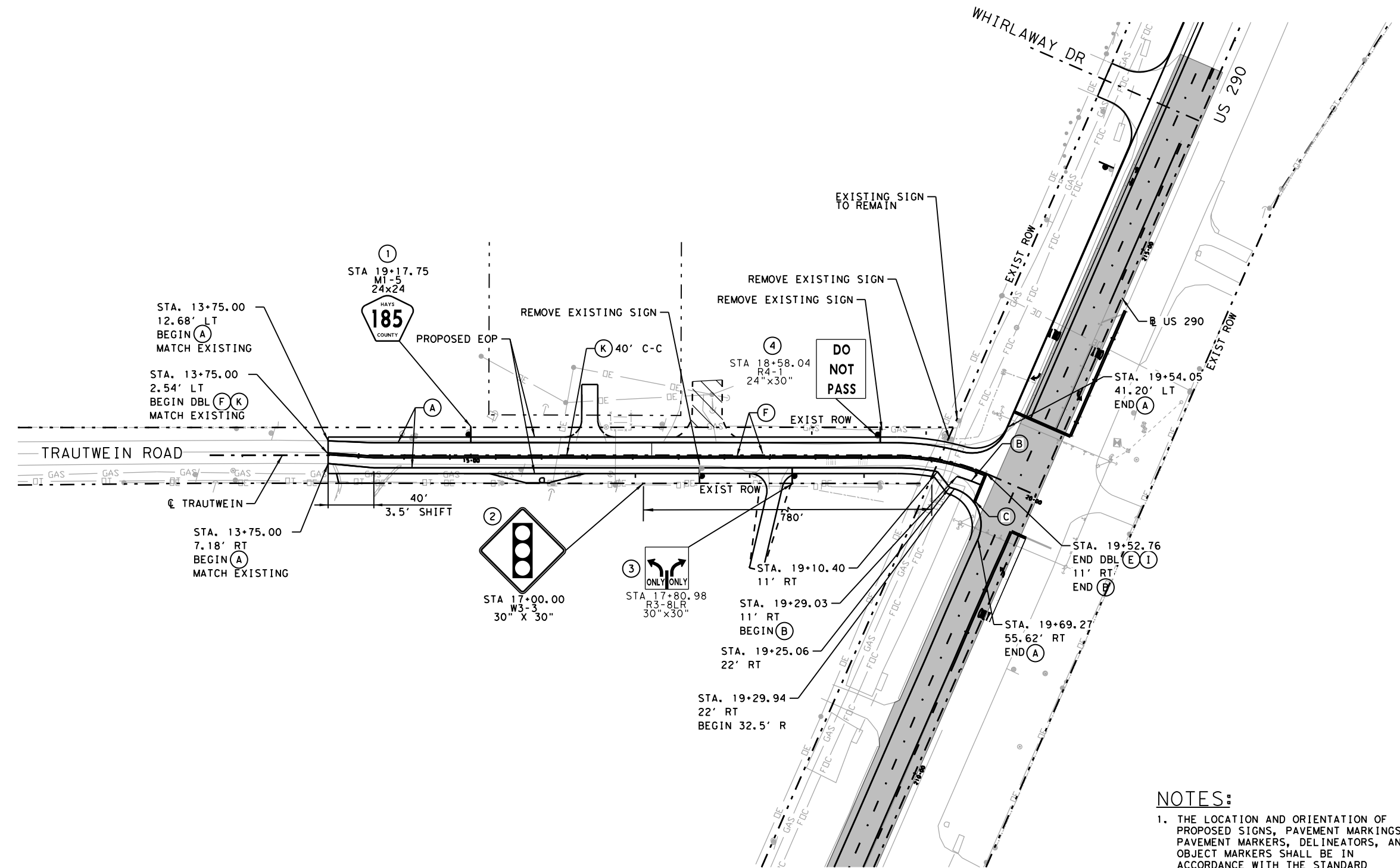


**HAYS COUNTY**



**US 290 AT  
TRAUTWEIN ROAD  
SIGNING & PAVEMENT  
MARKING PLAN**

DATE: 4/11/2023		SHEET 2 OF 2	
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07 072	US 290	59



**NOTES:**

1. THE LOCATION AND ORIENTATION OF PROPOSED SIGNS, PAVEMENT MARKINGS, PAVEMENT MARKERS, DELINEATORS, AND OBJECT MARKERS SHALL BE IN ACCORDANCE WITH THE STANDARD DETAILS INCLUDED IN THESE PLANS AND THE TEXAS MUTCD.

**SUMMARY OF SIGNING AND PAVEMENT MARKINGS**

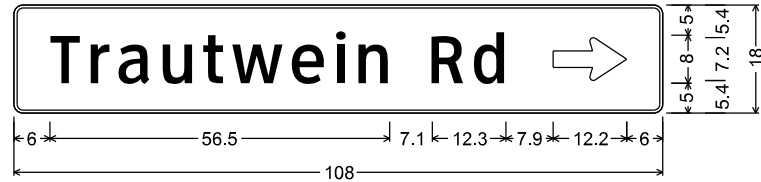
ITEM 666												ITEM 672	
REFLECTIVE PAVEMENT MARKINGS TY I & II												RAISED PAVEMENT MARKERS	
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(L)	(M)	(J)	(K)	
6" WHITE SLD	8" WHITE SLD	24" WHITE SLD	8" WHITE DOT	6" WHITE BRK	6" YELLOW SLD	6" YELLOW BRK	ARROW WHITE	WORD WHITE	BIKE ARROW WHITE	BIKE SYMBOL WHITE	CL B REFL TY I-C	CL B REFL TY II-A-A	
LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	
1208	23	28	0	0	1154	0	0	0	0	0	0	28	

SIGNING, STRIPING, AND DELINEATION LEGEND			
	PROPOSED SIGN ASSEMBLY		DELINEATOR ASSEMBLY
	EXISTING SIGN ASSEMBLY		OBJECT MARKER ASSEMBLY

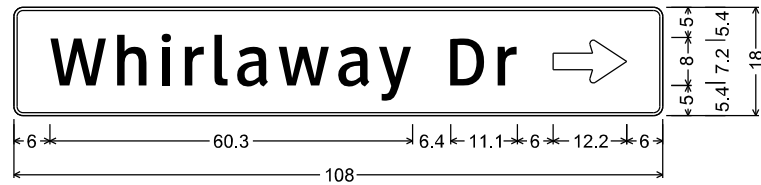
NOTE: SYMBOLS NOT TO SCALE

File name: \\... \Cad\Plan\016874-000\*ss02\*.t.dgn  
 Date: 4/11/2023





Identifier : D1-1R\_108x18;  
 1.5" Radius, 0.5" Border, White on Green;  
 [Trautwein Rd] ClearviewHwy-3-W;  
 Standard Arrow Custom 12.3" X 7.1" 0°;



Identifier : D1-1R\_108x18;  
 1.5" Radius, 0.5" Border, White on Green;  
 [Whirlaway Dr] ClearviewHwy-3-W;  
 Standard Arrow Custom 12.3" X 7.1" 0°;



*Daniel A. Rogers*

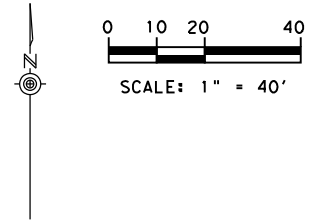
4/11/2023














**US 290 AT  
 TRAUTWEIN ROAD  
 SMALL SIGN  
 DETAILS**

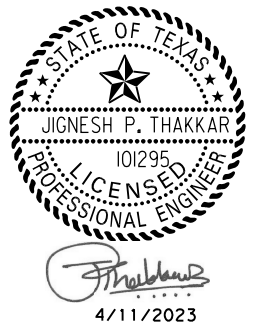
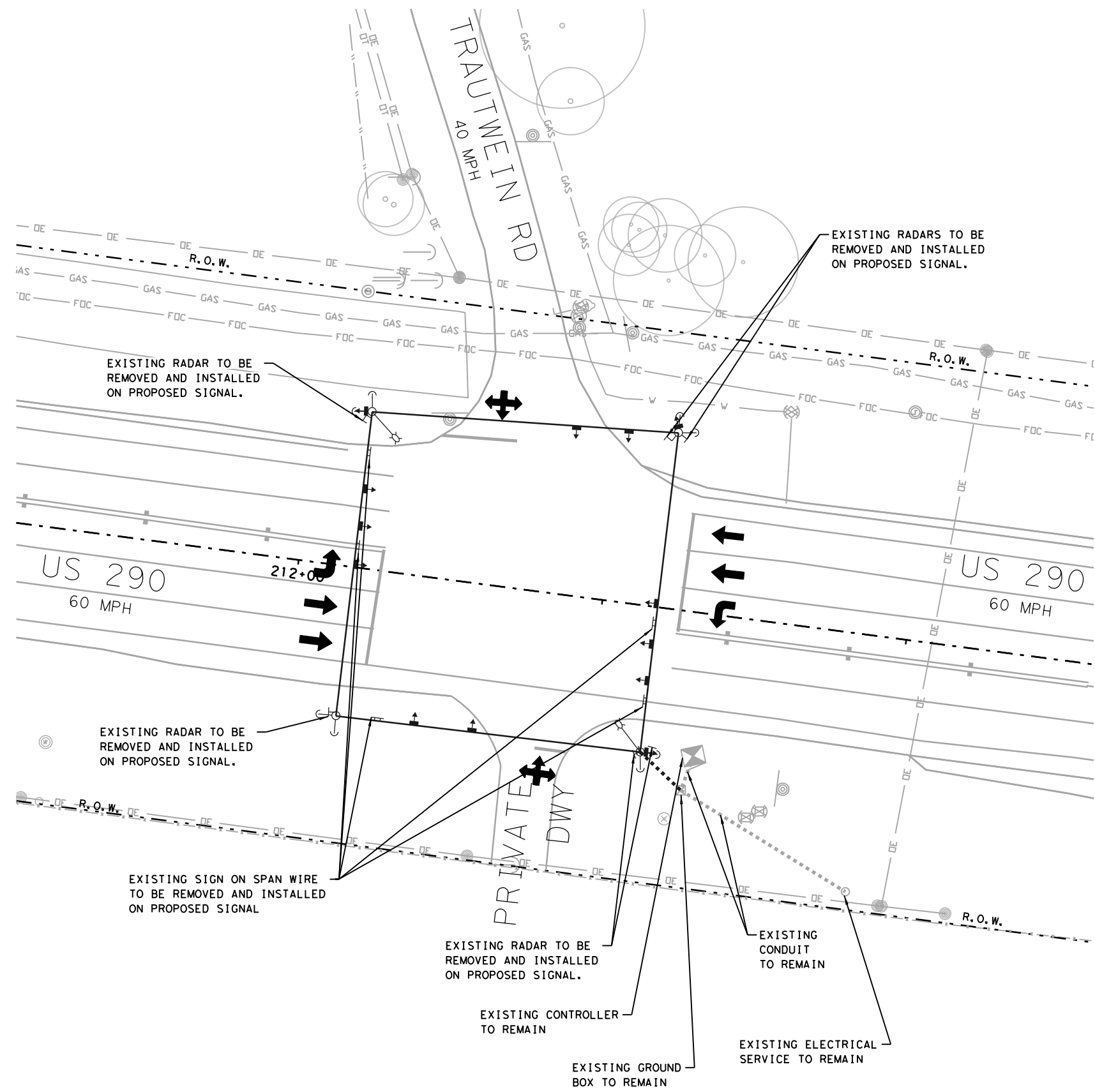
DATE: 4/11/2023				SHEET 1 OF 1	
STATE	STATE DIST. NO.	COUNTY			
TEXAS	14	HAYS			
CONT.	SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07	072	US 290	60	


N. T. S.




**LEGEND**

-  SIGNAL HEAD
-  RADAR DETECTION (PRESENCE)
-  RADAR DETECTION (ADVANCED)
-  SIGN ON SIGNAL
-  GROUND MOUNTED SIGN
-  CONTROLLER
-  GROUND BOX TY-D
-  CONDUIT
-  LUMINAIRE
-  WOOD POLE
-  GUY WIRE ANCHOR



 Texas Department of Transportation

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 **HAYS COUNTY**

 **wsb** WSB & ASSOCIATES, INC.  
FIRM # 16849

**US 290 AT  
TRAUTWEIN ROAD  
EXISTING CONDITIONS &  
REMOVAL**

DATE: 4/11/2023		SHEET 1 OF 5		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07 072	US 290	61	

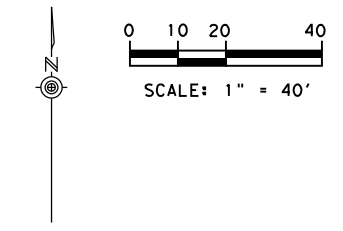
- NOTES:**
1. LOCATION OF UTILITIES IS APPROXIMATE.
  2. CONTRACTOR TO DELIVER SALVAGED TRAFFIC SIGNAL COMPONENTS (SIGNAL HEADS, LUMINAIRES) TO TxDOT DISTRICT SIGNAL SHOP.

File name: ...\\Plan\016874-000\*Existing.dgn  
 Date: 4/11/2023

**NOTES:**

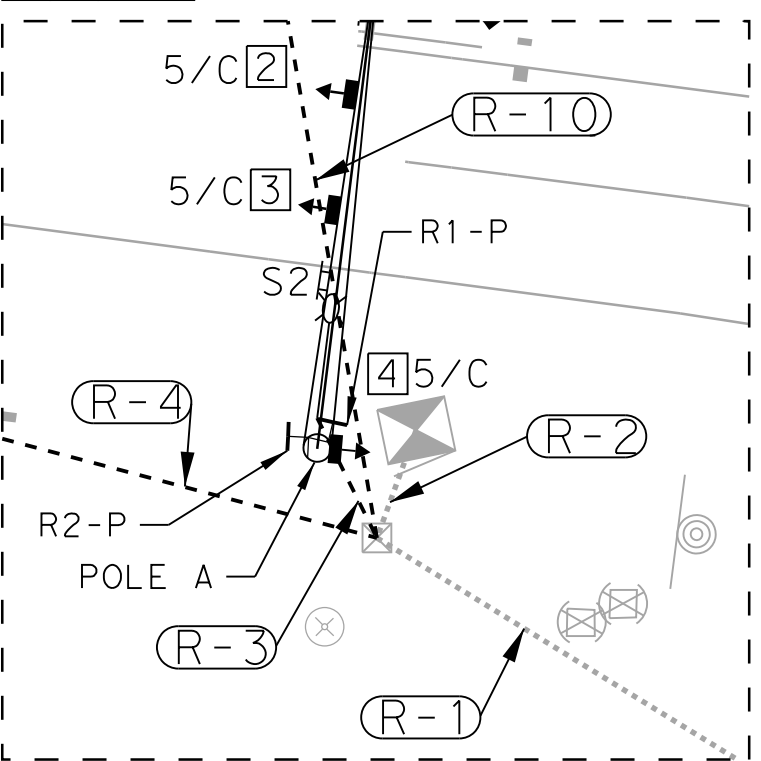
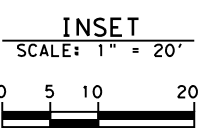
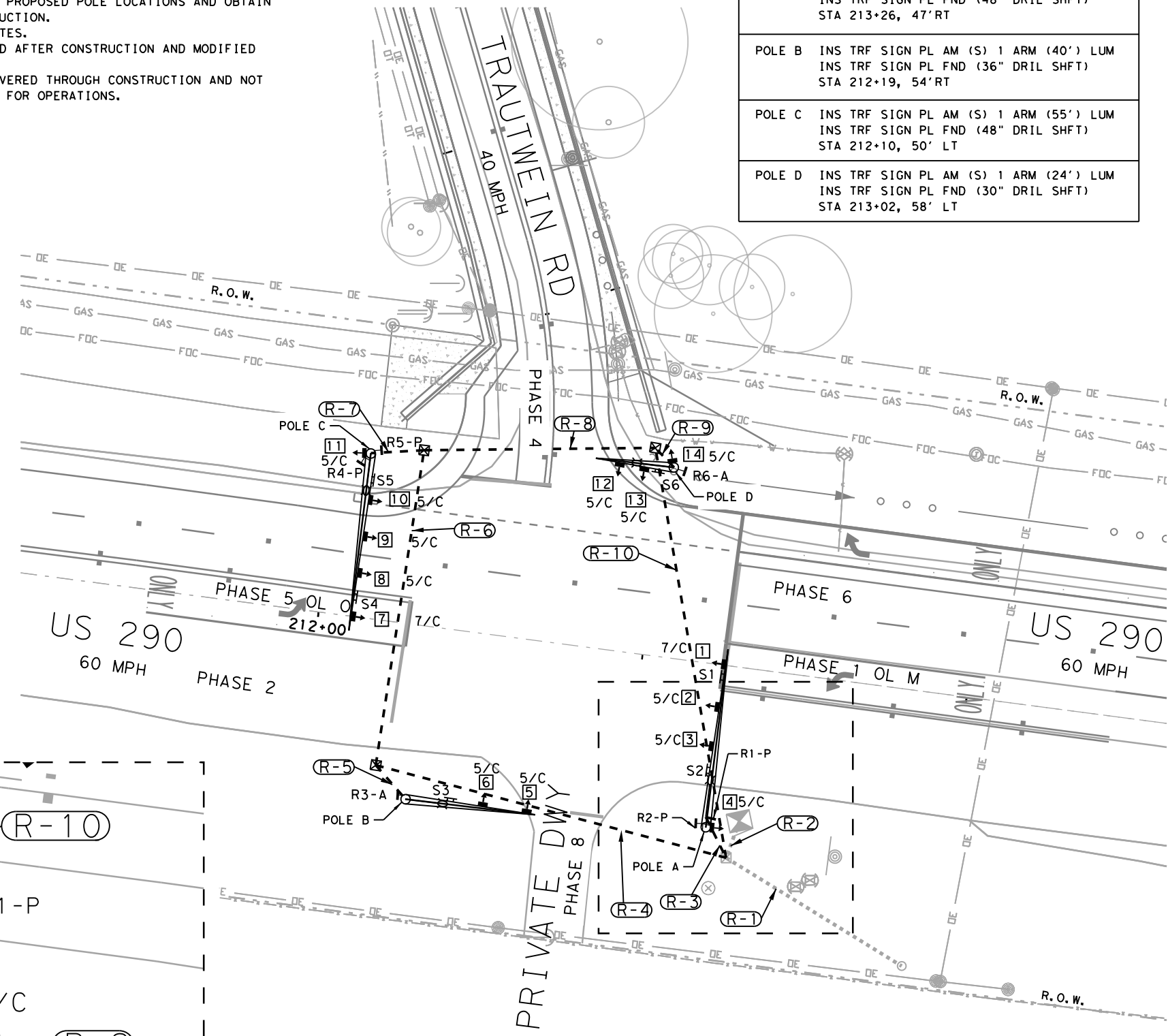
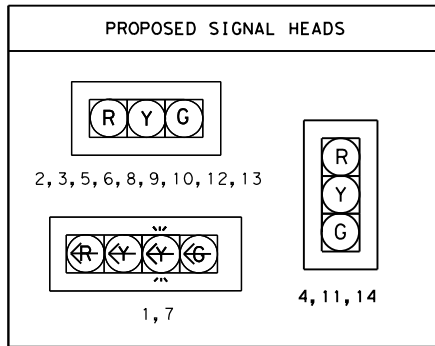
1. THIS SIGNAL IS TO BE CONSTRUCTED PER TXDOT STANDARDS AND SPECIFICATIONS.
2. POLE LOCATIONS PROVIDED ARE APPROXIMATE AND MAY NEED TO BE ADJUSTED IN THE FIELD TO AVOID CONFLICTS. STAKE PROPOSED POLE LOCATIONS AND OBTAIN APPROVAL FROM ENGINEER PRIOR TO CONSTRUCTION.
3. ALL SIGNAL HEADS WILL HAVE BACKPLATES.
4. SIGNAL OPERATIONS WILL BE MONITORED AFTER CONSTRUCTION AND MODIFIED AS NECESSARY.
5. PROPOSED SIGNAL HEADS TO REMAIN COVERED THROUGH CONSTRUCTION AND NOT BE REMOVED UNTIL PROPOSED SIGNAL READY FOR OPERATIONS.

PROPOSED SIGNAL POLE AND FOUNDATION DESCRIPTIONS	
POLE A	INS TRF SIGN PL AM (S) 1 ARM (55') LUM INS TRF SIGN PL FND (48" DRIL SHFT) STA 213+26, 47' RT
POLE B	INS TRF SIGN PL AM (S) 1 ARM (40') LUM INS TRF SIGN PL FND (36" DRIL SHFT) STA 212+19, 54' RT
POLE C	INS TRF SIGN PL AM (S) 1 ARM (55') LUM INS TRF SIGN PL FND (48" DRIL SHFT) STA 212+10, 50' LT
POLE D	INS TRF SIGN PL AM (S) 1 ARM (24') LUM INS TRF SIGN PL FND (30" DRIL SHFT) STA 213+02, 58' LT

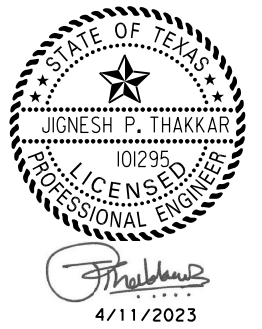


**LEGEND**

- ◄ PROPOSED SIGNAL HEAD
- ⊞ PROPOSED RADAR DETECTION (PRESENCE)
- ⊞ PROPOSED RADAR DETECTION (ADVANCED)
- ⊞ EXISTING RADAR DETECTION (PRESENCE) TO REMAIN
- ⊞ EXISTING RADAR DETECTION (ADVANCED) TO REMAIN
- ⊞ RELOCATED SIGN ON SIGNAL
- ⊞ EXISTING CONTROLLER TO REMAIN
- ⊞ EXISTING GROUND BOX TO REMAIN
- ⊞ PROPOSED GROUND BOX TY-D
- ⋯ EXISTING CONDUIT TO REMAIN
- PROPOSED CONDUIT
- ③ SIGNAL HEAD IDENTIFICATION
- Ⓡ RUN IDENTIFICATION
- ⊞ PROPOSED MAST ARM
- ⊞ PROPOSED LUMINAIRE



RELOCATED SIGNS FROM EXISTING SPAN WIRE TO PROPOSED MAST ARM	PROPOSED SIGN
<p>S1</p>	<p>S2, S5</p>
<p>S3</p>	<p>S4</p>
<p>S5</p>	<p>S6</p>



Texas Department of Transportation

HAYS COUNTY

wsb WSB & ASSOCIATES, INC. FIRM # 16849

**US 290 AT TRAUTWEIN ROAD  
PROPOSED SIGNAL LAYOUT**

DATE: 4/11/2023		SHEET 2 OF 5	
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07	072	US 290 62

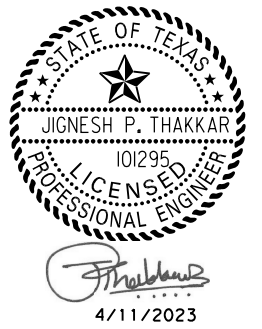
File name: \\... \Cad\p\lan\016874-000\*Signal.dgn  
 Date: 4/11/2023

CABLE SUMMARY FOR INSIDE MAST ARMS		
INSIDE ARMS	14 AWG	
	7/C	5/C
POLE A		
HEAD 1	55	
HEAD 2		40
HEAD 3		25
HEAD 4		
POLE B		
HEAD 5		40
HEAD 6		25
POLE C		
HEAD 7	55	
HEAD 8		40
HEAD 9		25
HEAD 10		15
HEAD 11		
POLE D		
HEAD 12		20
HEAD 13		10
HEAD 14		
TOTAL	110	240

CABLE TERMINATION CHART															
CNDR. NO.	CNDR. COLOR	CABLE 1 SH 1 TO CNTRL 7 CNDR	CABLE 2 SH 2 TO CNTRL 5 CNDR	CABLE 3 SH 3 TO CNTRL 5 CNDR	CABLE 4 SH 4 TO CNTRL 5 CNDR	CABLE 5 SH 5 TO CNTRL 5 CNDR	CABLE 6 SH 6 TO CNTRL 5 CNDR	CABLE 7 SH 7 TO CNTRL 7 CNDR	CABLE 8 SH 8 TO CNTRL 5 CNDR	CABLE 9 SH 9 TO CNTRL 5 CNDR	CABLE 10 SH 10 TO CNTRL 5 CNDR	CABLE 11 SH 11 TO CNTRL 5 CNDR	CABLE 12 SH 12 TO CNTRL 5 CNDR	CABLE 13 SH 13 TO CNTRL 5 CNDR	CABLE 14 SH 14 TO CNTRL 5 CNDR
1	BLACK	SH 1 Y ARW PHASE 5	SH 2 Y PHASE 2	SH 3 Y PHASE 2	SH 4 Y OL C	SH 5 Y PHASE 4	SH 6 Y PHASE 4	SH 7 Y ARW PHASE 1	SH 8 Y PHASE 6	SH 9 Y PHASE 6	SH 10 Y PHASE 6	SH 11 Y OL A	SH 12 Y PHASE 8	SH 13 Y PHASE 8	SH 14 Y OL B
2	WHITE	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON
3	RED	SH 1 R ARW PHASE 5	SH 2 R PHASE 2	SH 3 R PHASE 2	SH 4 R OL C	SH 5 R PHASE 4	SH 6 R PHASE 4	SH 7 R ARW PHASE 1	SH 8 R PHASE 6	SH 9 R PHASE 6	SH 10 R PHASE 6	SH 11 R OL A	SH 12 R PHASE 8	SH 13 R PHASE 8	SH 14 R OL B
4	GREEN	SH 1 G ARW PHASE 5	SH 2 G PHASE 2	SH 3 G PHASE 2	SH 4 G OL C	SH 5 G PHASE 4	SH 6 G PHASE 4	SH 7 G ARW PHASE 1	SH 8 G PHASE 6	SH 9 G PHASE 6	SH 10 G PHASE 6	SH 11 G OL A	SH 12 G PHASE 8	SH 13 G PHASE 8	SH 14 G OL B
5	ORANGE	SH 1 FY ARW OL O	SPARE	SPARE	SPARE	SPARE	SPARE	SH 7 FY ARW OL M	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
6	BLUE	SPARE						SPARE							
7	WHITE/BLACK	SPARE						SPARE							

CABLE SUMMARY FOR INSIDE POLES				
INSIDE POLES	14 AWG		RADAR 6/C	#8 AWG (INS)
	7/C	5/C		
POLE A	20	70	60	60
POLE B		40	30	60
POLE C	20	90	60	60
POLE D		70	30	60
TOTAL	40	270	180	240

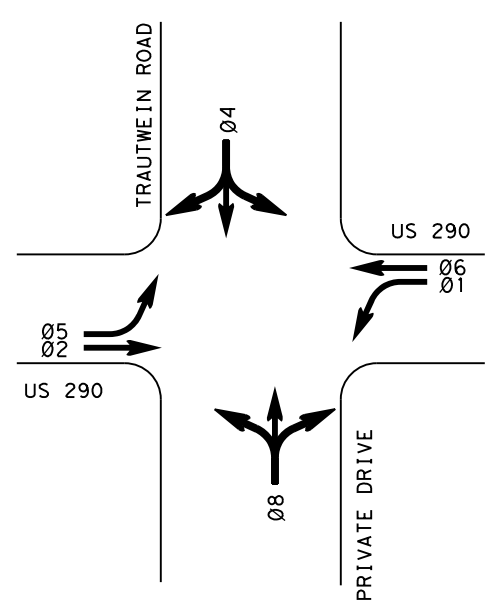
CABLE SUMMARY FOR INSIDE CABINET					
	14 AWG		#6 AWG (INS)	#6 AWG (BARE)	RADAR 6/C
	7/C	5/C			
TOTAL	10	60	10	5	30



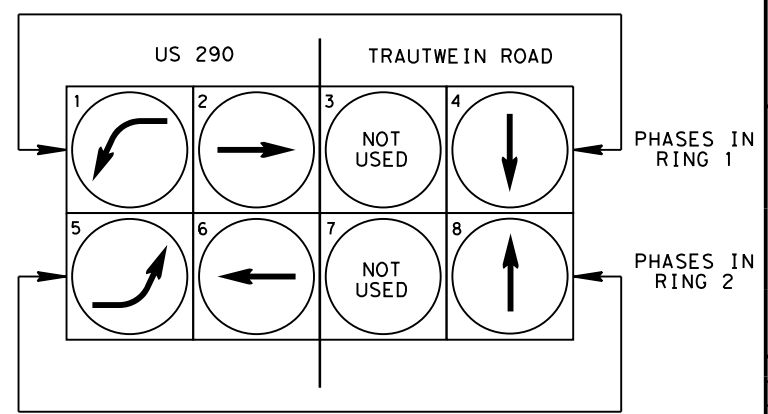
SUMMARY OF CONDUITS AND CABLES US 290 & TRAUTWEIN ROAD																
RUN	CONDUIT				LENGTH (FT)	SIGNAL			LUMINAIRE	GROUND	POWER	GROUND				
	PVC/BORE		PVC/TRENCH			5/C #14 AWG	7/C #14 AWG	6/C RADAR					#8 AWG (INS)	#8 AWG (BARE)	#6 AWG (INS)	#6 AWG (BARE)
	2"	3"	2"	3"												
*R-1			2		65					8	1	2	1			
*R-2			2	2	15	12	2	6			3	2	1			
R-3			1	2	15	3	1	2		2	3					
R-4			1	2	115	6	1	3		4	3					
R-5			1	2	15	2		1		2	3					
R-6		3			100	4	1	2		2	3					
R-7			1	2	20	4	1	2		2	3					
R-8	1	2			75						3					
R-9			1	2	10	3		1		2	3					
R-10		3			130	3		1		2	3					
TOTAL	75	840	335	380	560	1845	280	860	1560	1550	160	80				

\* NOTE: R-1 AND R-2 CONDUIT EXISTING TO REMAIN

PHASING DIAGRAM



ORIENTATION VIEW



NOTE:  
 OL A = PH 2  
 OL B = PH 4  
 OL C = PH 5  
 OL M = PH 1

Texas Department of Transportation

HAYS COUNTY

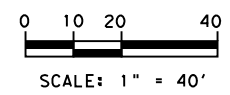
wsb WSB & ASSOCIATES, INC. FIRM # 16849

**US 290 AT TRAUTWEIN ROAD**  
**ELECTRICAL WIRING & PHASING**

DATE: 4/11/2023 SHEET 3 OF 5

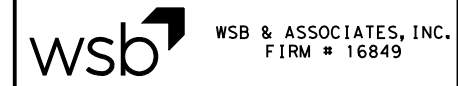
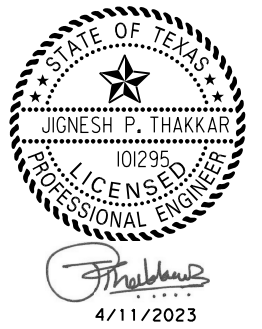
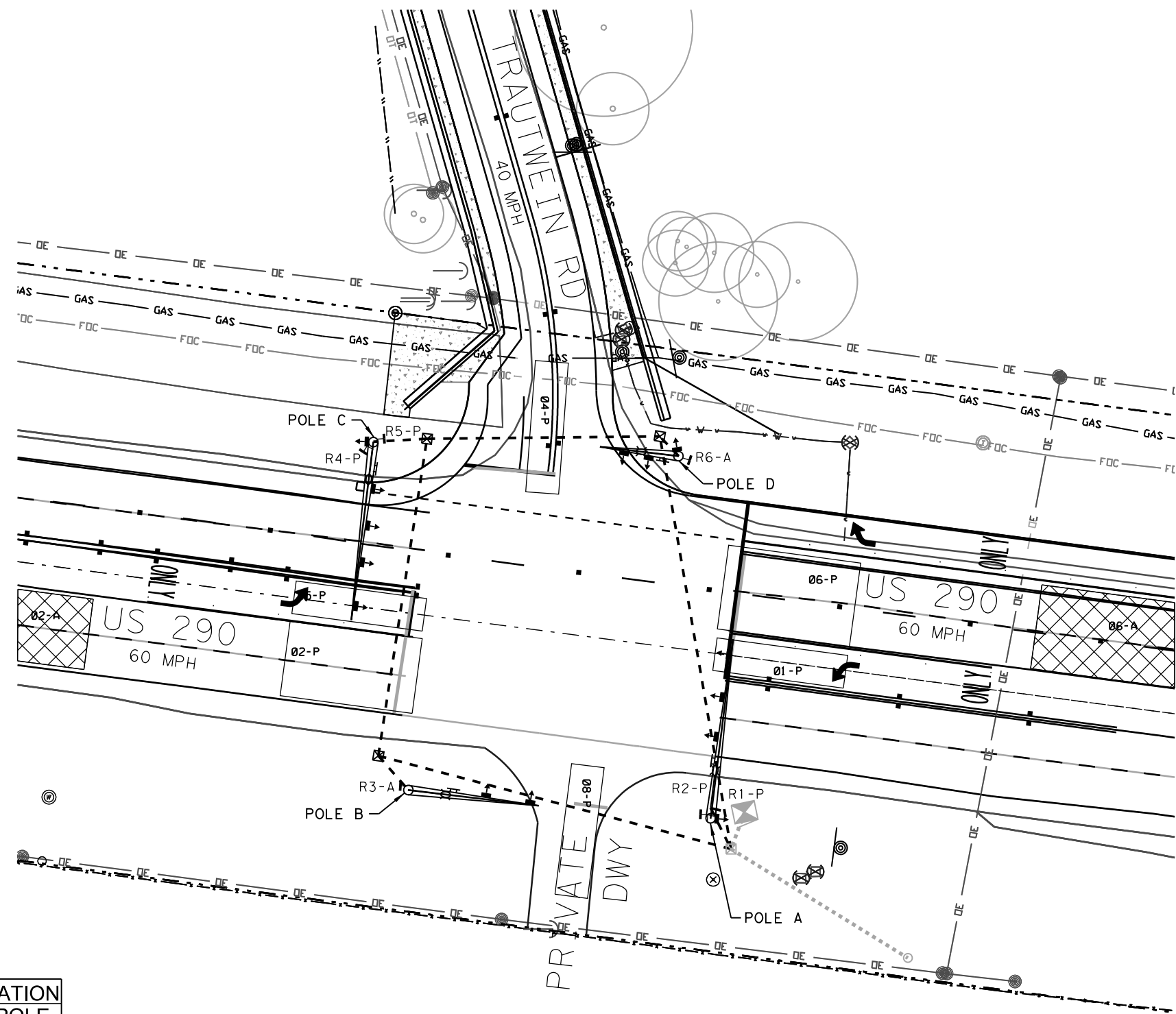
STATE	STATE DIST. NO.	COUNTY	
TEXAS	14	HAYS	
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.
0113	07 072	US 290	63

Filename: ...016874-000\*Signal-Detail.s.dgn  
 Date: 4/11/2023



LEGEND

- ◄ PROPOSED SIGNAL HEAD
- ⊥ PROPOSED RADAR DETECTION (PRESENCE)
- ⊥ PROPOSED RADAR DETECTION (ADVANCED)
- ⊥ EXISTING RADAR DETECTION (PRESENCE) TO REMAIN
- ⊥ EXISTING RADAR DETECTION (ADVANCED) TO REMAIN
- ⊥ RELOCATED SIGN ON SIGNAL
- ◻ EXISTING CONTROLLER TO REMAIN
- ◻ EXISTING GROUND BOX TO REMAIN
- ◻ PROPOSED GROUND BOX TY-D
- ⋯ EXISTING CONDUIT TO REMAIN
- - - PROPOSED CONDUIT
- 3 SIGNAL HEAD IDENTIFICATION
- (R-1) RUN IDENTIFICATION
- ⊥ PROPOSED MAST ARM
- ⊥ PROPOSED LUMINAIRE

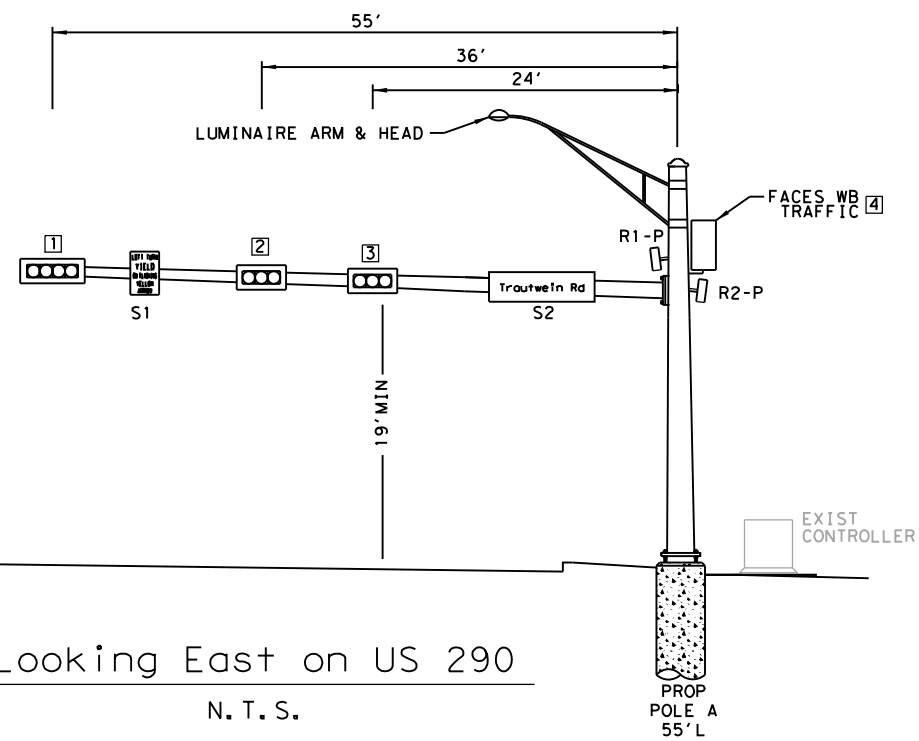


**US 290 AT  
TRAUTWEIN ROAD  
RADAR INFORMATION**

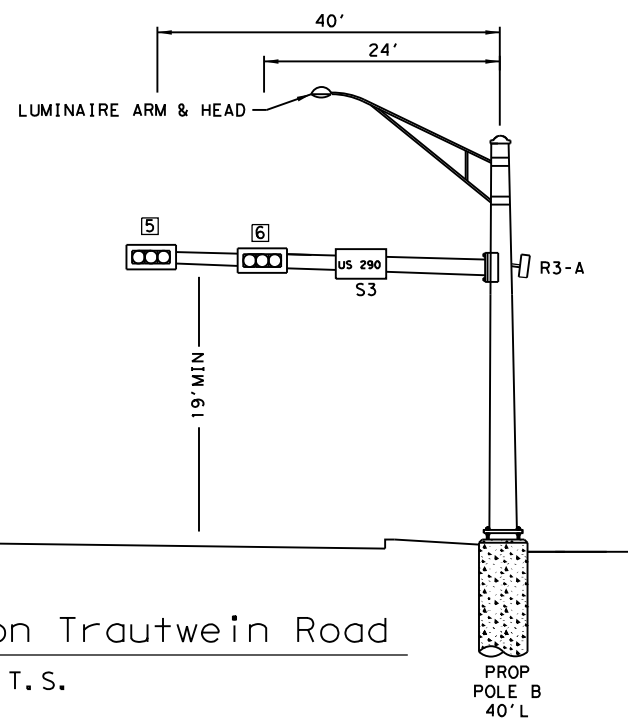
DETECTION ZONE INFORMATION		
ZONE	RADAR UNIT	POLE
Ø6-P	R1-P	A
Ø1-P	R1-P	A
Ø8-P	R2-P	A
Ø2-A	R3-A	B
Ø2-P	R4-P	C
Ø5-P	R4-P	C
Ø4-P	R5-P	C
Ø6-A	R6-A	D

DATE: 4/11/2023		SHEET 4 OF 5		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07	072	US 290	64

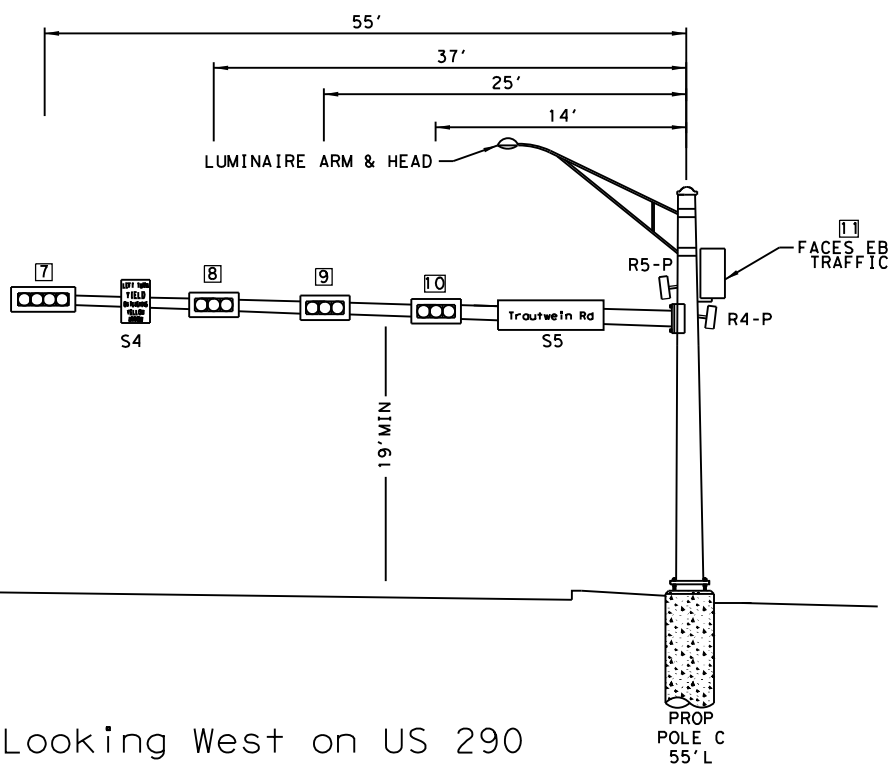
File name: ...\\016874-000\*Signal-Radar.dgn  
 Date: 4/11/2023



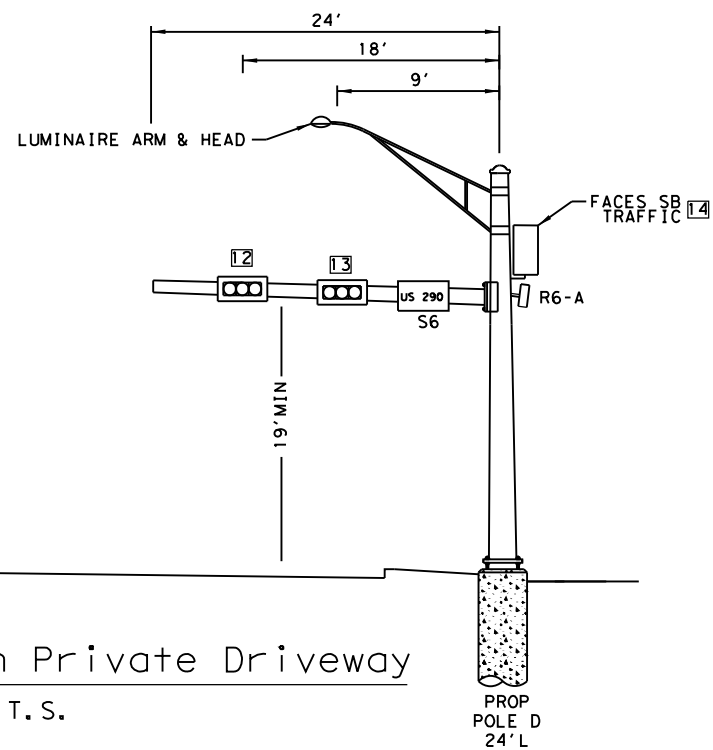
Looking East on US 290  
N. T. S.



Looking South on Trautwein Road  
N. T. S.

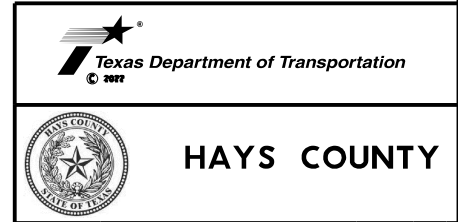
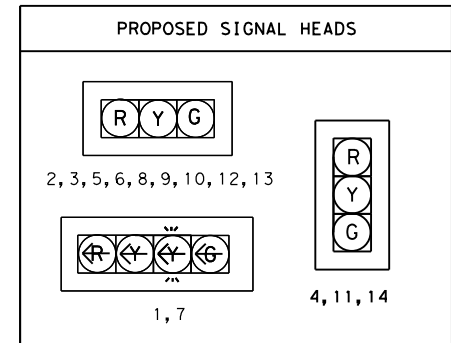


Looking West on US 290  
N. T. S.



Looking North on Private Driveway  
N. T. S.

NOTE:  
HEADS WILL BE INSTALLED PER T&MUTCD (LATEST)  
FOUNDATIONS WILL BE ADJUSTED IN THE FIELD IN ORDER TO MEET CLEARANCE.  
LOCATION OF MAST ARMS IS APPROXIMATE, ANY CHANGES WILL BE APPROVED BY THE ENGINEER.  
MAST ARM ATTACHMENT HEIGHT WILL BE CALCULATED BY THE CONTRACTOR IN THE FIELD AND APPROVED BY THE ENGINEER.



**US 290 AT TRAUTWEIN ROAD**  
**PROPOSED ELEVATIONS**

RELOCATED SIGNS FROM EXISTING SPAN WIRE TO PROPOSED MAST ARM		PROPOSED SIGN	
 S1	 S2, S5	 S3	 S4
		 S6	

DATE: 4/11/2023		SHEET 5 OF 5		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07 072	US 290	65	

File name: \\016874-000\*Signal-Elevations.dgn  
 Date: 4/11/2023

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 FILE: K:\016874-000\Cad\Plan\STANDARDS\4 - TRAFFIC\dom1-20.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS				DELINEATORS				D & OM DESCRIPTIVE CODES	
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	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 DIRECTION If Required BI = Bi-Directional BR = Bi-Directional with red on back
SHEETING	Yellow, White or Red Type B or C reflective sheeting				SHEETING				Yellow, White or Red Type B or C Reflective Sheeting
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (fix). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.				POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
					MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

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) 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 (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
		OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	
SHEETING	Yellow-Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroreflective yellow - Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting			Red -Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting	
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT	
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP	

DEPARTMENTAL MATERIAL SPECIFICATIONS	
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW		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.		
DEVICE	GF1	GF2	CTB	 W1-8				 W1-6			
	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.			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)
				MOUNTING HEIGHT	4' - 0" or 7' - 0"		7' - 0" Only		MOUNTING HEIGHT	7' - 0"	
				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).						
SHEETING	Yellow, White, Red										
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.										

Traffic Safety Division Standard

### DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

## D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	14	HAYS	66	

20A



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## POST TYPE AND SUPPORT FOUNDATION DETAILS

## TYPE OF BARRIER MOUNTS

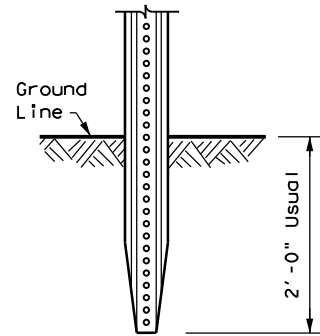
### WING CHANNEL (WC)

### FLEXIBLE POSTS (YFLX, WFLX)

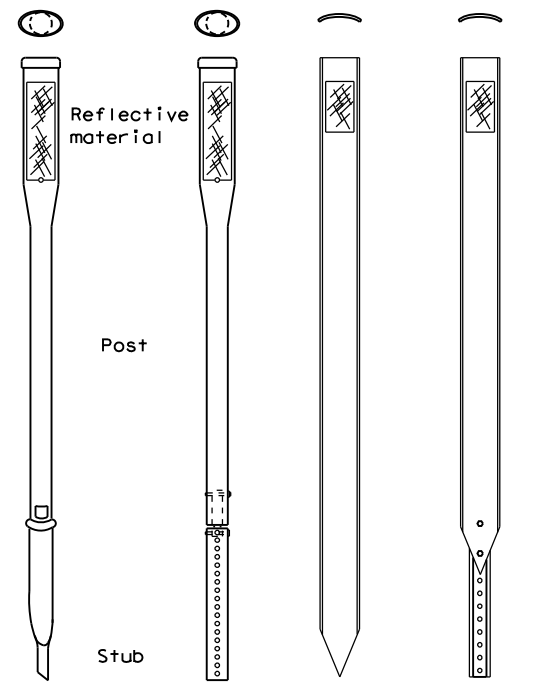
### WEDGE ANCHOR SYSTEMS

### GUARD FENCE ATTACHMENT

GND

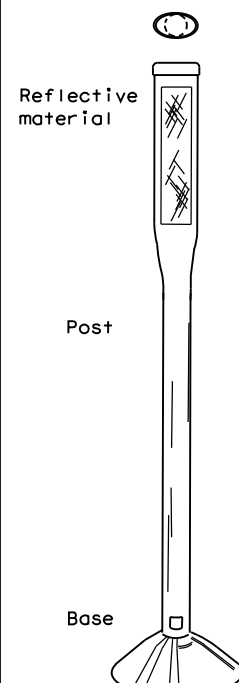


GND



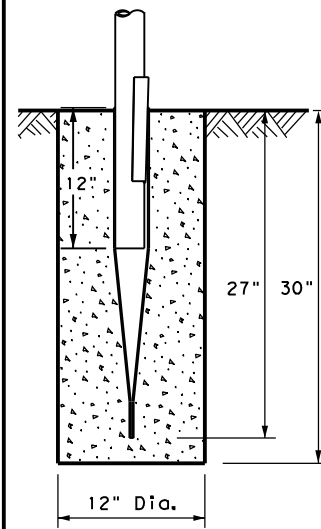
EMBEDDED

SRF



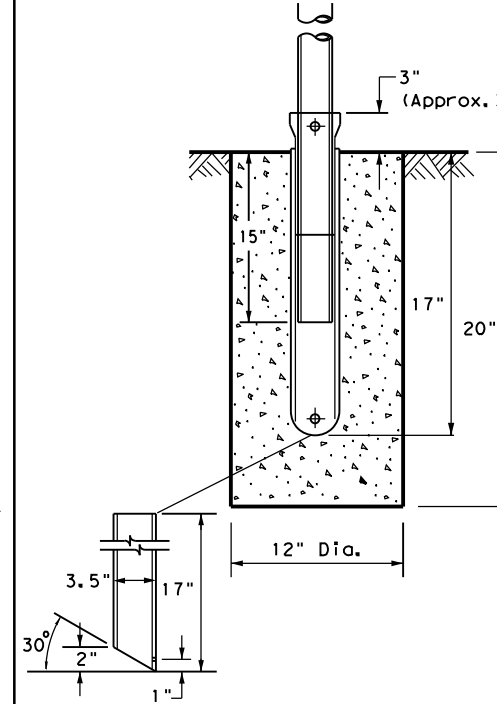
SURFACE MOUNT

WAS



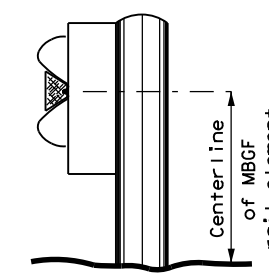
STEEL

WAP

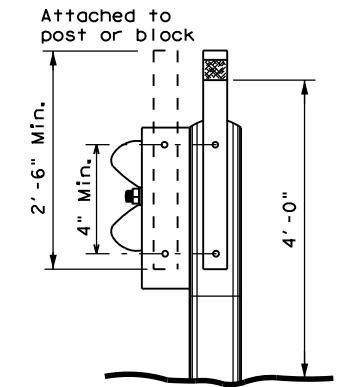


PLASTIC

GF 1



GF 2



**NOTES**

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

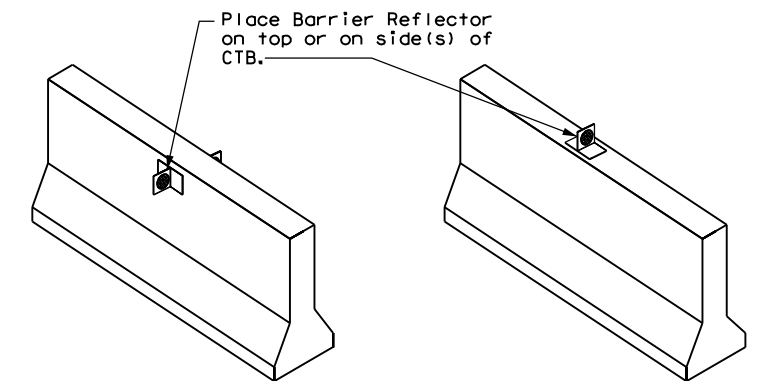
**NOTES**

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

**NOTE**

1. Install per manufacturer's recommendations.

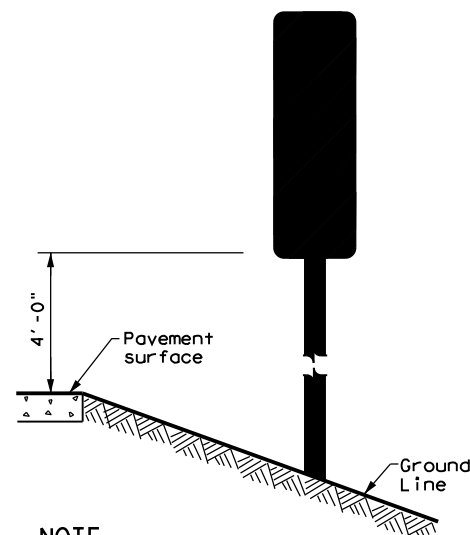
### CONCRETE TRAFFIC BARRIER (CTB)



**GENERAL NOTES**

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

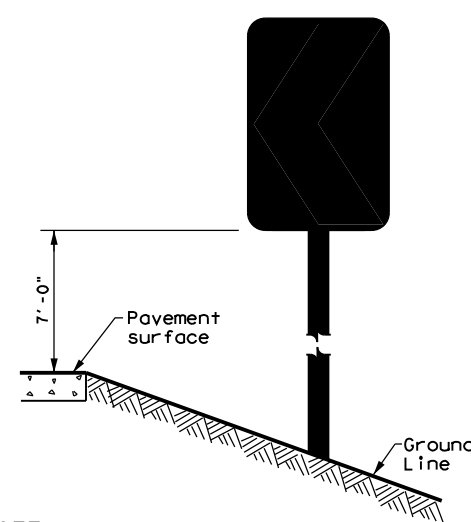
### TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS



**NOTE**

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

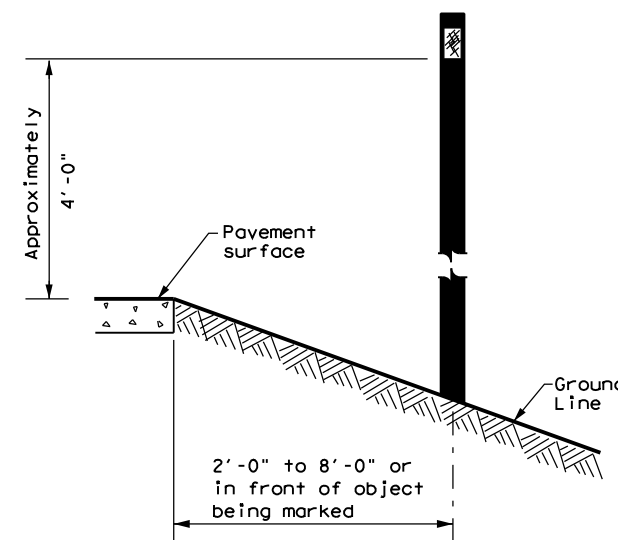
### CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



**NOTE**

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

### DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.



## DELINEATOR & OBJECT MARKER INSTALLATION

### D & OM(2)-20

FILE: dom2-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0113	07	072	US290
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	14	HAYS		67

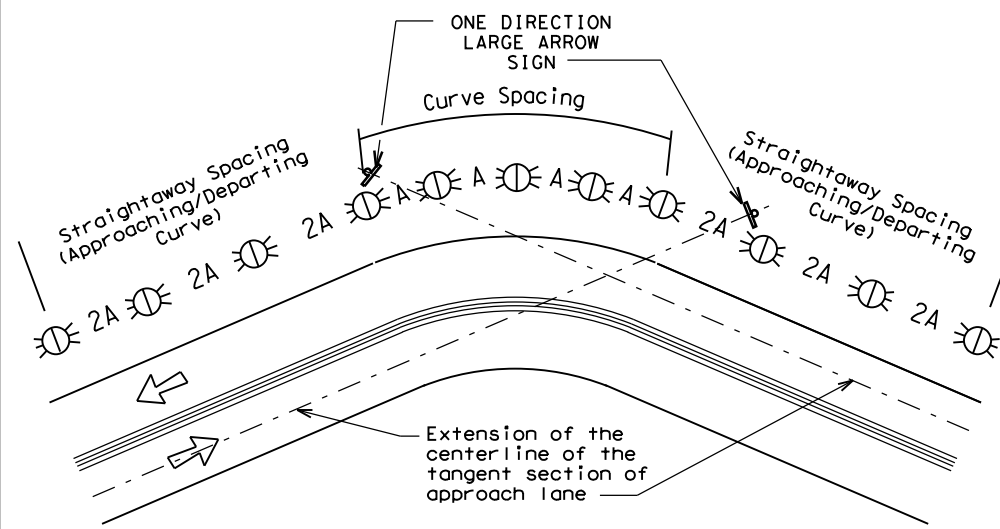
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### MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

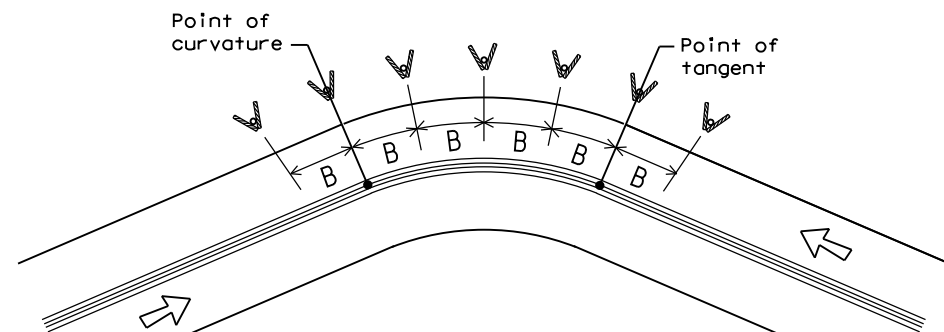
### SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



**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

Traffic Safety Division Standard

## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

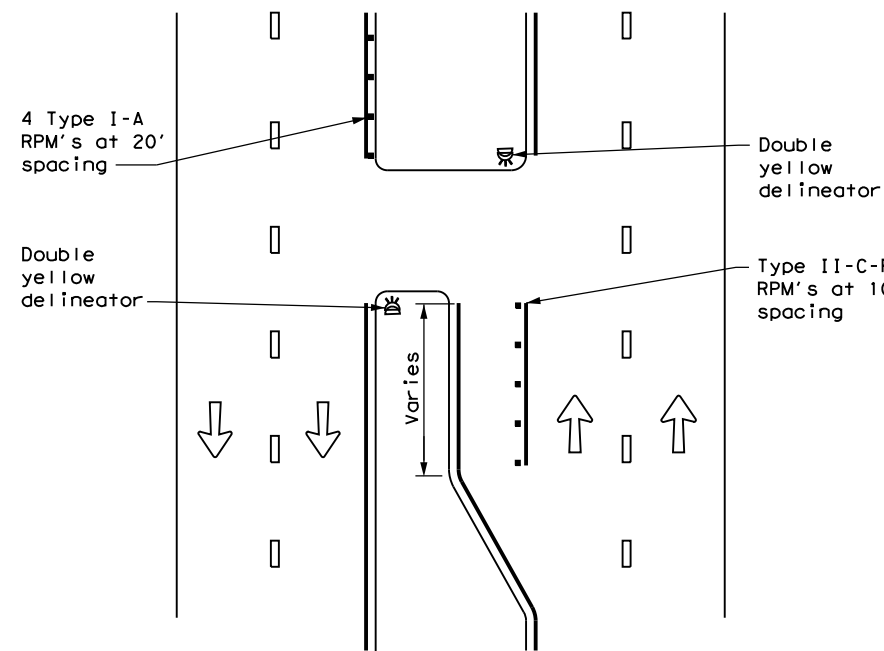
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© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS		0113	07	072
3-15 8-15	DIST	COUNTY	SHEET NO.	
8-15 7-20	14	HAYS	68	

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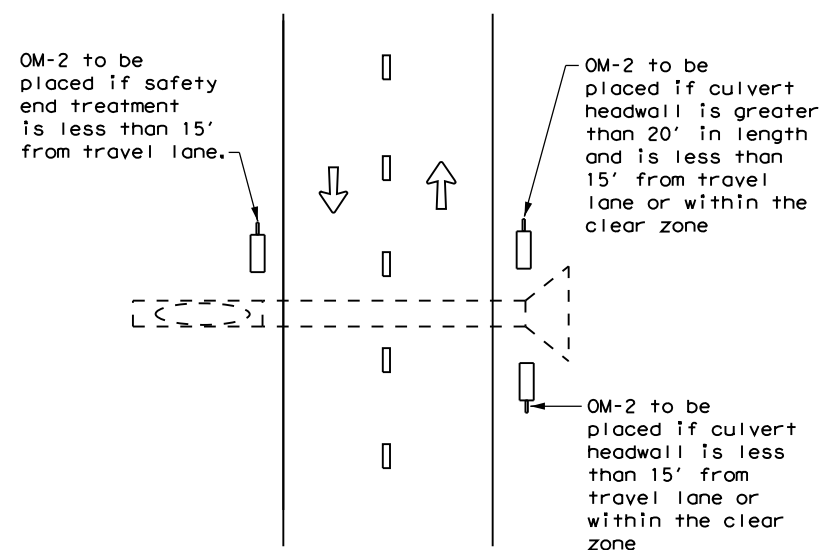
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**CROSSOVERS**



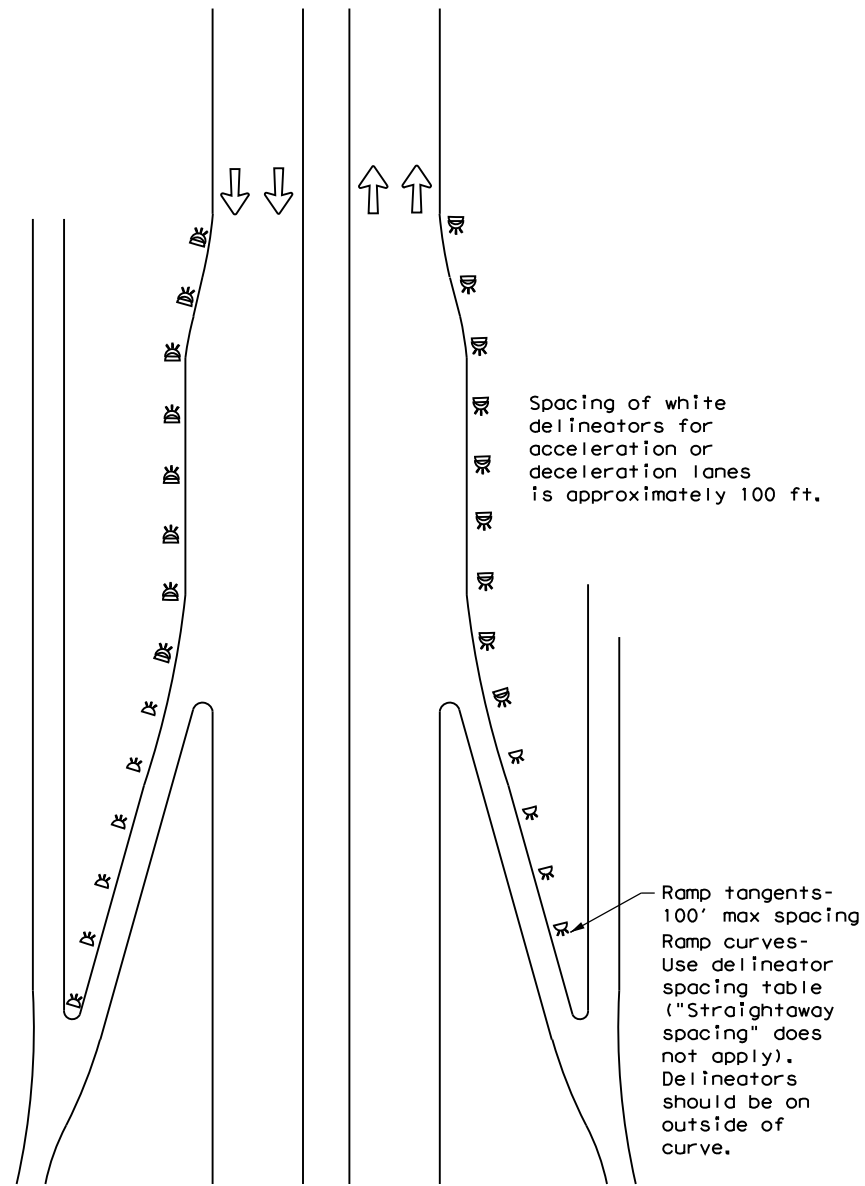
**DETAIL 1**

**FOR CULVERTS WITHOUT MBGF**



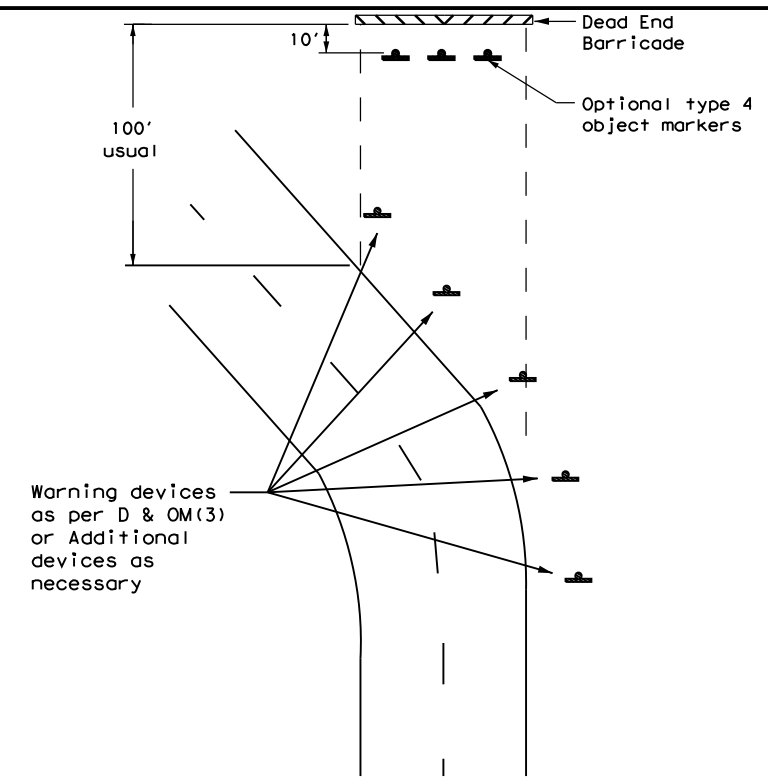
**DETAIL 2**

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



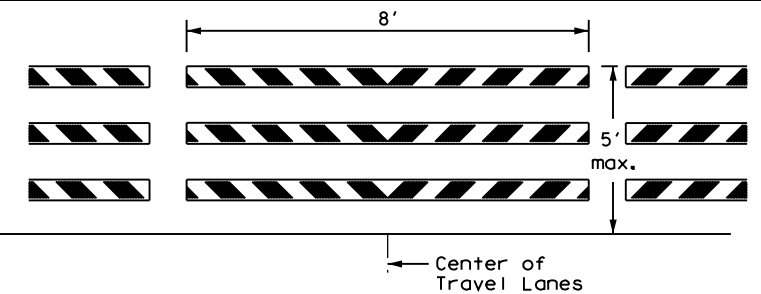
**DETAIL 3**

**TYPICAL APPLICATION OF DEAD END BARRICADE**



**DETAIL 4**

**TYPICAL DEAD END BARRICADE INSTALLATION**



**NOTES**

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

**DETAIL 5**

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



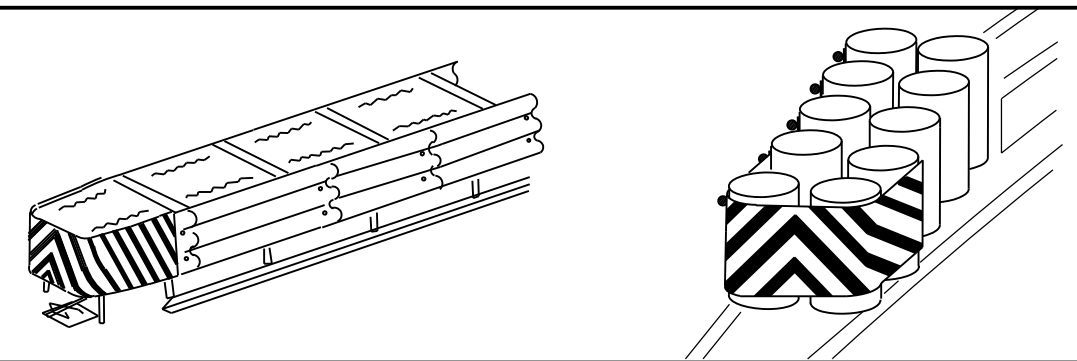
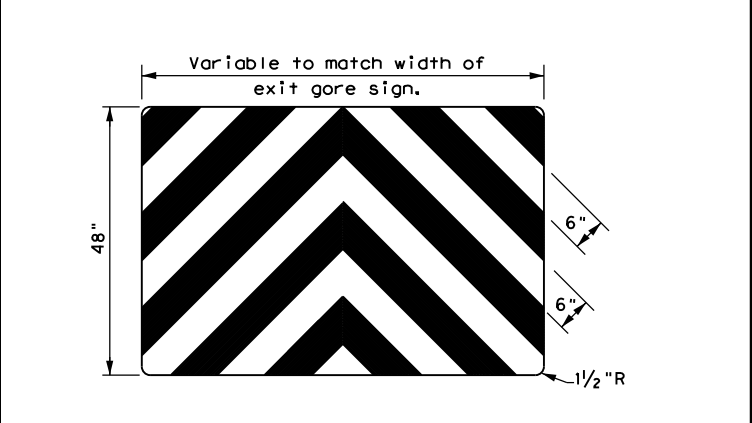
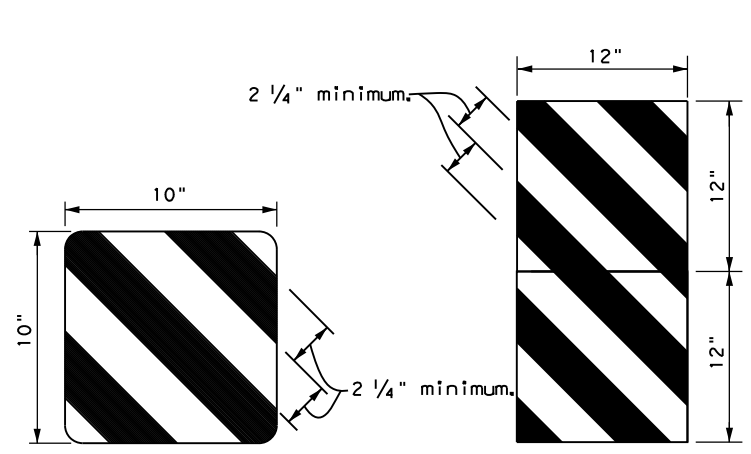
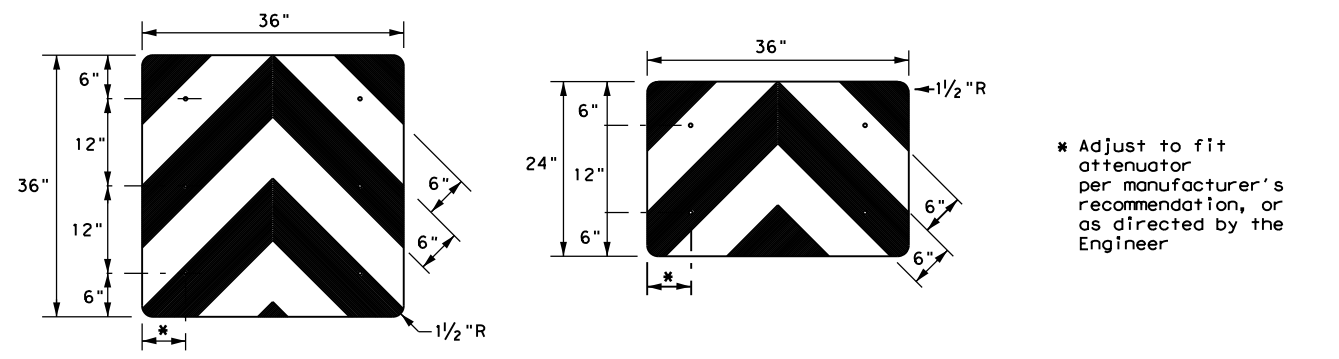
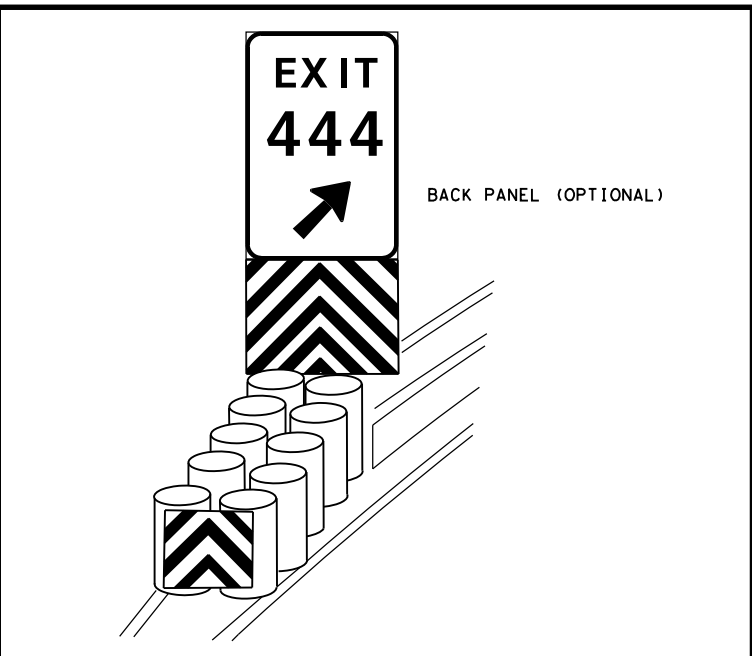
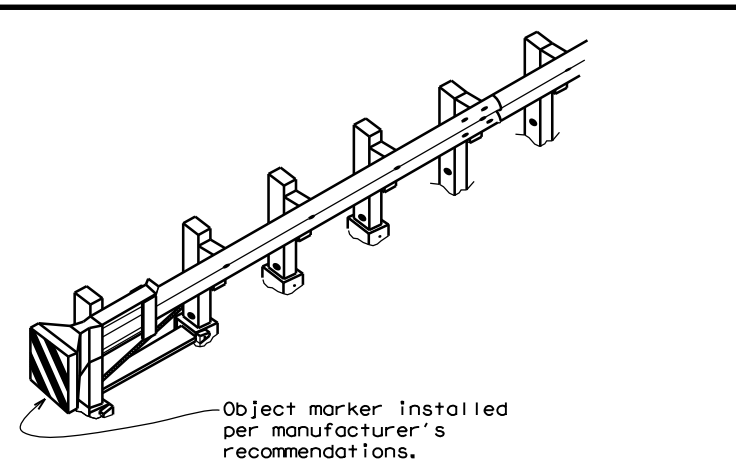
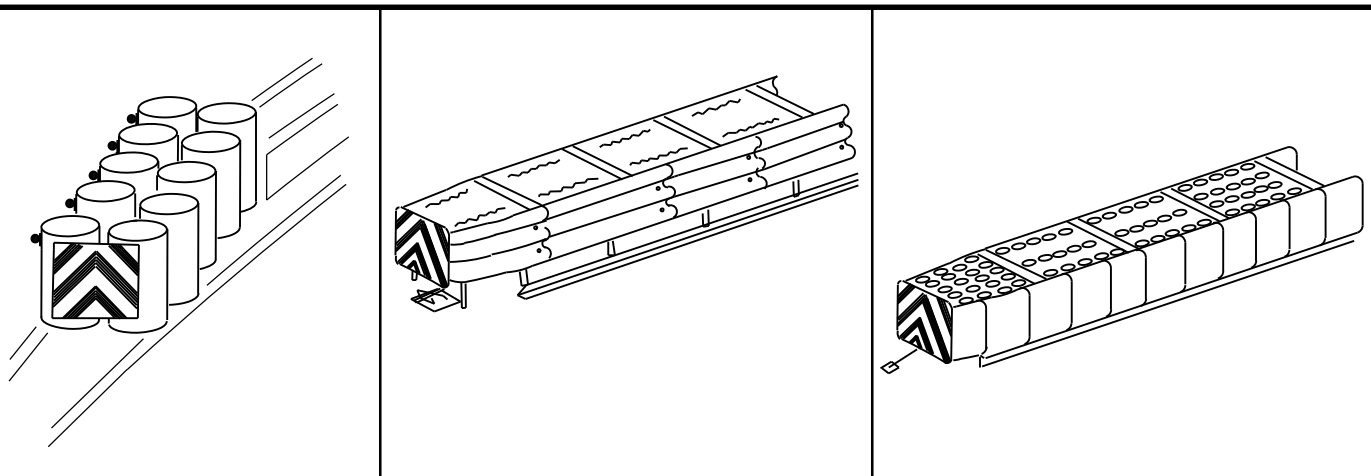
**DELINEATOR & OBJECT MARKER PLACEMENT DETAILS**

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

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REVISIONS	0113	07	072	US290
3-15	DIST	COUNTY	SHEET NO.	
7-20	14	HAYS	69	

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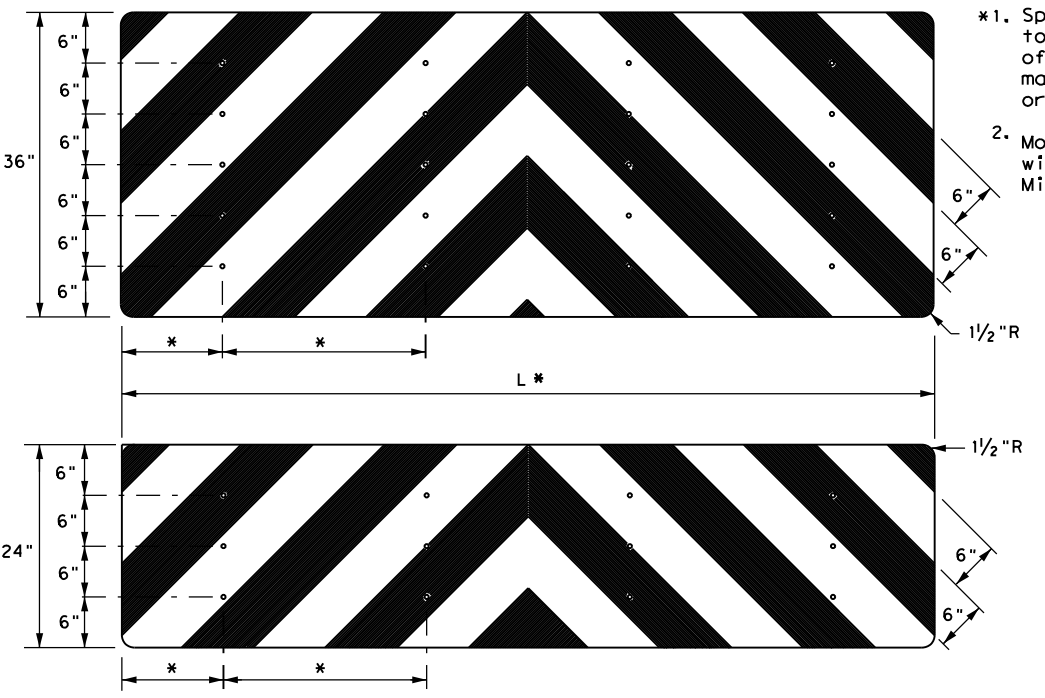
OBJECT MARKERS SMALLER THAN 3 FT<sup>2</sup>

**NOTES**

- Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.
- Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.
- Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".
- Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.
- Object Marker at nose of attenuator is subsidiary to the attenuator.
- See D & OM (1-4) for required barrier reflectors.

**NOTES**

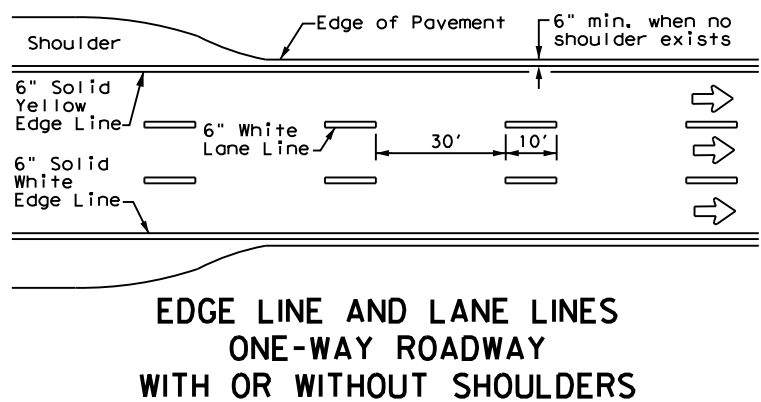
- Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
- Mounting should be flush with top of attenuator. Minimum size 96" x 24".



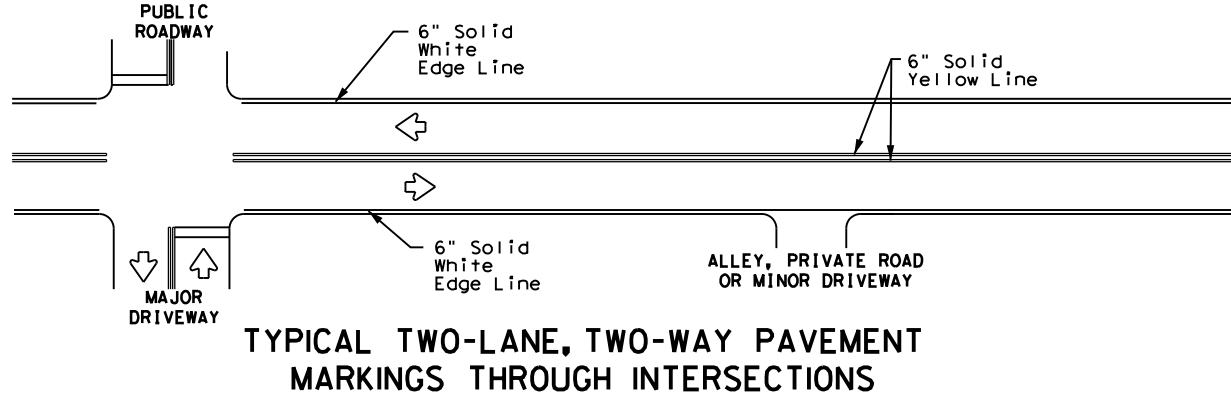
		<b>Traffic Safety Division Standard</b>	
<b>DELINEATOR &amp; OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS</b> <b>D &amp; OM(VIA) - 20</b>			
FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT
© TXDOT December 1989	CONT	SECT	JOB
REVISIONS		0113	07
4-92 8-04		072	US290
8-95 3-15			
4-98 7-20			
DIST	COUNTY	SHEET NO.	
14	HAYS	70	
20G			

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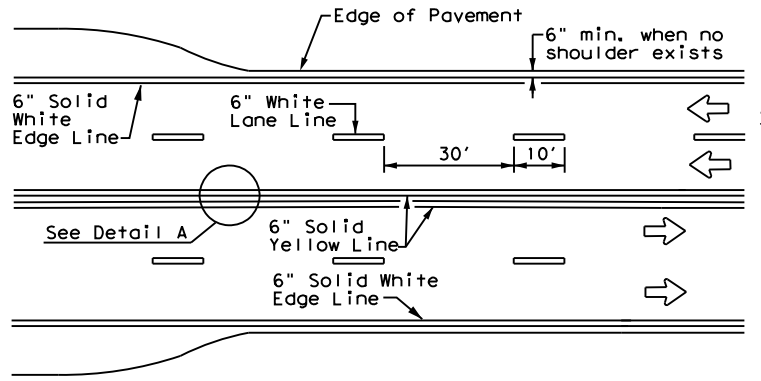
DATE: 4/11/2023 3:48:07 PM  
 FILE: K:\016874-000\Cad\Plan\STANDARDS\4 - TRAFFIC\pm1-22.dgn



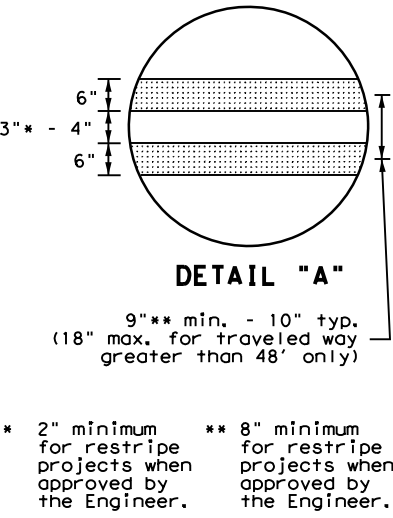
**EDGE LINE AND LANE LINES  
 ONE-WAY ROADWAY  
 WITH OR WITHOUT SHOULDERS**



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



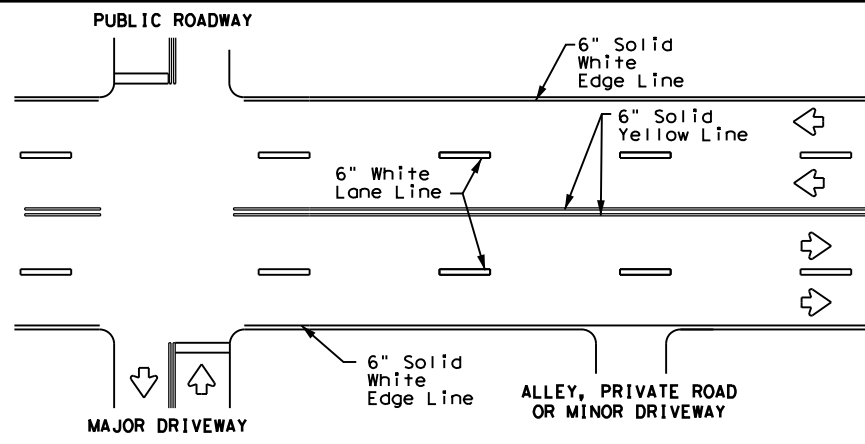
**CENTERLINE AND LANE LINES  
 FOUR LANE TWO-WAY ROADWAY  
 WITH OR WITHOUT SHOULDERS**



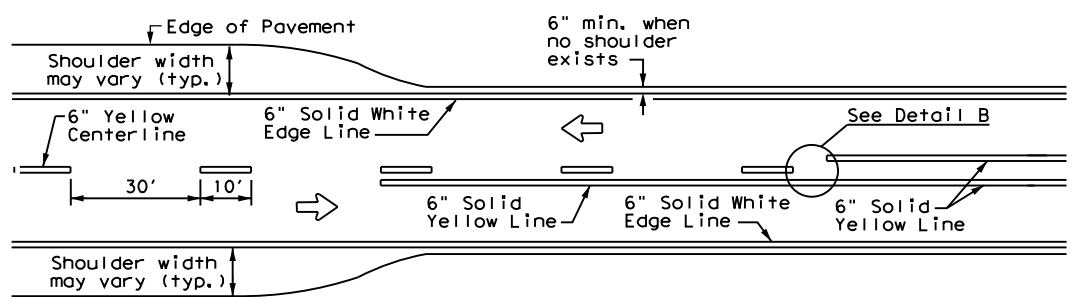
**DETAIL "A"**

9" min. - 10" typ.  
 (18" max. for traveled way greater than 48' only)

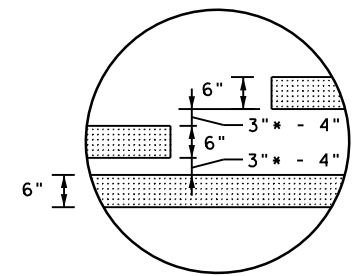
\* 2" minimum for restripe projects when approved by the Engineer.  
 \*\* 8" minimum for restripe projects when approved by the Engineer.



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

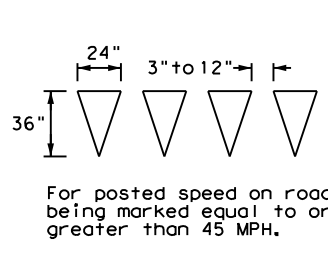


**TWO LANE TWO-WAY ROADWAY  
 WITH OR WITHOUT SHOULDERS**



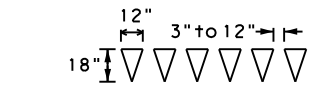
**DETAIL "B"**

\* 2" minimum for restripe projects when approved by the Engineer.



**YIELD LINES**

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



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

**NOTES**

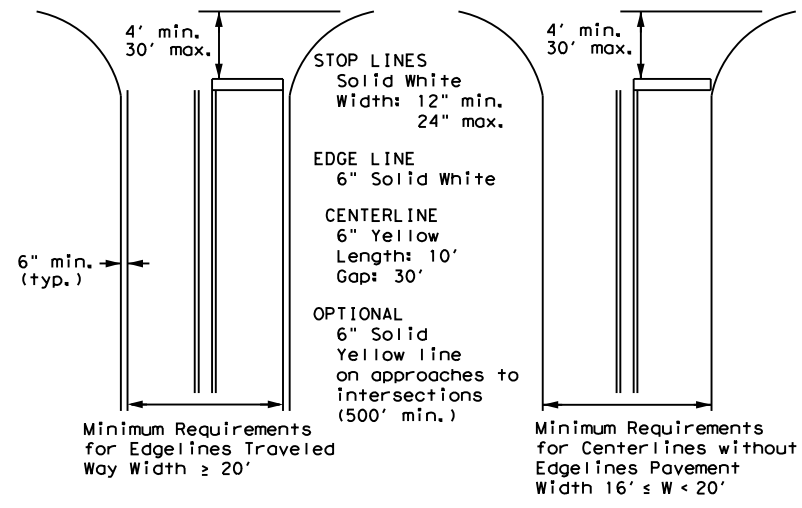
- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
- Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
- 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**

- Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
- The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

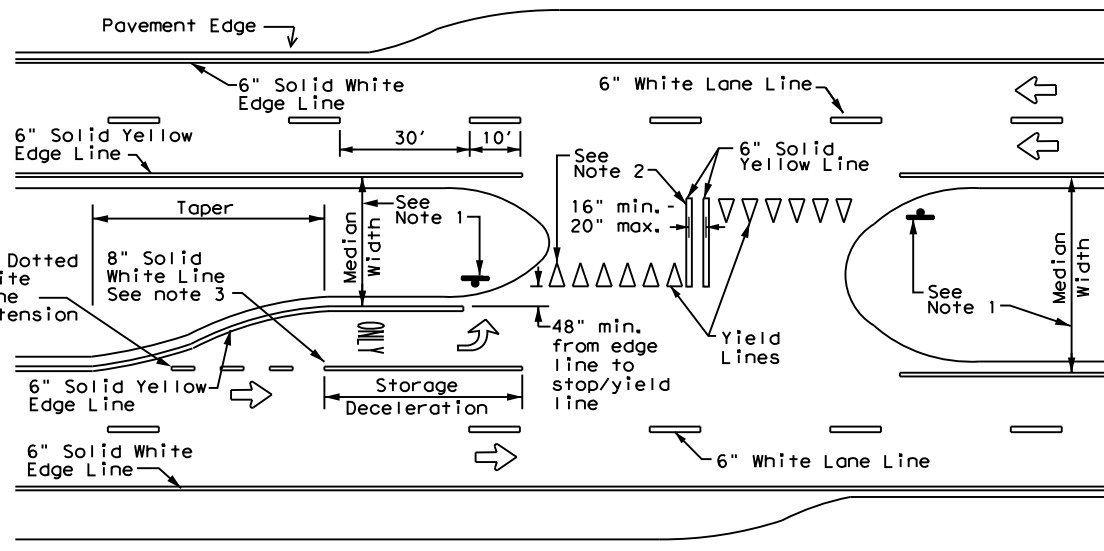
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

**GUIDE FOR PLACEMENT OF STOP LINES,  
 EDGE LINE & CENTERLINE**  
 Based on Traveled Way and Pavement Widths for Undivided Roadways



**FOUR LANE DIVIDED ROADWAY CROSSOVERS**

Texas Department of Transportation  
 Traffic Safety Division Standard

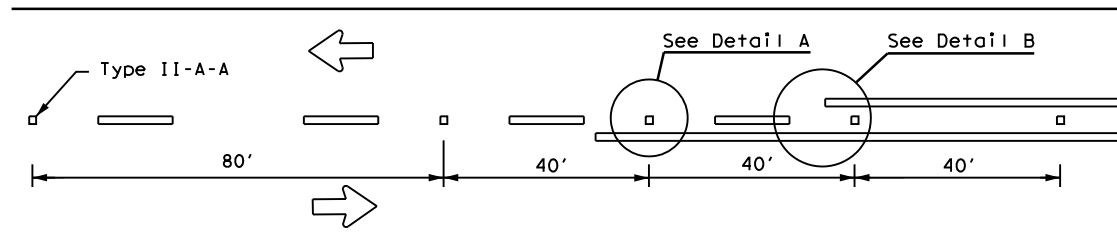
**TYPICAL STANDARD  
 PAVEMENT MARKINGS**

**PM(1) - 22**

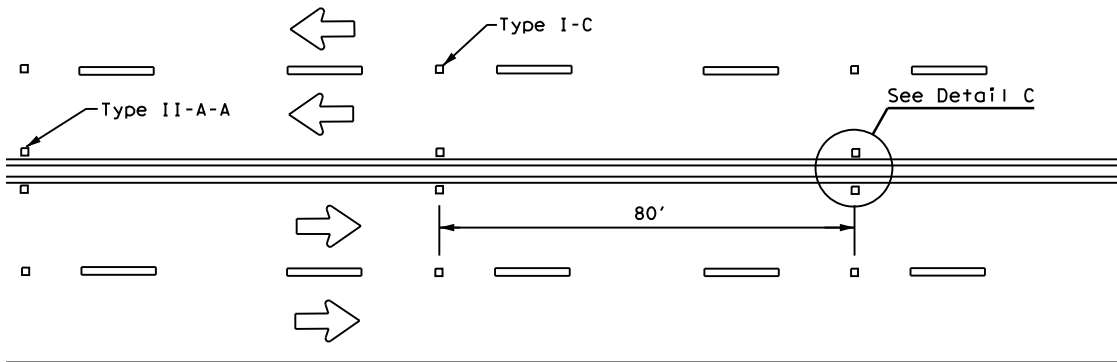
FILE: pm1-22.dgn	DN: 0113	CK: 07	DW: 072	CK: US290
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
11-78 8-00 6-20	DIST	COUNTY	SHEET NO.	
8-95 3-03 12-22	14	HAYS	71	
5-00 2-12				

# REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

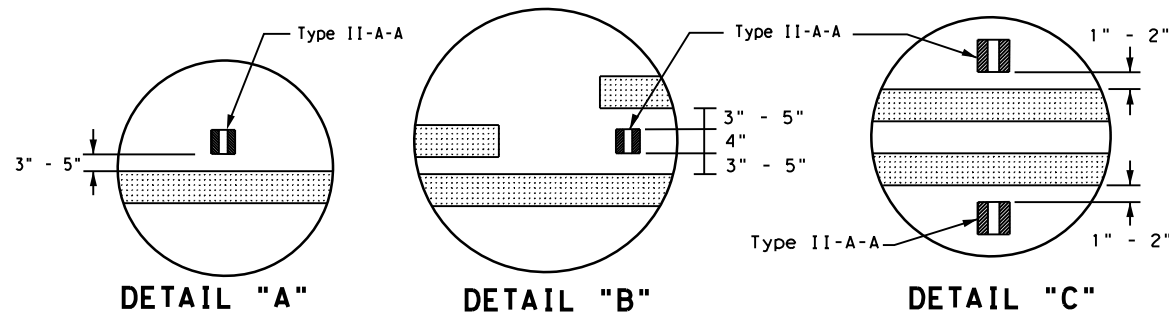
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**CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS**



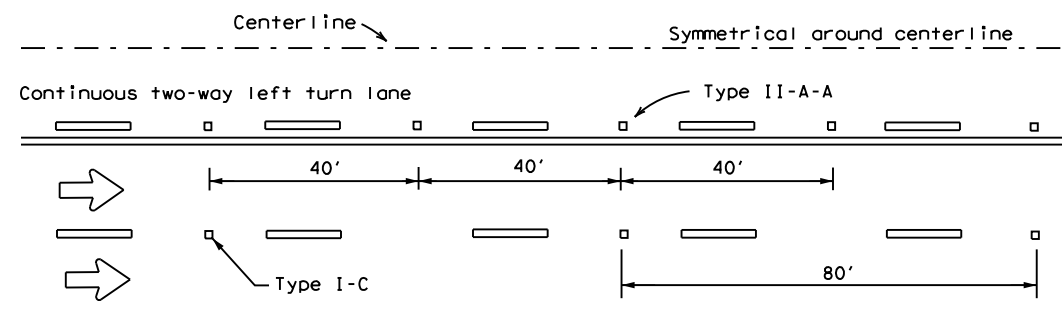
**CENTERLINE & LANE LINES  
FOR FOUR LANE TWO-WAY ROADWAYS**



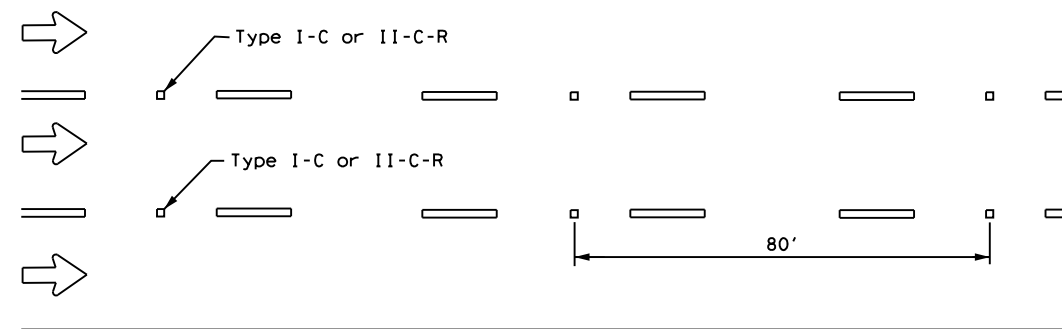
**DETAIL "A"**

**DETAIL "B"**

**DETAIL "C"**

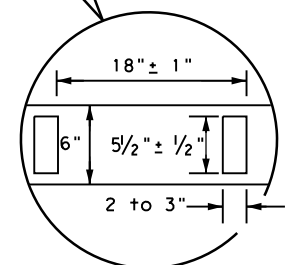
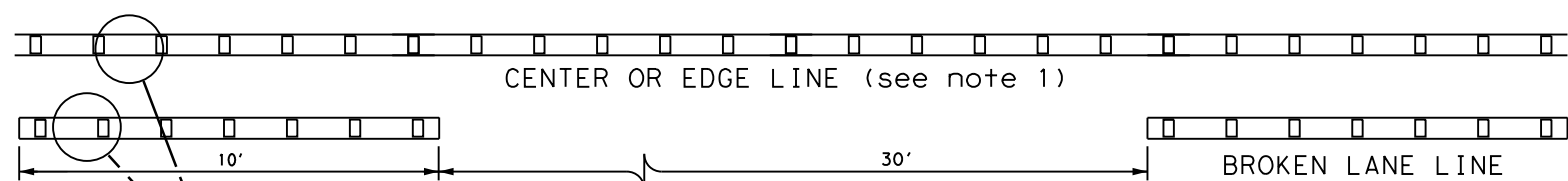


**CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE**



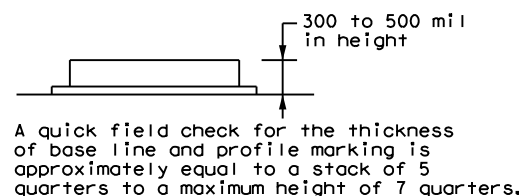
**LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)**

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.  
See Note 3.



**REFLECTORIZED PROFILE  
PATTERN DETAIL**

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



**NOTES**

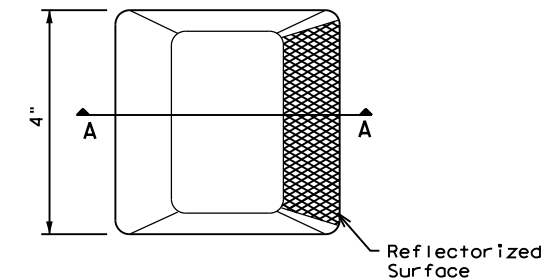
1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

**GENERAL NOTES**

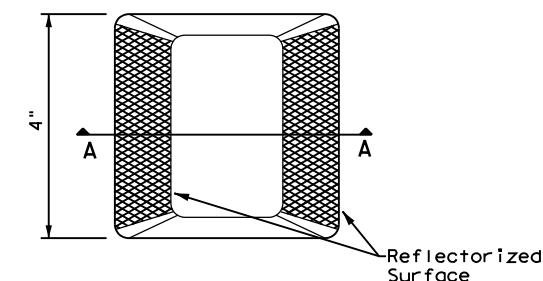
1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

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

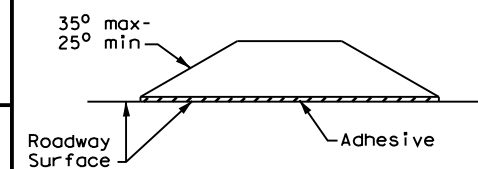
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



**Type I (Top View)**



**Type II (Top View)**



**SECTION A**

**RAISED PAVEMENT MARKERS**



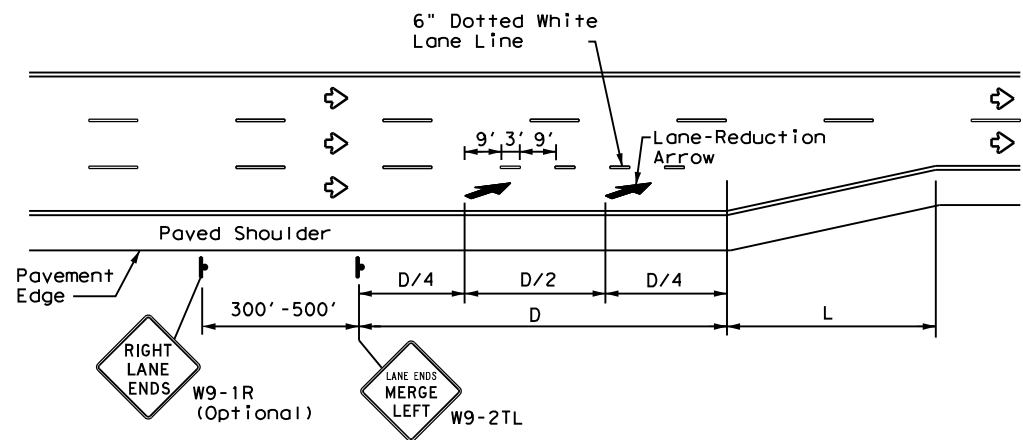
**POSITION GUIDANCE USING  
RAISED MARKERS  
REFLECTORIZED PROFILE  
MARKINGS  
PM(2) - 22**

FILE: pm2-22.dgn	DWG:	CHK:	DWG:	CHK:
© TxDOT December 2022	CONT:	SECT:	JOB:	HIGHWAY:
REVISIONS	0113	07	072	US290
4-77 8-00 6-20	DIST:	COUNTY:	SHEET NO.	
4-92 2-10 12-22	14	HAYS	72	
5-00 2-12				

DATE: 4/11/2023 3:48:08 PM  
FILE: K:\016874-000\Cad\Plan\STANDARDS\4 - TRAFFIC\pm2-22.dgn

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DATE: 4/11/2023 3:48:09 PM  
 FILE: K:\016874-000\Cad\Plan\STANDARDS\4 - TRAFFIC\pm3-22.dgn



LANE REDUCTION

NOTES

- Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
- On divided highways, an additional RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
- Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
- For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

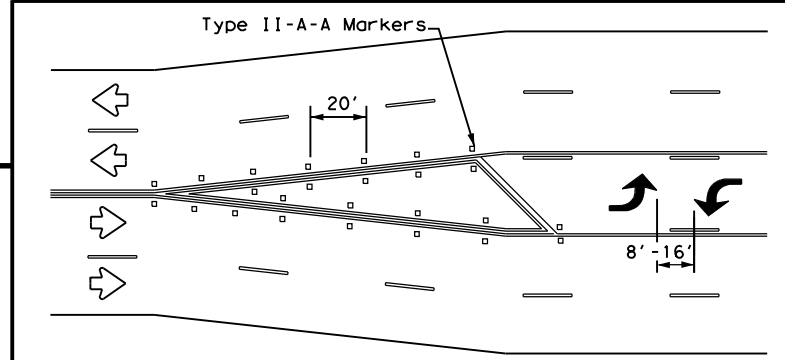
ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L = \frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	L=WS
45 MPH	775	
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

GENERAL NOTES

- Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
- When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
- Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
- Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

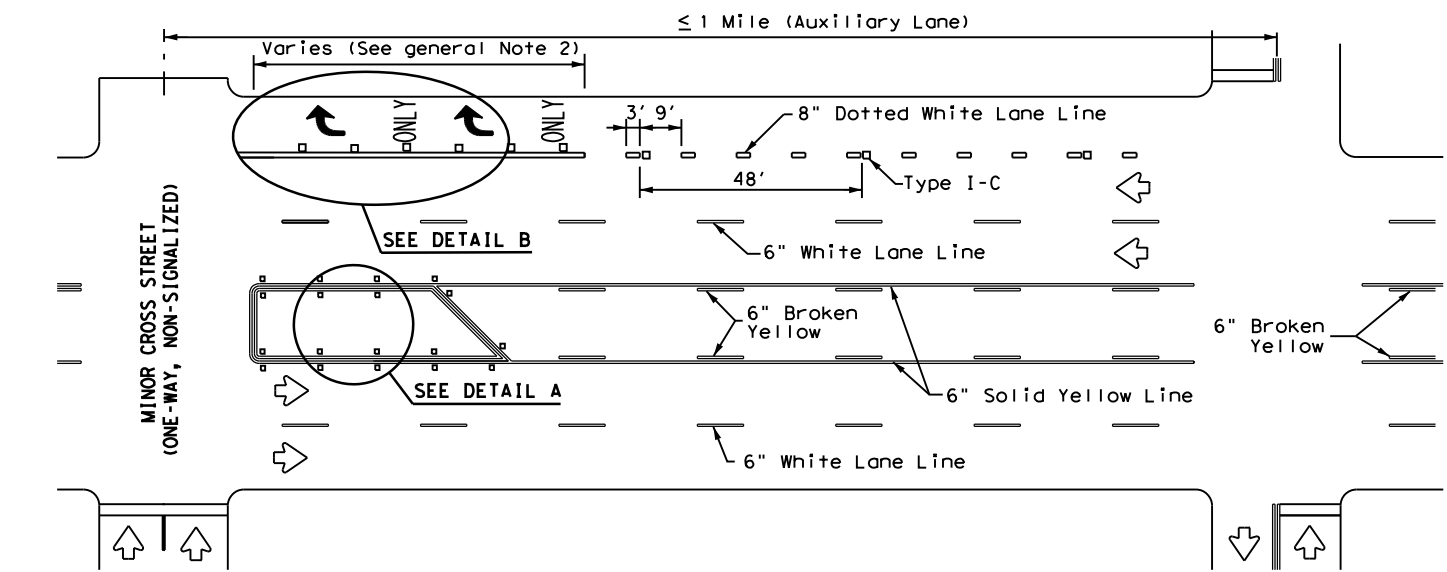
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

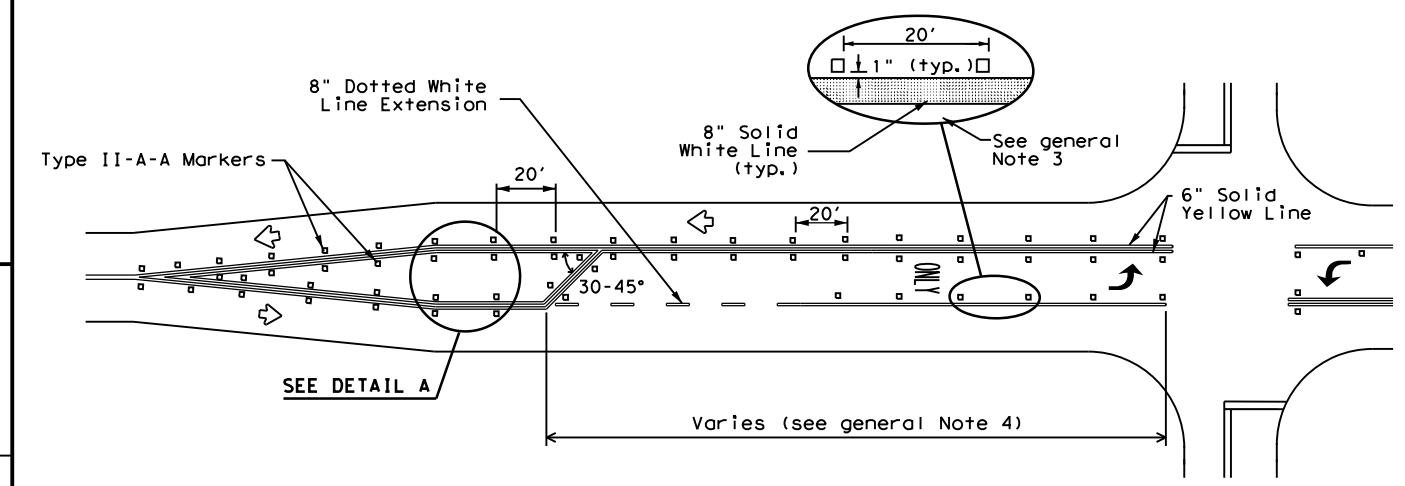


A two-way left-turn (TWLTL) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

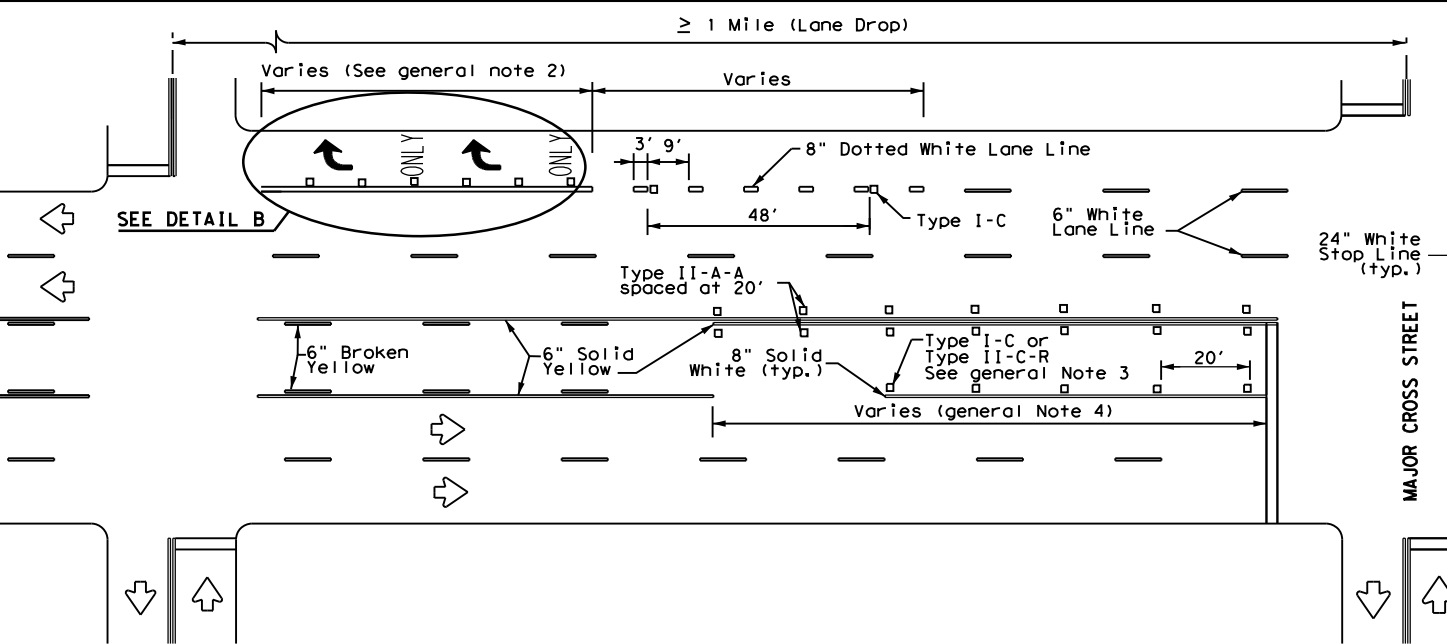
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



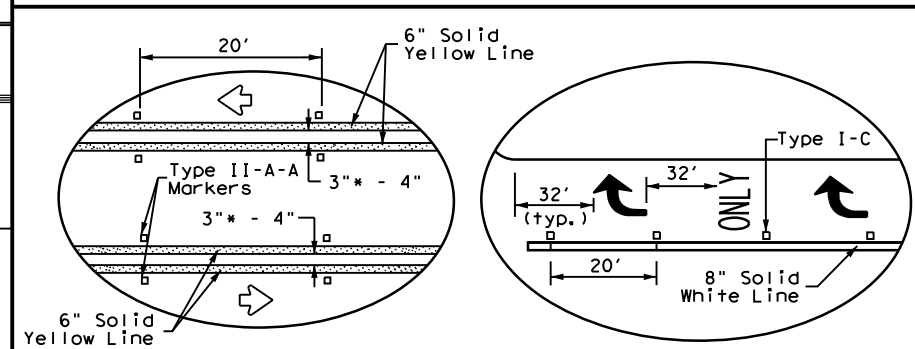
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



DETAIL A

DETAIL B

\* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation  
 Traffic Safety Division Standard

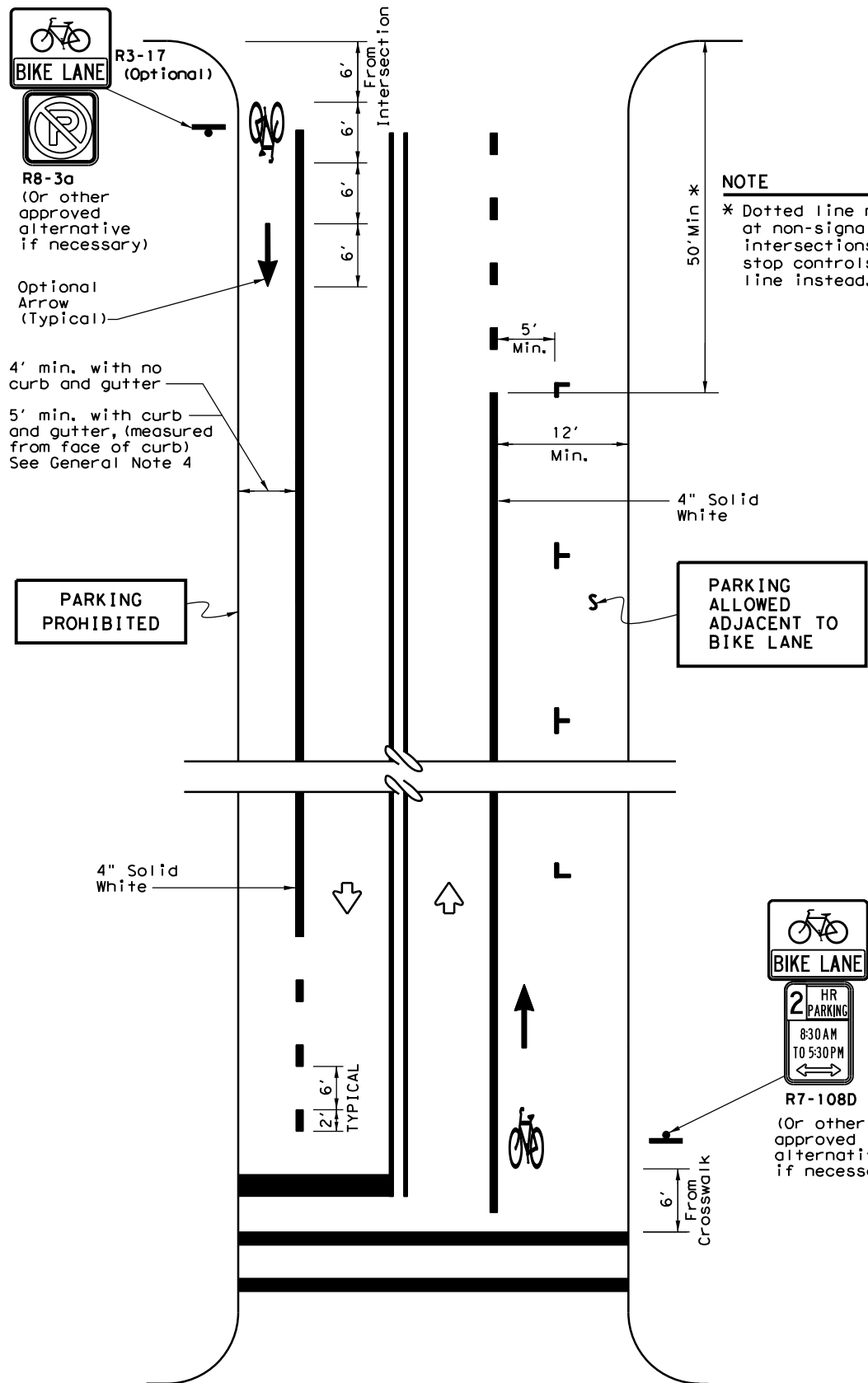
### TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3) - 22

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CON:	SECT:	JOB:	HIGHWAY:
REVISIONS	0113	07	072	US290
4-98 3-03 6-20	DIST:	COUNTY:	SHEET NO.:	
5-00 2-10 12-22	14	HAYS	73	
8-00 2-12				



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DATE: 4/11/2023 3:48:18 PM  
 FILE: K:\016874-000\Cad\Plan\STANDARDS\4 - TRAFFIC\blpm-10.dgn



**NOTES**

1. Bicycle lane pavement markings typically repeated after each intersection or signalized driveway.
2. On uninterrupted sections of roadway, bicycle lane pavement markings typically repeated as follows:  
 -1200' for 45 MPH or less roads  
 -2500' for 50 MPH and greater roads.

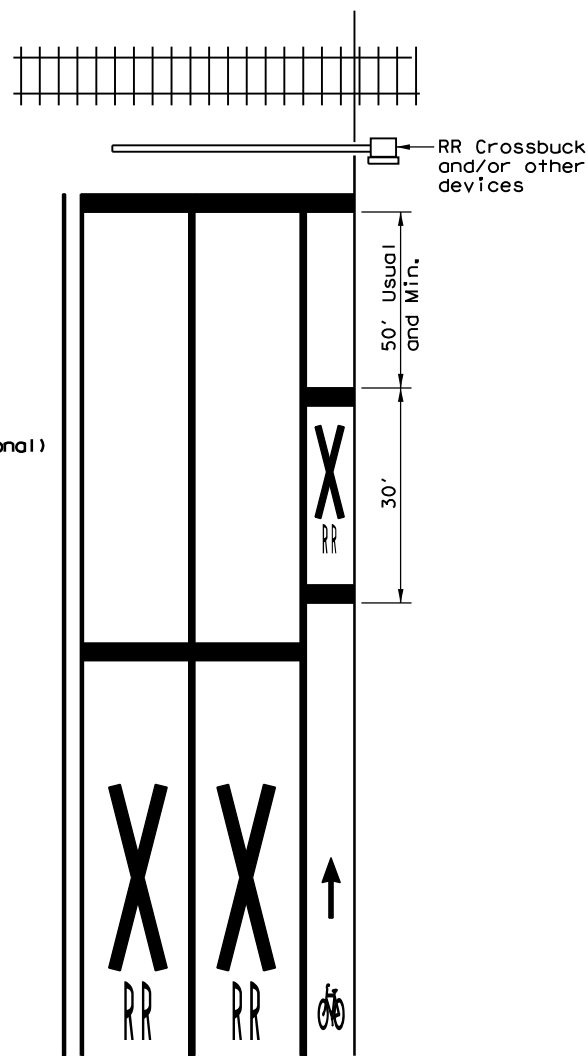
**TWO-WAY STREET**

**GENERAL NOTES**

1. All bicycle lane pavement markings shall be white unless otherwise noted.
2. All pavement marking materials shall meet the required Department Material Specifications as specified by the plans.
3. Exact sign placement and details are shown elsewhere in the plans.
4. The current edition of AASHTO'S Guide for the Development of Bicycle Facilities should be referenced for variations in design, other geometric conditions, and lane width options.
5. Other bicycle lane symbol or word markings as shown in the Texas Manual on Uniform Traffic Control Devices may be used. Details for words, arrows and symbols as shown in the Standard Highway Sign Designs for Texas.
6. The "BIKE LANE" (R3-17) sign with the "AHEAD" (R3-17a) sign mounted directly below should be installed in advance of the beginning of a marked bike lane.
7. The "BIKE LANE" (R3-17) sign with the "END" (R3-17b) sign mounted directly below should be installed at the end of marked bicycle lane.

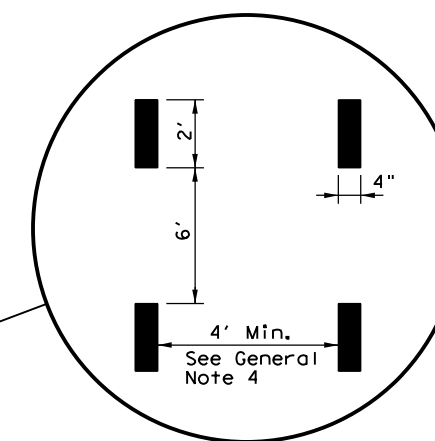
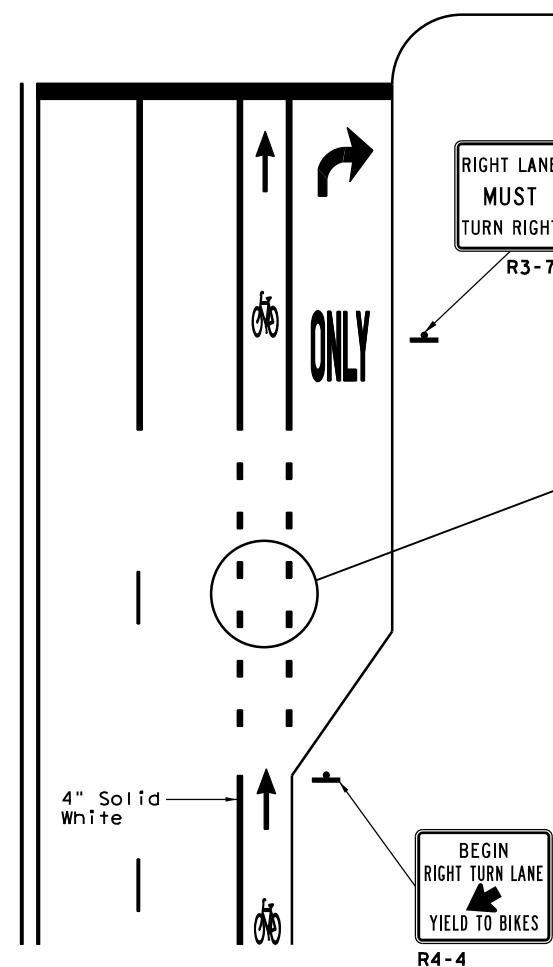
LEGEND	
	Sign
	Traffic Flow

SPECIFICATION REFERENCE TABLE	
Traffic Paint	DMS-8200
Hot Applied Thermoplastic	DMS-8220
Permanent Prefabricated Pavement Markings	DMS-8240
Glass Traffic Beads	DMS-8290



(See RCPM Standard for travel lane details)

**RAILROAD CROSSING APPROACH**



**DETAIL "A"**

Texas Department of Transportation  
 Traffic Operations Division

**BICYCLE LANE PAVEMENT MARKINGS**

**BLPM-10**

© TxDOT	May 2010	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS		CONT	SECT	JOB	HIGHWAY
		0113	07	072	US290
		DIST	COUNTY	SHEET NO.	
		14	HAYS	74	

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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)

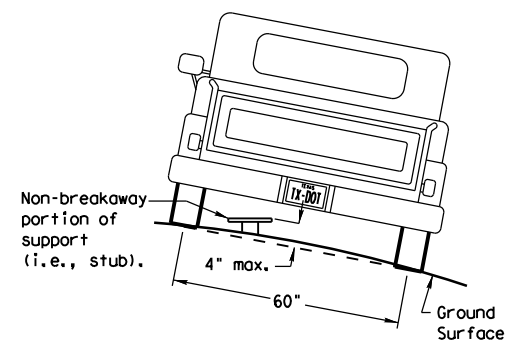
**Post Type**  
 FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))  
 TWT = Thin-Walled Tubing (see SMD(TWT))  
 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))  
 S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

**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))

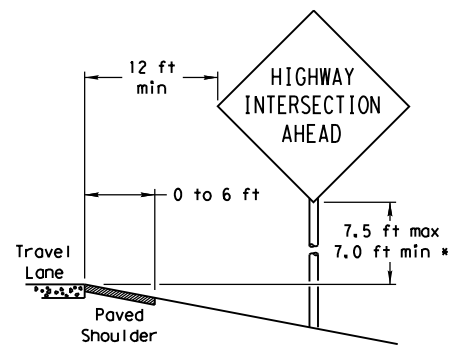
### REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

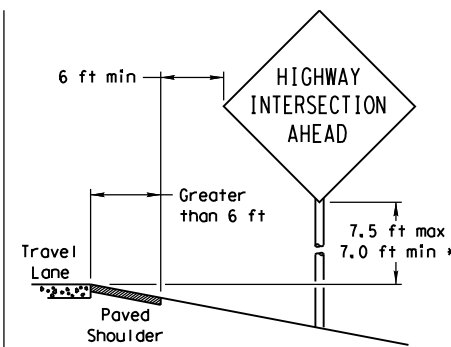
### SIGN LOCATION

#### PAVED SHOULDERS



LESS THAN 6 FT. WIDE

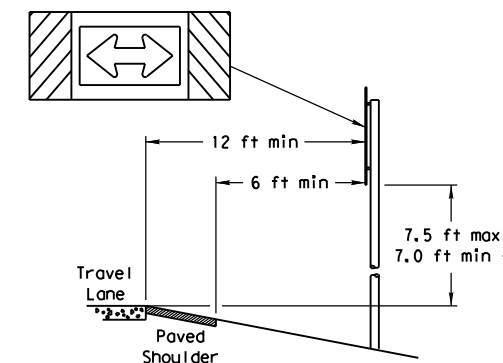
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



GREATER THAN 6 FT. WIDE

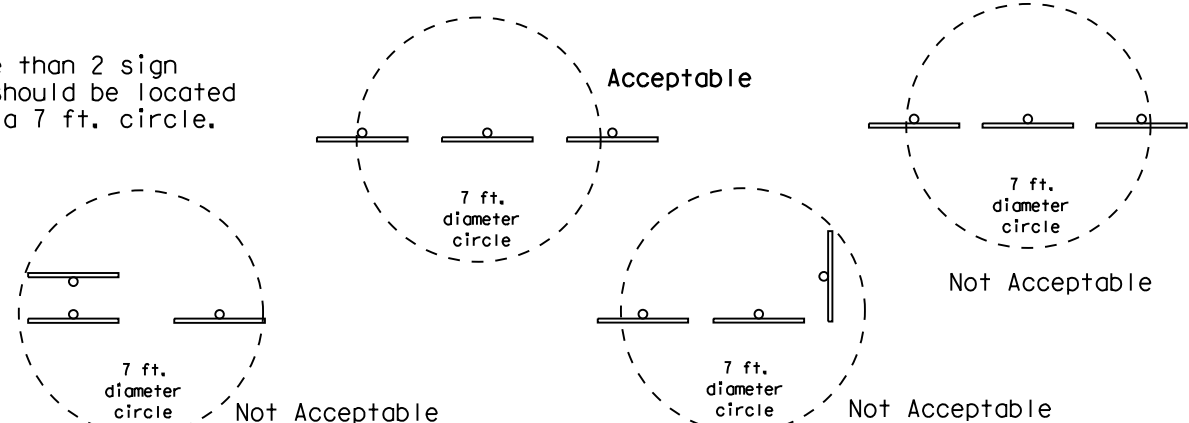
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

#### T-INTERSECTION

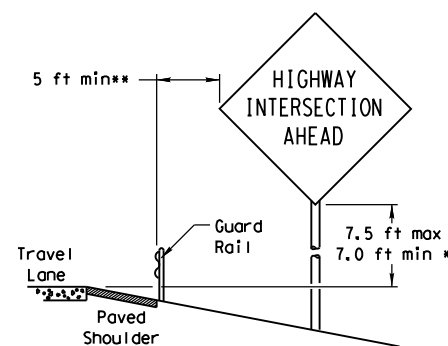


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

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

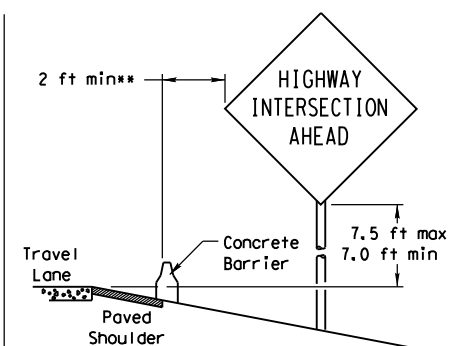


#### BEHIND BARRIER



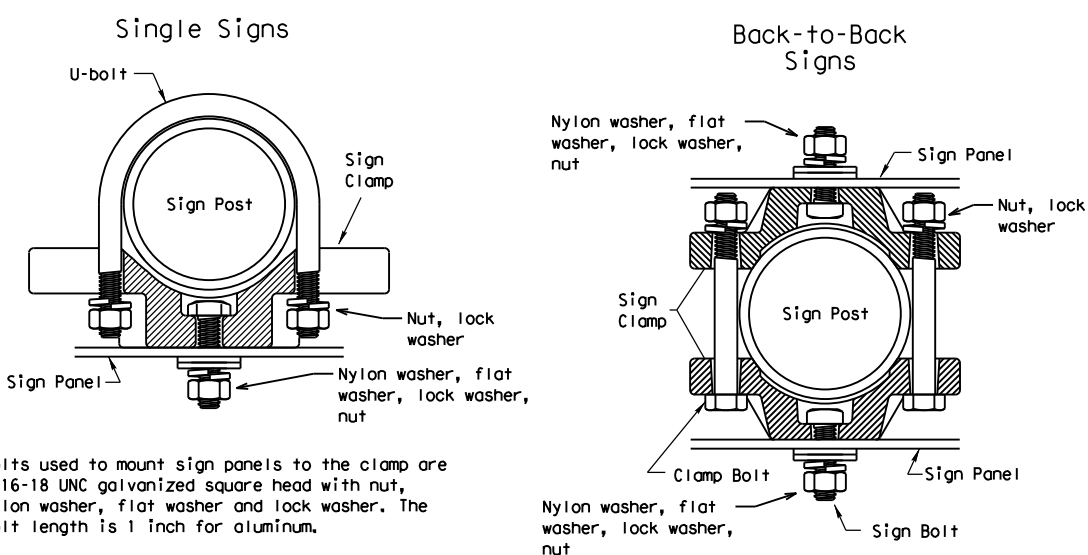
BEHIND GUARDRAIL

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



BEHIND CONCRETE BARRIER

### TYPICAL SIGN ATTACHMENT DETAIL



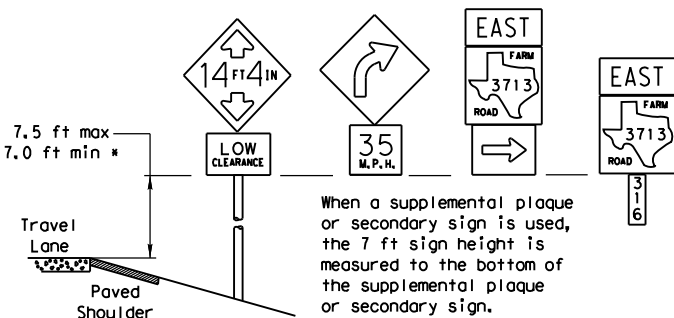
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

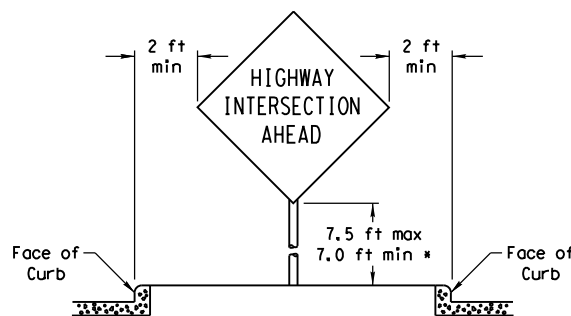
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

#### SIGNS WITH PLAQUES

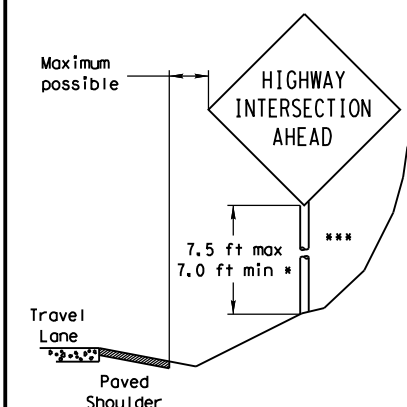


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

#### 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

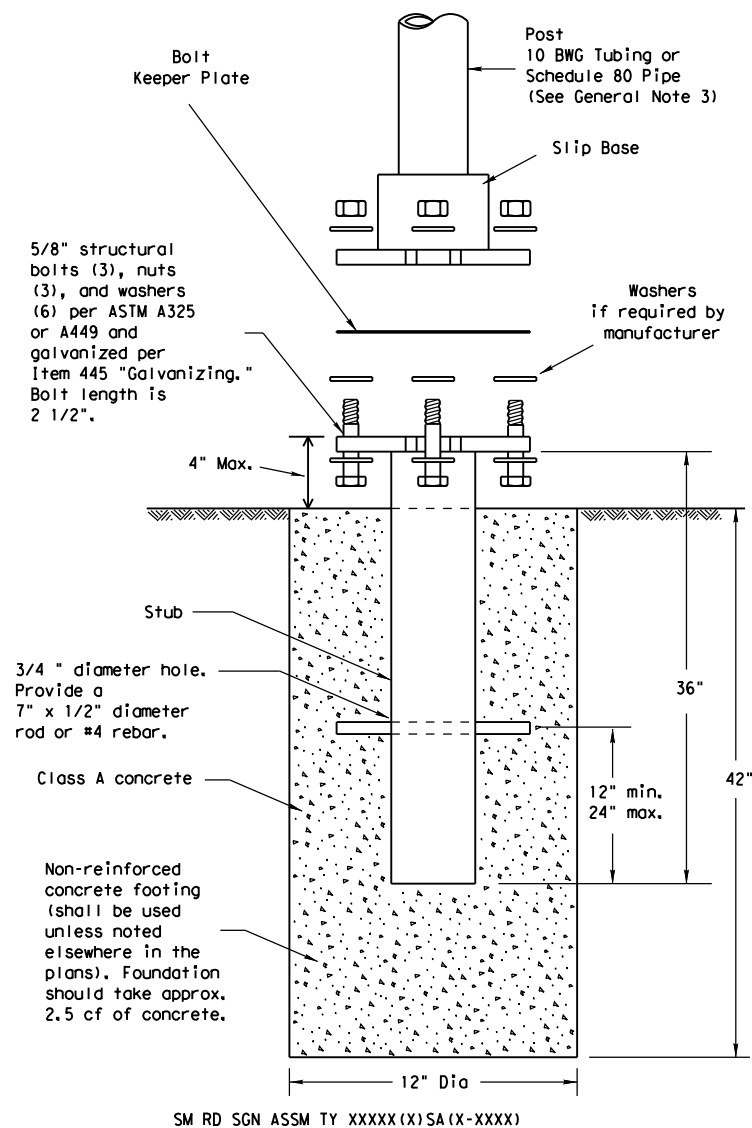
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9-08	REVISIONS	CONT	SECT	JOB
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		DIST	COUNTY	US290
		14	HAYS	75

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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

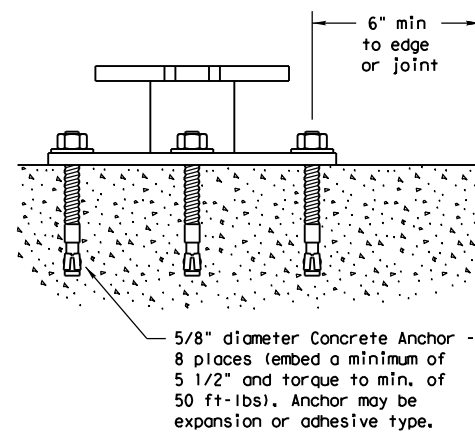
#### Foundation

- 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.

Texas Department of Transportation  
 Traffic Operations Division

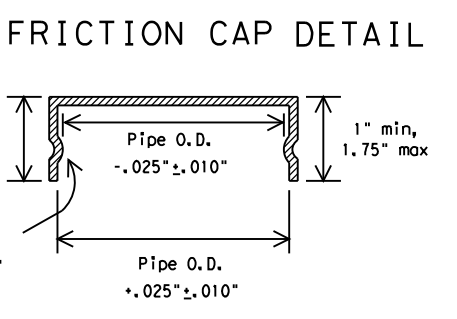
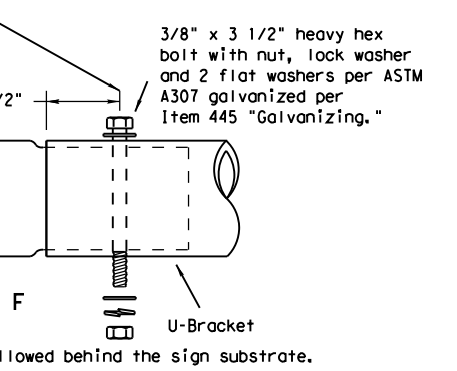
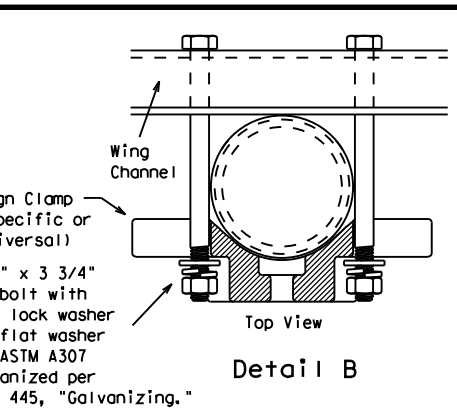
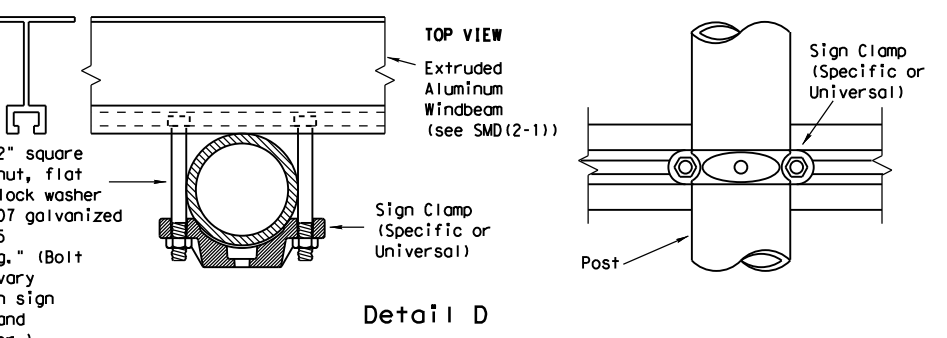
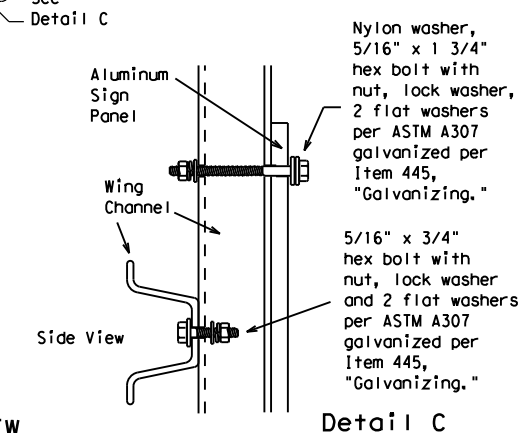
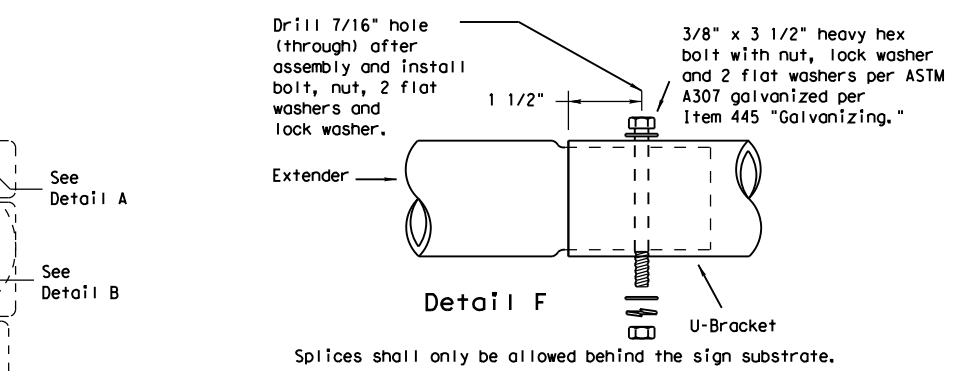
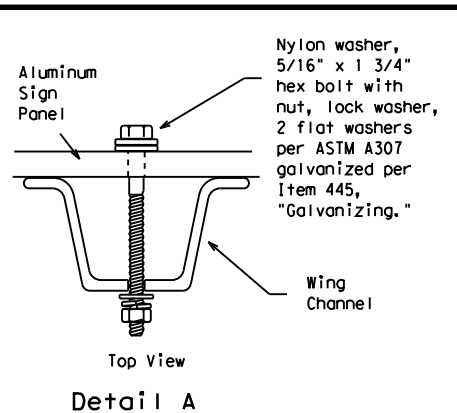
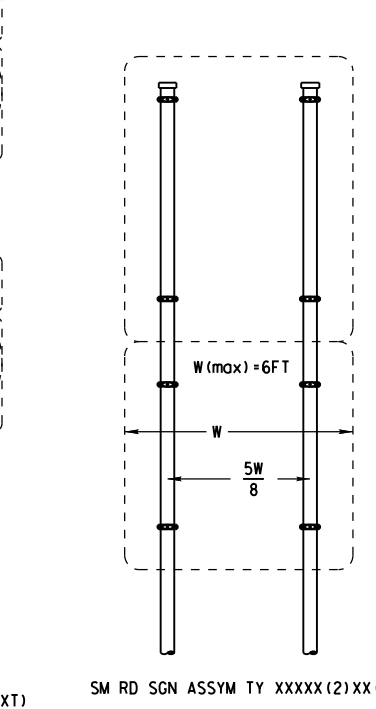
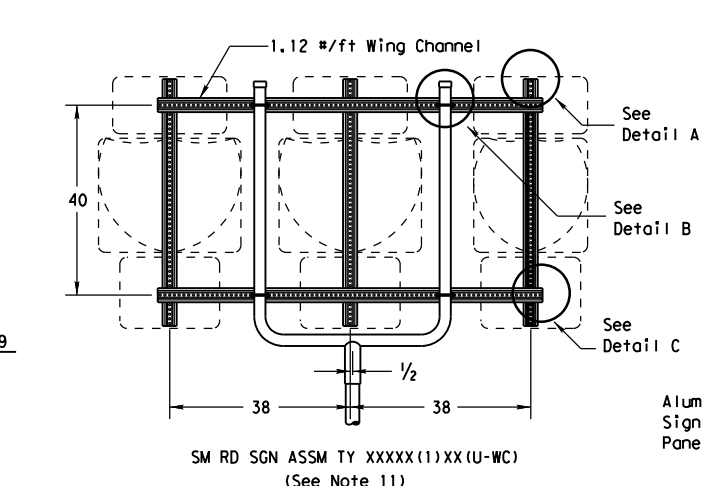
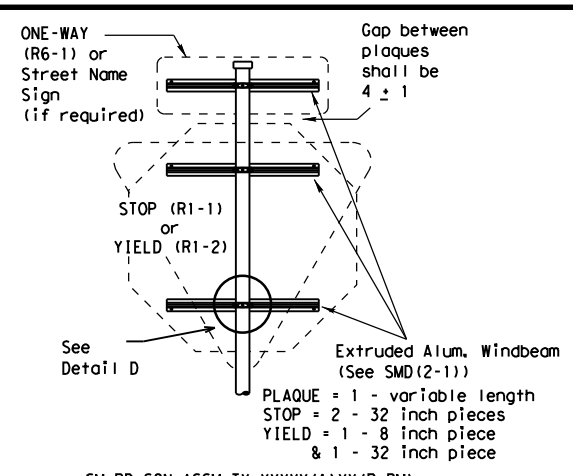
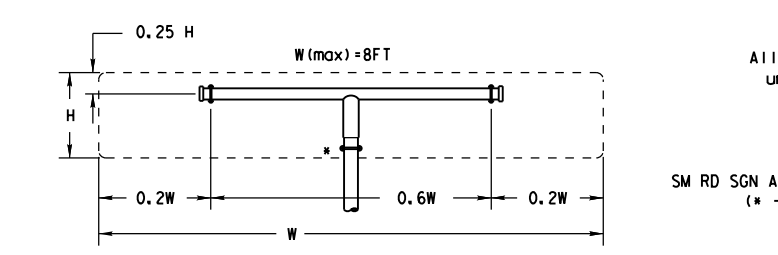
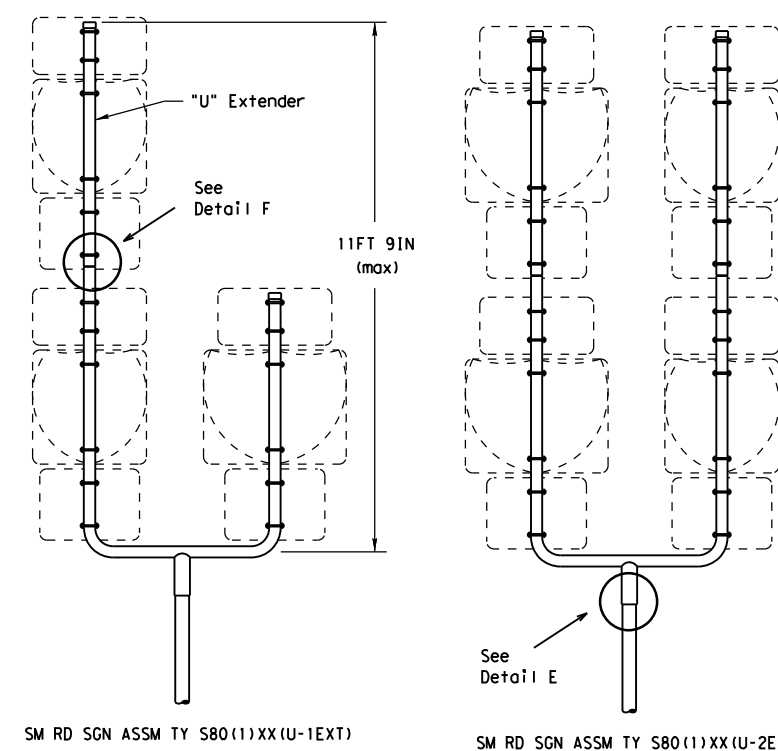
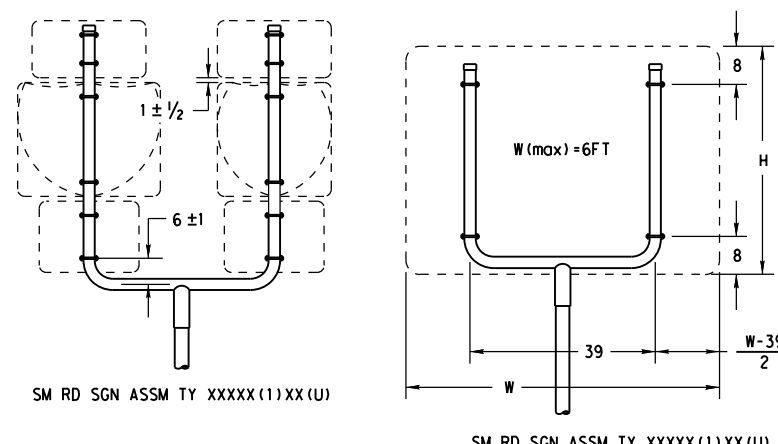
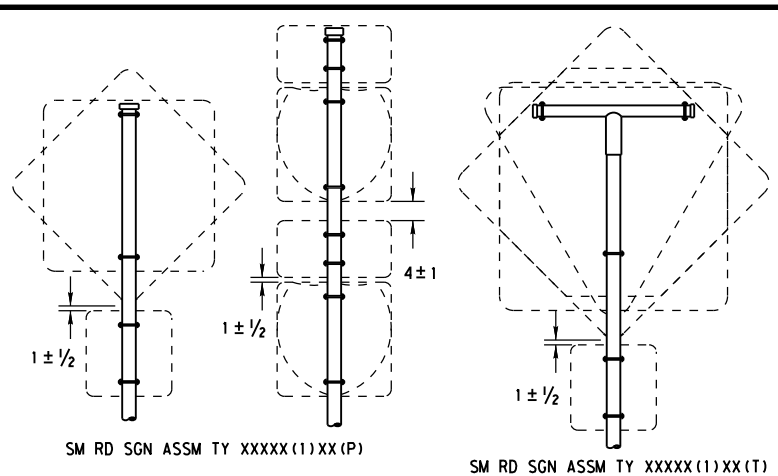
## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM SMD(SLIP-1)-08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
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		DIST	COUNTY	SHEET NO.	
		14	HAYS	76	

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All dimensions are in english unless detailed otherwise.

SM RD SGN ASSM TY XXXXX(1)XX(T) (\* - See Note 12)

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)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	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)	

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.

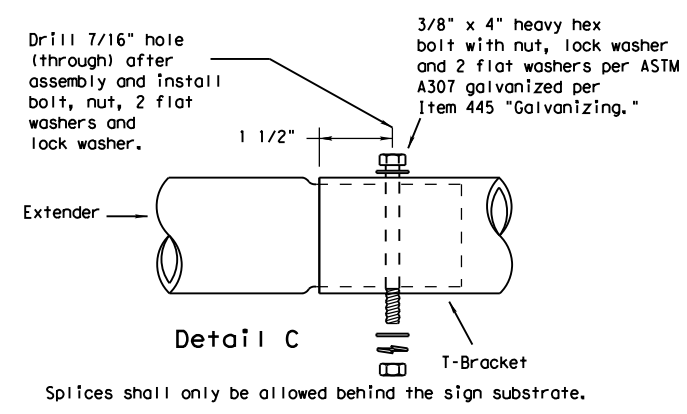
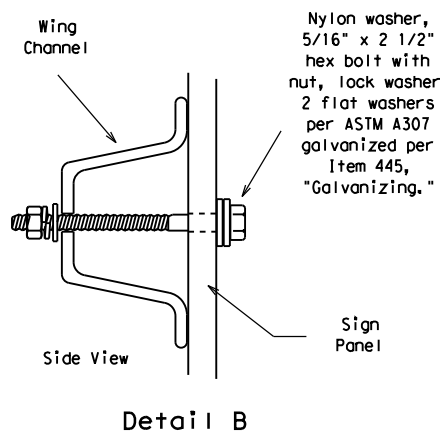
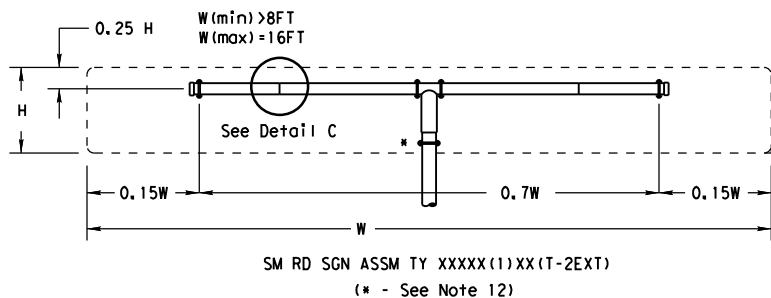


**SIGN MOUNTING DETAILS  
SMALL ROADSIDE SIGNS  
TRIANGULAR SLIPBASE SYSTEM  
SMD(SLIP-2)-08**

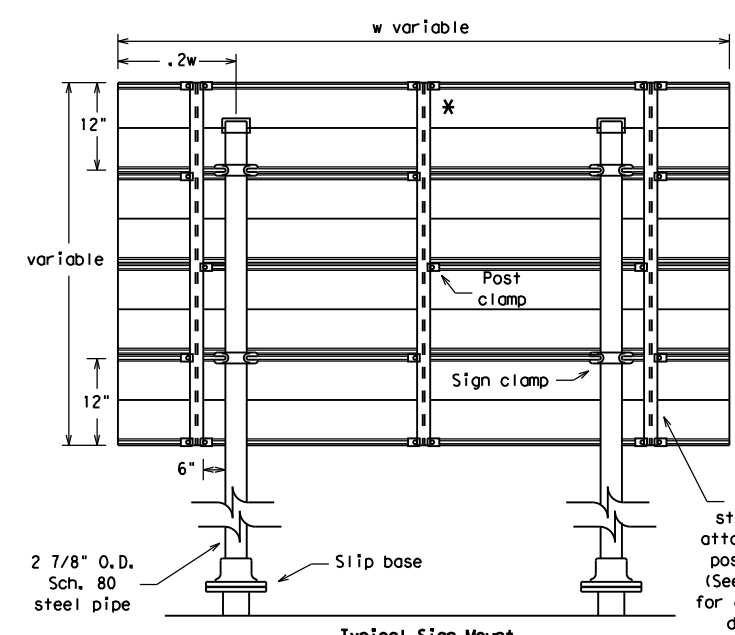
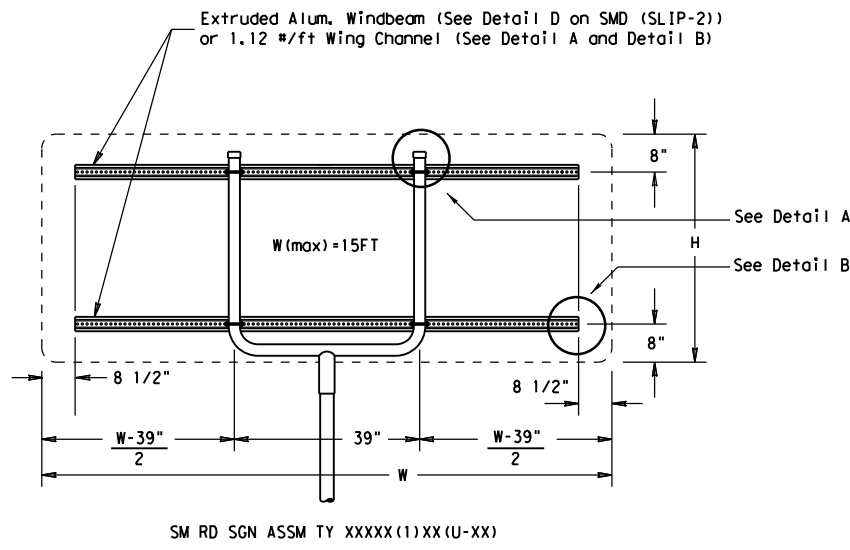
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9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	14	HAYS		77

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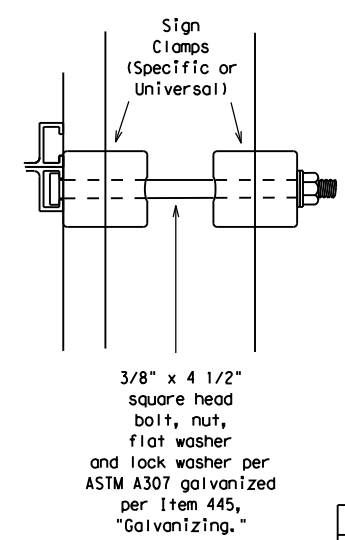
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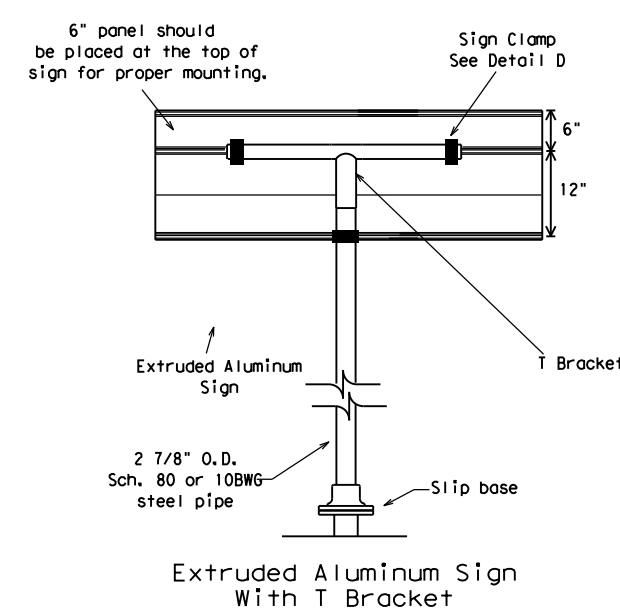
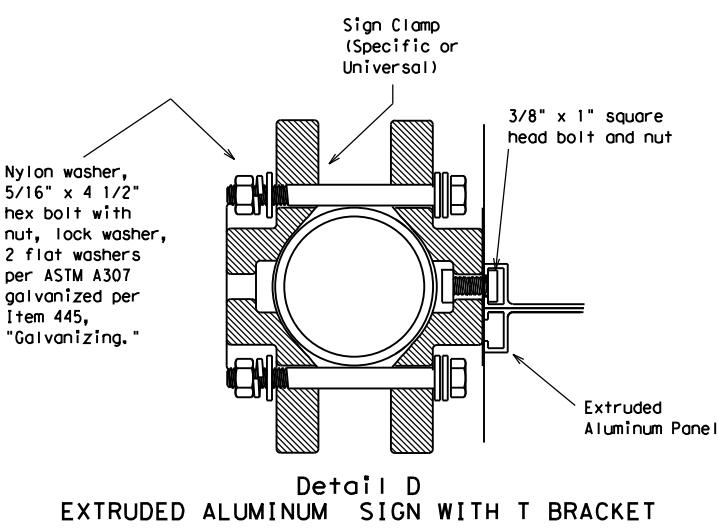
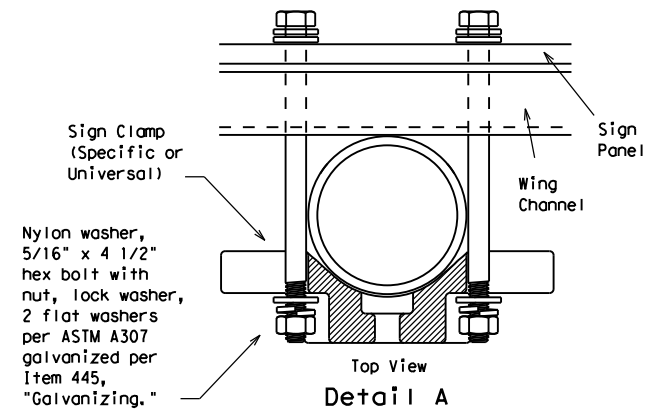
Splices shall only be allowed behind the sign substrate.



\* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



See Detail E for clamp installation



Use Extruded Alum. Windbeam as stiffeners See SMD (2-1) for additional details  
 See Detail E for clamp installation

GENERAL NOTES:

- | SIGN SUPPORT | # OF POSTS | MAX. SIGN AREA |
|--------------|------------|----------------|
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| 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."
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
- Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	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-3) -08**

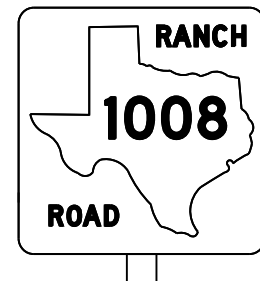
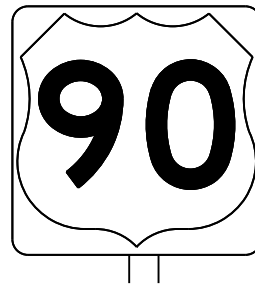
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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
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		DIST	COUNTY		SHEET NO.
		14	HAYS		78

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## REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

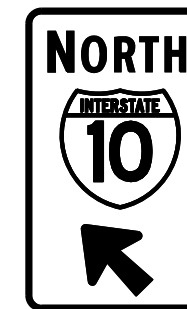
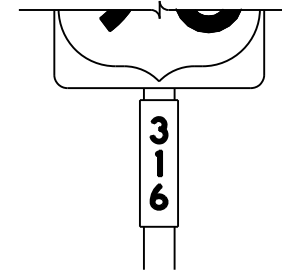
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

## REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

## GENERAL NOTES

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

- Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.
- Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

<http://www.txdot.gov/>



## TYPICAL SIGN REQUIREMENTS

### TSR(3) - 13

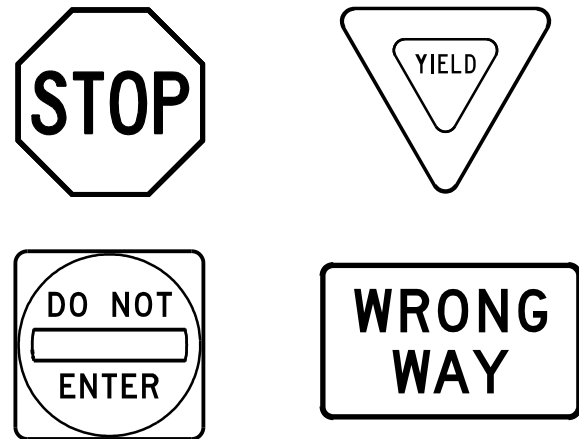
FILE:	tsr3-13.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0113	07	072	US290				
12-03	7-13	DIST	COUNTY	SHEET NO.					
9-08		14	HAYS	79					

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### REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

### REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

### GENERAL NOTES

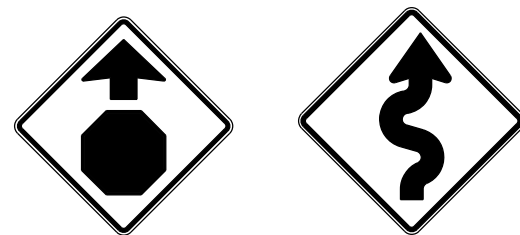
- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
- White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
- Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

### REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

### REQUIREMENTS FOR SCHOOL SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

				<i>Traffic Operations Division Standard</i>	
<h2>TYPICAL SIGN REQUIREMENTS</h2>					
<h3>TSR(4) - 13</h3>					
FILE:	tsr4-13.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2003	CONT:	SECT:	JOB:	HIGHWAY:
REVISIONS		0113	07	072	US290
12-03	7-13	DIST:	COUNTY:	SHEET NO.	
9-08		14	HAYS	80	



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**GENERAL NOTES FOR ALL ELECTRICAL WORK**

- The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.
- Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.
- Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is 1/2 in. or less in diameter.
- Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.
- Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.
- When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

**CONDUIT**

**A. MATERIALS**

- Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.
- Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.
- Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.


AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

- Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.
- Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.
- Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.
- Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

- Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.
- When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.
- Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

**B. CONSTRUCTION METHODS**

- Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.
- Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.
- Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.
- Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.
- When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."
- Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.
- During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.
- Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.
- Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.
- Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.
- At all electrical services, install a 6 AWG solid copper grounding electrode conductor.
- Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).
- Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.
- File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

				<b>Traffic Operations Division Standard</b>	
<h1>ELECTRICAL DETAILS CONDUITS &amp; NOTES</h1>					
<h2>ED(1) - 14</h2>					
FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
© TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		0113	07	072	US290
	DIST	COUNTY		SHEET NO.	
	14	HAYS		81	

# ELECTRICAL CONDUCTORS

## A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS) 11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

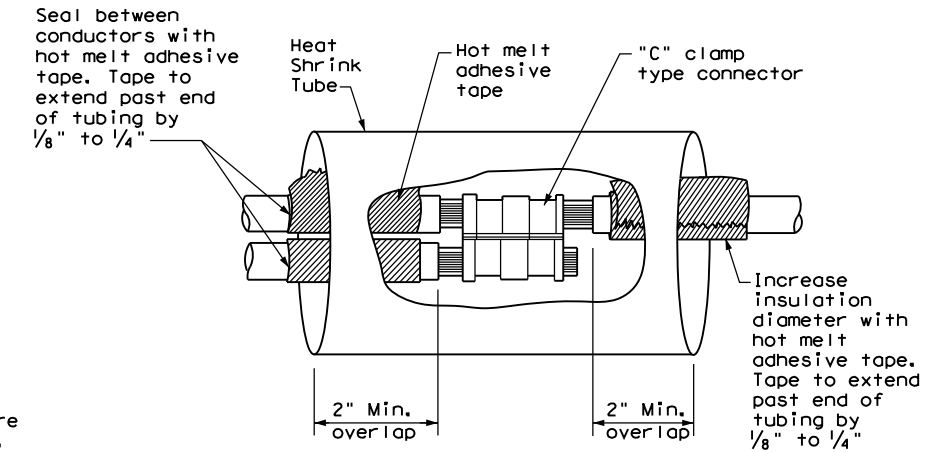
## B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

## C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.



**SPLICE OPTION 1  
Compression Type**

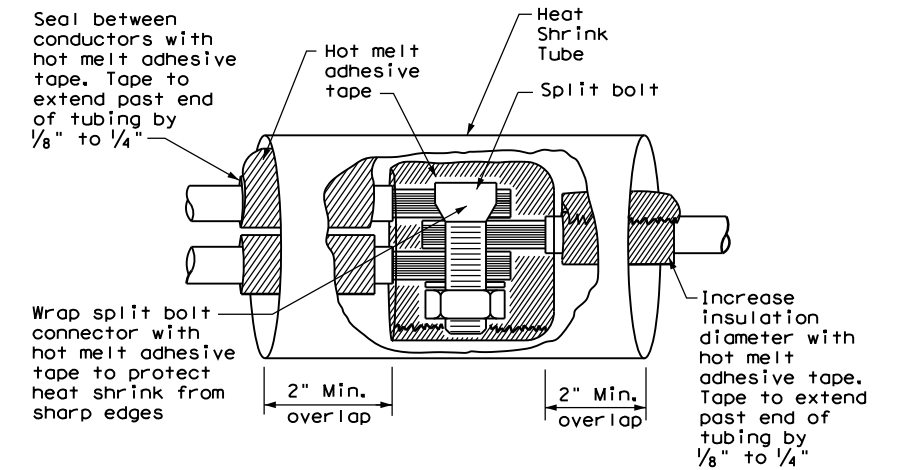
## GROUND RODS & GROUNDING ELECTRODES

### A. MATERIAL INFORMATION

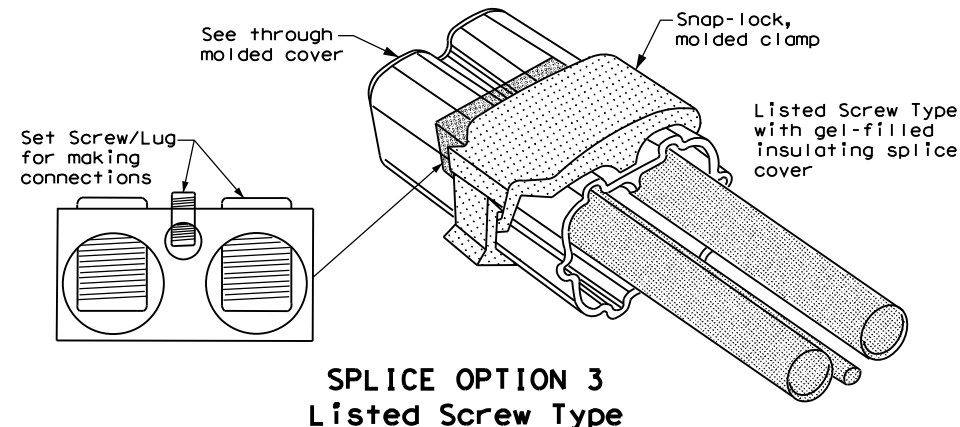
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

### B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



**SPLICE OPTION 2  
Split Bolt Type**



**SPLICE OPTION 3  
Listed Screw Type**

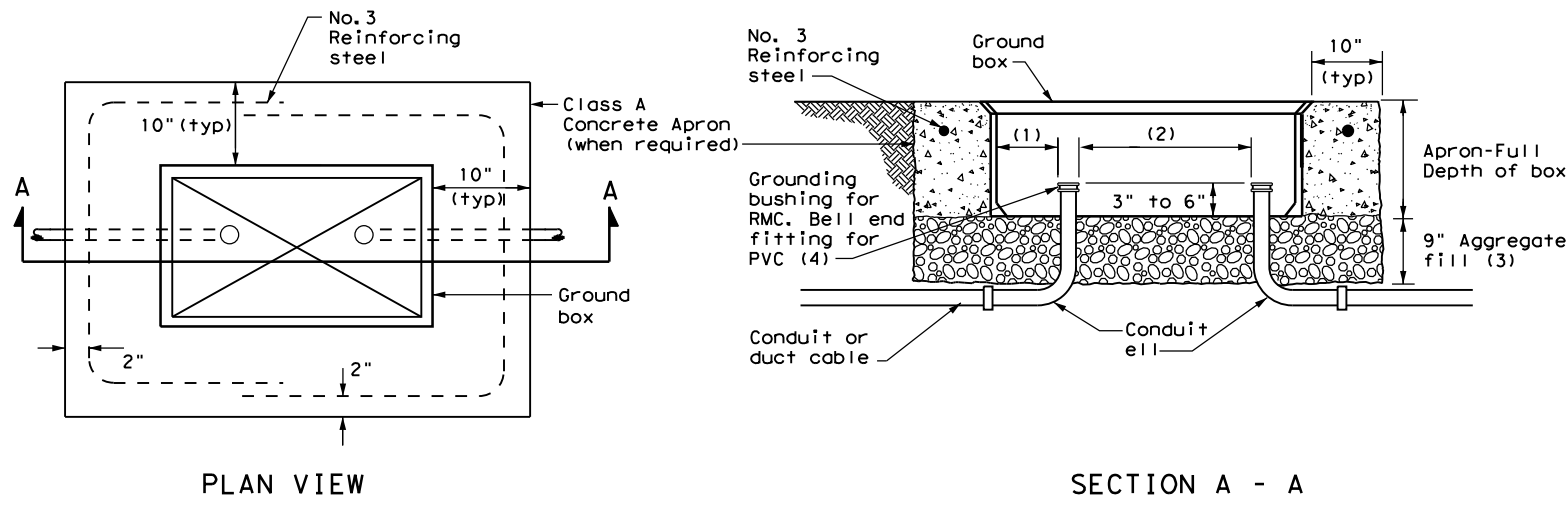
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		<b>Texas Department of Transportation</b>		<b>Traffic Operations Division Standard</b>	
<h1>ELECTRICAL DETAILS CONDUCTORS</h1>					
<h2>ED(3) - 14</h2>					
FILE:	ed3-14.dgn	DW:	TxDOT	CK:	TxDOT
© TxDOT	October 2014	CONT:	0113	SECT:	07
REVISIONS		JOB:	072	HIGHWAY:	US290
		DIST:	14	COUNTY:	HAYS
				SHEET NO.:	82

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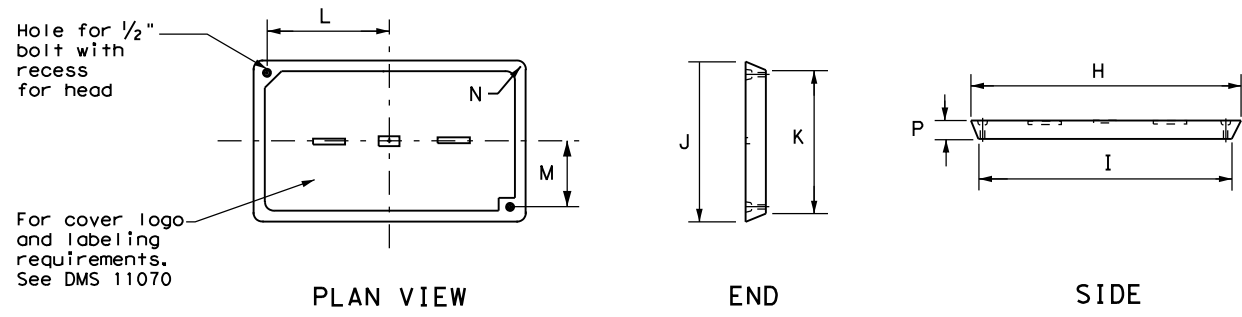


**APRON FOR GROUND BOX**

- (1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.
- (2) Maintain sufficient space between conduits to allow for proper installation of bushing.
- (3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.
- (4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



**GROUND BOX COVER**

**GROUND BOXES**

**A. MATERIALS**

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."
2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.
3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.
4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

**B. CONSTRUCTION METHODS**

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.
2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.
3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.
4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.
5. Temporarily seal all conduits in the ground box until conductors are installed.
6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.
7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.
8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.
9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.
10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.
11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

				Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS</h2> <h3>GROUND BOXES</h3> <h4>ED(4) - 14</h4>					
FILE:	ed4-14.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2014	CONT:	0113	SECT:	07
REVISIONS		JOB:	072	HIGHWAY:	US290
DIST:	14	COUNTY:	HAYS	SHEET NO.:	83

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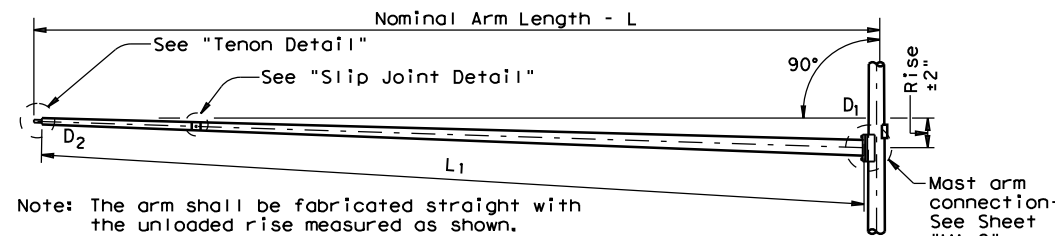
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Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D <sub>B</sub>	D <sub>19</sub>	D <sub>24</sub>	D <sub>30</sub>	① thk	D <sub>B</sub>	D <sub>19</sub>	D <sub>24</sub>	D <sub>30</sub>	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	10.5	7.8	7.1	6.3	.179	11.5	8.5	7.7	6.8	.179	30-A
24	11.0	8.3	7.6	6.8	.179	12.0	9.0	8.2	7.3	.179	30-A
28	11.5	8.8	8.1	7.3	.179	12.5	9.5	8.7	7.8	.179	30-A
32	12.5	9.8	9.1	8.3	.179	12.0	9.0	8.2	7.3	.239	30-A
36	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
40	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
44	12.5	9.8	9.1	8.3	.239	14.0	11.0	10.2	9.3	.239	36-A
48	13.0	10.3	9.6	8.8	.239	15.0	12.0	11.2	10.3	.239	36-A

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	① thk	Rise	L <sub>1</sub>	D <sub>1</sub>	② D <sub>2</sub>	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-1"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"
48	47.0	10.5	4.1	.239	3'-4"	47.0	11.0	3.5	.239	2'-9"

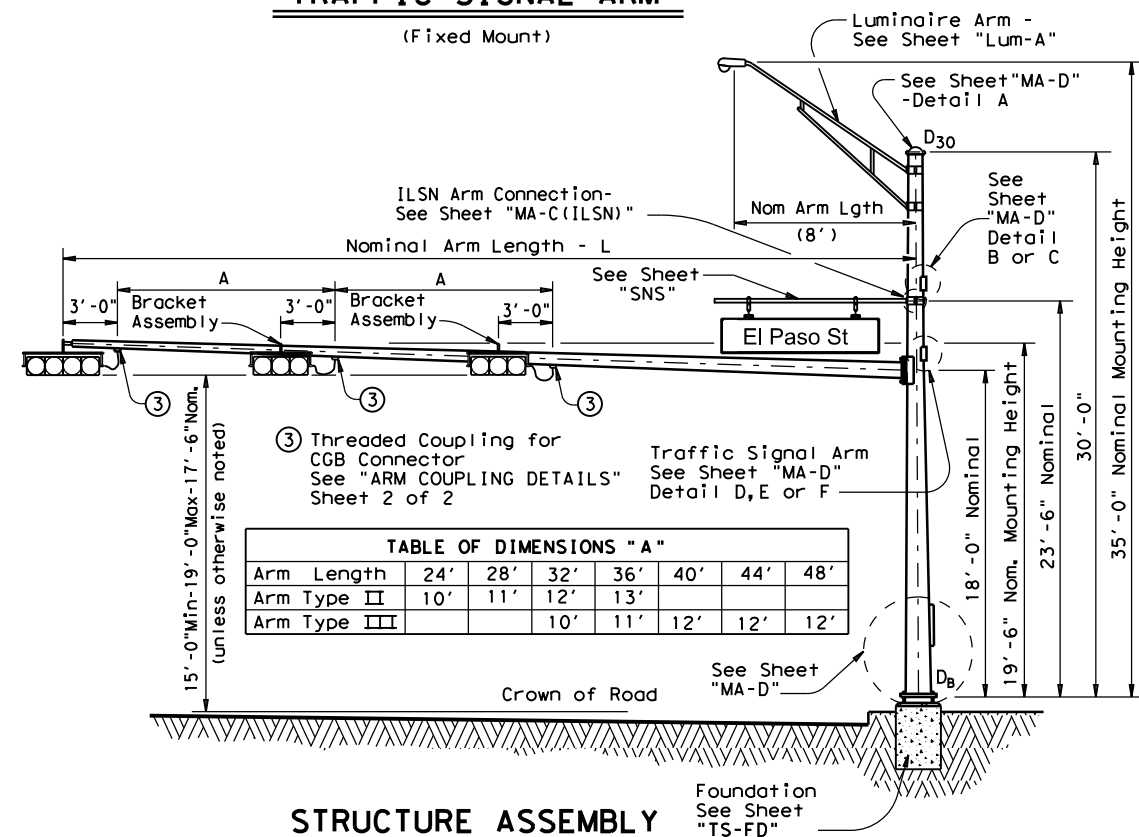
D<sub>B</sub> = Pole Base O.D.  
 D<sub>19</sub> = Pole Top O.D. with no Luminaire and no ILSN  
 D<sub>24</sub> = Pole Top O.D. with ILSN w/out Luminaire  
 D<sub>30</sub> = Pole Top O.D. with Luminaire  
 D<sub>1</sub> = Arm Base O.D.  
 D<sub>2</sub> = Arm End O.D.  
 L<sub>1</sub> = Shaft Length  
 L = Nominal Arm Length

- ① Thickness shown are minimums, thicker materials may be used.
- ② D<sub>2</sub> may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

**TRAFFIC SIGNAL ARM**  
(Fixed Mount)



③ Threaded Coupling for CGB Connector See "ARM COUPLING DETAILS" Sheet 2 of 2

TABLE OF DIMENSIONS "A"							
Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type II	10'	11'	12'	13'			
Arm Type III			10'	11'	12'	12'	12'

**STRUCTURE ASSEMBLY**

**SHIPPING PARTS LIST**

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Designation	Quantity	Designation	Quantity	Designation	Quantity
ft						
20	20L-80		20S-80		20-80	
24	24L-80	1	24S-80		24-80	
28	28L-80		28S-80		28-80	
32	32L-80		32S-80		32-80	
36	36L-80		36S-80		36-80	
40	40L-80	1	40S-80		40-80	
44	44L-80		44S-80		44-80	
48	48L-80		48S-80		48-80	

Traffic Signal Arms (1 per Pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	Designation	Quantity	Designation	Quantity	Designation	Quantity
ft						
20	20I-80					
24	24I-80		24II-80	1		
28	28I-80		28II-80			
32			32II-80		32III-80	
36			36II-80		36III-80	
40					40III-80	1
44					44III-80	
48					48III-80	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	2

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 1/2"	3'-4"	1
1 3/4"	3'-10"	1

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

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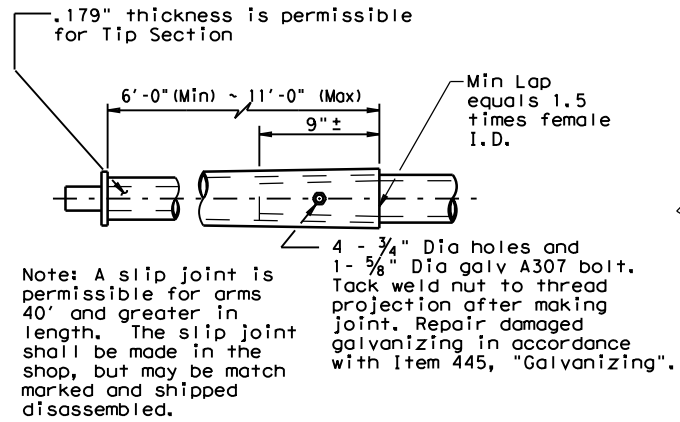
SHEET 1 OF 2

Texas Department of Transportation  
 Traffic Operations Division  
**TRAFFIC SIGNAL SUPPORT STRUCTURES**  
 SINGLE MAST ARM ASSEMBLY  
 (80 MPH WIND ZONE)  
**SMA-80(1)-12**

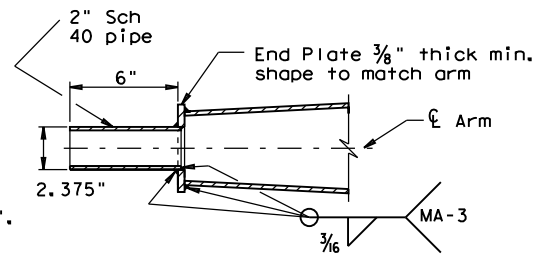
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11-99					
1-12					
	DIST	COUNTY		SHEET NO.	
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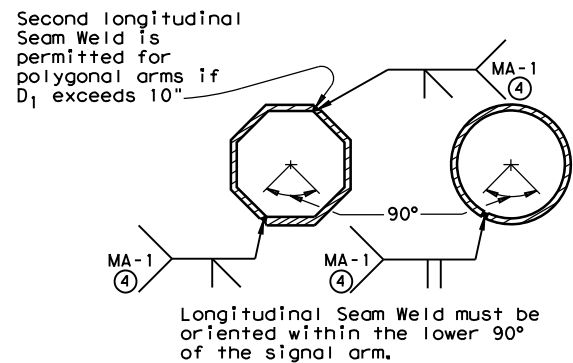
**SLIP JOINT DETAIL**



**TENON DETAIL**

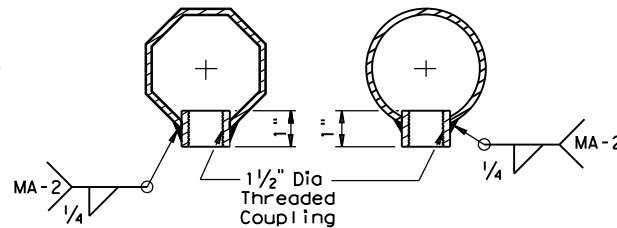
Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 1/2" Dia Threaded Coupling.

**BRACKET ASSEMBLY**



**ARM WELD DETAIL**

④ 60% Min. penetration  
 100% penetration within  
 6" of circumferential  
 base welds.



**ARM COUPLING DETAILS**

**VIBRATION WARNING**

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backplates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

**GENERAL NOTES:**

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.



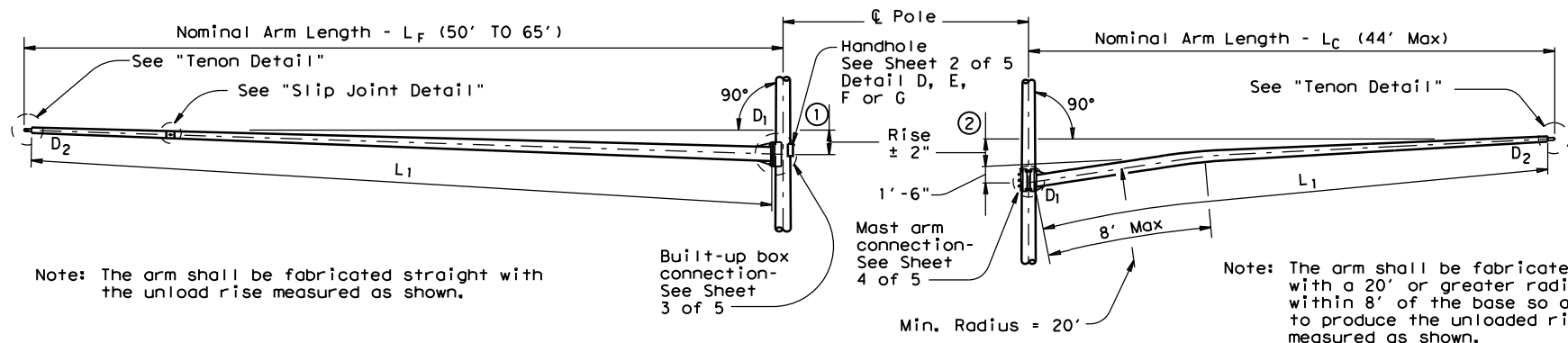
**TRAFFIC SIGNAL  
 SUPPORT STRUCTURES  
 SINGLE MAST ARM ASSEMBLY  
 (80 MPH WIND ZONE)**

**SMA-80(2) - 12**

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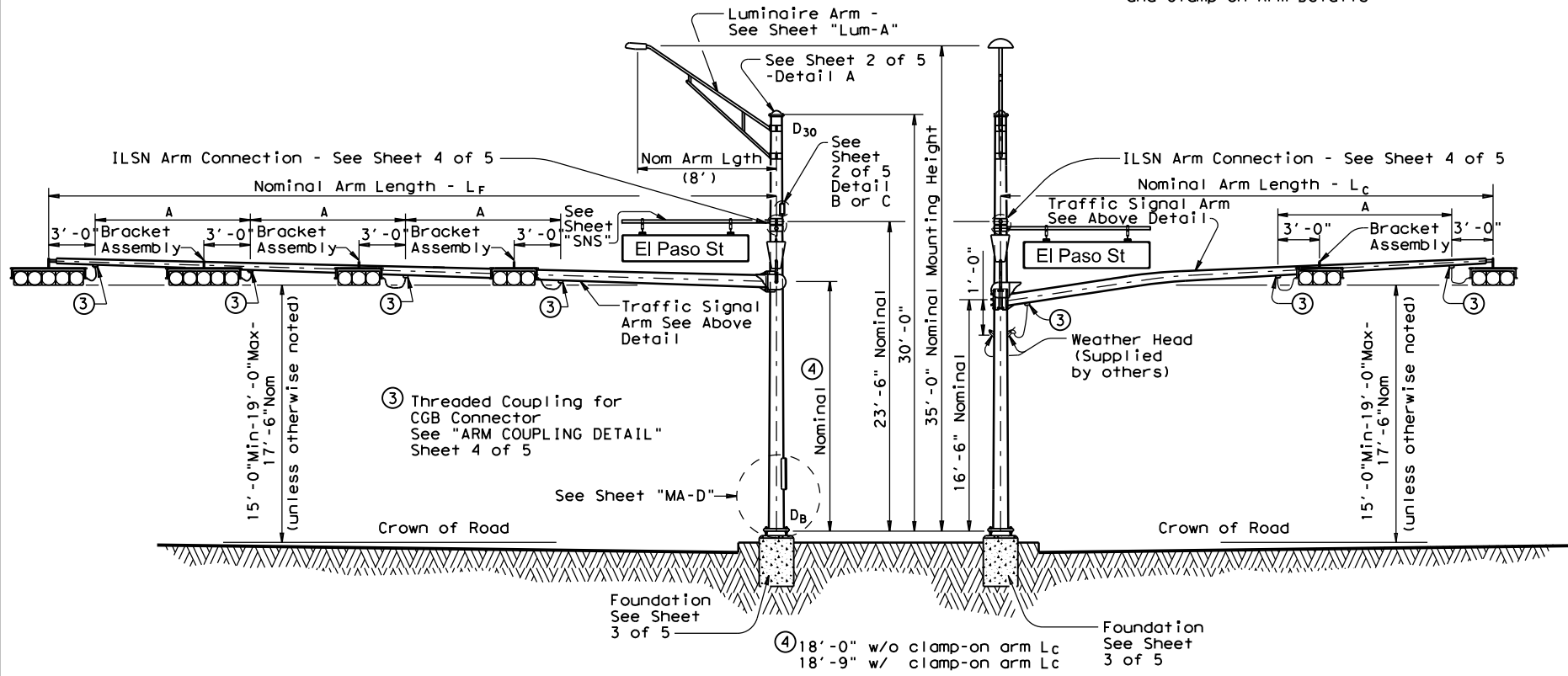


**FIXED MOUNT TRAFFIC SIGNAL ARM**

① See Sheet 3 of 5 for Arm Rise

**CLAMP-ON TRAFFIC SIGNAL ARM (IF REQUIRED)**

② See Sheet 4 of 5 for Arm Rise and Clamp-on Arm Details



**ELEVATION**

(Showing fixed mount arm)

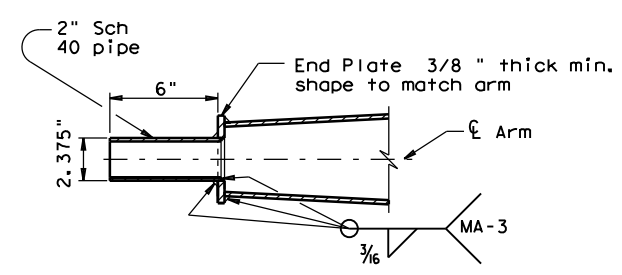
**STRUCTURE ASSEMBLY**

**ELEVATION**

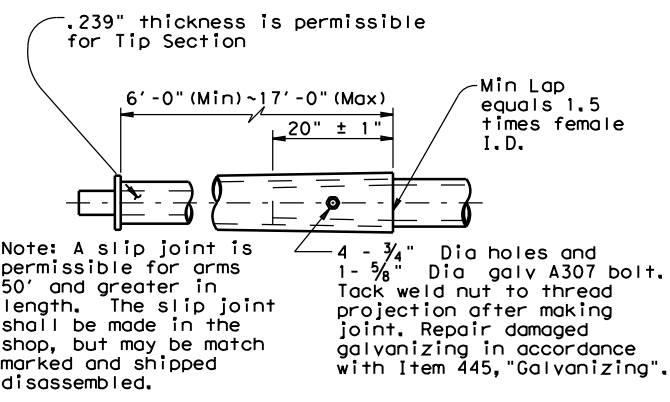
(Showing clamp-on arm)

TABLE OF DIMENSIONS "A"

Arm Length	24'	28'	32'	36'	40'	44'	50'	55'	60'	65'
Arm Type II	10'	11'	12'	13'						
Arm Type III			10'	11'	12'	12'				
Arm Type IV							12'	12'	12'	12'



**TENON DETAIL**



**SLIP JOINT DETAIL (FIXED MOUNT ARM)**

**GENERAL NOTES:**

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed can be either 100 mph or 80 mph plus a 1.3 gust factor. If clamp-on traffic signal is required, designs are based on an arm included angle of 90 degrees or more. Angles of less than approximately 75 degrees will require a special design.

Poles are designed to support one 8'-0" luminaire arm, two 9'-0" internally lighted street name (ILSN) signs and two traffic signal arms with limited length combinations.

Each arm with its related attachment is shown below

Arm	Equivalent DL ⑤	WL EPA ⑤⑥
8' Luminaire Arm	Luminaire 60 lbs	1.6 sq ft
9' ILSN Arm	Sign 85 lbs	11.5 sq ft
50' to 65' Fixed Mount Arm	Signal Loads 310 lbs	52 sq ft
Up to 44' Clamp-on Arm	Signal Loads 180 lbs	32.4 sq ft

⑤ Equivalent dead load plus horizontal wind load applied at the end of arm except ILSN arm, which applied 4.5' from the centerline of the pole.

⑥ Effective projected area (actual area times drag coefficient) for the application of horizontal wind load.

Except as noted in Sheet 1 thru 5 of 5, other details not covered shall refer to Standard Sheet "MA-D" for pole details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Material, fabrication tolerances, and shipping practices shall also meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing" after fabrication.

Deviations from the details and dimensions shown herein require submission of shop drawings in accordance with the Item 441, "Steel Structures". Alternate designs are not acceptable.

Installation of damping plate for the long mast arm is not recommended.

Provision of the bracket assembly used to support the traffic signal heads shall be under the direction of the Engineer for approval.

Design also conforms to NCHRP Report 412 for fatigue resistance except that there are no stiffeners at the base plate. TxDOT is conducting tests to determine if stiffeners at the base plate will or will not result in optimal performance; depending upon the results of the tests, poles may need a retrofit to ensure optimal fatigue performance.

Texas Department of Transportation  
 Traffic Operations Division

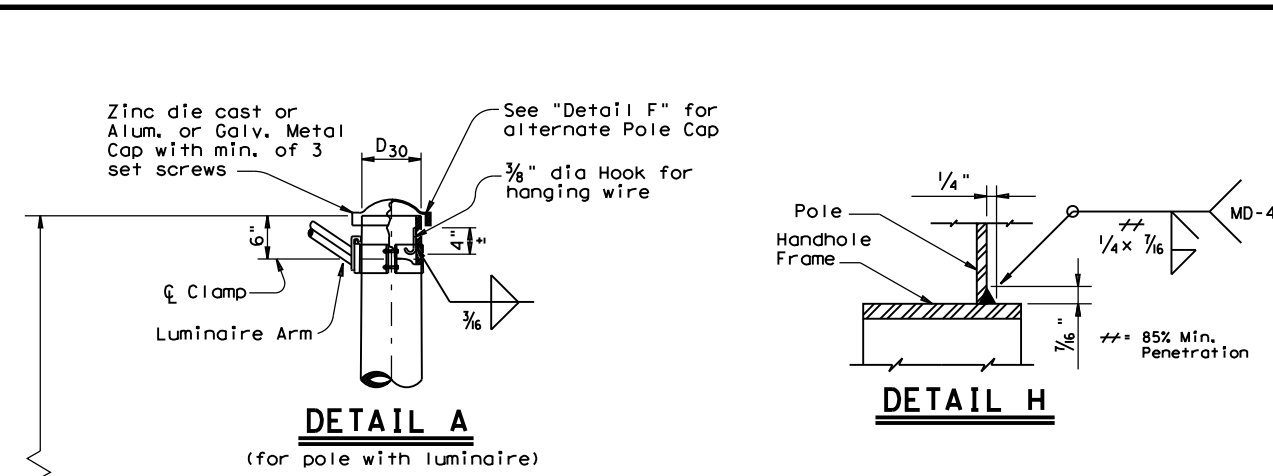
**TRAFFIC SIGNAL SUPPORT STRUCTURES**  
**LONG MAST ARM ASSEMBLY**  
 (50 TO 65 FT)  
 (80 AND 100 MPH WIND ZONE)  
 LMA(1)-12

Sheet 1 of 5

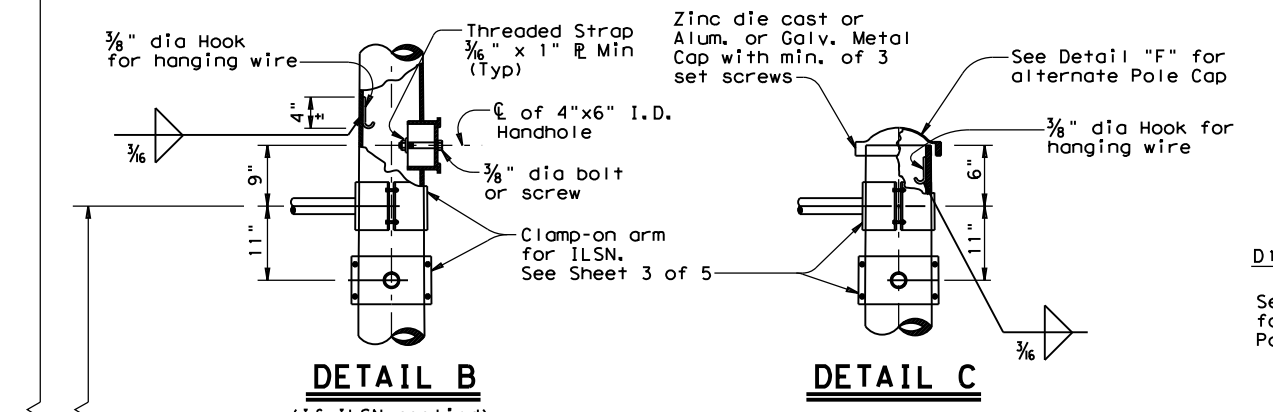
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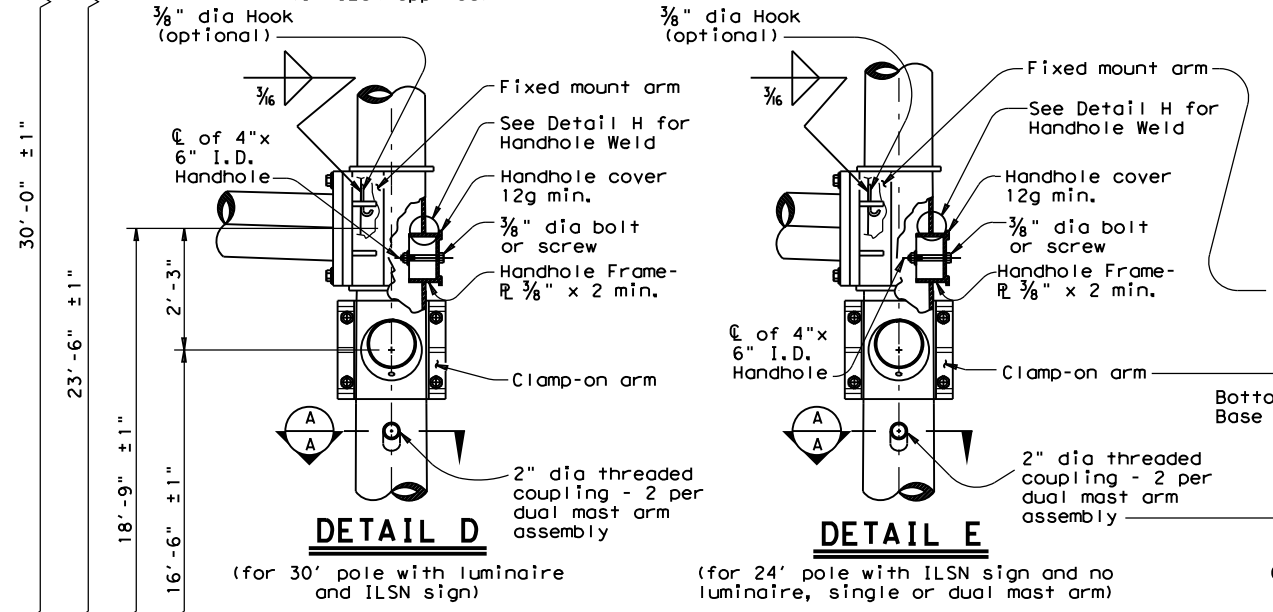
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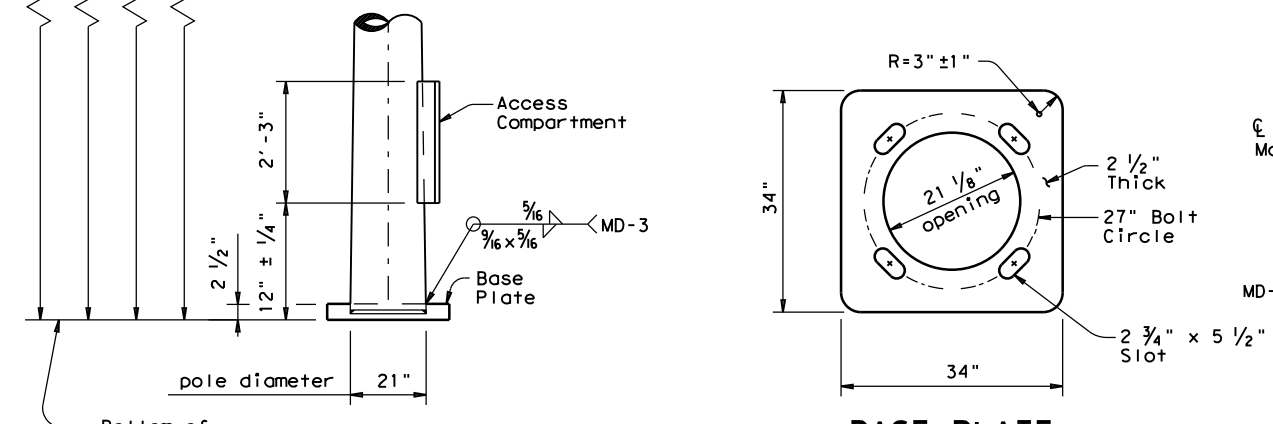
**DETAIL A**  
(for pole with luminaire)



**DETAIL B**  
(If ILSN applied)



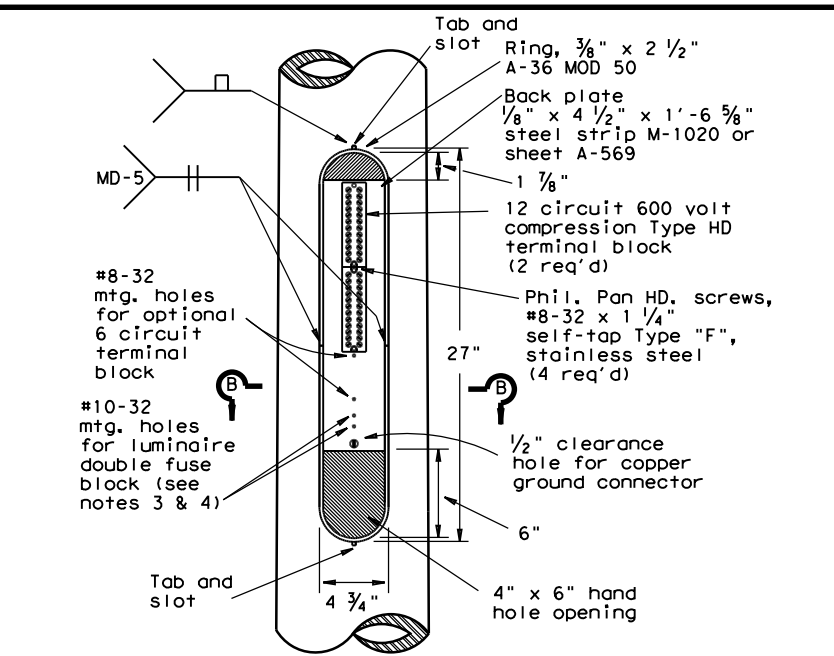
**DETAIL C**



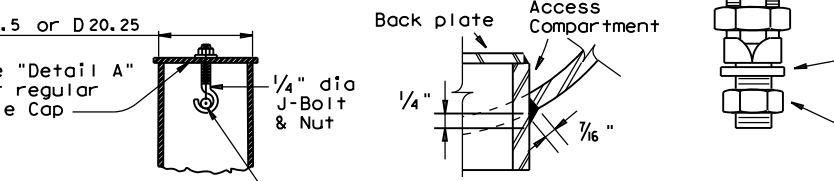
**DETAIL D**  
(for 30' pole with luminaire and ILSN sign)



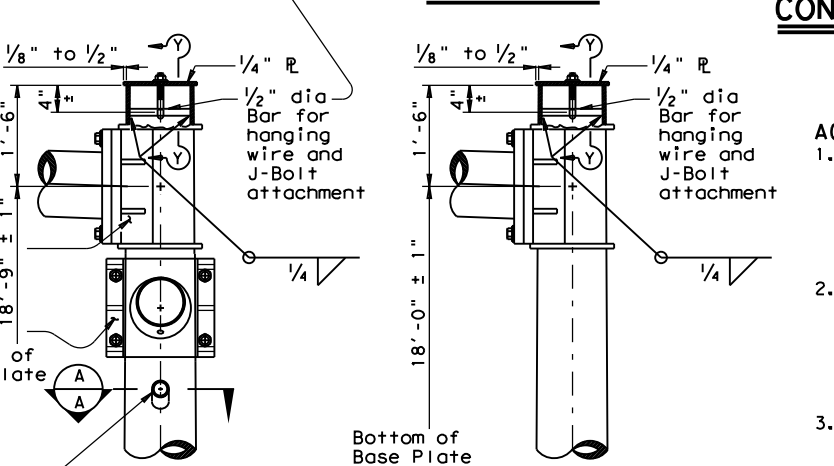
**DETAIL E**  
(for 24' pole with ILSN sign and no luminaire, single or dual mast arm)



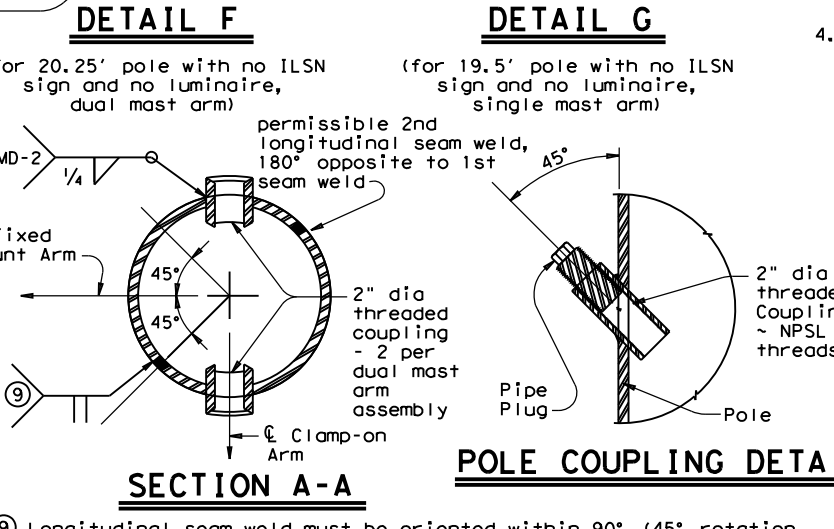
**ACCESS COMPARTMENT**



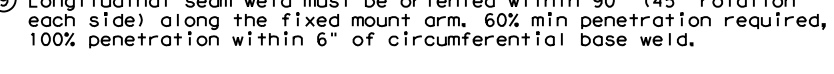
**SECTION Y-Y**



**DETAIL F**  
(for 20.25' pole with no ILSN sign and no luminaire, dual mast arm)



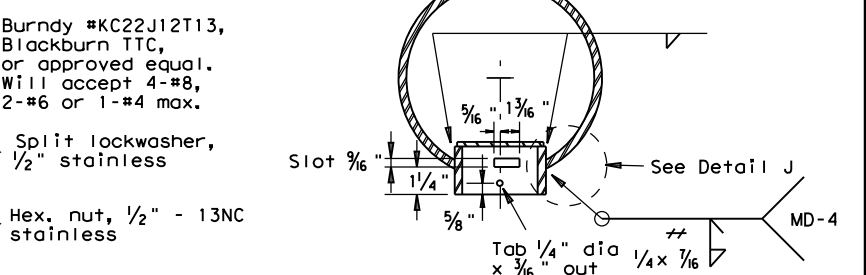
**DETAIL G**  
(for 19.5' pole with no ILSN sign and no luminaire, single mast arm)



**SECTION A-A**

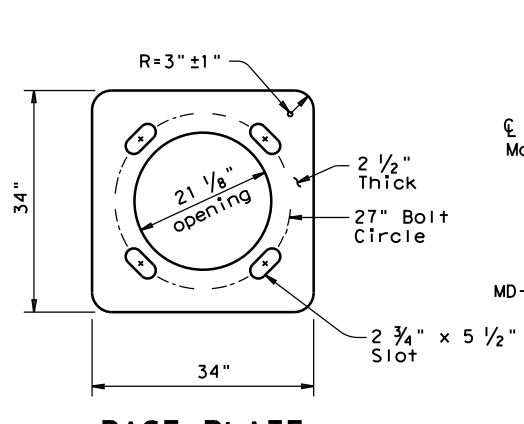
MATERIALS	
Round Shafts or Polygonal Shafts (7)	ASTM A595 Gr. A, A588, A1008 HSLAS Gr. 50 Class 2, A1011 HSLAS Gr. 50 Class 2, A572 Gr. 50 or A1011 SS Gr. 50 (8)
Plates (7)	ASTM A36, A588, or A572 Gr. 50
Connection Bolts	ASTM A325, or A449 except where noted
Pin Bolts	ASTM A325
Pipe (7)	ASTM A53 Gr. B, A501, A1008 HSLAS-F Gr. 50, A1011 HSLAS-F Gr. 50
Misc. Hardware	Galvanized steel or stainless steel or as noted

- (7) ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.
- (8) ASTM A1011 SS Gr. 50 shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

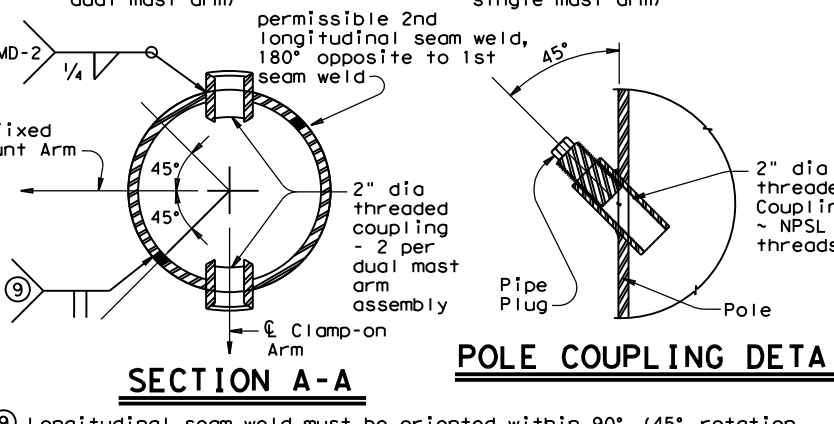


**COPPER GROUND CONNECTOR**

- ACCESS COMPARTMENT NOTES:**
- The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
  - The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilco SSS-5). The traffic signal contractor shall install the kit items in the field.
  - The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
  - Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.



**BASE PLATE**



**POLE COUPLING DETAIL**

Texas Department of Transportation  
 Traffic Operations Division

**TRAFFIC SIGNAL SUPPORT STRUCTURES  
 LONG MAST ARM ASSEMBLY  
 (50 TO 65 FT)  
 (80 AND 100 MPH WIND ZONE)  
 LMA (2) - 12**

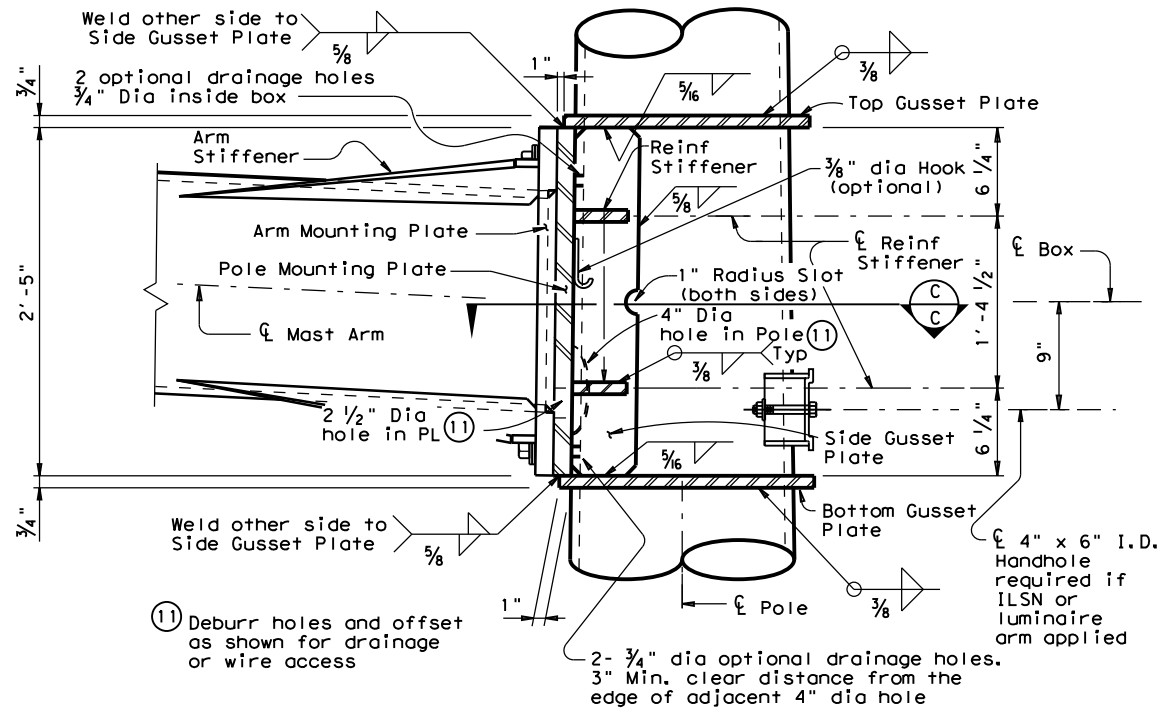
Sheet 2 of 5

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		14	HAYS	87	

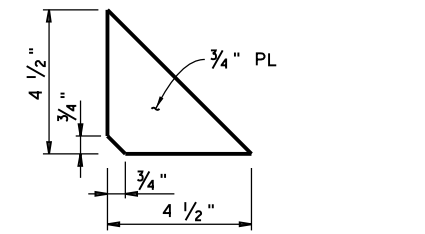


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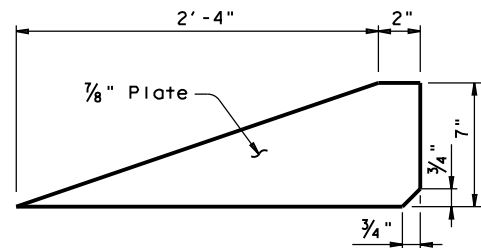
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**BUILT-UP BOX CONNECTION**

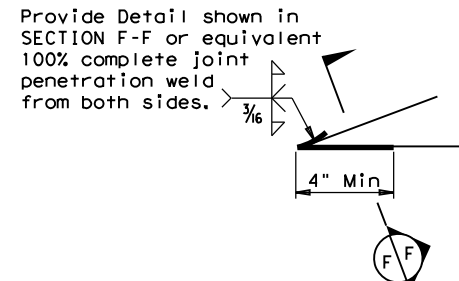


**REINFORCING STIFFENER**

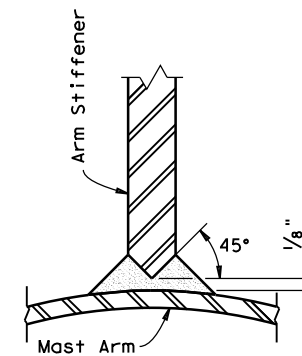


**ARM STIFFENER**

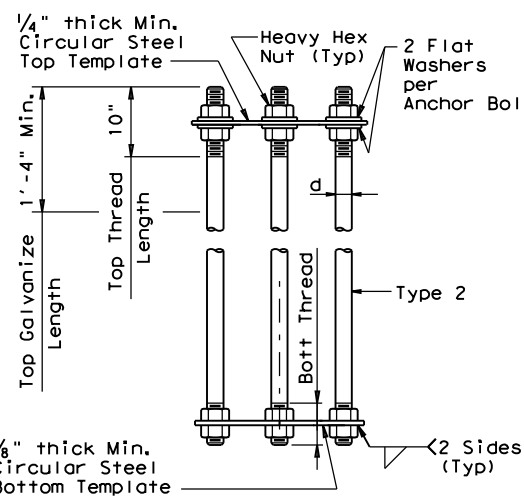
(Cut to match arm inclination and taper)



**DETAIL "K"**

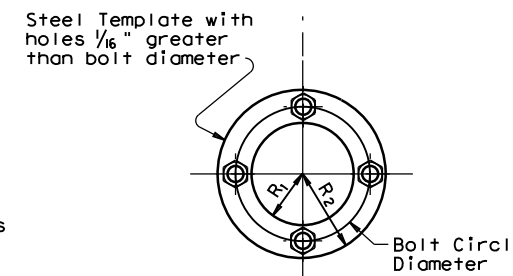


**SECTION F-F**

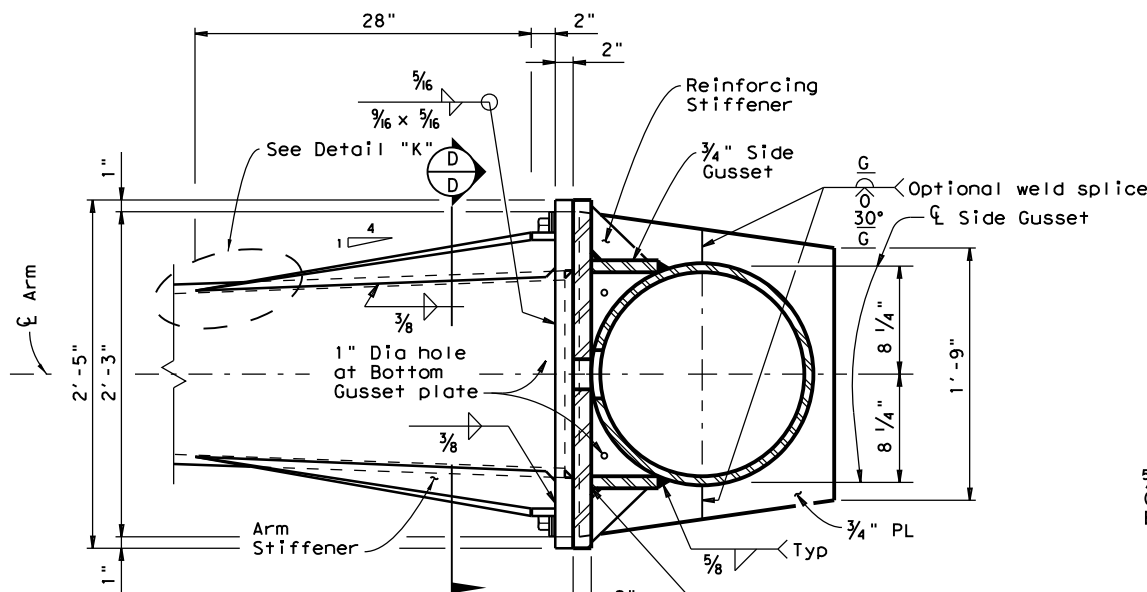


**NUT ANCHOR (TYPE 2)**

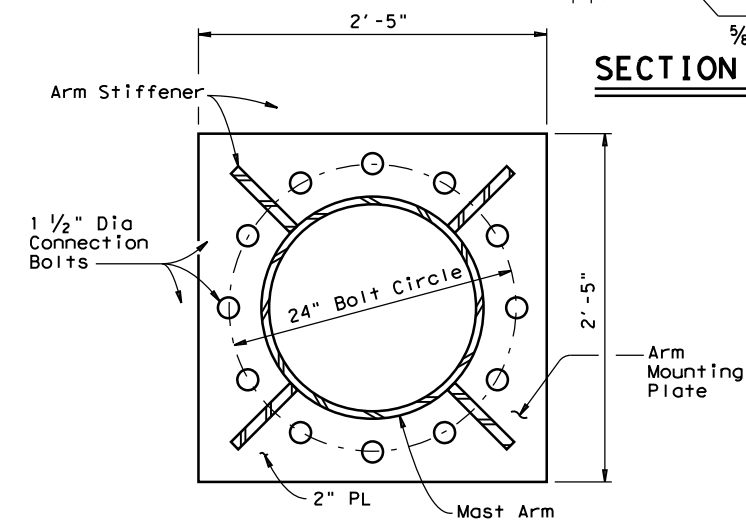
**ANCHOR BOLT ASSEMBLY**



**TEMPLATE DETAIL**



**SECTION C-C**



**SECTION D-D**

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		DRILLED SHAFT LENGTH-ft (16), (17), (18)			ANCHOR BOLT DESIGN (14)			FOUNDATION DESIGN LOAD (15)		TYPICAL APPLICATION	
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (KSI)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft		SHEAR Kips
				10	15	40							
48-A	48"	20 #9	#4 at 6"	21.9	19.5	14.7	2 1/2"	55	27"	2	490	10	50' to 65' Mast arm assembly.

SEE SHEET "TS-FD" FOR ADDITIONAL DETAILS.

- (14) Anchor bolt design develops the foundation capacity given under Foundation Design Loads.
- (15) Foundation Design Loads are the allowable moments and shears at the base of the structure.
- (16) Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.
- (17) If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.
- (18) Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

Fixed Mount Arm L F	ROUND POLES (13)					Foundation Type
	D <sub>B</sub>	D <sub>19.5</sub>	D <sub>20.25</sub>	D <sub>24</sub>	D <sub>30</sub>	
ft.	in.	in.	in.	in.	(12)thk in.	
50', 55', 60', 65'	21.0	18.2	17.6	16.8	.3125	48-A

Fixed Mount Arm L F	ROUND ARMS (13)				
	L <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	(12)thk	Rise
ft.	ft.	in.	in.	in.	
50	49	18.5	11.7	.3125	3'- 3"
55	54	18.5	11.0	.3125	3'- 7"
60	59	18.5	10.3	.3125	3'- 11"
65	64	18.5	9.6	.3125	4'- 4"

D<sub>B</sub> = Pole Base O.D.  
 D<sub>19.5</sub> = Pole Top O.D. with no Luminaire and no ILSN (single mast arm)  
 D<sub>20.25</sub> = Pole Top O.D. with no Luminaire and no ILSN (dual mast arm)  
 D<sub>24</sub> = Pole Top O.D. with ILSN w/out Luminaire  
 D<sub>30</sub> = Pole Top O.D. with Luminaire  
 D<sub>1</sub> = Arm Base O.D.  
 D<sub>2</sub> = Arm End O.D.  
 L<sub>1</sub> = Shaft Length  
 L F = Fixed Arm Length

- (12) Thickness shown is minimum, thicker materials may be used.
- (13) Shaft profile 16-sided or 18-sided is considered to be equivalent to round section.

**GENERAL NOTES:**

Built-up Box Connection: For the welded arm-to-pole connection as a built-up box configuration illustrated here is an example only, fabricators are required to submit a shop drawing of box connection for approval. The drawing shall specify the details of each box element, welds of arm-to-pole connection, arm-to-plate socket connection, and arm rise creation. Specify the proper location of drain holes along the pole. 2 1/2" dia hole in the pole mounting plate and 4" dia hole in the pole need to be aligned for wiring access or drainage. Arm stiffeners cut to match arm inclination and taper shall also be included.

The deviation from flat for either arm or pole mounting plate shall not exceed 1/32 in., which is measured along the center of mounting plate to a radial distance of 13.5 in. The deformed-from-flat connection between arm and pole mounting plates shall not be allowed if the center of both mounting plates cannot contact directly.

Fixed mount details are used for single mast arm assemblies and for the first arm in dual mast arm assemblies.

ANCHOR BOLT & TEMPLATE SIZE						
Bolt Dia in.	Length #	Top Thread	Bottom Thread	Bolt Circle	R <sub>2</sub>	R <sub>1</sub>
2 1/2"	5'-2"	10"	6 1/2"	27"	16"	11"

\*Min dimension given, longer bolts are acceptable.

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 Traffic Operations Division

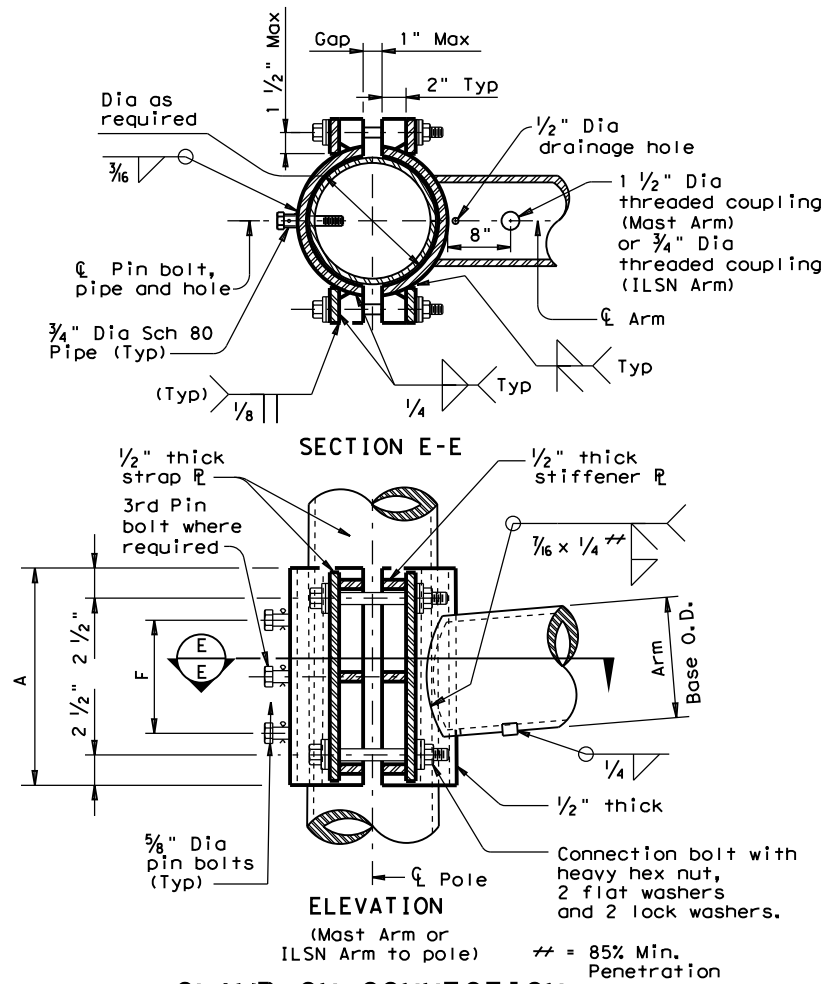
**TRAFFIC SIGNAL SUPPORT STRUCTURES**  
**LONG MAST ARM ASSEMBLY**  
 (50 TO 65 FT)  
 (80 AND 100 MPH WIND ZONE)

Sheet 3 of 5 **LMA(3)-12**

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**CLAMP-ON CONNECTION**

80 MPH WIND										
Clamp-on Arm LC	ROUND ARMS					POLYGONAL ARMS				
	L <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	thk (12)	Rise	L <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-0"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"

100 MPH WIND										
Clamp-on Arm LC	ROUND ARMS					POLYGONAL ARMS				
	L <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	thk (12)	Rise	L <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

D<sub>1</sub> = Arm Base O.D.  
 D<sub>2</sub> = Arm End O.D.  
 L<sub>1</sub> = Shaft Length  
 LC = Clamp-on Arm Length

(12) Thickness shown is minimum, thicker materials may be used.

CLAMP-ON ARM CONNECTION					
ILSN Arm Size		A	F	4 Conn. Bolts	5/8" Dia. Pin Bolts
Sch 40 pipe Dia	Thick				
in.	in.	in.	in.	in.	ea
3	.216	10	4	3/4	2

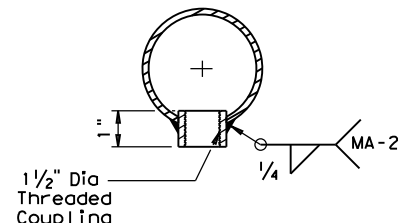
Mast Arm Size					
Base Dia	Thick	A	F	4 Conn. Bolts	5/8" Dia. Pin Bolts
6.5	.179	12	6	1	2
7.5	.179	14	8	1	2
8.0	.179	14	8	1	2
9.0	.179	16	10	1	2
9.5	.179	18	12	1 1/4	3
9.5	.239	18	12	1 1/4	3
10.0	.239	18	12	1 1/4	3
10.5	.239	18	12	1 1/4	3
11.0	.239	18	12	1 1/4	3
11.5	.239	18	12	1 1/4	3

**GENERAL NOTES:**

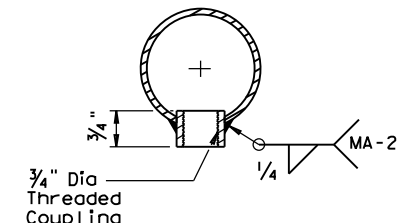
Clamp-on details are used for the second arm on dual mast arm assemblies or ILSN arm support. For a clamp-on mast arm, a maximum 1 1/2" wide vertical slotted hole may be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1". For an ILSN arm, a 1 1/2" diameter hole shall be cut in the front clamp plate for wire access. A matched hole shall be field drilled through the pole to provide wire access after arm is oriented. Deburr both holes.

Where duplicate parts occur on a detail, welds shown for part shall apply to all similar parts on the detail.

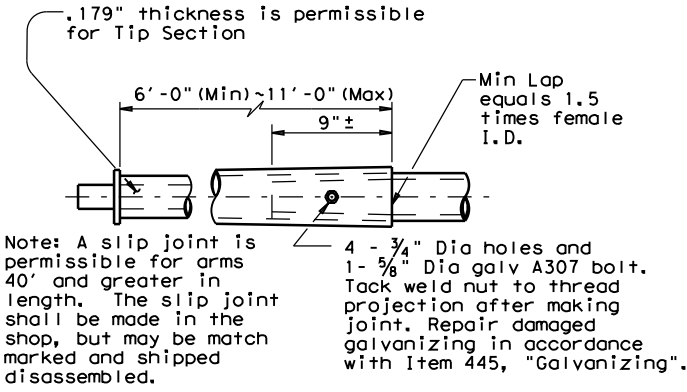
Pin bolts are required to prevent rotation of clamp-on arms under design wind forces. Pin bolts shall be ASTM A325 with threads excluded from the shear plane. Pin bolt and 3/4" diameter pipe shall have 3/16" diameter holes for a 1/8" diameter galvanized cotter pin. Back clamp plate shall be furnished with a 3/4" diameter hole for each pin bolt. An 1/16" diameter hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.



**ARM COUPLING DETAIL**



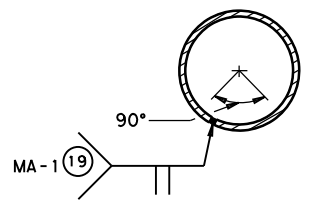
**ILSN ARM COUPLING DETAIL**



**SLIP JOINT DETAIL (CLAMP-ON ARM)**

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 1/2" Dia Threaded Coupling.

**BRACKET ASSEMBLY**



**ARM WELD DETAIL**

(19) Longitudinal Seam Weld must be oriented within the lower 90° of the signal arm. 60% Min penetration 100% penetration within 6" of circumferential base welds.

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**TRAFFIC SIGNAL SUPPORT STRUCTURES**  
**LONG MAST ARM ASSEMBLY**  
 (50 TO 65 FT)  
 (80 AND 100 MPH WIND ZONE)

Sheet 4 of 5 **LMA(4)-12**

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Shipping Parts List							
Ship each pole with the following attached: enlarged hand hole, pole cap, fixed arm connection bolts and washers, and any additional hardware listed in the table.							
Nominal Arm Length	30' Poles with Luminaire		24' Poles with ILSN		19.50' (Single Mast Arm) 20.25' (Dual Mast Arm) Poles with no Luminaire and no ILSN See note above		
	See note above plus: one (or two if ILSN attached) small hand hole, clamp-on simplex		See note above plus one small hand hole				
Single Mast Arm							
Lf ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity	
50	50L		50S		50		
55	55L	2	55S		55		
60	60L		60S		60		
65	65L		65S		65		
Dual Mast Arm							
Lf ft.	Lc ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50	20	5020L		5020S		5020	
	24	5024L		5024S		5024	
	28	5028L		5028S		5028	
	32	5032L		5032S		5032	
	36	5036L		5036S		5036	
	40	5040L		5040S		5040	
55	20	5520L		5520S		5520	
	24	5524L		5524S		5524	
	28	5528L		5528S		5528	
	32	5532L		5532S		5532	
	36	5536L		5536S		5536	
	40	5540L		5540S		5540	
60	20	6020L		6020S		6020	
	24	6024L		6024S		6024	
	28	6028L		6028S		6028	
	32	6032L		6032S		6032	
	36	6036L		6036S		6036	
	40	6040L		6040S		6040	
65	20	6520L		6520S		6520	
	24	6524L		6524S		6524	
	28	6528L		6528S		6528	
	32	6532L		6532S		6532	
	36	6536L		6536S		6536	
	40	6540L		6540S		6540	
	44	6544L		6544S		6544	

Foundation Summary Table \*\*

Location Ident.	Avg. N Blow/ft.	No. Each	Drill Shaft *** Length (feet)
EB US 290 POLE A	10	1	22
WB US 290 POLE C	10	1	22
Total Drill Shaft Length			44

Notes


- \*\* Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.
- \*\*\* Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

Abbreviations

- Lf= Fixed Arm Length
- Lc= Clamp-on Arm Length (44' Max.)

Shipping Parts List							
Traffic Signal Arms (Fixed Mount) (1 per pole) Ship each arm with listed equipment attached							
Nominal Arm Length	Type IV Arm (4 Signals) 3 Bracket Assembly and 4 CGB Connectors		Luminaire Arms (1 per 30' pole)				
ft.	Designation	Quantity	Nominal Arm Length		Quantity		
50	50IV		8' Arm		2		
55	55IV	2	ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers				
60	60IV		Nominal Arm Length		Quantity		
65	65IV		7' Arm				
			9' Arm				
Traffic Signal Arms (80 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached							
Nominal Arm Length	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp w/bolts and washers		Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp w/bolts and washers		
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity	
20	20I-80						
24	24I-80		24II-80				
28	28I-80		28II-80				
32			32II-80		32III-80		
36			36II-80		36III-80		
40					40III-80		
44					44III-80		
Traffic Signal Arms (100 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached							
Nominal Arm Length	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp		Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp		
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity	
20	20I-100						
24	24I-100		24II-100				
28	28I-100		28II-100				
32			32II-100		32III-100		
36			36II-100		36III-100		
40					40III-100		
44					44III-100		
Anchor Bolt Assemblies (1 per pole) Each anchor bolt assembly consists of the following: Top and bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers and 4 nut anchor devices (type 2) per Standard Drawing "TS-FD". Templates may be removed for shipment.							
Anchor Bolt Diameter	Anchor Bolt Length	Quantity					
2 1/2 "	5' - 3"	2					

US 290 AT TRAUTWIEN RD



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## LONG MAST ARM ASSEMBLY PARTS LIST

### LMA (5) - 12

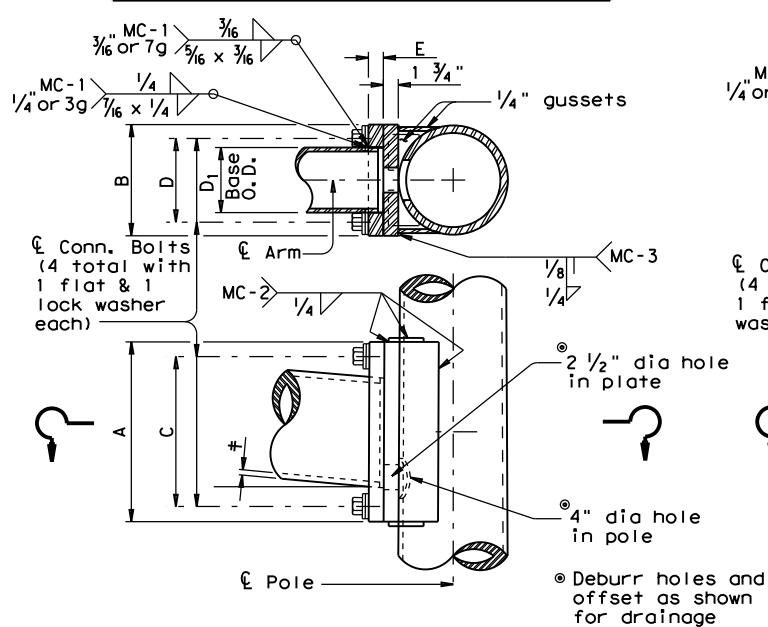
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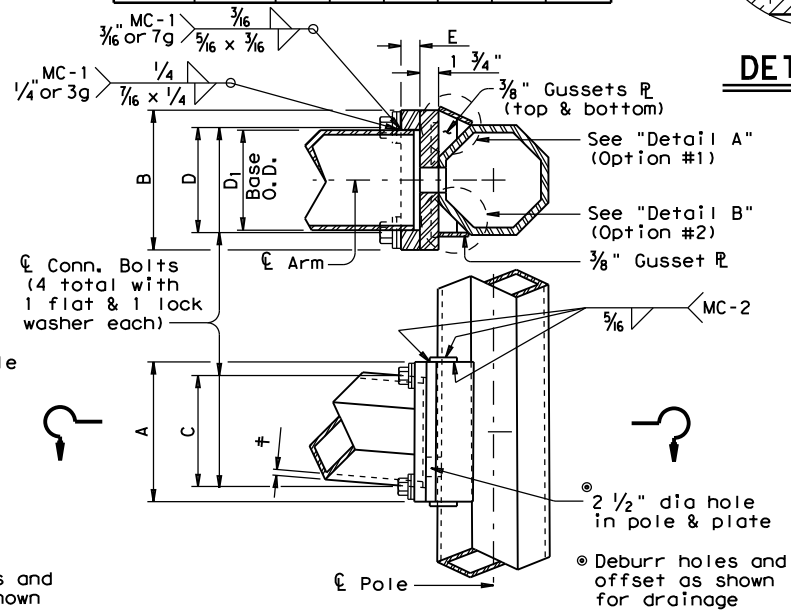
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ARM SIZE		A	B	C	D	E	CONN BOLT DIA
D <sub>1</sub>	φ	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1 3/4	1
7.5	.179	13	9	10	6	1 3/4	1
8.0	.179	14	10	11	7	2	1 1/4
9.0	.179	16	11	13	8	2	1 1/4
9.5	.179	17	12	14	9	2	1 1/4
9.5	.239	18	12	15	9	2	1 1/4
10.0	.239	18	12	15	9	2	1 1/4
10.5	.239	18	13	15	10	3	1 1/2
11.0	.239	18	13	15	10	3	1 1/2

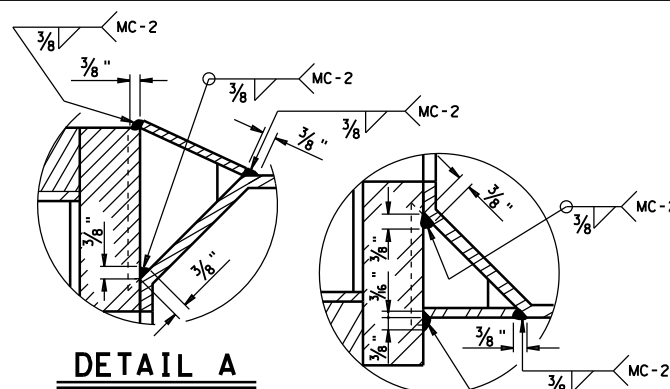


**FIXED MOUNT DETAIL 1**

ARM SIZE		A	B	C	D	E	CONN BOLT DIA
D <sub>1</sub>	φ	in.	in.	in.	in.	in.	in.
7.0	.179	11	11	8	8	1 3/4	1 1/4
7.5	.179	11	11	8	8	1 3/4	1 1/4
8.0	.179	11	11	8	8	2	1 1/4
9.0	.179	13	13	10	10	2	1 1/4
10.0	.179	13	13	10	10	2	1 1/4
9.5	.239	13	13	10	10	2	1 1/4
10.0	.239	14	14	11	11	2	1 1/2
11.0	.239	14	14	11	11	3	1 1/2
11.5	.239	14	14	11	11	3	1 1/2

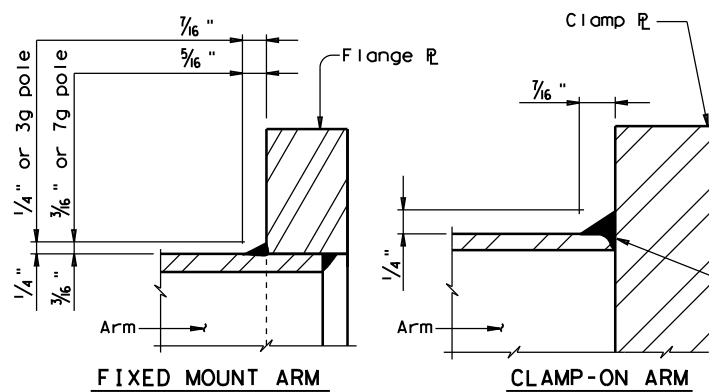


**FIXED MOUNT DETAIL 2**



**DETAIL A**

**DETAIL B**



**FIXED MOUNT ARM**

**CLAMP-ON ARM**

**ARM BASE WELD DETAILS**

MATERIALS	
Round Shafts or Polygonal Shafts <sup>①</sup>	ASTM A595 Gr. A, A588, A1008 HSLAS Gr. 50 Class 2, A1011 HSLAS Gr. 50 Class 2, A572 Gr. 50 or A1011 SS Gr. 50 <sup>②</sup>
Plates <sup>①</sup>	ASTM A36, A588, or A572 Gr. 50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe <sup>①</sup>	ASTM A53 Gr. B, A501, A1008 HSLAS-F Gr. 50, A1011 HSLAS-F Gr. 50
Misc. Hardware	Galvanized steel or stainless steel or as noted

- ① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.
- ② ASTM A1011 SS Gr. 50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

ARM SIZE		A	F	CONN. BOLTS		PIN BOLTS	
D <sub>1</sub>	φ	in.	in.	No.	Dia	No.	Dia
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 1/4	3	5/8
9.5	.239	18	12	4	1 1/4	3	5/8
10.0	.239	18	12	4	1 1/4	3	5/8

ARM SIZE		A	F	T	CONN. BOLTS		PIN BOLTS	
D <sub>1</sub>	φ	in.	in.	in.	No.	Dia	No.	Dia
7.0	.179	12	6	3/4	4	3/4	2	5/8
7.5	.179	14	8	3/4	4	3/4	2	5/8
8.0	.179	14	8	3/4	4	3/4	2	5/8
9.0	.179	16	10	7/8	4	1	2	5/8
10.0	.179	18	10	7/8	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

ARM SIZE		A	F	CONN. BOLTS		PIN BOLTS	
D <sub>1</sub>	φ	in.	in.	No.	Dia	No.	Dia
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8

**GENERAL NOTES:**

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 1/2" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

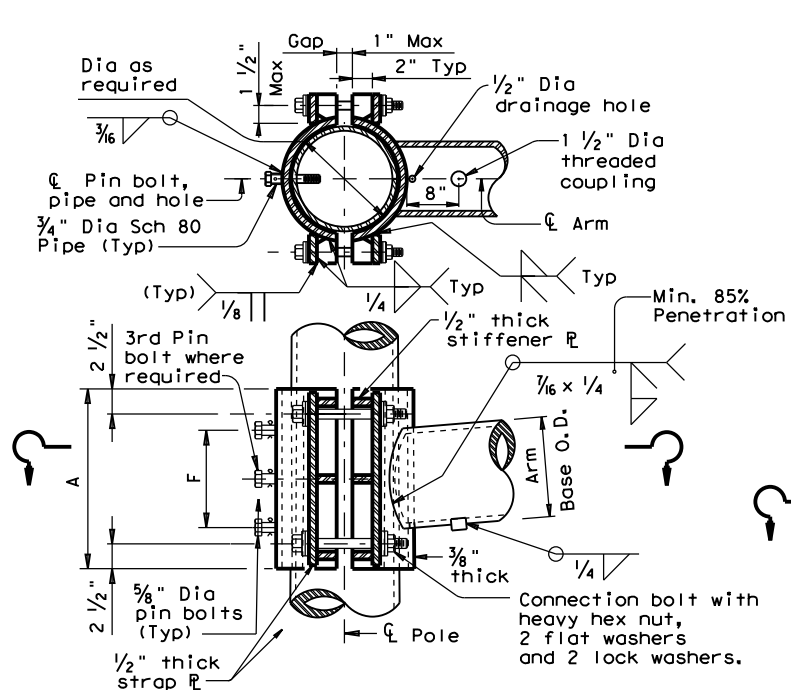
Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

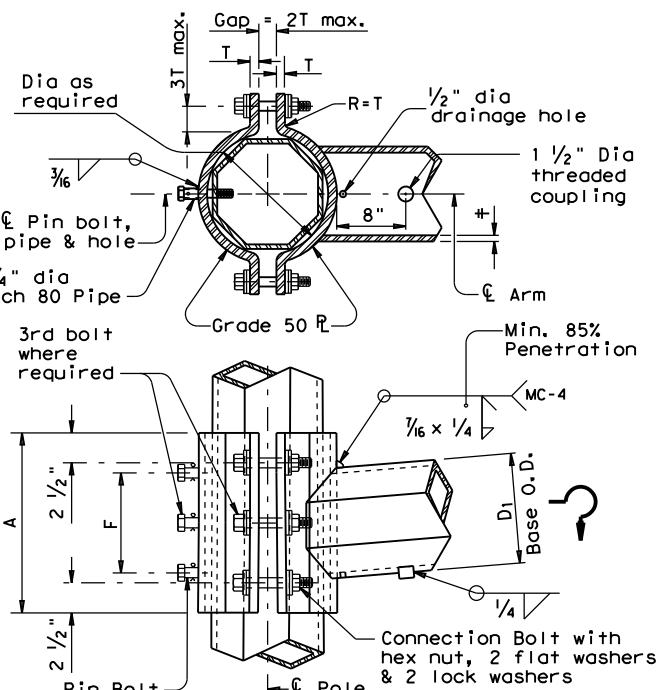
Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

**NOTE:**

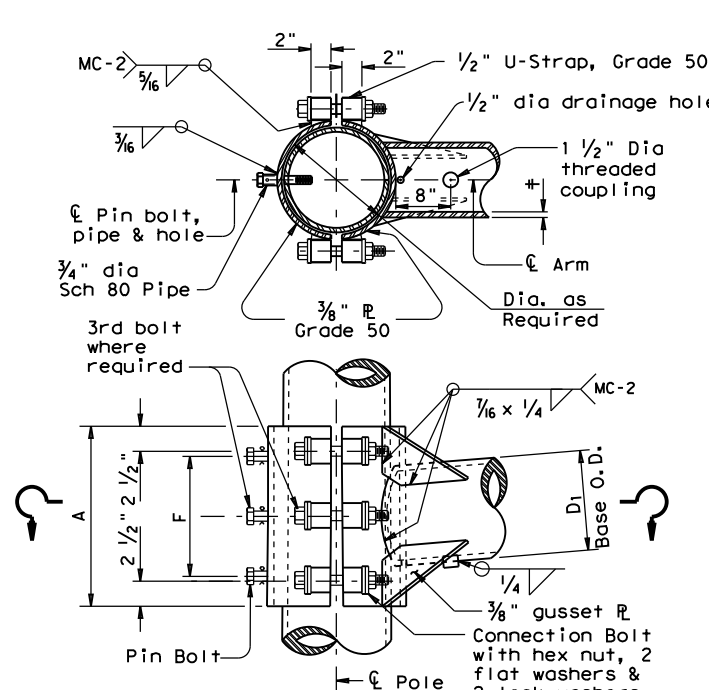
Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and 3/4" dia pipe shall have 3/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a 3/4" dia hole for each pin bolt. An 1/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.



**CLAMP-ON DETAIL 1**



**CLAMP-ON DETAIL 2**



**CLAMP-ON DETAIL 3**

Texas Department of Transportation  
 Traffic Operations Division

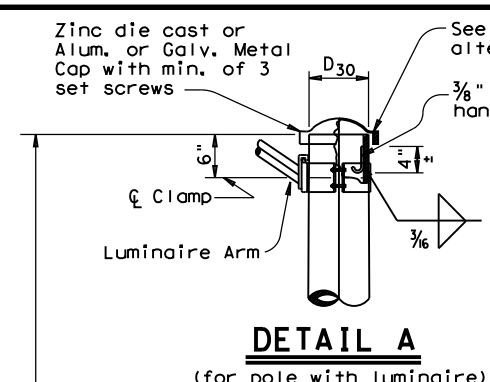
**STANDARD ASSEMBLY  
 FOR TRAFFIC SIGNAL  
 SUPPORT STRUCTURES  
 MAST ARM CONNECTIONS  
 MA-C-12**

© TxDOT August 1995		DN: MS	CK: JSY	DW: MMF	CK: JSY
REVISIONS		CONT	SECT	JOB	HIGHWAY
5-96	0113	07	072	US290	
5-09					
1-12					
	DIST	COUNTY		SHEET NO.	
	14	HAYS		91	

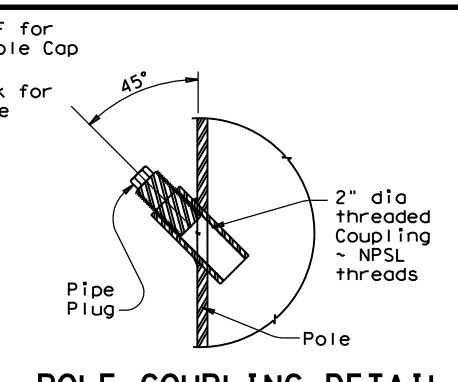
126A

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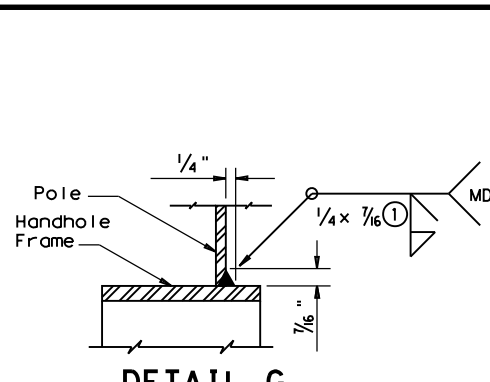
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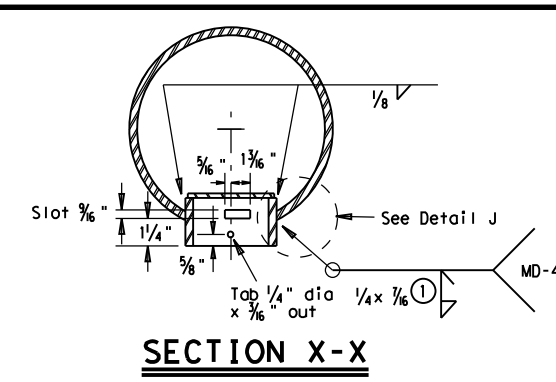
**DETAIL A**  
(for pole with luminaire)



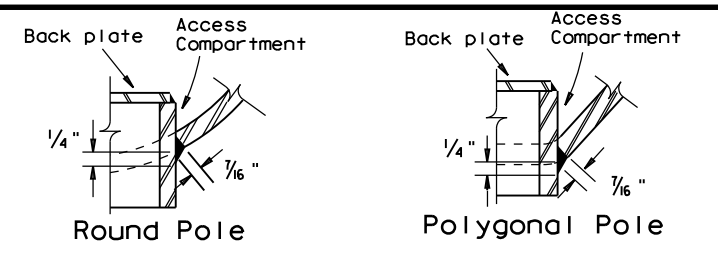
**POLE COUPLING DETAIL**



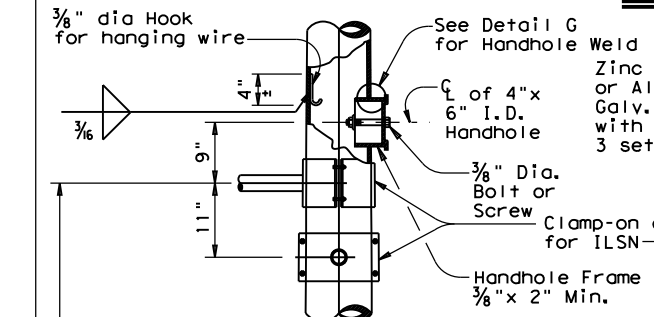
**DETAIL G**



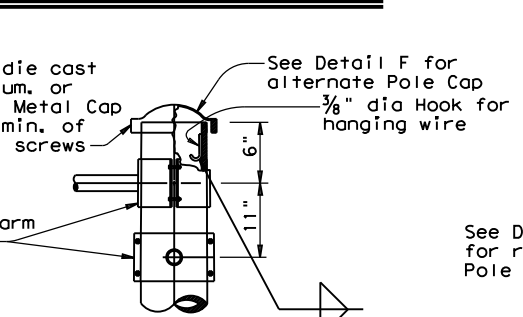
**SECTION X-X**



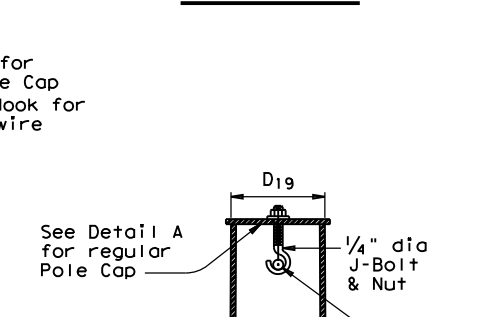
**DETAIL J**



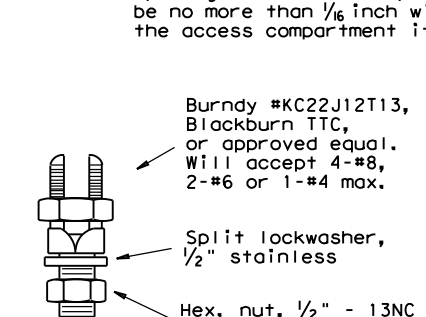
**DETAIL B**  
(If ILSN applied)



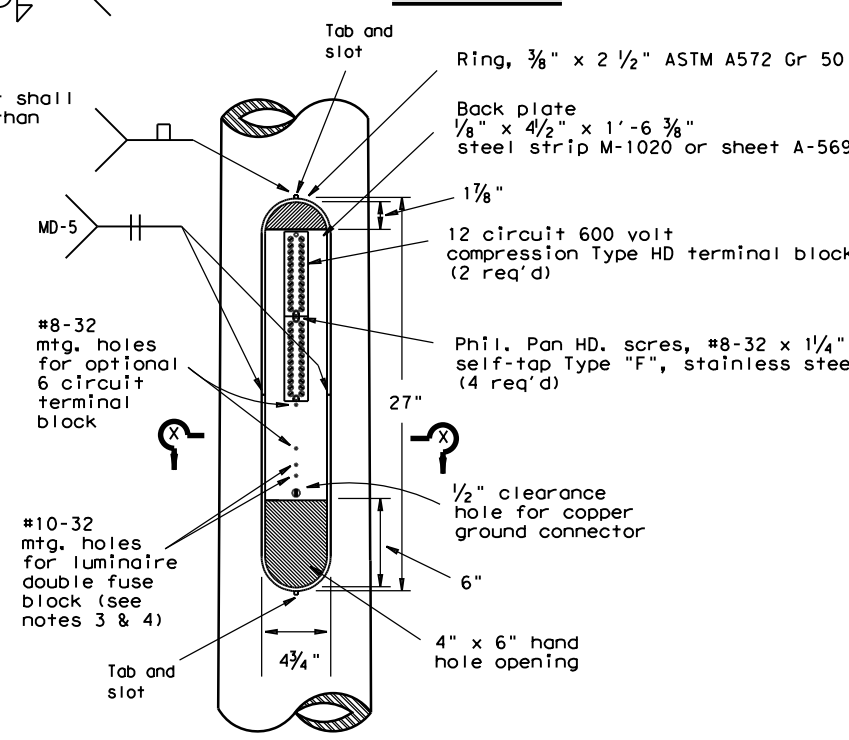
**DETAIL C**



**SECTION Y-Y**



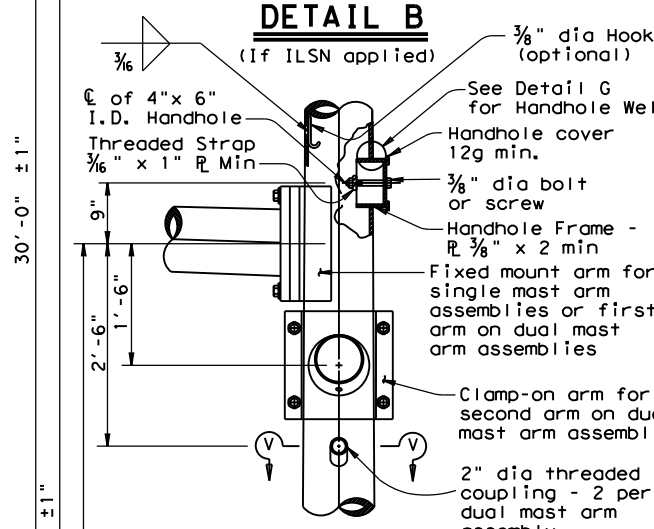
**COPPER GROUND CONNECTOR**



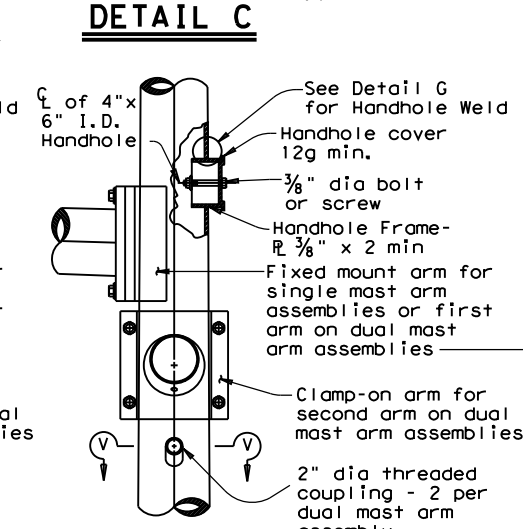
**ACCESS COMPARTMENT**

**NOTES:**

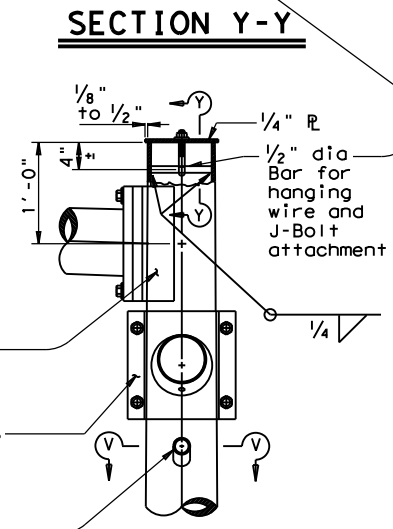
- The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
- The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4 self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilco SSS-5). The traffic signal contractor shall install the kit items in the field.
- The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
- Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.



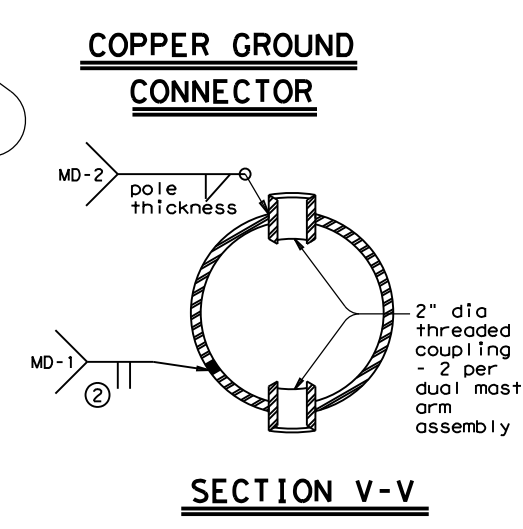
**DETAIL D**  
(for 30' pole with luminaire and ILSN sign)



**DETAIL E**  
(for 24' pole with ILSN sign and no luminaire)

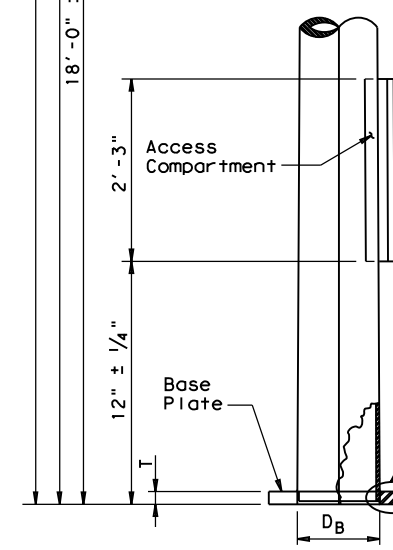


**DETAIL F**  
(for 19' pole with no ILSN sign and no luminaire)

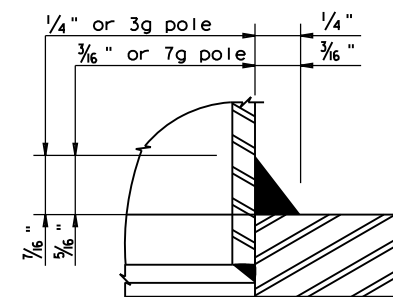


**SECTION V-V**

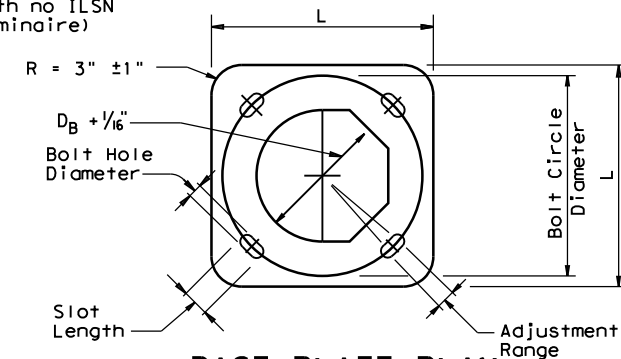
Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base R Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



**POLE ELEVATION**



**DETAIL H**



**BASE PLATE PLAN**

- 85% Min. penetration
- 60% Min. penetration  
100% penetration within 6" of circumferential base welds.

Texas Department of Transportation  
 Traffic Operations Division

**TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS**

**MA-D-12**

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DIST		COUNTY	SHEET NO.		
14		HAYS	92		

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**FOUNDATION DESIGN TABLE**

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft (4), (5), (6)			ANCHOR BOLT DESIGN (1)			FOUNDATION DESIGN LOAD (2)		TYPICAL APPLICATION	
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N Blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft		SHEAR Kips
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	3/4"	36	12 3/4"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 1/2"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 3/4"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 1/4"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

**NOTES:**

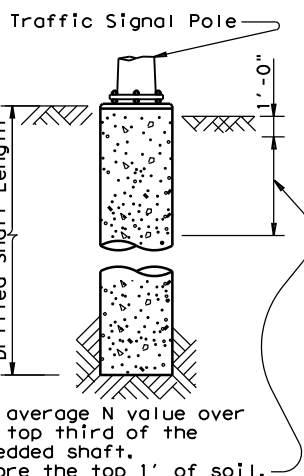
- Anchor bolt design develops the foundation capacity given under Foundation Design Loads.
- Foundation Design Loads are the allowable moments and shears at the base of the structure.
- Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.
- Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.
- If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.
- Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

**FOUNDATION SUMMARY TABLE (3)**

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH (6) (FEET)						
				24-A	30-A	36-A	36-B	42-A		
US 290 AT										
SB TRAUTWEIN										
POLE B	10	36-A	1			14				
NB TRAUTWEIN										
POLE D	10	30-A	1		12					
TOTAL DRILLED SHAFT LENGTHS					12	14				

**FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)**

80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
		24' X 24'			
MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	28' X 28'				
	32' X 28'				
		32' X 32'			
		36' X 36'			
		40' X 36'			
		44' X 28'	44' X 36'		
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
		28' X 28'			
		32' X 24'	32' X 32'		
			36' X 36'		
			40' X 24'	40' X 36'	
				44' X 36'	

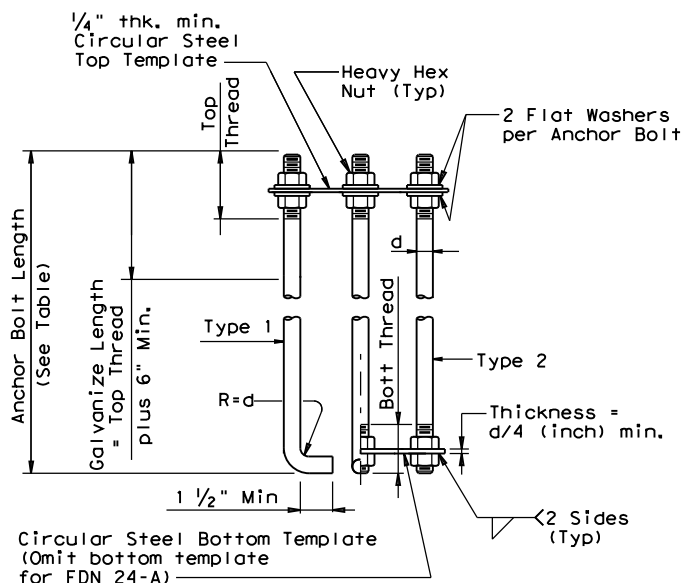


**ANCHOR BOLT & TEMPLATE SIZES**

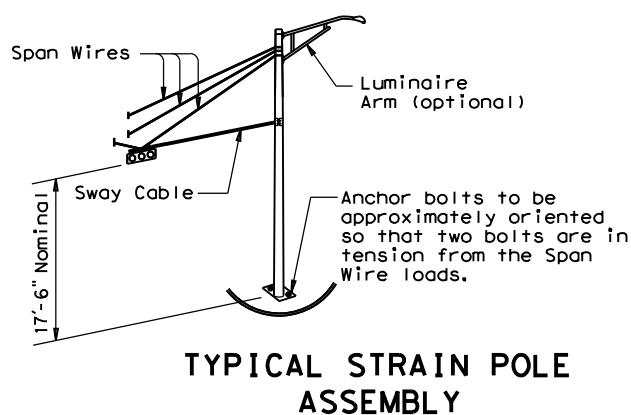
BOLT DIA IN.	(7) BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
3/4"	1'-6"	3"	—	12 3/4"	7 1/8"	5 5/8"
1 1/2"	3'-4"	6"	4"	17"	10"	7"
1 3/4"	3'-10"	7"	4 1/2"	19"	11 1/4"	7 3/4"
2"	4'-3"	8"	5"	21"	12 1/2"	8 1/2"
2 1/4"	4'-9"	9"	5 1/2"	23"	13 3/4"	9 1/4"

(7) Min dimensions given, longer bolts are acceptable.

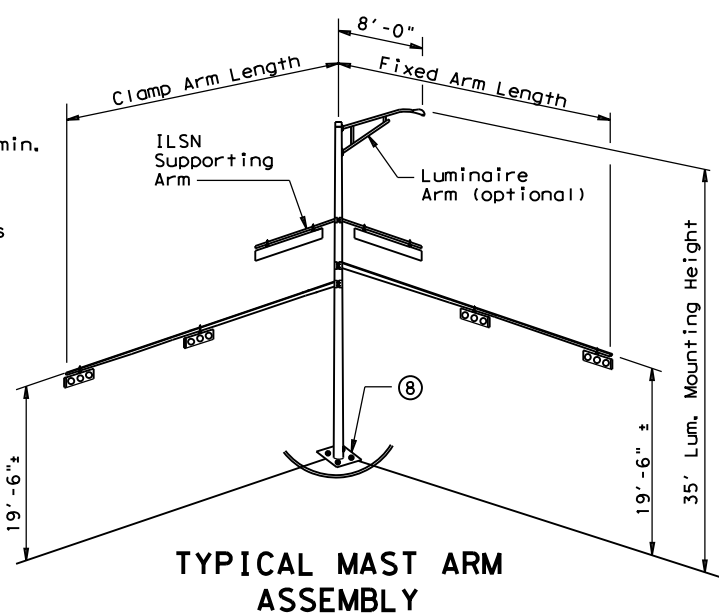
- EXAMPLE:**
- For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
  - For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



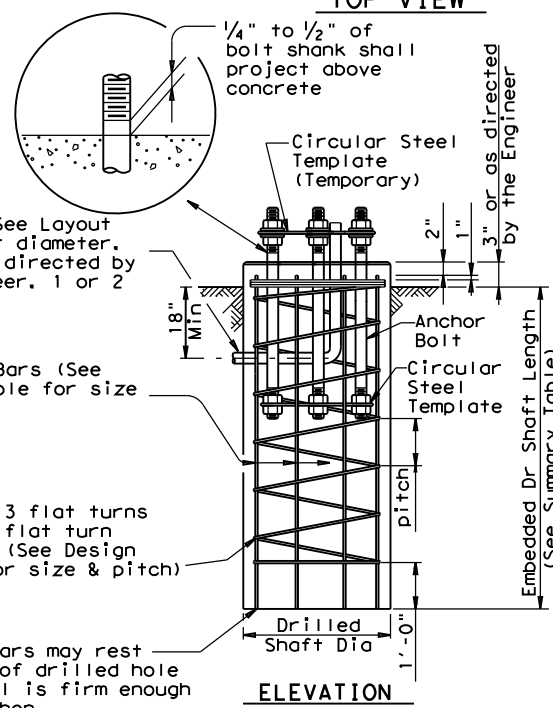
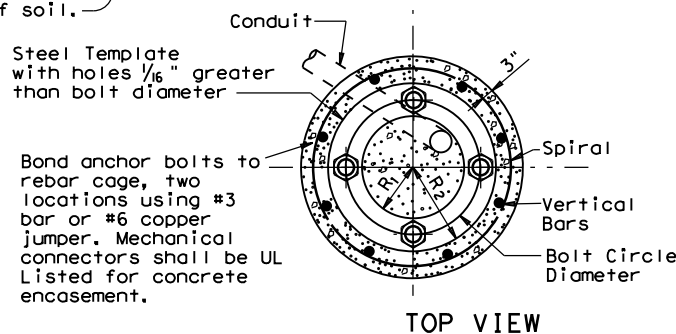
**HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2) ANCHOR BOLT ASSEMBLY**



**TYPICAL STRAIN POLE ASSEMBLY**



**TYPICAL MAST ARM ASSEMBLY**



**FOUNDATION DETAILS**

**GENERAL NOTES:**

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".



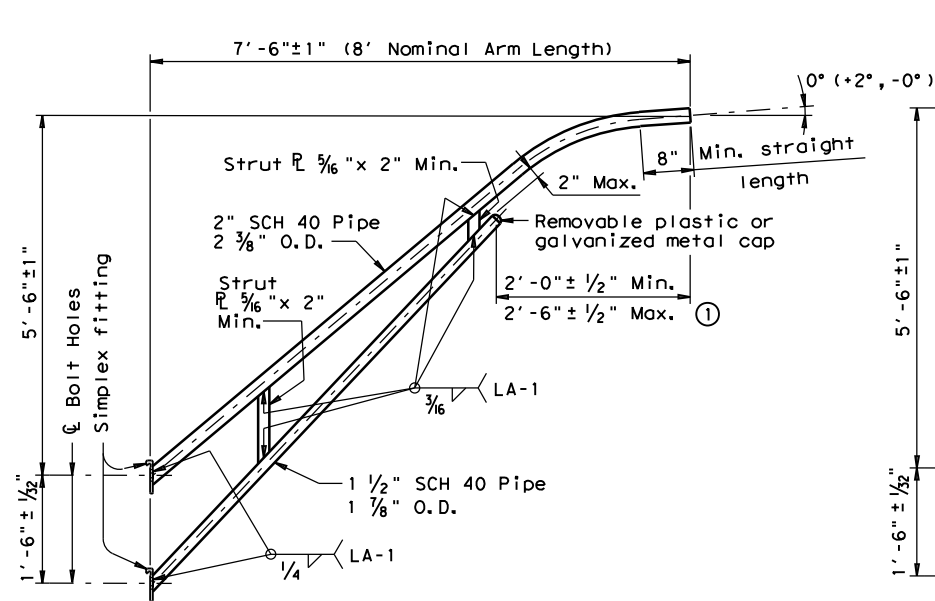
**TRAFFIC SIGNAL POLE FOUNDATION**

**TS-FD-12**

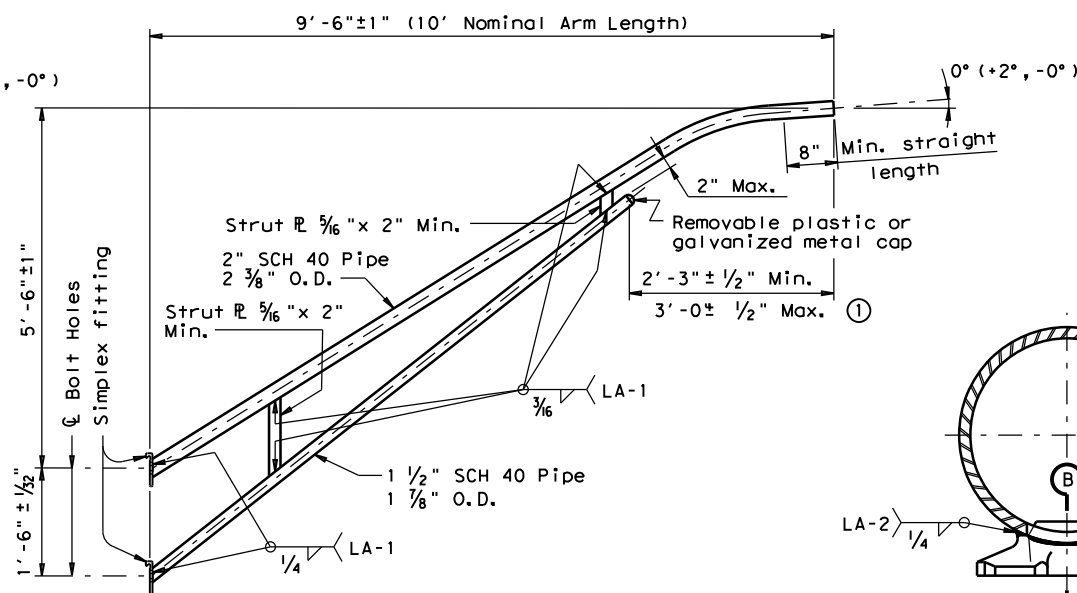
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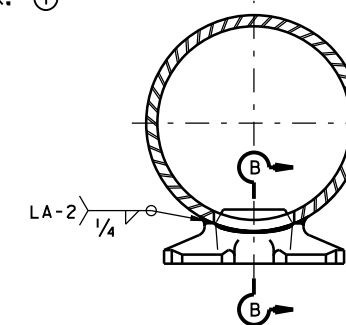
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8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr. 65-35 or A148 Gr. 80-50, A576 Gr. 1021 (3), or A36 (Arm only)
Arm Pipes	ASTM A53 Gr. B, A501, A1008 HSLAS-F Gr. 50 (4), or A1011 HSLAS-F Gr. 50 (4)
Arm Strut Plates (2)	ASTM A36, A572 Gr. 50 (4), or A588
Misc.	ASTM designations as noted

- Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.
- Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.
- ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminares, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

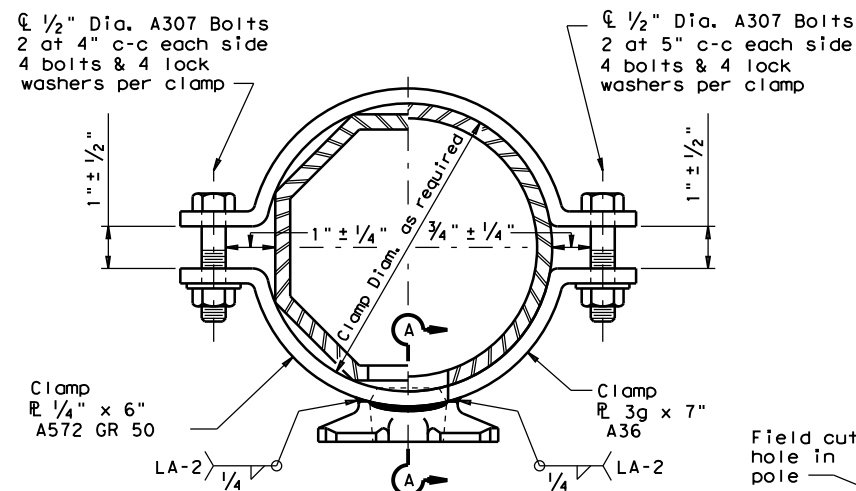
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified Fabricator tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

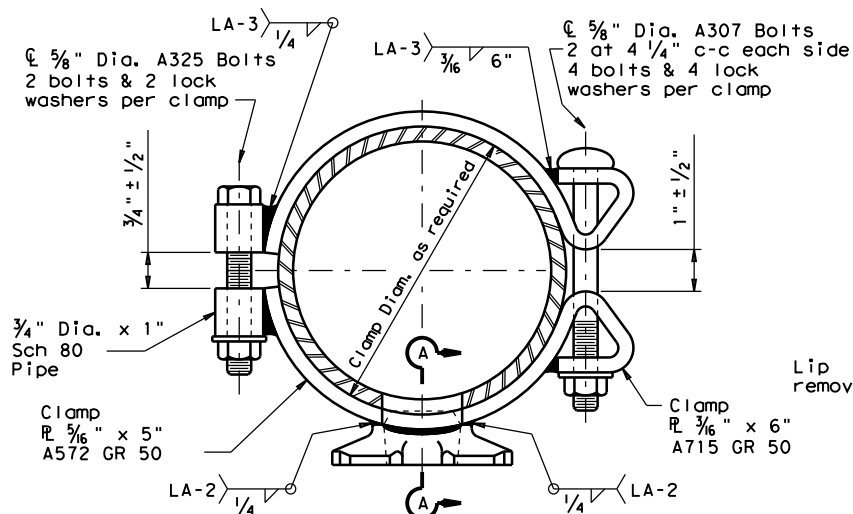
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



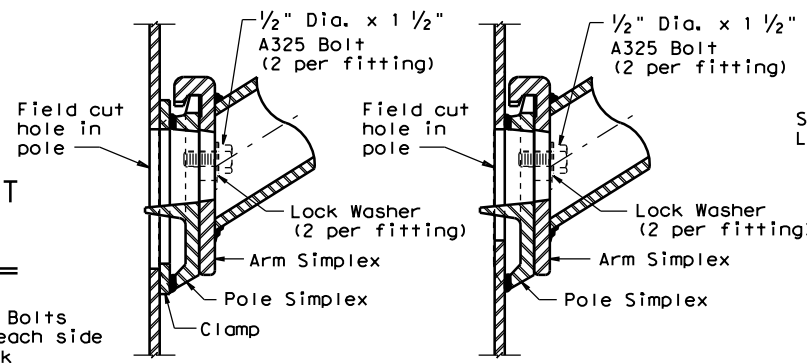
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



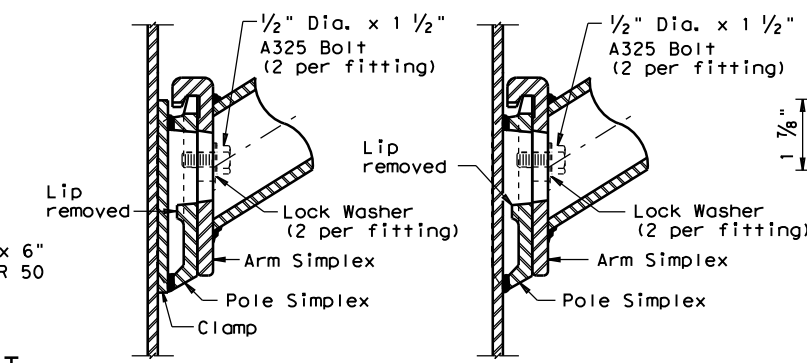
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)



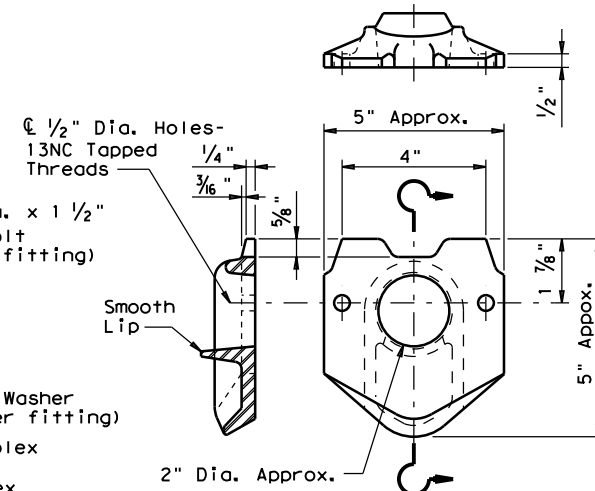
UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING

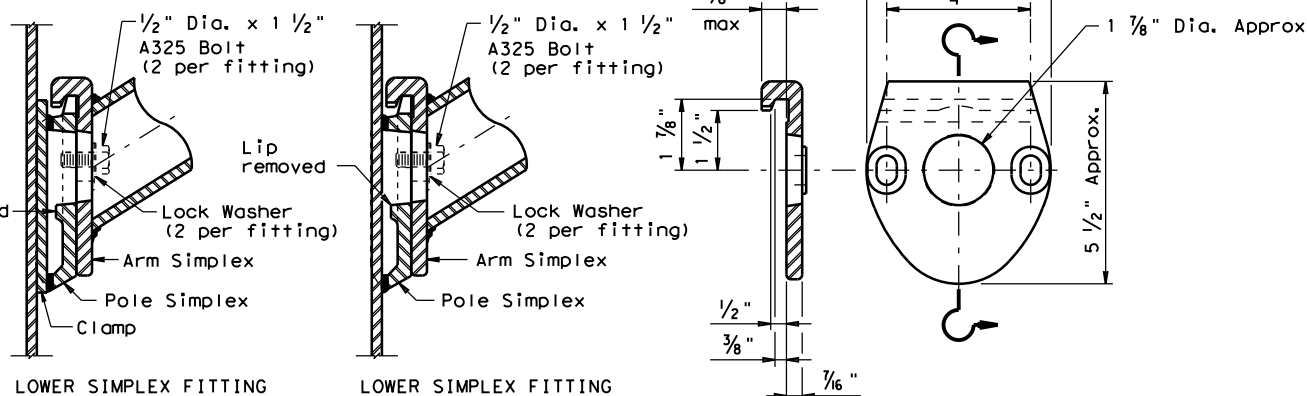


LOWER SIMPLEX FITTING

LOWER SIMPLEX FITTING

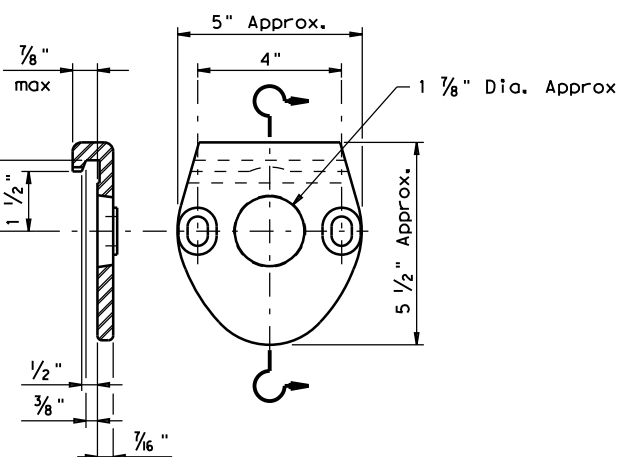


POLE SIMPLEX DETAIL



SECTION A-A

SECTION B-B



ARM SIMPLEX DETAIL

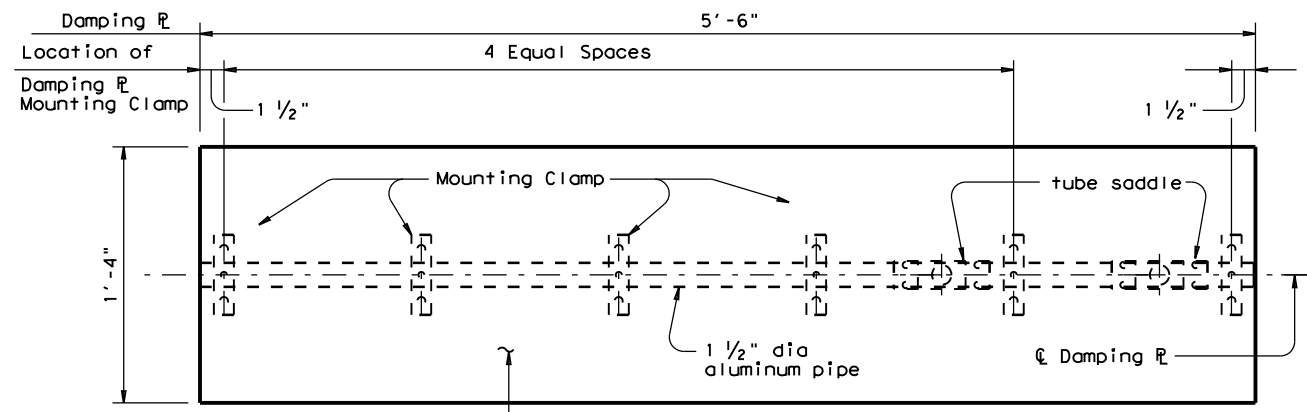
Texas Department of Transportation  
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**STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES**  
 ARM DETAILS  
**LUM-A-12**

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1-12		DIST	COUNTY		SHEET NO.
		14	HAYS		94

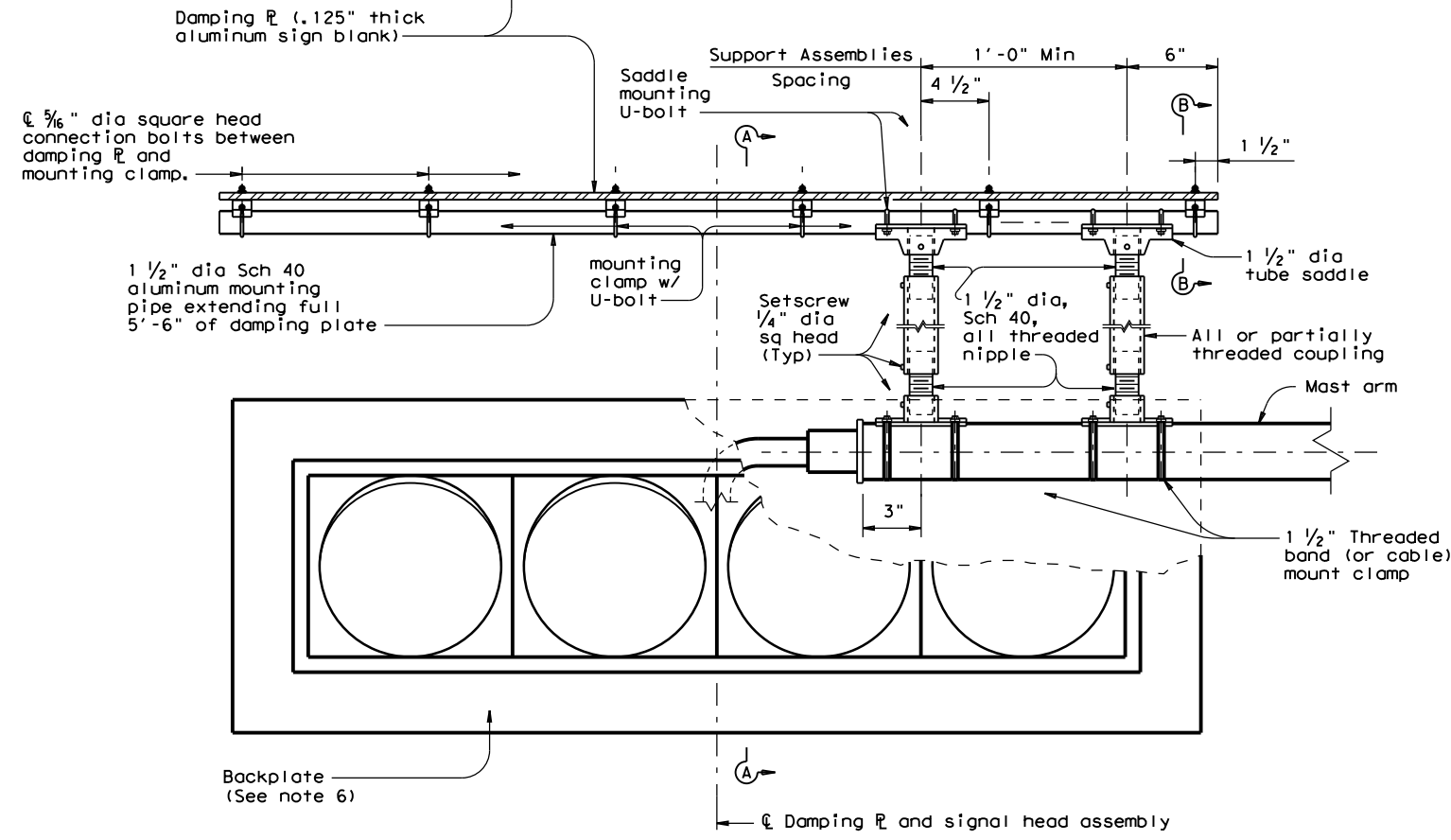


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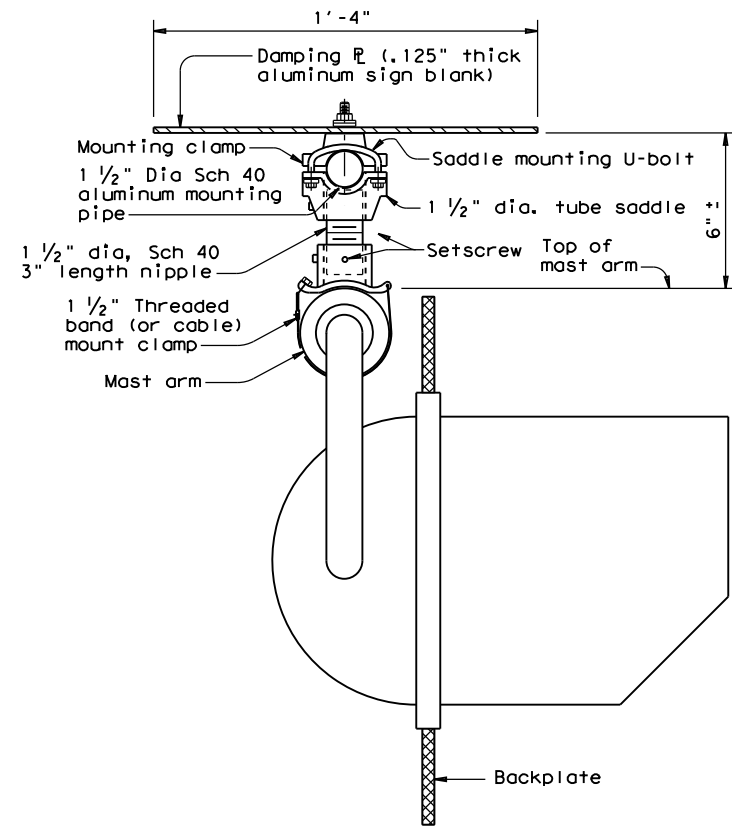


PLAN



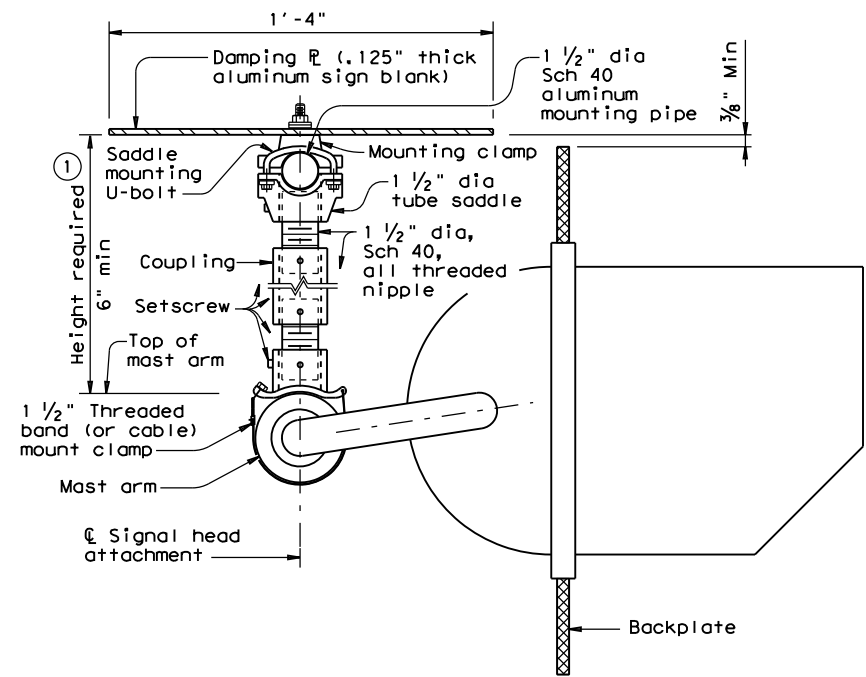
ELEVATION

**DAMPING PLATE MOUNTING DETAILS**  
 (Showing alternate placement of signal head)



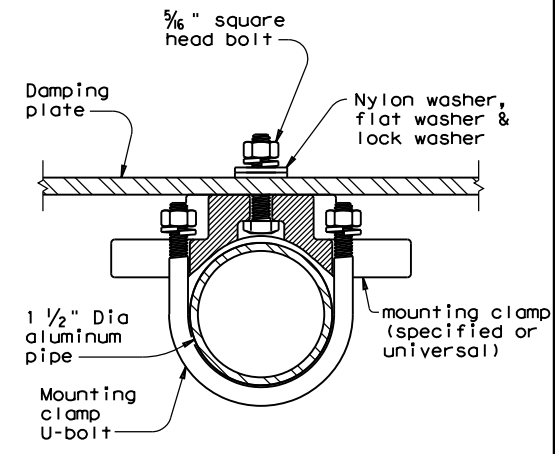
SECTION A-A

(Showing standard placement of signal head)  
 (Mounting clamp U-bolt is not shown for clarity)



SECTION A-A

(Showing alternate placement of signal head)  
 (Mounting clamp U-bolt is not shown for clarity)



SECTION B-B

(Showing damping plate attachment)

**GENERAL NOTES:**

- In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.
- Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies will conform to Standard sheet SMD(GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.
- Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.
- Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".
- Contractor will verify applicable field dimensions before the installation.
- Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B<sub>FL</sub> or C<sub>FL</sub> retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

① Recommended supporting assemblies to achieve required height for horizontal section heads

Height required	One nipple each length	Two nipples each length plus One coupling each length
6"-6 3/4"	3"	-
7"-8 1/2"	4"	-
9"-10 1/2"	6"	-
11"-15 1/2"	-	4" 5"
16"-24"	-	6" 10"

Texas Department of Transportation  
 Traffic Safety Division Standard

**MAST ARM DAMPING PLATE DETAILS**

**MA-DPD-20**

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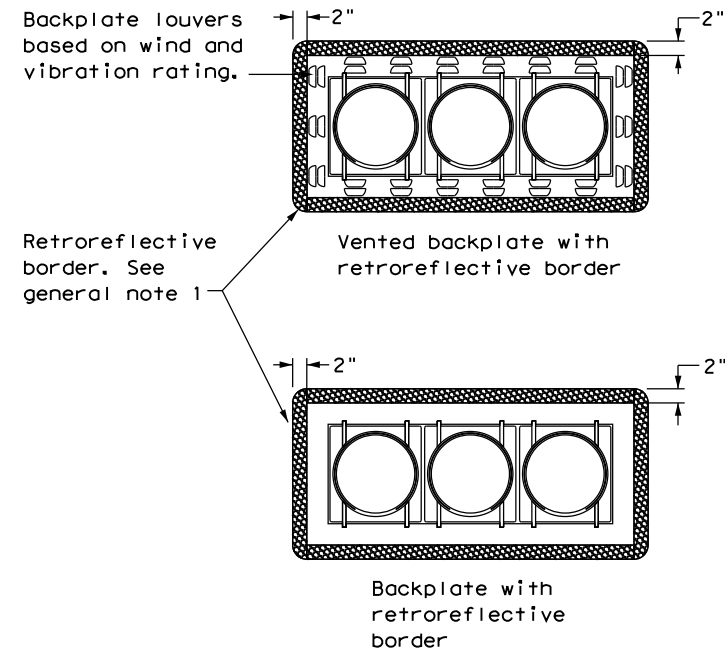
© TxDOT January 2012    CONT: 0113    SECT: 07    JOB: 072    HIGHWAY: US290

6-20    REVISIONS    DIST: 14    COUNTY: HAYS    SHEET NO.: 95

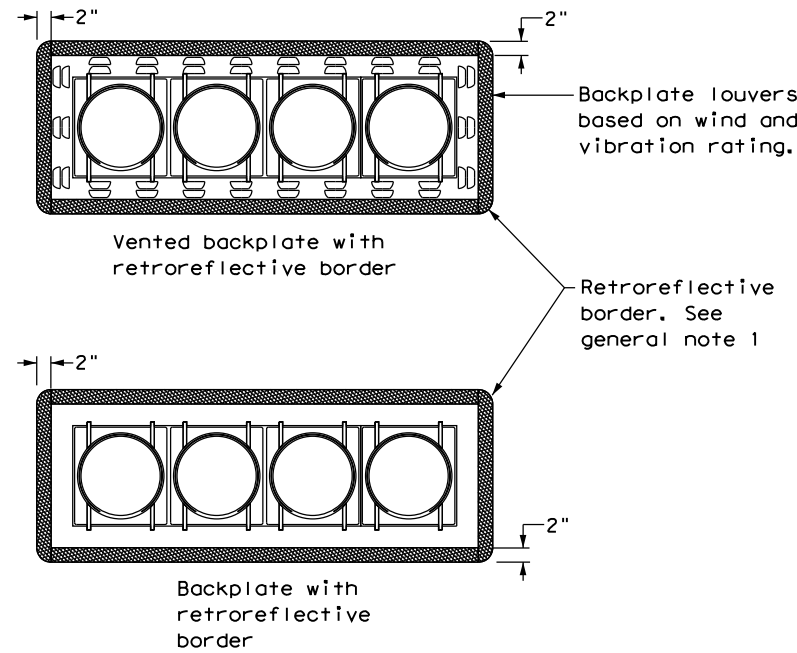


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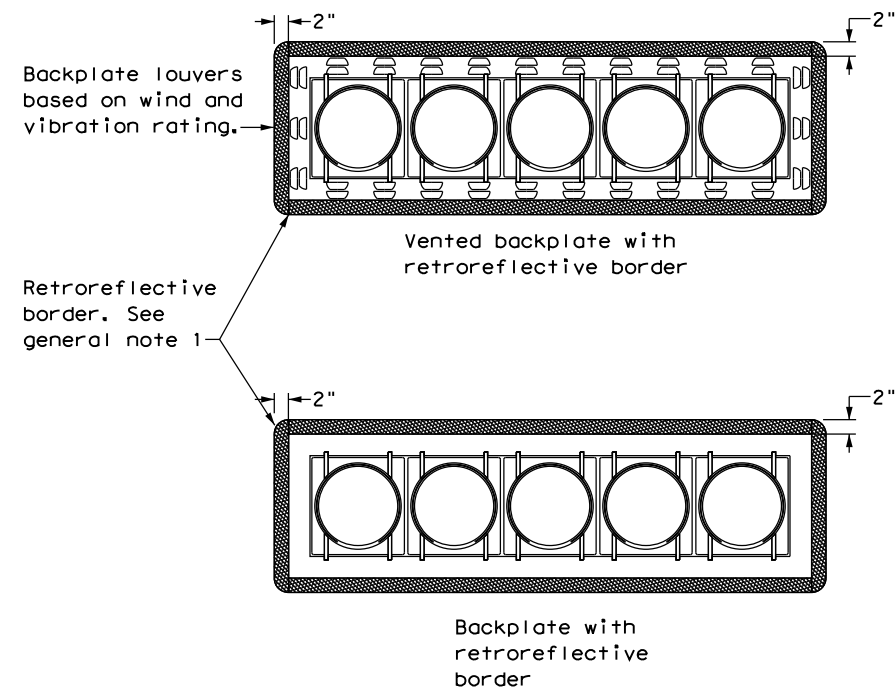
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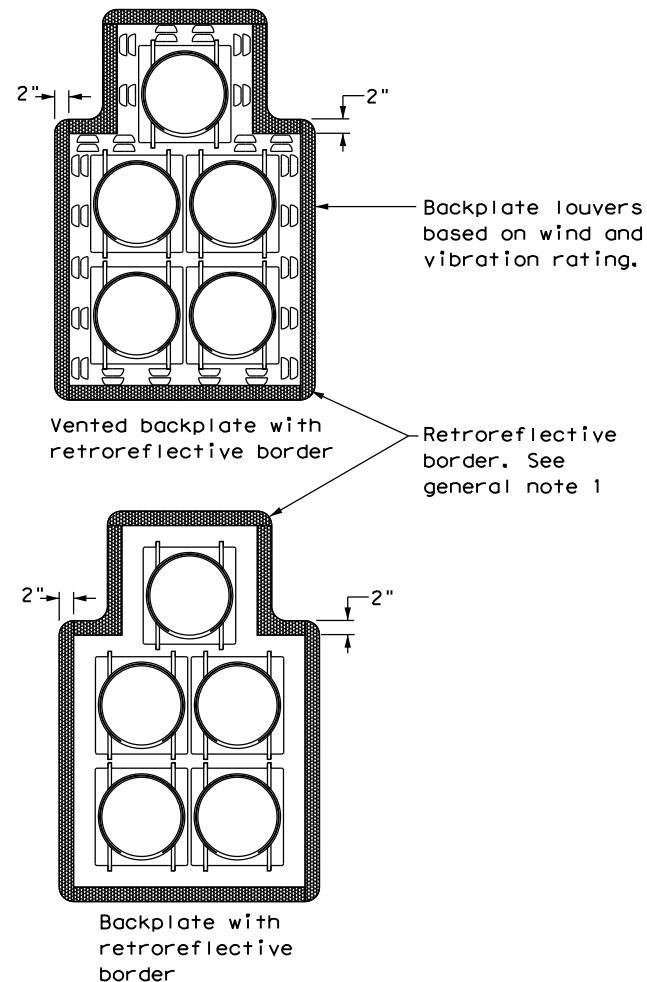
**THREE-SECTION HEAD**  
 HORIZONTAL OR VERTICAL



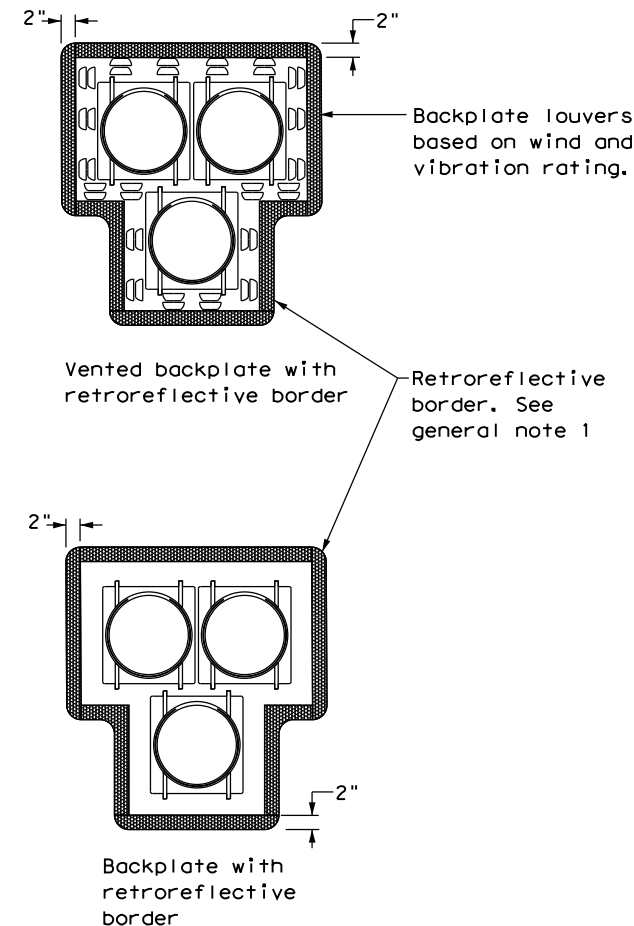
**FOUR-SECTION HEAD**  
 HORIZONTAL OR VERTICAL



**FIVE-SECTION HEAD**  
 HORIZONTAL OR VERTICAL



**FIVE-SECTION HEAD**  
 CLUSTER



**PEDESTRIAN HYBRID**  
 BEACON

**GENERAL NOTES:**

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B<sub>FL</sub> or C<sub>FL</sub> retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatibility must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
  - Pole mounted
  - Overhead mounted
  - Span wire mounted
  - Mast arm mounted
  - Vertical signal heads
  - Horizontal signal heads
  - Clustered signal heads
  - Pedestrian hybrid beacons

		<b>Texas Department of Transportation</b>		<b>Traffic Safety Division Standard</b>	
<b>TRAFFIC SIGNAL HEAD WITH BACKPLATE</b>					
<b>TS-BP-20</b>					
FILE: ts-bp-20.dgn	DW: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0113	07	072	US290	
	DIST	COUNTY	SHEET NO.		
	14	HAYS	96		

A. GENERAL SITE DATA

1. PROJECT LIMITS: US 290: FROM 400' WEST OF TRAUTWEIN ROAD TO 1000' EAST OF TRAUTWEIN ROAD  
 TRAUTWEIN: FROM 600' NORTH OF US 290 TO US 290

Project Coordinates: 13,985,212.98 Latitude (N), 2,280,491.18 Longitude (E)

2. PROJECT SITE MAPS:

- \* Project Location Map: The Title Sheet
- \* Drainage Patterns: Drainage Area Maps
- \* Slopes Anticipated After Major Gratings or Areas of Soil Disturbance: Typical Sections (Sheets 9-10)
- \* Location of Erosion and Sediment Controls: Erosion Control (Sheet 98)
- \* Surface Waters and Discharge Locations: Drainage and Culvert Layouts (Sheets 51-52)
- \* Project Specific Locations: To be specified by the Project Field Office during construction and located in the Project SW3P File. Reference Item #10 below

3. PROJECT DESCRIPTION: For the Construction of Roadway Improvements, consisting of grading, HMA surfacing, erosion control, retaining walls, a traffic signal, and drainage structures.

4. MAJOR SOIL DISTURBING ACTIVITIES:

Pavement widening, retaining wall construction and grading

5. EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

Project Area consists of Real-Comfort-Doss gravelly loam (100%). Vegetative cover is primarily native and introduced grasses related to existing roadway improvements.

6. TOTAL PROJECT AREA: 2.596 AC.

7. TOTAL AREA TO BE DISTURBED: 0.968 AC (37.3%)

8. WEIGHTED RUNOFF COEFFICIENT  
 BEFORE CONSTRUCTION: 0.717  
 AFTER CONSTRUCTION: 0.778

9. NAME OF RECEIVING WATERS: (Segment Number of Receiving waters)

The project drains south into Segment 1427H - Pier Branch which drains into Segment 1427 - Onion Creek

10. PROJECT SW3P FILE: For projects disturbing one acre or more, TxDOT will maintain an SW3P file with all pertinent environmental documents, correspondence, etc. at the project field office. If no field office is available then the SW3P file shall be kept in the Inspector's truck.

B. EROSION AND SEDIMENT CONTROLS

1. SOIL STABILIZATION PRACTICES:

- TEMPORARY SEEDING
- PERMANENT PLANTING, SODDING, OR SEEDING
- MULCHING
- SOIL RETENTION BLANKET
- BUFFER ZONES
- PRESERVATION OF NATURAL RESOURCES

OTHER:

Disturbed areas on which construction activity has ceased (temporarily or permanently) shall be stabilized within 14 days unless activities are scheduled to resume within 21 days.

2. STRUCTURAL PRACTICES:

- SILT FENCES
- ROCK FILTER DAMS
- DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- DIVERSION DIKE AND SWALE COMBINATIONS
- PIPE SLOPE DRAINS
- PAVED FLUMES
- ROCK BEDDING AT CONSTRUCTION EXIT
- TIMBER MATTING AT CONSTRUCTION EXIT
- CHANNEL LINERS
- SEDIMENT TRAPS
- SEDIMENT BASINS
- STORM INLET SEDIMENT TRAP
- STONE OUTLET STRUCTURES
- CURBS AND GUTTERS
- STORM SEWERS
- VELOCITY CONTROL DEVICES

OTHER: EROSION CONTROL LOGS

3. STORM WATER MANAGEMENT:

- A. Storm water drainage will be provided by ditches and culverts which will carry drainage within the R.O.W. to the lows within the roadway and project site which drains to natural facilities.
- B. Non paved areas and ditches shall be stabilized with a permanent vegetative cover.
- C. Other permanent erosion controls include hydraulic design to limit structure outlet velocities and grading design generally consisting of 4 : 1 or flatter slopes with permanent vegetative cover.

4. STORM WATER MANAGEMENT ACTIVITIES: (Sequence of Construction)

- 1. Prepare ROW
- 2. Place erosion control logs.
- 3. Construct roadway. Activities to include excavation, embankment, Flexible Base, HMA pavement, traffic signal, and retaining walls. Sediment control devices will be added or adjusted as needed to continue controlling runoff.
- 4. Stabilize disturbed areas with seeding.
- 5. Structural practices on grassed slopes will remain in place until seeding is effective. Inlet protection controls may be removed upon completion of pavement construction activities.

5. NON-STORM WATER DISCHARGES:

Filter non-storm water discharges, or hold retention basins, before being allowed to mix with storm water. These discharges consist of non-polluted ground water, spring water, foundation and/or footing drain water; and water used for dust control, pavement washing and vehicle washwater containing no detergents.

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:

Maintenance will be performed as indicated on Field Inspection and Maintenance Report Form 2118.

2. INSPECTION:

Inspection will be performed as indicated on Field Inspection and Maintenance Report Form 2118.

3. WASTE MATERIALS:

All waste materials will be collected, stored and disposed of in a legal and proper manner. No construction waste material will be buried on site.

4. HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

At a minimum, any products in the following categories are considered to be hazardous. Paints, acids for cleaning masonry surfaces, cleaning solvents, asphalt products, chemical additives for soil stabilization, or concrete curing compounds and additives. In the event a spill which may be hazardous, the spill coordinator must be contacted immediately.

5. SANITARY WASTE:

All sanitary waste will be collected from the portable units as necessary or as required by local regulation by a licensed sanitary waste management contractor.

OFFSITE VEHICLE TRACKING:

- HAUL ROADS DAMPENED FOR DUST CONTROL
- LOADED HAUL TRUCKS TO BE COVERED WITH TARPULIN
- EXCESS DIRT ON ROAD REMOVED DAILY
- STABILIZED CONSTRUCTION ENTRANCE

OTHER:

Excess dirt on road shall be broomed as needed or as directed by the engineer.

REMARKS: Disposal areas, stockpiles and haul roads shall be constructed in a manner that will minimize and control sediment from entering receiving waters. Disposal areas shall not be located in any waterbody or streambed.

Construction staging areas and vehicle maintenance areas shall be constructed to minimize the runoff of pollutants.

Filename: \\016874-000\* Aust in Dist\*SW3P.dgn  
 Date: 4/11/2023



*Daniel A. Rogers*

4/11/2023




**HAYS COUNTY**



WSB & ASSOCIATES, INC.  
FIRM # 16849

**US 290 AT  
TRAUTWEIN ROAD**

**STORM WATER POLLUTION  
PREVENTION PLAN (SW3P)**

DATE: 4/11/2023		SHEET 1 OF 1		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07	072	US 290	97

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DATE: FILE:

**I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402**

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.  
2.
- No Action Required     Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

**II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404**

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
- Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
- Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
- Individual 404 Permit Required
- Other Nationwide Permit Required: NWP# \_\_\_\_\_

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.  
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.  
2.  
3.  
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 GENERAL NOTES FOR MIGRATORY BIRD REQUIREMENTS.
- 2.
- 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.)

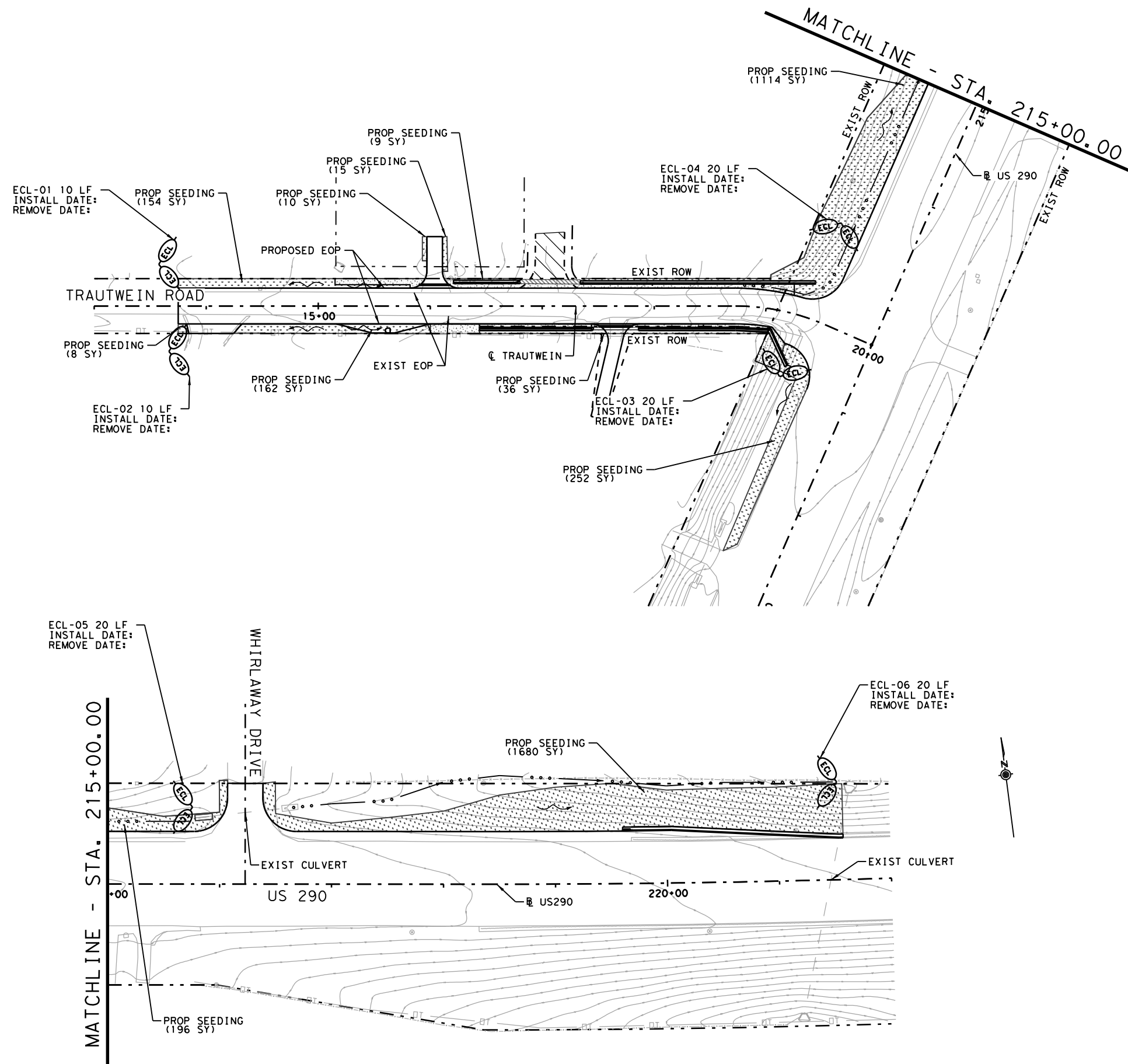
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Action No.

1.  
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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>				
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©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
12-12-2011 IDS REVISIONS	0113	07	072	US 290
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	HAYS	98	

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Date: 4/11/2023



- LEGEND**
- PERMANENT SEEDING
  - SOIL RETENTION BLANKET
  - EROSION CONTROL LOG
  - FLOW DIRECTION



*Daniel A. Rogers*

4/11/2023



**HAYS COUNTY**

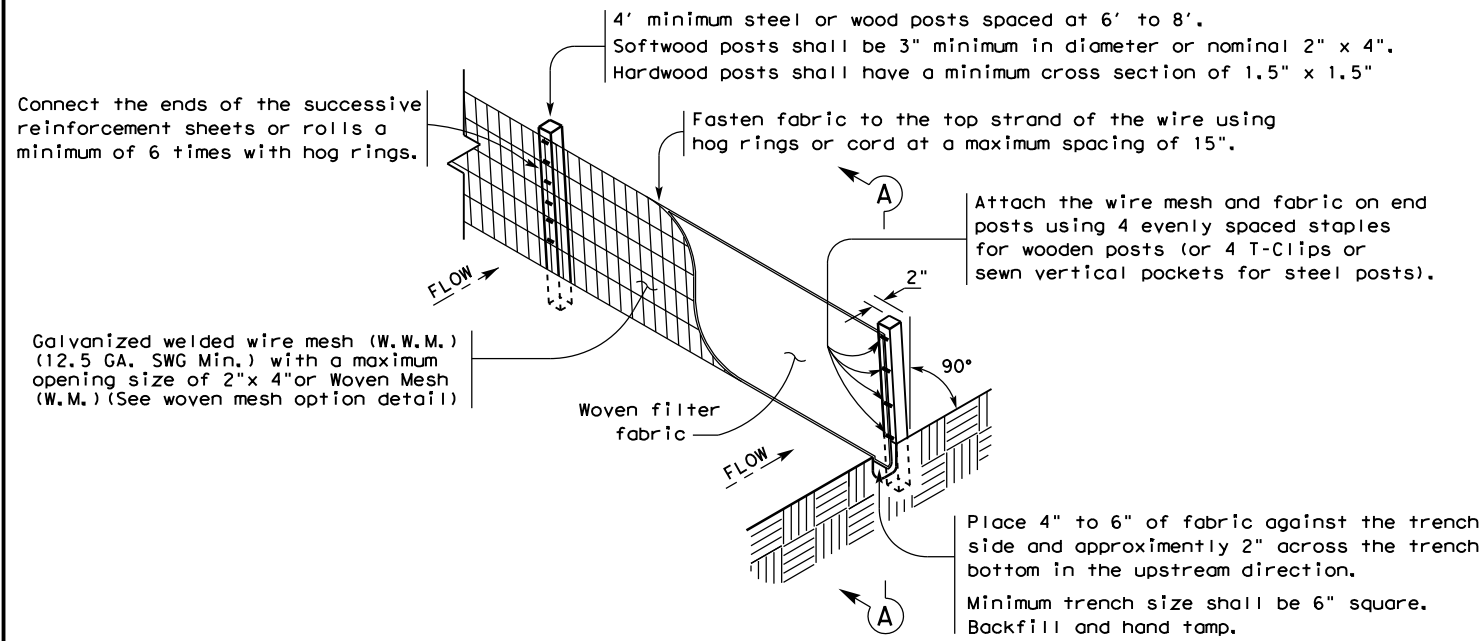


**US 290 AT  
TRAUTWEIN ROAD  
TEMPORARY AND  
PERMANENT  
EROSION CONTROL**

DATE: 4/11/2023		SHEET 1 OF 1		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07 072	US 290	99	

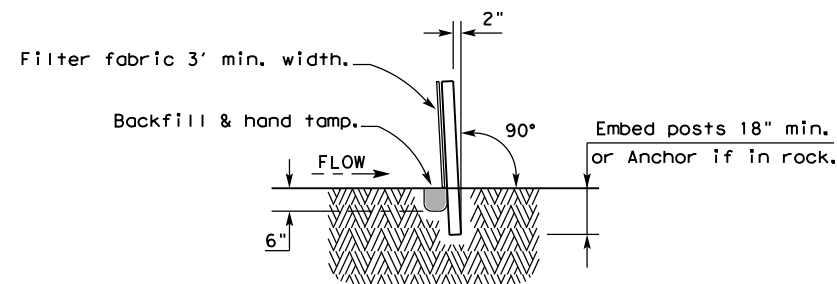
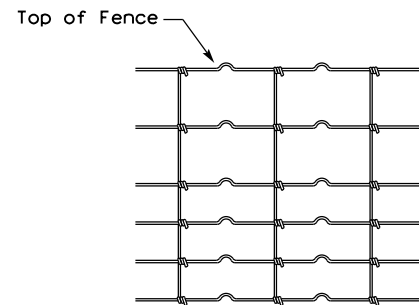
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TEMPORARY SEDIMENT CONTROL FENCE

SCF



SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA. SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT<sup>2</sup>. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

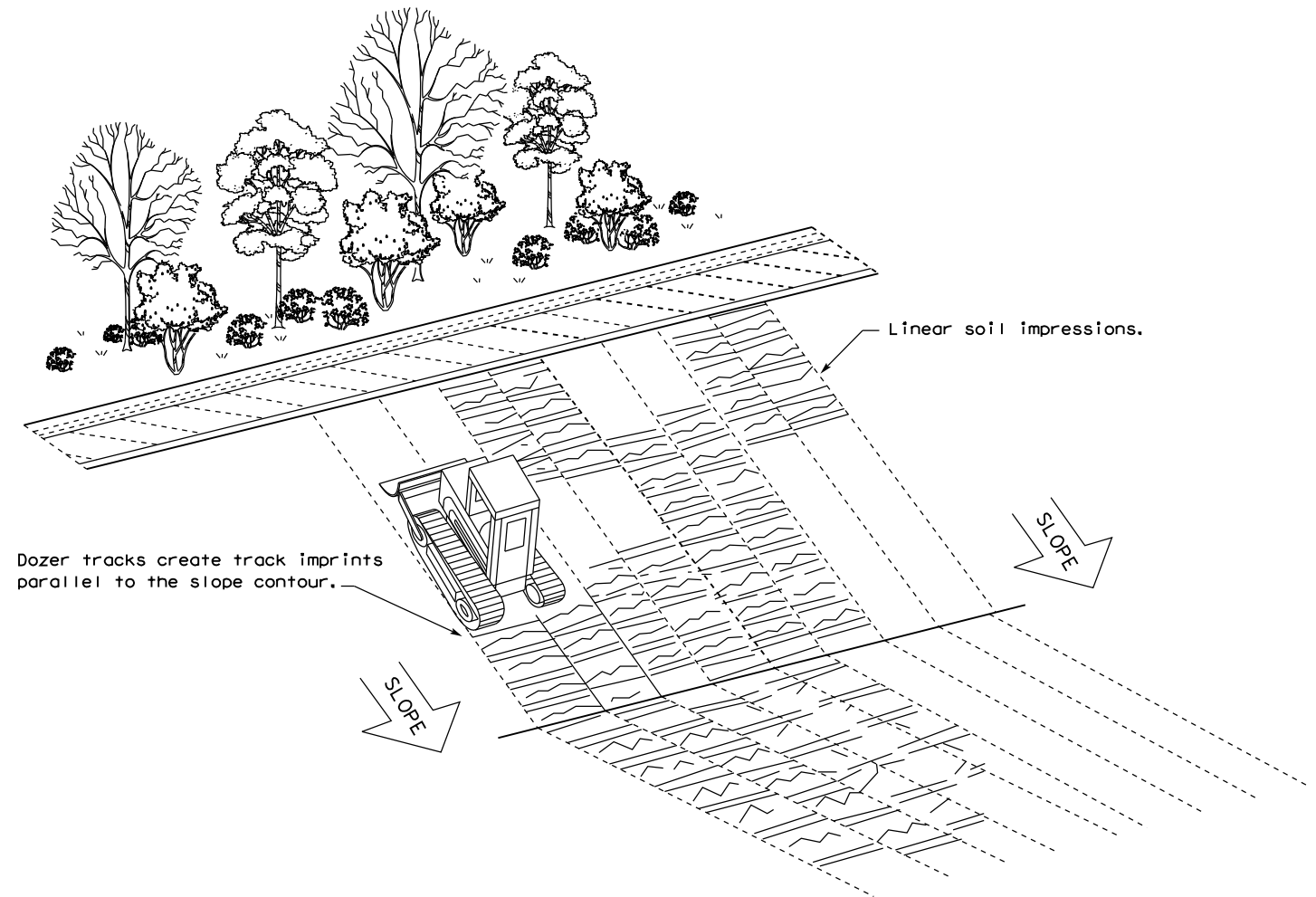
LEGEND

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.

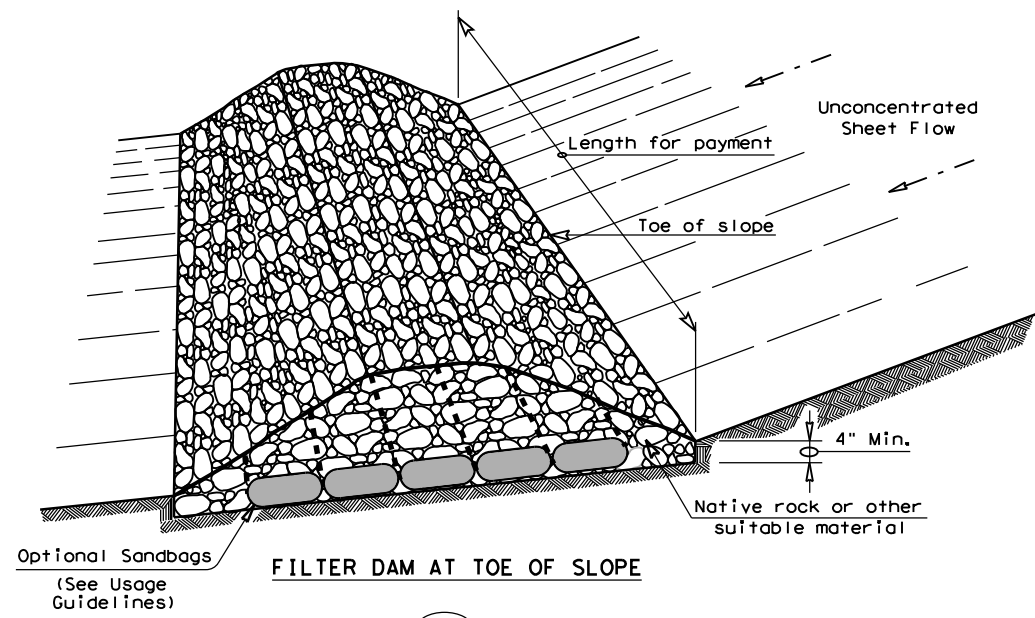


VERTICAL TRACKING

				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	0113	07	072	US290	
	DIST	COUNTY		SHEET NO.	
	14	HAYS		100	

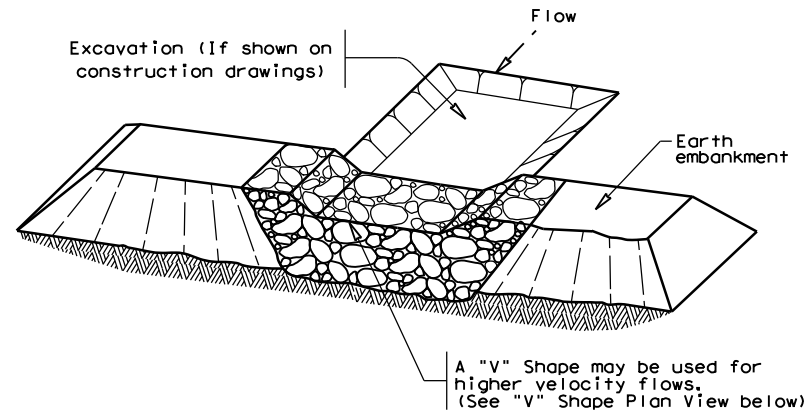
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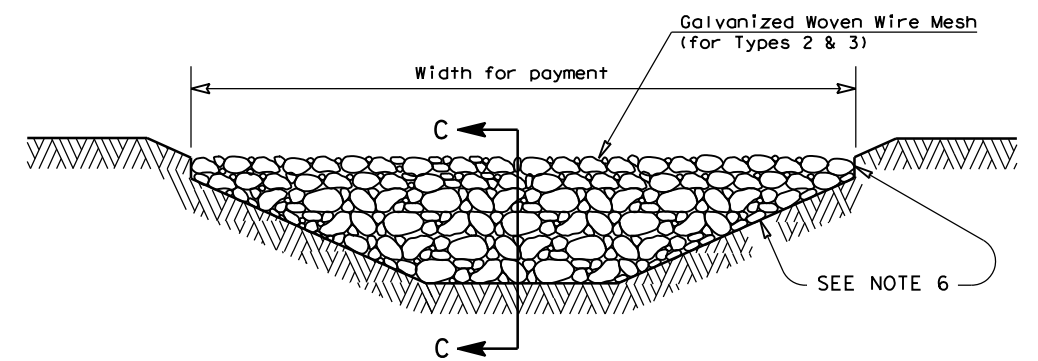
FILTER DAM AT TOE OF SLOPE

(RFD1)



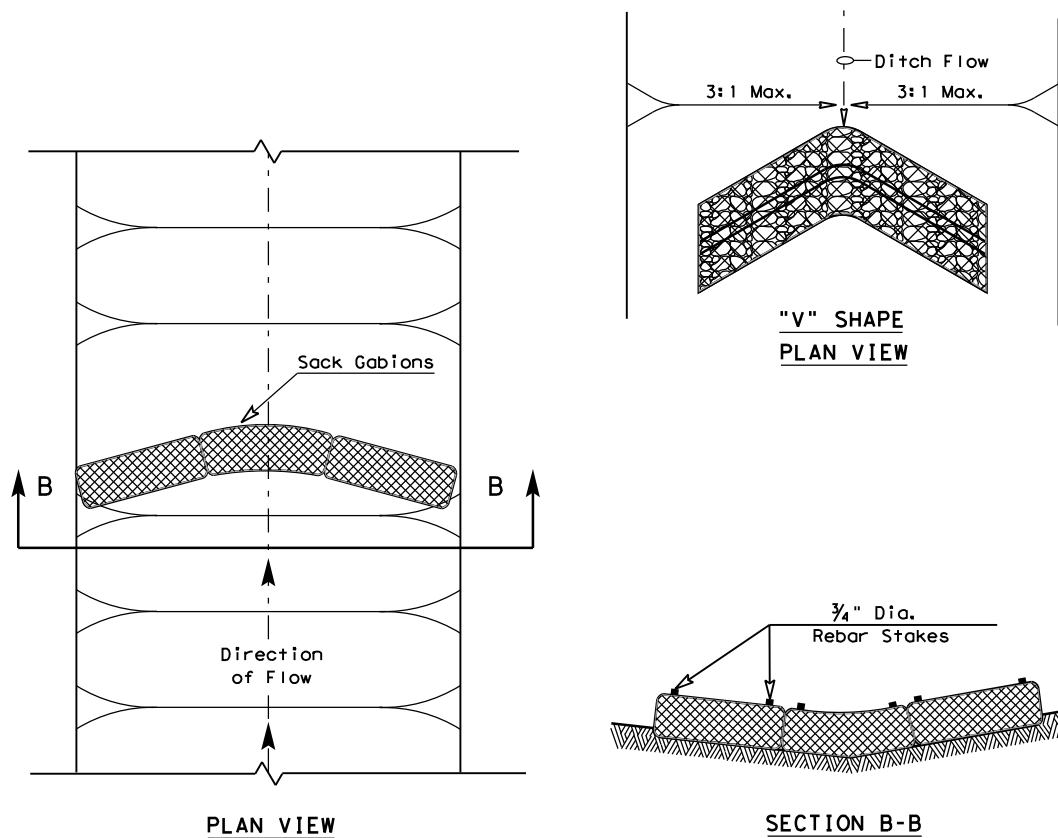
FILTER DAM AT SEDIMENT TRAP

(RFD1) OR (RFD2)



FILTER DAM AT CHANNEL SECTIONS

(RFD1) OR (RFD2) OR (RFD3)

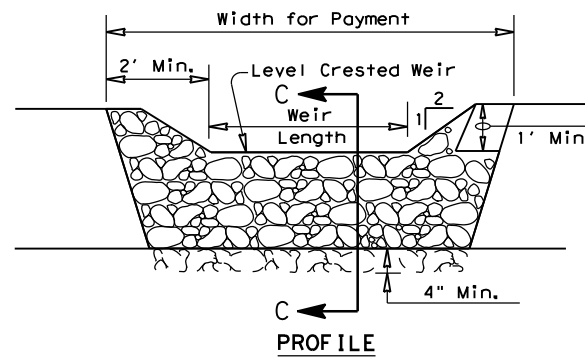


PLAN VIEW

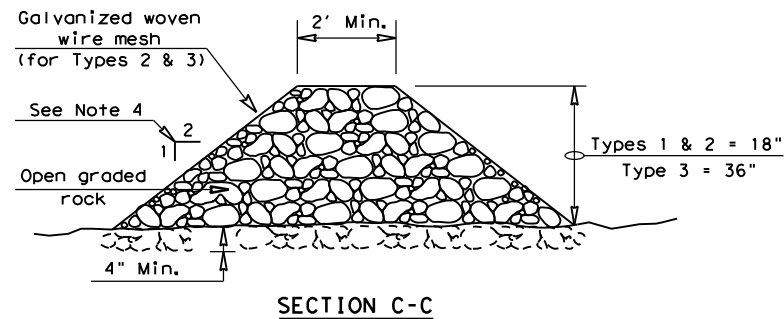
SECTION B-B

TYPE 4 (SACK GABIONS)

SECTION A-A



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.

**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.

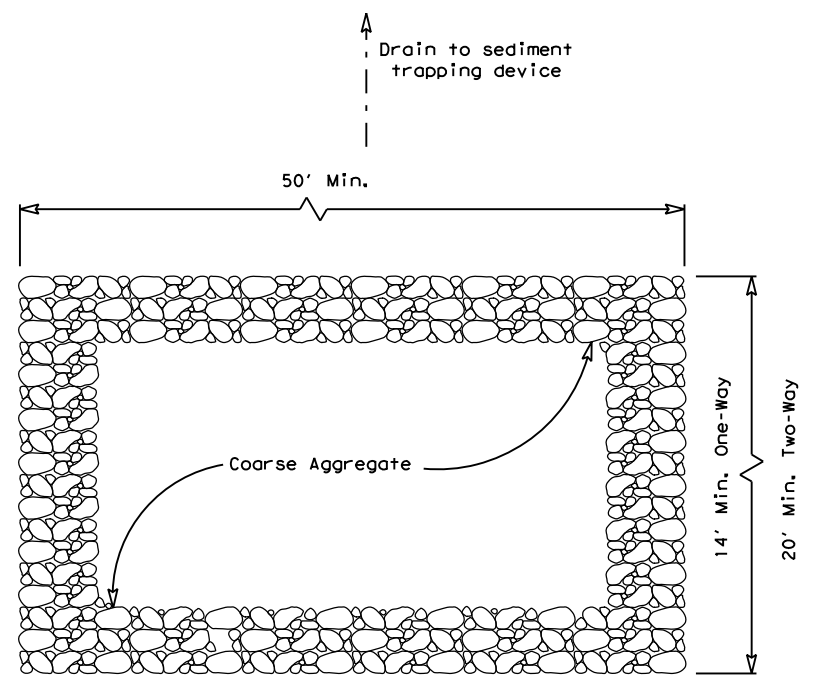
**PLAN SHEET LEGEND**

- Type 1 Rock Filter Dam (RFD1)
- Type 2 Rock Filter Dam (RFD2)
- Type 3 Rock Filter Dam (RFD3)
- Type 4 Rock Filter Dam (RFD4)

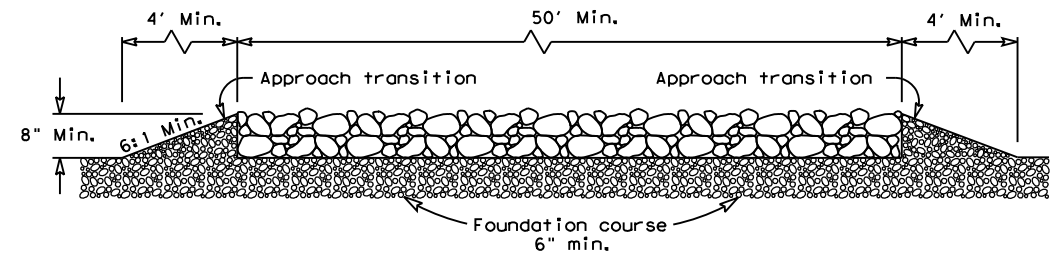
		Design Division Standard	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>ROCK FILTER DAMS</b> <b>EC(2)-16</b>			
FILE: ec216	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT: 0113	SECT: 07	JOB: 072
REVISIONS		HIGHWAY: US290	
DIST: 14	COUNTY: HAYS	SHEET NO.: 101	

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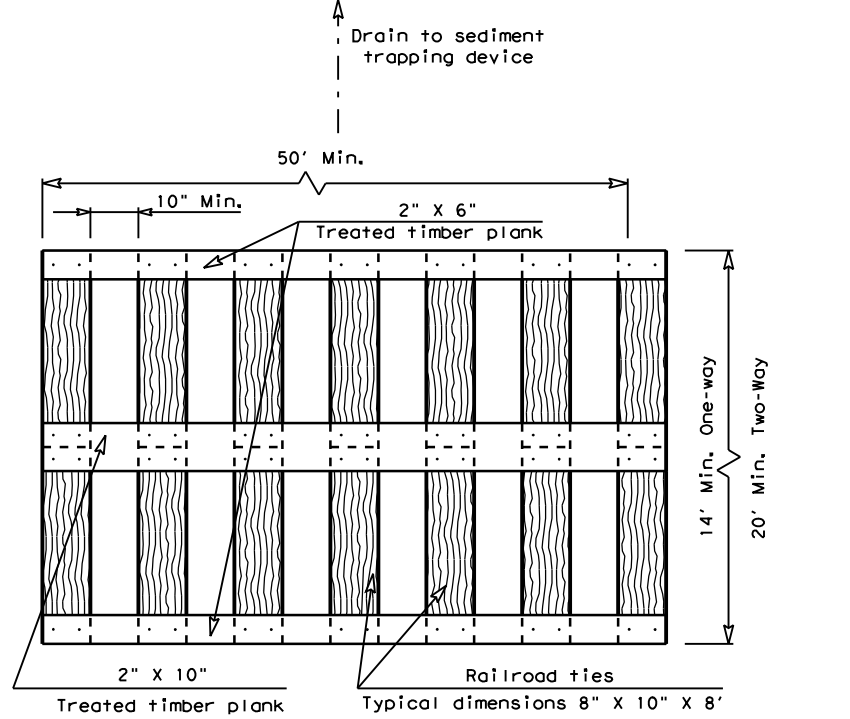


ELEVATION VIEW

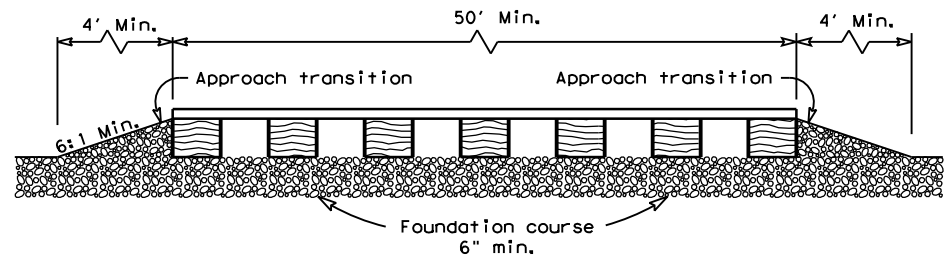
CONSTRUCTION EXIT (TYPE 1)  
 ROCK CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

- The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
- The coarse aggregate should be open graded with a size of 4" to 8".
- The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
- The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materials approved by the Engineer.
- The construction exit shall be graded to allow drainage to a sediment trapping device.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.
- Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



PLAN VIEW

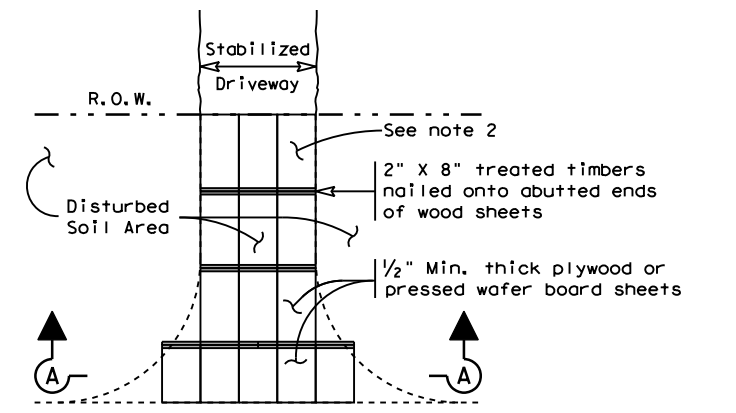


ELEVATION VIEW

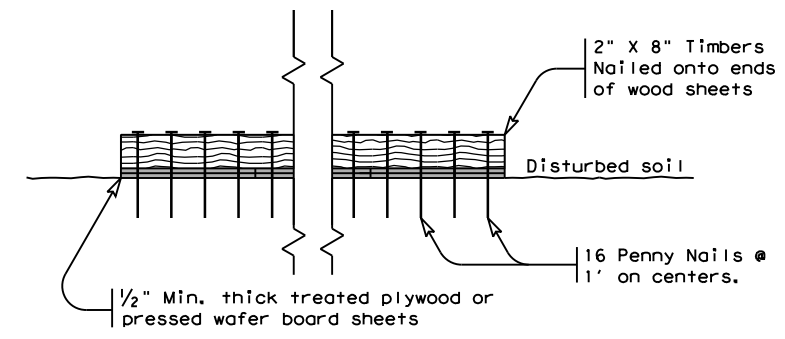
CONSTRUCTION EXIT (TYPE 2)  
 TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 2)

- The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
- The treated timber planks shall be attached to the railroad ties with 1/2" x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
- The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
- The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
- The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
- The construction exit should be graded to allow drainage to a sediment trapping device.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.
- Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



PLAN VIEW



SECTION A-A  
 CONSTRUCTION EXIT (TYPE 3)  
 SHORT TERM

GENERAL NOTES (TYPE 3)

- The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
- The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
- The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.



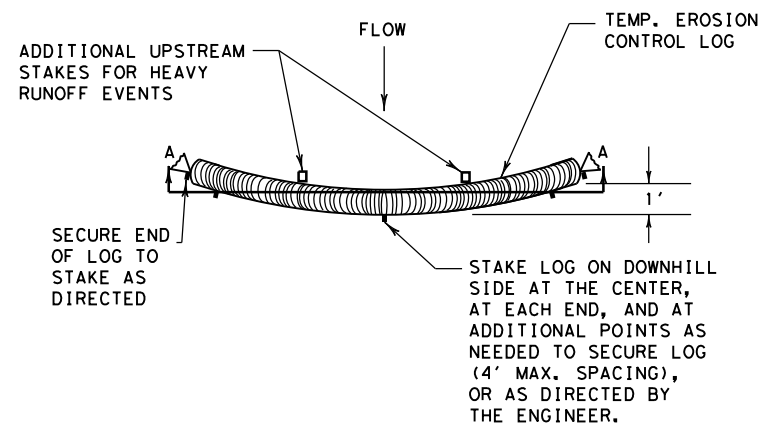
TEMPORARY EROSION,  
 SEDIMENT AND WATER  
 POLLUTION CONTROL MEASURES  
 CONSTRUCTION EXITS  
 EC(3)-16

FILE: ec316	DN: IxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
	DIST	COUNTY	SHEET NO.	
	14	HAYS	102	

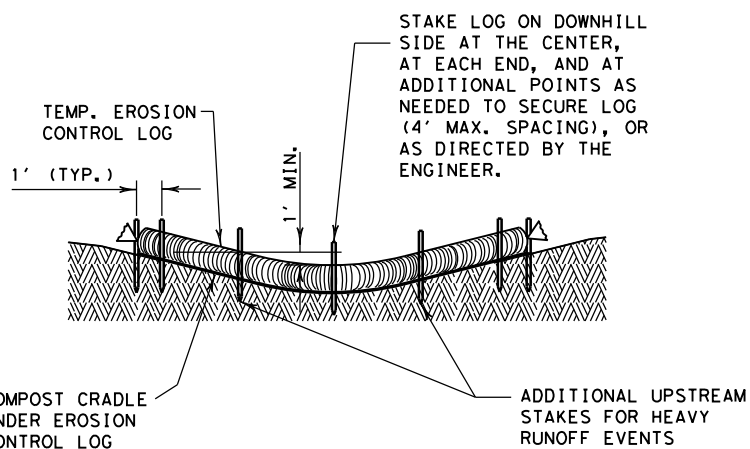


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PLAN VIEW



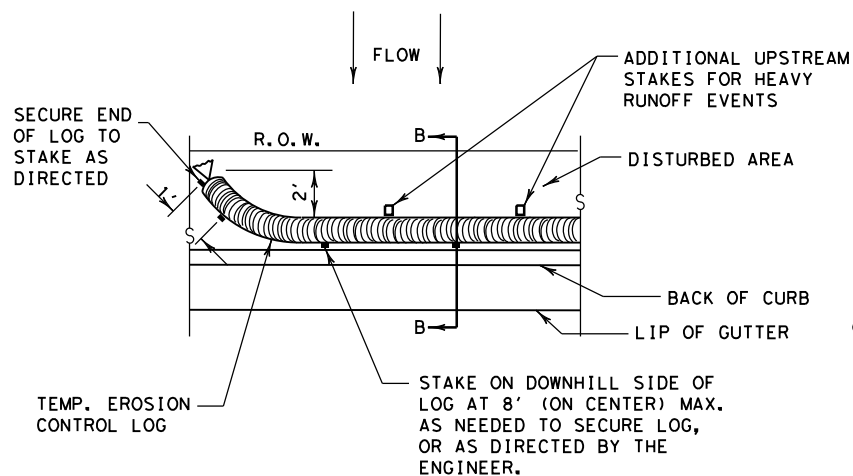
SECTION A-A

EROSION CONTROL LOG DAM

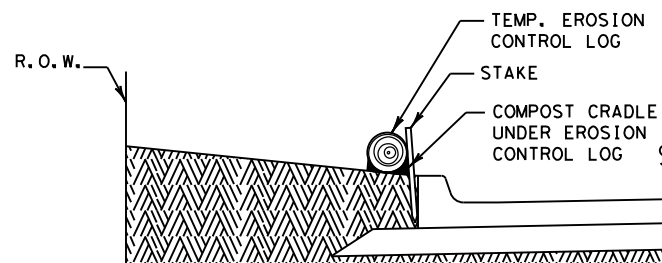
CL-D

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



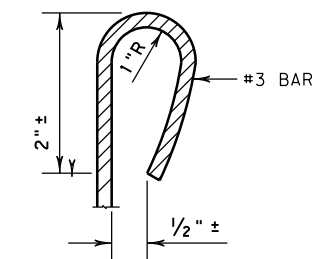
PLAN VIEW



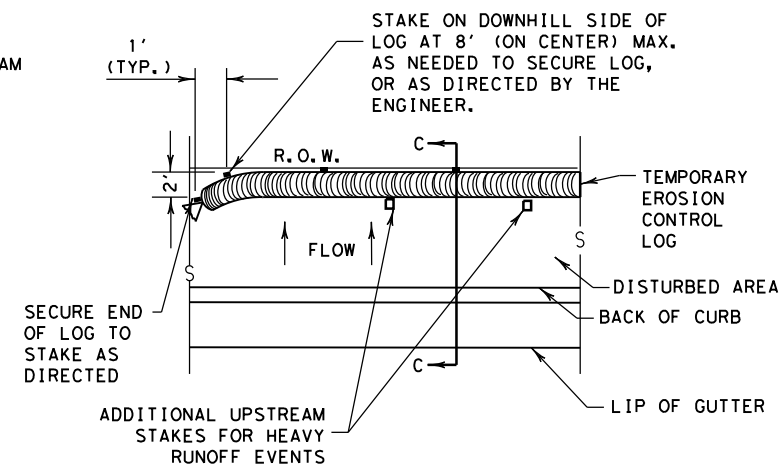
SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

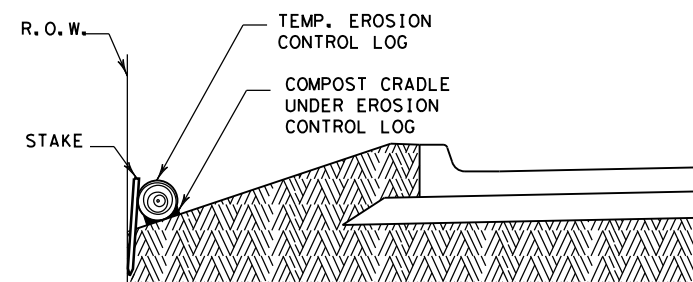
CL-BOC



REBAR STAKE DETAIL



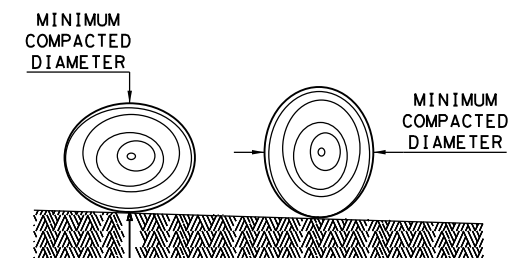
PLAN VIEW



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.

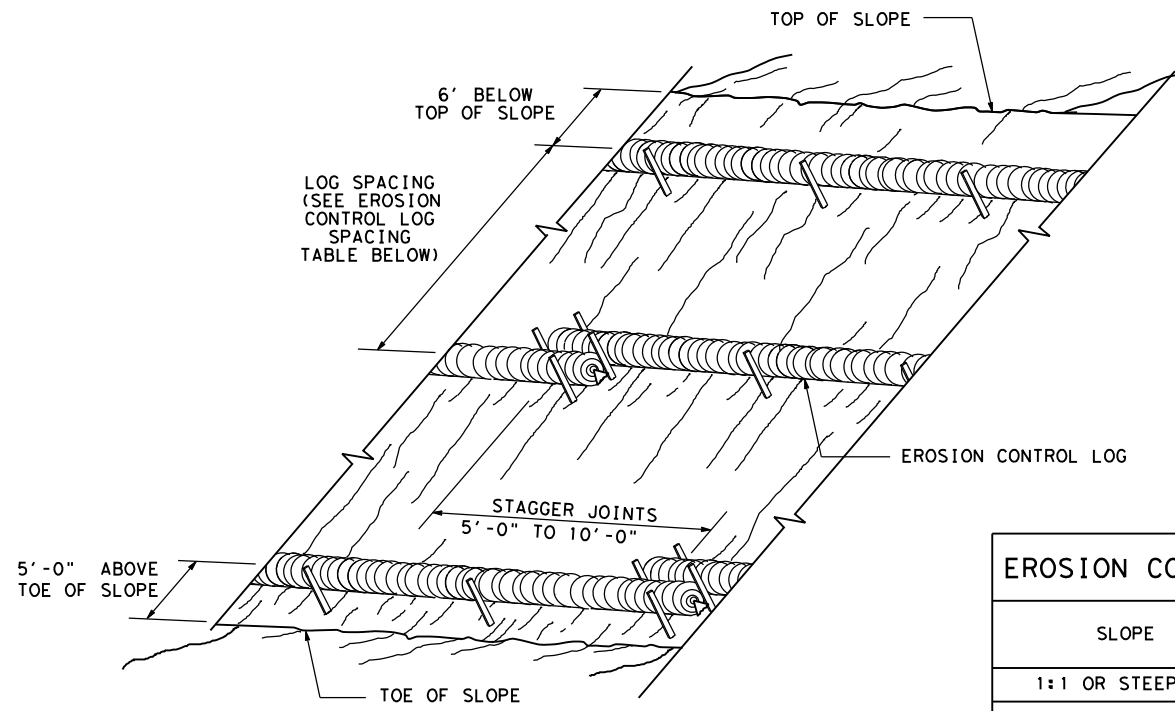
SHEET 1 OF 3

		Design Division Standard	
<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 SECT	JOB	HIGHWAY
REVISIONS	0113 07	072	US290
	DIST	COUNTY	SHEET NO.
	14	HAYS	103



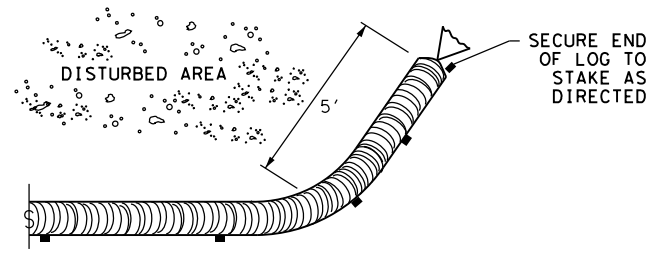
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EROSION CONTROL LOGS ON SLOPES  
 STAKE AND TRENCHING ANCHORING

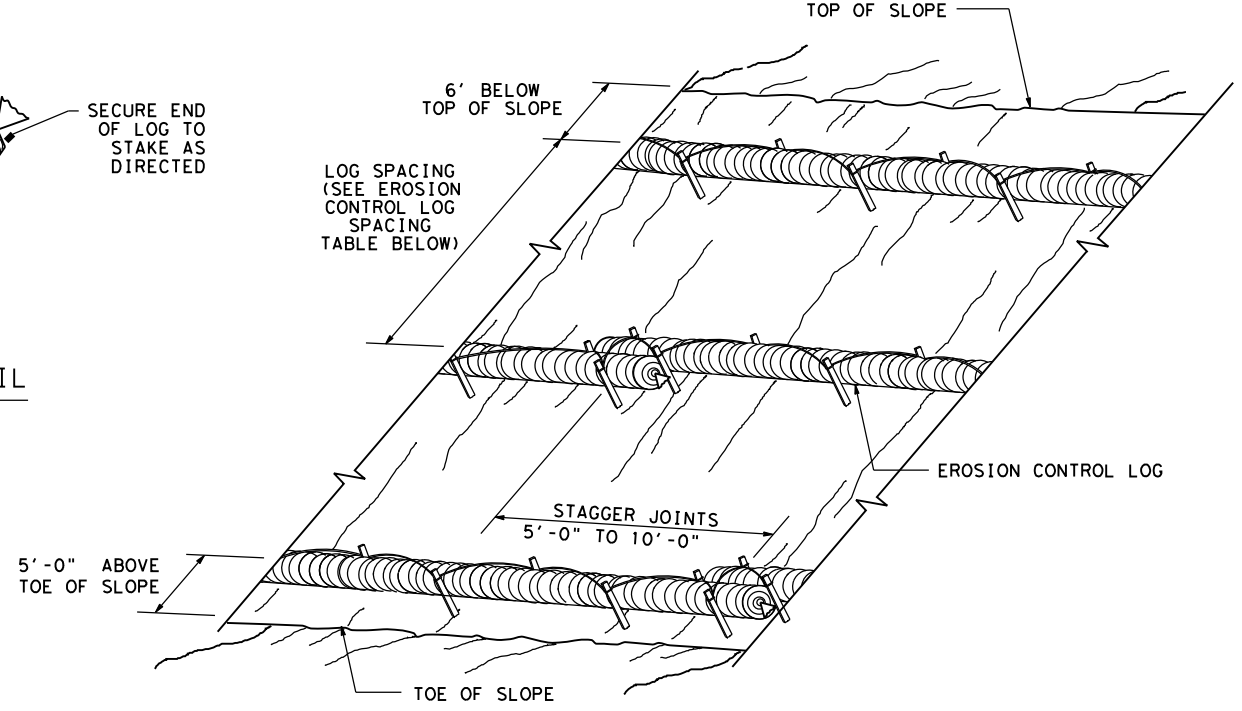
CL-SST



END SECTION RAP DETAIL

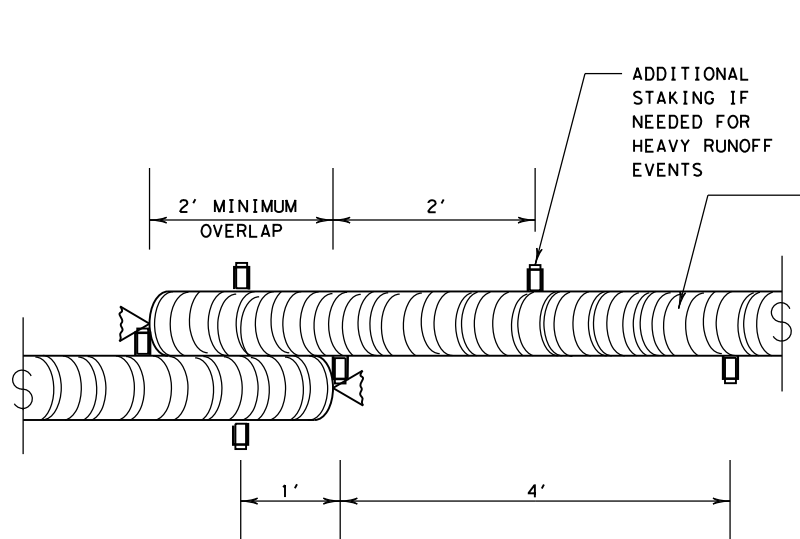
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

\* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:  
 SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;  
 HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



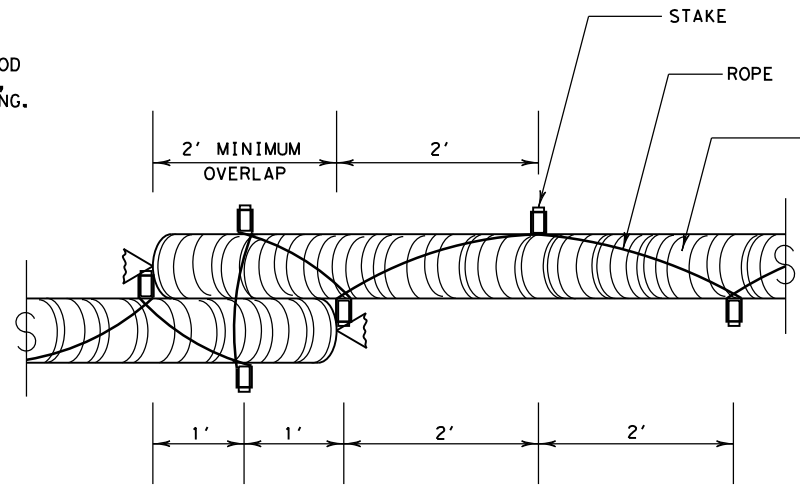
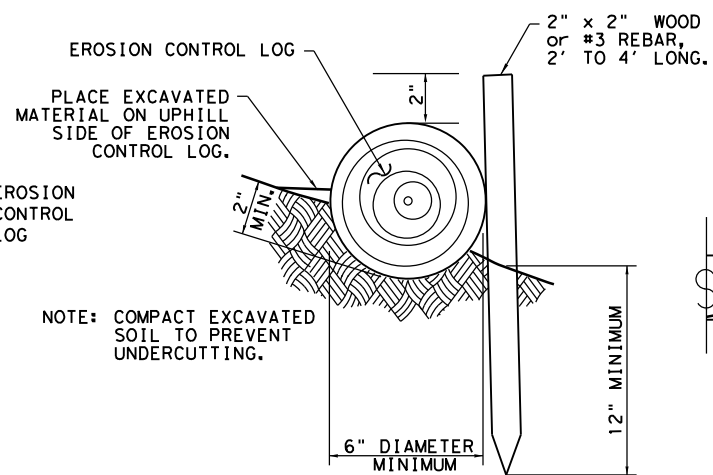
EROSION CONTROL LOGS ON SLOPES  
 STAKE AND LASHING ANCHORING

CL-SSL



STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

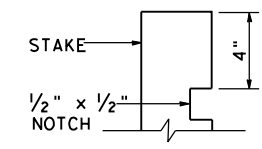


STAKE AND LASHING ANCHORING DETAIL

CL-SSL

LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"

TRENCH DEPTH TABLE



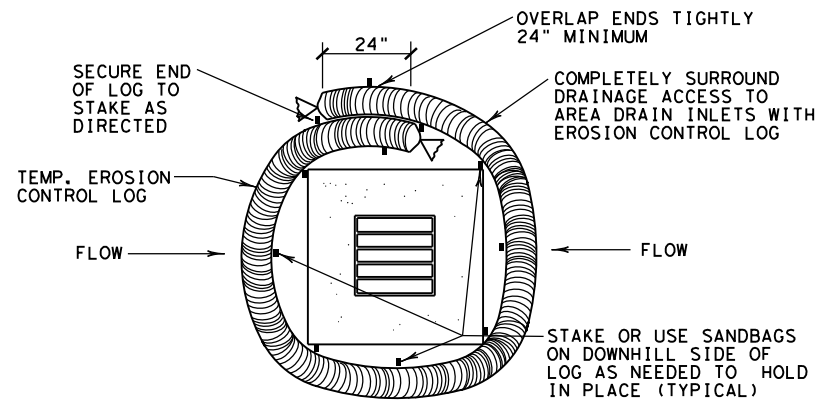
STAKE NOTCH DETAIL

SHEET 2 OF 3

		Design Division Standard	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>EROSION CONTROL LOG</b> <b>EC (9) - 16</b>			
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT
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REVISIONS	0113	07	072
	DIST	COUNTY	SHEET NO.
	14	HAYS	104

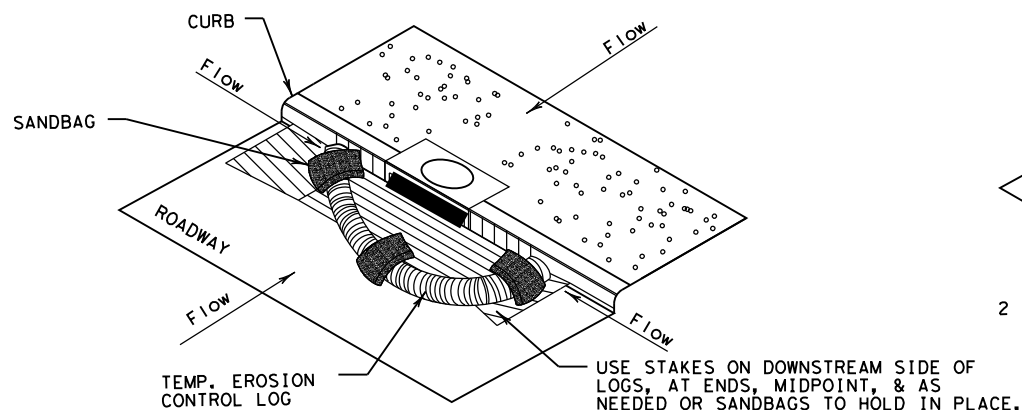
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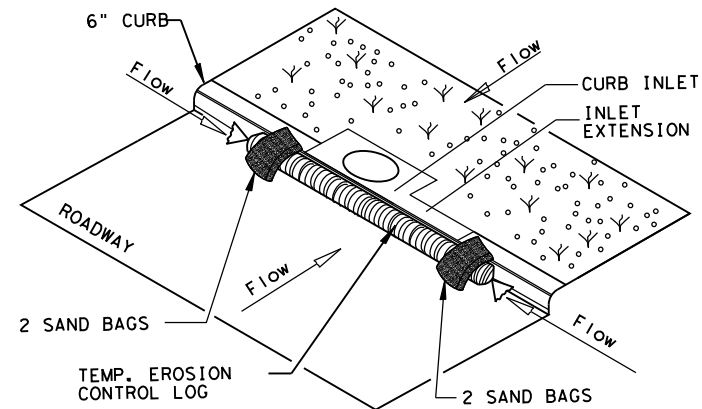
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

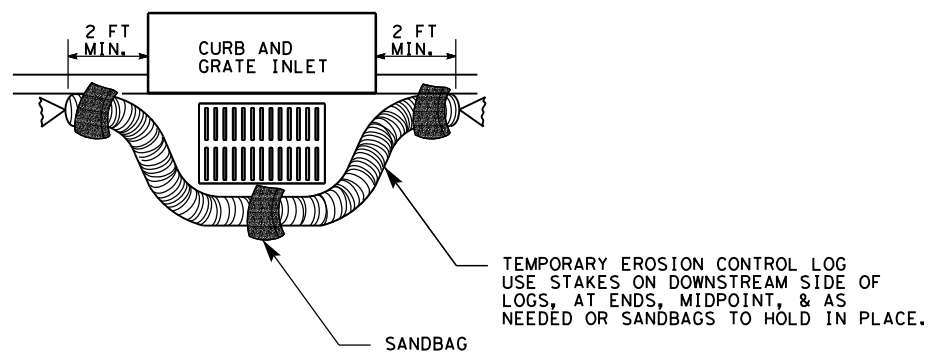
CL-CI



EROSION CONTROL LOG AT CURB INLET

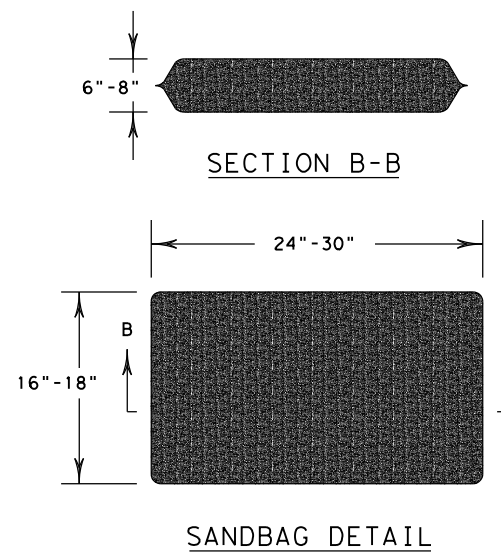
CL-CI

NOTE:  
 EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI



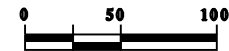
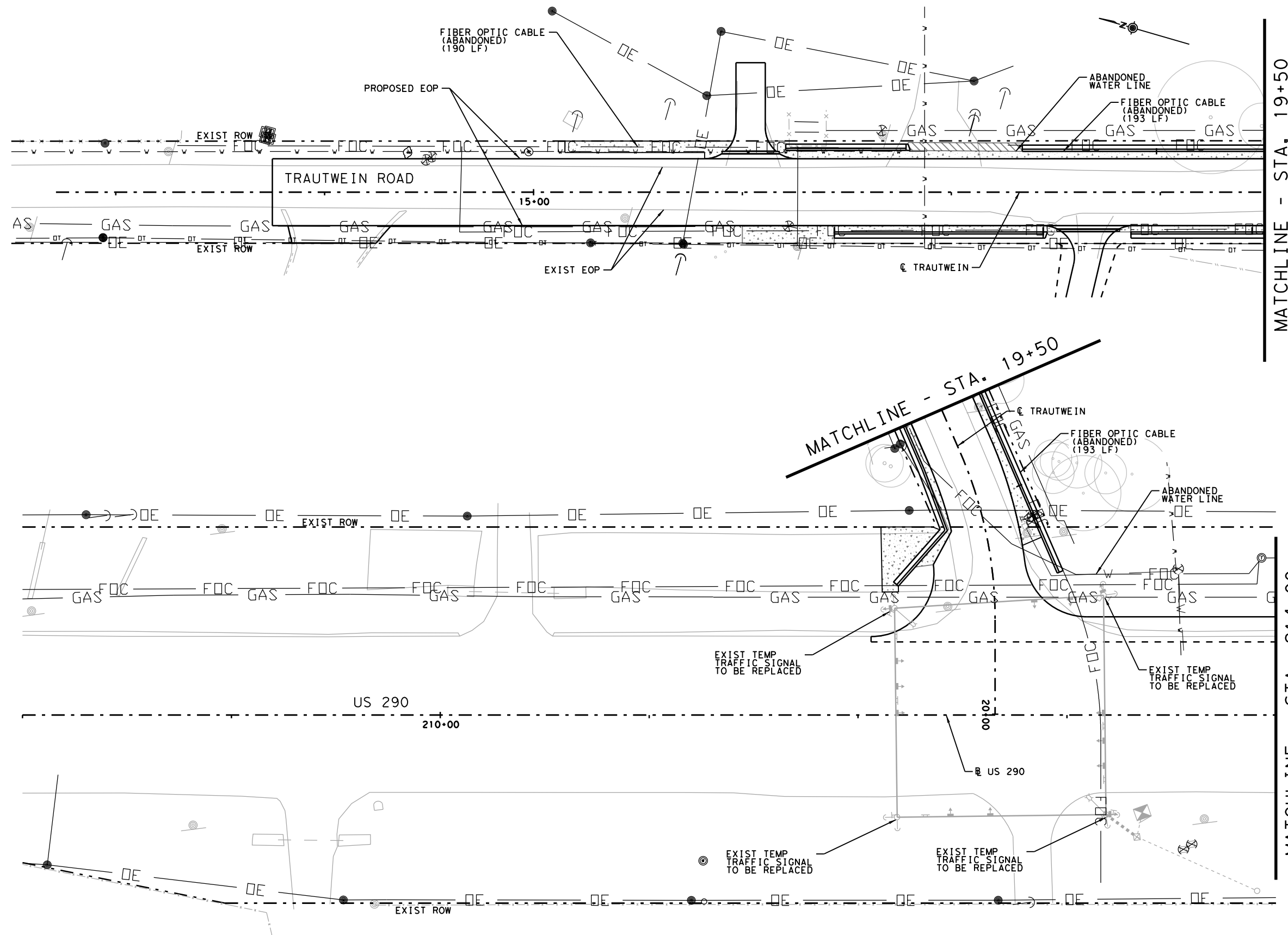
SHEET 3 OF 3



**TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES**  
**EROSION CONTROL LOG**  
**EC (9) - 16**

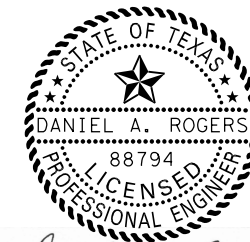
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© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0113	07	072	US290
	DIST	COUNTY	SHEET NO.	
	14	HAYS	105	

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Date: 4/13/2023



**LEGEND**

- OE — OVERHEAD ELECTRICAL
- OT — OVERHEAD TELEPHONE
- GAS — UNDERGROUND GAS
- FOC — UNDERGROUND FIBER OPTIC
- W — UNDERGROUND WATER LINE
- BURIED CONDUIT
- ⊗ WATER/GAS VALVE
- ⊙ WATER METER
- ⊕ HYDRANT
- ⊠ ELECTRIC PULL BOX
- ⊞ TRAFFIC SIGNAL CABINET
- ⊞ GROUND BOX



*Daniel G. Rogers*

4/13/2023



**HAYS COUNTY**



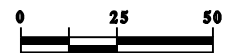
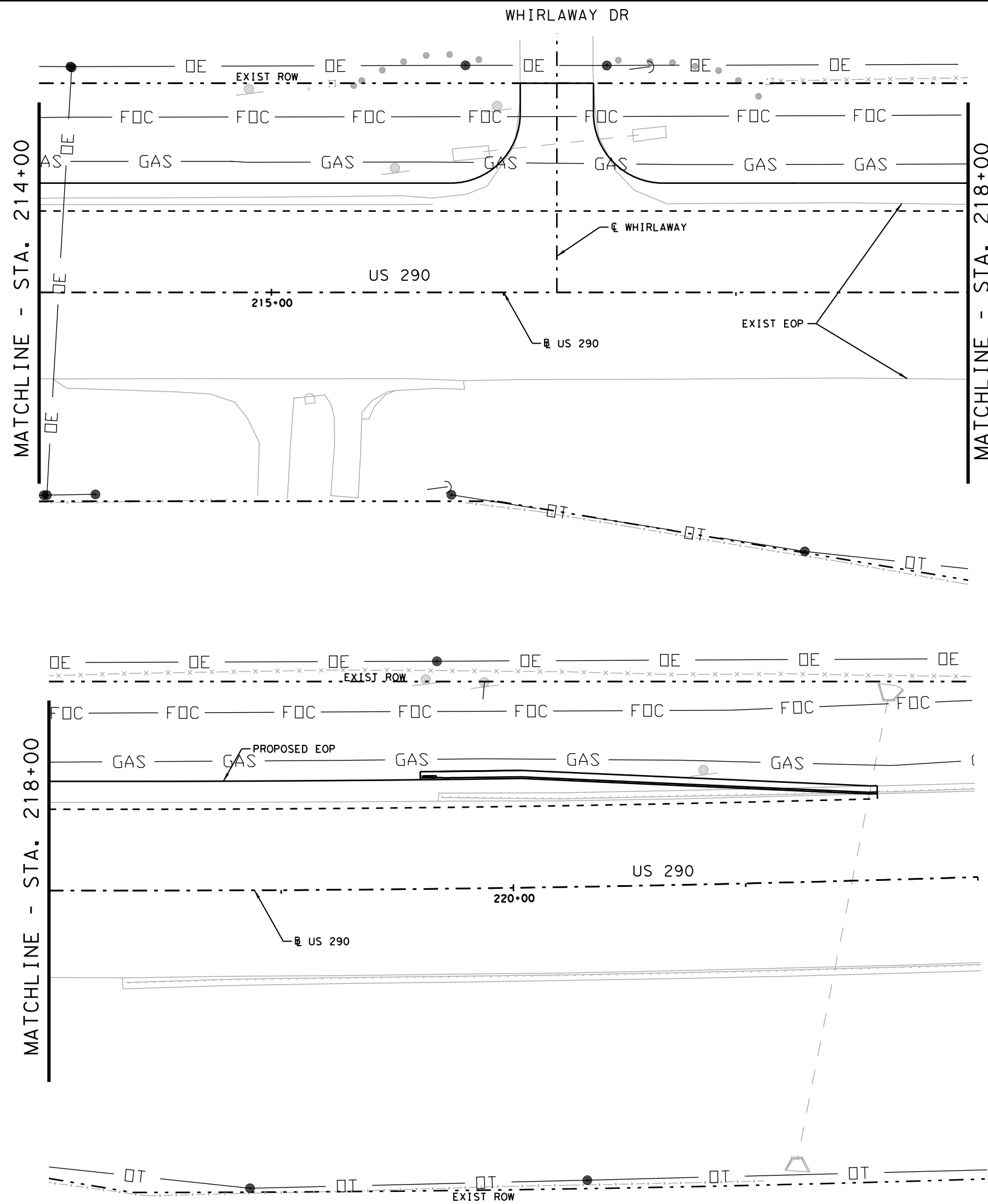
**US 290 AT  
TRAUTWEIN ROAD  
EXISTING UTILITIES**

**NOTES:**

1. THE LOCATION OF UTILITIES INDICATED ON THE PLANS IS APPROXIMATE AND THEIR FULL EXTENTS ARE NOT SHOWN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE ARRANGEMENTS WITH THE UTILITY OWNERS PRIOR TO WORKING IN THE AREA, TO CONFIRM THEIR EXACT LOCATIONS, AND TO DETERMINE WHETHER ANY ADDITIONAL UTILITIES OTHER THAN THOSE SHOWN ON THE PLANS MAY BE PRESENT.
2. THE PLANS SHOW THE STATUS OF UTILITY LOCATIONS AS OF APRIL 2023.

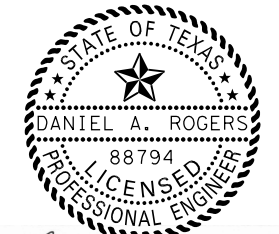
DATE: 4/13/2023		SHEET 1 OF 2		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07 072	US 290	106	

Filename: \\c:\p\lan\016874-000\*ut02\*1.dgn  
Date: 4/13/2023



**LEGEND**

- OE — OVERHEAD ELECTRICAL
- OT — OVERHEAD TELEPHONE
- GAS — UNDERGROUND GAS
- FOC — UNDERGROUND FIBER OPTIC
- W — UNDERGROUND WATER LINE
- BURIED CONDUIT
- ⊗ WATER/GAS VALVE
- ⊙ WATER METER
- ◇ HYDRANT
- ▣ ELECTRIC PULL BOX
- ▣ TRAFFIC SIGNAL CABINET
- ⊠ GROUND BOX



*Daniel A. Rogers*

4/13/2023



**US 290 AT  
TRAUTWEIN ROAD  
EXISTING UTILITIES**

- NOTES:**
- THE LOCATION OF UTILITIES INDICATED ON THE PLANS IS APPROXIMATE AND THEIR FULL EXTENTS ARE NOT SHOWN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE ARRANGEMENTS WITH THE UTILITY OWNERS PRIOR TO WORKING IN THE AREA, TO CONFIRM THEIR EXACT LOCATIONS, AND TO DETERMINE WHETHER ANY ADDITIONAL UTILITIES OTHER THAN THOSE SHOWN ON THE PLANS MAY BE PRESENT.
  - THE PLANS SHOW THE STATUS OF UTILITY LOCATIONS AS OF MAY 2017.

DATE: 4/13/2023		SHEET 2 OF 2		
STATE	STATE DIST. NO.	COUNTY		
TEXAS	14	HAYS		
CONT. SECT.	JOB	HIGHWAY NO.	SHEET NO.	
0113	07 072	US 290	107	