

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		1

SEE SHEET 2 FOR INDEX OF SHEETS

# STATE OF TEXAS DEPARTMENT OF TRANSPORTATION

## PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT F 2024 (654)  
**IH 10 MILL & OVERLAY  
CULBERSON COUNTY**  
CCSJ: 0003-01-064, ETC.

### FINAL PLANS

CONTRACTOR: \_\_\_\_\_  
 LETTING DATE: \_\_\_\_\_  
 TIME CHARGES BEGAN: \_\_\_\_\_  
 DATE CONTRACTOR BEGAN WORK: \_\_\_\_\_  
 DATE WORK WAS COMPLETED: \_\_\_\_\_  
 DATE WORK WAS ACCEPTED: \_\_\_\_\_  
 TOTAL DAYS CHARGED: \_\_\_\_\_  
 ORIGINAL CONTRACT AMOUNT: \$ \_\_\_\_\_  
 AMOUNT OF CONTRACT AMENDMENTS: \$ \_\_\_\_\_  
 FINAL CONTRACT COST: \$ \_\_\_\_\_

LIMITS FROM: 0.014 MI E OF US 90 TO: 13.3 MI E OF US 90  
 LIMITS FROM: 13.30 MI E OF US 90 TO: 15.4 MI E OF US 90

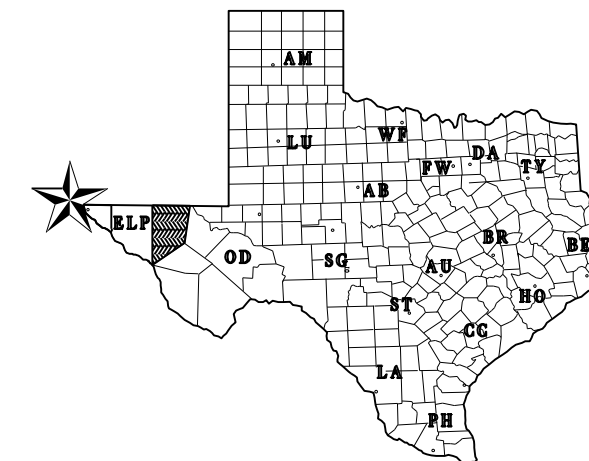
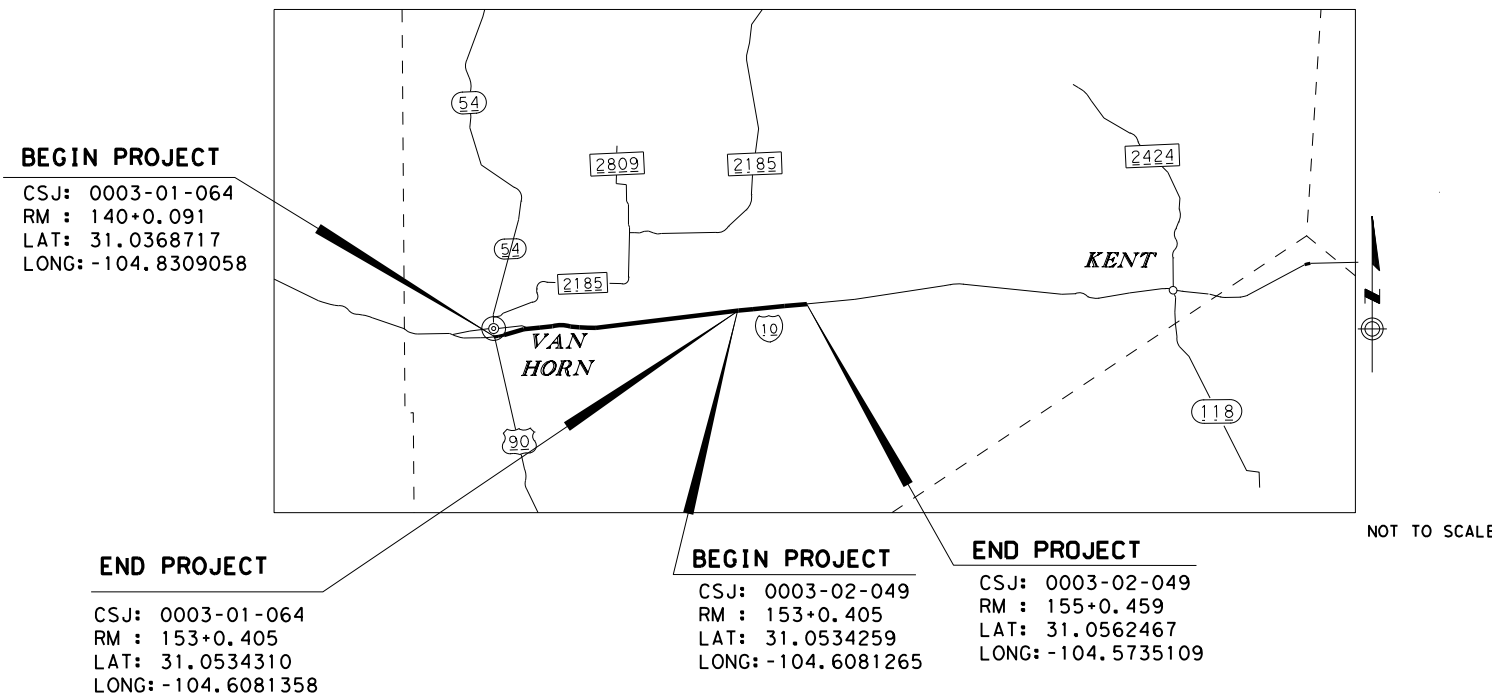
**CSJ: 0003-01-064:**  
 NET LENGTH OF ROADWAY= 69,560.16 FT. = 13.174 MI.  
 NET LENGTH OF BRIDGE = 780.00 FT. = 0.148 MI.

**CSJ: 0003-02-049:**  
 NET LENGTH OF ROADWAY= 10,887.36 FT. = 2.062 MI.  
 NET LENGTH OF BRIDGE = 0.00 FT. = 0.000 MI.  
 NET LENGTH OF PROJECT= 81,227.52 FT. = 15.384 MI.

\_\_\_\_\_ 20 \_\_\_\_\_

AREA ENGINEER

**FOR THE CONSTRUCTION OF PREVENTIVE MAINTENANCE  
CONSISTING OF MILL & OVERLAY, PAVEMENT MARKINGS AND  
INTELLIGENT TRANSPORTATION SYSTEMS**



KEY TO COUNTIES



11/8/2023

RECOMMENDED FOR LETTING:  
*Eduardo Perales, P.E.*  
 SAFETY REVIEW COMMITTEE CHAIRMAN

11/8/2023

RECOMMENDED FOR LETTING:  
*L. Raul Ortega Jr., P.E.*  
 DISTRICT DIRECTOR OF TRANSPORTATION  
 PLANNING AND DEVELOPMENT

11/8/2023

APPROVED FOR LETTING:  
*Tommy Trevino, P.E.*  
 DISTRICT ENGINEER

EXCEPTIONS: NONE  
 EQUATIONS: NONE  
 RAILROAD CROSSINGS: NONE

REGISTERED ACCESSIBILITY SPECIALIST  
 (RAS) INSPECTION NOT REQUIRED  
 TDLR No. EABPRJ \_\_\_\_\_ N/A

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)- 21 THRU BC (12)- 21 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, October 23, 2023)

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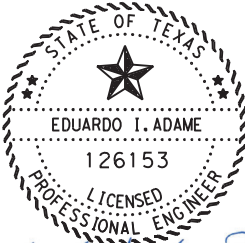
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#   
*Maricruz Saenz P.E.*  
 10/26/2023


>   
*Eduardo I. Adame P.E.*  
 10/17/2023

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A "#" ON THIS SHEET HAVE BEEN ISSUED BY MARICRUZ SAENZ AND ARE APPLICABLE TO THIS PROJECT.

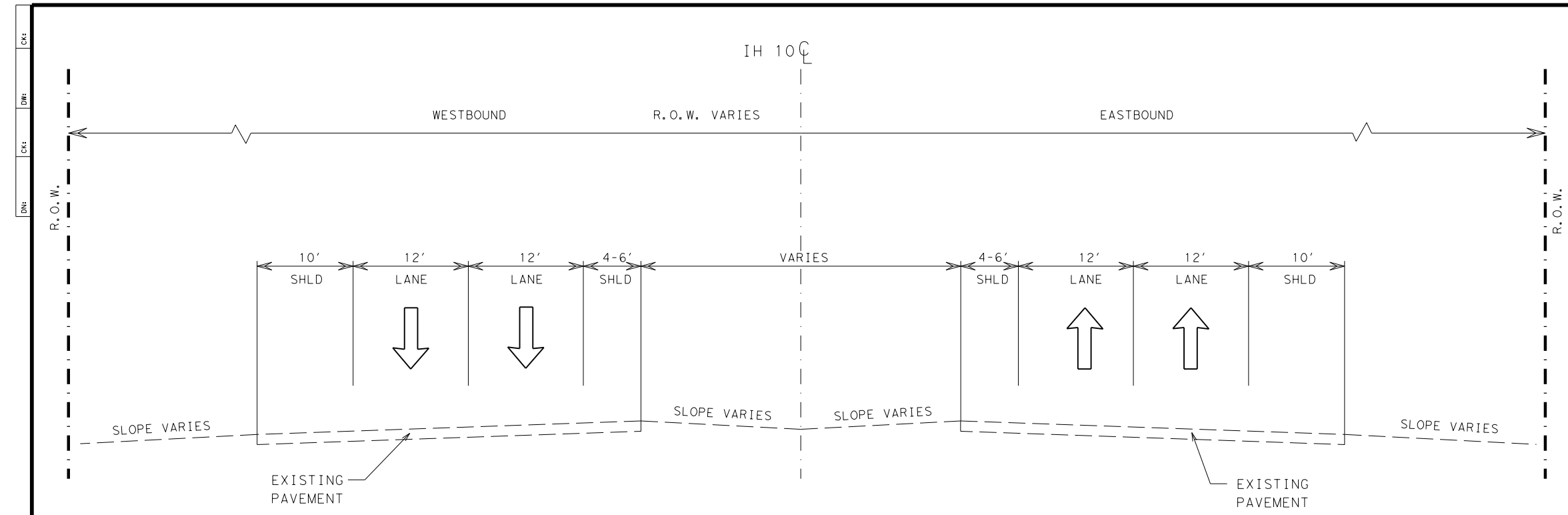
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**IH 10  
MILL & OVERLAY  
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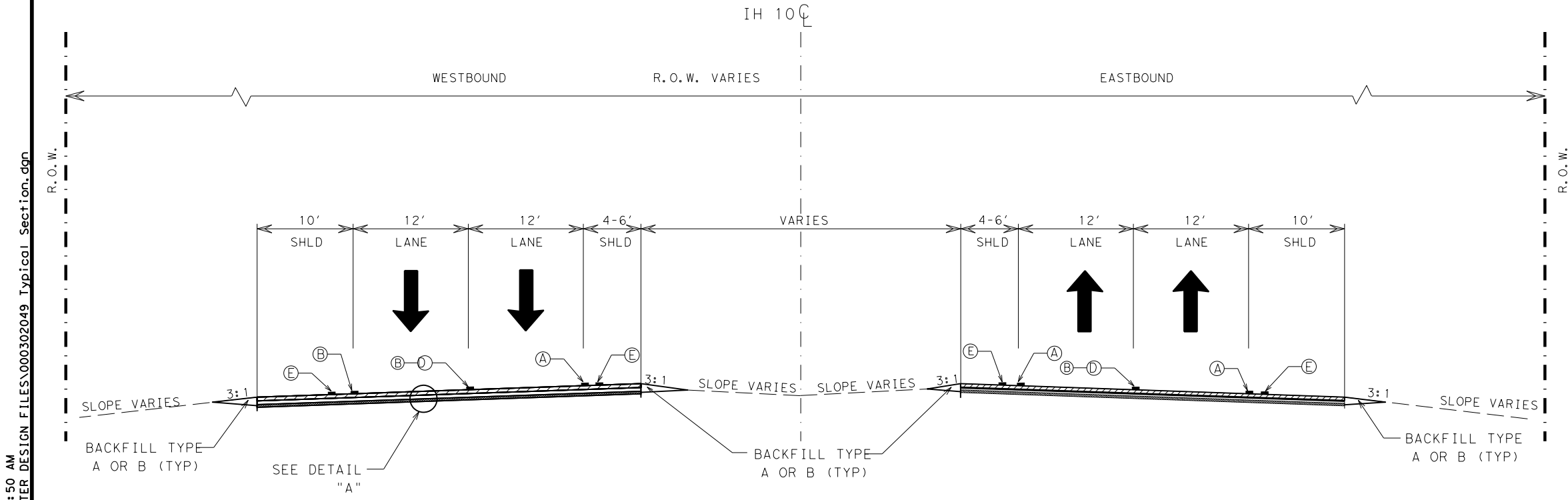
			
CONT	SECT	JOB	HIGHWAY
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**EXISTING TYPICAL SECTION IH 10**

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 CSJ: 0003-02-049 FROM RM 153+0.405 TO 155+0.459

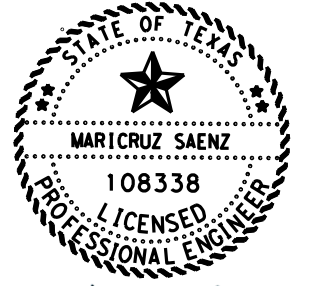
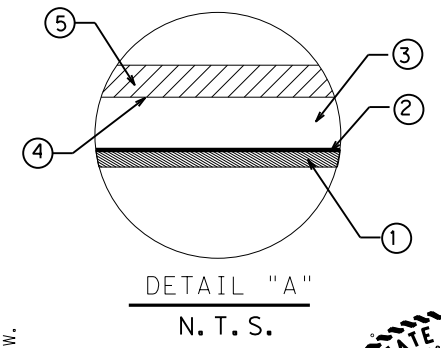


**PROPOSED TYPICAL SECTION IH 10**

CSJ: 0003-01-064 FROM RM 140+0.091 TO 153+0.405  
 CSJ: 0003-02-049 FROM RM 153+0.405 TO 155+0.459

- NOTES:
1. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. DO NOT USE FOR QUANTITY CALCULATIONS OR AS A CONSTRUCTION DETAIL.
  2. FIELD VERIFY ACTUAL LOCATIONS AND PAVEMENT DIMENSIONS. REFERENCE MARKERS ARE FOR LOCATION PURPOSES ONLY.
  3. THE MILL AND OVERLAY SHALL ONLY BE PERFORMED ON MAINLANE, SHOULDERS, AND RAMPS AS IN MISC. DETAILS. IT IS NOT TO BE PERFORMED ON BRIDGE DECKS OR ON ANY PAVEMENT ON FRONTAGE ROADS.
  4. TAPER WILL ALSO VARY IN THE INNER SHOULDERS FOR THE EAST AND WEST BOUND LANES
  5. REFER TO SIGNING AND PAVEMENT MARKING STANDARDS FOR FURTHER INFORMATION

- LEGEND
- ① 1" MICRO MILL
  - ② TACK COAT
  - ③ 2 1/2" STONE-MTRX-ASPH SMA-C SAC-A PG76-22
  - ④ TBWC (MEMBRANE)
  - ⑤ 3/4" TBWC (ASPHALT) (PG 76-22) & TBWC (AGGREGATE) (TY C) (SAC-A)
- Ⓐ RE PM W/RET REQ TY I (W)6" (SLD) (90MIL)
  - Ⓑ RE PM W/RET REQ TY I (W)6" (BRK) (90MIL)
  - Ⓒ RE PM W/RET REQ TY I (Y)6" (SLD) (90MIL)
  - Ⓓ REFL PAV MRKR TY II-C-R SPACING AT 80'
  - Ⓔ SHOULDER RUMBLE STRIPS



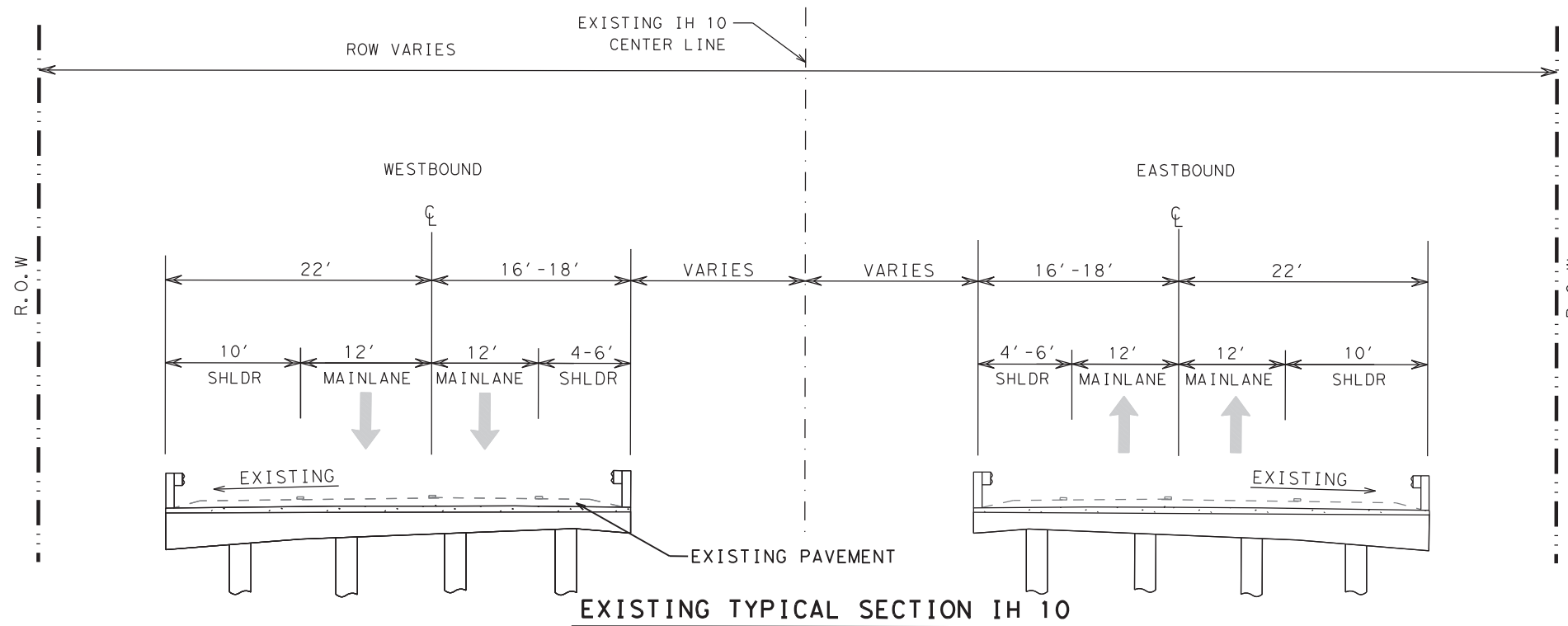
*Maricruz Saenz P.E.*  
10/19/2023

**IH 10  
MILL & OVERLAY  
GENERAL  
TYPICAL SECTIONS**

SCALE: N. T. S. SHEET 1 OF 2

Texas Department of Transportation			
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**EXISTING TYPICAL SECTION IH 10**

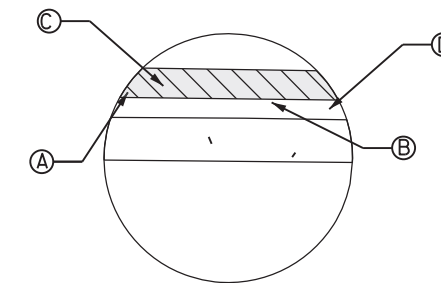
**NOTES:**

1. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. DO NOT USE FOR QUANTITY CALCULATIONS OR AS A CONSTRUCTION DETAIL.
2. FIELD VERIFY ACTUAL LOCATIONS AND PAVEMENT DIMENSIONS. REFERENCE MARKER ARE FOR LOCATIONS PURPOSES ONLY.
3. THE MILL AND OVERLAY SHALL BE PERFORMED ON MAINLANE, AND SHOULDERS, MILL AND TBWC SHALL BE PLACED ON BRIDGES ONLY.
4. THE CONTRACTOR IS RESPONSIBLE TO IDENTIFY THE SURFACE OF THE BRIDGE DECK BEFORE MILLING.

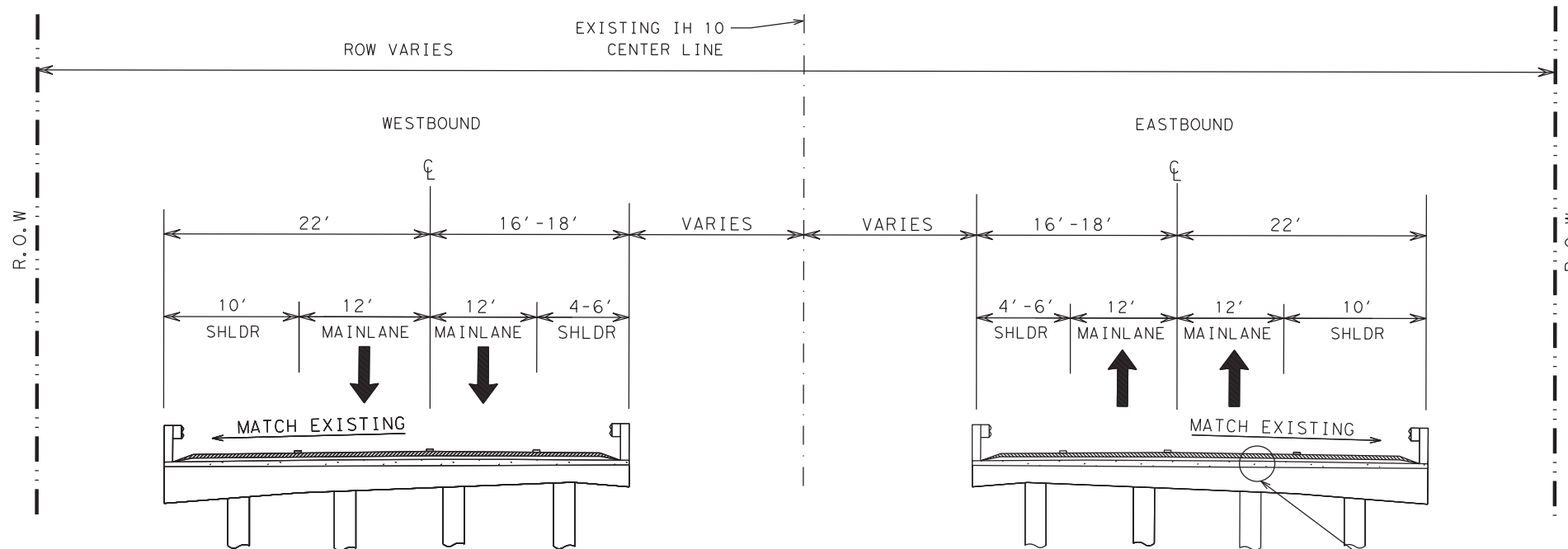
**LEGEND**

- (A) 0" TO 1" MICRO MILL
- (B) TBWC (MEMBRANE)
- (C) 3/4" TBWC PG 76-22 SAC-A TY-C
- (D) CONCRETE SLAB

LOCATION	NBI #	FACILITY CARRIED	FEATURE INTERSECTION	LATITUDE	LONGITUDE	RM EST
1	240550000301133	IH10	MICHIGANFLAT RD	31.05367069	-104.60837586	153+0.384
2	240550000301134	IH10	MICHIGANFLAT RD	31.05320927	-104.60871577	153+0.384
3	240550000301156	IH10	WILDHORSE CREEK	31.04395761	-104.76220916	144+0.238
4	240550000301157	IH10	WILDHORSE CREEK	31.04422232	-104.76080434	144+0.254
5	240550000301161	IH10	WILDHORSE RD	31.04411200	-104.71980900	146+0.742
6	240550000301162	IH10	WILDHORSE RD	31.04456803	-104.71945044	146+0.74
7	240550000301178	IH10	BUS LP (ROSS DR)	31.03965121	-104.81738999	140+0.939
8	240550000301180	IH10	BUS LP (ROSS DR)	31.04004000	-104.81726800	140+0.921



**DETAIL "B"**  
N. T. S.



**PROPOSED TYPICAL SECTION IH 10**

STATE OF TEXAS  
 MARI CRUZ SAENZ  
 108338  
 LICENSED PROFESSIONAL ENGINEER  
*Mari Cruz Saenz P.E.*

**IH 10  
MILL & OVERLAY  
GENERAL  
TYPICAL SECTIONS**

10/30/2023

SCALE: N. T. S. SHEET 2 OF 2

Texas Department of Transportation			
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**General Notes:**

**Specification Data**

**Table 1**

**Basis of Estimate**

Item	Description	Rate
3080	STONE MTRX-ASPH SMA-C SAC-A PG76-22	2 1/2" = 275 LBS/SY
3080	TACK COAT	0.15 GAL/SY
3082	TBWC (MEMBRANE)	0.22 GAL/SY
3082	TBWC PG 76-22 SAC-A TY C	3/4" =100 LBS/SY 94.5%AGGREGATE 5.5% ASPHALT
351	D-GR HMA(SQ) TY C PG 64-22 (EXEMPT)	1" =110 LBS/SY

1. Deviation from the rates shown will require approval.
2. Tack Coat to be applied to each layer as directed by the Engineer. Rate shown is based on the desired residual application of 0.10 gal./sq.yd.

**General Requirements**

This project consists of a mill and overlay, and intelligent transportation systems on IH 10 Highway in Culberson County.

Maintain the entire project area in a neat and orderly manner throughout the duration of the work. Remove all construction litter and undesirable vegetation within the right of way inside the project limits. This work will be subsidiary to the various bid items.

Keep traveled surfaces used in hauling operations clear and free of dirt or other material.

Become familiar with project site prior to submitting bids.

Where nighttime work is approved, provide adequate lighting for the entire work site as directed. This will be considered subsidiary to the various bid items.

Comply with all Occupational Safety & Health Administration (OSHA) and United States Environmental Protection Agency (EPA) regulations as well as all local and State requirements.

**General ITS**

Contact the Department's El Paso District Signal Shop at [txdotelplocates@txdot.gov](mailto:txdotelplocates@txdot.gov) to request all Department utility line locates within the project limits. The Signal Shop will locate one time only, upon request. Record locates for the purpose of refreshing and maintaining all markings throughout the duration of the project.

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

**Armando Ramirez, P.E**  
**Alpine Area Engineer**

[Armando.Ramirez2@txdot.gov](mailto:Armando.Ramirez2@txdot.gov)

**Monica Ruiz, P.E**

**District Construction**

[Monica.Ruiz@txdot.gov](mailto:Monica.Ruiz@txdot.gov)

**Aldo Madrid, P.E.**

**Director of Construction**

[Aldo.Madrid@txdot.gov](mailto:Aldo.Madrid@txdot.gov)

Questions may be submitted via the 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>.

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

**Item 4 – Scope of Work**

Schedule and perform all work to assure proper drainage during the course of construction operations. All labor, tools, equipment, and supervision required, to ensure drainage, removal, and handling of water shall be considered incidental work.

**Item 5 – Control of the Work**

The Department will furnish horizontal and vertical reference points. Contractor must verify horizontal and vertical reference points with conventional survey methods before proceeding with construction activities. Verification must be submitted for review and approval to the Department's R.P.L.S. prior to start of construction. Any discrepancies not reported will be at no additional cost to the Department.

Plan datum for this project is NAD 83 for horizontal and NAVD 88 for elevation based.

Keep traveled surfaces used in hauling operations clear and free of dirt or other material. The Contractor shall verify all dimensions and grades before proceeding with the work. Any discrepancies found shall be reported immediately to the Engineer, otherwise the Contractor shall be held responsible for their correctness.

Existing pavement, utilities, structures, etc. damaged as a result of the operations will be repaired at no additional cost to the Department.

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Protect from damage and destruction all areas of the right of way, which are not included in the actual limits of the proposed construction areas. Exercise care to prevent damage to trees, vegetation, and other natural features.

Restore any area disturbed or damaged to a condition "as good as" or "better than" prior to start of construction operation. This work will be at the Contractor's expense.

Arrange the operations so that any two consecutive exit or entrance ramps will not be closed at the same time, unless directed otherwise.

#### **Item 6 – Control of Materials**

The Contractor must schedule a Pre-ITS installation meeting with the Department Area Office and the Department's El Paso District Signal Shop prior to starting any ITS work.

The Contractor must coordinate with the Engineer regarding the items to be purchased by the Department. It is the Contractor's responsibility to contact the Department, so that items can be ordered adequately with respect to time. The approximate lead time to receive these items is 120 calendar days (4 months) from the date the charge codes for the ITS items can be generated by the Department. The Contractor must submit shop drawings for all ITS, Traffic Signal, and Illumination items immediately, so that these materials can be ordered on time and the project can be on schedule.

Furnish all materials on this Contract except for the following that the Department will provide:

- IP Addressable Power Strip
- CCTV Digital
- Cellular Modem
- Full Color Freeway DMS with Pole Mounted Cabinet

ITS materials to be furnished by the Department can be picked up at the ELP District Traffic Signal Shop. Contact the supervisor forty-eight (48) hours in advance of picking up materials. Use the above listed materials furnished by the Department only on the intended TXDOT project. The installation of these items will be paid for under the various Force Accounts established for the project.

To comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the contractor must submit an 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.

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

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

<https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html>

#### **Item 7 – Legal Relations and Responsibilities**

Comply with all requirements of the Environmental Permits Issues and Commitments (EPIC) Sheet.

Do not discharge any liquid pollutant from vehicles onto the roadside. Immediately clean spills and dispose in compliance with local, state, and federal regulations to the satisfaction of the Engineer at no additional cost to the Department.

Occupational Safety & Health Administration (OSHA) regulations prohibit operations that bring people or equipment within 10 ft. of an energized electrical line. Where workers and/or equipment may be close to an energized electrical line, notify the electrical power company and make all necessary adjustments to ensure the safety of workers near the energized line. No significant traffic generator events identified.

#### **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.

Complete the daily tracking form provided by the department and submit proof of payment such as cancelled checks for the approved invoices that have been billed to the project no later than 30 days from the invoice date.

No payment will be made for law enforcement personnel needed for moving equipment or payment for drive time to/from the event site.

#### **Item 8 – Prosecution and Progress**

Working days will be calculated in accordance with Section 8.3.1., "Standard Workweek." A bar chart schedule is required for this project conforming to Section 8.5.5.1., "Bar Chart." Provide updates as directed by the Engineer.

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Prior to beginning operations, schedule and attend a preconstruction conference with the Engineer. Provide the Department a written outline of the proposed sequence of work (Bar Chart Schedule) and an estimated progress schedule.

#### **Item 9 – Measurement and Payment**

Submit Material on Hand (MOH) payment requests at least two (2) working days before the end of the month for payment consideration on that month's estimate.

When approved, provide uniformed, off-duty law enforcement officers with marked vehicles during work that requires a lane closure. The officer in marked vehicles shall be located as approved to monitor or direct traffic during the closure. The method used to direct traffic at signalized intersections shall be as approved. Additional officers and vehicles may be provided when approved or directed.

Complete the daily tracking form provided by the department and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided. Show proof of certification by the Texas Commission on Law Enforcement Standards. All law enforcement personnel used in Work Zone Traffic Control shall be trained for performing duties in work zones and are required to take "Safe and Effective Use of Law Enforcement Personnel in Work Zones" WEB-BASED (Course #133119) which can be found online at the following site: <https://www.nhi.fhwa.dot.gov/>

Certificates of completion should be available to all who finish the course. These should be kept by the officers in order to substantiate completion when reporting to the work site.

Minimums, scheduling fees, etc. will not be paid; TxDOT will consider paying cancellation fees on a case-by-case basis.

#### **Item 100 – Preparing Right of Way**

Remove existing vegetation and level the ground in an area measuring 50 feet by 50 feet at each location shown in the plans. Cost includes removal of trees, shrubs, rocks, roots, backfill materials, backfilling holes, hauling, disposal, equipment, labor, tools, and incidentals.

#### **Item 110 – Excavation (Special)**

Pothole and identify possible utility conflicts at proposed ITS pole drill shaft foundations. When a conflict exists notify the Engineer. Any pothole will be paid under item 110-6003.

Fill the potholes up to the bottom of the pavement surface after excavation with material from the hole and compact to 95% density. The holes must be patched with a suitable hot mix asphalt concrete material or earthen material as directed by the Engineer. Maintain these patches in good repair until the completion of work. All equipment, labor, and materials associated with this work will be consider subsidiary to the various bid items.

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SHEET 5B

Inform the Engineer and the respective utility companies when it becomes apparent that utility lines will interface with work in progress.

#### **Item 134 – Backfilling Pavement Edges**

Backfill pavement edges immediately after the surface course has begun unless determined otherwise by the Engineer.

Backfill edges to allow no more than a 1:3 slope from pavement edge to existing ground.

Reclaimed asphalt pavement (RAP) may be used to backfill pavement edges. If insufficient RAP is available, then substitute Flexible Base of A type and grade acceptable by the Engineer to backfill pavement edges at no additional cost to the Department.

If Contractor elects to use RAP material for backfill pavement edges, the RAP material must pass a 2" sieve. All material not passing sieve will be removed and disposed of properly. This shall be considered subsidiary to Item 134.

Apply emulsified asphalt at a 50/50 solution of water to emulsion over the disturbed area with backfill material. The application rate shall achieve a final emulsion rate of 0.15 gal/sy residual asphalt.

#### **Item 314 – Emulsified Asphalt Treatment**

Payment will not be made for water. Scarify the existing subgrade to the depth shown on the plans. Place the emulsion at the percentage as indicated on Table 1 "Basis of Estimate" in the general notes or as noted elsewhere in the plans. Process and thoroughly mix the existing subgrade/emulsion material with water. Compact the layer to the required density in accordance with Section 132.3.4.2., "Density Control". The work performed under Section 132.3.4.2, "Density Control" will be subsidiary to this item.

Apply a 2.0 ft. wide strip of emulsified asphalt at a total rate of 0.80 gallons per square yard as an edge seal along each pavement edge. Lap the pavement edge seal onto the pavement a maximum of 6 in. Dilute the emulsion 3 parts water (0.60 gallons per square yard) to 1 part asphalt (0.20 gallons per square yard). Residual asphalt rate is 9.0 gallons per station of roadbed. Payment will not be made for water Use MS-2, MC-30, AE-P or other asphalt if approved.

#### **Item 351 – Flexible Pavement Structure Repair (use when determined by the engineer)**

Provide **SIX (6) inches of D-GR HMA(SQ) TY C PG 64-22 (Exempt)** for all repairs. **D-GR HMA(SQ) TY C PG 64-22 (Exempt), 1in.=110 lbs/sy** will not be measured but will be subsidiary to Item 351, "Flexible Pavement Structure Repair".

Perform repairs on locations shown in plans, as per plan quantities or as directed by the Engineer.

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The minimum area to be repaired shall be five (5) square yards. Repairs shall have a minimum quantity of 40 square yards per callout. Material quantity must be agreed upon by the Contractor and Engineer prior to ordering.

Repair pavement edges to the line and grade of the original pavement. Sides of the repair area shall be made square by saw cutting or other approved methods. Any loose and foreign material shall be removed. Repair area to be clean and dry prior to application of prime coat. SS-1H to be applied as prime coat at 0.15 gal/sy to repaired area surfaces, unless otherwise directed. Waste material to be removed and disposed of as directed or approved.

Tack coat to be applied all surfaces that will be in contact with the subsequent HMA placement at 0.15 GAL/SY, unless otherwise directed.

Use of a motor grader will not be permitted unless otherwise directed by the Engineer.

Proof rolling or other approved compacting method as directed by the Engineer shall be required in the event that Flex Base or Subgrade is exposed, payment is subsidiary to this item.

#### **Item 354 – Planing and Texturing Pavement**

On bridge deck and ramps, contractor to field verify the pavement thicknesses before milling operation to determine the depth, as directed by the Engineer.

When a bridge deck is planned and textured, remove excess material. Do not broom to the sides of the bridge, under guardrail, etc. Cover or protect all sealed expansion joints, rails on bridge, and all railroad tracks encountered as approved by the engineer. Clean all these features if they weren't properly protected. This work is subsidiary work to applicable bid items. Refer to Item 438, "Cleaning and Sealing Joints", for procedures and methods.

Reclaimed Asphalt Pavement (RAP) removed from the project may be incorporated into the project. Incorporate the RAP into the pavement mix design as approved by the Engineer. Performed any necessary tests to ensure RAP is appropriate for use. Any remaining RAP shall be delivered to the location specified by the Engineer.

The contractor shall coordinate with TxDOT when delivering RAP to the locations given below:

- IH-10 mm 88 Exit North
- IH-10 mm 129 Allamore Exit South
- IH-10 mm 136 Scenic Overlook West End
- IH-10 mm 166 Boracho Exit South
- IH-10 mm 179 Kent Stock Yard

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Before delivery of rap material, the contractor shall contact:

**Rudy Valdez**

**Maintenance Section Supervisor**

[Rudy.Valdez@txdot.gov](mailto:Rudy.Valdez@txdot.gov)

Phone: (432) 283-2501

Van Horn Maintenance section (ELP) area maintenance supervisor for coordination of this work. Hauling of rap material and incidentals to complete this work shall not be paid for directly but shall be subsidiary to this item.

Use Item 354-6002 for milling on transitions of ramps, bridge approaches, and at the beginning and end of project limits. Use Item 354-6020 for milling on bridge decks, and Item 354-6188 for milling performed on main lanes, shoulders, and ramps.

#### **Item 416 – Drilled Shaft Foundations**

Construct drilled shaft at all abutments as per the approved method.

Stake all foundations and locations prior to commencement of drilling operations for verification to ensure no conflicts with utility lines. Approval by Engineer will be required for all non-bridge foundations.

Cover drilled shafts with plywood and delineate with pedestrian fence, to the satisfaction of the Engineer, when no work is being performed and after working hours. This work will be considered subsidiary to this item.

Remove spoils, daily, out of the drainage areas or as directed.

Survey verify and provide the Engineer finished drilled shaft elevations.

#### **Item 429 – Concrete Structure Repair**

Use Department approved products to accomplish full depth, horizontal and vertical concrete repairs. Follow the procedures outlined in the Concrete Repair Manual unless approved otherwise. Submit for approval all materials and methods of application at least 3 weeks before beginning any repair work. This item is to be used at the discretion of the engineer.

#### **Item 432 – Riprap**

Wire mesh and fibers for concrete will not be allowed for concrete riprap in accordance with item 432.3.1, "Concrete Riprap" on this project for this Item. Reinforce all concrete riprap using bar reinforcement conforming to Item 440, "Reinforcement for Concrete," as shown on the plans, or as directed.



**Item 502 – Barricades, Signs, and Traffic Handling**

Prior to beginning construction, the Engineer will approve the routing of traffic and sequence of work.

Additional signs and barricades, placed as directed, will be considered subsidiary to this Item. In accordance with Section 7.2.6.1, designate, in writing, a Contractor Responsible Person (CRP) and a CRP alternate to take full responsibility for the set-up, maintenance, and necessary corrective measures of the traffic control plan. The CRP or CRP alternate must be present at site and implement the initial set up of every traffic control phase/stage, at each location, and/or each call out, for the entire duration of the project. At the written request of the Engineer, immediately remove the CRP or CRP alternate from the project if, in the opinion of the Engineer, is not competent, not present at initial TCP set-ups, or does not perform in a proper, skillful, or safe manner. These individuals shall not be reinstated without written consent of the Engineer. CRP and CRP alternate must be trained using Department approved training. Provide a copy of the certificate of completion to the Engineer for project records. Refer to Table 2 for Department approved Training.

**Table 2**

**Contractor Responsible Person and Alternate**

Provider	Course Number	Course Title	Duration	Notes
American Traffic Safety Services Association	TCS	Traffic Control Supervisor	2 days	
National Highway Institute	133112	Design and Operation of Work Zone Traffic Control	1 day	Both courses are required to meet minimum required training.
	133113	Work Zone Traffic Control for Maintenance Operations	1 day	
Texas Engineering Extension Services	133112A	Design and Operation of Work Zone Traffic Control	3 days	
University of Texas Arlington Division for Enterprise Development	WKZ421	Traffic Control Supervisor	16 hours	Contact UTA for training needs.

All contractor workers involved with the traffic control implementation and maintenance must participate and complete a Department approved training course. Provide a copy of the certificate of completion to the Engineer for project records. Refer to Table 3 for Department approved training.

**Table 3  
 Other Work Zone Personnel**

Provider	Course Number	Course Title	Duration	Notes
American Traffic Safety Services Association	TCT	Traffic Control Technician	1 day	
Texas Engineering Extension Services	HWS002	Work Zone Traffic Control	16 hours	Identical to HWS-410. Counts for 3-year CRP requirement.
National Highway Institute	133116	Maintenance of Traffic for Technicians	5 hours	Web based
National Highway Institute	134109-I	Maintenance Training Series: Basics of Work Zone Traffic Control	1 hour	Free, Web based
University of Texas at Arlington, Division for Enterprise Development	WKZ100	Work Zone Safety: Temporary Traffic Control	4 hours	Note name change. Free, Web based
TxDOT/AGC Joint Development	N/A	Safe Workers Awareness	16 minutes	Videos available through AGC of Texas offices. English & Spanish
		Highway Construction Work Zone Hazards	18 minutes	
AGC America	N/A	Highway Work Zone Safety Training	1 day	
Texas Engineering Extension Service	HWS400	Temporary Traffic Control Worker	4 hours	Contact TEEX, if interested in course
TxDOT/AGC Joint Development	N/A	Work Zone Fundamentals	10 minutes	Videos available through ACT of Texas offices. English & Spanish

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Contractor may choose to train workers involved with the traffic control implementation and maintenance with a contractor developed training in lieu of Department approved training.

Contractor developed training must be equivalent to the Department approved training shown in Table 2. Provide the Engineer a copy of the course curriculum for pre-approval, prior to conducting the contractor developed training. Provide the Engineer a copy of the log of attendees after training completion for project records.

Existing regulatory signs, route marker auxiliaries, guide signs, and warning signs that must be removed due to widening shall be relocated temporarily and erected on approved supports at locations shown in the plans, or as directed. This work will not be paid for directly but considered subsidiary to this Item.

Notify the Department officials when major traffic changes are to be made, such as detours. Coordinate with the Department on all traffic changes. Advance notification for the following week's work must be made by 5 P.M. on Wednesdays.

If Law Enforcement Personnel is required by the Engineer, coordinate with local law enforcement as directed or agreed. Complete the weekly tracking form provided by the Department and submit invoices with 5% allowance for Law Enforcement payments by Contractor that agree with the tracking form for payment at the end of each month where approved services were provided.

Provide access to intersecting side roads and driveways at all times, unless otherwise directed. Any approved change to the sequence of work or TCP, must be signed and sealed by a Contractor's Licensed Professional Engineer assuming full responsibility for any additional barricade signs and devices needed.

Use striping operations to channelize traffic into the newly completed roadway, as directed. Maintain shoulders and median areas in a condition capable of serving as emergency paths, as approved. This work will be subsidiary to this Item. Use portable changeable message signs (PCMS) to alert public of construction two weeks prior to construction.

Use flaggers when directed. Provide two-way radio communication for all flaggers.

Place and maintain sufficient additional warning signs, beacons, delineators, and barricades to warn and always guide the public of all hazards through the construction zone, and as directed. Use flashing arrow boards on all tapers for each lane closure.

Some signs, barricades, and channelization devices may not be shown at the precise or measured position. Place the barricades, devices, or signs, with approval, in positions to meet field conditions.

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Fill any holes left by barricade or sign supports and restore the area to its original condition.

Use Type A flashing warning lights or delineators to mark open excavation, footings, foundations, or other obstructions near lanes that may be open to traffic, as directed.

For additional information pertaining to channelization, signing, spacing details, and flagging procedures required to regulate, warn, and guide traffic through project, refer to the "Barricade and Construction Standards," BC (1)-21 and to the current *Texas Manual on Uniform Traffic Control Devices (TMUTCD)*.

Remove or cover signs that do not apply to current conditions at the end of each day's work

Repair and/or replace all signs damaged by the public or due to weather events. All project signs shall be maintained free of litter, debris, or sediment build up at the base supports. This work is subsidiary to this item of work.

#### **Safety Contingency**

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

#### **Item 506 – Temporary Erosion, Sedimentation, and Environmental Controls**

It is not anticipated 10/6/2023 that any erosion, sedimentation, or environmental control devices will be needed on this project. However, if such controls are necessary, the Storm Water Pollution Prevention Plan (SWP3) for this project shall consist of the use of any temporary erosion control measures deemed necessary by the Engineer and as provided under this Item. Payment for the work will be determined in accordance with Article 9.7, "Payment for Extra Work and Force Account Method."

#### **Item 540 – Metal Beam Guard Fence**

Provide composite block-outs for all Metal Beam Guard Fence (MBGF) posts.

Install guardrails in the direction of traffic flow.

Stake the locations for approval prior to beginning the installation of the proposed MBGF.

Remove all delineators and object markers associated with the MBGF. This work will be subsidiary to the various bid items.

Verify MBGF post lengths and heights prior to ordering materials.

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Place reflectors, as per Delineator & Object Marker Standard Sheet D&OM (1)-20 on the metal beam rail element or as directed. Install tubular Type GF2 guard fence attachment barrier mount. This work will not be paid for directly but will be considered subsidiary to pertinent items.

At the end of each workday, protect all untreated, incomplete, MBGF/Rail blunt ends exposed to traffic flow during construction until the permanent end treatment is in place. All work and incidentals are considered subsidiary to this Item.

MBGF not used will become the property of the Contractor.

#### **Item 585 – Ride Quality for Pavement Surfaces**

##### **Ride Quality for SMA:**

Measure the ride quality of the Stone-Matrix Asphalt (SMA) before placement of Thin Bonded Friction Course (TBWC), unless otherwise approved. Use a certified profiler operator from the Department's MPL. When requested, furnish the Engineer documentation for the person certified to operate the profiler. Provide all profile data to the Engineer in electronic data files within 24 hours of the ride quality using the format specified in Tex-1001-S. The Engineer will use Department software to evaluate longitudinal profiles to determine areas requiring corrective action. Provide all profile measurements in electronic data to [ELP-LAB@txdot.gov](mailto:ELP-LAB@txdot.gov) using the format specified in Tex-1001-S.

Correct any 0.1-mi. section with an average IRI over 95.0 in. per mile. Correct the deficient section to an IRI of 65 in. per mile or less.

Measure localized roughness using an inertial profiler in accordance with Tex-100-S. The Engineer will determine areas of localized roughness using the individual profile from each wheel path.

Use a 10-ft. straightedge, when allowed, to locate areas that have more than 1/8-in. variation between any 2 contacts on the straightedge.

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

Use diamond grinding or equivalent to correct areas of localized roughness. For flexible pavements, use CSS-1H emulsion to fog seal the corrected areas. The work performed,

materials furnished, certification and recertification, traffic control for all testing, and materials will not be measured or paid directly but will be subsidiary to pertinent Items.

##### **Ride quality for Final Riding Surface Thin Bonded Wearing Course (TBWC)**

Use Surface Test Type B and pay adjustment schedule 1 to evaluate ride quality for the final riding surface (TBWC) of travel lanes. Notify the District Laboratory 48 hours prior to conducting Surface Test Type B. Properly mark all starting/ending points and leave-out sections prior to

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testing. Deliver test results within 24 hours of testing. Provide all profile measurements in electronic data to [ELP-LAB@txdot.gov](mailto:ELP-LAB@txdot.gov) using the format specified in Tex-1001-S.

Unless otherwise approved by the Engineer, no corrective action will be allowed on the final riding surface (TBWC) of travel lanes.

#### **Item 618 – Conduit**

The location of conduit is diagrammatic and may be varied to meet local conditions upon approval of the Engineer.

When shown on the plans, use underground warning tape in the trench installation of conduit (PVC).

For conduit placement in pavement, an earth-saw may be used provided the cut does not exceed 6 in. Backfill as shown on the trench details in the plans.

For all underground conduit bends of 45°, provide rigid metal conduit. Where the rigid metal conduit is exposed at any point and where rigid metal extends into ground boxes, bond the metal conduit to the grounding conductor with grounding type bushings or by other UL-listed grounding connectors, approved by the Engineer. Rigid metal bends will not be paid for directly but will be considered incidental to the PVC conduit system.

Use rigid metal conduit when crossing bridges or culverts. All clamps, expansion joints, bolts, and accessories necessary to install the rigid metal will be subsidiary to this Item.

Backfill roadway and driveway trench with cement-stabilized backfill at the end of each working day. Place an ACP patch at the end of the week or as directed by the Engineer.

All conduit elbows and rigid metal extensions required to be installed on PVC conduit systems will not be paid for separately but will be considered subsidiary to the various bid items.

All bore items shall be directional and shall be paid for under this item. Bore quantities include the distance beneath the roadway plus an additional 2 ft. on either side of the curb, sidewalk, or edge of pavement.

For conduits install by open trench method, backfill the trench as shown on the plans.

Place all conduit at a minimum depth of 18 in. below the pavement surface. Place conduit prior to the new pavement construction.

Fit both ends of each raceway with a temporary cap to prevent dirt and debris from entering during construction.

Install a continuous green insulated copper wire as shown in the plans in every conduit throughout the electrical system in accordance with the electrical detail sheets, and the latest edition of the National Electrical Code.

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When conduit is to be installed where riprap presently exists, take care in breaking the existing riprap for placement of the conduit. Do not break out a greater area that is required for placement of the conduit. Replace broken riprap with Class "C" concrete to the exact slope, pattern, color, and thickness of the existing riprap. Replacement of riprap will be subsidiary to this Item.

**Item 620 – Electrical Conductors**

Use NEC type XHHW for all conductors.

Insulate grounding conductors with a green jacket and neutral conductors with a white jacket.

At every accessible point, bond together the grounding conductors which share the same conduit, junction box, ground box or structure in accordance with the electrical detail sheets and the latest edition of the National Electrical Code.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holder as shown on the Department's Materials Producers List under "Roadway Illumination and Electrical Supplies." category. Fuse holder is shown on the list under Item 610, "Roadway Illumination Assemblies," and Item 620, "Electrical Conductors." Provide 10 amp time delay fuses.

Bond metal conduit to the circuit grounding conductors in accordance with the National Electrical Code.

Refer to Article 7.18, "Electrical Requirements," for electrical certification and electrical licensing requirements.

**Item 624 – Ground Boxes**

Remove all conductors in ground boxes as shown on the plans to be abandoned. Payment for removal of conductors will be subsidiary to this Item.

The location of all ground boxes is diagrammatic and may be shifted to accommodate field conditions only as approved by the Engineer.

Stake all foundations and locations approved by the Engineer prior to commencement of drilling operations in order to ensure no conflicts with utility lines. Coordinate with the Utility companies for utility location within the project limits. Repair any damage to existing utilities to the satisfaction of the Engineer and the utility owner at no additional cost to the Department.

Ground boxes should be placed outside the path of travel leaving a clear unobstructed walking surface of at least 36" whenever possible.

Install expansion joint material approved by the Engineer between the ground box and concrete riprap apron. This material and work will be subsidiary to this pay item.

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Due to limited availability of record drawings and information on existing conduit, conductors, and ground boxes, the Contractor shall field verify all existing ground boxes, conduit, and conductors.

The Contractor shall remove all ground boxes and conductors that are connected to existing Illumination, Traffic Signal and Traffic Management poles that are being removed and abandon existing conduit or as shown on the plans. The Contractor shall keep all existing poles active that are to remain or as shown on the plans. This work shall be paid under this item.

**Item 628 – Electrical Services**

Meet at the service locations with representatives of the Department and electrical utility company at least twelve weeks before electric power is needed to finalize exact service pole placement and resolve any issues.

Any electrical costs for connection, test, and operation will be the responsibility of the government agency that will have the final operational control of the items built.

For all existing electrical services, where additional branch circuits will be installed, the Department shall coordinate with the local electrical utility company to determine if the existing power source can be reused. The Department shall document that the additional branch circuits do not total more than 80% of the designed service load. Upgrades in main circuit breaker to be completed by the Contractor.

Coordinate with representatives of the Department and electrical utility company when placing multiple electrical services close together to prevent electrical conductors from touching each other.

When installing electrical services, place electrical services as close to the power source to prevent electrical conductors from touching each other.

**Item 644 – Small Roadside Sign Assemblies**

Stake all sign locations and receive approval prior to sign placement.

The 2-1/2 inch, Schedule 10 post will meet the following requirements:

- 0.120 in. nominal wall thickness
- Seamless or electric-resistance welded steel tubing or pipe
- Steel will be HSLAS Grade 55 per ASTM A1011 or ASTM A1008

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Other steel may be used, if it meets the following:

- 55,000 psi minimum yield strength
- 70,000 psi minimum tensile strength
- 20% minimum elongation in 2 in.
- Wall thickness (uncoated) to be within the range of 0.108 in. to 0.132 in. galvanization per ASTM A123 or ASTM A653 G90

For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metalizing with zinc wire per ASTM B833.

Verify all post lengths to ensure the proper sign height. Remove and replace any sign installed incorrectly. This work will be done at no expense to the Department.

Provide Texas Universal Triangular Slip Base clamp type for all signs as shown on SMD (Slip-1)-08.

As directed, some regulatory and guide signs will be relocated before construction begins. Mark and locate each reference marker perpendicular to the road and along the right of way, or as

directed, prior to removal. Re-erect reference markers at their original location upon completion of construction.

All signs removed will remain property of the Department. Coordinate with Area Office to verify this is necessary and specify the location where the signs are to be delivered.

#### **Item 650 – Overhead Sign Supports**

Provide a minimum clearance of 21 ft. from the high elevation point of the roadway to the bottom of the proposed Dynamic Message Signs as shown on the plans, or as directed.

Base column lengths on base plate elevations provided on plans. Verify by field survey that plan dimensions and all base plate elevations mirror field conditions, prior to column fabrication. Furnish corrected column lengths to the Engineer for approval, after placement of the drill shafts.

The DMS sign support structure locations shown on the plans may be adjusted to fit field conditions. The tower heights shown on the plans are to be used for bidding purposes only. Prior to fabrication, the Contractor, in cooperation with the Engineer, will take finished grade elevations at the tower locations and will determine their exact height for fabrication, in accordance with the details shown on the plans.

All sign support quantities, pipe and structural steel, will be based on the dimensions shown on the approved shop drawings, or those established in writing. Calculations for measurement of the sign support quantities will be made from the approved shop drawings, in accordance with Item 9: Measurement and Payment, Article 1, of the Standard Specifications. Increases and decreases in quantities by change in design, after the shop drawings are approved, will be measured as specified, and the revised quantities will be the basis for payment.

All towers and trusses will be matched and marked for erection by the fabricator. After the sign supports, with signs attached, have been erected, individual units requiring cleaning will be washed with a cleaning solution. The cleaning solution will be capable of removing all grease, oil, dirt smears, streaks, and other foreign particles.

All labor, materials, and incidentals required to accomplish all work described above for this Item will be considered subsidiary to Item 650.

#### **Item 662 – Work Zone Pavement Markings**

In those areas where existing pavement markings are to be covered or removed, field locate and record the existing pavement markings by survey or other approved method by the Engineer as directed. Place final striping on these locations.

Remove and properly dispose of tabs upon completion of the final striping. This work is considered subsidiary to various bid items.

#### **Item 666 –Retroreflectorized Pavement Markings**

Reference the existing striping to stripe the roadway as it was prior to surfacing. Air blasting is required as pavement surface preparation.

In those areas where existing pavement markings are to be covered or removed, field locate and record the existing pavement markings by survey or other approved method by the Engineer as directed. Place final striping on these locations.

#### **Item 672 – Raised Pavement Markers**

Use a pilot line for final pavement markers and remove pilot line after all striping is complete. Remove pilot line in accordance with the methods specified in Item 677, "Eliminating Existing Pavement Markings and Markers," and will be subsidiary to this Item.

Air blasting is required for pavement surface preparation.

Furnish adhesives that conform to DMS-6100, "Epoxy and Adhesives," and DMS-6130, "Bituminous Adhesive for Pavement Markers," for this Item.

Do not place raised pavement markers when the pavement surface temperature is below 60°F.

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Removal of all existing raised pavement markers will be considered subsidiary to the various bid items.

**Item 3080 – Stone-Matrix Asphalt**

Use Surface Aggregate Classification “A” material for all surface mixes. In place of typical tack materials shown in Table 18 under Item 300, use a tracking resistant asphalt interlayer (TRAIL) material as a tack coat. Approved TRAIL products are found on TxDOT’s Material Producer List under Asphalt Interlayer (Tracking Resistant) through <http://www.txdot.gov/business/resources/materials.html>

Do not dilute the tack coat. Tack coat shall be applied to each layer as directed by the Engineer. Supply Warm-Mix Asphalt (WMA) under this item.

When Reclaimed Asphalt Pavement (RAP) is used in the production of hot-mix asphaltic concrete, use fractionated RAP. Do not exceed 10.0% of Fractionated RAP on surface mixtures. Use of RAS is not allowed for any mixtures.

Substitute PG Binders (grade dumping) will not be allowed for any mixtures.

Obtain the current version of the templates at <http://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/site-manager.html>. Submit electronically to the Engineer. Design the mixture at 50 gyrations (Ndesign).

Do not cover with asphaltic material, any existing survey monuments, manholes, or valve covers, etc. Adjustments shall be done in coordination with the respective utility owners. Place a string line or other suitable marking to ensure smooth neat lines, or as directed. Provide smooth transitions to existing driveways and intersections. Provide a minimum of 40 ft skis during paving operations to ensure smooth final surface. Place longitudinal joints approximately 6 in. from the broken striping, or as directed. Avoid placing under the wheel path.

Operate the spreading and finishing machine at a uniform forward speed consistent with the plant production rate, hauling capability, and roller train capacity to result in a continuous operation. The speed will be slow enough, so that stopping between trucks is not ordinarily required. If the Engineer determines non-uniform delivery of material is affecting the HMA placement, the Engineer may require the paving operations to cease until acceptable methods are employed to minimize starting and stopping of the paver. Item 3082 – Thin Bonded Friction Courses. The use of Reclaimed Asphalt Pavement (RAP) or Recycled Asphalt Shingles (RAS) will not be allowed in the mixture.

In place of typical tack materials shown in Table 18 under Item 300, use a tracking resistant asphalt interlayer (TRAIL) material as a tack coat. Approved TRAIL products are found on

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TxDOT’s Material Producer List under Asphalt Interlayer (Tracking Resistant) through <http://www.txdot.gov/business/resources/materials.html>. Obtain the current version of the templates at <http://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/site-manager.html>. Submit electronically to the Engineer.

Place the TBWC between May 15th and September 15th, unless otherwise approved by the Engineer. If the season for TBWC placement is past, time and work on the project will not be suspended until all other work deemed necessary by the Department is complete. When all other deemed necessary work is complete, the Engineer will suspend time and work until the hot mix season begins.

**Item 6003 – ITS System Support Equipment**

Furnish the following items, meeting the specifications in this Contract:

Description	Bid Code	Quantity
SOLAR POWERED BACKLIT LED LEGEND ROADSIDE SIGN	6489-6002	2

All Contractor-furnished equipment will be compatible with the Department’s existing equipment and mounting facilities. Submit all equipment and specifications for approval prior to delivery. Contact the Engineer and verify equipment models prior to ordering system support equipment.

Deliver all equipment provided under this Item to:

Texas Department of Transportation  
Signal Shop  
13301 Gateway West Blvd  
El Paso, TX 79928

*(Provide TxDOT with a 24-hour notice prior to delivering equipment)*

**Item 6005 – Testing, Training, Documentation, Final Acceptance, and Warranty**

The 90-day Final Acceptance Test will begin only when all TMS equipment installation, cabling, wiring, testing, field work, TransVista operations center work, etc. for the entire project is completed and acceptable to TxDOT. Partial testing is not allowed.

**Item 6010 - Closed Circuit Television Field Equipment (Digital) (Install Only)**

Contractor to install CCTV according to the manufacturer’s recommendations to achieve the specified accuracy and reliability.

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Contractor to configure and integrate the CCTV system to communicate with TransVista through cellular modem. Contractor to calibrate CCTV field equipment. Contractor to maintain CCTV video feed communication link until project is accepted.

**Item 6028 – Dynamic Message Sign System**

The Department will provide IP addressable power strip. The contractor will install, configure, and integrate the IP addressable power strip with the TxDOT Traffic Management Center. This work will subsidiary to item 6028-6001.

**Item 6064 – Intelligent Transportation System (ITS) Pole w/Cabinet**

Furnish equipment compatible with the Department’s existing equipment and mounting practices. Submit equipment list and specifications for approval by the Engineer prior to delivery. ITS field device cabinets will be Type 2, Configuration 2 pole mounted cabinets.

Provide cabinets with 0.125” thick aluminum, 5052-H32, mill finish sun shields on top, front, and both sides offset from cabinet shell. A sunshield is not required on the pole mounting side. Provide cabinets that are painted white on the interior and left with steel finish on the exterior.

The Department will provide IP addressable power strip. The contractor will install, configure, and integrate the IP addressable power strip with the TxDOT Traffic Management Center. This work will subsidiary to item 6064-6084.

**Item 6185 – Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)**

All TMA Operators must participate in a TMA workshop to be conducted by the El Paso District Safety Office, on the proper use of TMAs, prior to working on Department Right of Way (ROW).

A certificate of completion will be issued to TMA Operators that successfully complete the TMA workshop. The certificate of completion must be carried by TMA Operators at all times while working on Department right of way.

Acquire the TCP and TMA Operator’s certificates of completion prior to the authorization to begin work. No time suspension will be granted, and no traffic control work will be allowed without certificates of completion.

This project has up to 3 shadow vehicles with TMA required for this type of work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

The supporting vehicle for the TMA shall have a minimum gross (i.e., ballasted) vehicular weight of 19,000 pounds.

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**Table 4**

Basis of Estimate for Stationary TMAs			
TMA (Stationary)			
Standards	Required	Additional	TOTAL
TCP (5-1b)-18	1	0	1
TCP (6-1a), (6-5a)-12	1	0	1
TCP (6-8b)-14	1	0	1

**Table 5**

Basis of Estimate for Mobile TMAs			
TMA (Mobile)			
Standards	Required	Additional	TOTAL
TCP (3-2a)-13	3	0	3
TCP (3-3c)-14	3	0	3

**Item 6377 – System Integration**

Furnish equipment compatible with the Department’s existing equipment and mounting facilities. Submit equipment list and specifications for approval by the Engineer prior to delivery.

Submit the following data prior to final acceptance during construction of Traffic Management equipment for approval by the Engineer and TransVista:

1. Freeway Management System Geographic Information System (FMGIS) Data by providing survey information in the following format (NAD 83) and (Lat & Long) of all poles, ground boxes, controller cabinets, and overhead sign structures.
2. Digital photos and serials of all poles, controller cabinets, elements in controller cabinets, and overhead sign structures.

Contractor to program all field equipment provided by the state including cellular modems.

**Item 6489 – Backlit LED Legend Roadside Sign**

Signs shall be Backlit with Perimeter LED Roadside Signs and they shall be solar powered.



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0003-01-064

DISTRICT El Paso  
HIGHWAY IH 10

COUNTY Culberson

CONTROL SECTION JOB				0003-01-064		0003-02-049		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00182969		A00182970			
COUNTY				Culberson		Culberson			
HIGHWAY				IH 10		IH 10			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL	EST.	FINAL		
	100-6001	PREPARING ROW	AC	0.300		0.060		0.360	
	110-6003	EXCAVATION (SPECIAL)	CY	3.500		0.500		4.000	
	134-6004	BACKFILL (TY A OR B)	STA	1,389.000		218.000		1,607.000	
	314-6009	EMULS ASPH (EROSN CONT)(MULTI)	GAL	3,471.000		544.000		4,015.000	
	351-6002	FLEXIBLE PAVEMENT STRUCTURE REPAIR(6")	SY	31,600.000		4,744.000		36,344.000	
	354-6002	PLAN & TEXT ASPH CONC PAV(0" TO 2")	SY	15,778.000		4,000.000		19,778.000	
	354-6020	PLANE ASPH CONC PAV(0" TO 1")	SY	7,193.000				7,193.000	
	354-6188	PLANE ASPH CONC PAV(MICRO-MLLING)(1")	SY	623,797.000		94,874.000		718,671.000	
	356-6021	PAV JT UNDERSEAL (24")	LF	352.000				352.000	
	416-6005	DRILL SHAFT (42 IN)	LF	84.000		21.000		105.000	
	416-6006	DRILL SHAFT (48 IN)	LF	90.000				90.000	
	429-6006	CONC STR REPR(RAPID DECK REP(FULL DPT))	SF	576.000				576.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	10.500		1.500		12.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	39.000				39.000	
	438-6002	CLEANING AND SEALING EXIST JOINTS(CL3)	LF	1,724.000				1,724.000	
	500-6001	MOBILIZATION	LS	0.870		0.130		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	8.000				8.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	280,791.000		43,465.000		324,256.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	450.000				450.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	3.000				3.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	3.000				3.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF	350.000		20.000		370.000	
	618-6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	725.000		235.000		960.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	2,220.000		825.000		3,045.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	780.000				780.000	
	620-6016	ELEC CONDR (NO.2) INSULATED	LF	1,180.000				1,180.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	14.000		3.000		17.000	
	628-6128	ELC SRV TY D 120/240 060(NS)GS(N)GC(O)	EA	1.000				1.000	
	628-6225	ELC SRV TY D 120/240 100(NS)GS(N)GC(O)	EA	2.000				2.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	2.000				2.000	
	644-6002	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	EA	2.000		2.000		4.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	78.000		10.000		88.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	45.000		14.000		59.000	
	644-6078	REMOVE SM RD SN SUP&AM (SIGN ONLY)	EA	5.000				5.000	
	650-6028	INS OH SN SUP(30 FT BAL TEE)	EA	3.000				3.000	
	662-6005	WK ZN PAV MRK NON-REMOV (W)6"(BRK)	LF	35,099.000		5,434.000		40,533.000	
	662-6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	LF	145,190.000		22,997.000		168,187.000	





# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0003-01-064

DISTRICT El Paso  
HIGHWAY IH 10

COUNTY Culberson

CONTROL SECTION JOB				0003-01-064		0003-02-049		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00182969		A00182970			
COUNTY				Culberson		Culberson			
HIGHWAY				IH 10		IH 10			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL	EST.	FINAL		
	662-6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	LF	140,396.000		21,733.000		162,129.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	12,418.000		1,810.000		14,228.000	
	666-6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	280.000		40.000		320.000	
	666-6074	REFL PAV MRK TY I (W)(NUMBER)(090MIL)	EA	8.000				8.000	
	666-6080	REFL PAV MRK TY I(W)(ENTR GORE)(090MIL)	EA	8.000		1.000		9.000	
	666-6083	REFL PAV MRK TY I(W)(EXIT GORE)(090MIL)	EA	8.000		1.000		9.000	
	666-6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	35,099.000		5,434.000		40,533.000	
	666-6308	RE PM W/RET REQ TY I (W)6"(SLD)(090MIL)	LF	145,190.000		22,997.000		168,187.000	
	666-6317	RE PM W/RET REQ TY I (Y)6"(BRK)(090MIL)	LF			212,733.000		212,733.000	
	666-6320	RE PM W/RET REQ TY I (Y)6"(SLD)(090MIL)	LF	140,396.000		21,733.000		162,129.000	
	672-6008	REFL PAV MRKR TY I-R	EA	364.000		28.000		392.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	2,700.000		362.000		3,062.000	
	3076-6034	D-GR HMA TY-C PG76-22 (LEVEL-UP)	TON	3.000				3.000	
	3080-6001	STONE-MTRX-ASPH SMA-C SAC-A PG76-22	TON	85,773.000		13,045.000		98,818.000	
	3080-6029	TACK COAT	GAL	91,703.000		14,231.000		105,934.000	
	3082-6004	TBWC (MEMBRANE)	GAL	135,934.000		20,872.000		156,806.000	
	3082-6005	TBWC PG76-22 SAC-A TY C	TON	29,200.000		4,744.000		33,944.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	128.000		32.000		160.000	
	6003-6001	ITS SYSTEM SUPPORT EQUIPMENT	LS	0.500		0.500		1.000	
	6010-6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	4.000		1.000		5.000	
	6027-6003	CONDUIT (PREPARE)	LF	10.000				10.000	
	6027-6008	GROUND BOX (PREPARE)	EA	1.000				1.000	
	6028-6001	INSTALL DMS (POLE MTD CABINET)	EA	3.000				3.000	
	6064-6046	ITS POLE (55 FT)(90 MPH)	EA	4.000		1.000		5.000	
	6064-6084	ITS POLE MNT CAB (TY 2)(CONF 2)	EA	4.000		1.000		5.000	
	6084-6001	MODIFY EXISTING ELECTRICAL SERVICE	EA	1.000				1.000	
	6185-6002	TMA (STATIONARY)	DAY	128.000		32.000		160.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	25.000		5.000		30.000	
	6377-6001	SYSTEM INTEGRATION	LS	0.500		0.500		1.000	
	6386-6001	INSTALLATION OF CELLULAR MODEM	EA	7.000		1.000		8.000	
	6489-6002	BACKLIT W/ PERIMETER LED RDSG SGN	EA	36.000				36.000	
	14	PUBLIC UTILITY FORCE ACCT WORK (PARTICIPATING)	LS	1.000				1.000	
	16	MATERIAL FURNISHED BY THE STATE (PARTICIPATING)	LS	1.000				1.000	
	18	LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000				1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000				1.000	



DISTRICT	COUNTY	CCSJ	SHEET
El Paso	Culberson	0003-01-064	006A



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0003-01-064

DISTRICT El Paso

COUNTY Culberson

HIGHWAY IH 10

CONTROL SECTION JOB				0003-01-064		0003-02-049		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00182969		A00182970			
COUNTY				Culberson		Culberson			
HIGHWAY				IH 10		IH 10			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL	EST.	FINAL		
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000				1.000	

Ck: DWF: Ck: DWF: Ck: DWF:

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SUMMARY OF ROADWAY ITEMS												
LOCATION	134 6004	314 6009	351 6002	354 6002	354 6020	354 6188	533 6003	3076 6034	3080 6001	3080 6029	3082 6004	3082 6005
	BACKFILL (TY A OR B)	EMULS ASPH (EROSN CONT)(MULTI)	FLEXIBLE PAVEMENT STRUCTURE REPAIR(6")	PLAN & TEXT ASPH CONC PAV(0"TO 2")	PLANE ASPH CONC PAV (0" to 1")	PLANE ASPH CONC PAV(MICRO-MLL NG)(1")	RUMBLE STRIPS (SHOULDER) ASPHALT	D-GR HMA TY-C PG76-22 (LEVEL-UP)	STONE-MTR X-ASPH SMA-C SAC-A PG76-22	TACK COAT	TBWC (MEMBRANE)	TBWC PG76-22 SAC-A TY-C
	STA	GAL	SY	SY	SY	SY	LF	TON	TON	GAL	GAL	TON
CSJ: 0003-01-064	1389	3471	31600	15778	7193	623797	280791	3	85773	91703	135934	29200
CSJ: 0003-02-049	218	544	4744	4000	0	94874	43465		13045	14231	20872	4744
<b>PROJECT TOTALS</b>	<b>1607</b>	<b>4015</b>	<b>36344</b>	<b>19778</b>	<b>7193</b>	<b>718671</b>	<b>324256</b>	<b>3</b>	<b>98818</b>	<b>105934</b>	<b>156806</b>	<b>33944</b>

SUMMARY OF PAVEMENT MARKING ITEMS								
LOCATION	666 6035	666 6080	666 6074	666 6083	666 6305	666 6308	666 6320	672 6010
	REFL PAVMRK TY I (W)8"(SLD)(090M IL)	REFL PAVMRK TY I(W)(ENTR GORE)(090MIL)	REFL PAVMRK TY I (W)(NUMBER)(090MIL)	REFL PAVMRK TY I(W)(EXIT GORE)(090MIL)	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	RE PM W/RET REQ TY I (W)6"(SLD)(090M IL)	RE PM W/RET REQ TY I (Y)6"(SLD)(090MIL)	IREFL PAVMRKR TY II-C-R
	LF	EA	EA	EA	LF	LF	LF	EA
CSJ: 0003-01-064	280	8	8	8	35099	145190	140396	2700
CSJ: 0003-02-049	40	1		1	5434	22997	21733	362
<b>PROJECT TOTALS</b>	<b>320</b>	<b>9</b>	<b>8</b>	<b>9</b>	<b>40533</b>	<b>168187</b>	<b>162129</b>	<b>3062</b>

SUMMARY OF BRIDGE ITEMS			
LOCATION	356 6021	429 6006	438 6002
	PAVJT UNDERSEAL (24")	CONC STR REPR(RAPID DECK REP(FULL DPT))	CLEANING AND SEALING EXIST JOINTS(CL3)
	LF	SF	LF
24-055-0-0003-01-133	176	72	176
24-055-0-0003-01-134	176	72	176
24-055-0-0003-01-156	0	72	306
24-055-0-0003-01-157	0	72	306
24-055-0-0003-01-161	0	72	176
24-055-0-0003-01-162	0	72	176
24-055-0-0003-01-178	0	72	204
24-055-0-0003-01-180	0	72	204
<b>PROJECT TOTALS</b>	<b>352</b>	<b>576</b>	<b>1724</b>

SUMMARY OF TRAFFIC CONTROL ITEMS									
LOCATION	500 6001	502 6001	662 6005	662 6008	662 6037	662 6109	6001 6001	6185 6002	6185 6005
	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING	WK ZN PAV MRK NON-REMOV (W)6"(BRK)	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY W	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	MO	MO	LF	LF	LF	EA	DAY	DAY	DAY
CSJ: 0003-01-064	0.87	8	35099	145190	140396	12418	128	128	5
CSJ: 0003-02-049	0.13	8	5434	22997	21733	1810	32	32	25
<b>PROJECT TOTALS</b>	<b>1</b>	<b>16</b>	<b>40533</b>	<b>168187</b>	<b>162129</b>	<b>14228</b>	<b>160</b>	<b>160</b>	<b>30</b>

**IH 10  
MILL & OVERLAY  
QUANTITY SUMMARY**

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SUMMARY OF ITS ITEMS																			
LOCATION	100	110	416	416	432	432	540	540	544	618	618	620	620	620	624	628	628	650	6003
	6001	6003	6005	6006	6001	6045	6002	6016	6001	6023	6024	6010	6012	6016	6002	6128	6225	6028	6001
	PREPARING ROW	EXCAVATION (SPECIAL)	DRILL SHAFT (42 IN)	DRILL SHAFT (48 IN)	RIPRAP (CONC) (4 IN)	RIPRAP (MOW STRIP) (4 IN)	MTL W-BEAM GD FEN (STEEL POST)	DOWNSTREAM ANCHOR TERMINAL SECTION	GUARDRAIL END TREATMENT (INSTALL)	CONDT (PVC) (SCH 40) (2")	CONDT (PVC) (SCH 40) (2") (BORE)	ELEC CONDR (NO. 6) INSULATED	ELEC CONDR (NO. 4) INSULATED	ELEC CONDR (NO. 2) INSULATED	GROUND BOX TY A (122311) W/A PRON	ELC SRV TY D 120/240 060 (NS) GS (N) GC (O)	ELC SRV TY D 120/240 100 (NS) GS (N) GC (O)	INS OH SN SUP (30 FT BAL TEE)	ITS SYSTEM SUPPORT EQUIPMENT
	AC	CY	LF	LF	CY	CY	LF	EA	EA	LF	LF	LF	LF	LF	EA	EA	EA	EA	LS
CSJ 0003-01-064																			
1 OF 8	0.06	0.5	0	30	1.5	13	150	1	1	20	260	0	0	1180	2	0	1	1	0
2 OF 8	0.06	0.5	21	0	1.5	0	0	0	0	20	60	285	0	0	2	1	0	0	0
3 OF 8	0.06	0.5	0	30	1.5	13	150	1	1	90	0	420	0	0	2	0	1	1	0
4 OF 8	0.00	0.5	21	0	1.5	0	0	0	0	20	165	600	0	0	2	0	0	0	0
5 OF 8	0.00	0.5	21	0	1.5	0	0	0	0	65	0	270	0	0	1	0	0	0	0
6 OF 8	0.06	0.5	21	0	1.5	0	0	0	0	115	80	645	0	0	3	0	0	0	0
7 OF 8	0.06	0.5	0	30	1.5	13	150	1	1	20	160	0	780	0	2	0	0	1	0
TOTAL	0.30	3.5	84	90	10.5	39	450	3	3	350	725	2220	780	1180	14	1	2	3	0.5
CSJ 0003-02-049																			
8 OF 8	0.06	0.5	21	0	1.5	0	0	0	0	20	235	825	0	0	3	0	0	0	0
TOTAL	0.06	0.5	21	0	1.5	0	0	0	0	20	235	825	0	0	3	0	0	0	0.5
PROJECT TOTAL	0.36	4.0	105	90	12.0	39	450	3	3	370	960	3045	780	1180	17	1	2	3	1

SUMMARY OF ITS ITEMS															
LOCATION	6010	6027	6027	6028	6064	6064	6084	6377	6386						
	6011	6003	6008	6001	6046	6084	6001	6001	6001						
	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	CONDUIT (PREPARE)	GROUND BOX (PREPARE)	INSTALL DMS (POLE MNT CABINET)	ITS POLE (55 FT) (90 MPH)	ITS POLE MNT CAB (TY 2) (CONF 2)	MODIFY EXISTING ELECTRICAL SERVICE	SYSTEM INTEGRATION	INSTALLATION OF CELLULAR MODEM	CELLULAR MODEM**	CCTV FIELD EQUIPMENT (DIGITAL)**	IP ADDRESSABLE POWER STRIP**	FULL COLOR FREEWAY DMS (POLE MTD CABINET)**	ELC SRV TY D 120/240 060 (NS) GS (N) TP (O)***	ELC SRV TY D 120/240 100 (NS) GS (N) TP (O)***
	EA	LF	EA	EA	EA	EA	LS	EA	EA	EA	EA	EA	EA	EA	
CSJ 0003-01-064															
1 OF 8	0	0	0	1	0	0	0	1	1	0	1	1	0	0	
2 OF 8	1	0	0	0	1	1	0	1	1	1	1	0	0	0	
3 OF 8	0	0	0	1	0	0	0	1	1	0	1	1	0	0	
4 OF 8	1	0	0	0	1	1	0	1	1	1	1	0	1	0	
5 OF 8	1	10	1	0	1	1	0	1	1	1	1	0	0	0	
6 OF 8	1	0	0	0	1	1	0	1	1	1	1	0	1	0	
7 OF 8	0	0	0	1	0	0	0	1	1	0	1	1	0	1	
TOTAL	4	10	1	3	4	4	0.5	7	7	4	7	3	2	1	
CSJ 0003-02-049															
8 OF 8	1	0	0	0	1	1	0	0	1	1	1	0	1	0	
TOTAL	1	0	0	0	1	1	0	0.5	1	1	1	0	1	0	
PROJECT TOTAL	5	10	1	3	5	5	1	1	8	8	5	3	3	1	

\*\* ITEMS PROVIDED BY THE STATE  
 \*\*\* ITEMS PROVIDED AND INSTALLED BY RIO GRANDE ELECTRIC AND PAID BY TXDOT USING STATE FORCE

SUMMARY OF WWD SIGN & PAVEMENT MARKING ITEMS							
LOCATION	644	644	644	644	672	6489	
	6001	6002	6004	6076	6078	6008	6002
	IN SM RD SN SUP&AM TY10BWG (1)S A (P)	IN SM RD SN SUP&AM TY10BWG (1)S A (P-BM)	IN SM RD SN SUP&AM TY10BWG (1)S A (T)	REMOVE SM RD SN SUP&AM	REMOVE SM RD SN SUP&AM (SIGN ONLY)	REFL PAV MRKR TY 1-R	BACKLIT W/PERIMETER LED RDSD SGN
	EA	EA	EA	EA	EA	EA	EA
CSJ 0003-01-064							
1 OF 13	0	0	4	2	0	28	0
2 OF 13	1	0	6	4	0	28	4
3 OF 13	1	0	6	4	0	28	4
4 OF 13	0	2	12	8	1	56	4
5 OF 13	0	0	6	2	0	28	4
6 OF 13	0	0	6	2	0	28	4
7 OF 13	0	0	4	4	0	14	0
8 OF 13	0	0	10	7	0	28	4
9 OF 13	0	0	10	8	0	28	4
10 OF 13	0	0	7	2	2	42	4
11 OF 13	0	0	7	2	2	56	4
TOTAL	2	2	78	45	5	364	36
CSJ 0003-02-049							
12 OF 13	0	2	4	8	0	14	0
13 OF 13	0	0	6	6	0	14	0
TOTAL	0	2	10	14	0	28	0
PROJECT TOTAL	2	4	88	59	5	392	36

**IH 10**  
**MILL & OVERLAY**  
**QUANTITY SUMMARY**

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: 10/11/2023  
FILE: U:\000301064\MASTER DESIGN FILES\epic.dgn

**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.  
2.  
3.  
4.

**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:**

<b>Erosion</b>	<b>Sedimentation</b>	<b>Post-Construction TSS</b>
<input type="checkbox"/> Temporary Vegetation	<input type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Blankets/Matting	<input 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.  
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	SWSP: 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.)

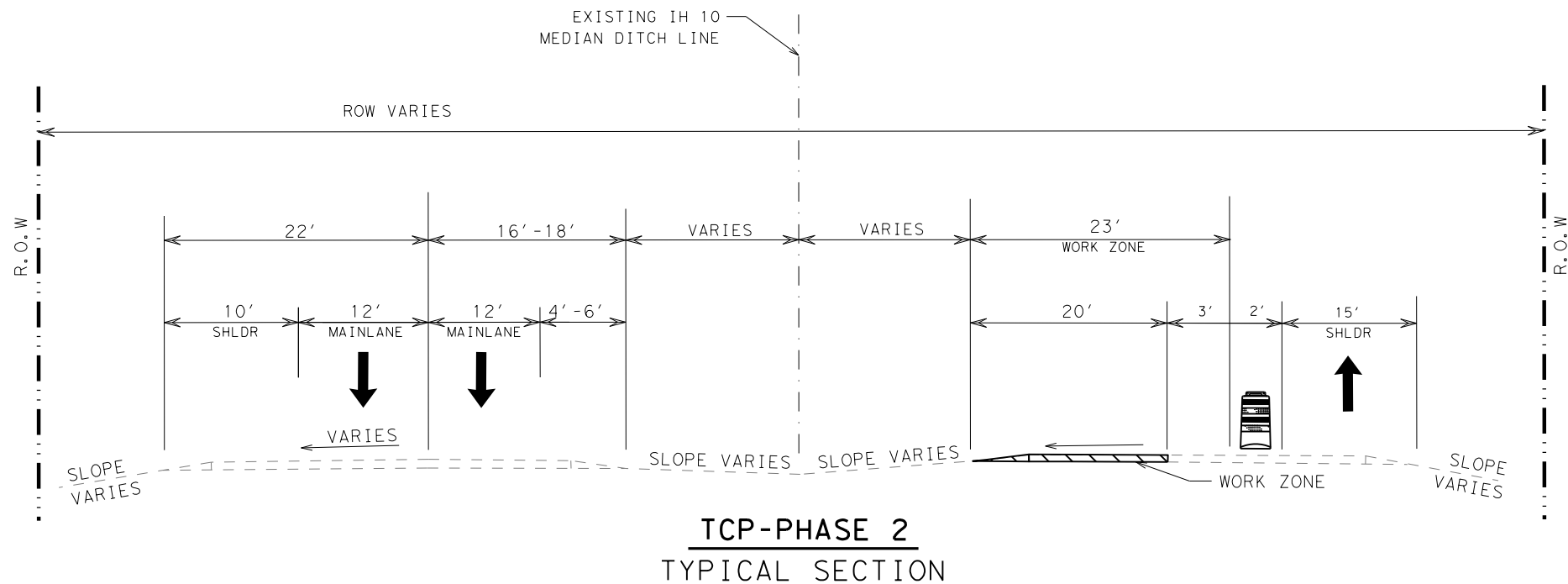
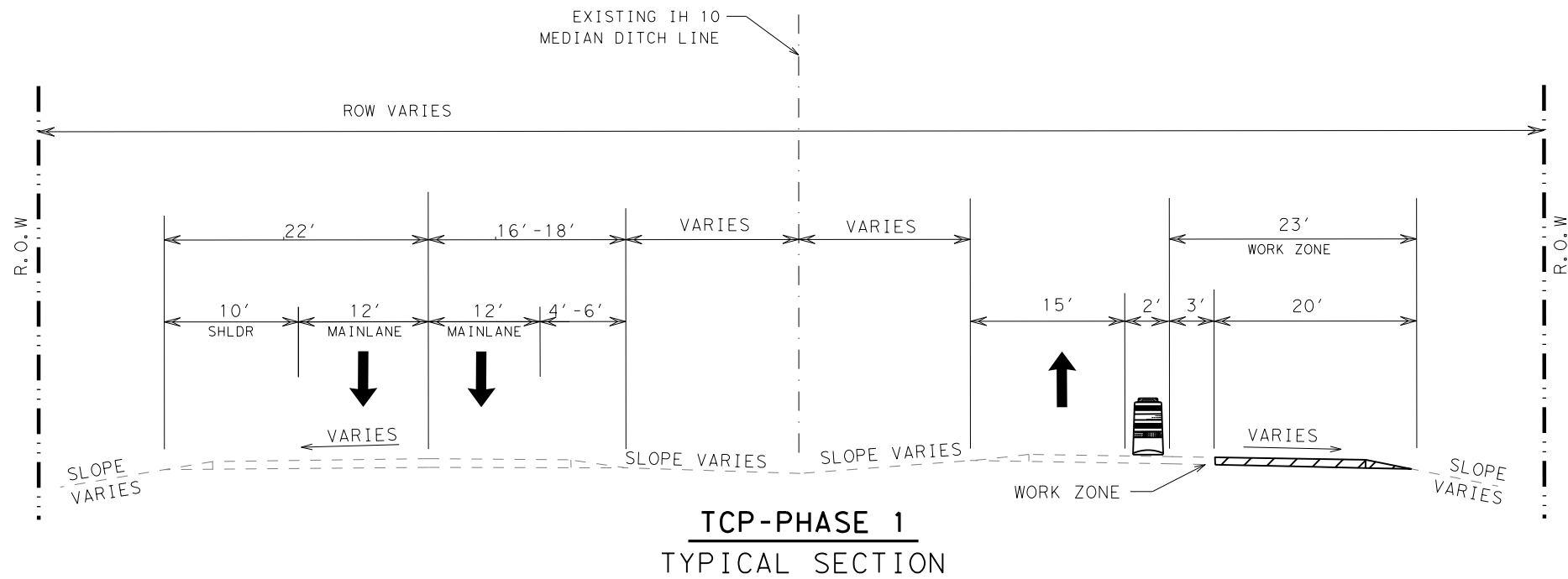
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- Action No.  
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		<b>Design Division Standard</b>		
<b>ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC SHEET</b>				
FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
12-12-2011 (DS) REVISIONS	0003	01	064, ETC	IH 10
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.	ELP	CULBERSON	9	

### TCP SELECTION TABLE

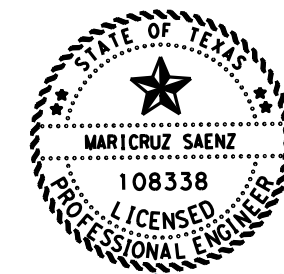
TYPE OF WORK	STANDARD SHEET	SHEET DESCRIPTION	SHEET DIAGRAM	SUGGESTED USE
MILLING & PAVING (MAINLANES, SHOULDERS, & BRIDGES)	TCP (5-1)-18, TCP (6-1)-12, TCP (6-8)-14	SHOULDER WORK FOR FREEWAYS/EXPRESSWAYS FREEWAY LANE CLOSURES WORK IN GORE FOR ADT GREATER THAN 10,000	TCP (5-1b), TCP (6-1a), TCP (6-8b)	REFER TO TCP PHASE 1 AND PHASE 2 FOR SETUP OF LANE CLOSURES.
MILLING & PAVING (RAMPS)	TCP (6-2)-12, TCP (6-3)-12, TCP (6-4)-12, TCP (6-5)-12	WORK AREA NEAR/BEYOND RAMP WORK AREA AT EXIT/BEYOND RAMP	TCP (6-2), TCP (6-3a), TCP (6-4a), TCP (6-5a)	LANE CLOSURES
PAVEMENT MARKING	TCP (3-2)-13	MOBILE OPERATIONS-DIVIDED HIGHWAYS	TCP (3-2a)	MOBILE OPERATIONS
RPM INSTALLATION	TCP (3-3)-14	MOBILE OPERATIONS-RAISED PAVEMENT MARKER	TCP (3-3c)	MOBILE OPERATIONS



**NOTES:**

1. APPLY TRAFFIC CONTROL PLAN SETUP AS DESCRIBED IN THE TCP SELECTION TABLE, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. KEEP A 2 MILE LENGTH WORK ZONE PER DIRECTION. ADDITIONAL LIMITS ARE AT DISCRETION OF THE ENGINEER.
3. COORDINATE WITH OVERLAPPING PROJECTS TO PROVIDE A BETTER RIDE WHEN SCHEDULING SEGMENTS.
4. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. DO NOT USE FOR QUANTITY CALCULATIONS OR AS A CONSTRUCTION DETAIL.

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*Maricruz Saenz P.E.*  
10/19/2023

**IH 10  
MILL & OVERLAY  
GENERAL  
TRAFFIC CONTROL  
TCP SELECTION TABLE**

SCALE: N.T.S. SHEET 1 OF 1

		© 2022	
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		10

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

- 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).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- Traffic control devices should be in place only while work is actually in progress or a definite need exists.
- The Engineer has the final decision on the location of all traffic control devices.
- 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:**


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

**COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES**

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

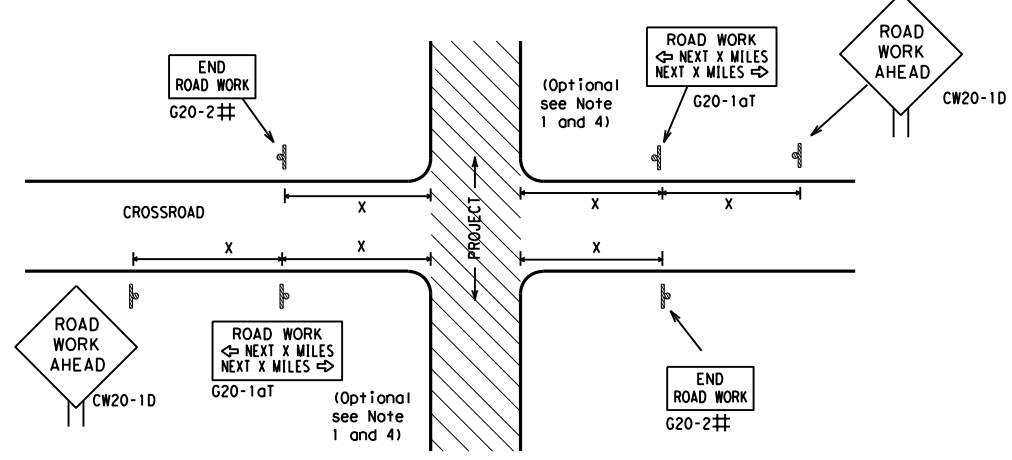
<b>THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT</b> <a href="http://www.txdot.gov">http://www.txdot.gov</a>
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD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

SHEET 1 OF 12

 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
© TxDOT	November 2002	CONT	SECT
		0003	01
		JOB	
		064, ETC	
		HIGHWAY	
		IHWYO	
REVISIONS		DIST	COUNTY
4-03	7-13		
9-07	8-14		
5-10	5-21	ELP	CULBERSON
			SHEET NO.
			11

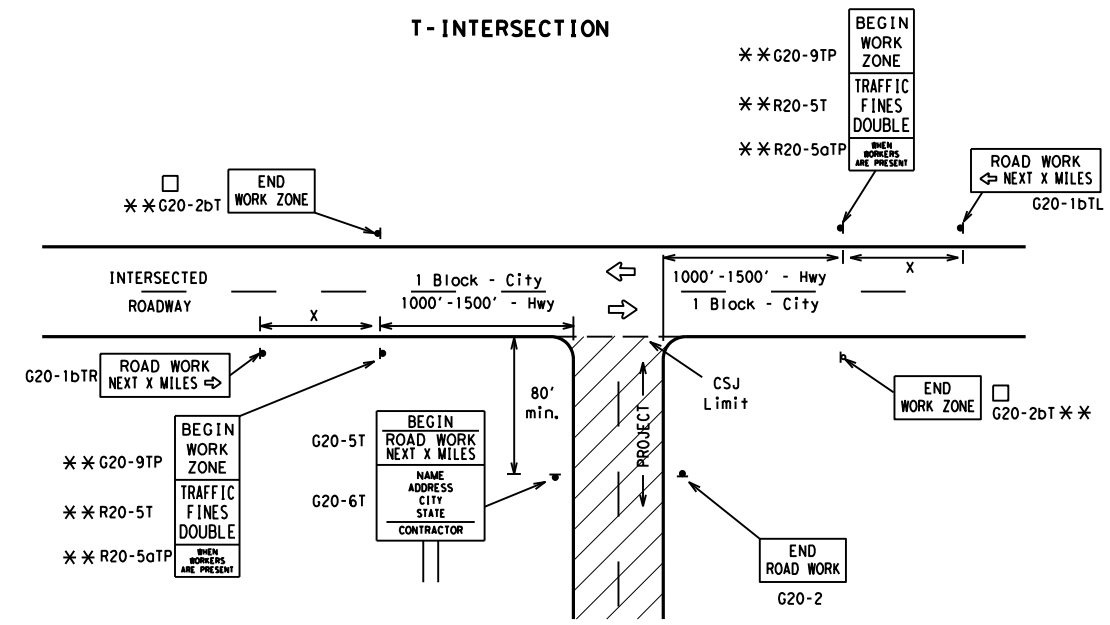
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**TYPICAL LOCATION OF CROSSROAD SIGNS**



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

**T-INTERSECTION**



**CSJ LIMITS AT T-INTERSECTION**

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

**TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING<sup>1,5,6</sup>**

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Δ Spacing "x" Feet (Apprx.)
CW20 <sup>4</sup>	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25			50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	55	500 <sup>2</sup>
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>

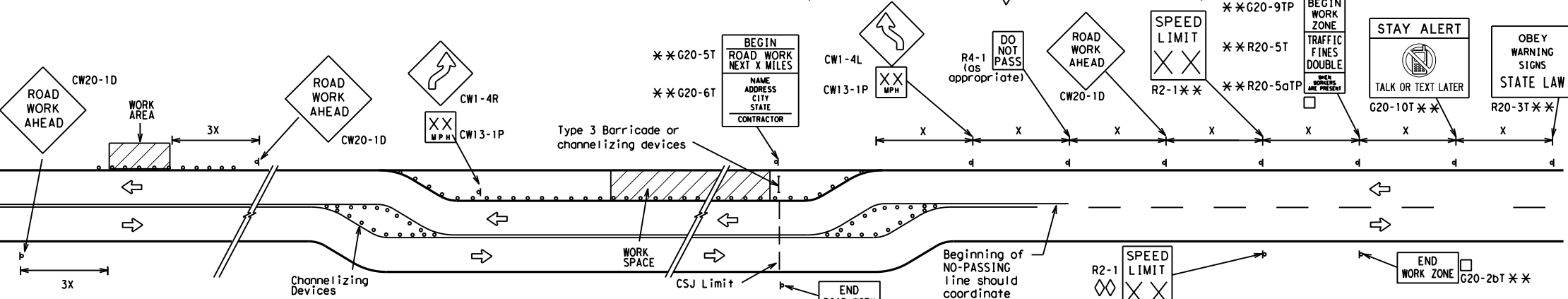
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

**GENERAL NOTES**

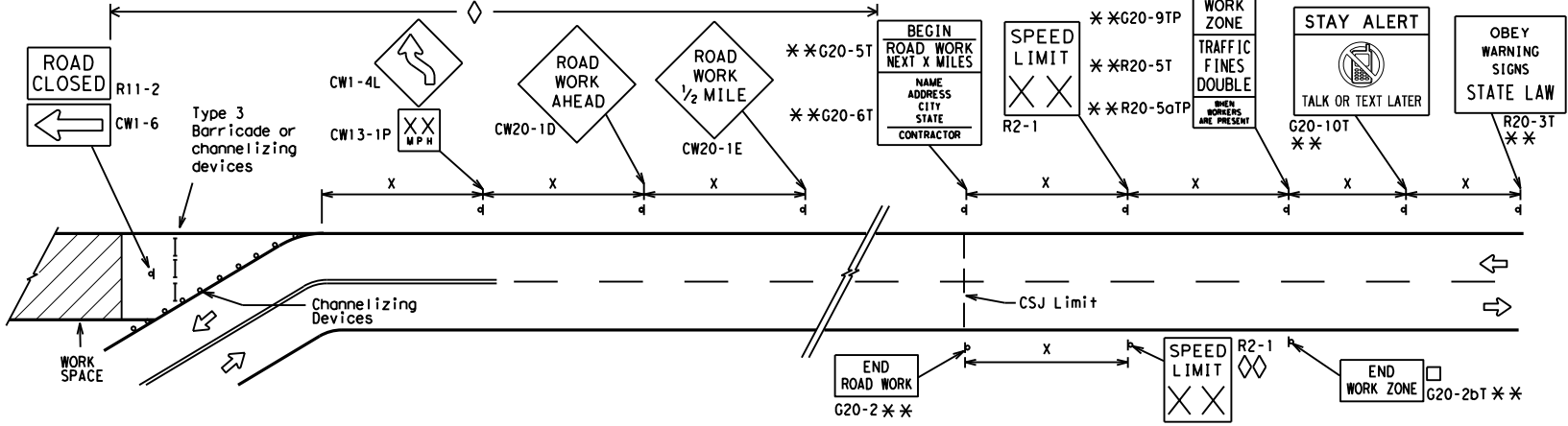
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

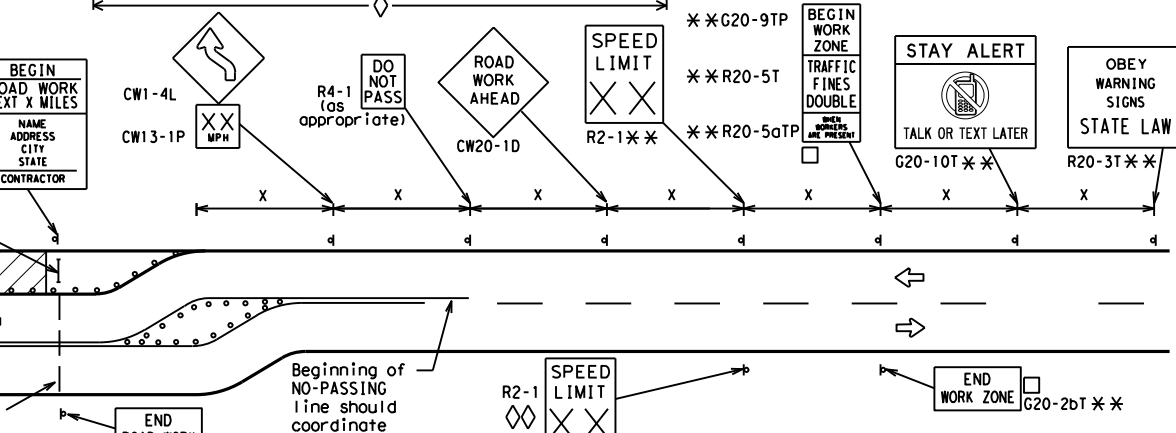


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

**BC(2)-21**

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	SI	064J,ETC	IHWYO
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	BSP	CULBERSON	12	

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# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



## GUIDANCE FOR USE:

### LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

- 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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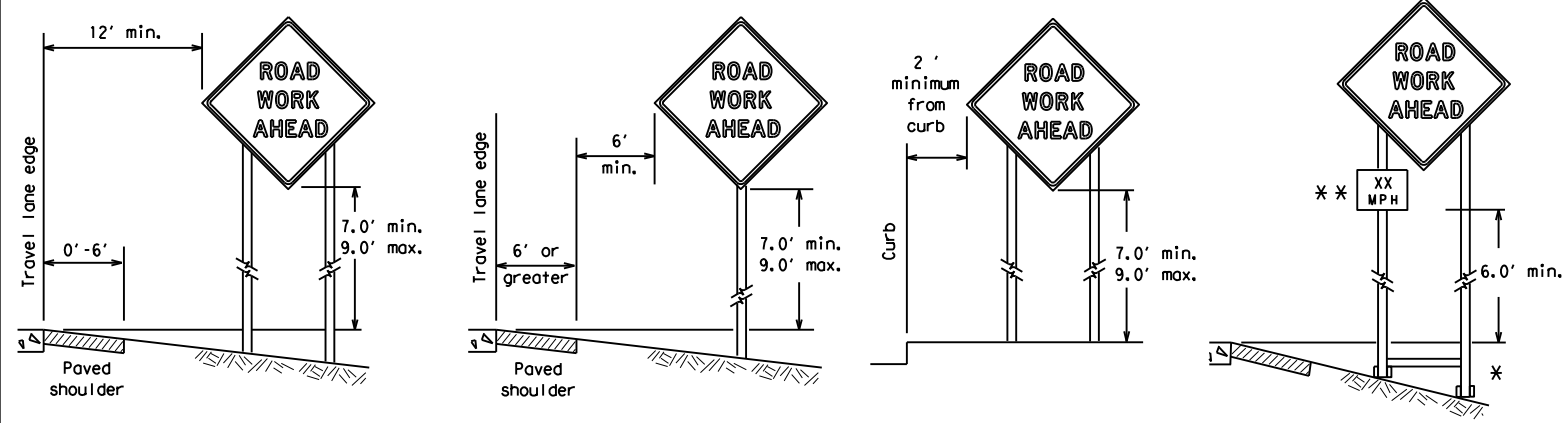
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SHEET 3 OF 12

<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	CONT	SECT
REVISIONS		JOB	HIGHWAY
9-07	8-14	0003 01	064, ETC
7-13	5-21	DIST	COUNTY
		ELP	CULBERSON
			SHEET NO. 13

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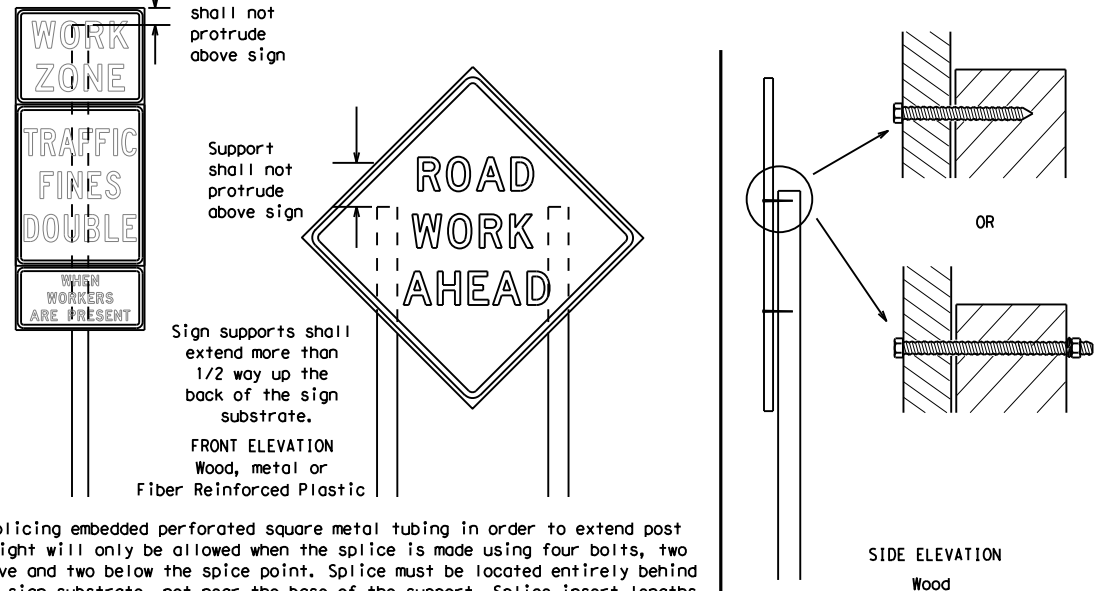
**TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS**



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

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

**ATTACHMENT FOR SIGN SUPPORTS**



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

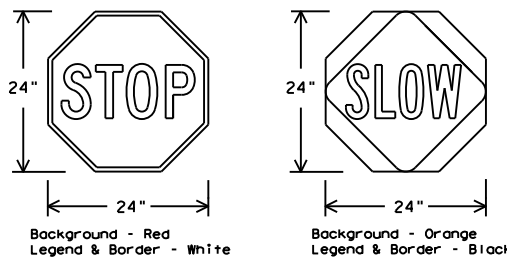
- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not 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 retroreflective 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.



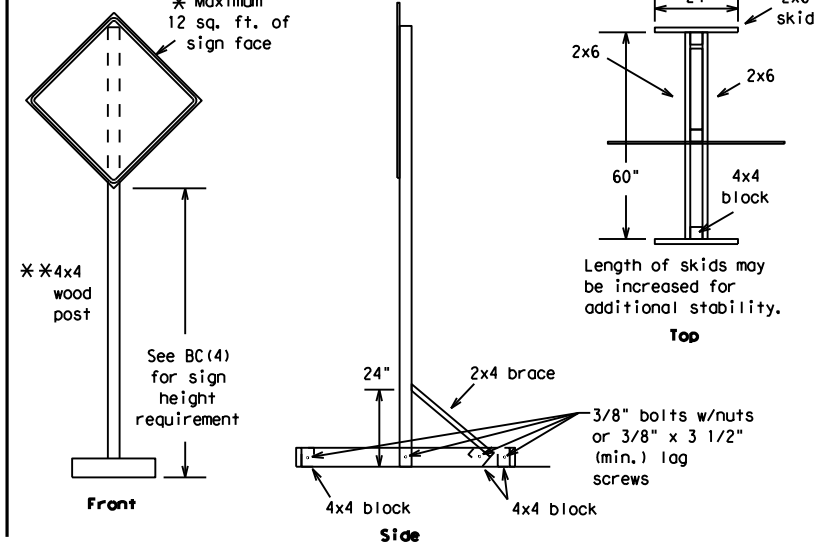
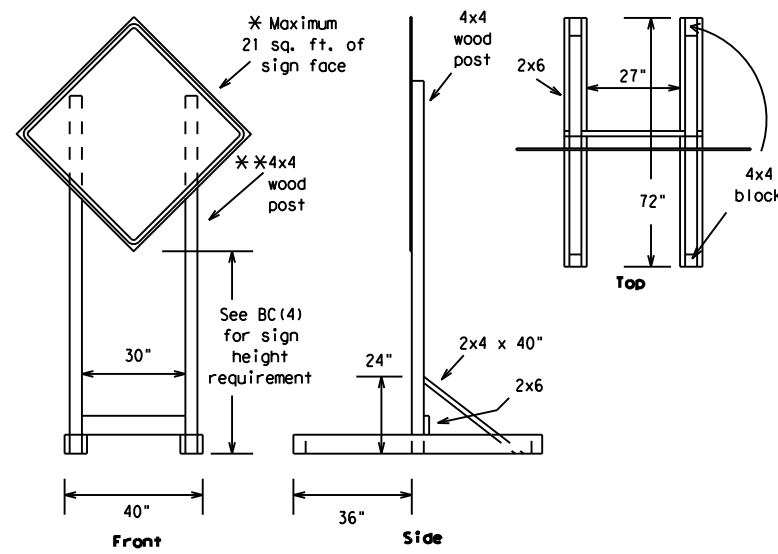
**BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES**

**BC (4) - 21**

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9-07	8-14	DIST	COUNTY	SHEET NO.					
7-13	5-21	ELP	CULBERSON	14					

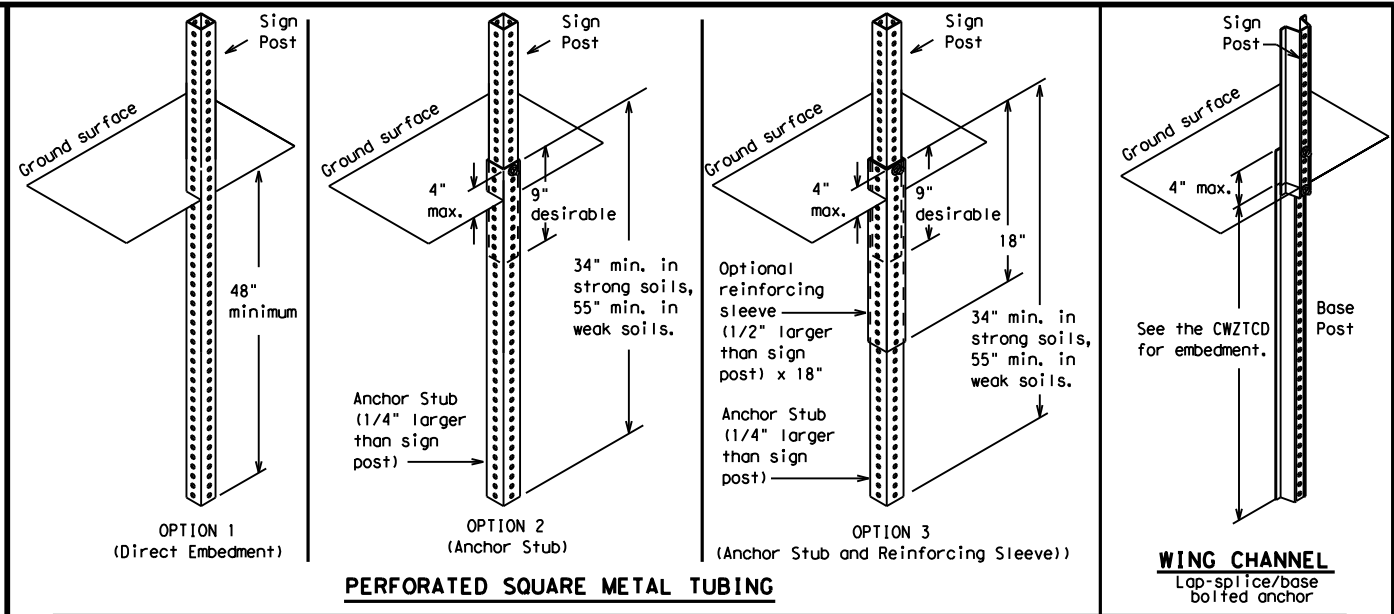
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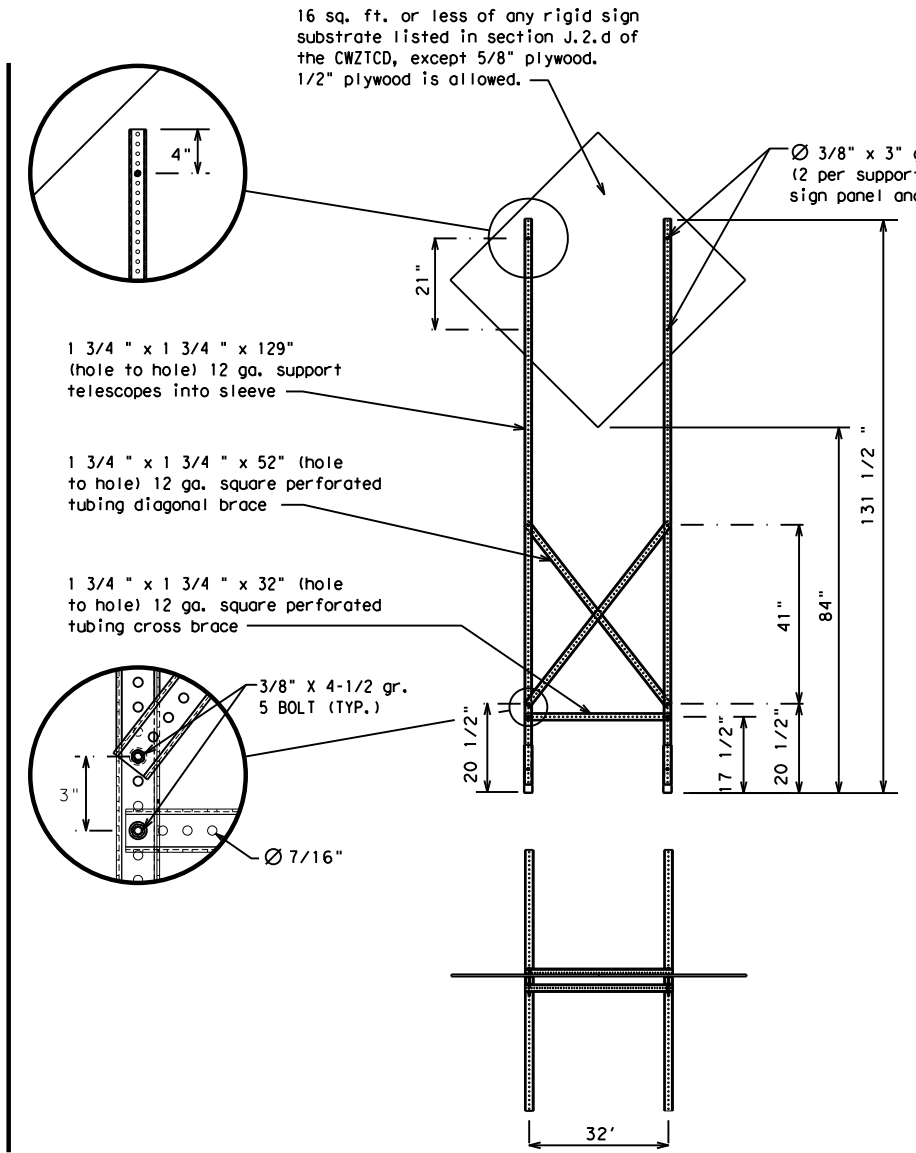
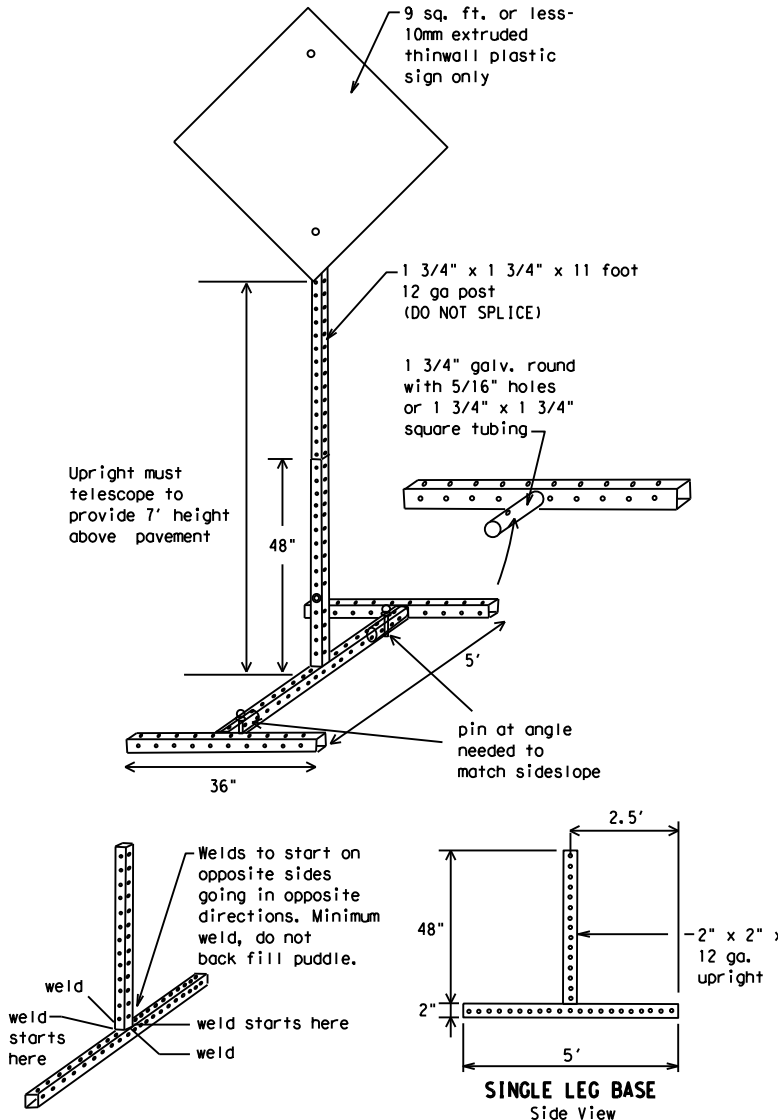
### SKID MOUNTED WOOD SIGN SUPPORTS

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



### GROUND MOUNTED SIGN SUPPORTS

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



### 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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7-13	5-21	ELP	CULBERSON	15					

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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	FRONTAGE ROAD CLOSED
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT
RIGHT X LANES CLOSED	RIGHT X LANES OPEN
CENTER LANE CLOSED	DAYTIME LANE CLOSURES
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE
EXIT CLOSED	RIGHT LN TO BE CLOSED
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI
XXXXXXXX BLVD CLOSED	

### Other Condition List

ROADWORK XXX FT	ROAD REPAIRS XXXX FT
FLAGGER XXXX FT	LANE NARROWS XXXX FT
RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
DETOUR X MILE	ROUGH ROAD XXXX FT
ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
BUMP XXXX FT	US XXX EXIT X MILES
TRAFFIC SIGNAL XXXX FT	LANES SHIFT *

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

## Phase 2: Possible Component Lists

### Action to Take/Effect on Travel List

MERGE RIGHT	FORM X LINES RIGHT
DETOUR NEXT X EXITS	USE XXXXX RD EXIT
USE EXIT XXX	USE EXIT I-XX NORTH
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N
TRUCKS USE US XXX N	WATCH FOR TRUCKS
WATCH FOR TRUCKS	EXPECT DELAYS
EXPECT DELAYS	PREPARE TO STOP
REDUCE SPEED XXX FT	END SHOULDER USE
USE OTHER ROUTES	WATCH FOR WORKERS
STAY IN LANE *	

### Location List

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

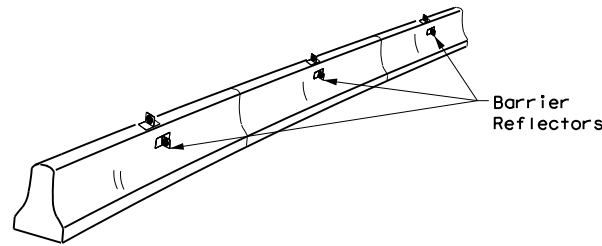
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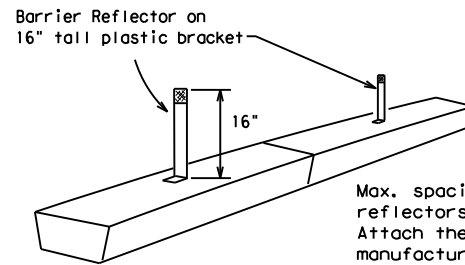
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors 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.

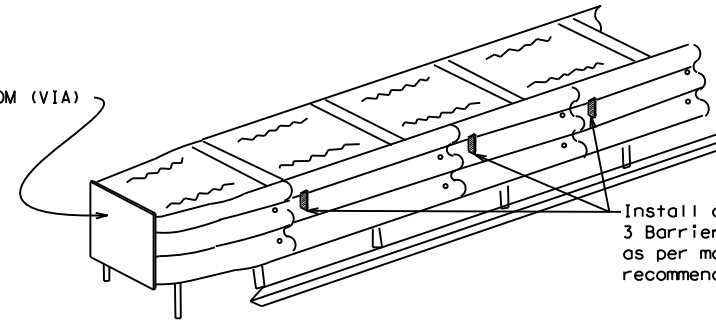


**LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES**

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

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

**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**

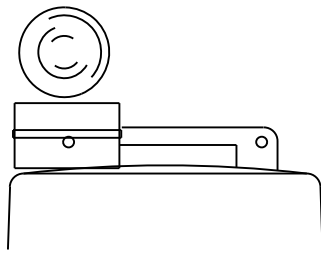
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet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

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

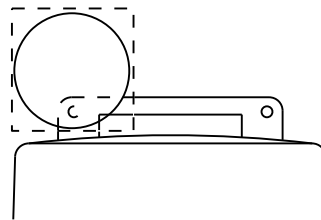
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing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



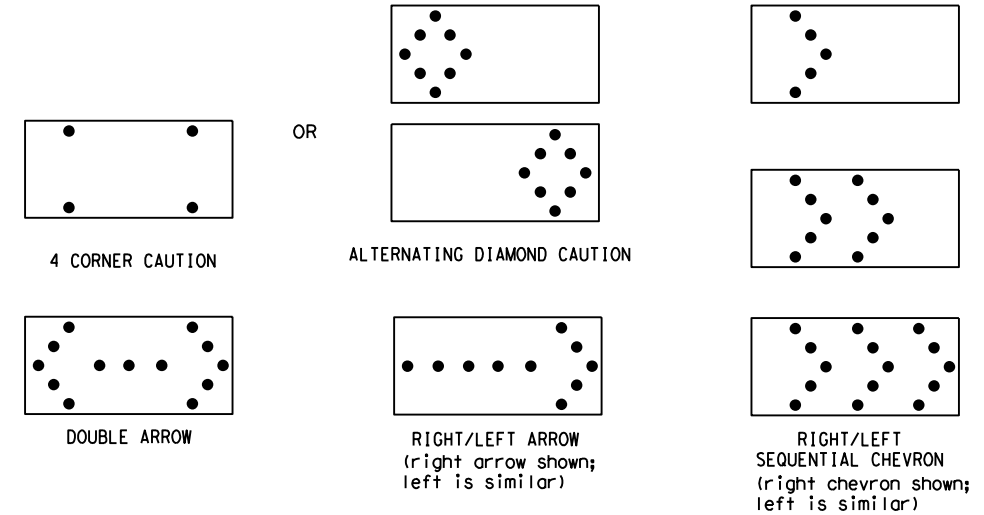
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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**

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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0003	01	064, ETC	IH 10				
9-07	8-14	DIST	COUNTY	SHEET NO.					
7-13	5-21	ELP	CULBERSON	17					

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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:

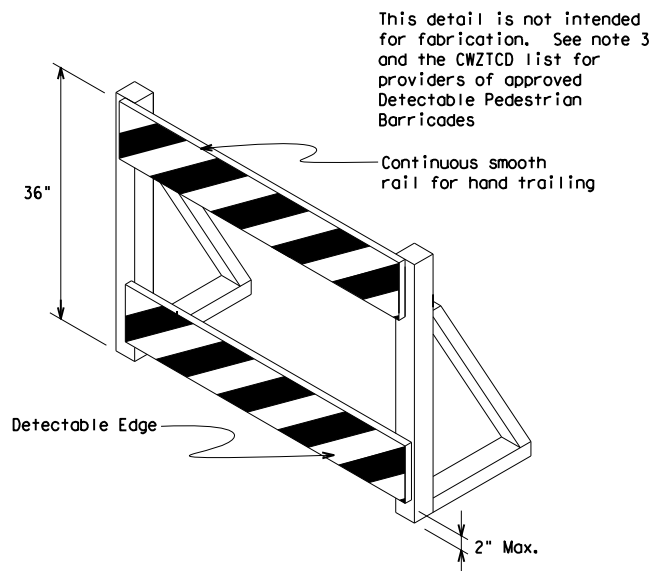
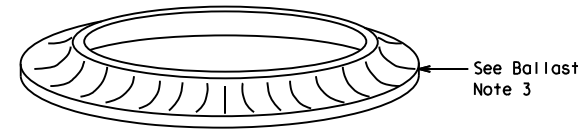
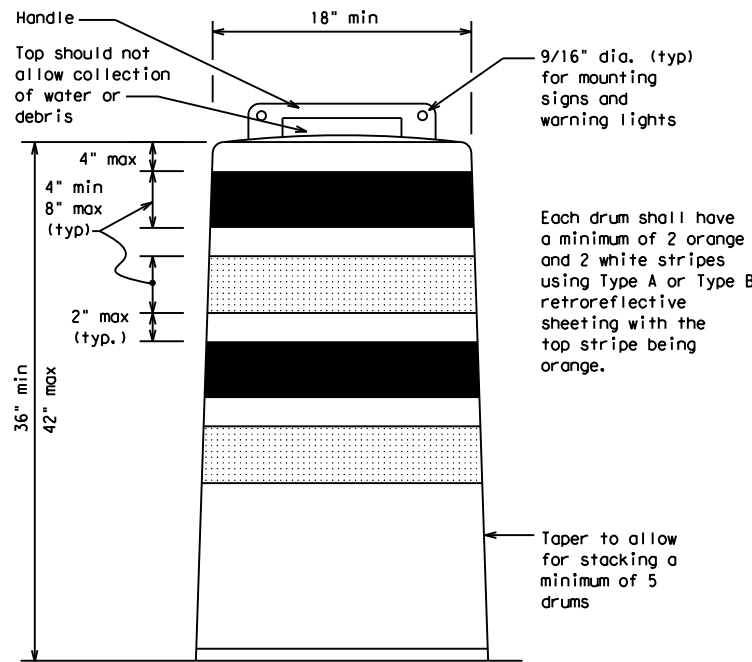
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

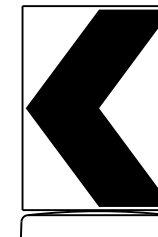
**BALLAST**

- 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.

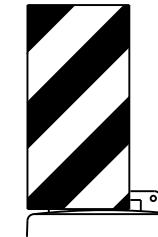


**DETECTABLE PEDESTRIAN BARRICADES**

- 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

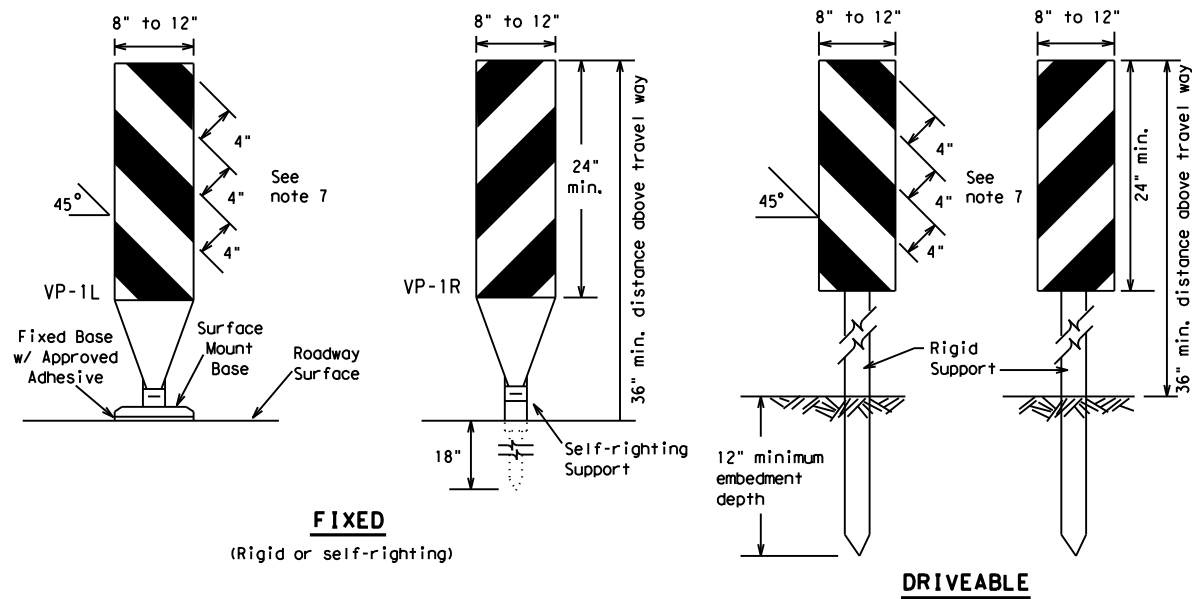


**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (8) - 21**

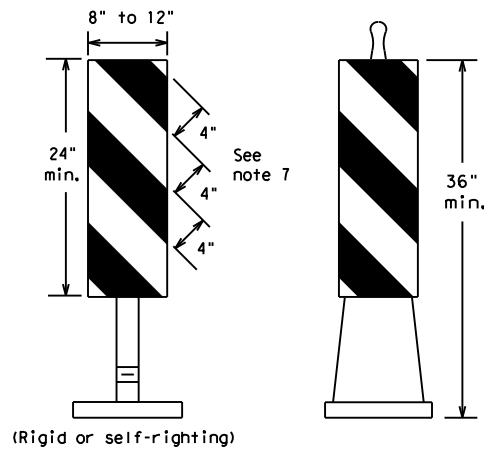
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REVISIONS		0003	01	064, ETC	IH 10				
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**FIXED**  
(Rigid or self-righting)

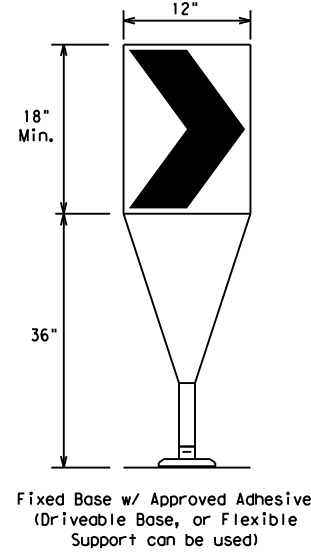
**DRIVEABLE**



**PORTABLE**

**VERTICAL PANELS (VPs)**

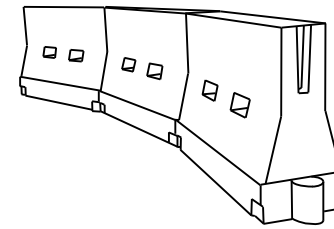
- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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



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

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

**CHEVRONS**



**LONGITUDINAL CHANNELIZING DEVICES (LCD)**

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

**WATER BALLASTED SYSTEMS USED AS BARRIERS**

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

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

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

**GENERAL NOTES**

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

Posted Speed	Formula	Minimum Desirable Taper Lengths * *			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

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

**SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS**

SHEET 9 OF 12



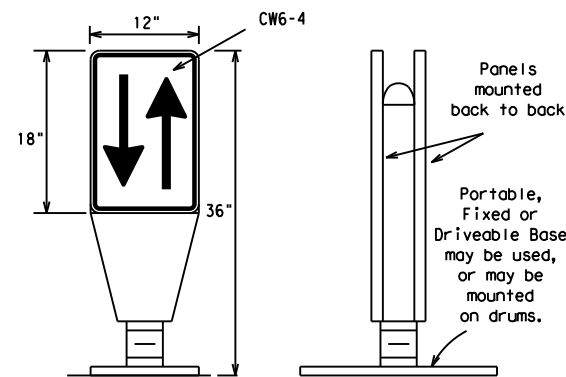
**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (9) - 21**

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7-13 5-21	ELP	CULBERSON	19	

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**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**



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

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**TYPE 3 BARRICADES**

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

Barricades shall NOT be used as a sign support.



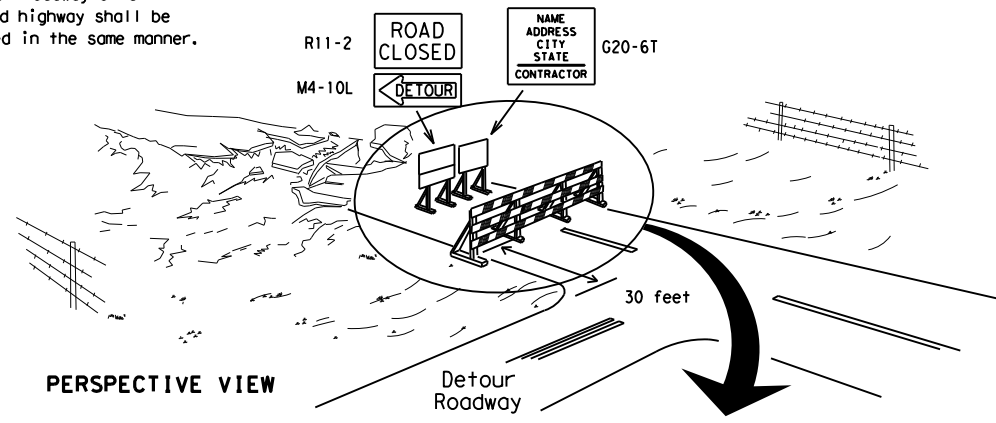
**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



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

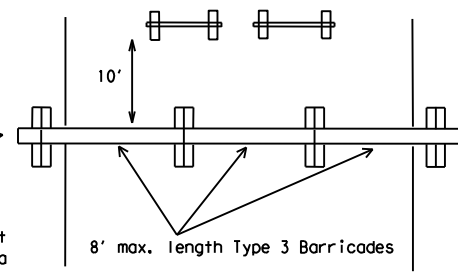
**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

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



PERSPECTIVE VIEW

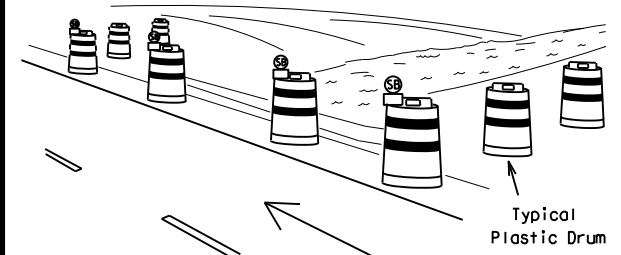
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



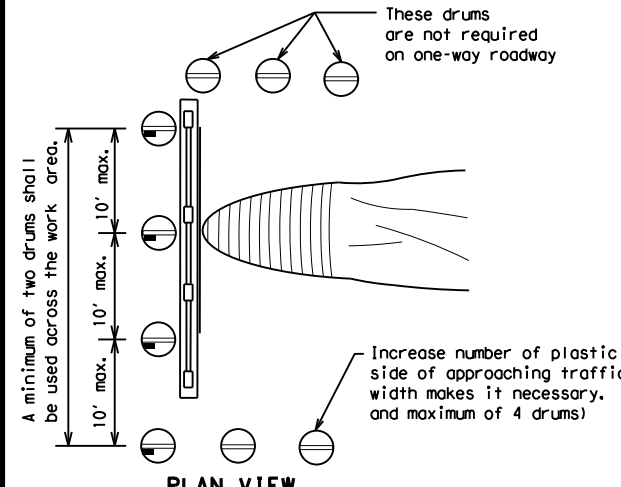
PLAN VIEW

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

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



PERSPECTIVE VIEW

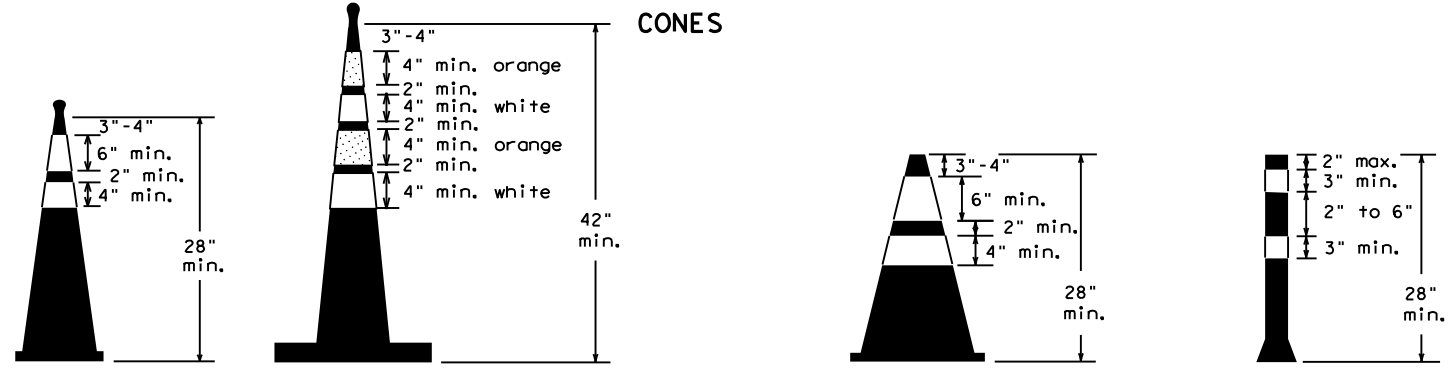


PLAN VIEW

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**



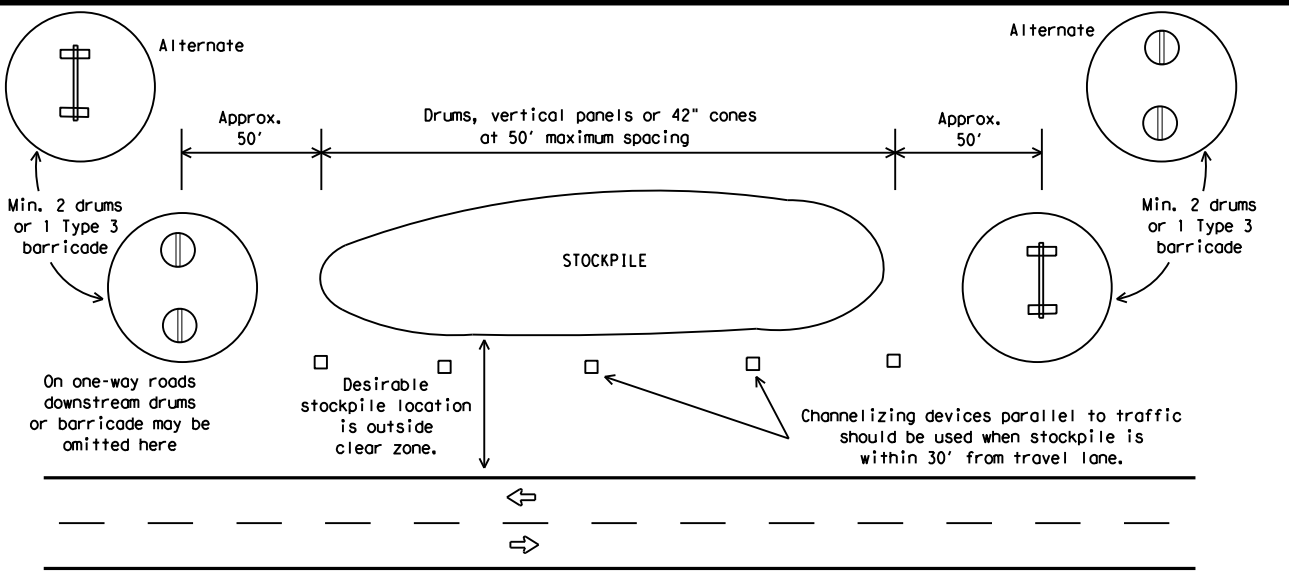
Two-Piece cones

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	OW: TxDOT	CR: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	ELP	CULBERSON	20	

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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.

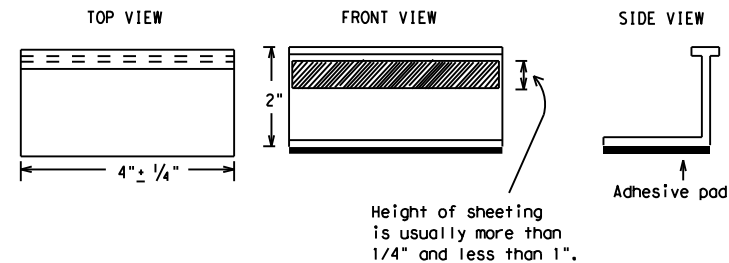
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- 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**

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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1-02 7-13	ELP	CULBERSON	21	
11-02 8-14				

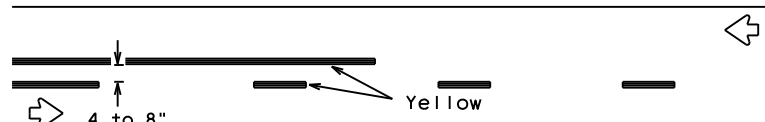
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## PAVEMENT MARKING PATTERNS

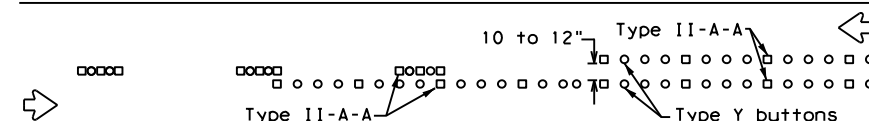


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

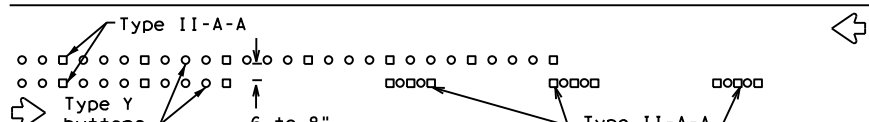


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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



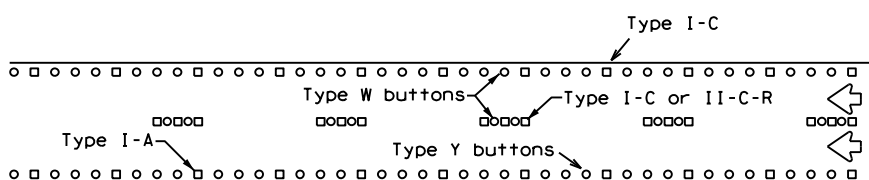
RAISED PAVEMENT MARKERS - PATTERN B

## 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.



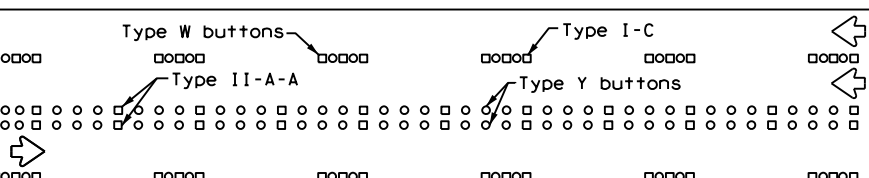
RAISED PAVEMENT MARKERS

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



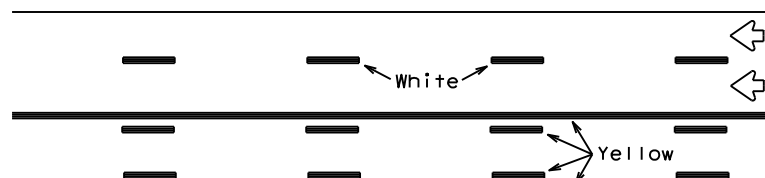
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



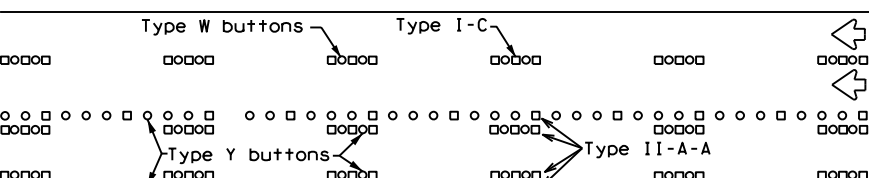
RAISED PAVEMENT MARKERS

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

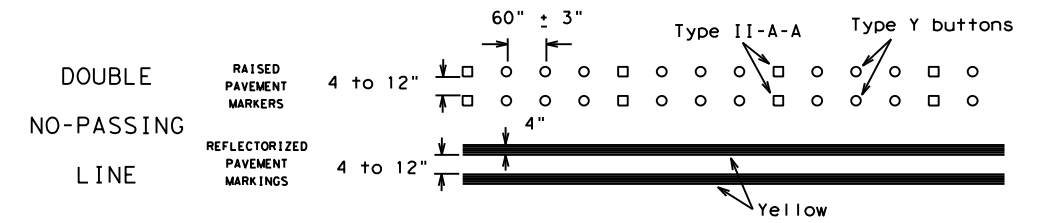
Prefabricated markings may be substituted for reflectORIZED pavement markings.



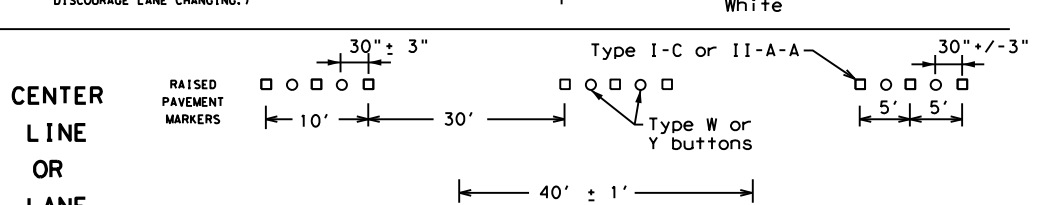
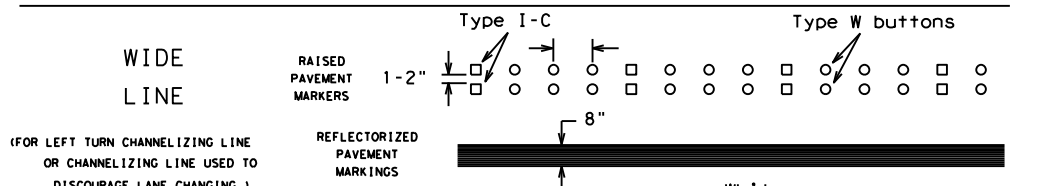
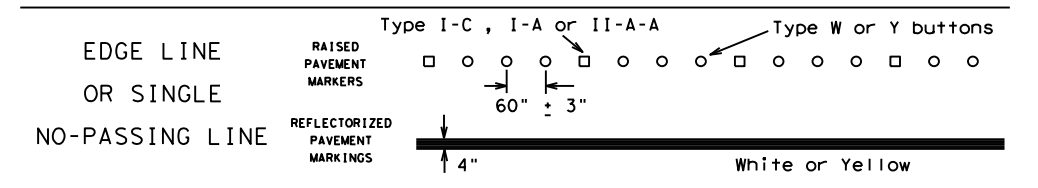
RAISED PAVEMENT MARKERS

## TWO-WAY LEFT TURN LANE

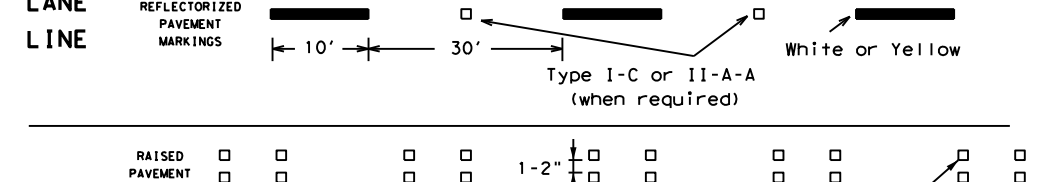
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



### SOLID LINES



### BROKEN LINES



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

Centerline only - not to be used on edge lines

SHEET 12 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

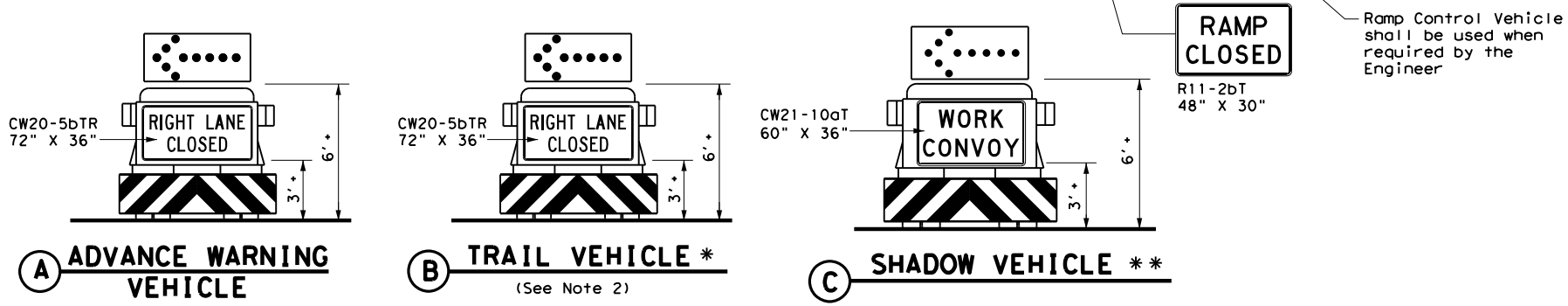
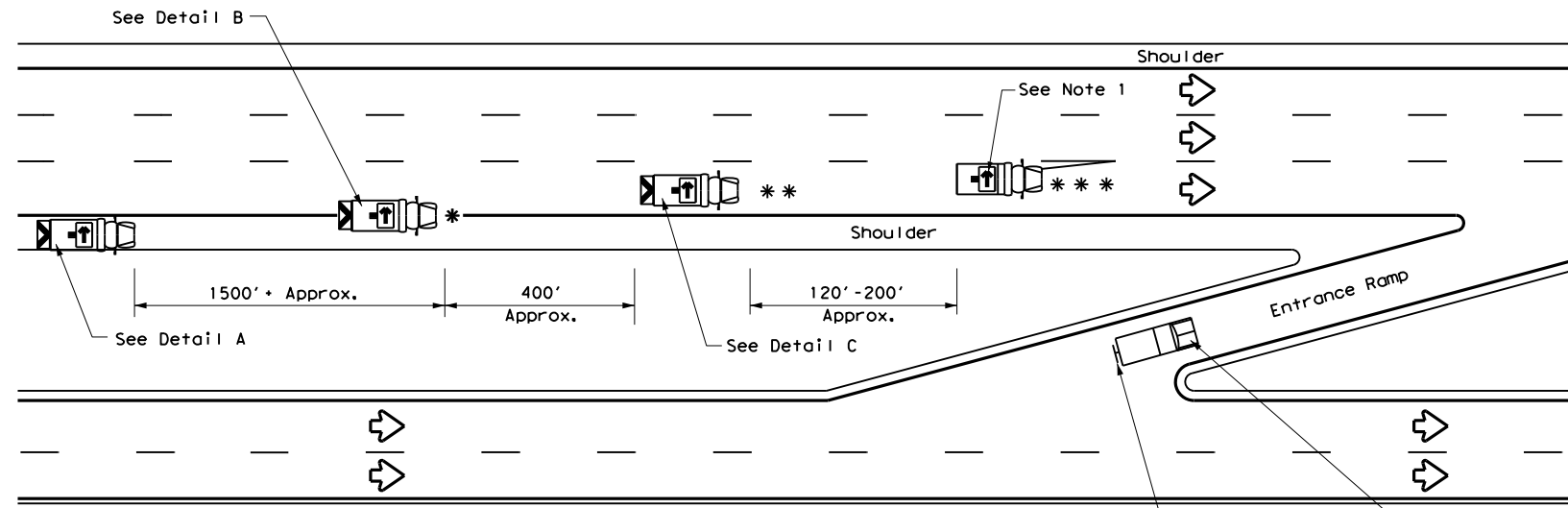
Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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2-98 7-13	ELP	CULBERSON	22	
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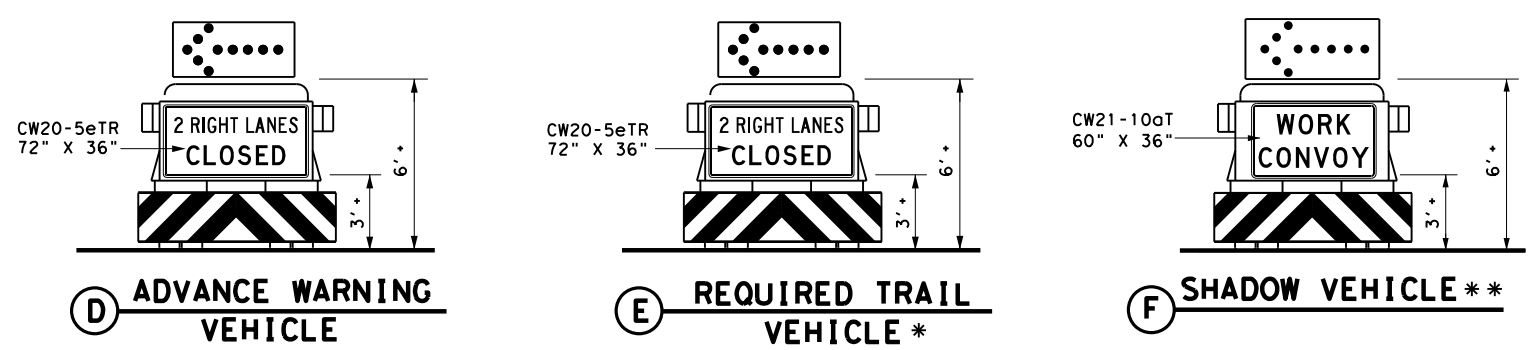
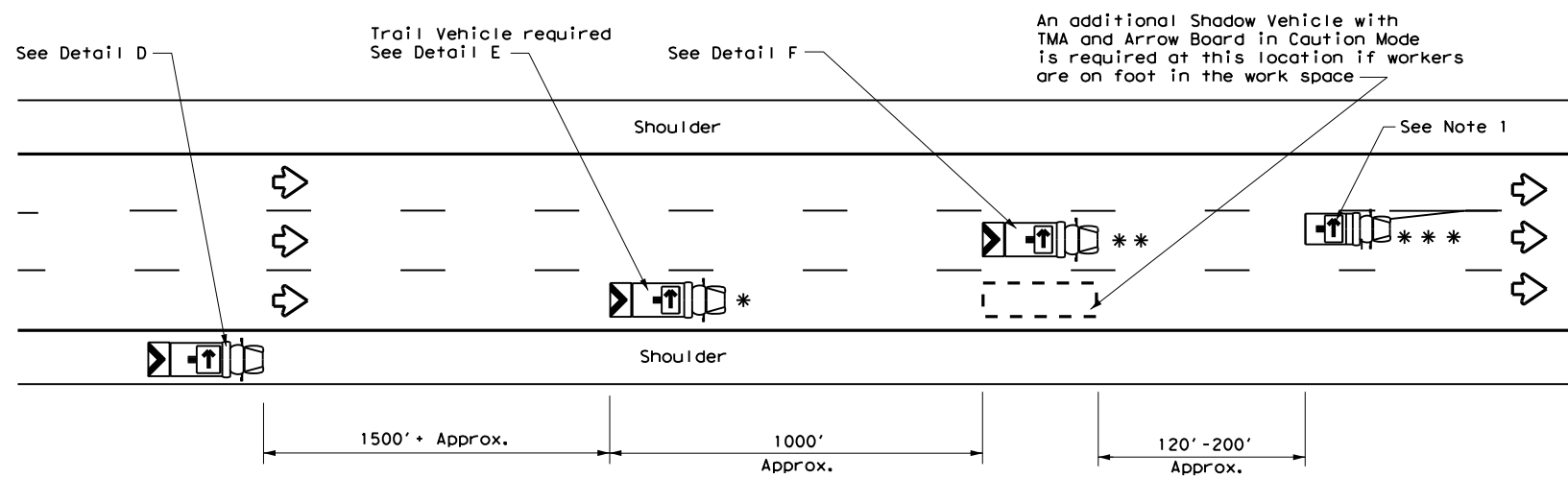
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**RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)**



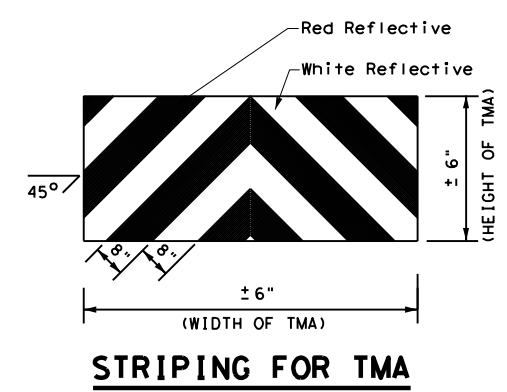
**INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)**

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**

- ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
- For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
- 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.
- The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
- Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
- Each vehicle shall have two-way radio communication capability.
- When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
- Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE may vary according to terrain, work activity and other factors.
- Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
- The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a 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, must 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.
- Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
- The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance, and ramp frequency.
- Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
- The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.

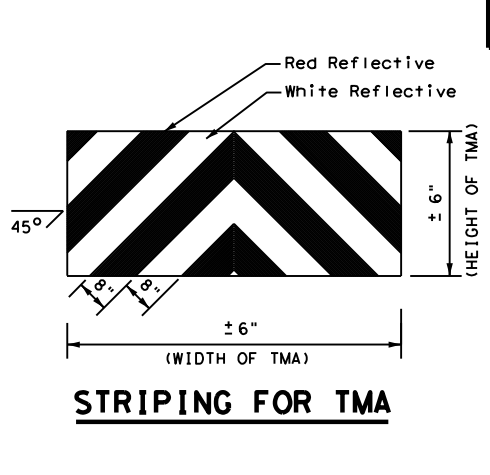
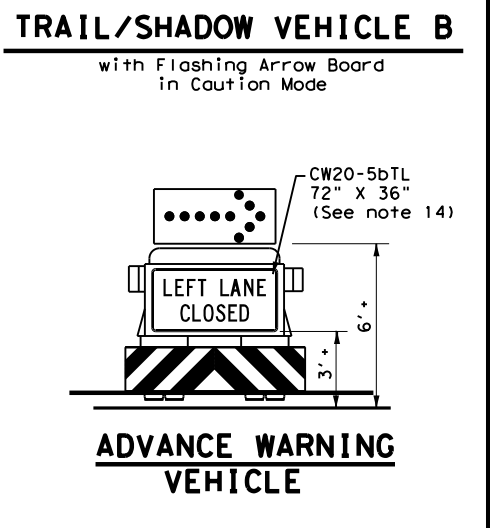
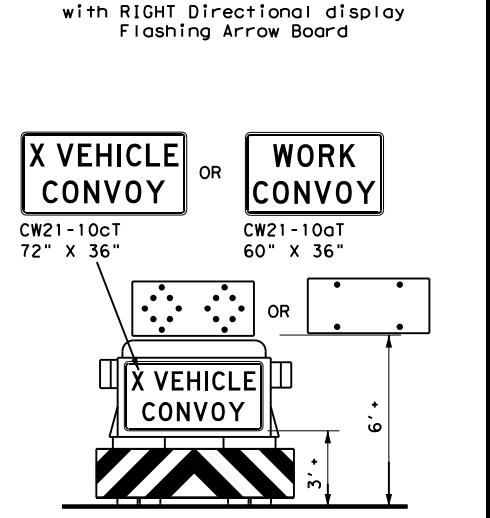
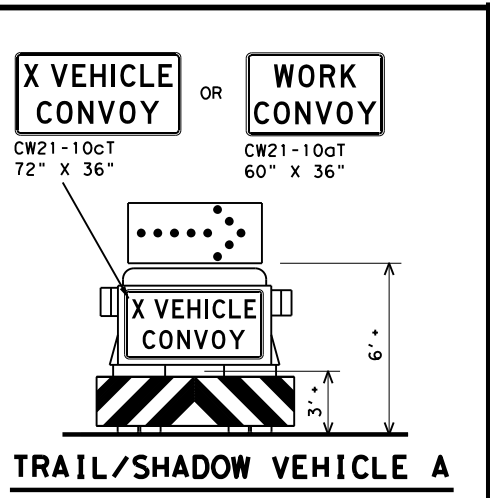
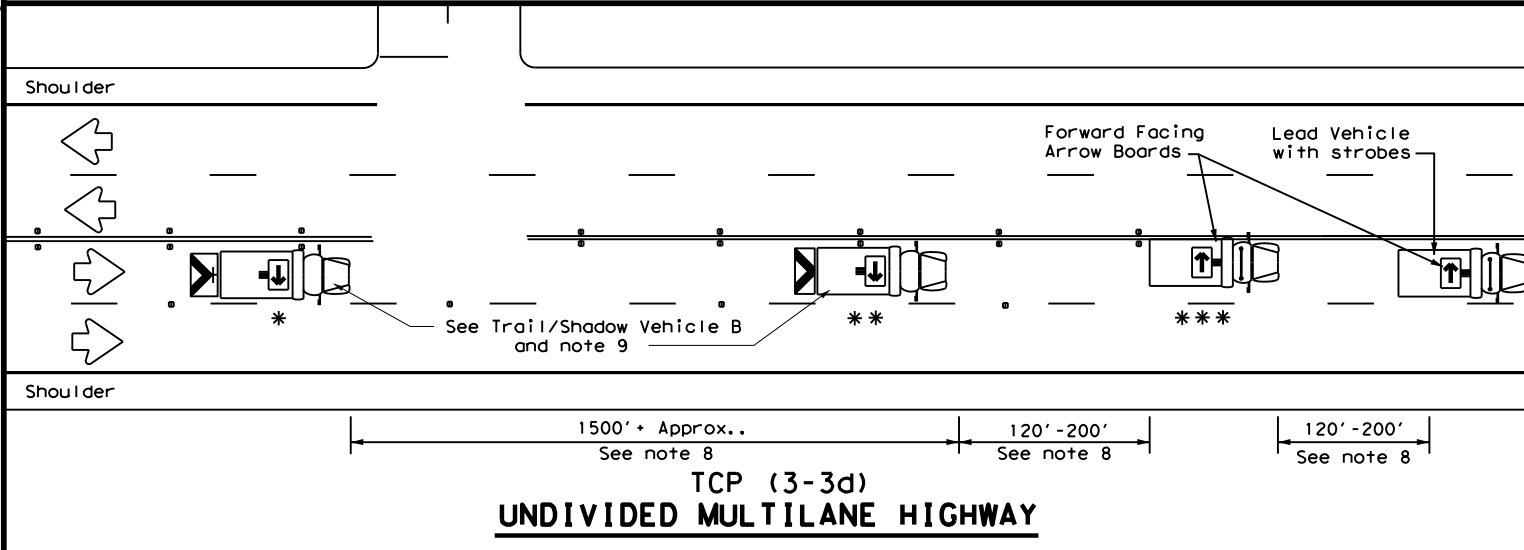
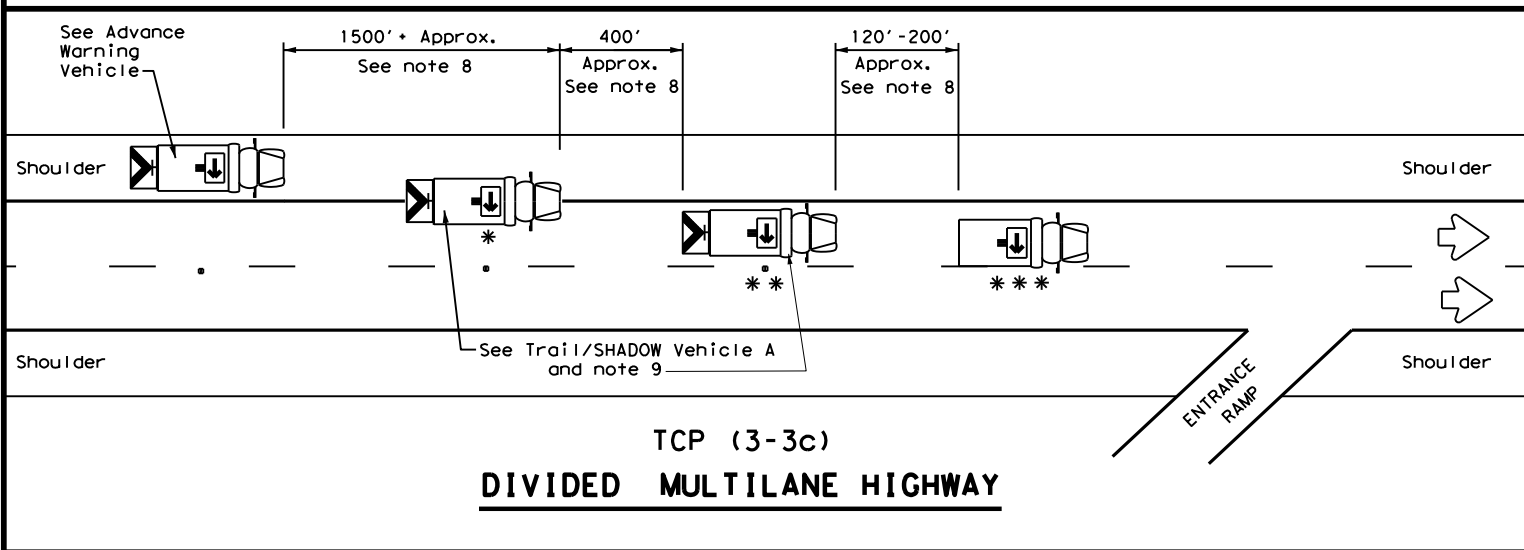
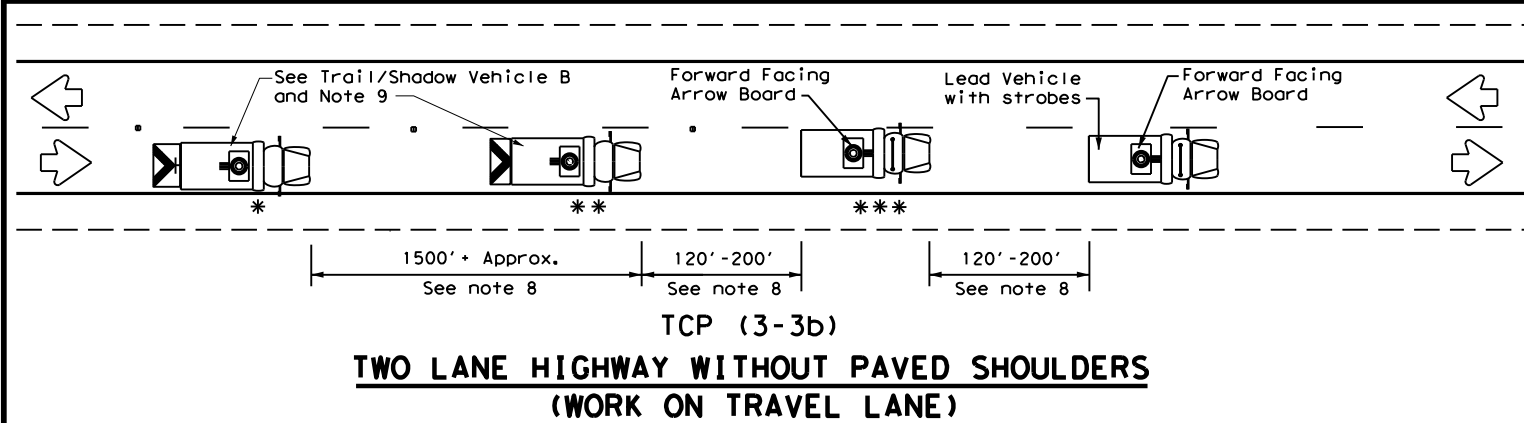
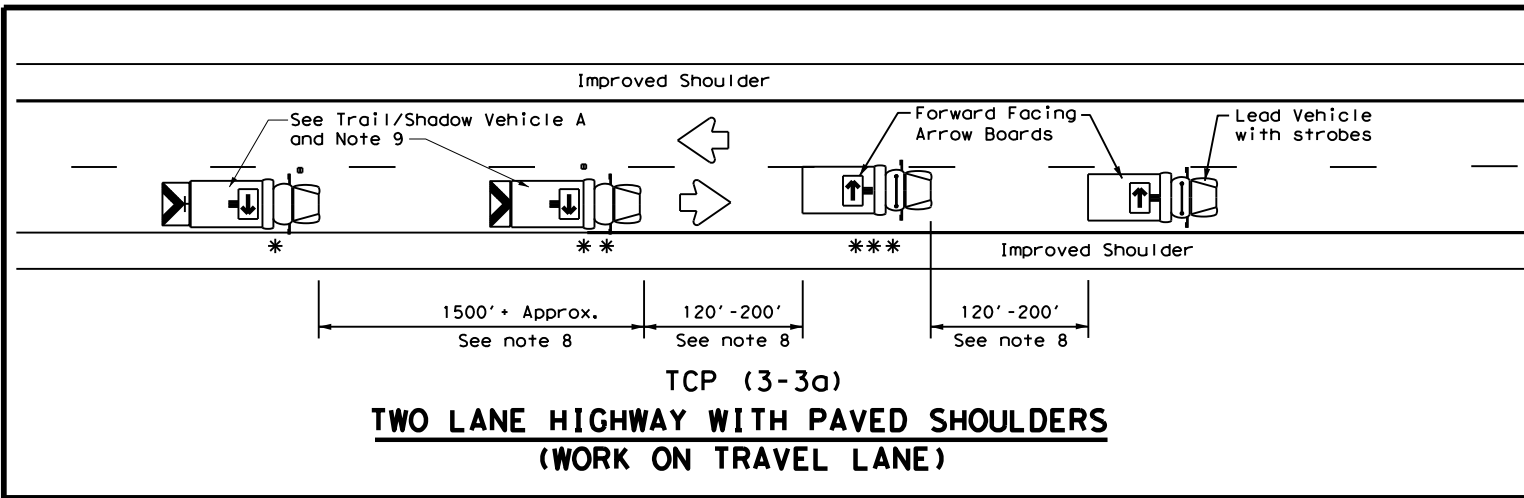


**STRIPING FOR TMA**

		<b>Traffic Operations Division Standard</b>	
<b>TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS</b>			
<b>TCP(3-2)-13</b>			
FILE: tcp3-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT December 1985	CONT	SECT	JOB
REVISIONS	0003	01	064, ETC
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8-95 7-13			
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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
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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

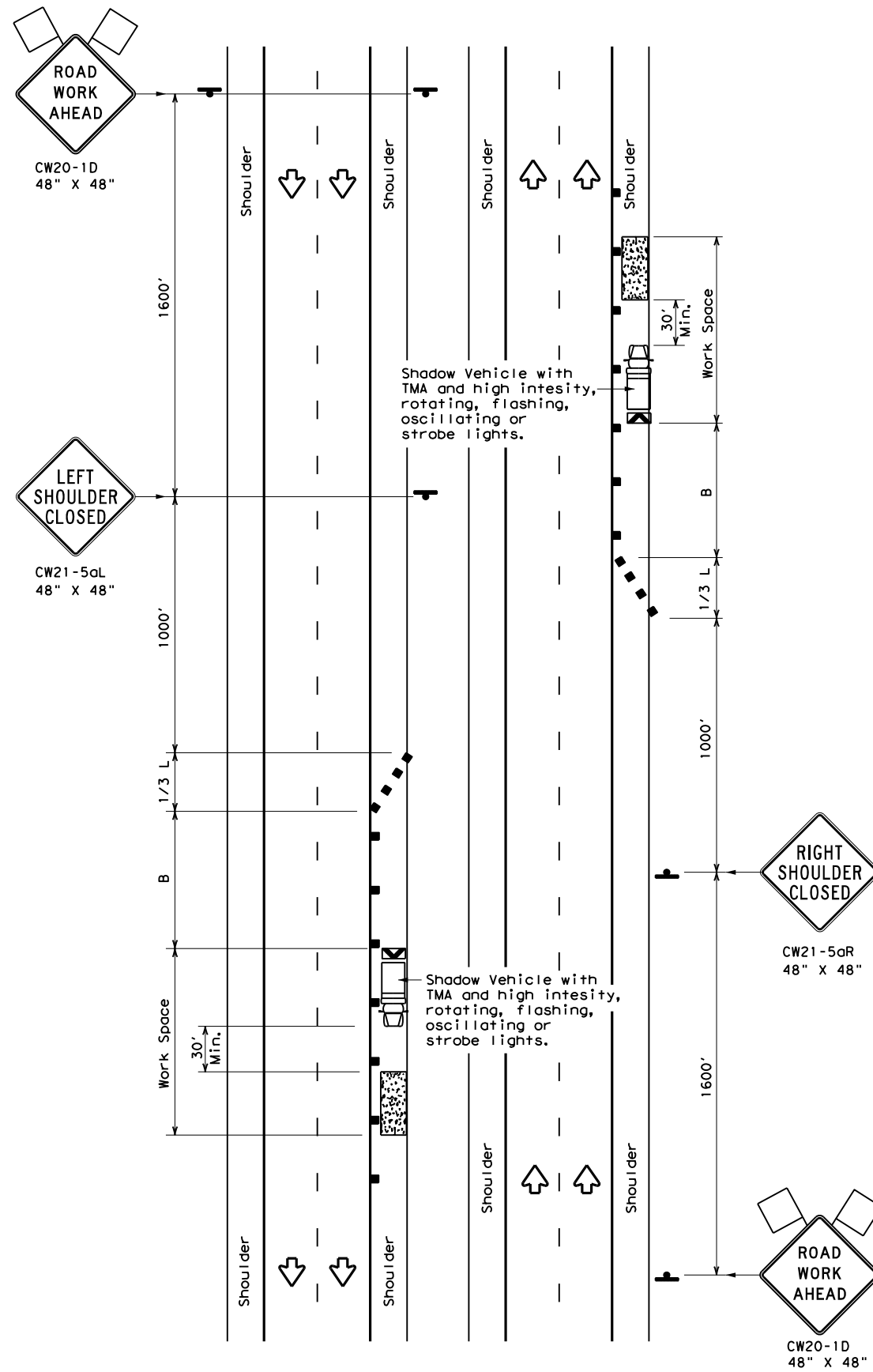
Traffic Operations Division Standard

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

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
© TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	ELP	CULBERSON		24
1-97 7-14				

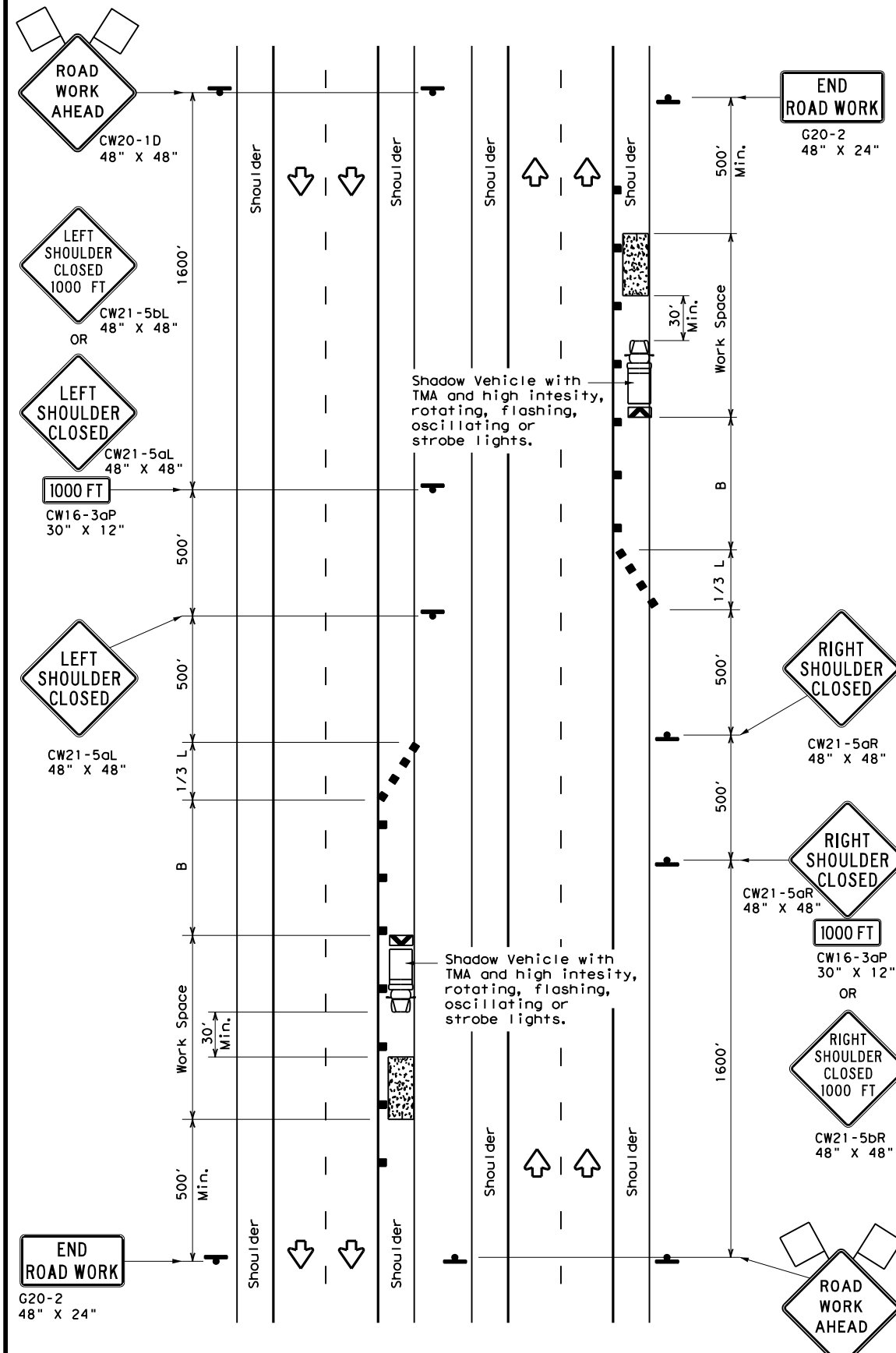
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 FILE: U:\000301064\MASTER DESIGN FILES\tcp5-1-18.dgn



TCP (5-1a)

**WORK AREA ON SHOULDER**



TCP (5-1b)

**WORK AREA ON SHOULDER**

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		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'	90'
35		205'	225'	245'	35'	70'	120'
40		265'	295'	320'	40'	80'	155'
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70	700'	770'	840'	70'	140'	475'	
75	750'	825'	900'	75'	150'	540'	
80	800'	880'	960'	80'	160'	615'	

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	TCP (5-1a)	TCP (5-1b)	TCP (5-1b)	

**GENERAL NOTES**

1. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the performance or quality of the work. Type 3 barricades or drums may be substituted when workers on foot are no longer present when approved by the Engineer.
2. 28" tall or taller one-piece cones will be allowed only for Short Duration or Short Term stationary operations when workers are present to maintain the devices upright and in proper location. Intermediate Term stationary work areas should use Drums, Vertical Panels or 42" tall two-piece cones.



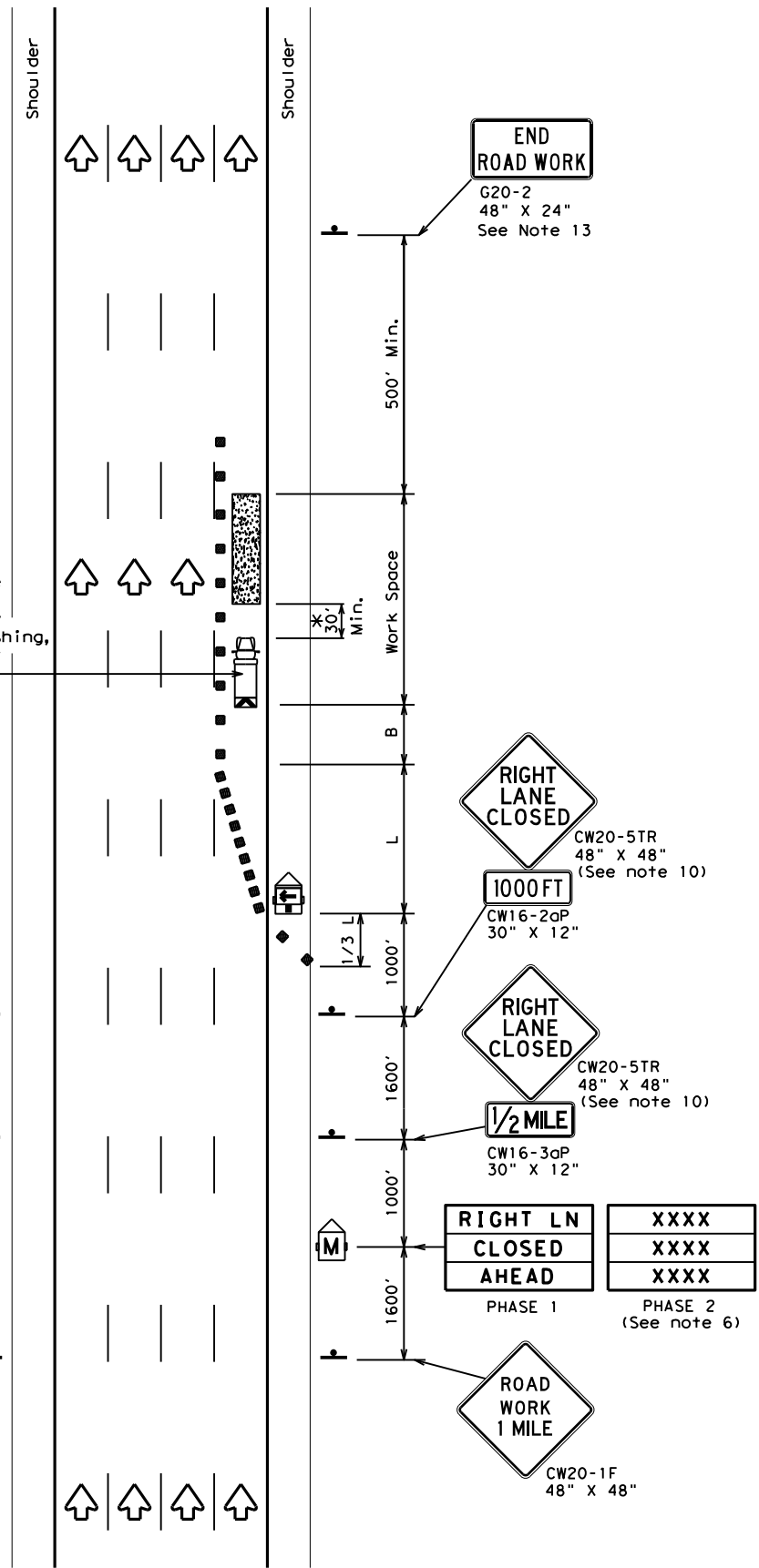
**TRAFFIC CONTROL PLAN  
 SHOULDER WORK FOR  
 FREEWAYS / EXPRESSWAYS**

**TCP (5-1) - 18**

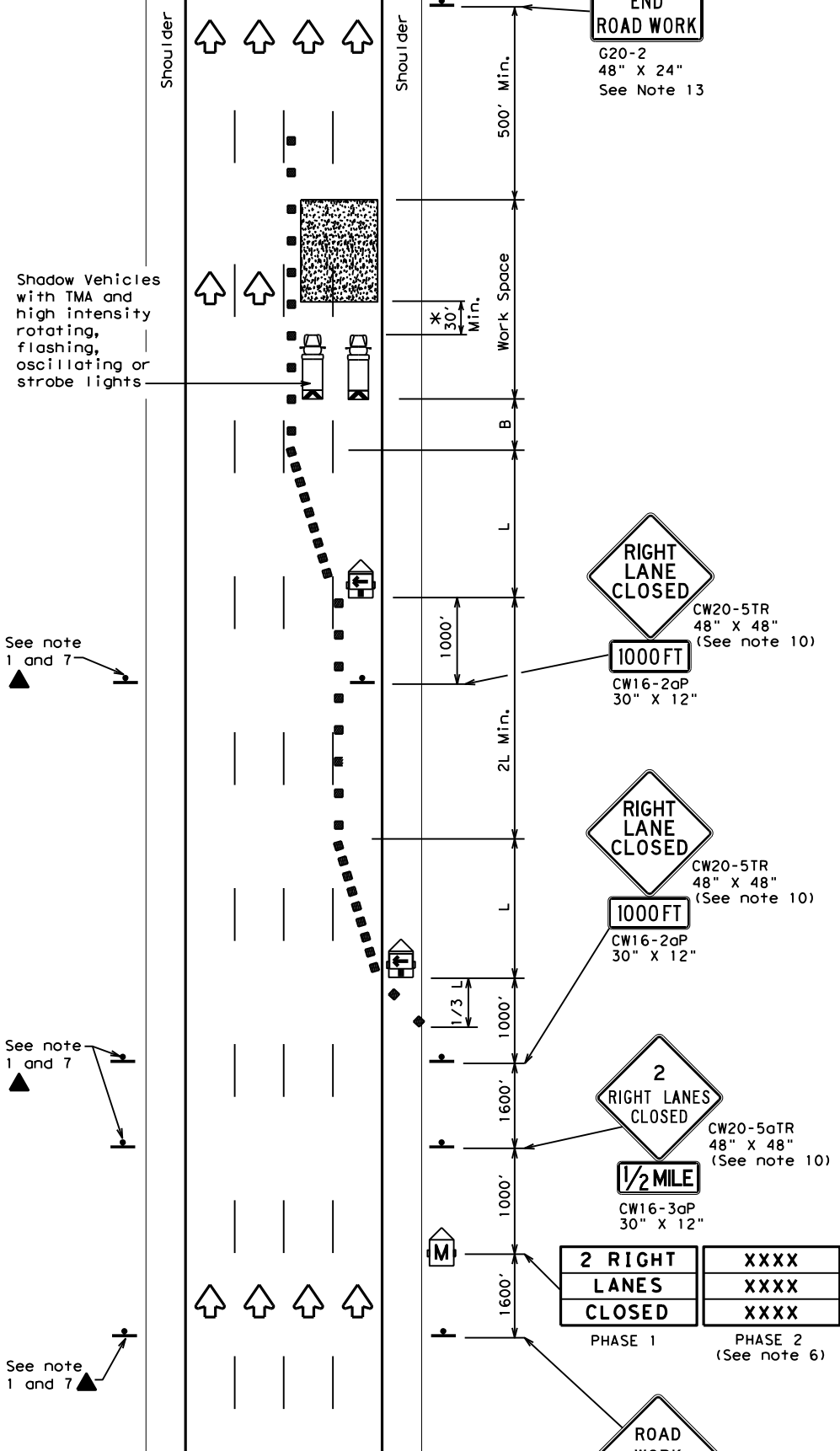
FILE: tcp5-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
2-18	REVISIONS	0003 01	064, ETC	IH 10
	DIST	COUNTY	SHEET NO.	
	ELP	CULBERSON	25	

DATE: 10/11/2023 10:36:17 AM  
 FILE: U:\000301064\MASTER DESIGN FILES\tcp6-1.dgn

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TCP (6-1a)  
**TYPICAL FREEWAY  
 ONE LANE CLOSURE**



TCP (6-1b)  
**TYPICAL FREEWAY  
 TWO LANE CLOSURE**

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 "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80	800'	880'	960'	80'	160'	615'	

\*\* 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**

- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
- Drums or 42" cones are the typical channelizing devices. For Intermediate Term Stationary work, drums shall be used on tapers with drums or 42" cones used on tangent sections. Other channelizing devices may be used as directed by the Engineer.
- All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
- The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
- Static message boards or changeable message signs stating the date and duration of ramp or freeway lane closures shall be placed a minimum of seven (7) calendar days in advance of the actual closure.
- Phase 2 of the PCMS message should include appropriate information formatted as shown on BC(6), such as "MERGE LEFT," recommended advisory speed, delay information, or other specific warnings.
- Duplicate construction warning signs should be erected on the medians side of freeways where median width will permit and traffic volume justifies the signing.
- The number of closed lanes may be increased provided the spacing of traffic control devices, taper lengths and tangent lengths meet the requirements of the TMUTCD.
- Warning signs for intermediate term stationary work should be mounted at 7' to the bottom of the sign.
- Warning signs shown shall be appropriately altered for left lane closures. When signs are mounted at 1' height for short term stationary or short duration work, sign versions shown in the SHSD for Texas with distances on the sign face rather than mounted on a plaque below the sign may be used.
- When possible, PCMS units should be located in advance of the last available exit ramp prior to the lane closure to allow motorists an alternate route. They may also be relocated to improve advance warning in case of unanticipated queuing or congestion.
- For Intermediate Term Stationary work at night, floodlights should be used to illuminate the work area and equipment crossings. Floodlights shall not produce a disabling glare condition for road users or workers.
- The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

\* A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.



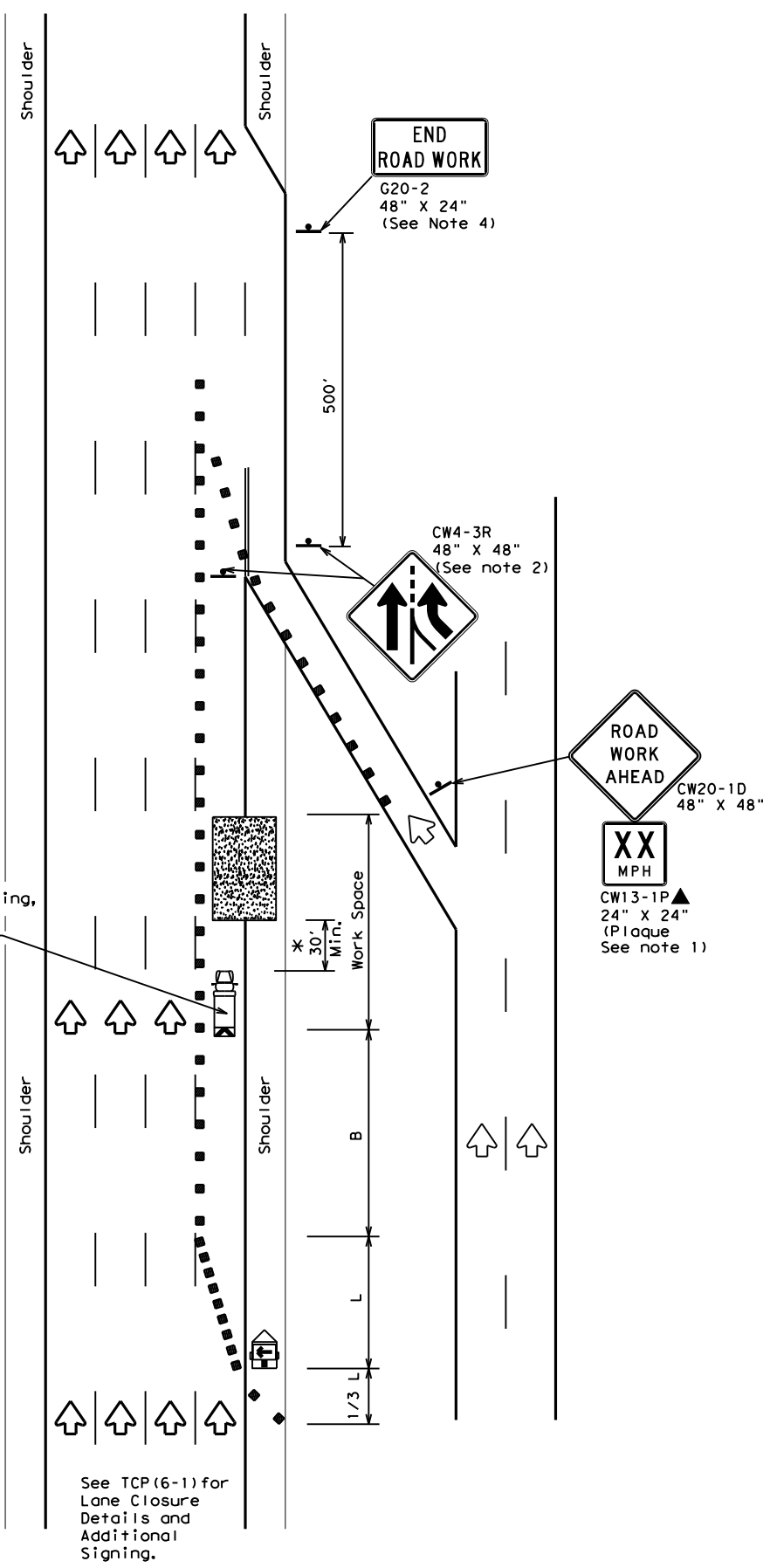
**TRAFFIC CONTROL PLAN  
 FREEWAY LANE CLOSURES**

**TCP (6-1) - 12**

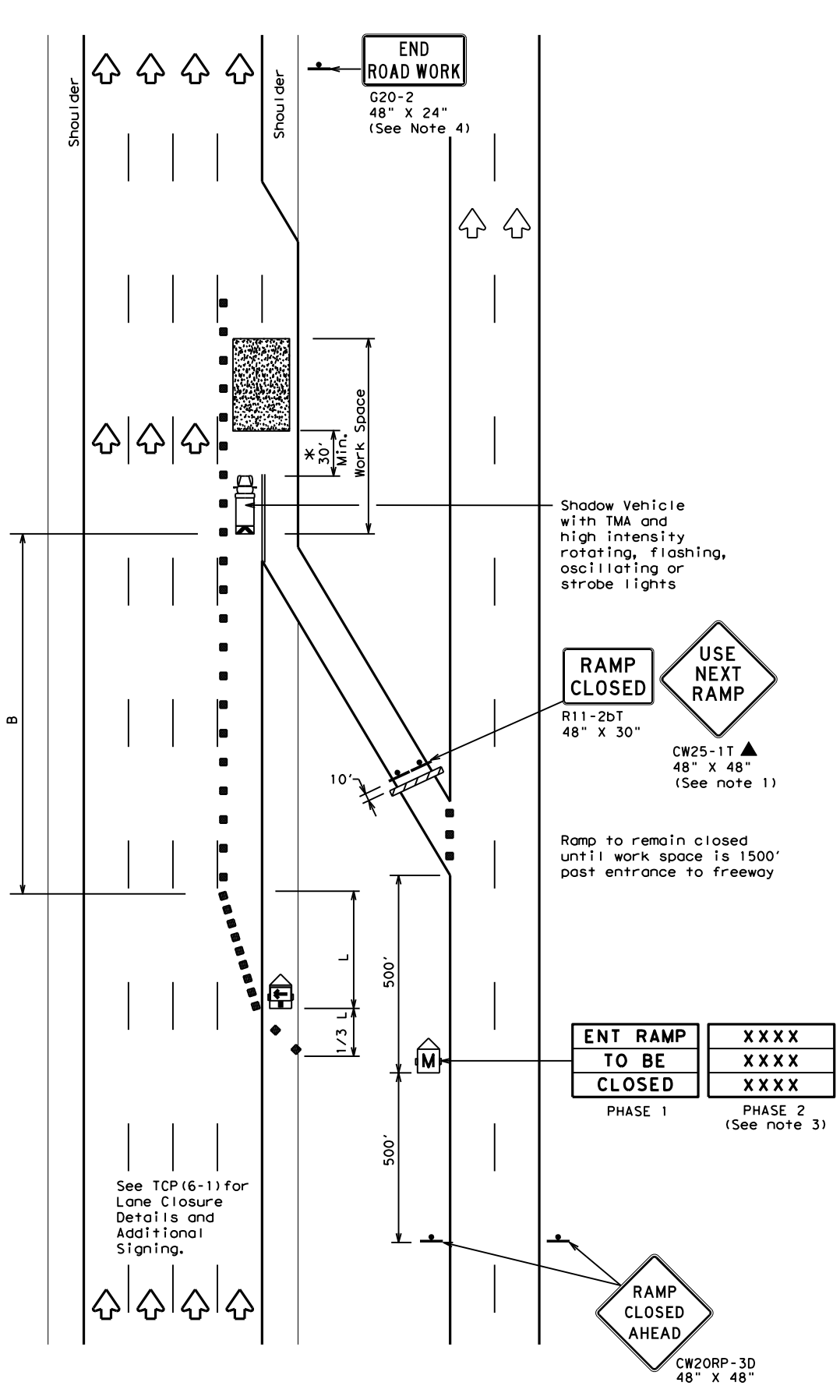
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© TxDOT	February 1998	CONT	SECT	JOB	HIGHWAY				
8-12	REVISIONS	0003	01	064, ETC	IH 10				
	DIST	COUNTY	SHEET NO.						
	ELP	CULBERSON	26						

DATE: 10/11/2023 10:36:19 AM  
 FILE: U:\000301064\MASTER DESIGN FILES\tcp6-2.dgn

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TCP (6-2a)  
**ENTRANCE RAMP OPEN**  
**WORK WITHIN 500' OF RAMP**



TCP (6-2b)  
**ENTRANCE RAMP 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 "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\* 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**

- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
- ADDED LANE Symbol (CW4-3) sign may be omitted when sign between ramp and mainlane can be seen from both roadways.
- See "Advance Notice List" on BC(6) for recommended date and time formatting options for PCMS Phase 2 message.
- The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

**Texas Department of Transportation**  
 Traffic Operations Division Standard

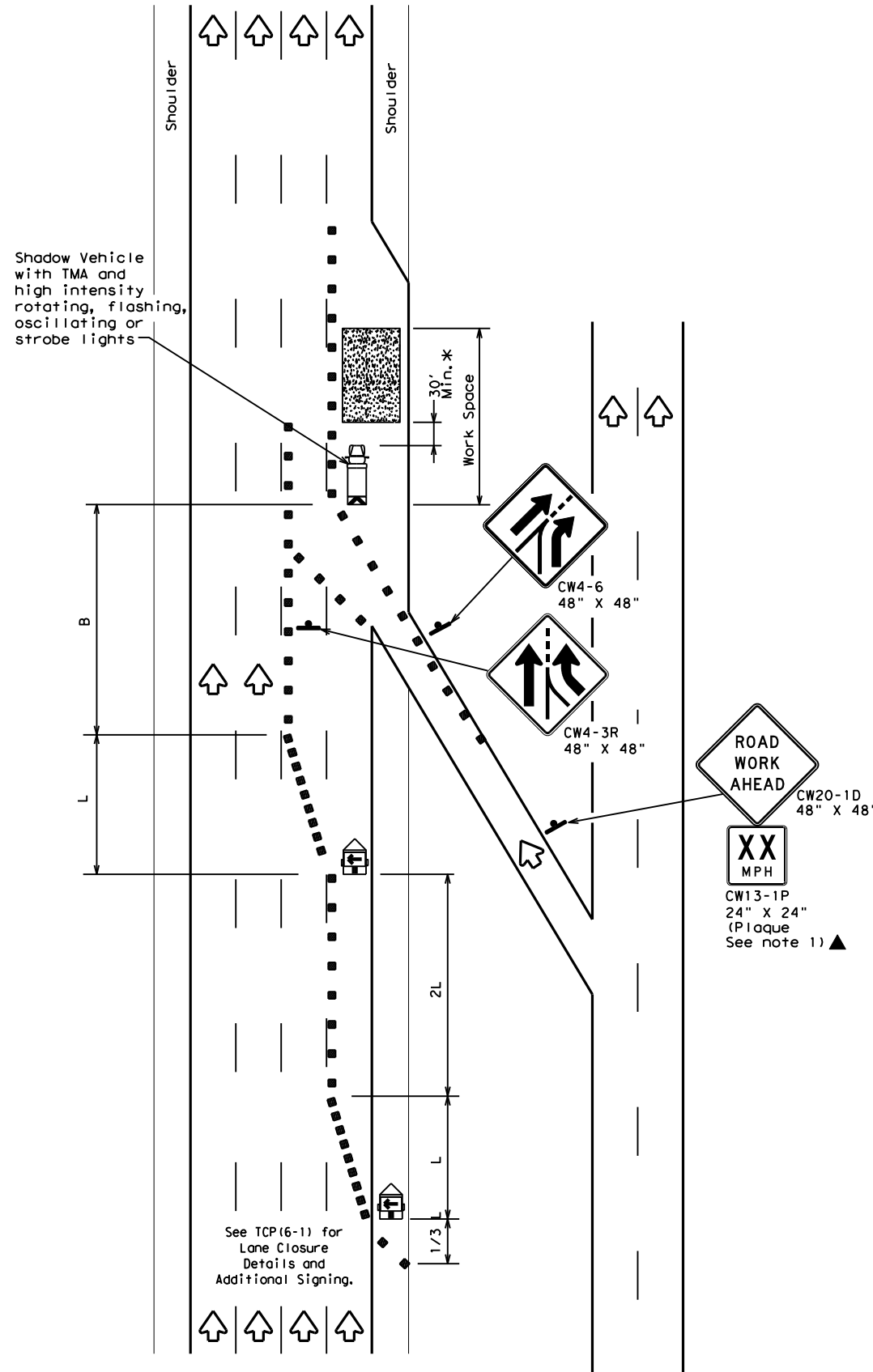
**TRAFFIC CONTROL PLAN**  
**WORK AREA NEAR RAMP**

**TCP (6-2) - 12**

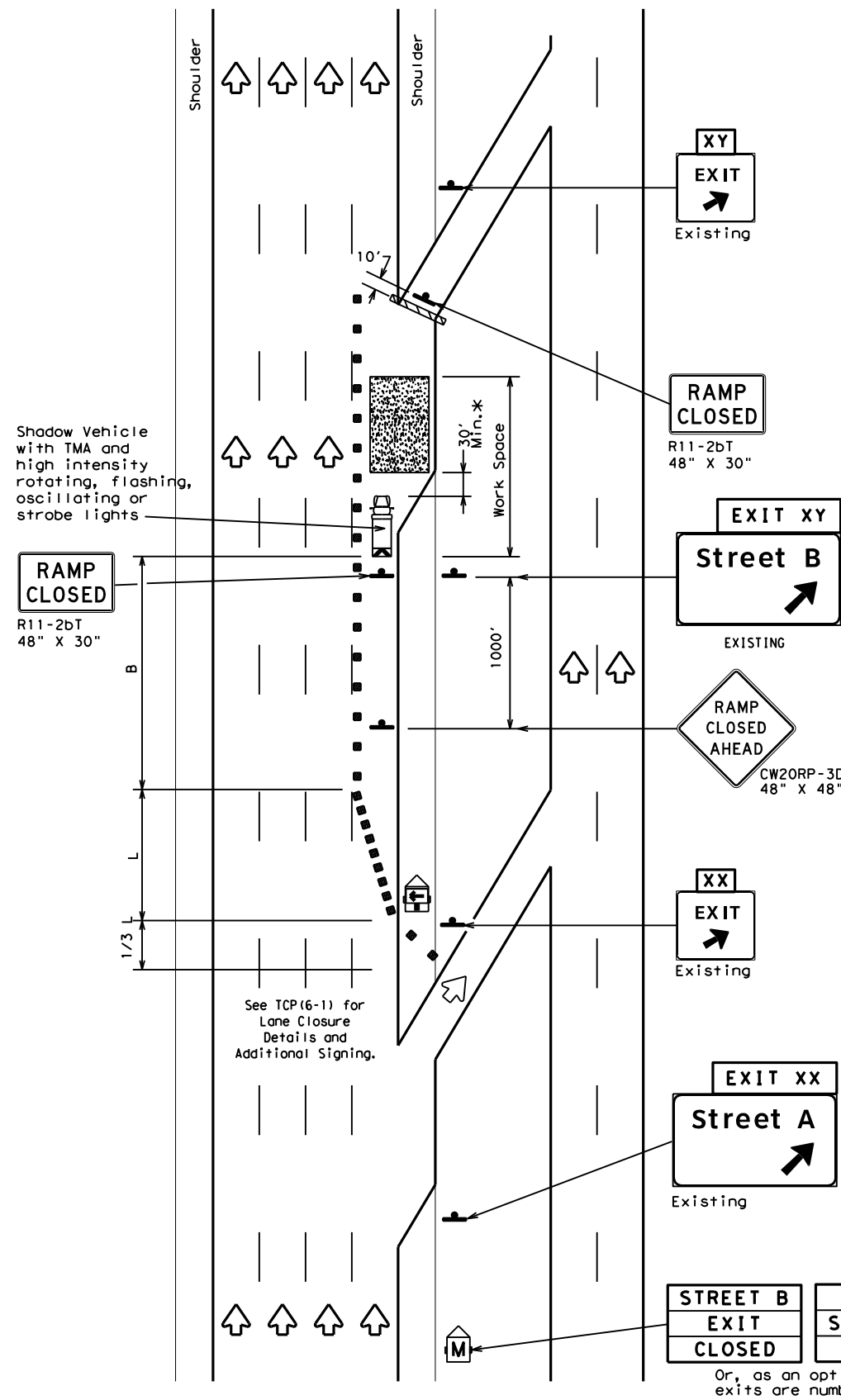
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©TxDOT	February 1994	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0003	01	064, ETC	IH 10				
1-97	8-98			DIST	COUNTY	SHEET NO.			
4-98	8-12			ELP	CULBERSON	27			

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 FILE: U:\000301064\MASTER DESIGN FILES\tcp6-3.dgn



TCP (6-3a)  
**ENTRANCE RAMP OPEN**



TCP (6-3b)  
**EXIT RAMP CLOSED**  
**TRAFFIC EXITS PRIOR TO CLOSED RAMP**

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 "L" **			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

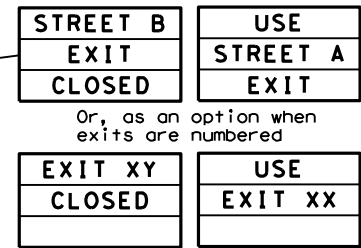
\*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

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

- GENERAL NOTES:
- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.



Texas Department of Transportation  
 Traffic Operations Division Standard

**TRAFFIC CONTROL PLAN  
 WORK AREA BEYOND RAMP**

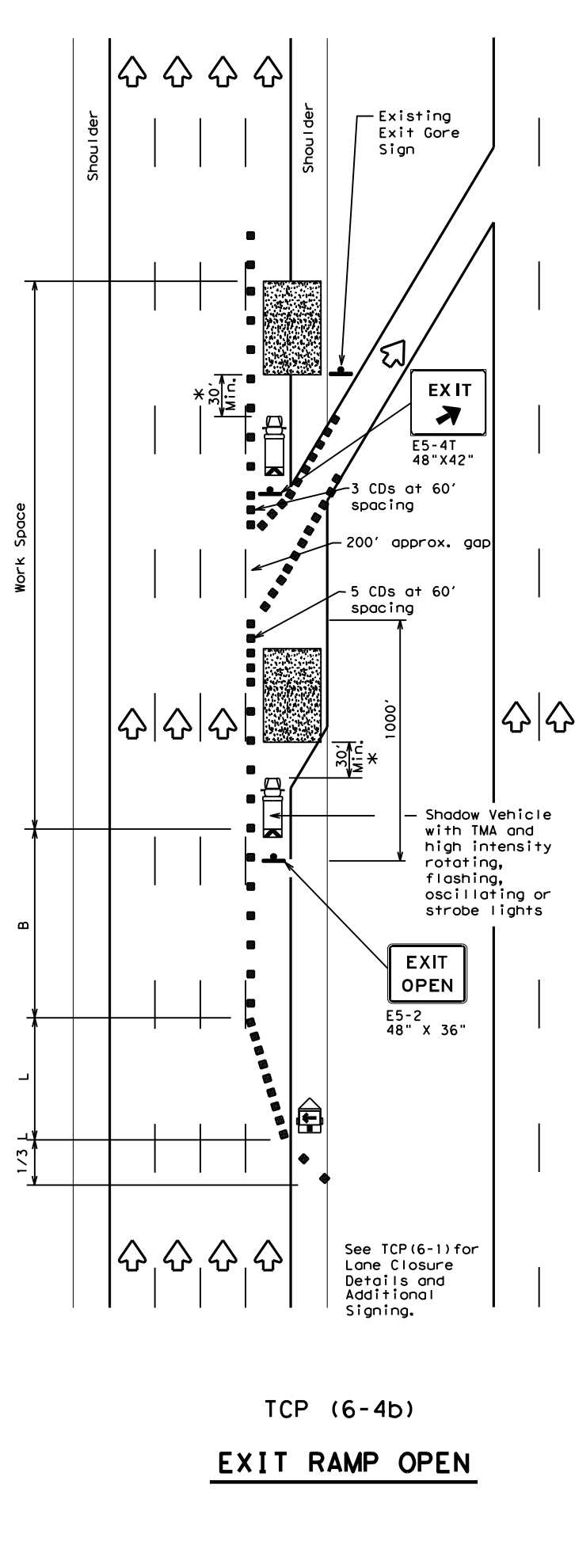
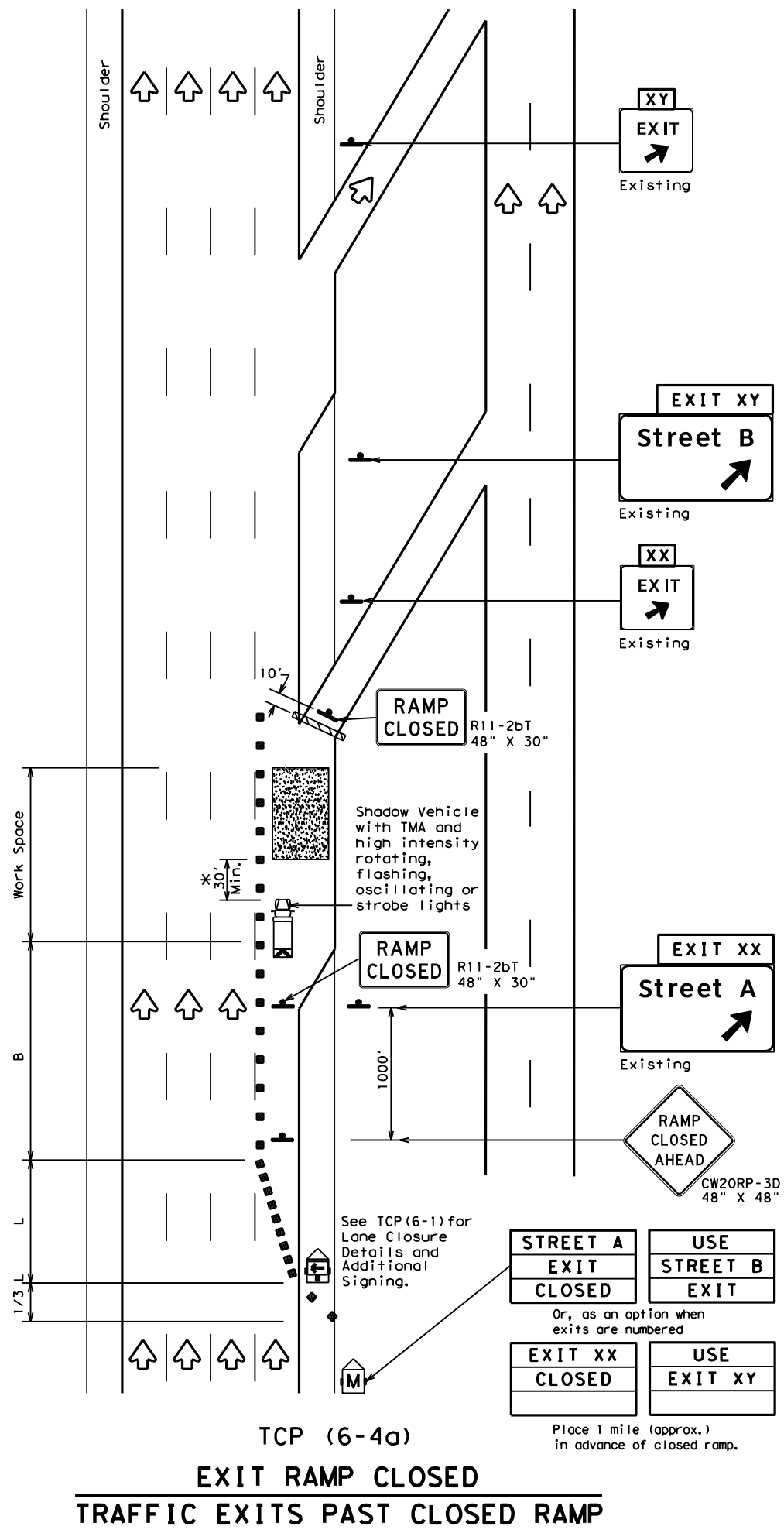
**TCP (6-3) - 12**

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©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
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1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	ELP	CULBERSON	28	



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 FILE: U:\000301064\MASTER DESIGN FILES\tcp6-4.dgn



LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	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 "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\*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**
- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
  - See BC Standards for sign details.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.



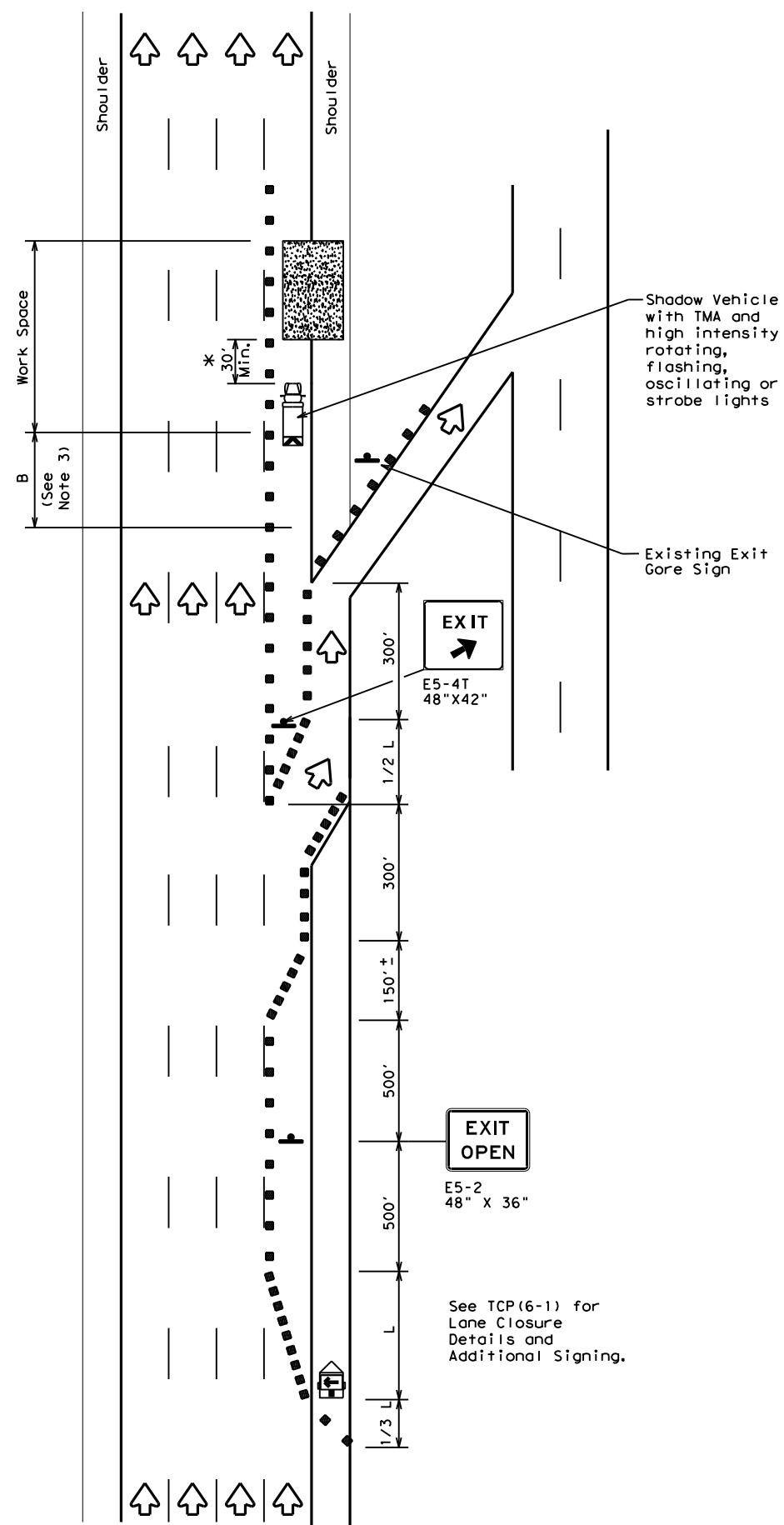
**TRAFFIC CONTROL PLAN**  
**WORK AREA AT EXIT RAMP**

**TCP (6-4) - 12**

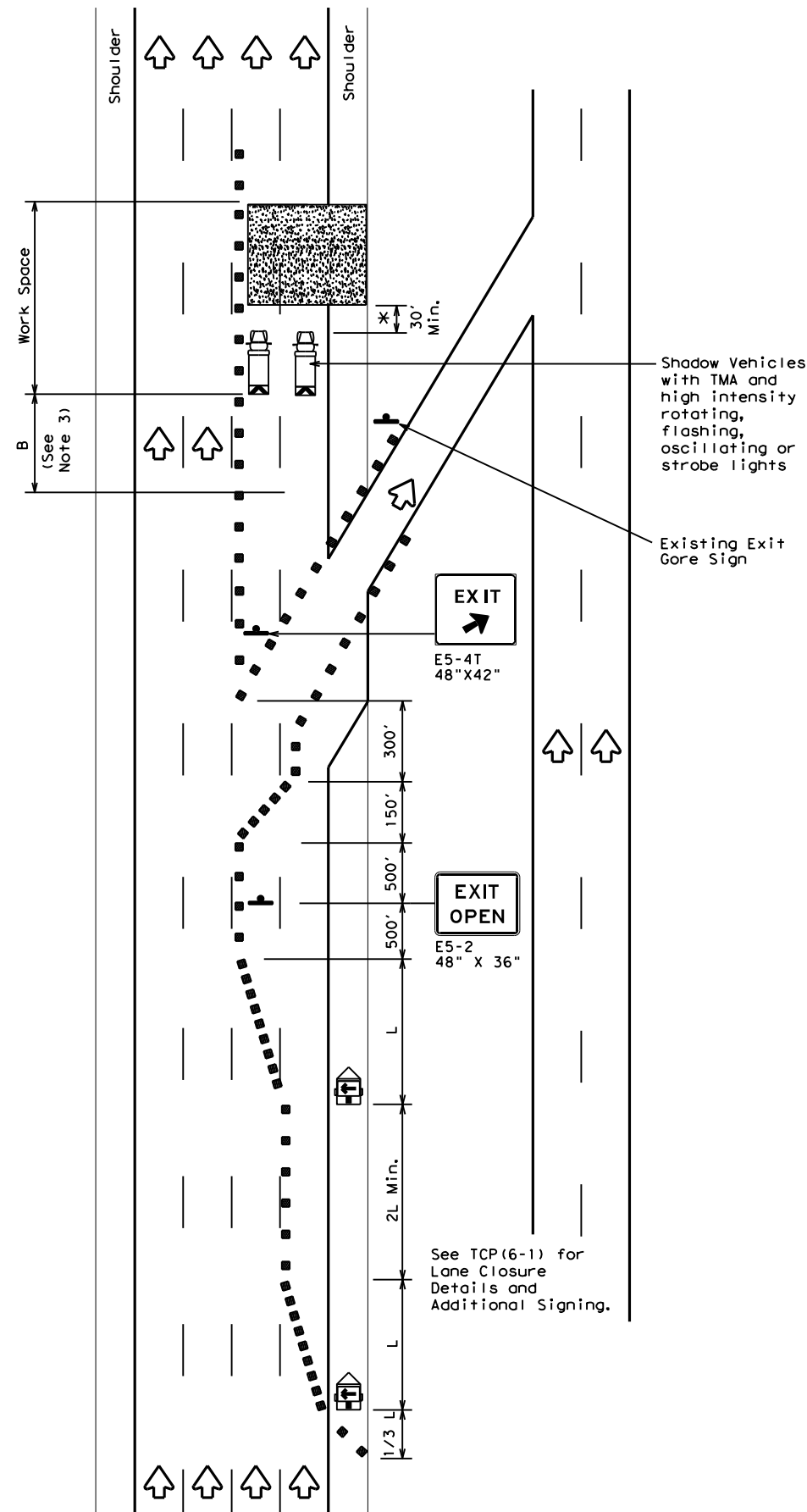
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©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003 01	064, ETC	IH 10	
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	ELP	CULBERSON	29	

10/11/2023 10:36:22 AM  
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TCP (6-5a)  
**EXIT RAMP OPEN**



TCP (6-5b)  
**EXIT RAMP OPEN  
 TWO LANE CLOSURE WITHIN  
 1500' PAST EXIT RAMP**

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 "L" * * *			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\* \* \* 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**

- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
- See BC standards for sign details.
- If adequate longitudinal buffer length "B" does not exist between the work space and the exit ramp, consideration should be given to closing the ramp.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation  
 Traffic Operations Division Standard

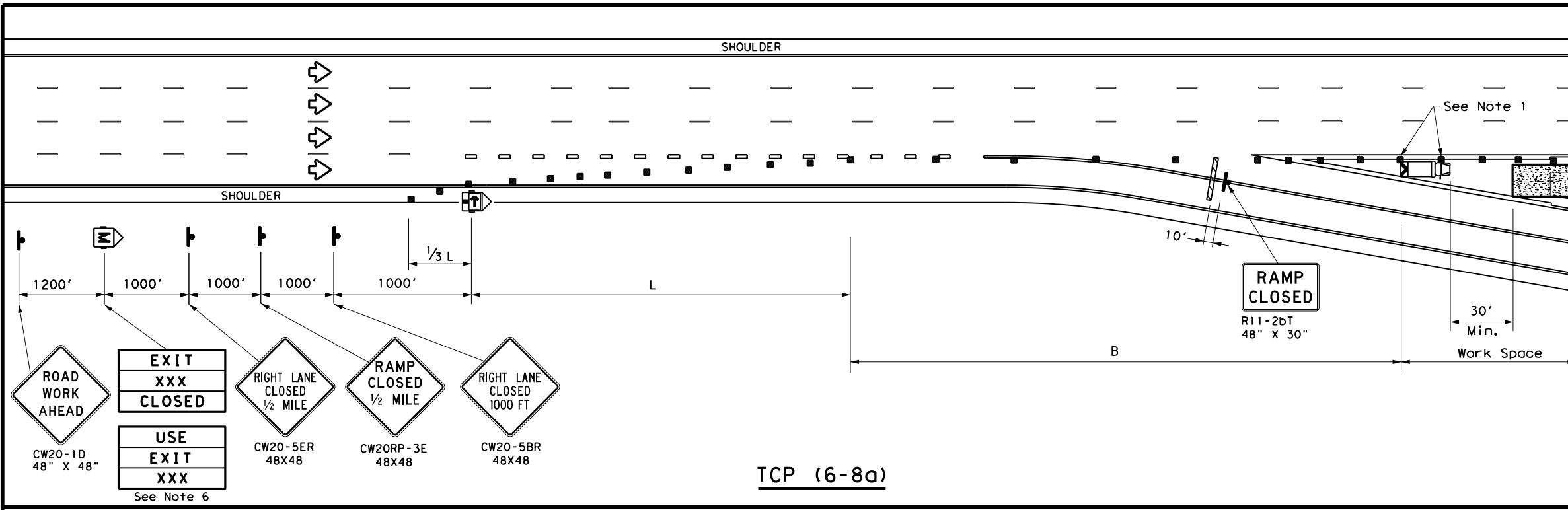
**TRAFFIC CONTROL PLAN  
 WORK AREA BEYOND EXIT RAMP**

**TCP (6-5) - 12**

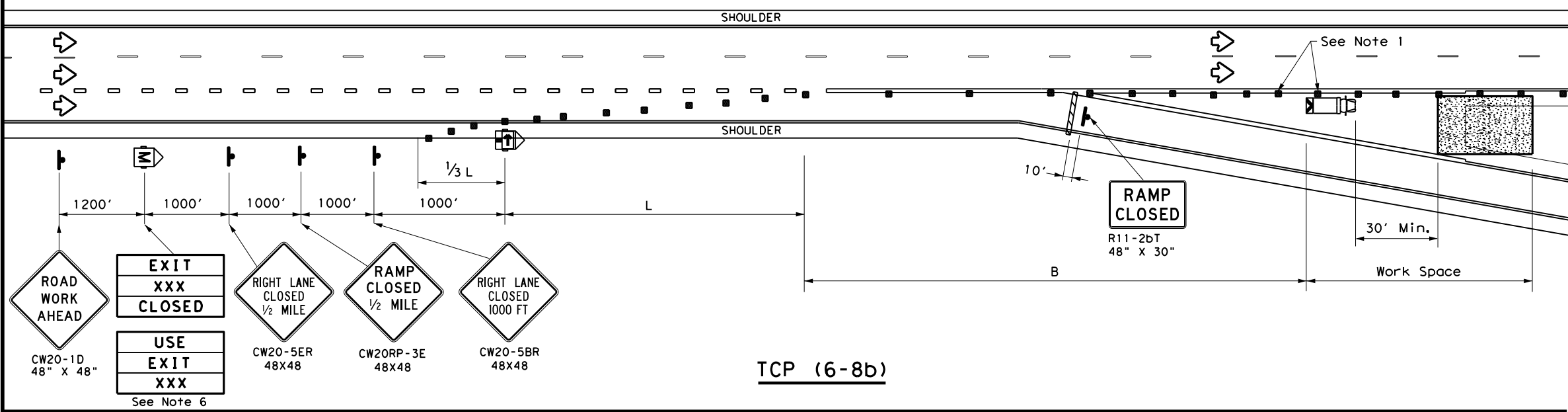
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REVISIONS		0003	01	064, ETC	IH 10				
1-97	8-98			DIST	COUNTY	SHEET NO.			
4-98	8-12			ELP	CULBERSON	30			

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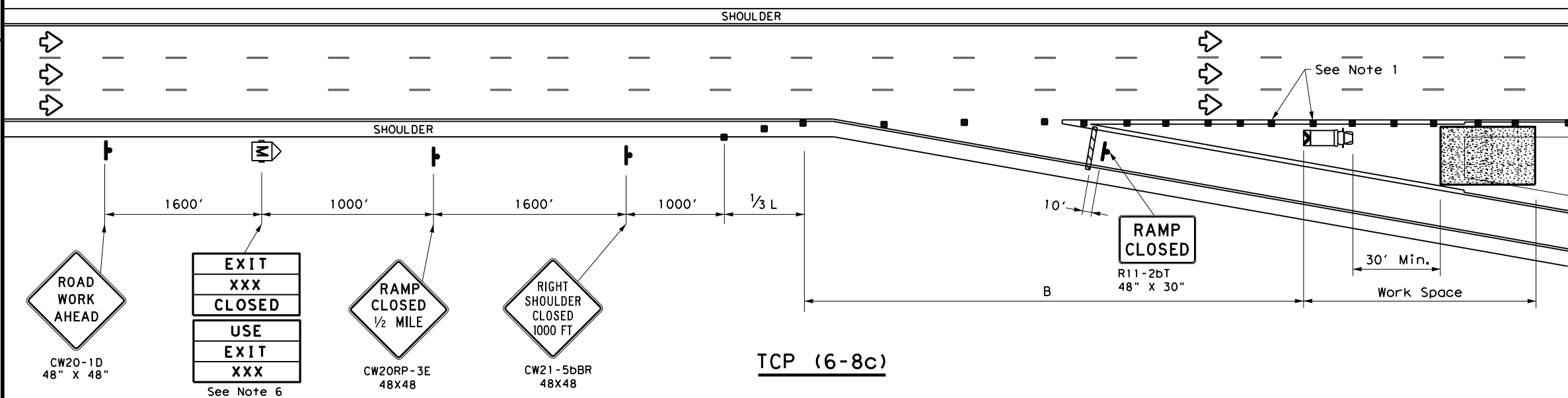
DATE: 10/11/2023 10:36:23 AM  
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TCP (6-8a)



TCP (6-8b)



TCP (6-8c)

LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	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 "L" **			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\* 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**
- Place channelizing devices in the gore at 20' spacing.
  - See the Standard Highway Sign Design for Texas (SHSD) for sign details.
  - The PCMS may be omitted when a permanent DMS sign is available in an appropriate location to display a similar message as called for on the PCMS.
  - When it is determined that a through lane should be closed in addition to the exit ramp, refer to TCP(6-4) for traffic control details.
  - Truck mounted attenuator is required.
  - The PCMS may be omitted if replaced with a "RAMP CLOSED" AHEAD (CW20RP-3D) Sign.
  - Roadway ADT should be greater than 10,000.

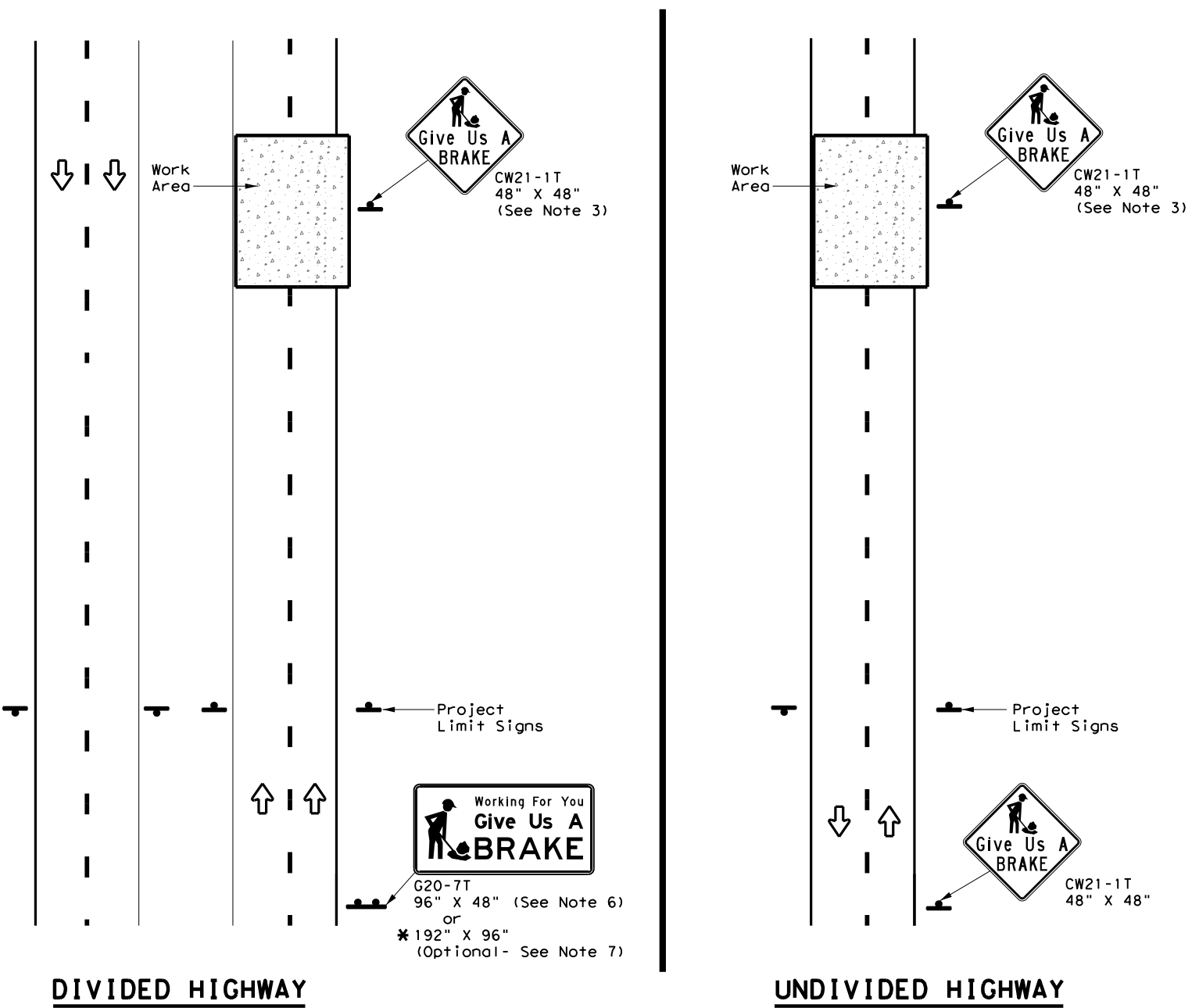
**WORK IN EXIT GORE FOR ADT GREATER THAN 10,000**

**TCP (6-8) - 14**

FILE: tcp6-8.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	SI	064, ETC	IH 10
DIST	COUNTY	SHEET NO.		
ELP	CULBERSON			31

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SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

\* 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.

Traffic Operations Division Standard

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

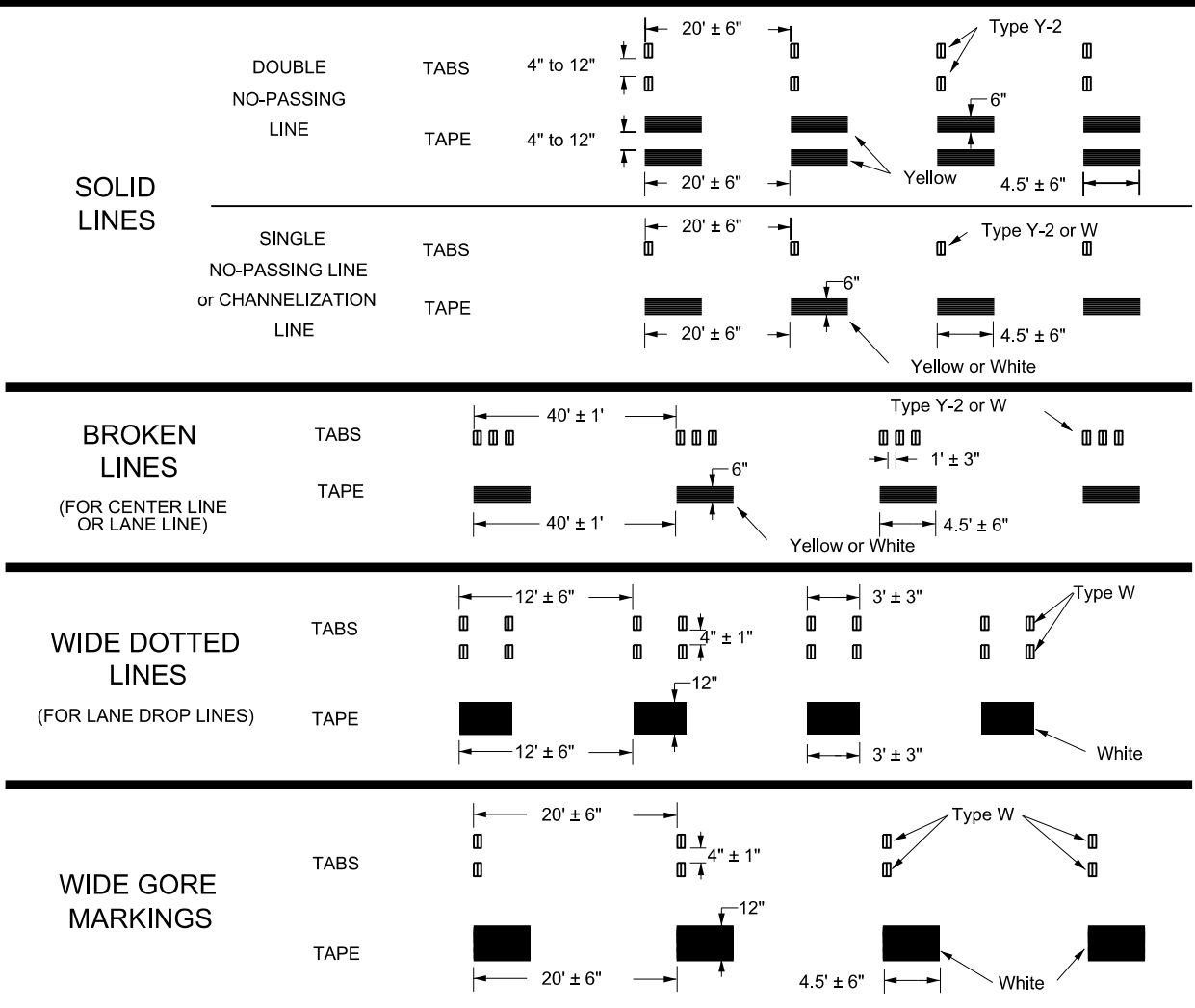
**WZ (BRK) - 13**

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
6-96 5-98 7-13	DIST	COUNTY	SHEET NO.	
8-96 3-03	ELP	CULBERSON	32	

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DATE: 10/11/2023 10:36:26 AM  
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## WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



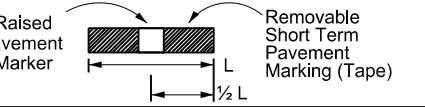
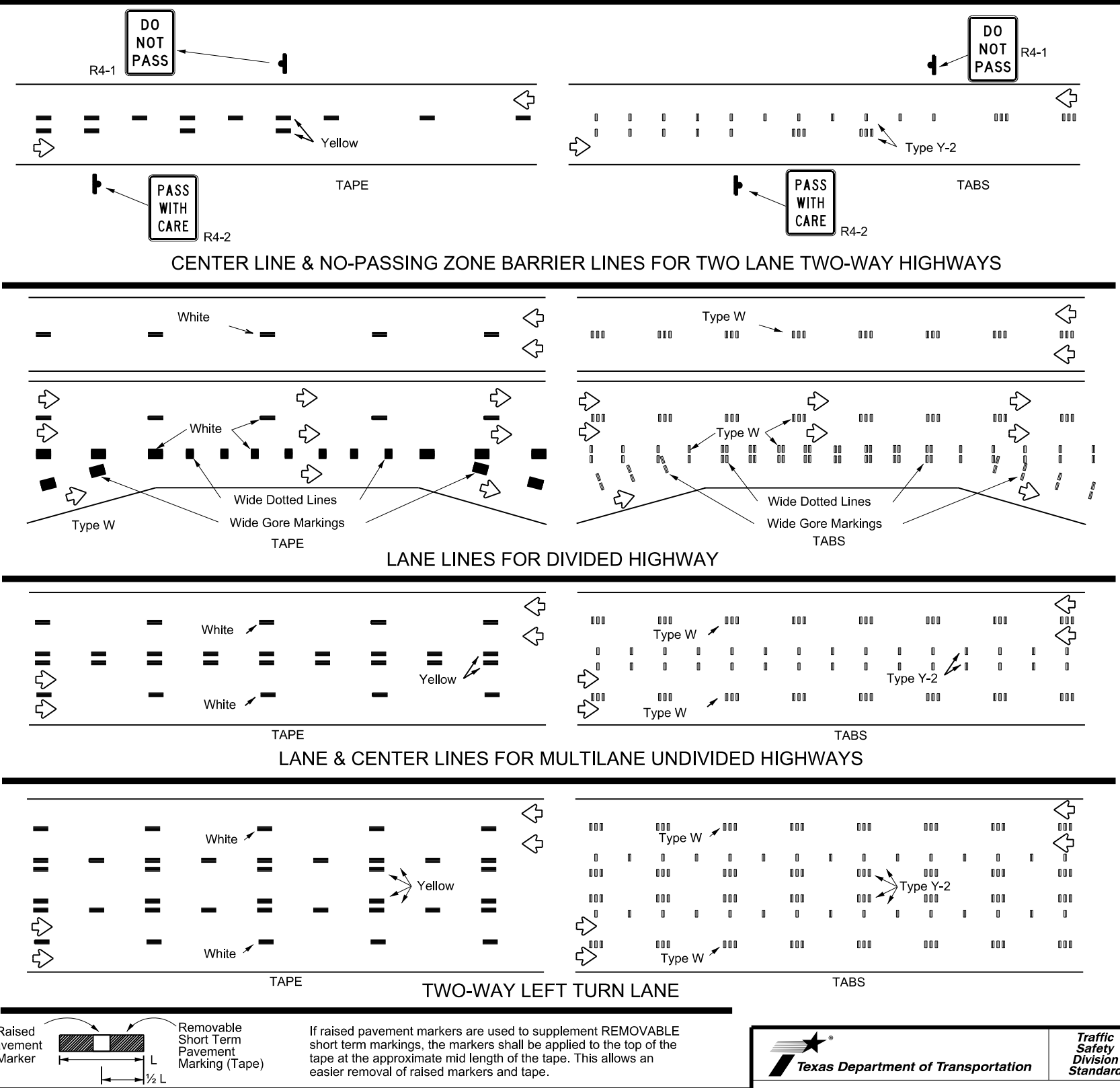
### NOTES:

- 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



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

### PREFABRICATED PAVEMENT MARKINGS

- 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)



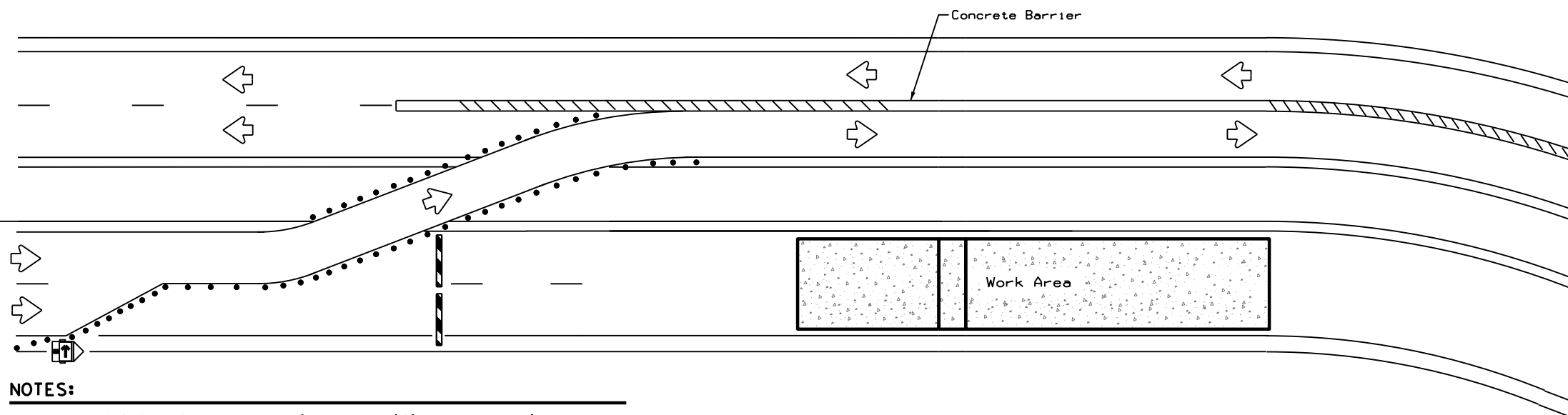
## WORK ZONE SHORT TERM PAVEMENT MARKINGS

### WZ(STPM)-23

FILE:	wzstpm-23.dgn	DW:	CK:	CK:
© TxDOT	February 2023	CONT	SECT	JOB
		0003	01	064.ETC
		DIST	COUNTY	HIGHWAY
		ELP	CULBERSON	IH 10
4-92	7-13			SHEET NO.
1-97	2-23			33
3-03				

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

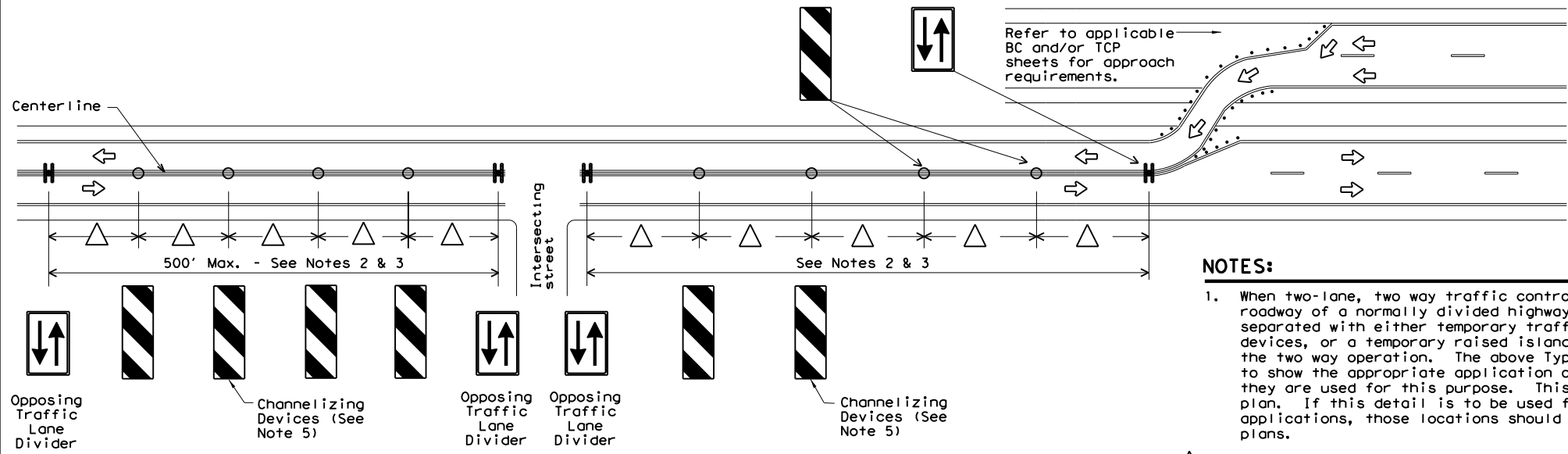
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
DELINEATORS AND OBJECT MARKERS	DMS-8600
MODULAR GLARE SCREENS FOR HEADLIGHT BARRIER	DMS-8610

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:**

- Length of Safety Glare screen will be specified elsewhere in the plans.
- 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.
- 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.
- Payment for these devices will be under statewide Special Specification "Modular Glare Screens for Headlight Barrier."
- 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**



**NOTES:**

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



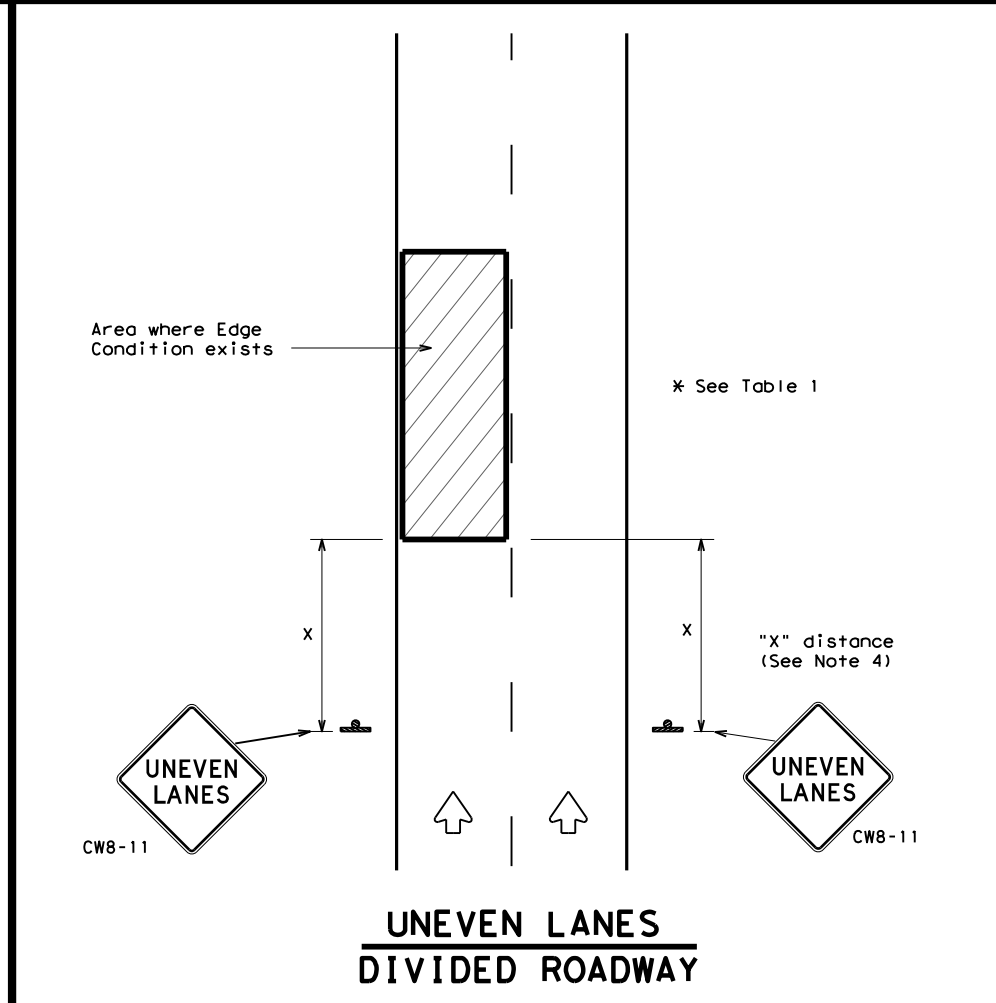
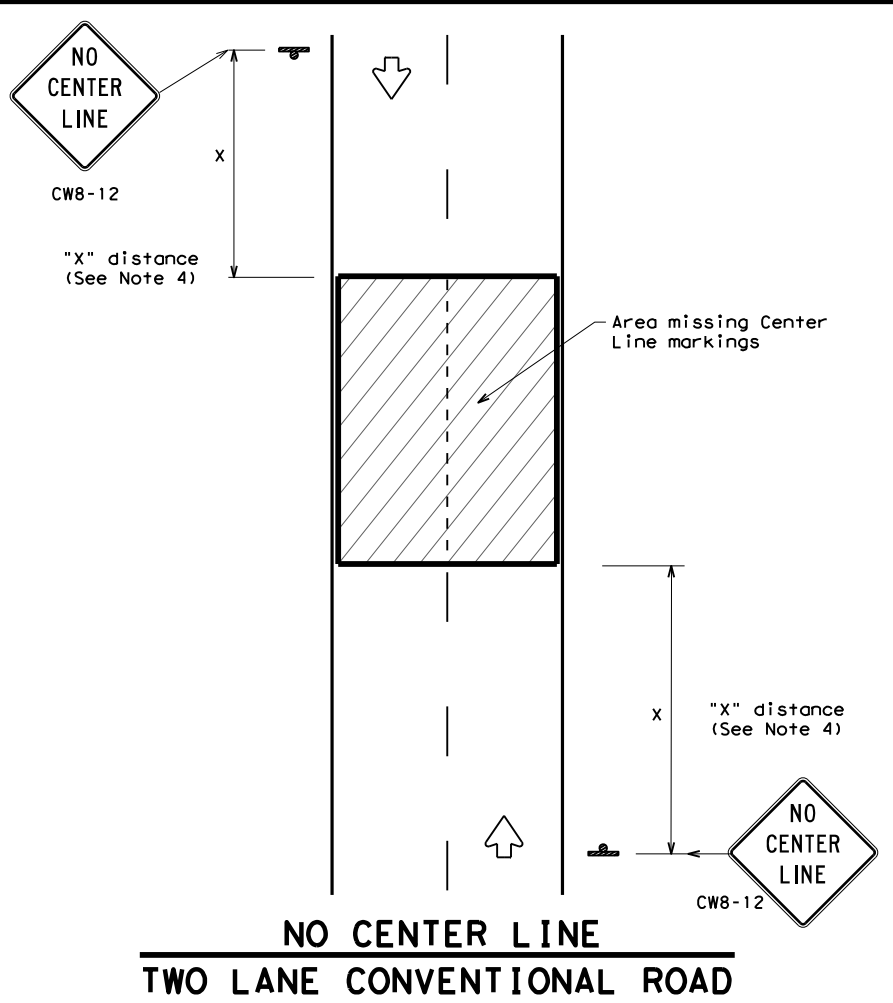
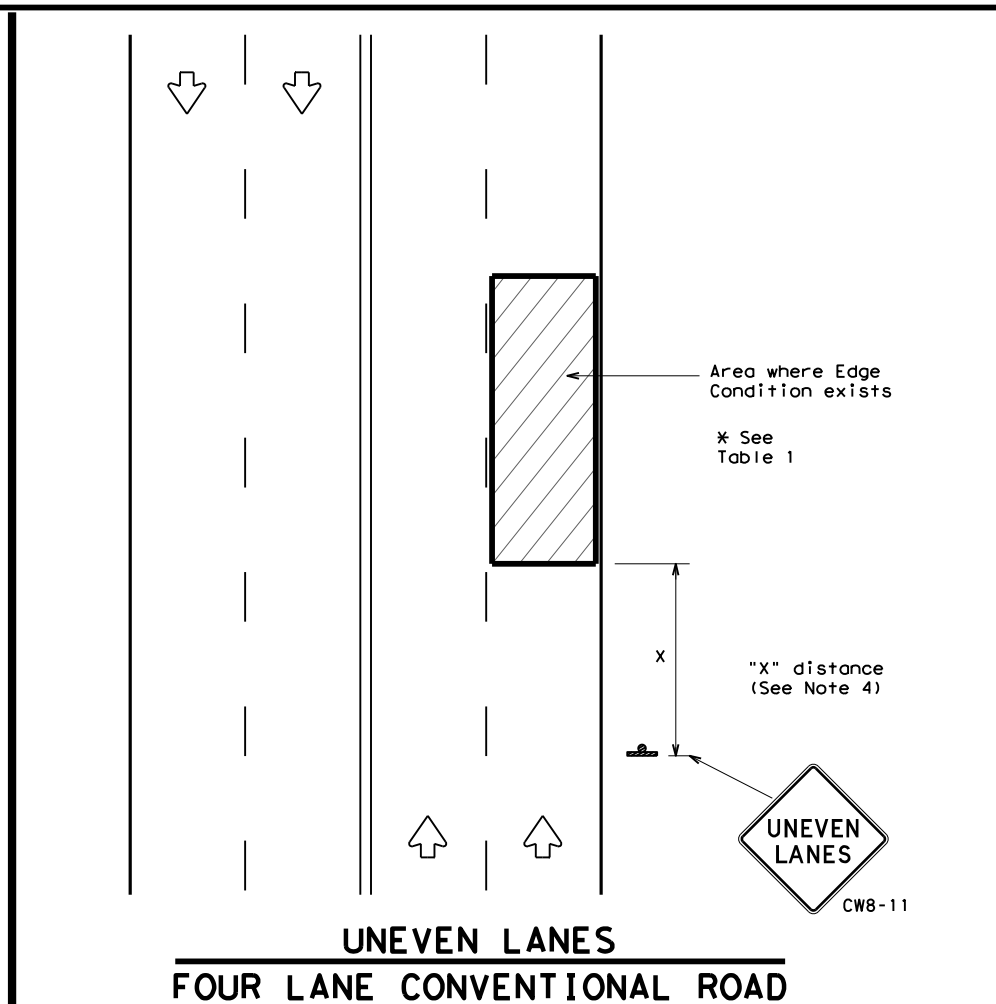
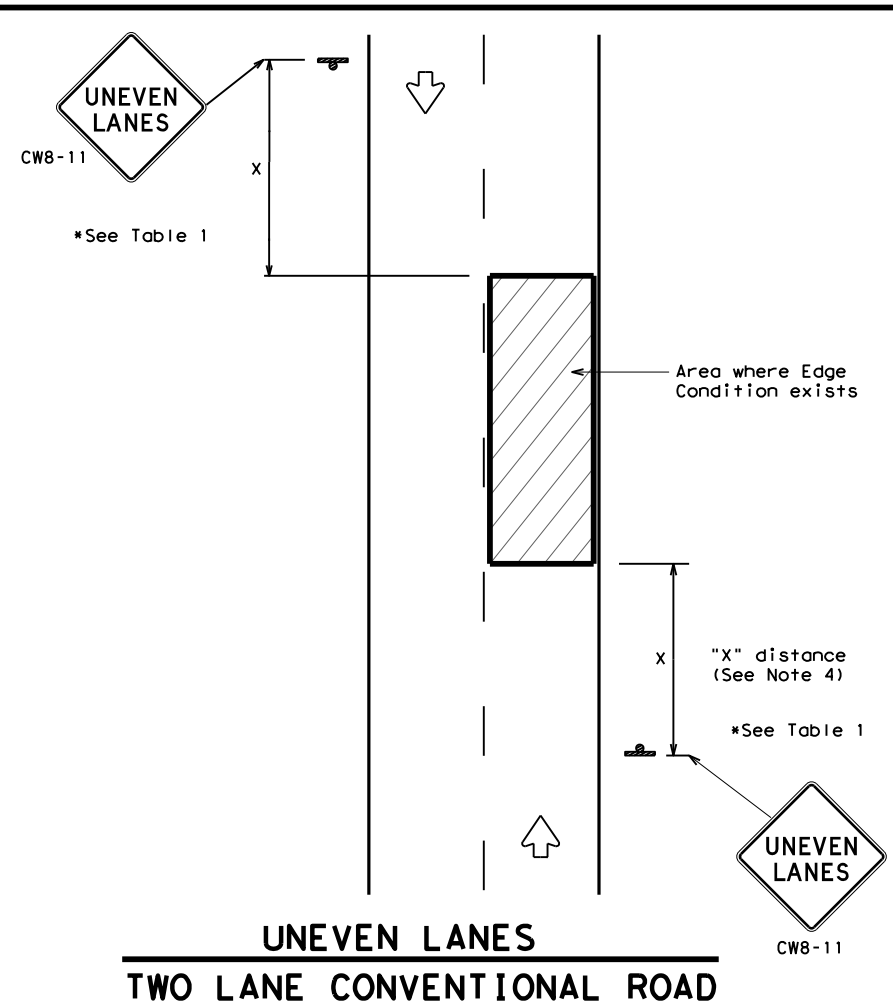
**TRAFFIC CONTROL PLAN TYPICAL DETAILS**

**WZ(TD) - 17**

FILE:	wztd-17.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CR:	TxDOT
© TxDOT	February 1998	CONT	SECT	JOB	HIGHWAY				
4-98	2-17	0003	01	064, ETC	IH 10				
3-03		DIST	COUNTY	SHEET NO.					
7-13		ELP	CULBERSON	34					

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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.

TABLE 1		
Edge Condition	Edge Height (D)	* Warning Devices
①	Less than or equal to: 1/4" (maximum-planing) 1 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"

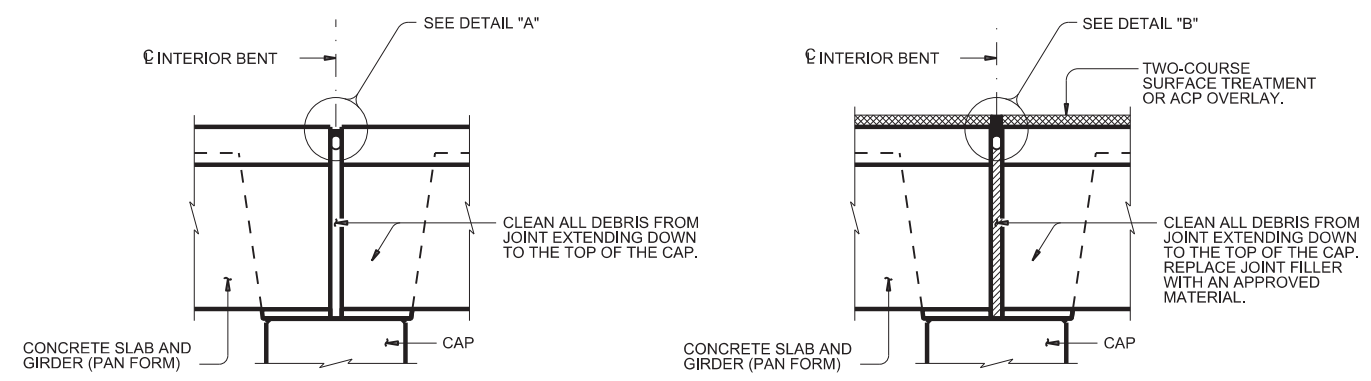


**SIGNING FOR UNEVEN LANES**

**WZ (UL) - 13**

FILE: wz1-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064JETC	IHWYO
8-95 2-98 7-13	DIST	COUNTY	SHEET NO.	
1-97 3-03	BSF	CULBERTSON	35	

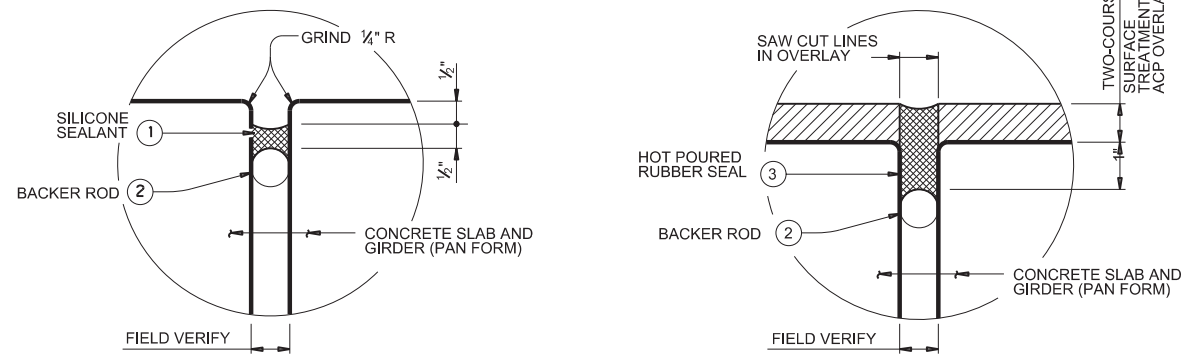
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FILE: U:\000301064\MASTER DESIGN FILES\Cleaning and Sealing Bridge Joints.dgn



**JOINT WITH SILICONE SEAL**  
(USED WITHOUT ACP OVERLAY)

**JOINT WITH HOT POURED RUBBER SEAL**  
(USED WITH ACP OVERLAY)

**EXISTING CONCRETE SLAB & GIRDER JOINT REPAIR**



**DETAIL "A"**

**DETAIL "B"**

- ① USE CLASS 7 SILICONE SEALANT. PREPARE JOINT AND SEAL IN ACCORDANCE WITH ITEM 438 "CLEANING AND SEALING JOINTS."
- ② BACKER ROD MUST BE 25% LARGER THAN JOINT OPENING AND MUST BE COMPATIBLE WITH THE SEALANT.
- ③ USE CLASS 3 HOT POURED RUBBER SEAL. PREPARE JOINT AND SEAL IN ACCORDANCE WITH ITEM 438 "CLEANING AND SEALING JOINTS."

**PROCEDURE FOR CLEANING AND SEALING EXISTING CONCRETE GIRDER JOINT WITH SILICONE SEAL:**

- 1) CLEAN JOINT OPENING OF ALL OLD EXPANSION MATERIALS/DEVICES, DIRT, AND ALL OTHER DELETERIOUS MATERIALS IN ACCORDANCE WITH ITEM 438, "CLEANING AND SEALING JOINTS." CLEAN JOINT OUT FULL DEPTH OF THE JOINT.
- 2) OBTAIN APPROVAL OF CLEANED JOINT PRIOR TO PROCEEDING WITH JOINT SEALING OPERATION.
- 3) PLACE BACKER ROD INTO JOINT OPENING 1" BELOW THE TOP OF CONCRETE. THE BACKER ROD MUST BE 25% LARGER THAN THE JOINT OPENING.
- 4) SEAL THE JOINT OPENING WITH A CLASS 7 SILICONE. RECESS SEAL 1/2" BELOW TOP OF CONCRETE IN TRAVEL LANES AND 1/4" BELOW TOP OF CONCRETE IN SHOULDERS.

**PROCEDURE FOR CLEANING AND SEALING EXISTING CONCRETE GIRDER JOINT WITH HOT POURED RUBBER SEAL:**

- 1) SAW CUT THROUGH THE ASPHALT AT THE CENTERLINE OF JOINT. MAKE MULTIPLE SAW CUTS TO CREATE A 1/2" MINIMUM JOINT OPENING OR MATCH THE EXISTING JOINT OPENING. CLEAN JOINT OPENING OF ALL OLD EXPANSION MATERIALS/DEVICES, BITUMINOUS MATERIALS, DIRT, GREASE AND ALL OTHER DELETERIOUS MATERIALS IN ACCORDANCE WITH ITEM 438, "CLEANING AND SEALING JOINTS."
- 2) OBTAIN APPROVAL OF CLEANED JOINT PRIOR TO PROCEEDING WITH JOINT SEALING OPERATION.
- 3) PLACE BACKER ROD INTO JOINT OPENING 1" BELOW THE TOP OF CONCRETE. BACKER ROD MUST BE OF THE TYPE THAT CAN HANDLE THE HEAT AND BE COMPATIBLE WITH THE HOT POURED RUBBER SEAL. THE BACKER ROD MUST BE 25% LARGER THAN THE JOINT OPENING.
- 4) SEAL THE JOINT OPENING WITH A CLASS 3, "HOT POURED RUBBER." SEAL FLUSH TO THE TOP OF THE ASPHALTIC CONCRETE PAVEMENT.

**PROCEDURE FOR CLEANING AND SEALING EXISTING ARMOR JOINTS:**

- 1) REMOVE EXISTING SEAL.
- 2) ABRASIVE BLAST CLEAN EXISTING STEEL SURFACE WHERE SILICONE SEAL IS TO BE PLACED.
- 3) OBTAIN APPROVAL OF CLEANED JOINT PRIOR TO PROCEEDING WITH JOINT SEALING OPERATION.
- 4) PLACE BACKER ROD INTO JOINT OPENING 1" BELOW THE TOP OF CONCRETE. THE BACKER ROD MUST BE 25% LARGER THAN THE JOINT OPENING.
- 5) SEAL THE JOINT OPENING WITH A CLASS 7 SILICONE. RECESS SEAL 1/2" BELOW TOP OF CONCRETE IN TRAVEL LANES AND 1/4" BELOW TOP OF CONCRETE IN SHOULDERS.

**GENERAL NOTES:**

CLEANING EXISTING JOINT OPENING (FULL DEPTH) OF ALL DEBRIS, PROVIDING AND PLACING BACKER ROD, SAW-CUTTING JOINT OPENING, AND SEALING JOINT IS PAID FOR BY AND MEASURED BY THE FOOT OF "CLEANING AND SEALING EXISTING JOINTS."

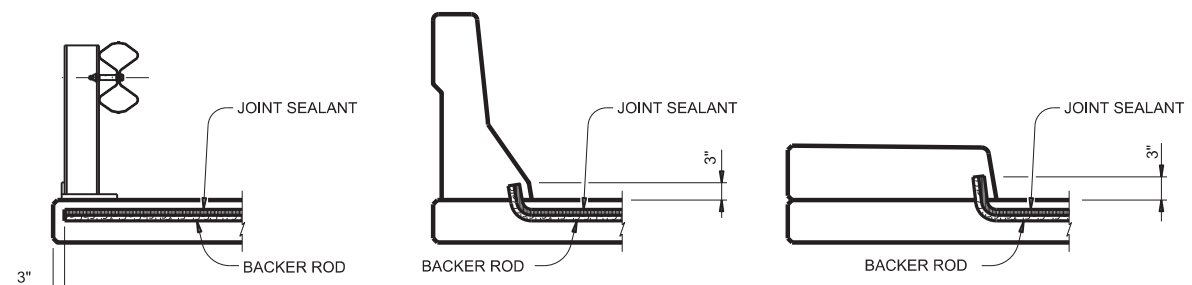
OBTAIN APPROVAL FOR ALL TOOLS, EQUIPMENT, MATERIALS AND TECHNIQUES PROPOSED FOR USE TO PREPARE THE JOINT.

FOR CLASS 3 HOT POURED RUBBER SEAL, PROVIDE BACKER ROD COMPATIBLE WITH THE HOT POURED RUBBER SEALANT AND RATED FOR A MINIMUM OF 400°F.

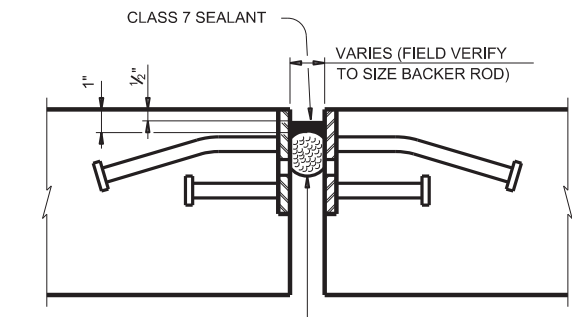
PROVIDE CLASS 3 SEALANT IN ACCORDANCE WITH DMS-6310, "JOINT SEALANTS AND FILLERS" FOR JOINTS IN ASPHALT OVERLAY.

PROVIDE CLASS 7 SILICONE SEALANT IN ACCORDANCE WITH DMS-6310, "JOINT SEALANTS AND FILLERS" FOR JOINTS IN CONCRETE.

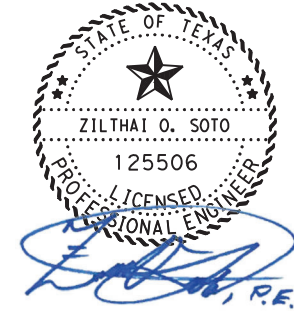
EXTEND SEALANT UP INTO RAIL OR CURB 3 INCHES ON LOW SIDE OR SIDES OF DECK. IF THE CLASS 7 SEALANT CANNOT BE EFFECTIVELY PLACED IN THE VERTICAL POSITION, A CLASS 4 SEALANT COMPATIBLE WITH THE CLASS 7 SEALANT IS ALLOWED FOR THE EXTENSION OF THE SEAL INTO THE CURB OR RAIL. PREPARE SURFACES WHERE SEALANT IS TO BE PLACED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.



**JOINT SEALANT TERMINATION DETAILS**



**CLEANING AND SEALING EXISTING ARMOR JOINTS**  
(SHOWING ARMOR JOINT SECTION)



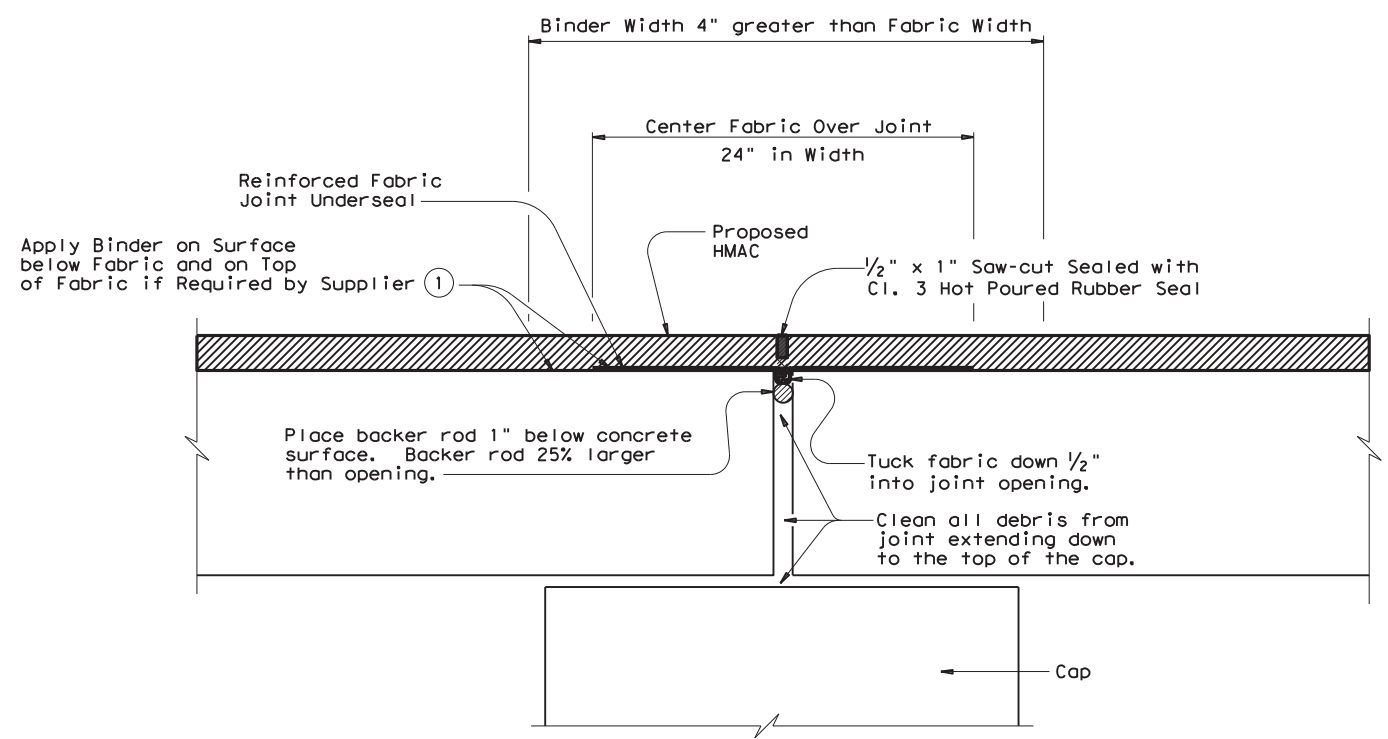
**IH 10  
MILL & OVERLAY  
BRIDGE**

**CLEANING AND SEALING EXISTING BRIDGE JOINTS DETAILS**

SHEET 1 OF 1			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		36



DWG:   
 CDS:   
 DMF:   
 CKE:



① A tack coat must be applied if the surface has been milled.

### FABRIC JOINT SEAL WITH HOT POURED RUBBER

**PROCEDURES:**

- 1) Prior to the placement of the fabric joint underseal, clean joint opening of all old expansion materials/devices, bituminous materials, dirt, grease and all other deleterious materials in accordance with Item 438, "Cleaning and Sealing Joints and Cracks."
- 2) Repair any significant spalled or cracked areas, as determined by the Engineer, around the joint opening with an approved proprietary concrete repair material as Approved by the Engineer. This work will be paid for by Item 429-6006 or as directed.
- 3) Place tack coat or binder as required by the fabric joint underseal manufacturer's installation instructions. Place backer rod in joint opening prior to placing tack coat.
- 4) Place reinforced fabric joint underseal centered over joint opening. Tuck fabric down approximately 1/2" into the joint opening. Install underseal in accordance with manufacturer's recommendations.
- 5) When using the self-adhesive type fabric underseal, pressure roll fabric joint underseal to improve adhesion.
- 6) Just prior to paving, fill tucked in portion of underseal with sand flush with surface. Apply a tack coat to fabric joint underseal as required by the manufacturer's installation instructions. Mark location of centerline of joint on curb or barrier as approved.
- 7) After the asphaltic concrete pavement operations are complete, saw cut 1" into the asphalt at centerline of joint. Make multiple saw cuts to create a 1/2" joint opening or match the existing joint opening, whichever is greater. Do not damage the underseal.
- 8) Seal the joint opening with a Class 3, "Hot Poured Rubber." Seal flush with the top of the asphaltic concrete pavement.

**GENERAL NOTES:**

Removal of existing asphalt pavement, cleaning existing joint opening (full depth) of all debris, providing and placing backer rod, saw-cutting joint opening, and sealing joint is paid for by Item 438, "Cleaning and Sealing Joints and Cracks" and measured by the foot of "Cleaning and Sealing of Existing Joints." Providing and placing tack coat and, providing and placing fabric joint underseal is paid for by Item 356, "Fabric Underseal" and measured by the foot of "Pavement Joint Underseal."

Obtain approval for all tools, equipment, materials and techniques proposed for use to prepare the joint.

Provide the reinforced fabric joint underseal in accordance with DMS-6260, "Reinforced Fabric Joint Underseal" or DMS-6220, "Fabric for Underseals." Provide the Class 3 joint sealant in accordance with DMS-6310, "Joint Sealants and Fillers."

Provide TBWC PG76-22 SAC-A TY C for proposed HMAC in accordance with Item 3082 "Thin Bonded Friction Courses" as proposed in the miscellaneous roadway details for bridge decks.

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**IH 10  
 MILL & OVERLAY  
 BRIDGE**

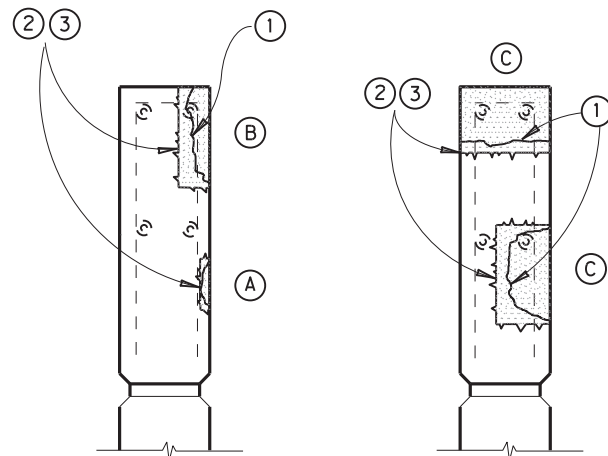
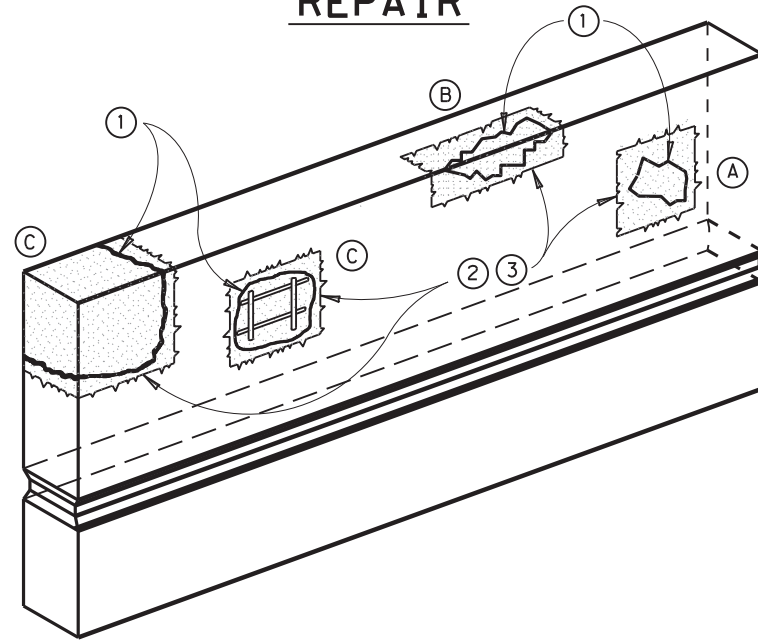
**BRIDGE FABRIC JOINT  
 UNDERSEAL DETAIL**

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		37

CNG  
 DWF  
 CNG  
 DWF

## CONCRETE STRUCTURE REPAIR



### CONCRETE STRUCTURE REPAIR NOTES:

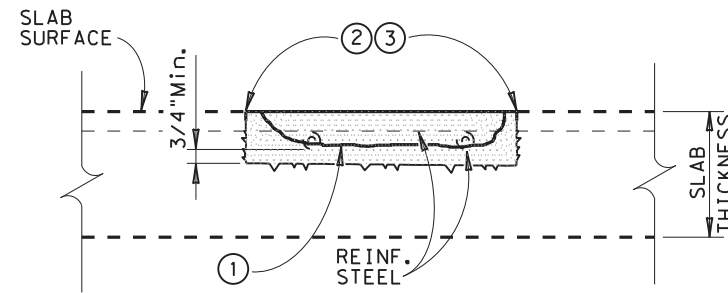
- (A) LESS THAN 1" - SHALLOW REPAIRS NOT EXTENDING TO THE REINFORCING STEEL.
- (B) 1" TO 6" - MID-DEPTH REPAIR EXTENDING TO OR SLIGHTLY BELOW THE REINFORCING STEEL.
- (C) OVER 6" - DEEP REPAIR EXTENDING WELL BEYOND THE REINFORCING STEEL, UP TO FULL DEPTH.

FOR ALL REPAIRS OVER TRAFFIC, WITH OR WITHOUT ADDITIONAL REINFORCEMENT, ANCHORS ARE REQUIRED.

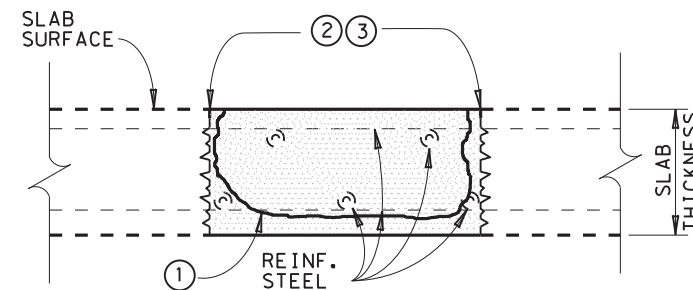
### GENERAL REPAIR NOTES:

- (1) - FRACTURE LINE, SHADED PORTION TO BE REMOVED
- (2) - LAY OUT A SYMMETRIC SAW CUT LINE OUTSIDE OF EXTREME EDGE OF FRACTURED CONCRETE.
- (3) - SAW CUT 1/2" DEEP ALONG THE LAYOUT LINE INTO SOUND CONCRETE. CARE SHALL BE TAKEN NOT TO CUT OR DAMAGE REINFORCING STEEL, SEE GENERAL NOTES.

## CONCRETE BRIDGE DECK REPAIR



TYPE 1 SLAB REPAIR



TYPE 2 SLAB REPAIR

### CONCRETE BRIDGE DECK REPAIR NOTES:

ALL WORK WILL CONFORM TO ITEM 439 & 429.

- TYPE 1 - TO HALF DEPTH OF SLAB.
- TYPE 2 - FULL DEPTH OF SLAB.

FULL DEPTH REPAIR OF A DECK WITH PRECAST PANELS IS PROHIBITED, THE DEPTH OF REPAIR WILL NOT EXTEND BELOW THE TOP OF THE PRECAST PANEL.

### WORK TO BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING:

ITEM 420 "CONCRETE SUBSTRUCTURES"  
 ITEM 421 "HYDRAULIC CEMENT CONCRETE"  
 ITEM 429 "CONCRETE STRUCTURE REPAIR"  
 ITEM 431 "PNEUMATICALLY PLACED CONCRETE"  
 ITEM 439 "BRIDGE DECK OVERLAYS"  
 ITEM 440 "REINFORCEMENT FOR CONCRETE"  
 ITEM 448 "STRUCTURAL FIELD WELDING"  
 ITEM 780 "CONCRETE CRACK REPAIR"  
 DMS 4655 "CONCRETE REPAIR MATERIALS"  
 PAYMENT WILL BE AS PER ITEM 429 UNLESS SPECIFIED OTHERWISE IN THE PLANS.

### NOTES:

1. ALL CONCRETE REPAIR MATERIALS WILL MEET REQUIREMENTS SPECIFIED IN THE PLANS AS FOLLOWS: RAPID - RETURN TO SERVICE WITHIN 2 HOURS OF PLACEMENT ( $f'c = 2000$  psi min.) PROMPT - RETURN TO SERVICE WITHIN 24 HOURS OF PLACEMENT ( $f'c = 3600$  psi min.) NORMAL - RETURN TO SERVICE WHEN REQUIRED CURE TIME AND MIN. 7 DAY COMPRESSIVE STRENGTH HAS BEEN ATTAINED AS SPECIFIED IN ITEMS 429 OR 439. IF NOT SPECIFIED IN THE PLANS, A MATERIAL MEETING A NORMAL "RETURN TO SERVICE" WILL BE USED. AIR ENTRAINMENT IS NOT REQUIRED.
2. PRIOR TO THE COMMENCEMENT OF WORK, THE CONTRACTOR WILL VERIFY ALL EXISTING DIMENSIONS, LIMITS OF CONCRETE REPAIR, AND DETERMINE REPAIR METHOD FOR CONCRETE REPAIRS AS OUTLINED IN THE "CONCRETE REPAIR MANUAL" AND AS APPROVED BY THE ENGINEER.
3. REMOVAL OF CONCRETE WILL BE PERFORMED AS SPECIFIED IN ITEMS 429 AND 439. MINIMUM CLEARANCE BETWEEN EXPOSED STEEL AND SURROUNDING CONCRETE IS 1/2" OR 2 TIMES THE MAXIMUM AGGREGATE SIZE. ANY DAMAGE TO THE CONCRETE SUBSTRATE, REINFORCING STEEL OR BOND BETWEEN THE TWO WILL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. DAMAGED REINFORCING STEEL WILL BE REPLACED, LAP SPLICES FOR ALL MAIN REINFORCEMENT WILL BE AS REQUIRED BY ITEM 440, MECHANICAL COUPLERS OR WELDED SPLICES ARE PERMITTED. IF A WELDED SPLICE IS USED, THE EXISTING AND REPLACEMENT STEEL MUST MEET ALL MATERIAL REQUIREMENTS OF ITEM 448. ALL REINFORCING STEEL WILL BE GRADE 60.
4. EPOXY INJECTION MAY BE USED TO REPAIR MINOR NON-STRUCTURAL CRACKS 1/16" OR LESS IN WIDTH AS APPROVED BY THE ENGINEER.
5. WHEN WORKING OVER A STREAM OR ANY OTHER BODY OF WATER, THE CONTRACTOR IS RESPONSIBLE FOR CONTAINMENT AND REMOVAL OF ALL DEBRIS ASSOCIATED WITH THE REPAIR, TO INCLUDE ALL AREAS UNDER THE BRIDGE AND THE TOP OF BENT CAPS. IF CONTAINMENT IS REQUIRED, DEBRIS MAY BE CAPTURED ON TARPS OR BY OTHER METHODS APPROVED BY THE ENGINEER. MATERIAL WILL BE DISPOSED OF IN ACCORDANCE WITH ALL APPLICABLE STATE AND FEDERAL REGULATIONS.



**IH 10  
MILL & OVERLAY  
BRIDGE**

**CONCRETE REPAIR  
DETAILS**

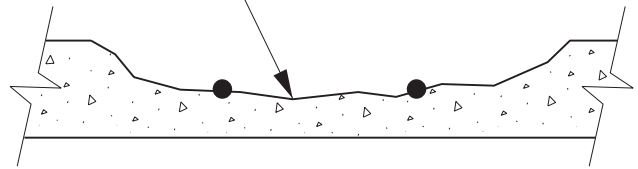
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DIST	COUNTY		SHEET NO.
ELP	CULBERSON		38

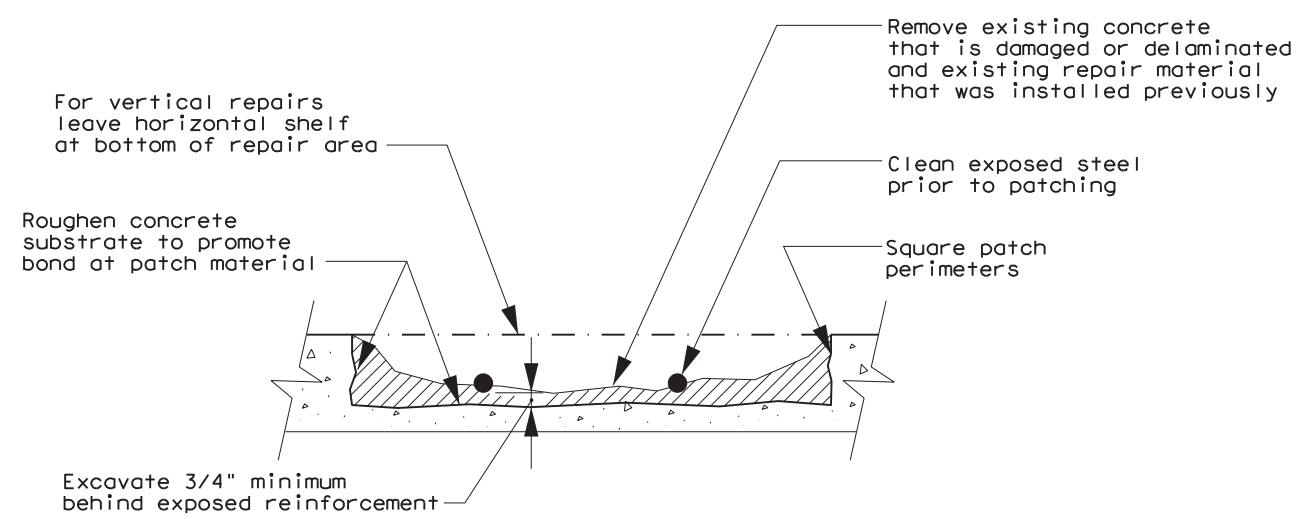
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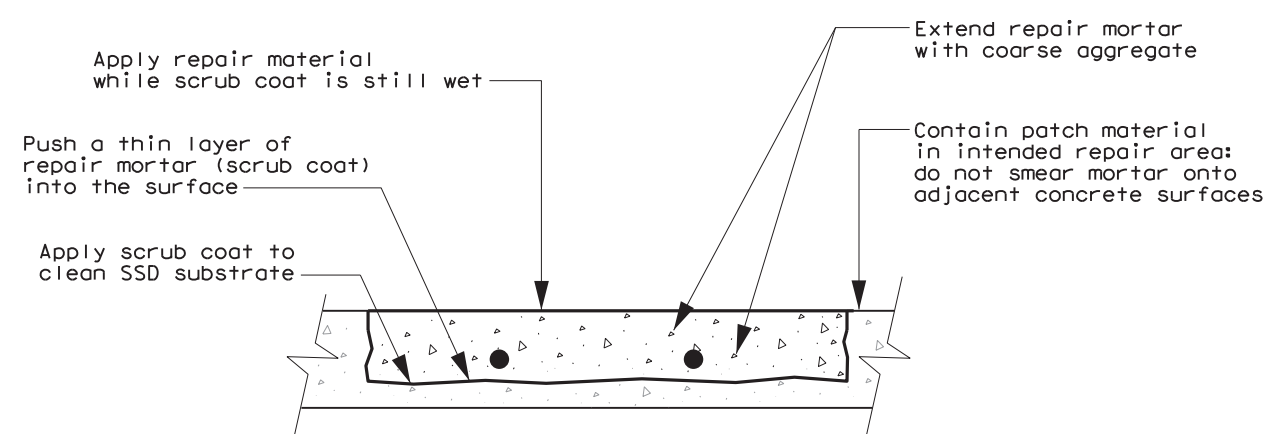
Remove existing concrete that is damaged or delaminated and existing repair material that was installed previously



**Damaged Condition**



**Step 1  
Excavation and Preparation**



**Step 2  
Patch Damaged Area**

**CONCRETE REPAIR NOTES:**

1. PERFORM WORK IN ACCORDANCE WITH ITEM 429, "CONCRETE STRUCTURE REPAIR". USE A TYPE A-4 REPAIR MATERIAL PER DMS 4655, "CONCRETE REPAIR MATERIALS." REFER TO THE "CONCRETE REPAIR MATERIAL", MATERIAL PRODUCER LIST (MPL) FOR A LIST OF PRE-APPROVED TYPE A-4 MATERIALS.
2. SURFACE PREPARATION: REMOVE ANY DAMAGED OR LOOSE CONCRETE OR PREVIOUSLY APPLIED REPAIR MATERIAL. UNLESS OTHERWISE APPROVED BY THE ENGINEER, USE ONLY HAND TOOLS OR POWER DRIVEN CHIPPING HAMMERS (15 LB. CLASS MAXIMUM) TO REMOVE CONCRETE. SQUARE THE PATCH PERIMETERS USING HANDHELD GRINDERS OR SAWS; DO NOT OVER-CUT PATCH PERIMETERS AT THE CORNERS OF THE REPAIR AREAS. ROUGHEN THE SUBSTRATE TO ENSURE THERE WILL BE A MECHANICAL BOND BETWEEN THE PATCH MATERIAL AND PARENT CONCRETE. REMOVE RUST, OIL AND OTHER CONTAMINANTS FROM EXPOSED STEEL REINFORCEMENT. JUST PRIOR TO PATCHING BLAST THE REPAIR AREA USING A HIGH-PRESSURE AIR COMPRESSOR EQUIPPED WITH FILTERS TO REMOVE OIL FROM THE COMPRESSED AIR.
3. MIXING: USE MEASURING CUPS OR BUCKETS TO DETERMINE THE PROPER QUANTITY OF EACH COMPONENT PER THE MANUFACTURER'S REQUIREMENTS, THEN DISPENSE INTO A CLEAN CONTAINER. DO NOT "EYEBALL" OR GUESS AT THE PROPER AMOUNTS WHILE ADDING DIFFERENT COMPONENTS. MIX THE COMPONENTS THOROUGHLY UNTIL THEY ARE WELL-BLENDED (3MINUTES MINIMUM) USING A LOW-SPEED ELECTRIC DRILL AND A CLEAN "JIFFY" TYPE MIXING PADDLE. IN NO CASE WILL MIXING BY HAND BE PERMITTED. EXTEND THE REPAIR MORTAR WITH COARSE AGGREGATE IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS. DO NOT ATTEMPT TO MAKE THE MATERIAL WORKABLE BY OVER-MIXING OR ADDING ADDITIONAL LIQUID AFTER IT HAS BEGUN TO SET.
4. APPLICATION: OBTAIN A SATURATED SURFACE-DRY (SSD), SUBSTRATE JUST PRIOR TO PATCHING USING A HIGH-PRESSURE WATER BLAST FOR A BRIEF PERIOD (1 MINUTE MINIMUM) OR OTHER APPROVED METHOD. SURFACE MAY BE DAMP BUT MUST BE FREE OF STANDING WATER. APPLY A BONDING COAT CONSISTING OF A THIN LAYER OF NON-EXTENDED REPAIR MORTAR SCRUBBED INTO THE SUBSTRATE. APPLY REPAIR CONCRETE WHILE THE SCRUB COAT IS STILL WET. DO NOT EXCEED THE MAXIMUM LIFT DEPTH PERMITTED BY THE MANUFACTURER. IN MULTIPLE LIFT APPLICATIONS ROUGHEN THE SURFACE OF THE PRECEDING LIFT BEFORE IT REACHES INITIAL SET. WET THE SURFACE JUST PRIOR TO APPLYING THE NEXT LIFT.
5. CURING : MOIST CURE PATCH MATERIAL FOR A MINIMUM OF 72 HOURS USING SET MATS, WATER SPRAY, PONDING OR OTHER METHOD APPROVED BY THE ENGINEER.



**IH 10  
MILL & OVERLAY  
BRIDGE**

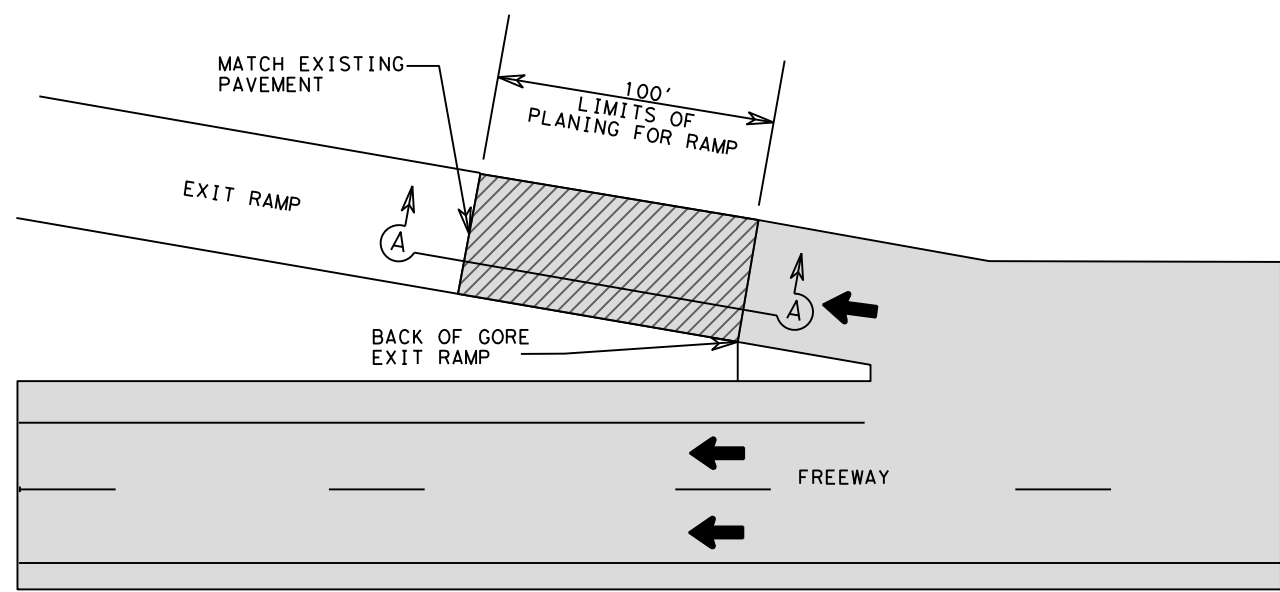
**CONCRETE REPAIR  
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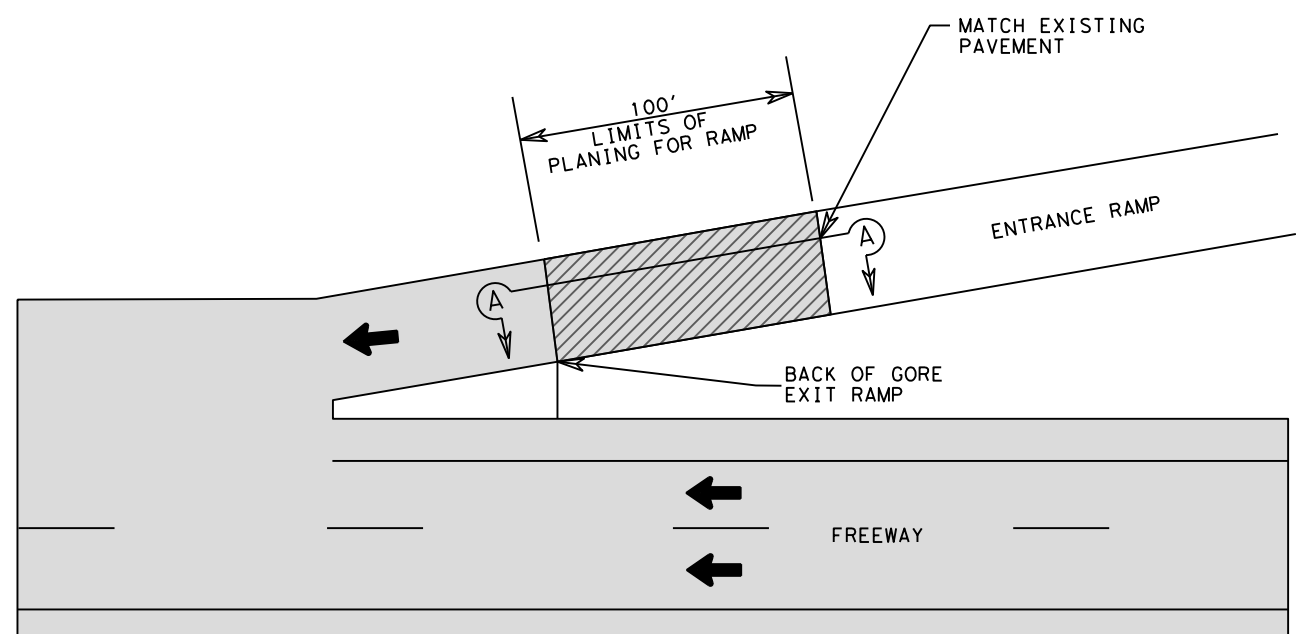
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CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
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ELP	CULBERSON		<b>39</b>

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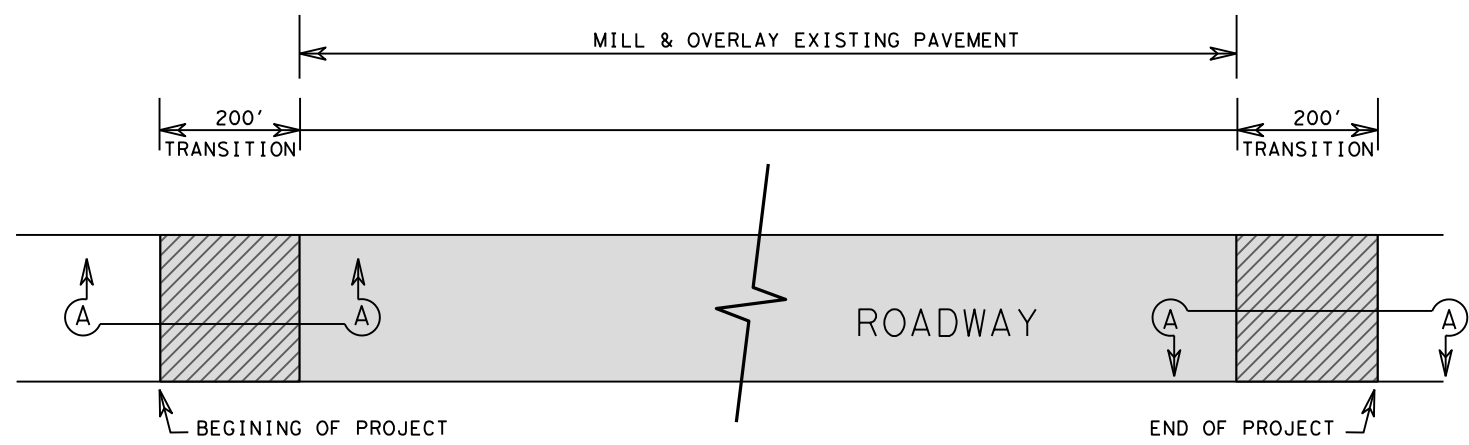


**TYPICAL EXIT RAMP DETAIL**  
OVERLAY WITH NO CURB

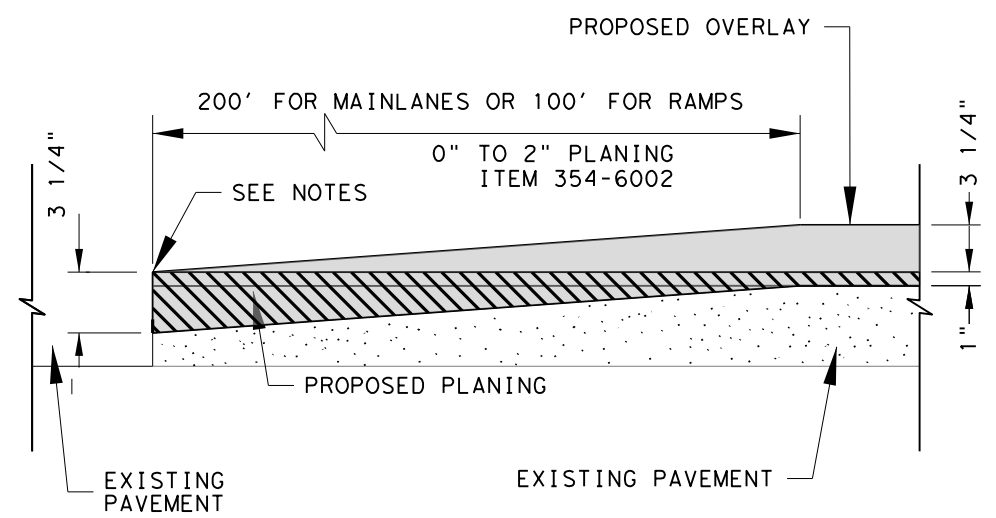


**TYPICAL ENTRANCE RAMP DETAIL**  
OVERLAY WITH NO CURB

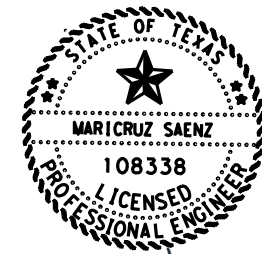
- NOTES:**
1. TAPER MILLING AND OVERLAY OPERATIONS TO MATCH EXISTING PAVEMENT GRADE ELEVATION AT BEGINING AND AT THE END OF THE PROJECT LIMIT.
  2. MATCH EXISTING ROADWAY CROSS SLOPE AND OUTSIDE EDGE OF PAVEMENT.
  3. BOTH PLANNING AND OVERLAY OPERATIONS SHALL BEGIN TAPERING FROM BACK OF GORE TO MATCH EXISTING PAVEMENT.
  4. ELEVATION ON ROADWAY AND BRIDGE SHOULD MATCH.



**TYPICAL DETAIL FOR ROADWAY**



**TRANSITION DETAIL SECTION "A-A"**



*Maricruz Saenz P.E.*  
10/19/2023

**IH 10  
MILL & OVERLAY  
ROADWAY**

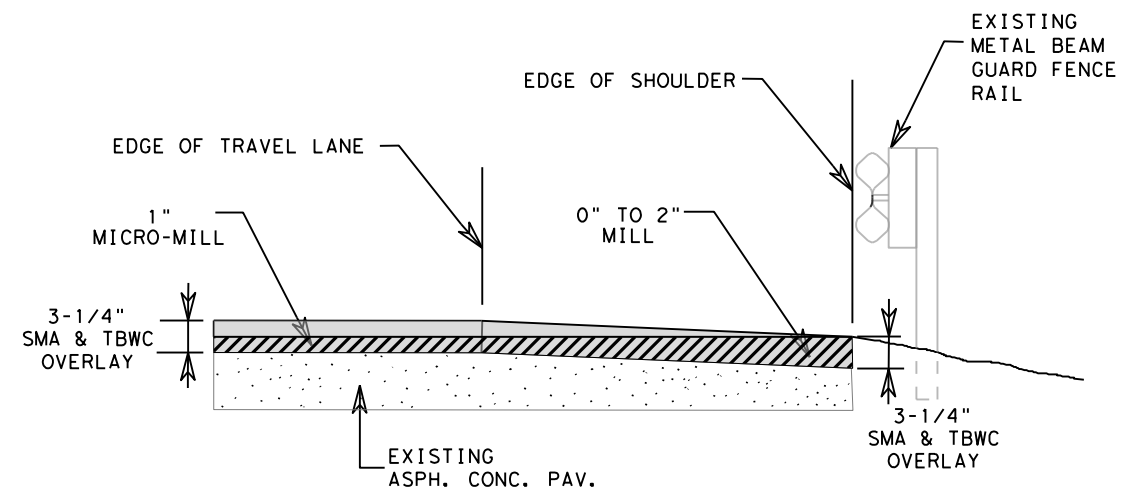
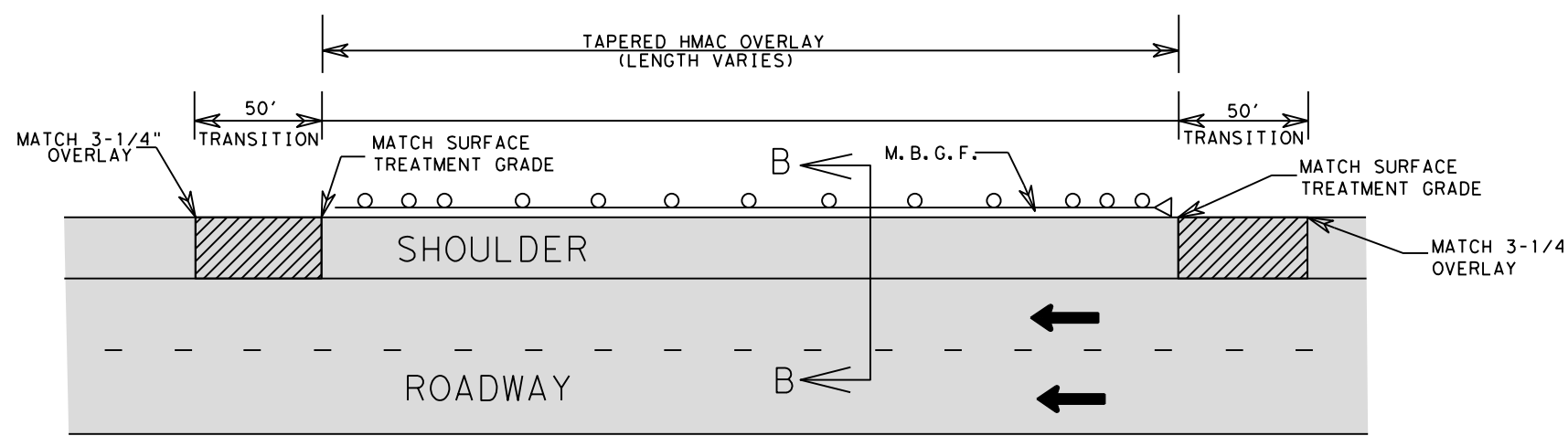
**MISCELLANEOUS  
DETAILS**

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Texas Department of Transportation			
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DIST	COUNTY		SHEET NO.
ELP	CULBERSON		40

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**SECTION B-B**

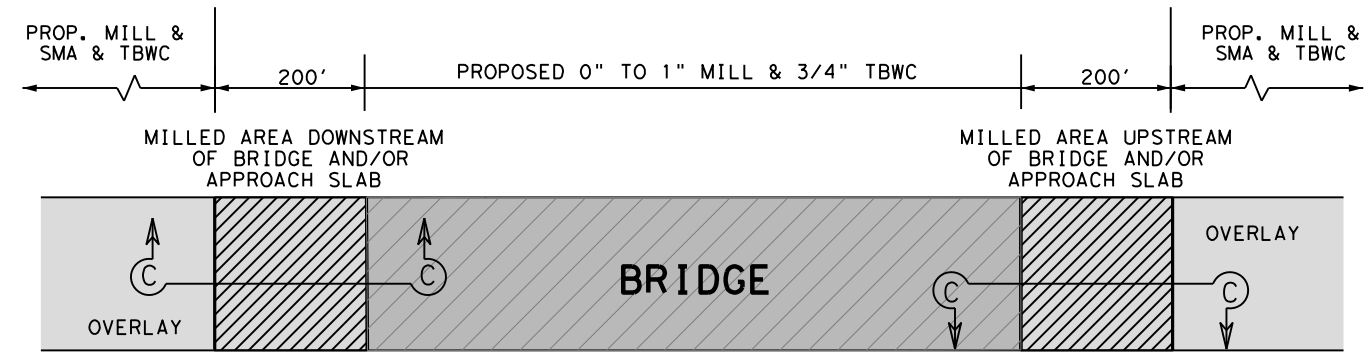
**SECTION B-B NOTE:**

1. TBWC OVERLAY ON SHOULDER TO BE TAPERED AT EDGE OF PAVEMENT ONLY FOR THE LENGTH OF THE M.B.G.F PLUS TRANSITIONS.
2. TAPER AT THE EDGE OF PAVEMENT WILL ALSO APPLY IN SHOULDER AREAS ADJACENT TO CONCRETE TRAFFIC BARRIERS.

**TYPICAL SHOULDER DETAILS FOR AREAS ADJACENT TO M.B.G.F.**

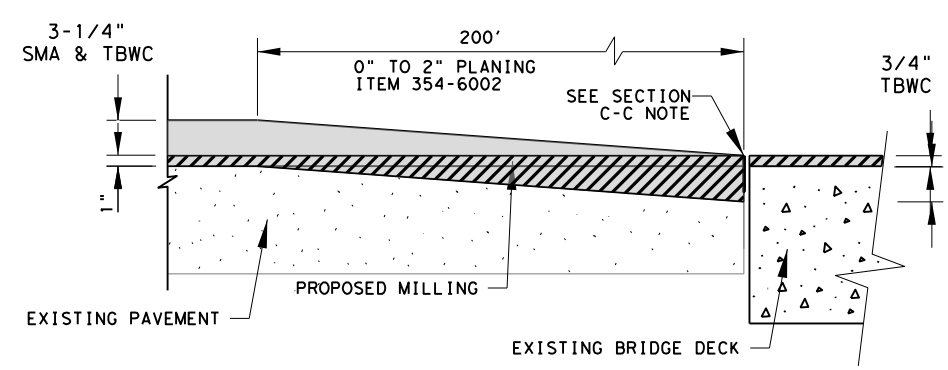
**LEGEND**

- OVERLAY
- INLAY
- 0"-2" MILLING
- 0"-1" MILLING



**BRIDGE DETAIL**

MILL & INLAY AT BRIDGE APPROACHES



**SECTION C-C**

OVERLAY DETAIL

**SECTION C-C NOTE:**

1. ELEVATION ON ROADWAY AND BRIDGE SHOULD MATCH.

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 10/19/2023

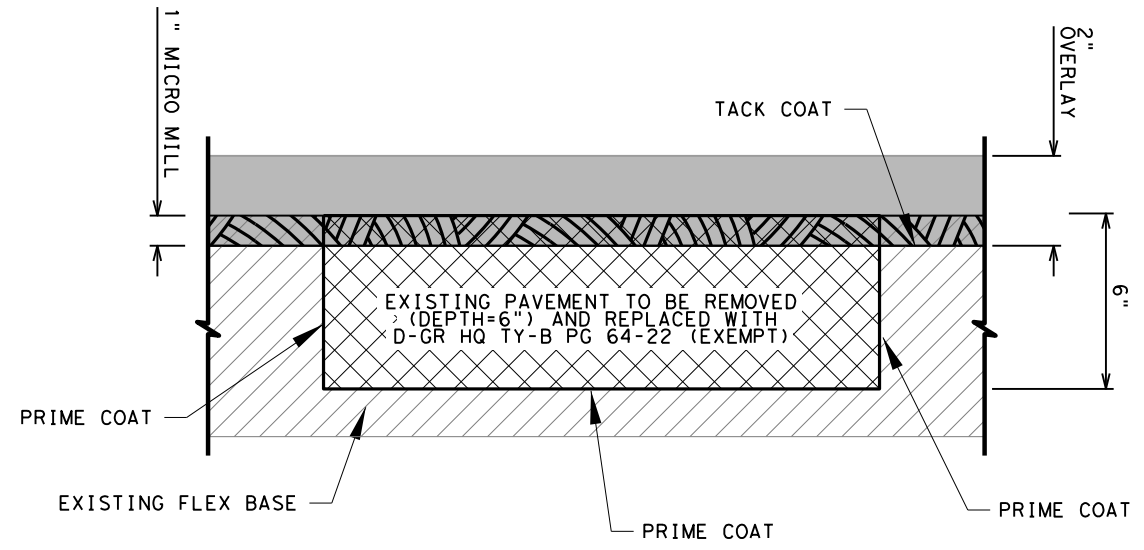
**IH 10  
MILL & OVERLAY  
ROADWAY**

**MISCELLANEOUS  
DETAILS**

SCALE: N.T.S. SHEET 2 OF 3

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CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		41

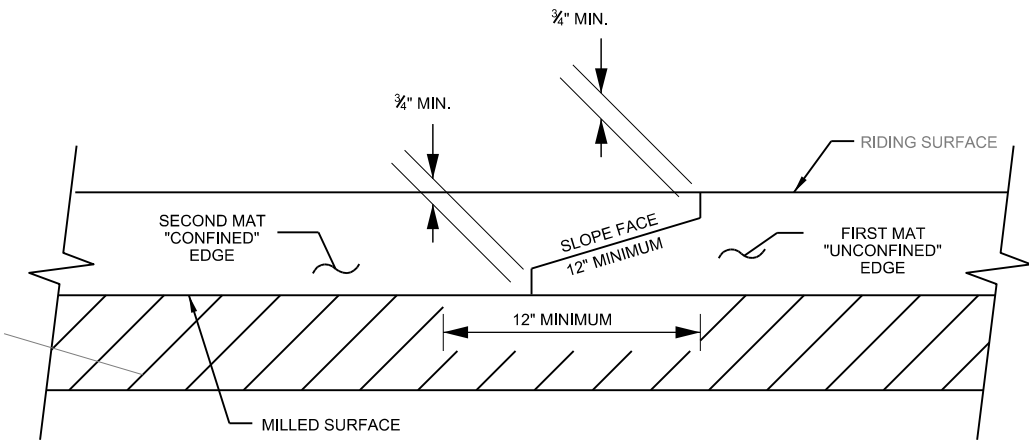
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**FLEXIBLE PAVEMENT REPAIR DETAIL**

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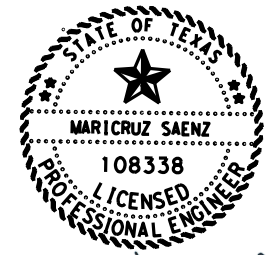
1. EXACT LOCATIONS MUST BE VERIFIED WITH THE ENGINEER. QUANTITIES WILL BE ADJUSTED AS DIRECTED BY THE ENGINEER.
2. PROVIDE MATERIALS OF TYPE AND GRADE AS SHOWN BELOW AND IN ACCORDANCE WITH ITEM 3076, "EXEMPT PRODUCTION" THE FOLLOWING DATA IS FOR CONTRACTOR'S INFORMATION ONLY AND WILL BE SUBSIDIARY TO ITEM 351, "FLEXIBLE PAVEMENT STRUCTURE REPAIR."
  - 3. D-GR HQ TY-B PG 64-22 (EXEMPT), 1IN=110 LBS/SY  
PRIME COAT (AE-P)=0.15 GAL/SY  
TACK COAT (TRAIL)=0.15 GAL/SY
4. CONTRACTOR TO PROVIDE CLEAN SAW-CUT EDGES. IF FLEX BASE IS EXPOSED, PRIME COAT IS TO BE APPLIED FOR PROPER BONDING. WHEN NO FLEX BASE IS EXPOSED, TACK COAT SHALL BE APPLIED TO BOND WITH EXISTING PAVEMENT.
5. PLACE 6" OF PROPOSED MIXTURE AND COMPACT TO REQUIRED DENSITY. MATCH THE EXISTING PAVEMENT SURFACE ELEVATION.



**LONGITUDINAL "WEDGE" JOINT DETAIL**  
SECTION C-C

**LONGITUDINAL "WEDGE" JOINT DETAIL NOTES:**

1. CONSTRUCT LONGITUDINAL JOINTS BY TAPERING THE SURFACE TREATMENT MAT.
2. EXTEND THE TAPERED PORTION BEYOND THE NORMAL PAVING LANE WIDTH TO AVOID JOINTS AND TAPERS IN THE WHEEL PATH.
3. CONSTRUCT THE TAPERED PORTION OF THE MAT USING A STRIKE OFF DEVICE THAT WILL PROVIDE A UNIFORM SLOPE AND WILL NOT RESTRICT THE MAIN SCREED.
4. COMPACT THE TAPER USING A PNEUMATIC ROLLER OR A STATIC WHEEL ROLLER WITHOUT DAMAGING THE NOTCH.
5. APPLY TACK COAT TO THE IN-PLACE TAPER BEFORE PLACING THE ADJACENT MAT.
6. FINAL DENSITY REQUIREMENTS FOR THE ENTIRE PAVEMENT INCLUDING THE TAPERED AREA WILL REMAIN UNCHANGED.
7. THE ENGINEER MAY WAIVE THE TAPERED JOINT REQUIREMENTS.
8. FULL PAVING OF ALL LANES AND SHOULDERS BY THE END OF EACH DAY'S PRODUCTION WILL REQUIRE A TAPERED JOINT.



*Maricruz Saenz P.E.*  
10/19/2023

**IH 10  
MILL & OVERLAY  
ROADWAY**

**MISCELLANEOUS  
DETAILS**

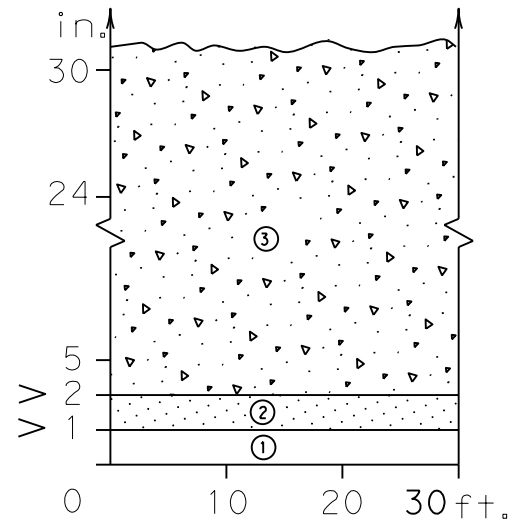
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ELP	CULBERSON		42

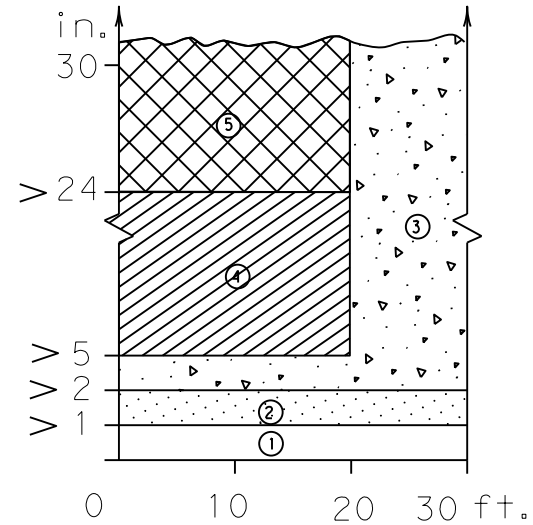
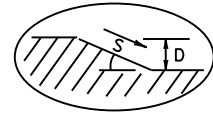
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# DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

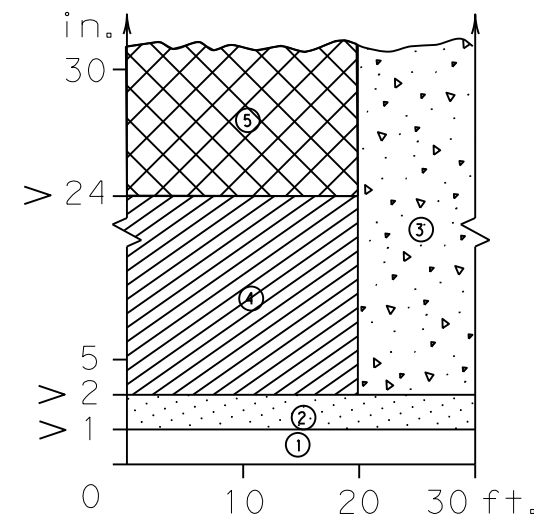
Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet



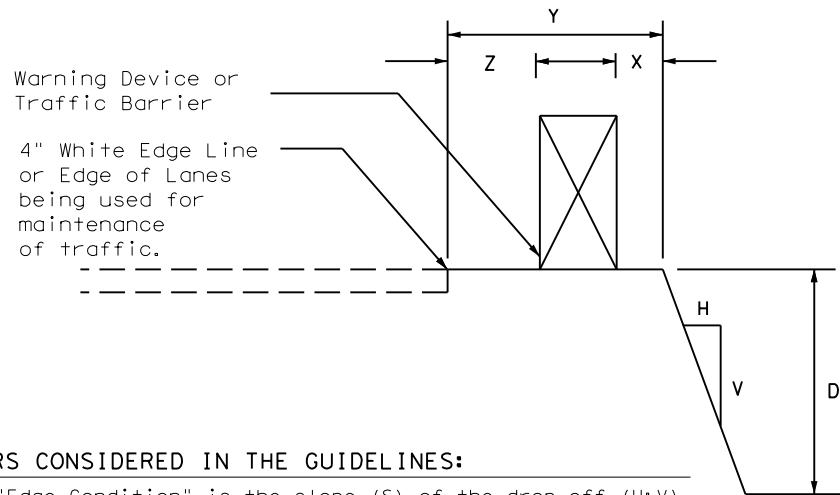
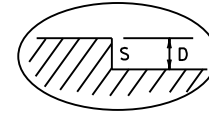
Edge Condition I  
S = (3:1) (or flatter)



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



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

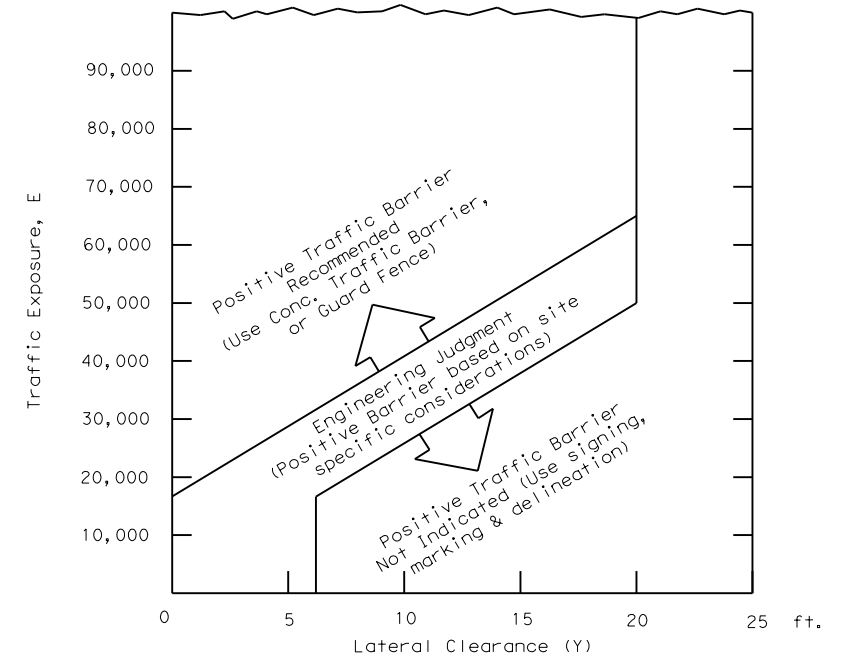


Zone	Treatment Types Guidelines:
①	No treatment
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge slope to that of the proferred Edge 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] )



- $E = ADT \times T$   
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 the clear zone.

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.

### 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.

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Engineer's Seal

Date 10/19/2023

*Maricruz Saenz P.E.*

Texas Department of Transportation

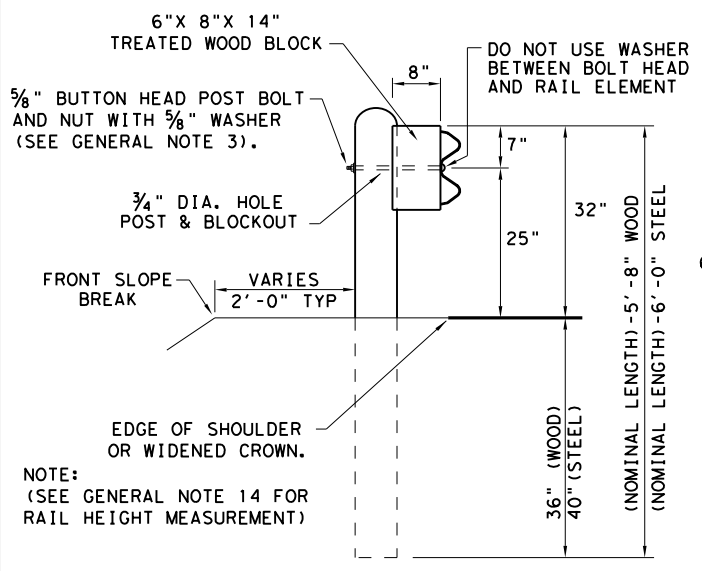
Traffic Safety Division Standard

## TREATMENT FOR VARIOUS EDGE CONDITIONS

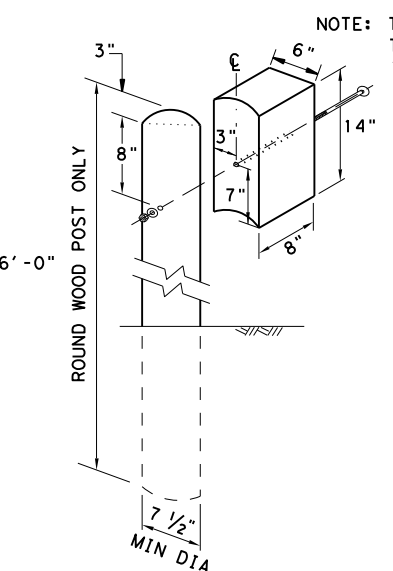
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© TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
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03-01	DIST	COUNTY	SHEET NO.	
08-01	ELP	CULBERSON	43	
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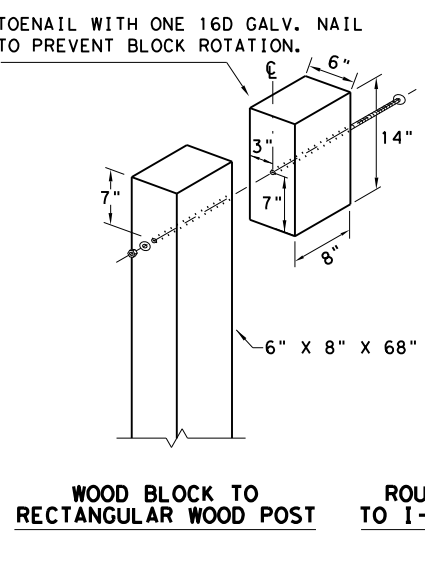
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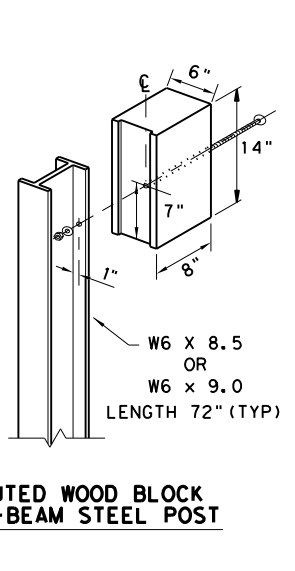
**TYPICAL POST PLACEMENT**



**WOOD BLOCK TO ROUND WOOD POST**

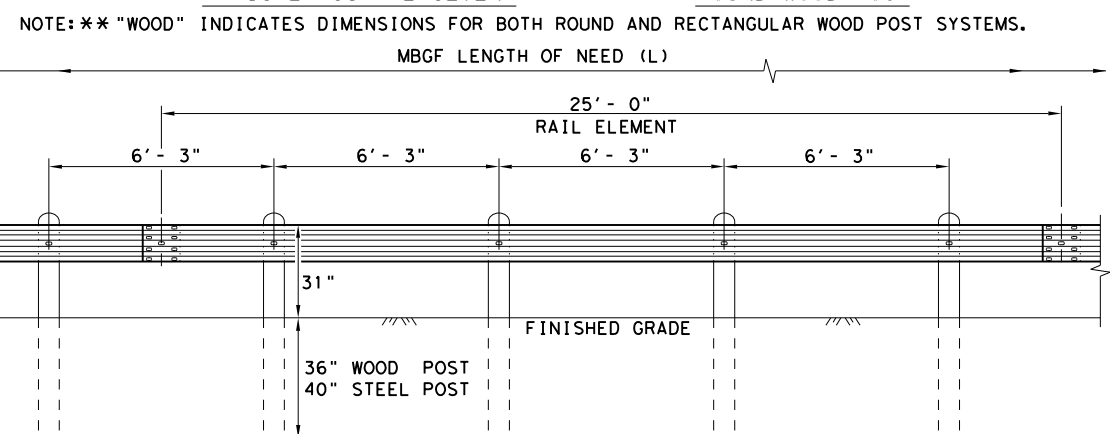


**WOOD BLOCK TO RECTANGULAR WOOD POST**



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

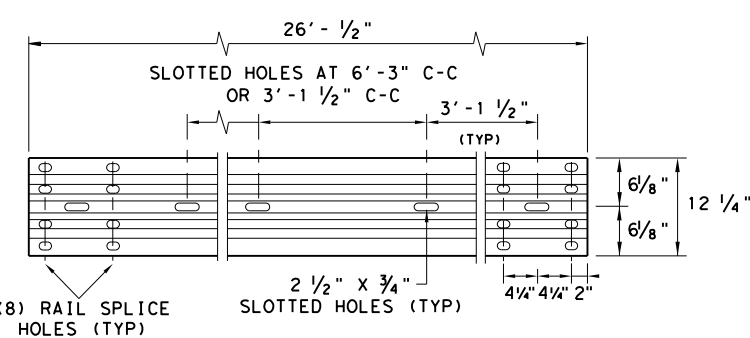
- GENERAL NOTES**
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
  2. RAIL ELEMENTS 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 (FWC16G) 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**

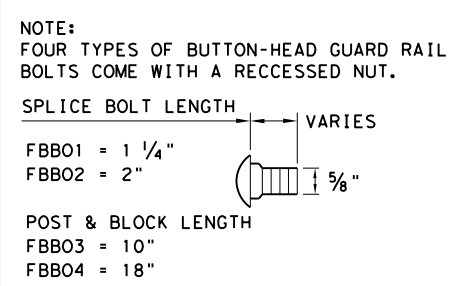
NOTE: \*\* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.

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



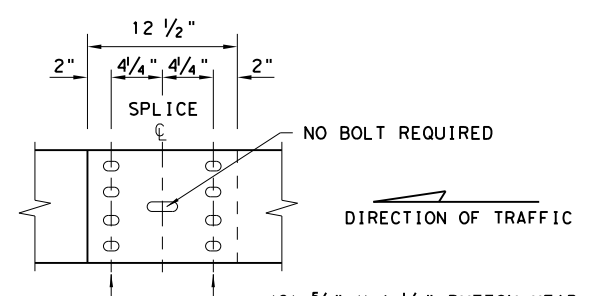
**ELEVATION 25'-0" (NOM.) W-BEAM SECTION**

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



**BUTTON HEAD BOLT**

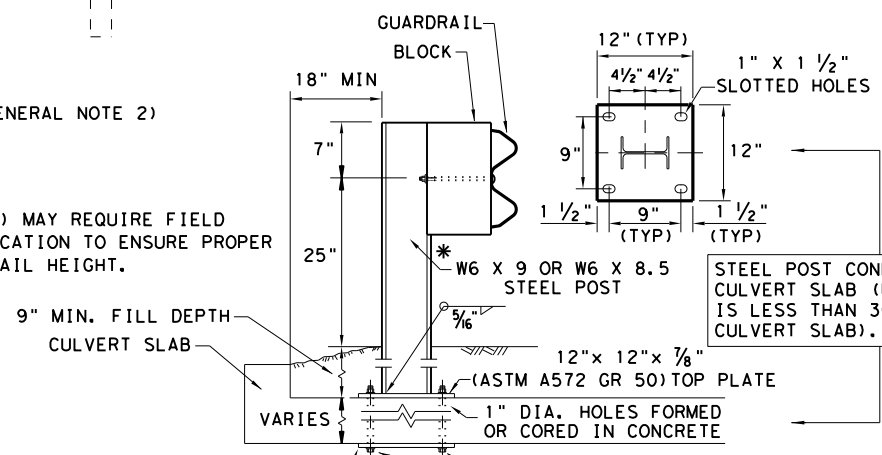
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



**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.

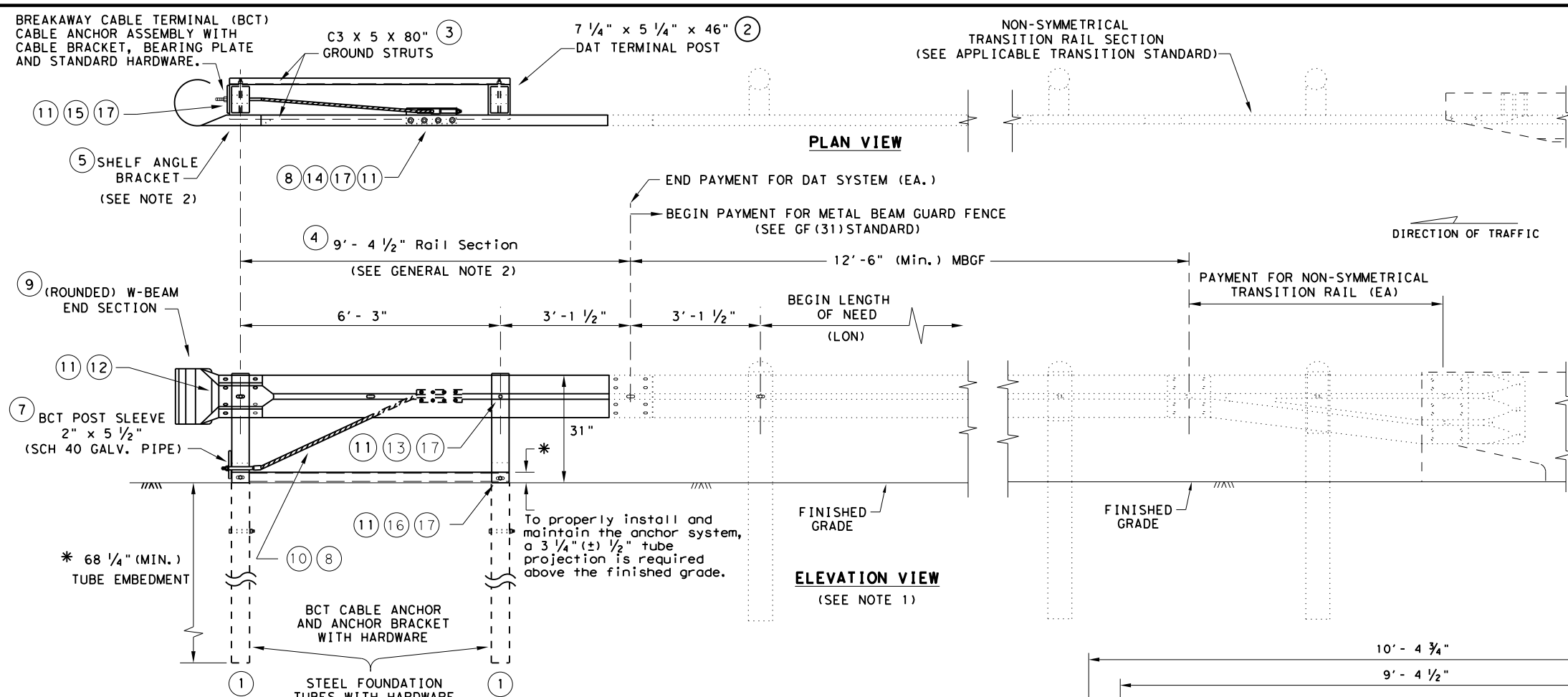
1. **BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
2. **EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR 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.

				Design Division Standard
<b>METAL BEAM GUARD FENCE</b> <b>TL-3 MASH COMPLIANT</b> <b>GF(31)-19</b>				
FILE: gcf3119.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
	DIST	COUNTY	SHEET NO.	
	ELP	CULBERSON	44	



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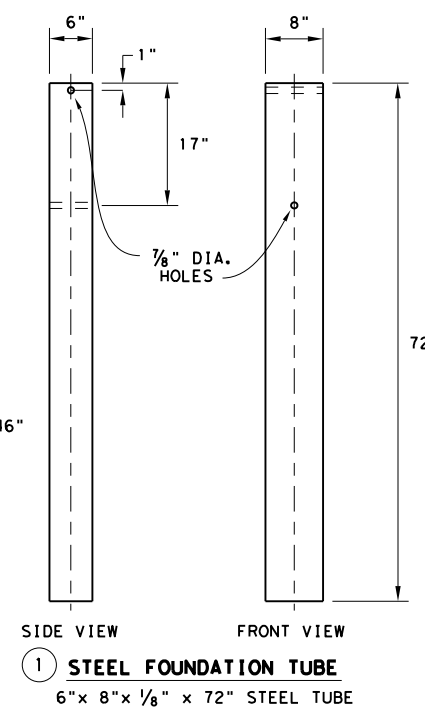
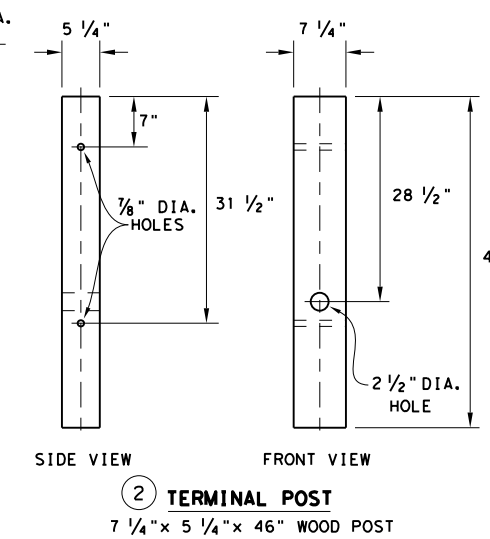
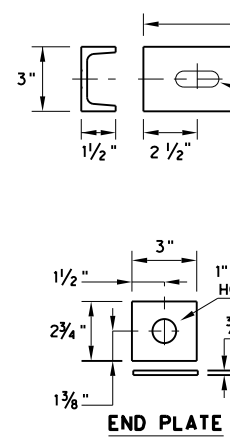
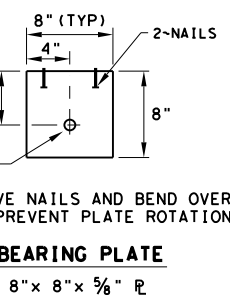
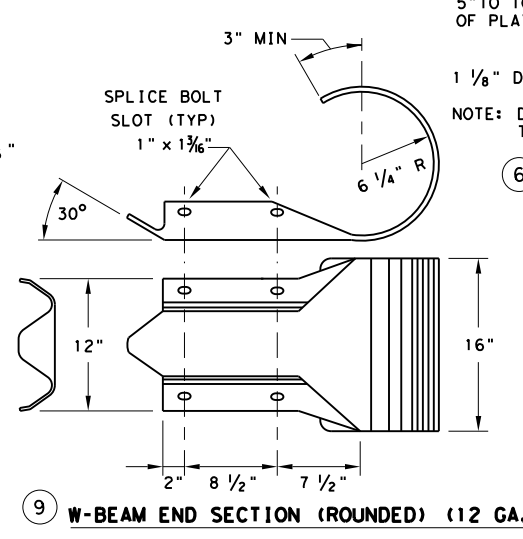
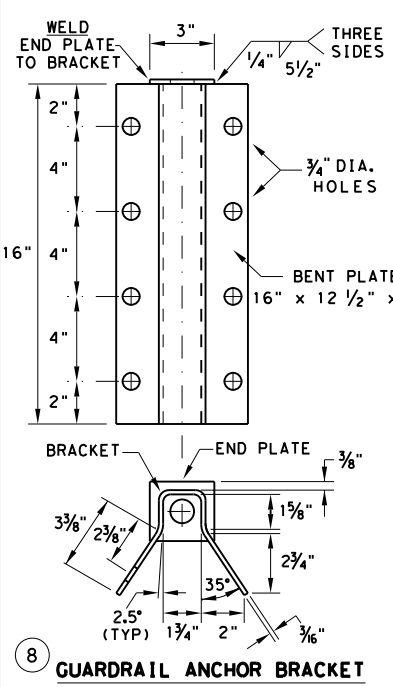
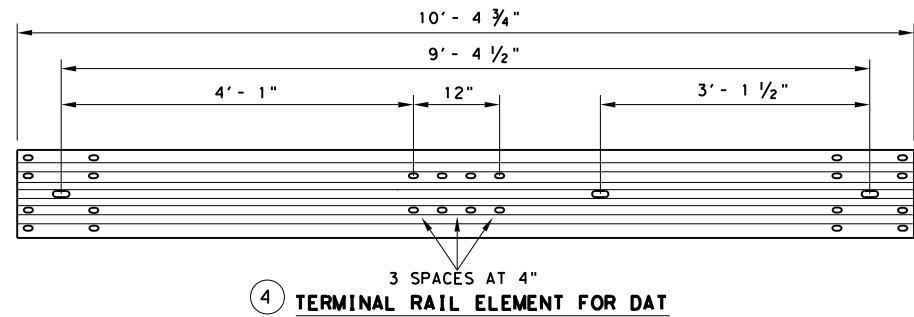


**DOWNSTREAM ANCHOR TERMINAL (DAT)**  
 NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

- 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.

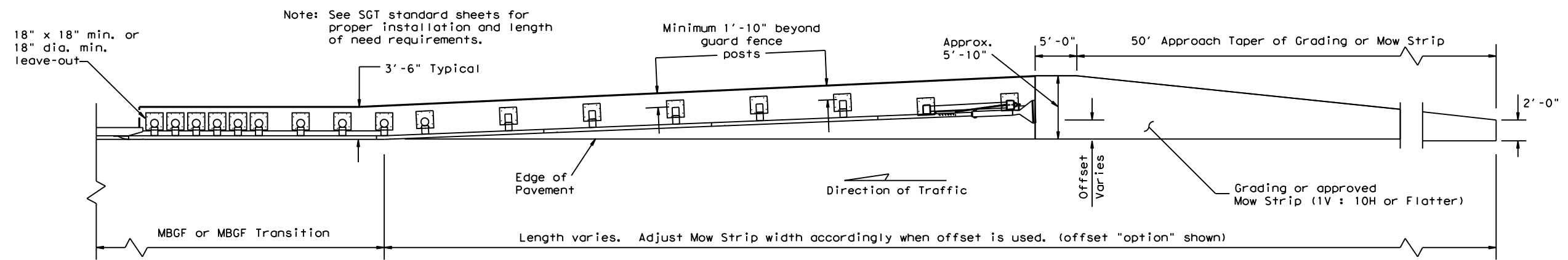
**MOW STRIP INSTALLATION**  
 IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(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



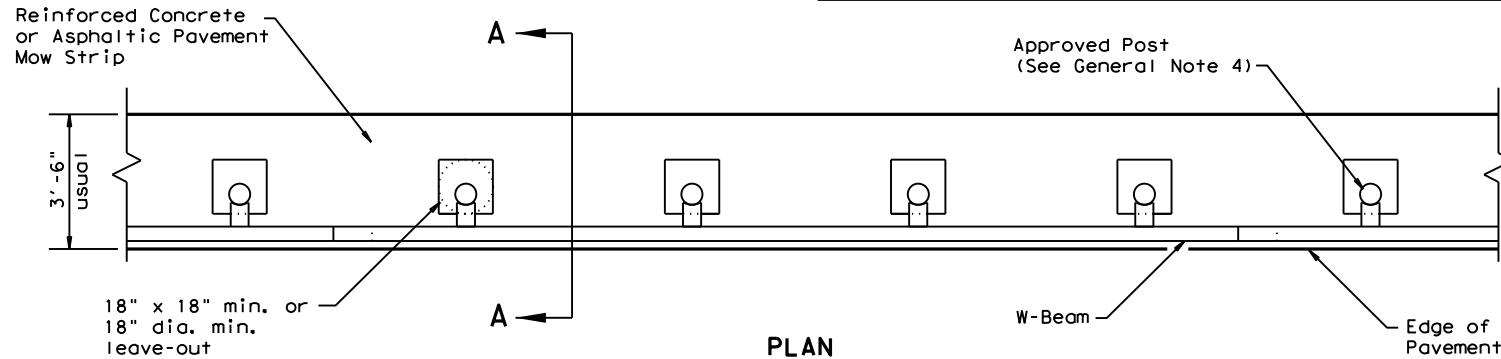
Design Division Standard  
**METAL BEAM GUARD FENCE (DOWNSTREAM ANCHOR TERMINAL) TL-3 MASH COMPLIANT GF(31)DAT-19**  
 FILE: gf31dot19.dgn DN: TXDOT CK: KM DW: VP CK: CGL/AG  
 © TXDOT: NOVEMBER 2019 CONT SECT JOB DIVISION HIGHWAY  
 REVISIONS 0003 01 064, ETC IH 10  
 DIST COUNTY SHEET NO.  
 ELP CULBERSON 45

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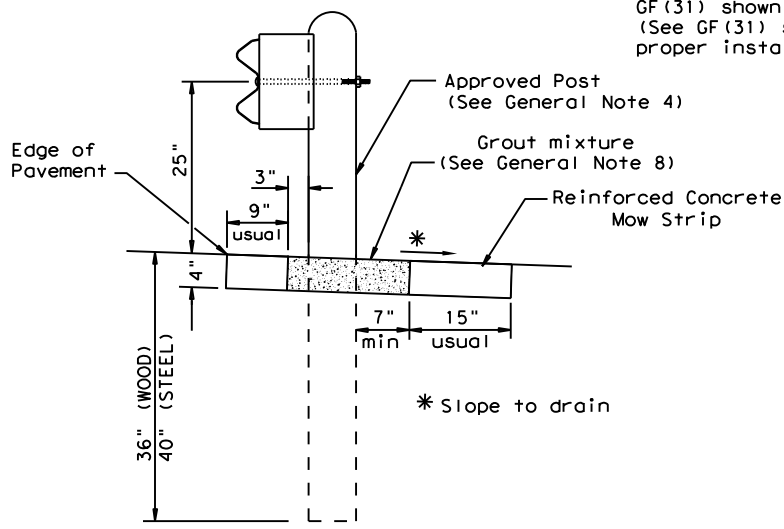
**GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS**

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.



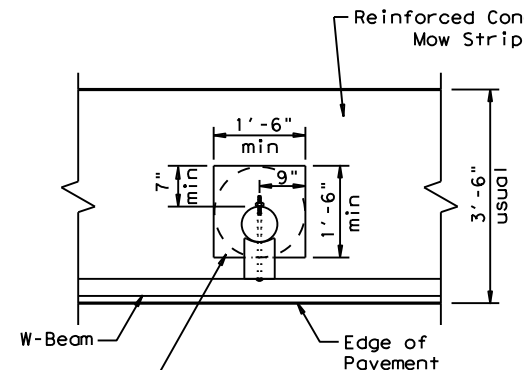
**PLAN**

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



**SECTION A-A**

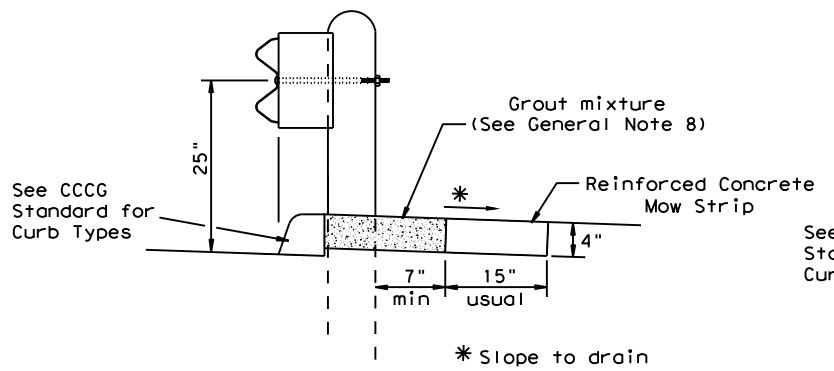
Typical



**MOW STRIP DETAIL**

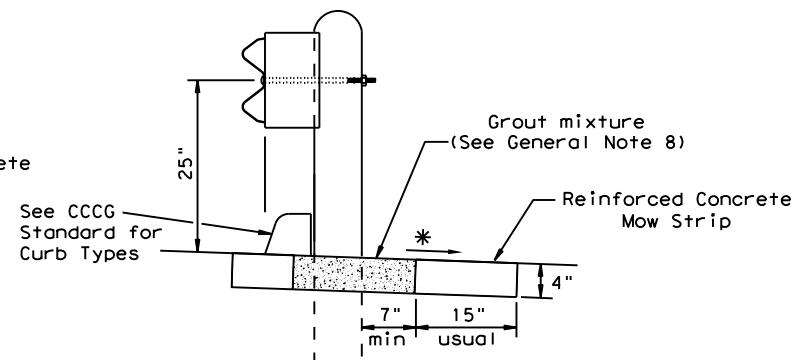
Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.

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



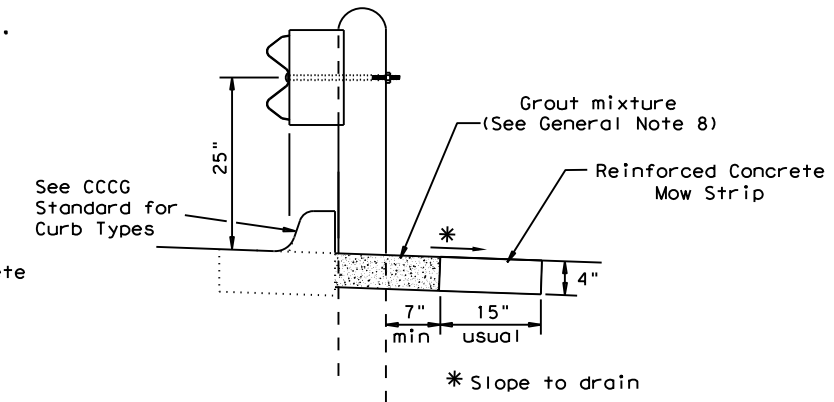
**CURB OPTION (1)**

This option will increase the post embedment throughout the system.



**CURB OPTION (2)**

Curb shown on top of mow strip

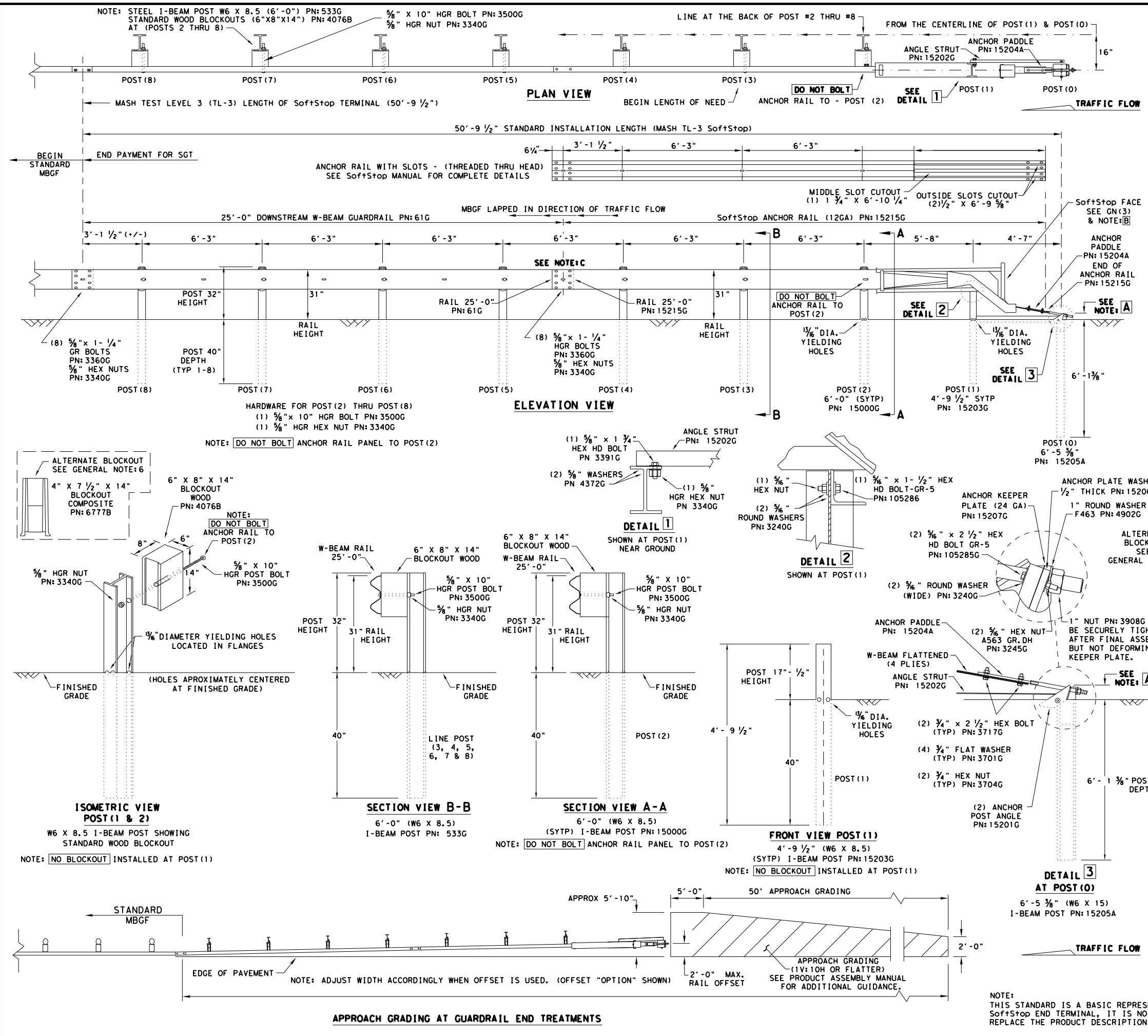


**CURB OPTION (3)**

				Design Division Standard
<b>METAL BEAM GUARD FENCE (MOW STRIP)</b> <b>TL-3 MASH COMPLIANT</b> <b>GF(31)MS-19</b>				
FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
	DIST	COUNTY	SHEET NO.	
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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 MOW STRIP 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 PADDL
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

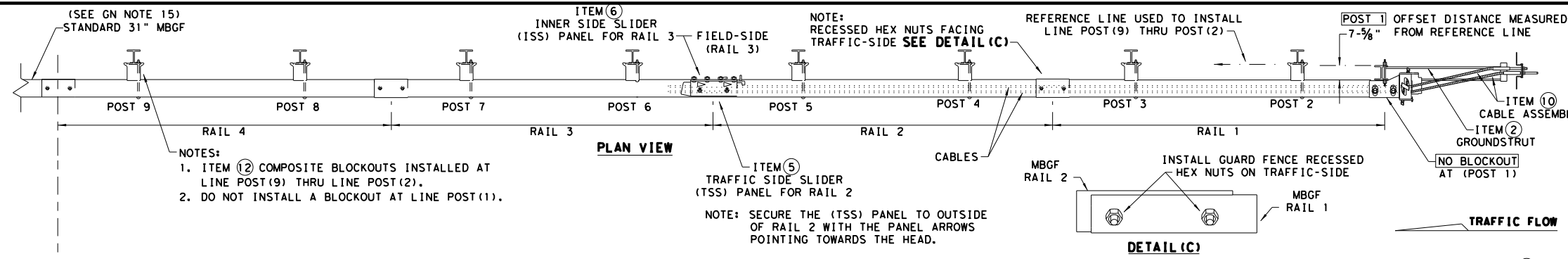
Texas Department of Transportation  
 Design Division Standard

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

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©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
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	ELP	CULBERSON	47	

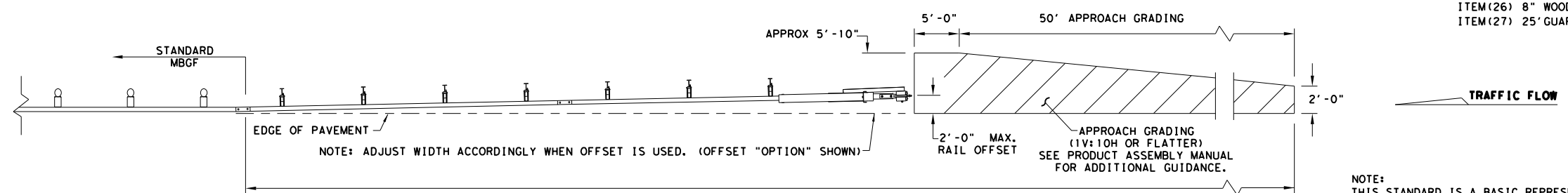
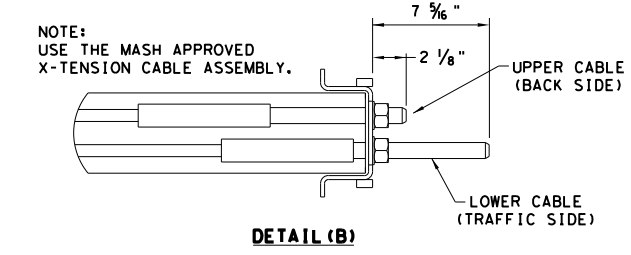
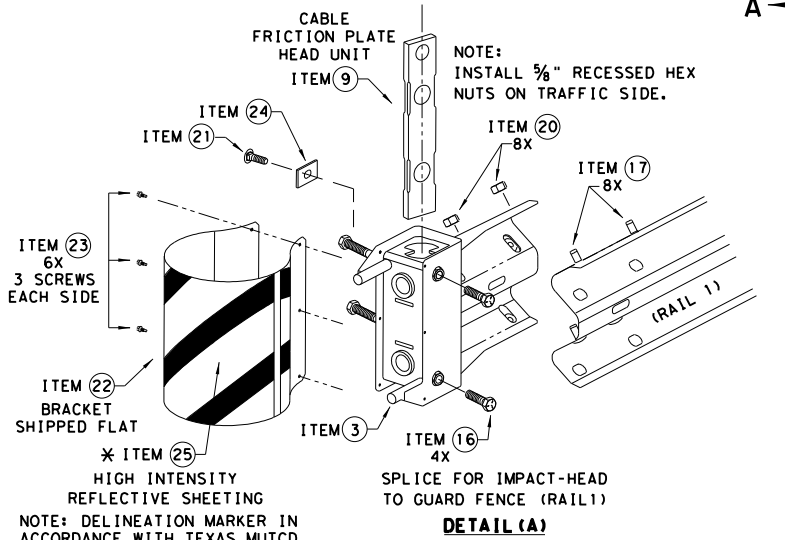
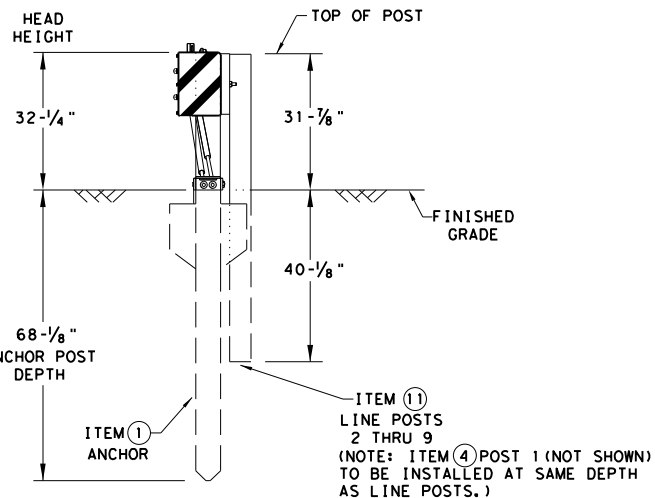
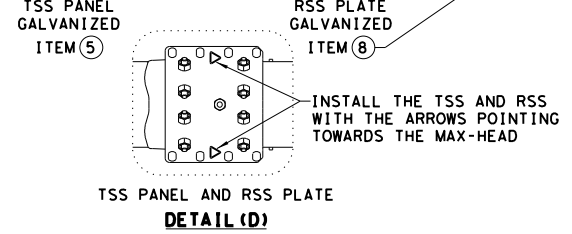
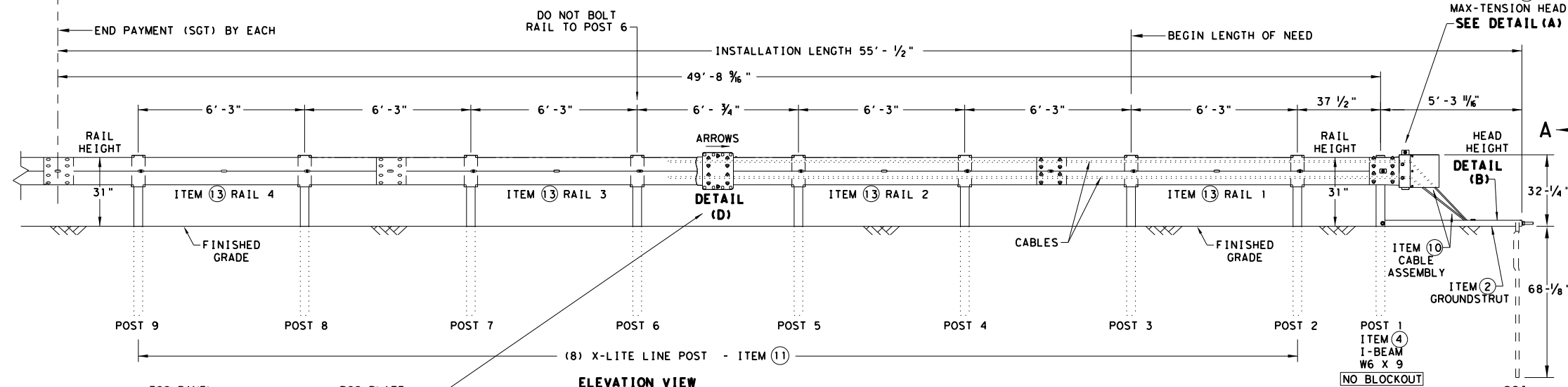
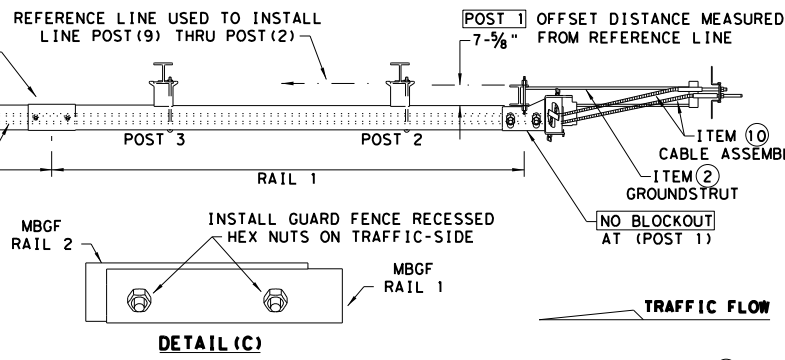
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NOTES:  
 1. ITEM ② COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (9) THRU LINE POST (2).  
 2. DO NOT INSTALL A BLOCKOUT AT LINE POST (1).

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



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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

GENERAL NOTES

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

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

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

**Texas Department of Transportation**  
 Design Division Standard

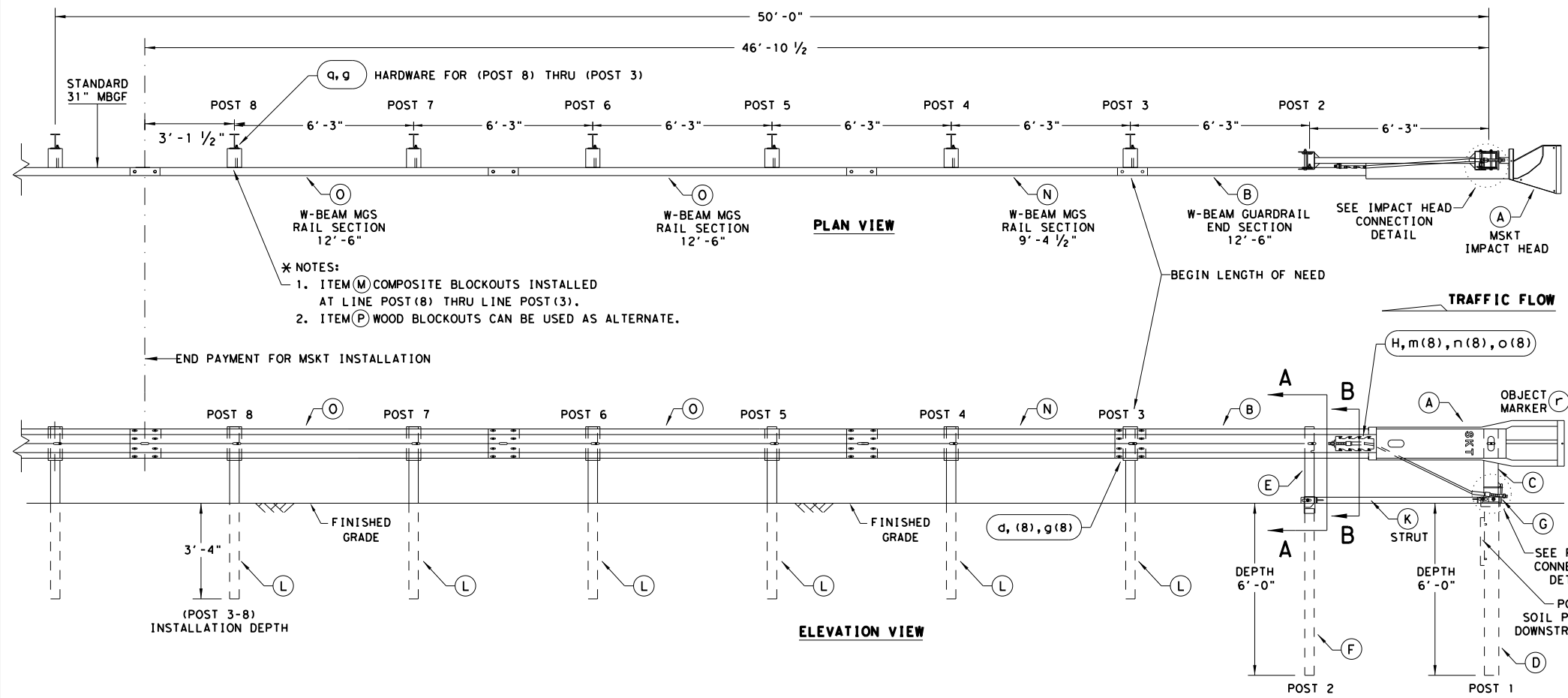
## MAX-TENSION END TERMINAL

### MASH - TL-3

### SGT (11S) 31-18

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© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
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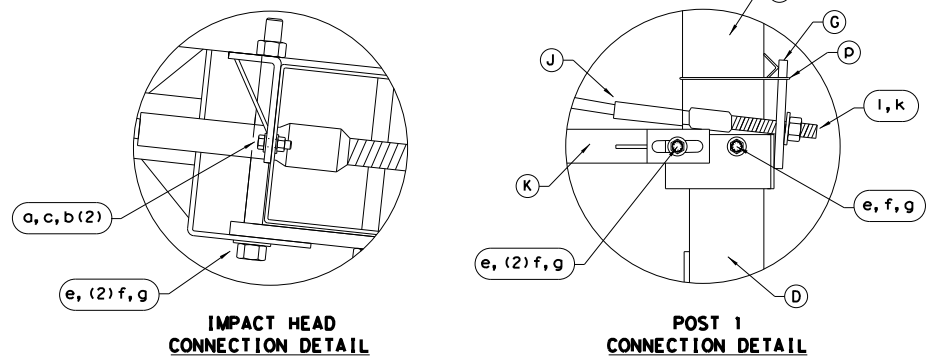
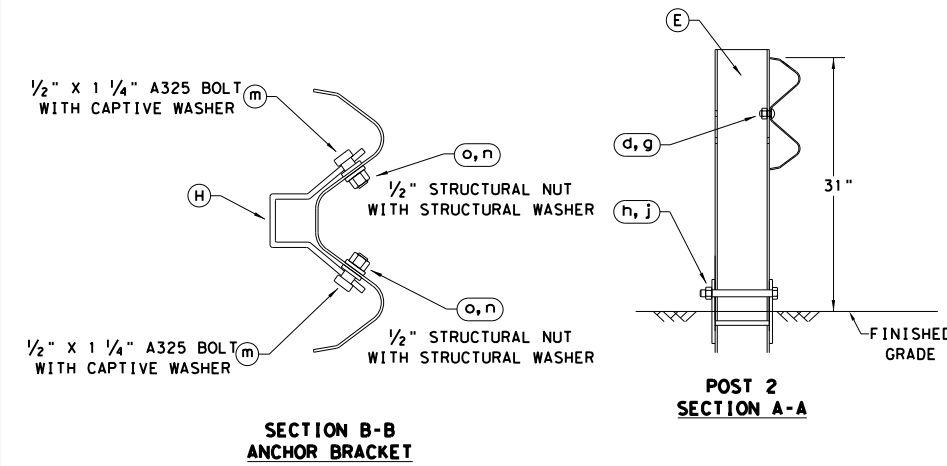
DISCLAIMER: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.  
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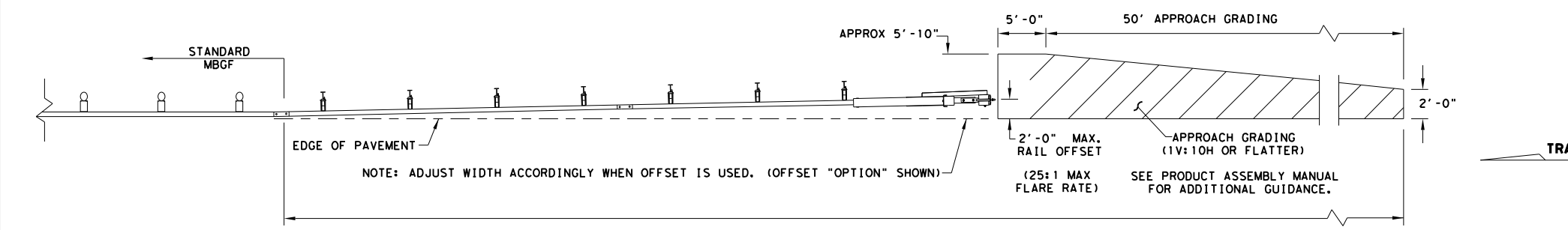
- \* NOTES:**
- ITEM (O) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (8) THRU LINE POST (3).
  - ITEM (P) WOOD BLOCKOUTS CAN BE USED AS ALTERNATE.

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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Go.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6X9 OR W6X8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
SMALL HARDWARE			
o	2	5/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	5/8" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
i	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/8" O.D. x 3/8" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151



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



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

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

**Design Division Standard**

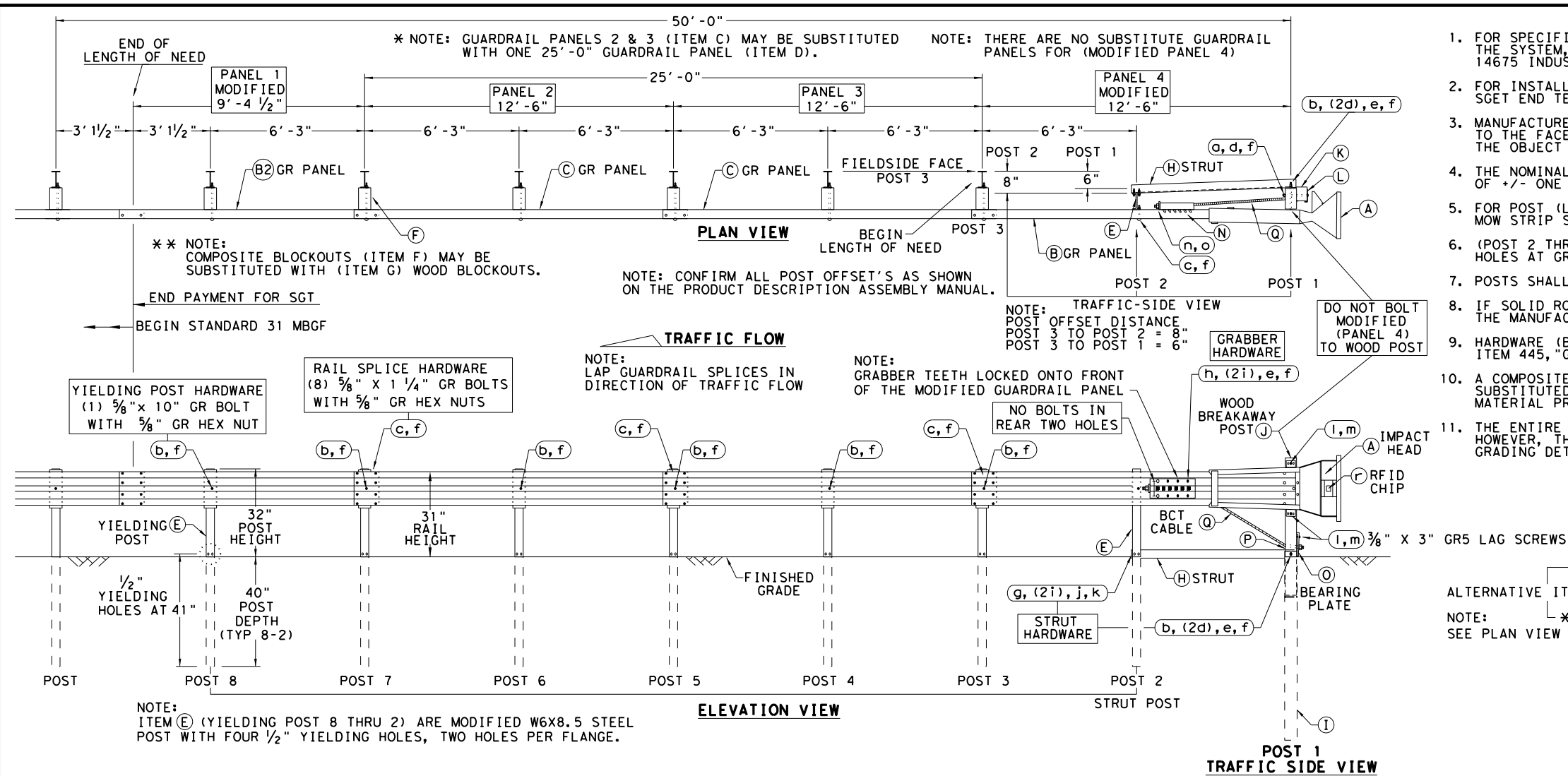
## SINGLE GUARDRAIL TERMINAL

### MSKT-MASH-TL-3

### SGT (12S) 31-18

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	DIST	COUNTY	SHEET NO.	
	ELP	CULBERSON	<b>49</b>	

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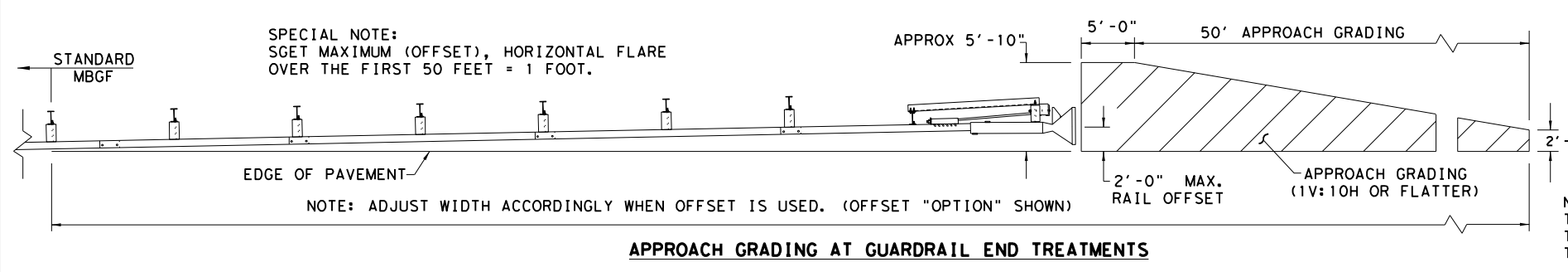
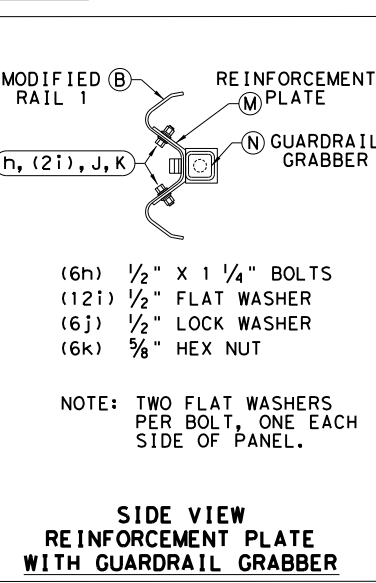
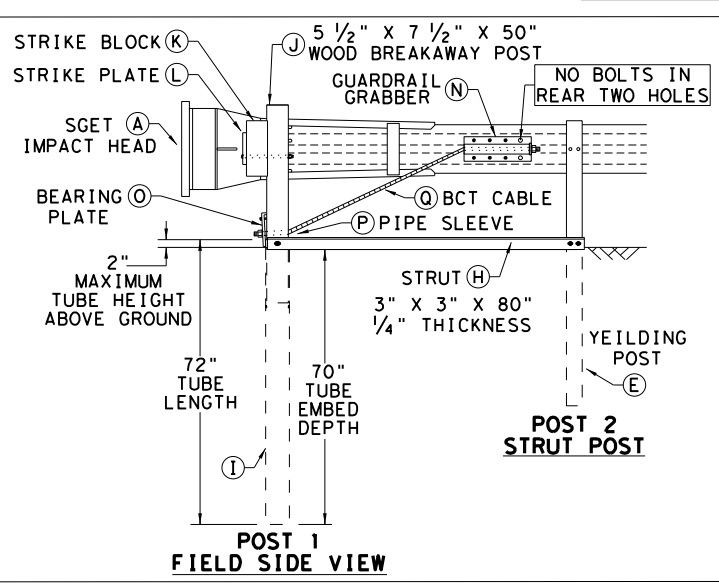
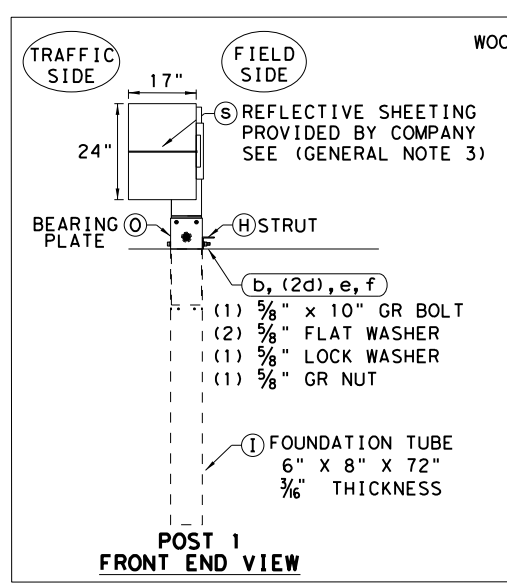
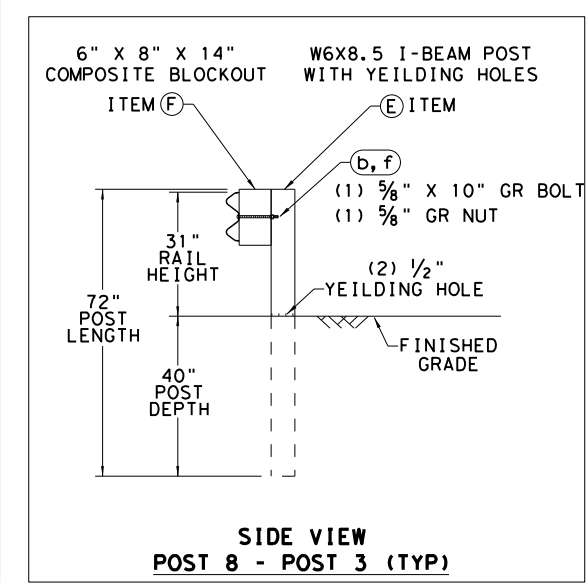


- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" X 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" X 3/8"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" X 7 1/2" X 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81

ITEM	QTY	SMALL HARDWARE	ITEM #
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPlice BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563HD HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M



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

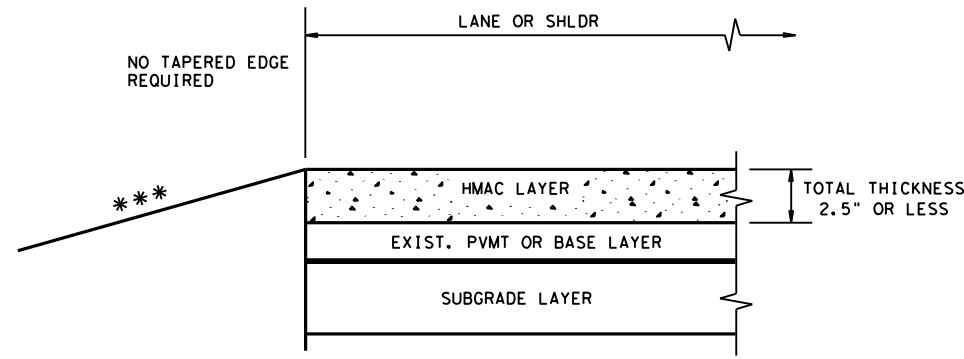
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**SINGLE GUARDRAIL TERMINAL**  
**SGET - TL-3 - MASH**  
**SGT (15) 31-20**

FILE: sgt153120.dgn	DN: TXDOT	CK: KM	DW: VP	CK: VP
© TXDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
	DIST	COUNTY	SHEET NO.	
	ELP	CULBERSON	50	

Design Division Standard

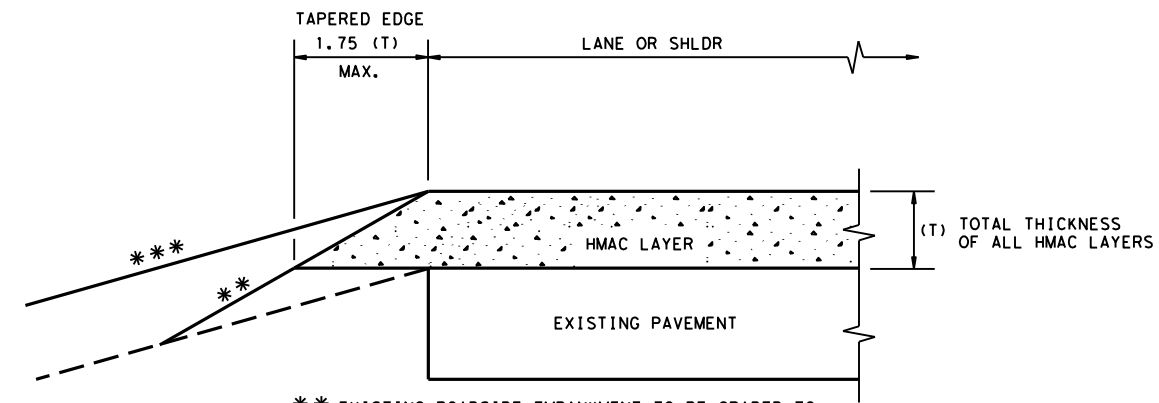
DISCLAIMER:  
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its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

DATE: 10/11/2023  
FILE: U:\000301064\MASTER DESIGN FILES\tehmac11.dgn



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

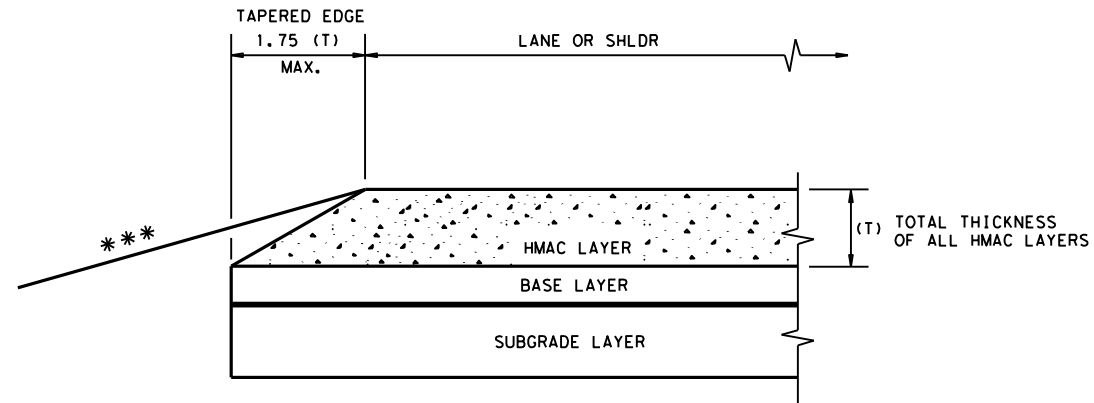
**CONDITION - 1**  
THIN HMAC SURFACES OR HMAC OVERLAY  
WITH THICKNESS OF 2.5" OR LESS



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

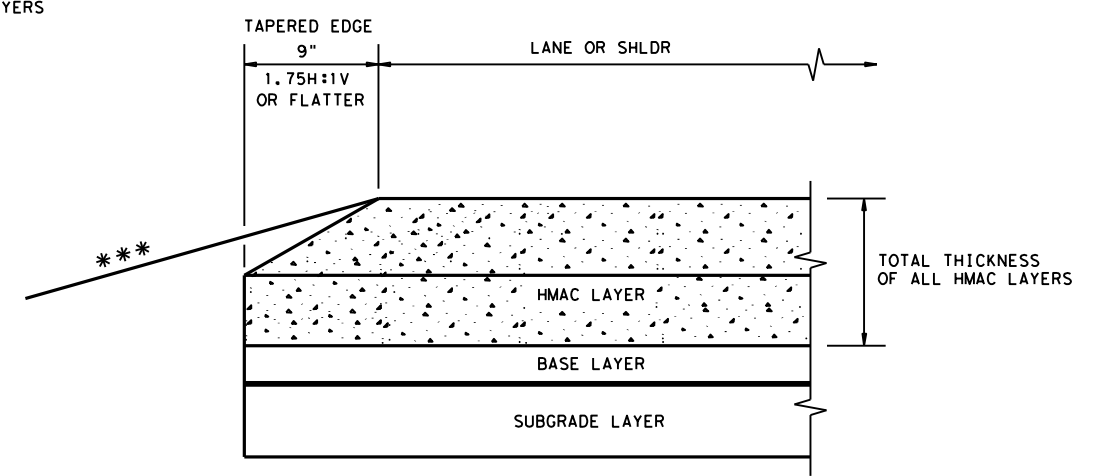
\*\*\* SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



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

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



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

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

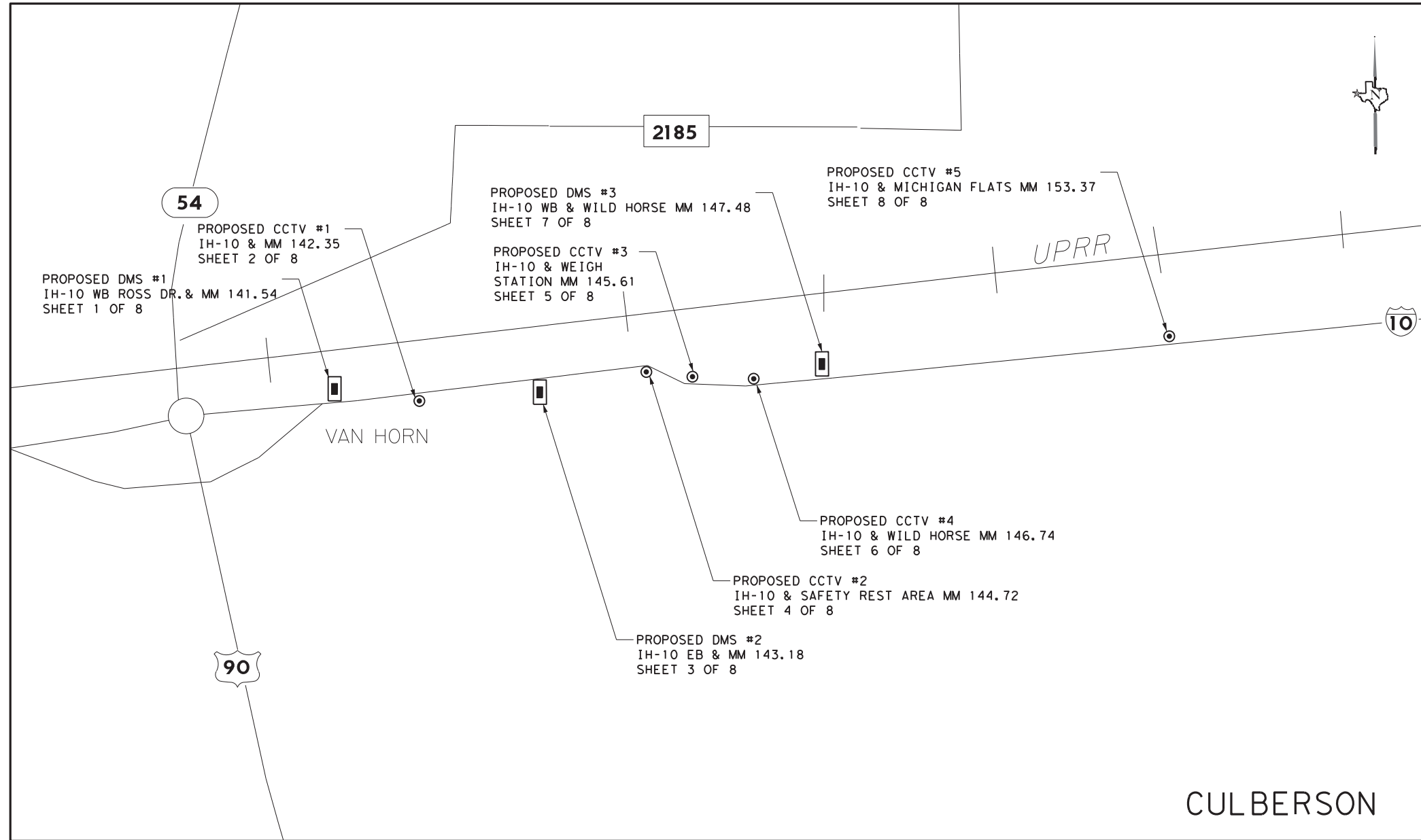
**GENERAL NOTES**

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

(NOT TO SCALE)

				Design Division Standard	
<b>TAPERED EDGE DETAILS HMAC PAVEMENT</b>					
<b>TE (HMAC) - 11</b>					
FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:	
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY	
REVISIONS		0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.		
ELP	CULBERSON		51		

DATE: 10/11/2023 10:36:50 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\1. GENERAL\GN Traffic\IH10 ITS KEY MAP.dgn



STATE OF TEXAS  
 EDUARDO I. ADAME  
 126153  
 LICENSED PROFESSIONAL ENGINEER  
*Eduardo I. Adame P.E.*  
 10/17/2023

CSJ003-01-064					
DEVICE	NAME	HIGHWAY	MM	**LATITUDE	**LONGITUDE
DMS #1	IH-10 WB ROSS DR. MM 141.54	IH 10	141+0.54	31.042125	-104.8070874
CCTV #1	IH-10 & MM 142.35	IH 10	142+0.35	31.042742	-104.7932391
DMS #2	IH-10 EB & MM 143.18	IH 10	143+0.18	31.043946	-104.7794535
CCTV #2	IH-10 & SAFETY REST AREA MM 144.72	IH 10	144+0.72	31.042873	-104.7536373
CCTV #3	IH-10 & WEIGH STATION MM 145.61	IH 10	145+0.61	31.043351	-104.7386479
CCTV #4	IH-10 & WILD HORSE MM 146.74	IH 10	146+0.74	31.044682	-104.7196162
DMS #3	IH-10 WB & WILD HORSE MM 147.48	IH 10	147+0.48	31.045624	-104.7071824

CSJ003-02-049					
DEVICE	NAME	HIGHWAY	MM	**LATITUDE	**LONGITUDE
CCTV #5	IH-10 & MICHIGAN FLATS MM 153.37	IH 10	153+0.37	31.053741	-104.6086638

\*\* FOR CONTRACTOR INFORMATION PURPOSES ONLY, DEVICE LOCATION MUST BE FIELD VERIFIED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.

CULBERSON

IH 10

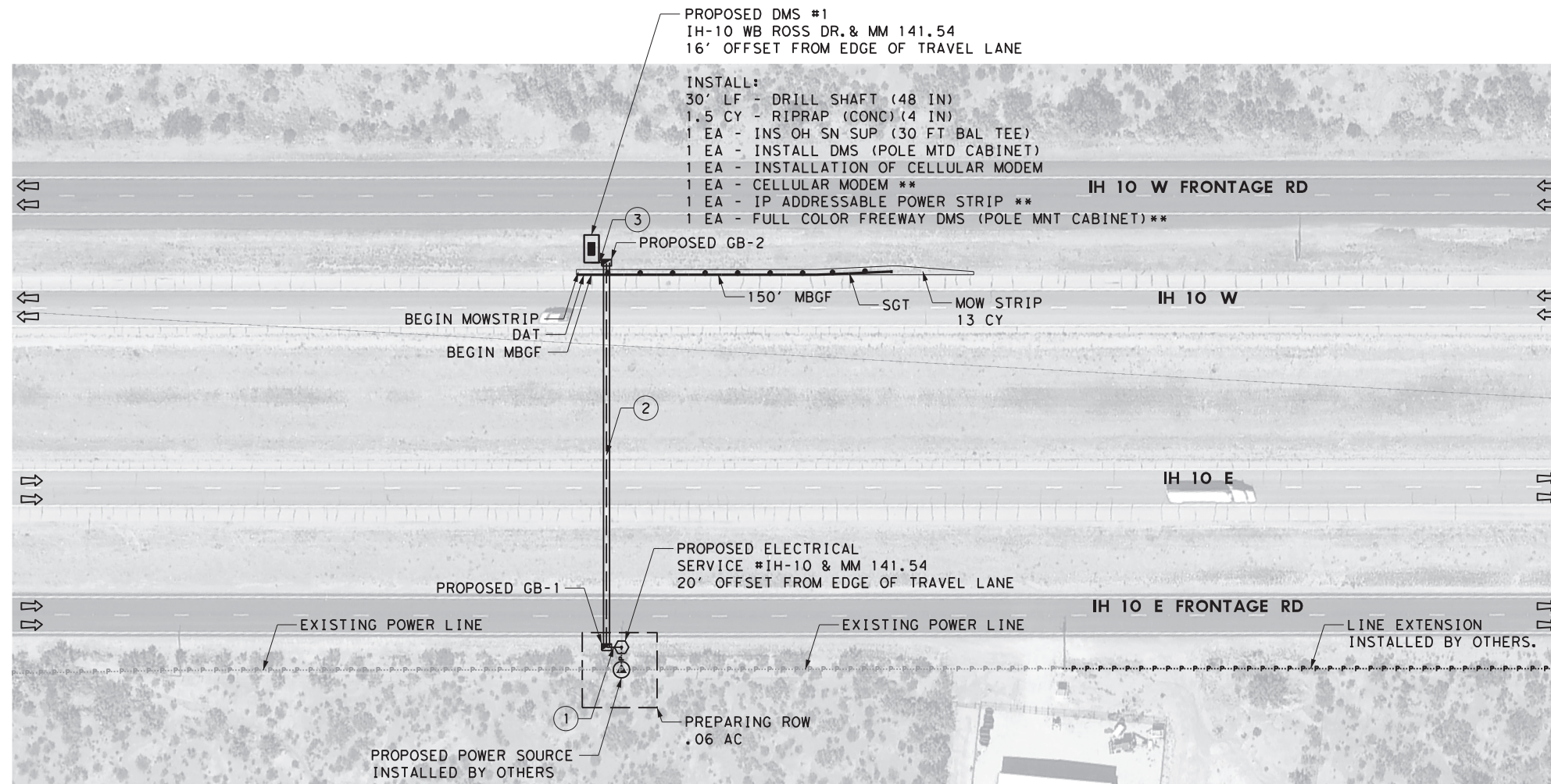
ITS  
KEY MAP

SCALE: N. T. S. SHEET 1 OF 1

Texas Department of Transportation		©2022	
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		52

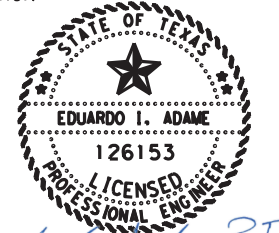


DATE: 10/11/2023 10:36:52 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC\IH0010\_TRF\_ITS\_Layout\_01.dgn



- LEGEND**
- EXISTING DMS
  - PROPOSED DMS
  - EXISTING ITS POLE
  - PROPOSED ITS POLE
  - EXISTING/PROPOSED ELECTRICAL SERVICE
  - EXISTING/PROPOSED POWER SOURCE
  - EXISTING/PROPOSED POWER LINE
  - PROPOSED GROUND BOX ( TY A )
  - EXISTING GROUND BOX
  - EXISTING CONDUIT
  - PROPOSED CONDUIT TRENCH
  - PROPOSED CONDUIT BORE
  - PROPOSED METAL BEAM GUARD FENCE
  - PROPOSED SMALL SIGN
  - TRAFFIC FLOW ARROW
  - CONDUIT RUN NUMBER

**NOTE:**  
 1. REFER TO STANDARD ITS (7)-15 FOR RIPRAP CONC. APRON



*Eduardo I. Adame P.E.*  
 10/17/2023

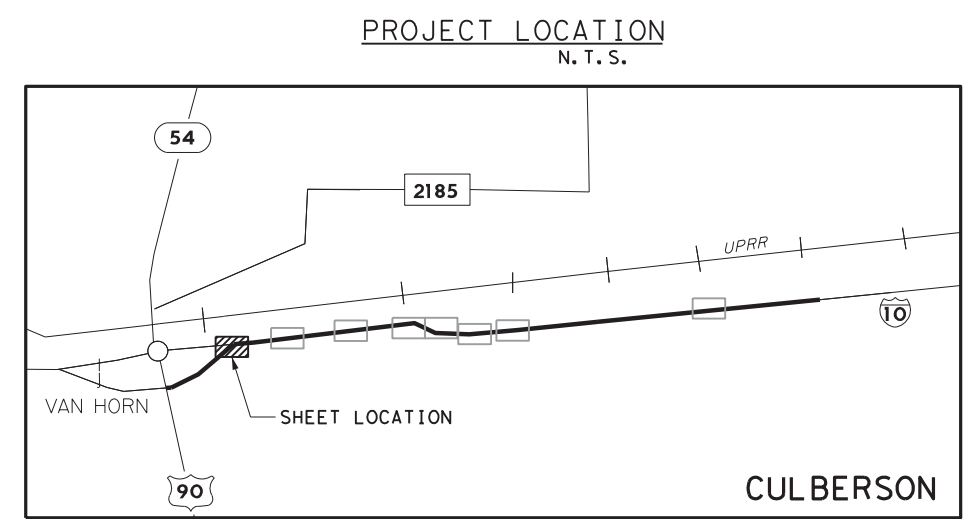
**ITS QUANTITIES (CSJ 0003-01-064)**

ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
100	6001	PREPARING ROW	AC	0.06
110	6003	EXCAVATION (SPECIAL)	CY	0.5
416	6006	DRILL SHAFT (48 IN)	LF	30
432	6001	RIPRAP (CONC) (4 IN)	CY	1.5
432	6045	RIPRAP (MOW STRIP) (4 IN)	CY	13
540	6002	MTL W-BEAM GD FEN (STEEL POST)	LF	150
540	6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1
544	6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1
618	6023	CONDT (PVC) (SCH 40) (2")	LF	20
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	260
620	6016	ELEC CONDR (NO. 2) INSULATED	LF	1180
624	6002	GROUND BOX TY A (122311) W/APRON	EA	2
628	6225	ELC SRV TY D 120/240 100(NS)GS(N)GC(O)	EA	1
650	6028	INS OH SN SUP(30 FT BAL TEE)	EA	1
6028	6001	INSTALL DMS (POLE MNT CABINET)	EA	1
6386	6001	INSTALLATION OF CELLULAR MODEM	EA	1
		CELLULAR MODEM**	EA	1
		IP ADDRESSABLE POWER STRIP**	EA	1
		FULL COLOR FREEWAY DMS (POLE MTD CABINET)**	EA	1

\*\* ITEMS PROVIDED BY THE STATE

**CONDUIT AND CONDUCTOR RUNS**

RUN NO.	LENGTH OF RUN (FT)	CONDUIT (FT)				ELECTRICAL CONDUCTOR			
		SCHED 40 PVC (2")		ELEC CONDR (NO. 2) INSUL		ELEC CONDR (NO. 2) INSUL		POWER	
		EA	TRENCH	EA	BORE	GROUND	POWER		
1	10	1	10	0	1	15	3	3	45
2	260	0	0	1	260	1	265	3	795
3	10	1	10	0	1	15	3	3	45
<b>TOTAL</b>			20		260	295			885

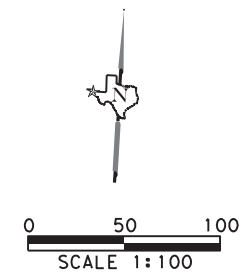
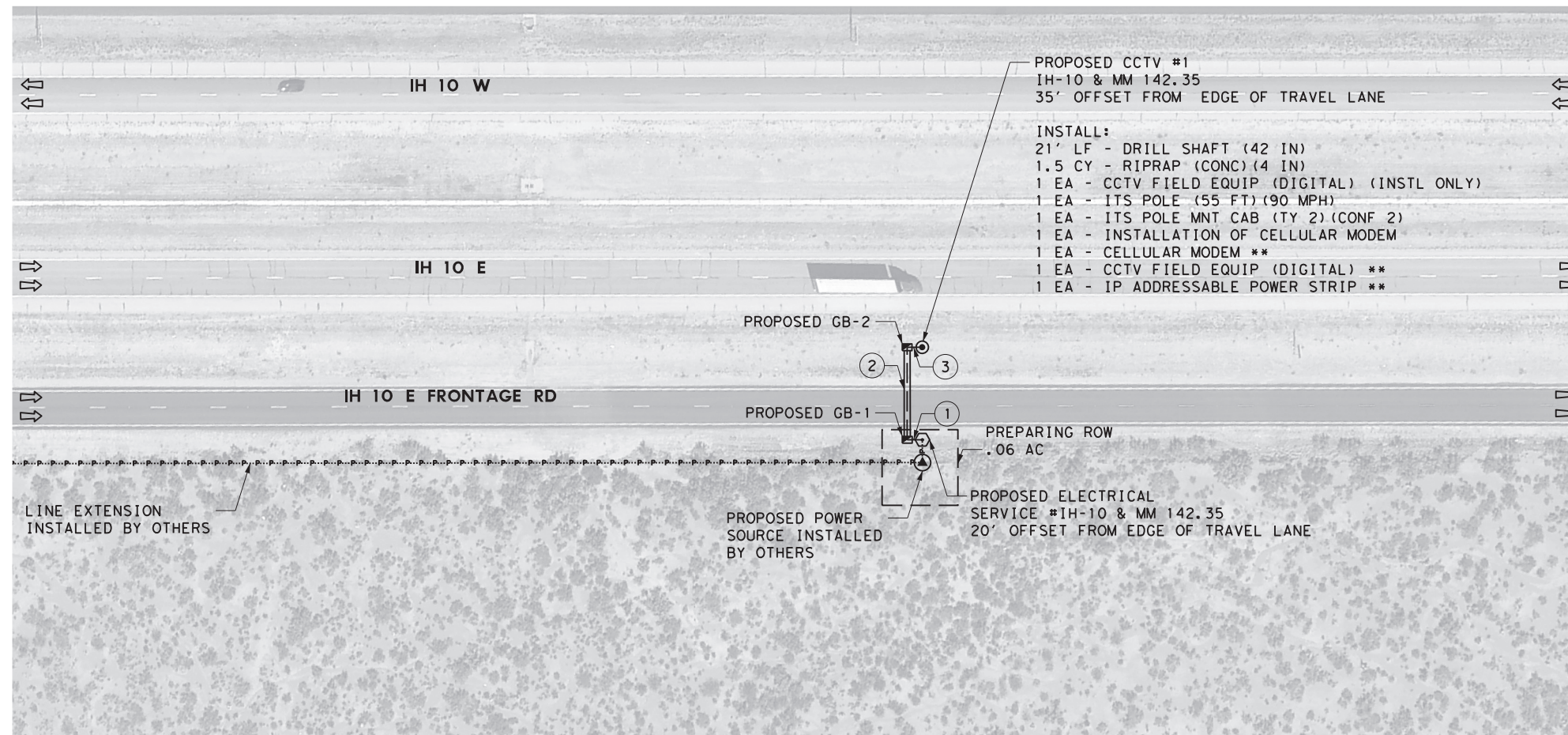


**IH 10**  
**ITS LAYOUT**  
 IH 10 &  
 MM 141.54

SHEET 1 OF 8  
 ©2022

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		53

DATE: 10/11/2023 10:37:33 AM  
FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC\IH0010\_TRF\_ITS\_Layout\_02.dgn



- LEGEND**
- EXISTING DMS
  - PROPOSED DMS
  - EXISTING ITS POLE
  - PROPOSED ITS POLE
  - EXISTING/PROPOSED ELECTRICAL SERVICE
  - EXISTING/PROPOSED POWER SOURCE
  - EXISTING/PROPOSED POWER LINE
  - PROPOSED GROUND BOX (TY A)
  - EXISTING GROUND BOX
  - EXISTING CONDUIT
  - PROPOSED CONDUIT TRENCH
  - PROPOSED CONDUIT BORE
  - PROPOSED METAL BEAM GUARD FENCE
  - PROPOSED SMALL SIGN
  - TRAFFIC FLOW ARROW
  - CONDUIT RUN NUMBER

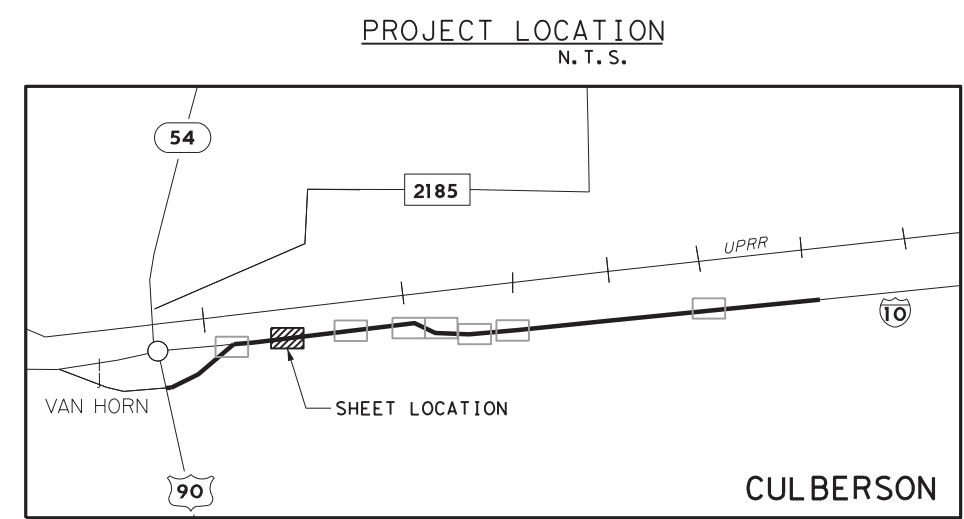
**NOTE:**

1. REFER TO STANDARD ITS (7)-15 FOR RIPRAP CONC. APRON

ITS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
100	6001	PREPARING ROW	AC	0.06
110	6003	EXCAVATION (SPECIAL)	CY	0.5
416	6005	DRILL SHAFT (42 IN)	LF	21
432	6001	RIPRAP (CONC) (4 IN)	CY	1.5
618	6023	CONDT (PVC) (SCH 40) (2")	LF	20
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	60
620	6010	ELEC CONDR (NO. 6) INSULATED	LF	285
624	6002	GROUND BOX TY A (122311)W/APRON	EA	2
628	6128	ELC SRV TY D 120/240 060 (NS)GS (N)GC (O)	EA	1
6010	6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	1
6064	6046	ITS POLE (55 FT) (90 MPH)	EA	1
6064	6084	ITS POLE MNT CAB (TY 2) (CONF 2)	EA	1
6386	6001	INSTALLATION OF CELLULAR MODEM	EA	1
		CELLULAR MODEM**	EA	1
		CCTV FIELD EQUIPMENT (DIGITAL)**	EA	1
		IP ADDRESSABLE POWER STRIP**	EA	1

\*\* ITEMS PROVIDED BY THE STATE

RUN NO.	LENGTH OF RUN (FT)	CONDUIT (FT)				ELECTRICAL CONDUCTOR				
		SCHED 40 PVC (2")				ELEC CONDR (NO. 6) INSUL				
		EA	TRENCH	EA	BORE	GROUND	POWER	GROUND	POWER	
1	10	1	10	0	1	15	2	30		
2	60		0	1	60	1	65	2	130	
3	10	1	10		0	1	15	2	30	
<b>TOTAL</b>			20		60		95		190	



Eduardo I. Adame P.E.  
 10/17/2023

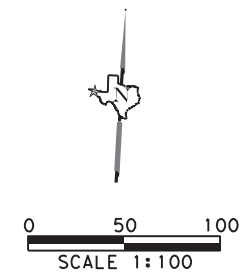
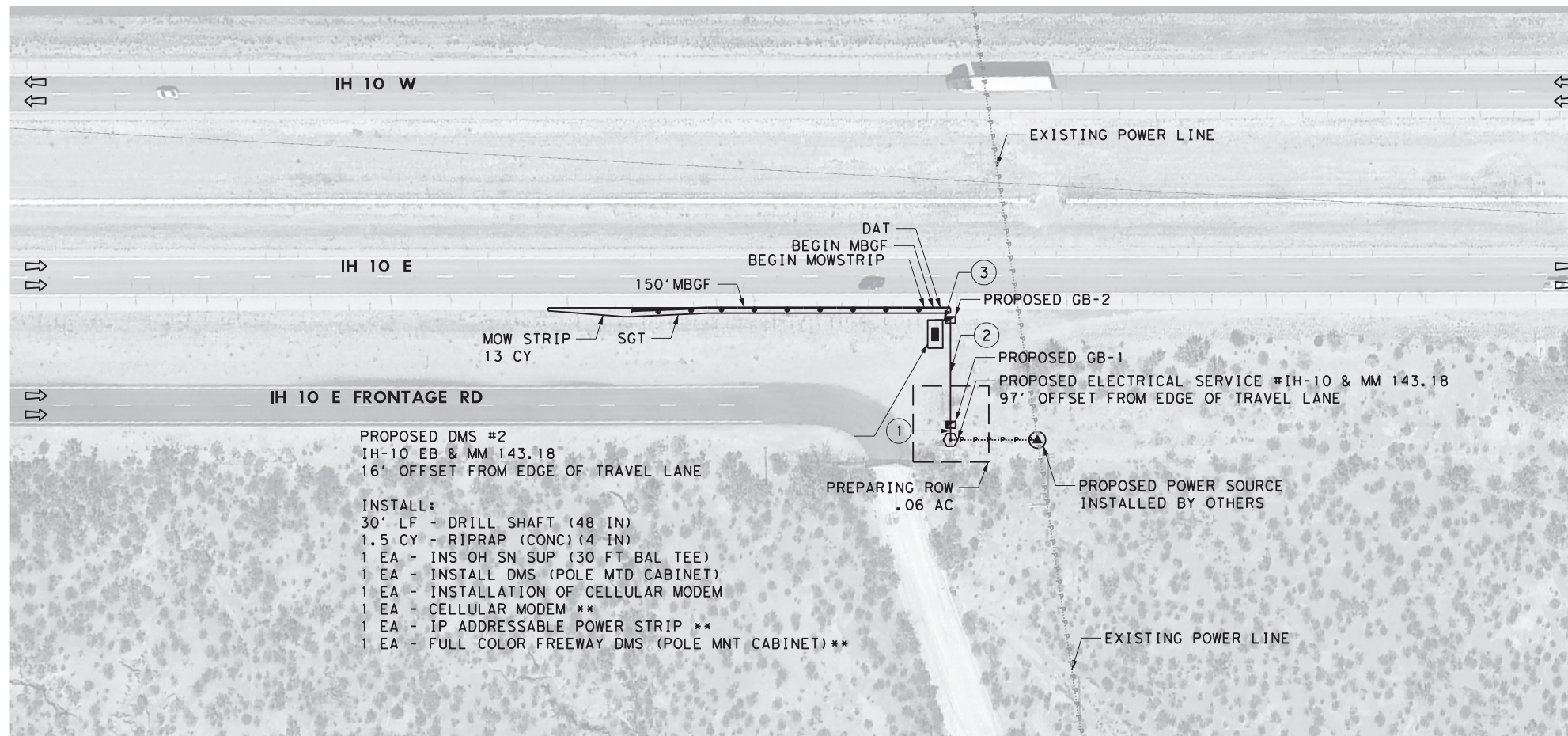
**ITS LAYOUT**

IH 10 & MM 142.35

SHEET 2 OF 8

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		54

DATE: 10/11/2023 10:38:19 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC\IH0010\_TRF\_ITS\_Layout\_03.dgn



- LEGEND**
- EXISTING DMS
  - PROPOSED DMS
  - EXISTING ITS POLE
  - PROPOSED ITS POLE
  - EXISTING/PROPOSED ELECTRICAL SERVICE
  - EXISTING/PROPOSED POWER SOURCE
  - EXISTING/PROPOSED POWER LINE
  - PROPOSED GROUND BOX ( TY A )
  - EXISTING GROUND BOX
  - EXISTING CONDUIT
  - PROPOSED CONDUIT TRENCH
  - PROPOSED CONDUIT BORE
  - PROPOSED METAL BEAM GUARD FENCE
  - PROPOSED SMALL SIGN
  - TRAFFIC FLOW ARROW
  - CONDUIT RUN NUMBER

**NOTE:**  
 1. REFER TO STANDARD ITS (7)-15 FOR RIPRAP CONC. APRON

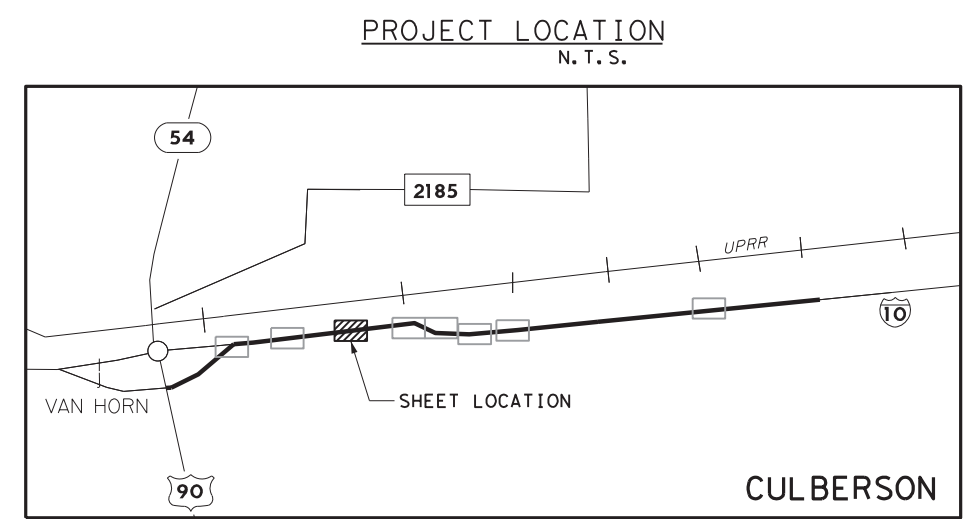
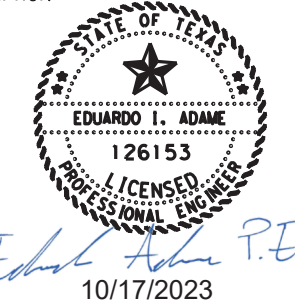
ITS QUANTITIES (CSJ 0003-01-064)

ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
100	6001	PREPARING ROW	AC	0.06
110	6003	EXCAVATION (SPECIAL)	CY	0.5
416	6006	DRILL SHAFT (48 IN)	LF	30
432	6001	RIPRAP (CONC) (4 IN)	CY	1.5
432	6045	RIPRAP (MOW STRIP) (4 IN)	CY	13
540	6002	MTL W-BEAM GD FEN (STEEL POST)	LF	150
540	6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1
544	6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1
618	6023	CONDT (PVC) (SCH 40) (2")	LF	90
620	6010	ELEC CONDR (NO.6) INSULATED	LF	420
624	6002	GROUND BOX TY A (122311)W/APRON	EA	2
628	6225	ELC SRV TY D 120/240 100(NS)GS(N)GC(O)	EA	1
650	6028	INS OH SN SUP(30 FT BAL TEE)	EA	1
6028	6001	INSTALL DMS (POLE MNT CABINET)	EA	1
6386	6001	INSTALLATION OF CELLULAR MODEM	EA	1
		CELLULAR MODEM**	EA	1
		IP ADDRESSABLE POWER STRIP**	EA	1
		FULL COLOR FREEWAY DMS (POLE MTD CABINET)**	EA	1

\*\* ITEMS PROVIDED BY THE STATE  
 \*\*\* ITEMS PROVIDED AND INSTALLED BY RIO GRANDE ELECTRIC AND PAID BY TXDOT USING STATE FORCE

CONDUIT AND CONDUCTOR RUNS

RUN NO.	LENGTH OF RUN (FT)	CONDUIT (FT)				ELECTRICAL CONDUCTOR			
		SCHED 40 PVC (2")		BORE		ELEC CONDR (NO. 6) INSUL		POWER	
		EA	TRENCH	EA	BORE	GROUND	POWER	GROUND	POWER
1	10	1	10		0	1	15	3	45
2	70	1	70		0	1	75	3	225
3	10	1	10		0	1	15	3	45
<b>TOTAL</b>			90		0		105		315

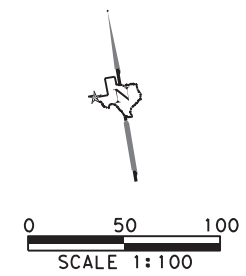
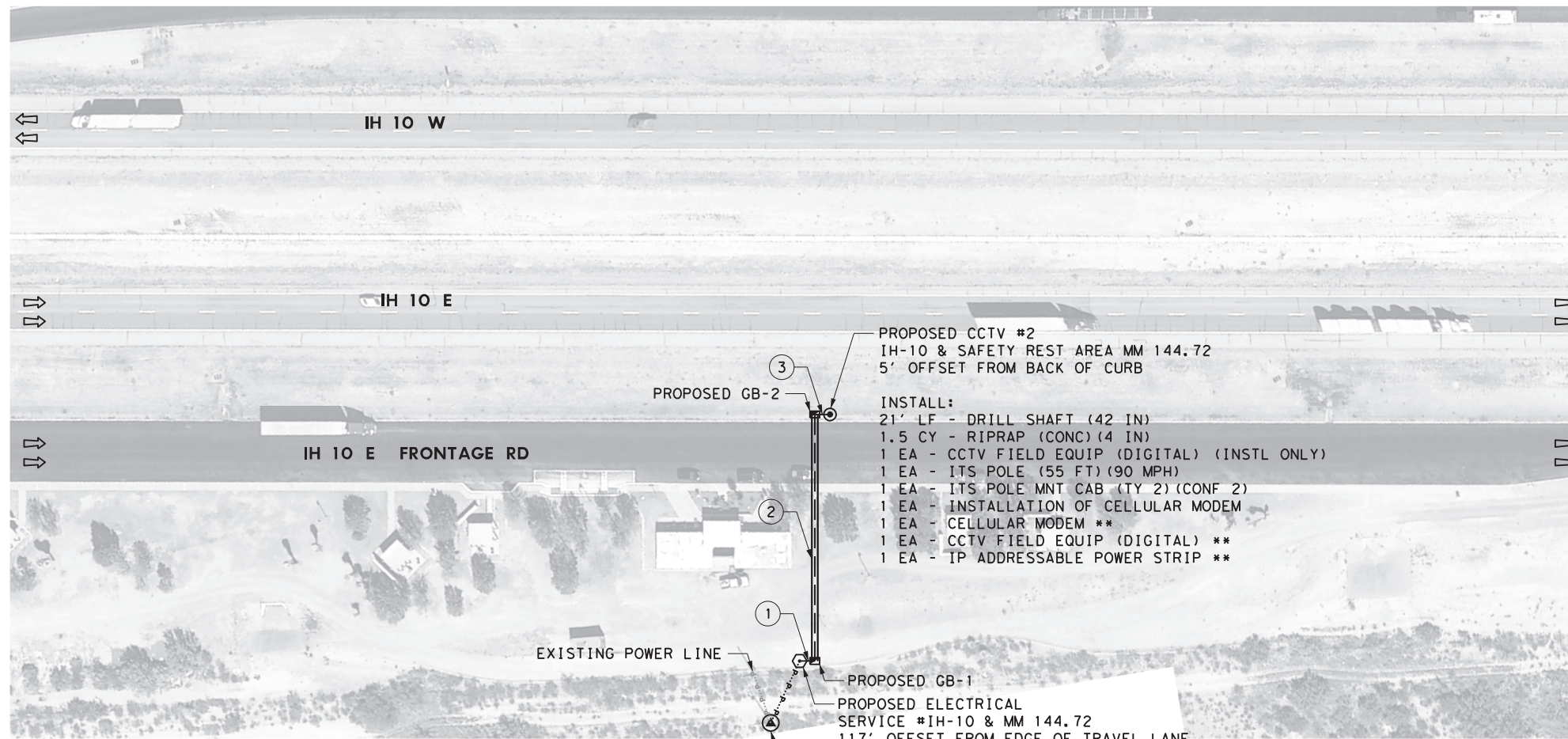


**IH 10**  
**ITS LAYOUT**  
 IH 10 &  
 MM 143.18

SHEET 3 OF 8  
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CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		55

DATE: 10/11/2023 10:38:37 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC\IH0010\_TRF\_ITS\_Layout\_04.dgn



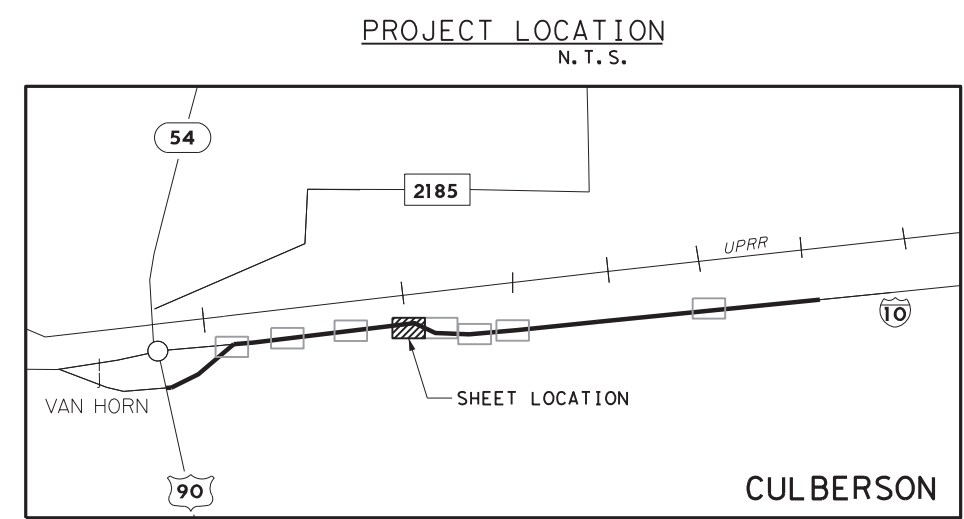
- LEGEND**
- EXISTING DMS
  - PROPOSED DMS
  - EXISTING ITS POLE
  - PROPOSED ITS POLE
  - EXISTING/PROPOSED ELECTRICAL SERVICE
  - EXISTING/PROPOSED POWER SOURCE
  - EXISTING/PROPOSED POWER LINE
  - PROPOSED GROUND BOX (TY A)
  - EXISTING GROUND BOX
  - EXISTING CONDUIT
  - PROPOSED CONDUIT TRENCH
  - PROPOSED CONDUIT BORE
  - PROPOSED METAL BEAM GUARD FENCE
  - PROPOSED SMALL SIGN
  - TRAFFIC FLOW ARROW
  - CONDUIT RUN NUMBER

NOTE:  
 1. REFER TO STANDARD ITS (7)-15 FOR RIPRAP CONC. APRON

ITS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
110	6003	EXCAVATION (SPECIAL)	CY	0.5
416	6005	DRILL SHAFT (42 IN)	LF	21
432	6001	RIPRAP (CONC) (4 IN)	CY	1.5
618	6023	CONDT (PVC) (SCH 40) (2")	LF	20
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	165
620	6010	ELEC CONDR (NO. 6) INSULATED	LF	600
624	6002	GROUND BOX TY A (122311)W/APRON	EA	2
6010	6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	1
6064	6046	ITS POLE (55 FT) (90 MPH)	EA	1
6064	6084	ITS POLE MNT CAB (TY 2) (CONF 2)	EA	1
6386	6001	INSTALLATION OF CELLULAR MODEM	EA	1
		CELLULAR MODEM**	EA	1
		CCTV FIELD EQUIPMENT (DIGITAL)**	EA	1
		IP ADDRESSABLE POWER STRIP**	EA	1
		ELC SRV TY D 120/240 060 (NS) GS (N) TP (O) ***	EA	1

\*\* ITEMS PROVIDED BY THE STATE  
 \*\*\* ITEMS PROVIDED AND INSTALLED BY RIO GRANDE ELECTRIC AND PAID BY TXDOT USING STATE FORCE

RUN NO.	LENGTH OF RUN (FT)	CONDUIT (FT)				ELECTRICAL CONDUCTOR			
		SCHED 40 PVC (2")				ELEC CONDR (NO. 6) INSUL			
		EA	TRENCH	EA	BORE	GROUND		POWER	
1	10	1	10		0	1	15	2	30
2	165		0	1	165	1	170	2	340
3	10	1	10		0	1	15	2	30
<b>TOTAL</b>			20		165		200		400



Eduardo I. Adame P.E.  
 10/17/2023

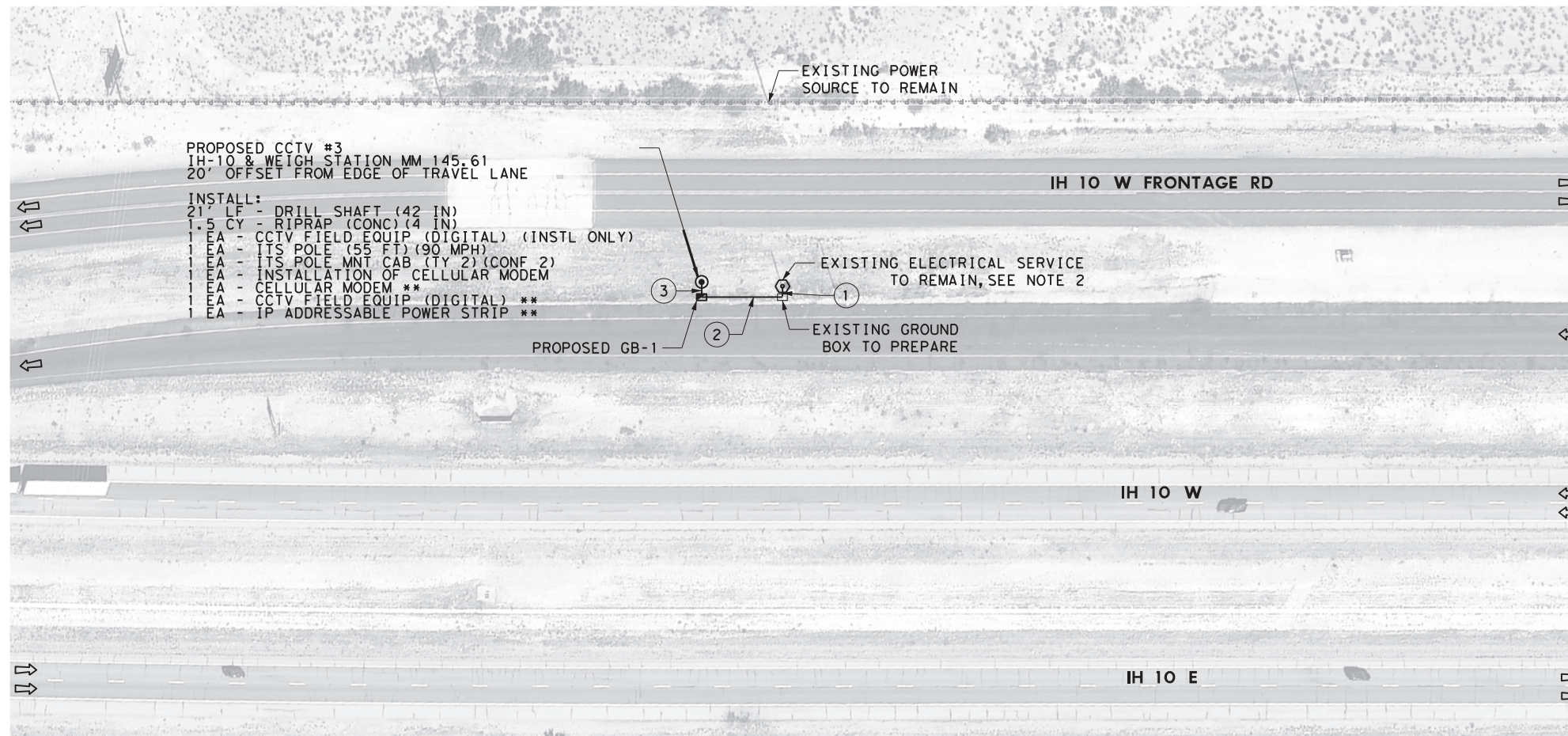
**IH 10  
ITS LAYOUT**

IH 10 &  
SAFETY REST AREA MM 144.72

SHEET 4 OF 8  
©2022

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		56

DATE: 10/11/2023 10:39:12 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC\IH0010\_TRF\_ITS\_Layout\_05.dgn



**LEGEND**

- EXISTING DMS
- PROPOSED DMS
- EXISTING ITS POLE
- PROPOSED ITS POLE
- EXISTING/PROPOSED ELECTRICAL SERVICE
- EXISTING/PROPOSED POWER SOURCE
- EXISTING/PROPOSED POWER LINE
- PROPOSED GROUND BOX (TY A)
- EXISTING GROUND BOX
- EXISTING CONDUIT
- PROPOSED CONDUIT TRENCH
- PROPOSED CONDUIT BORE
- PROPOSED METAL BEAM GUARD FENCE
- PROPOSED SMALL SIGN
- TRAFFIC FLOW ARROW
- CONDUIT RUN NUMBER

- NOTE:**
- REFER TO STANDARD ITS (7)-15 FOR RIPRAP CONC. APRON
  - CONTRACTOR WILL CONTACT RIO GRANDE ELECTRIC FOR TEMPORARY DISCONNECT AT METER 29586A. CONTRACTOR WILL REPLACE EXISTING MAIN DISCONNECT & BREAKER BOX WITH NEW 100A MAIN DISCONNECT PANEL & BREAKER BOX UNDERNEATH EXISTING METER CAN. THIS WORK WILL BE SUBSIDIARY TO ITEM 6084-6001.

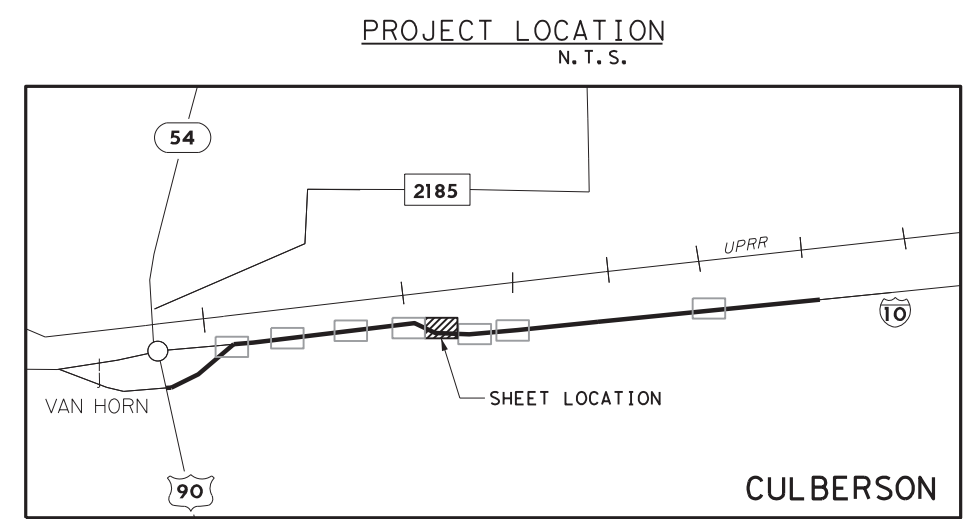
ITS QUANTITIES (CSJ 0003-01-064)

ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
110	6003	EXCAVATION (SPECIAL)	CY	0.5
416	6005	DRILL SHAFT (42 IN)	LF	21
432	6001	RIPRAP (CONC) (4 IN)	CY	1.5
618	6023	CONDT (PVC) (SCH 40) (2")	LF	65
620	6010	ELEC CONDR (NO.6) INSULATED	LF	270
624	6002	GROUND BOX TY A (122311)W/APRON	EA	1
6010	6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	1
6027	6003	CONDUIT (PREPARE)	LF	10
6027	6008	GROUND BOX (PREPARE)	EA	1
6064	6046	ITS POLE (55 FT) (90 MPH)	EA	1
6064	6084	ITS POLE MNT CAB (TY 2) (CONF 2)	EA	1
6084	6001	MODIFY EXISTING ELECTRICAL SERVICE	EA	1
6386	6001	INSTALLATION OF CELLULAR MODEM	EA	1
		CELLULAR MODEM**	EA	1
		CCTV FIELD EQUIPMENT (DIGITAL)**	EA	1
		IP ADDRESSABLE POWER STRIP**	EA	1

\*\* ITEMS PROVIDED BY THE STATE  
 \*\*\* ITEMS PROVIDED AND INSTALLED BY RIO GRANDE ELECTRIC AND PAID BY TXDOT USING STATE FORCE

CONDUIT AND CONDUCTOR RUNS

RUN NO.	LENGTH OF RUN (FT)	CONDUIT (FT)						ELECTRICAL CONDUCTOR			
		SCH 40 PVC (2")						ELEC CONDR (NO. 6) INSUL			
		EA	CONDUIT (PREPARE)	EA	TRENCH	EA	BORE	GROUND	POWER	EA	BORE
1	10	1	10		0		0	1	15	2	30
2	55		0	1	55		0	1	60	2	120
3	10			1	10		0	1	15	2	30
<b>TOTAL</b>			10		65		0		90		180



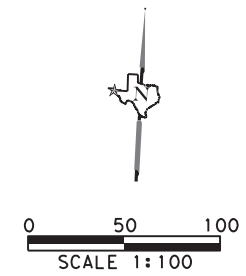
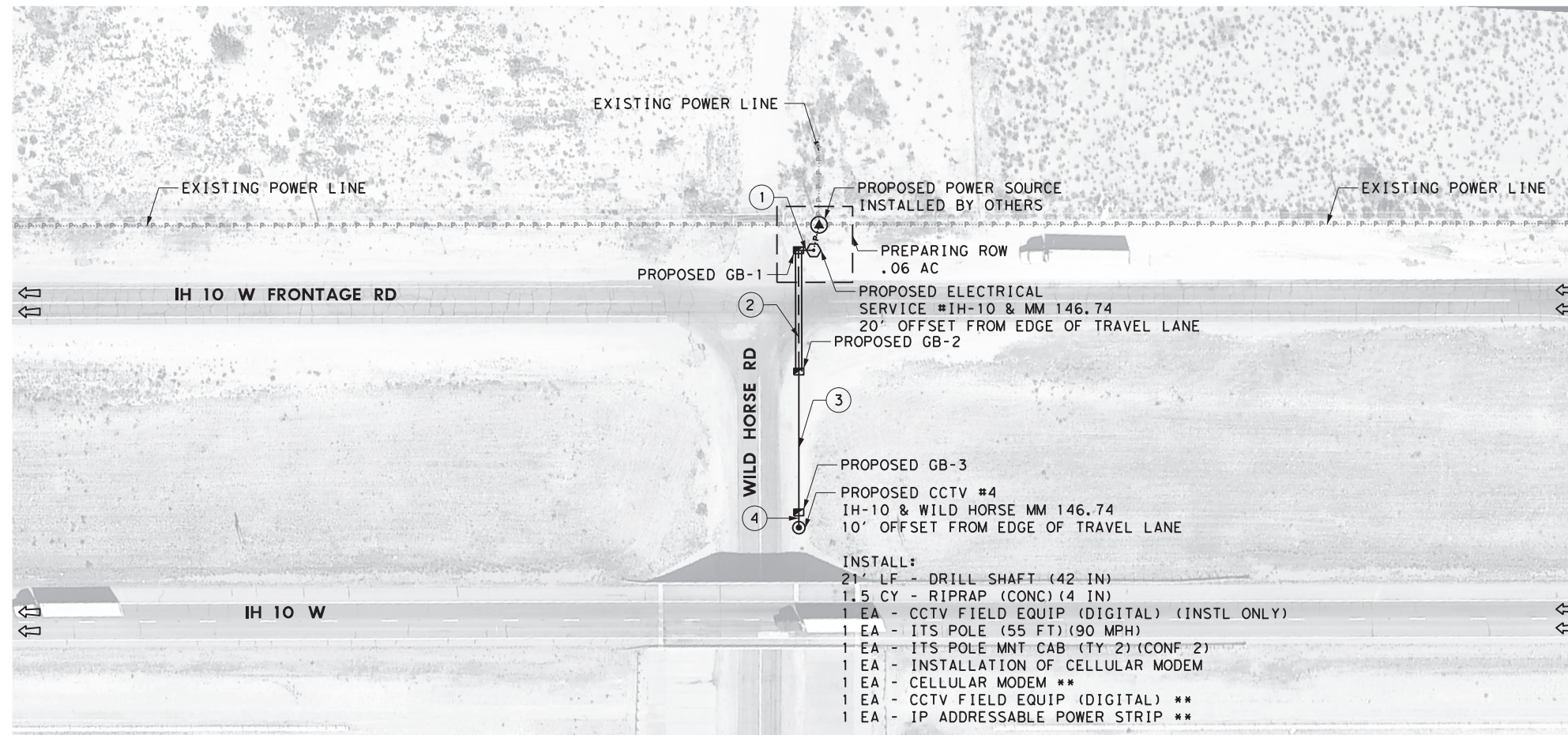
Eduardo I. Adame P.E.  
 10/17/2023

**IH 10**  
**ITS LAYOUT**  
 IH 10 &  
 WEIGH STATION MM 145.61  
 SHEET 5 OF 8

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CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		57

DATE: 10/11/2023 10:39:53 AM  
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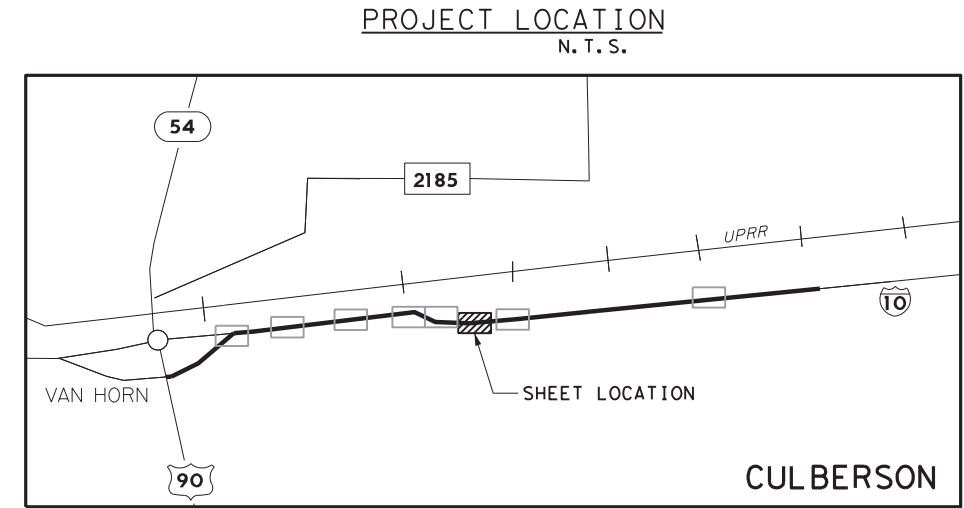
- LEGEND**
- EXISTING DMS
  - PROPOSED DMS
  - EXISTING ITS POLE
  - PROPOSED ITS POLE
  - /  EXISTING/PROPOSED ELECTRICAL SERVICE
  - /  EXISTING/PROPOSED POWER SOURCE
  - /  EXISTING/PROPOSED POWER LINE
  - PROPOSED GROUND BOX ( TY A )
  - EXISTING GROUND BOX
  - EXISTING CONDUIT
  - PROPOSED CONDUIT TRENCH
  - PROPOSED CONDUIT BORE
  - PROPOSED METAL BEAM GUARD FENCE
  - PROPOSED SMALL SIGN
  - TRAFFIC FLOW ARROW
  - CONDUIT RUN NUMBER

NOTE:  
1. REFER TO STANDARD ITS (7)-15 FOR RIPRAP CONC. APRON

ITS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
100	6001	PREPARING ROW	AC	0.06
110	6003	EXCAVATION (SPECIAL)	CY	0.5
416	6005	DRILL SHAFT (42 IN)	LF	21
432	6001	RIPRAP (CONC) (4 IN)	CY	1.5
618	6023	CONDT (PVC) (SCH 40) (2")	LF	115
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	80
620	6010	ELEC CONDR (NO.6) INSULATED	LF	645
624	6002	GROUND BOX TY A (122311)W/APRON	EA	3
6010	6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	1
6064	6046	ITS POLE (55 FT) (90 MPH)	EA	1
6064	6084	ITS POLE MNT CAB (TY 2) (CONF 2)	EA	1
6386	6001	INSTALLATION OF CELLULAR MODEM	EA	1
		CELLULAR MODEM**	EA	1
		CCTV FIELD EQUIPMENT (DIGITAL)**	EA	1
		IP ADDRESSABLE POWER STRIP**	EA	1
		ELC SRV TY D 120/240 060(NS)GS(N)TP(O)***	EA	1

\*\* ITEMS PROVIDED BY THE STATE  
\*\*\* ITEMS PROVIDED AND INSTALLED BY RIO GRANDE ELECTRIC AND PAID BY TXDOT USING STATE FORCE

CONDUIT AND CONDUCTOR RUNS								
RUN NO.	LENGTH OF RUN (FT)	CONDUIT (FT)				ELECTRICAL CONDUCTOR		
		EA	TRENCH	EA	BORE	GROUND	POWER	
1	10	1	10	0	1	15	2	30
2	80		0	1	80	85	2	170
3	95	1	95		1	100	2	200
4	10	1	10		0	15	2	30
TOTAL			115		80	215		430



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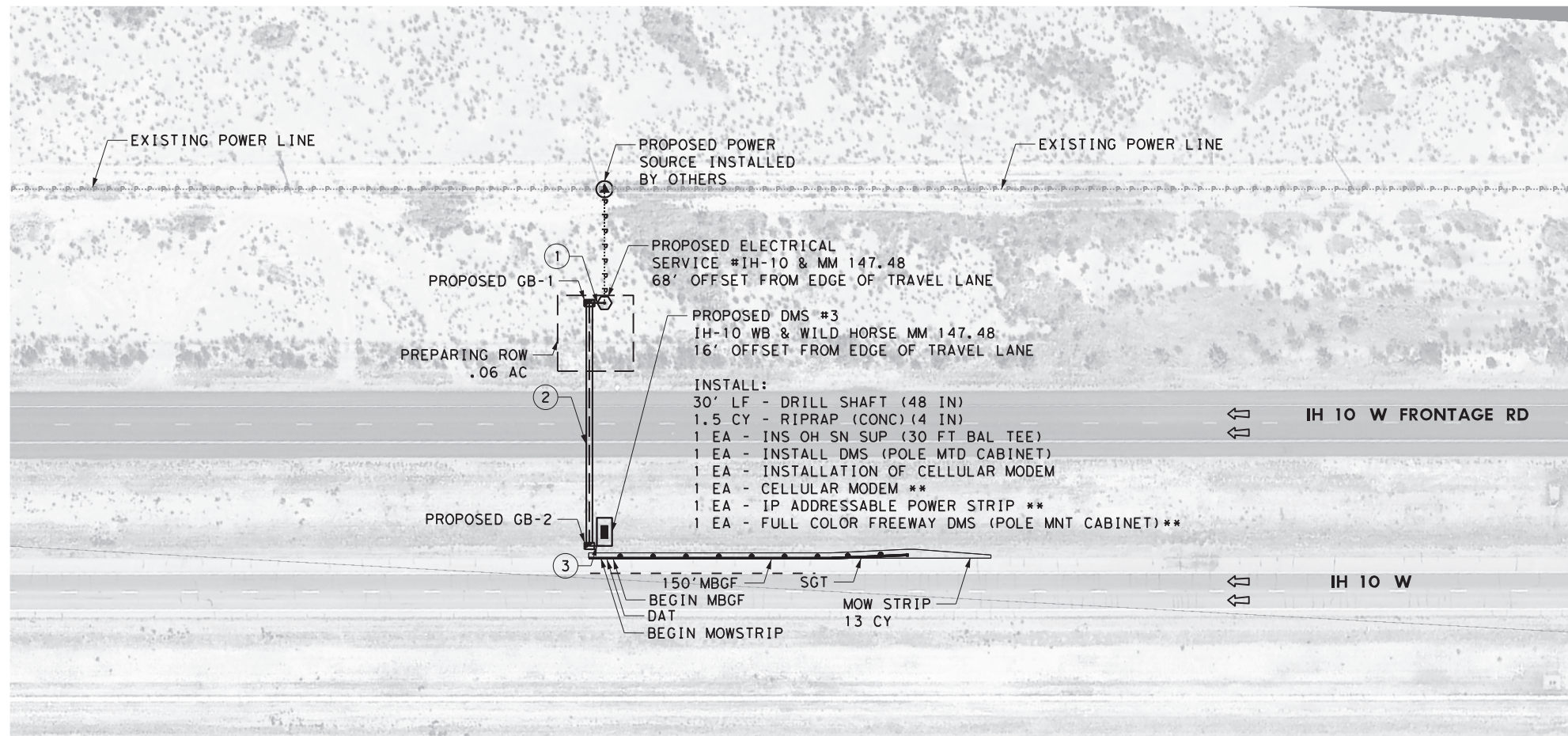
**ITS LAYOUT**

IH 10 & WILD HORSE MM 146.74

SHEET 6 OF 8

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		58

DATE: 10/11/2023 10:40:11 AM  
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0 50 100  
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- LEGEND**
- EXISTING DMS
  - PROPOSED DMS
  - EXISTING ITS POLE
  - PROPOSED ITS POLE
  - EXISTING/PROPOSED ELECTRICAL SERVICE
  - EXISTING/PROPOSED POWER SOURCE
  - EXISTING/PROPOSED POWER LINE
  - PROPOSED GROUND BOX (TY A)
  - EXISTING GROUND BOX
  - EXISTING CONDUIT
  - PROPOSED CONDUIT TRENCH
  - PROPOSED CONDUIT BORE
  - PROPOSED METAL BEAM GUARD FENCE
  - PROPOSED SMALL SIGN
  - TRAFFIC FLOW ARROW
  - CONDUIT RUN NUMBER

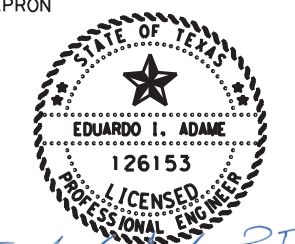
NOTE:

1. REFER TO STANDARD ITS (7)-15 FOR RIPRAP CONC. APRON

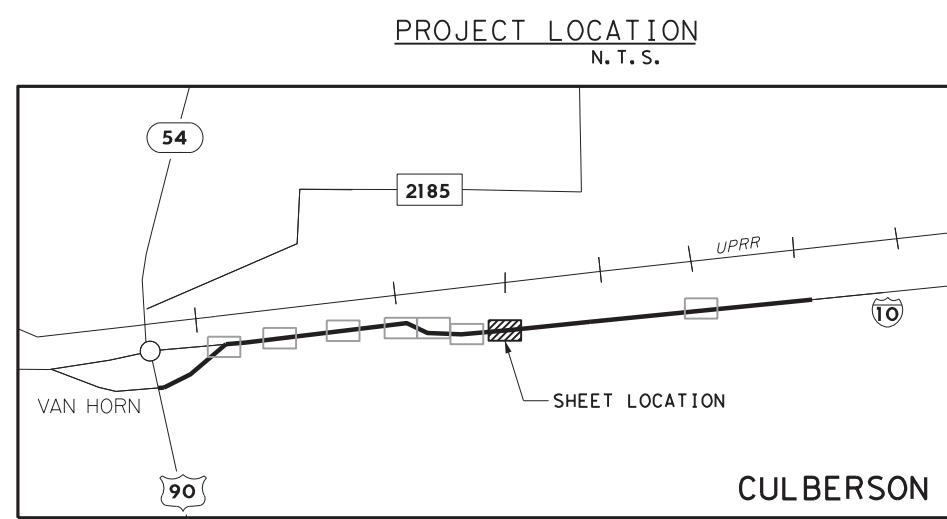
ITS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
100	6001	PREPARING ROW	AC	0.06
110	6003	EXCAVATION (SPECIAL)	CY	0.5
416	6006	DRILL SHAFT (48 IN)	LF	30
432	6001	RIPRAP (CONC) (4 IN)	CY	1.5
432	6045	RIPRAP (MOW STRIP) (4 IN)	CY	13
540	6002	MTL W-BEAM GD FEN (STEEL POST)	LF	150
540	6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1
544	6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1
618	6023	CONDT (PVC) (SCH 40) (2")	LF	20
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	160
620	6012	ELEC CONDR (NO. 4) INSULATED	LF	780
624	6002	GROUND BOX TY A (122311)W/APRON	EA	2
650	6028	INS OH SN SUP (30 FT BAL TEE)	EA	1
6028	6001	INSTALL DMS (POLE MNT CABINET)	EA	1
6386	6001	INSTALLATION OF CELLULAR MODEM	EA	1
		CELLULAR MODEM**	EA	1
		IP ADDRESSABLE POWER STRIP**	EA	1
		FULL COLOR FREEWAY DMS (POLE MTD CABINET)**	EA	1
		ELC SRV TY D 120/240 100(NS)GS(N)TP(O)***	EA	1

\*\* ITEMS PROVIDED BY THE STATE  
 \*\*\* ITEMS PROVIDED AND INSTALLED BY RIO GRANDE ELECTRIC AND PAID BY TXDOT USING STATE FORCE

RUN NO.	LENGTH OF RUN (FT)	CONDUIT (FT)				ELECTRICAL CONDUCTOR				
		SCHD 40 PVC (2")				ELEC CONDR (NO. 4) INSUL				
		EA	TRENCH	EA	BORE	GROUND	POWER	GROUND	POWER	
1	10	1	10	0	1	15	3	45		
2	160		0	1	160	1	165	3	495	
3	10	1	10		0	1	15	3	45	
<b>TOTAL</b>			20		160		195		585	



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 10/17/2023

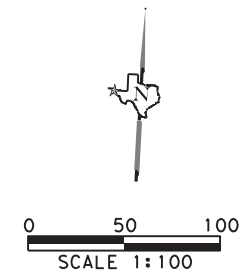
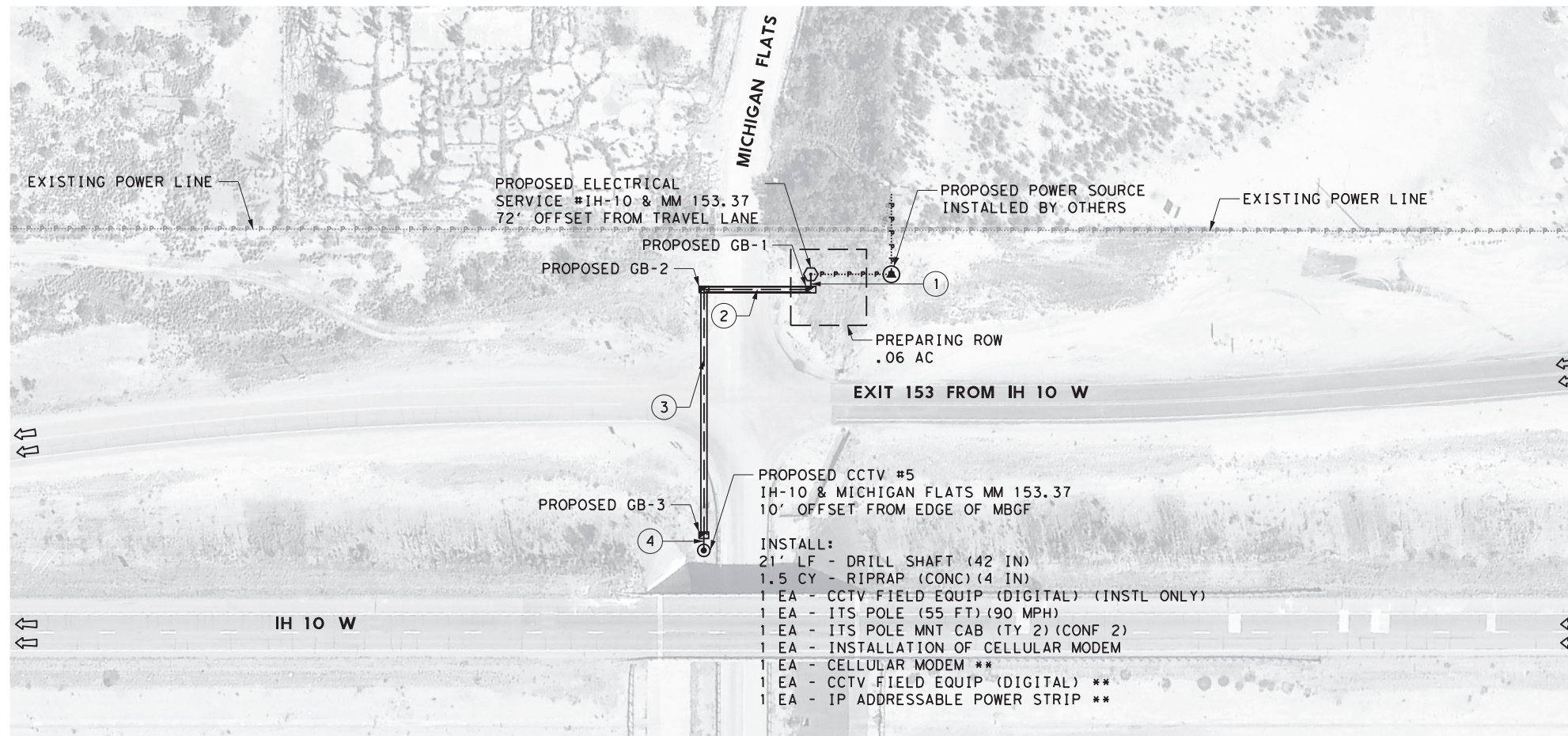


**IH 10**  
**ITS LAYOUT**  
 IH 10 &  
 MM 147.48

SHEET 7 OF 8  
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CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST		COUNTY	SHEET NO.
ELP		CULBERSON	59

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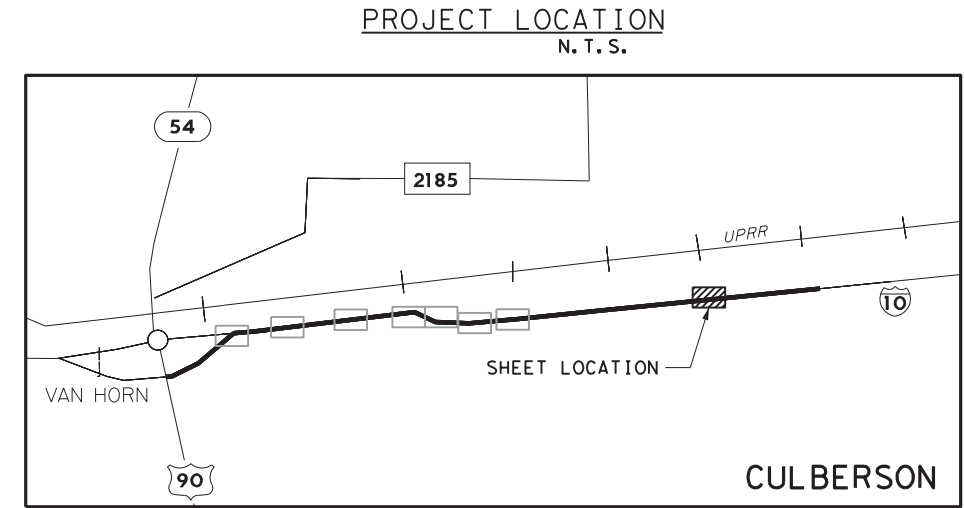
- LEGEND**
- EXISTING DMS
  - PROPOSED DMS
  - EXISTING ITS POLE
  - PROPOSED ITS POLE
  - EXISTING/PROPOSED ELECTRICAL SERVICE
  - EXISTING/PROPOSED POWER SOURCE
  - EXISTING/PROPOSED POWER LINE
  - PROPOSED GROUND BOX ( TY A )
  - EXISTING GROUND BOX
  - EXISTING CONDUIT
  - PROPOSED CONDUIT TRENCH
  - PROPOSED CONDUIT BORE
  - PROPOSED METAL BEAM GUARD FENCE
  - PROPOSED SMALL SIGN
  - TRAFFIC FLOW ARROW
  - CONDUIT RUN NUMBER

NOTE:  
1. REFER TO STANDARD ITS (7)-15 FOR RIPRAP CONC. APRON

ITS QUANTITIES (CSJ 0003-02-049)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
100	6001	PREPARING ROW	AC	0.06
110	6003	EXCAVATION (SPECIAL)	CY	0.5
416	6005	DRILL SHAFT (42 IN)	LF	21
432	6001	RIPRAP (CONC) (4 IN)	CY	1.5
618	6023	CONDT (PVC) (SCH 40) (2")	LF	20
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	235
620	6010	ELEC CONDR (NO.6) INSULATED	LF	825
624	6002	GROUND BOX TY A (122311)W/APRON	EA	3
6010	6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	1
6064	6046	ITS POLE (55 FT) (90 MPH)	EA	1
6064	6084	ITS POLE MNT CAB (TY 2) (CONF 2)	EA	1
6386	6001	INSTALLATION OF CELLULAR MODEM	EA	1
		CELLULAR MODEM**	EA	1
		CCTV FIELD EQUIPMENT (DIGITAL)**	EA	1
		IP ADDRESSABLE POWER STRIP**	EA	1
		ELC SRV TY D 120/240 060(NS)GS(N)TP(O)***	EA	1

\*\* ITEMS PROVIDED BY THE STATE  
\*\*\* ITEMS PROVIDED AND INSTALLED BY RIO GRANDE ELECTRIC AND PAID BY TXDOT USING STATE FORCE

CONDUIT AND CONDUCTOR RUNS								
RUN NO.	LENGTH OF RUN (FT)	CONDUIT (FT)				ELECTRICAL CONDUCTOR		
		EA	TRENCH	EA	BORE	GROUND	POWER	
1	10	1	10	0	1	15	2	30
2	70		0	1	70	1	75	150
3	165		0	1	165	1	170	340
4	10	1	10	0	1	15	2	30
<b>TOTAL</b>			<b>20</b>		<b>235</b>	<b>275</b>		<b>550</b>



Eduardo I. Adame P.E.  
 10/17/2023

**ITS LAYOUT**

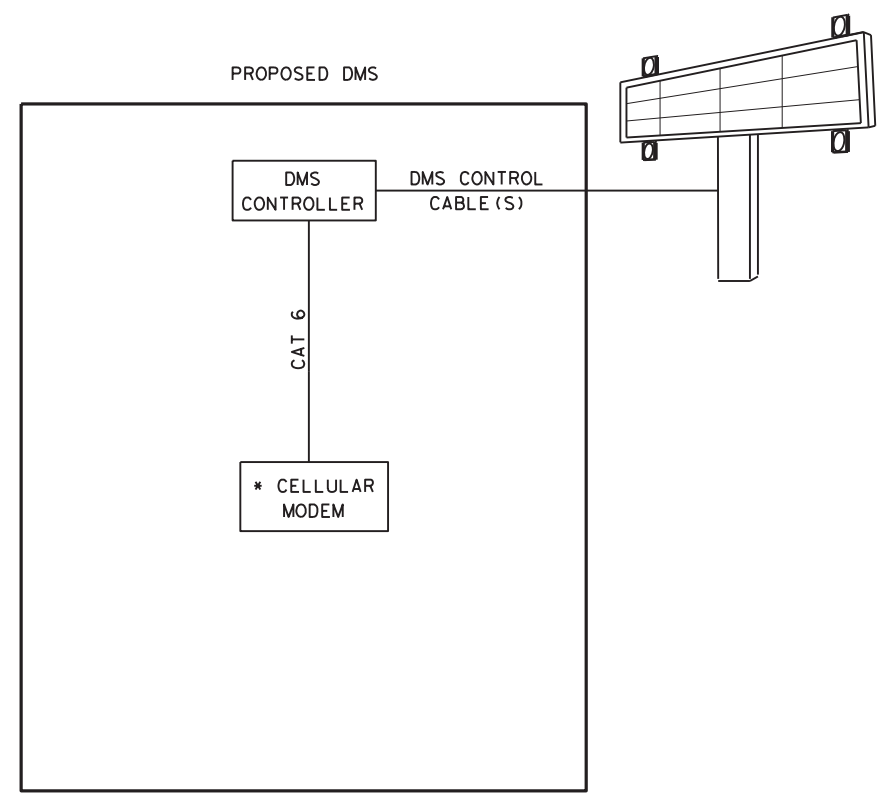
IH 10 & MICHIGAN FLATS MM 153.37

SHEET 8 OF 8

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		60



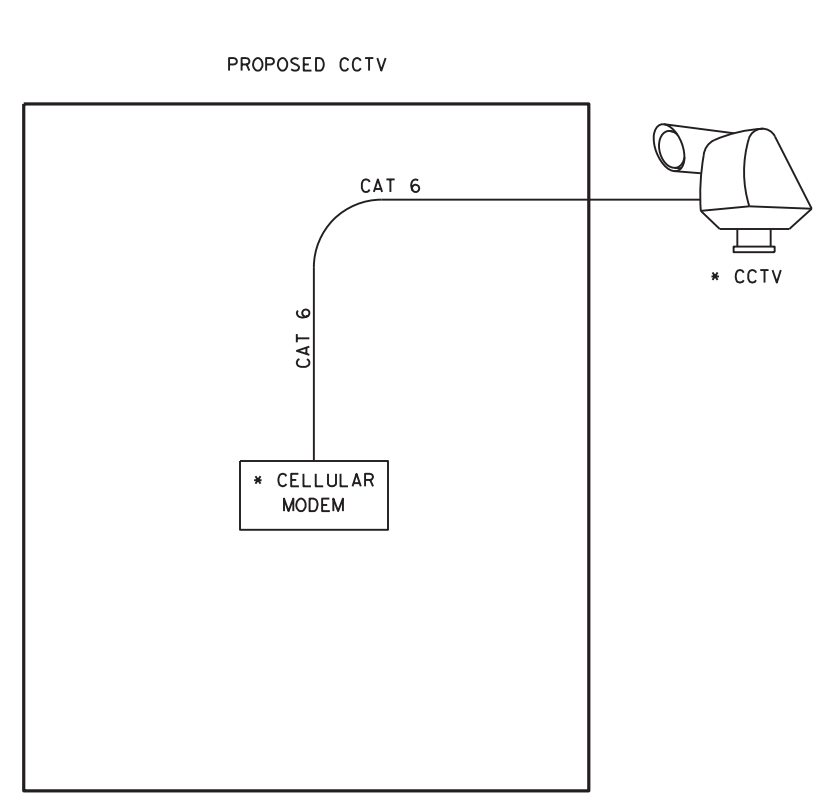
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PROPOSED DMS #1  
 IH-10 WB ROSS DR. & MM 141.54  
 SHEET 1 OF 8

PROPOSED DMS #3  
 IH-10 WB & WILD HORSE MM 147.48  
 SHEET 7 OF 8

PROPOSED DMS #2  
 IH-10 EB & MM 143.18  
 SHEET 3 OF 8



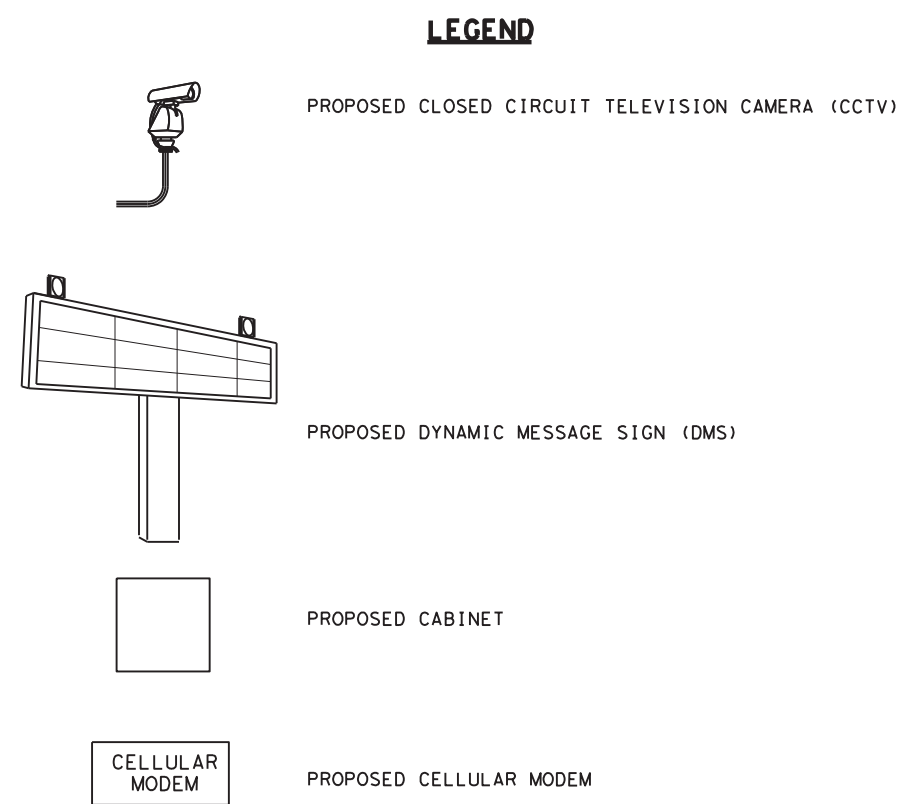
PROPOSED CCTV #1  
 IH-10 & MM 142.35  
 SHEET 2 OF 8

PROPOSED CCTV #3  
 IH-10 & WEIGH STATION MM 145.61  
 SHEET 5 OF 8

PROPOSED CCTV #5  
 IH-10 & MICHIGAN FLATS MM 153.37  
 SHEET 8 OF 8

PROPOSED CCTV #2  
 IH-10 & SAFETY REST AREA MM 144.72  
 SHEET 4 OF 8

PROPOSED CCTV #4  
 IH-10 & WILD HORSE MM 146.74  
 SHEET 6 OF 8



**NOTES:**

- THIS SHEET IS A CONCEPTUAL DESIGN OF THE TRANSPORTATION MANAGEMENT COMMUNICATIONS SYSTEM. ALL EQUIPMENT AND/OR CONNECTIONS REQUIRED MAY NOT BE SHOWN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT THE SYSTEM IS PROVIDED COMPLETE AND MADE FULLY FUNCTIONAL.

\* DENOTES ITEMS PROVIDED BY THE DEPARTMENT.

Eduardo I. Adame P.E.  
 10/17/2023

**IH 10  
 COMMUNICATION  
 SCHEMATIC**

SHEET 1 OF 1  
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CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		61

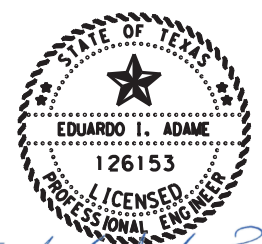
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ELECTRICAL SERVICE DATA - CSJ:0003-01-064

Elec. Service ID	ITS Layout Sheet Number	Electrical Service Description	Service *Conduit Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Lighting Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
IH-10 & MM 141.54	1 OF 8	ELC SRV TY D 120/240 100 (NS)GS(N)GC(O)	1 1/4"	3/#2	N/A	2P/100	N/A	100	PROPOSED DMS #1 IH-10 WB ROSS DR.& MM 141.54	2P/70	50	12.0
IH-10 & MM 142.35	2 OF 8	ELC SRV TY D 120/240 060 (NS)GS(N)GC(O)	1 1/4"	3/#4	N/A	2P/60	N/A	100	PROPOSED CCTV #1 IH-10 & MM 142.35	1P/20	15	1.8
IH-10 & MM 143.18	3 OF 8	ELC SRV TY D 120/240 100 (NS)GS(N)GC(O)	1 1/4"	3/#2	N/A	2P/100	N/A	100	PROPOSED DMS #2 IH-10 EB & MM 143.18	2P/70	50	12.0
IH-10 & MM 144.72	4 OF 8	ELC SRV TY D 120/240 060 (NS)GS(N)TP(O)	1 1/4"	3/#4	N/A	2P/60	N/A	100	PROPOSED CCTV #2 IH-10 & SAFETY REST AREA MM 144.72	1P/20	15	1.8
IH-10 & MM 146.74	6 OF 8	ELC SRV TY D 120/240 060 (NS)GS(N)TP(O)	1 1/4"	3/#4	N/A	2P/60	N/A	100	PROPOSED CCTV #4 IH-10 & WILD HORSE MM 146.74	1P/20	15	1.8
IH-10 & MM 147.48	7 OF 8	ELC SRV TY D 120/240 100 (NS)GS(N)TP(O)	1 1/4"	3/#2	N/A	2P/100	N/A	100	PROPOSED DMS #3 IH-10 WB & WILD HORSE MM 147.48	2P/70	50	12.0

ELECTRICAL SERVICE DATA - CSJ:0003-02-049

Elec. Service ID	ITS Layout Sheet Number	Electrical Service Description	Service *Conduit Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Lighting Contactor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
IH-10 & MM 153.37	8 OF 8	ELC SRV TY D 120/240 060 (NS)GS(N)TP(O)	1 1/4"	3/#4	N/A	2P/60	N/A	100	PROPOSED CCTV #5 IH-10 & MICHIGAN FLATS MM 153.37	1P/20	15	1.8



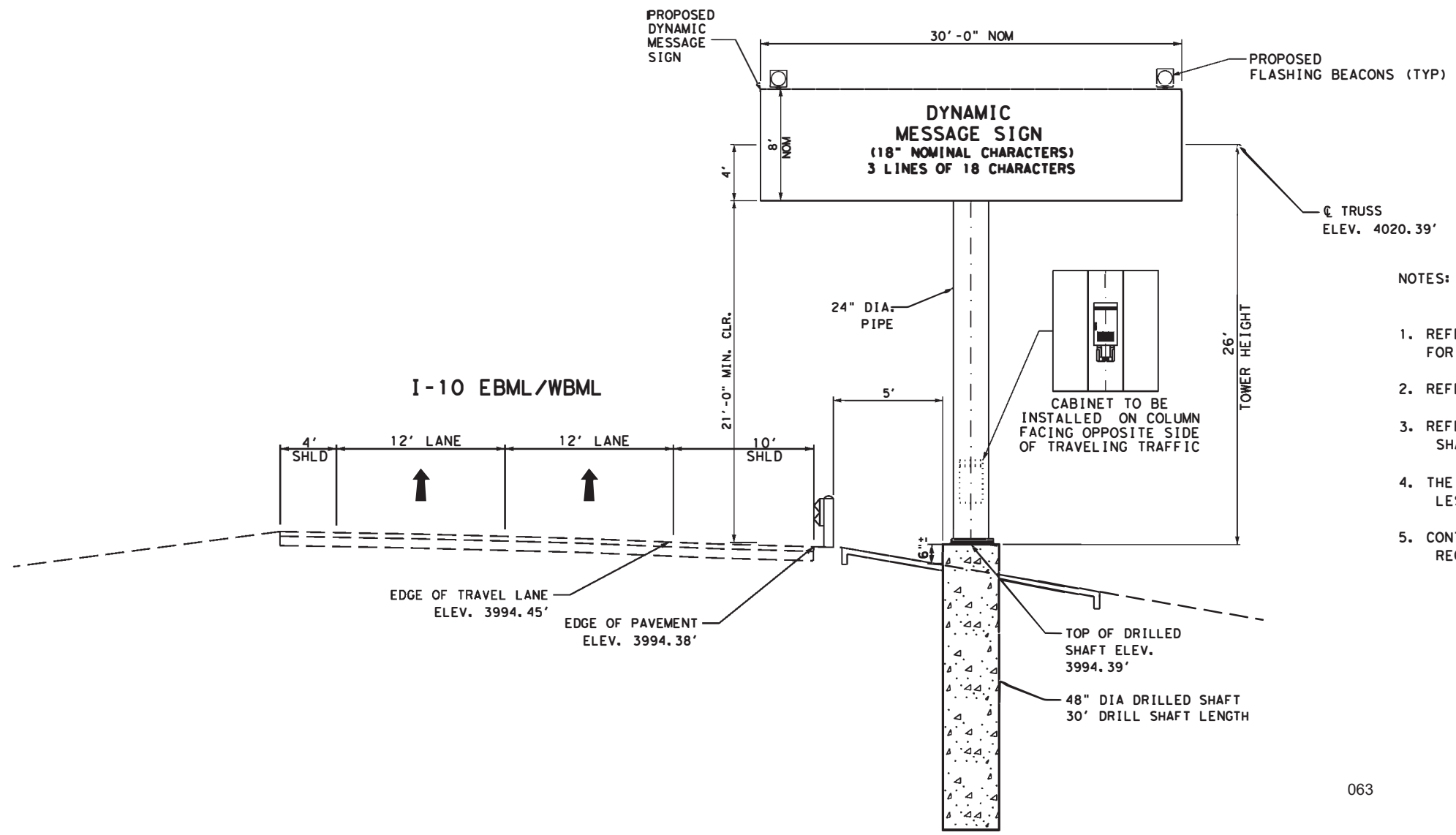
*Eduardo I. Adame P.E.*  
10/17/2023

IH 10  
ELECTRICAL SERVICE DATA

SHEET 1 OF 1

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CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		62

DATE: 10/18/2023 2:05:47 PM  
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**NOTES:**

1. REFER TO COSS-SE, HCOSS-Z1-21, COSSD, COSSF-21, AND COSS-FD FOR ADDITIONAL SUPPORT DETAILS.
2. REFER TO ITS(7)-15 FOR RIPRAP APRON/STEP DETAILS.
3. REFER TO ITS LAYOUT FOR OFFSET DIMENSIONS. OFFSET FROM MBGF SHALL NOT BE LESS THAN 5 FEET.
4. THE ACTUAL TRUSS LENGTH SHALL BE 1 FOOT (6 INCHES EACH SIDE) LESS THAN THE ACTUAL DMS LENGTH.
5. CONTROL SHEET INFORMATION CAN BE PROVIDED BY THE ENGINEER AS REQUESTED BY THE CONTRACTOR.

(\* ) CONTRACTOR TO VERIFY DIMENSION BEFORE CONSTRUCTING THE PROPOSED FOUNDATION.

**PROPOSED DMS STRUCTURE**

PROPOSED DMS #1  
 IH-10 WB ROSS DR. & MM 141.54  
 SHEET 1 OF 8

<b>DESIGN DATA</b>	
DESIGN TOWER HEIGHT	26.00 LF
DESIGN SPAN LENGTH	30.00 LF
DESIGN DMS AREA	240 SF
<b>DESIGN LOADS</b>	
SHEAR	18.25 K
TORSION	250.41 K-FT
MOMENT	467.86 K-FT
<b>STRUCTURE DATA</b>	
STRUCTURE CODE	HCOSS-Z1-21
TRUSS SIZE	4.5' X 4.5'
TOWER SIZE	24" DIA
<b>SUMMARY OF DRILLED SHAFT</b>	
30' OF 48" DIA DRILLED SHAFT	
TOP DRILLED SHAFT ELEVATION	3994.39 FT
GROUND ELEVATION	3993.89 FT
PENETROMETER VALUE (N)	N=12

063

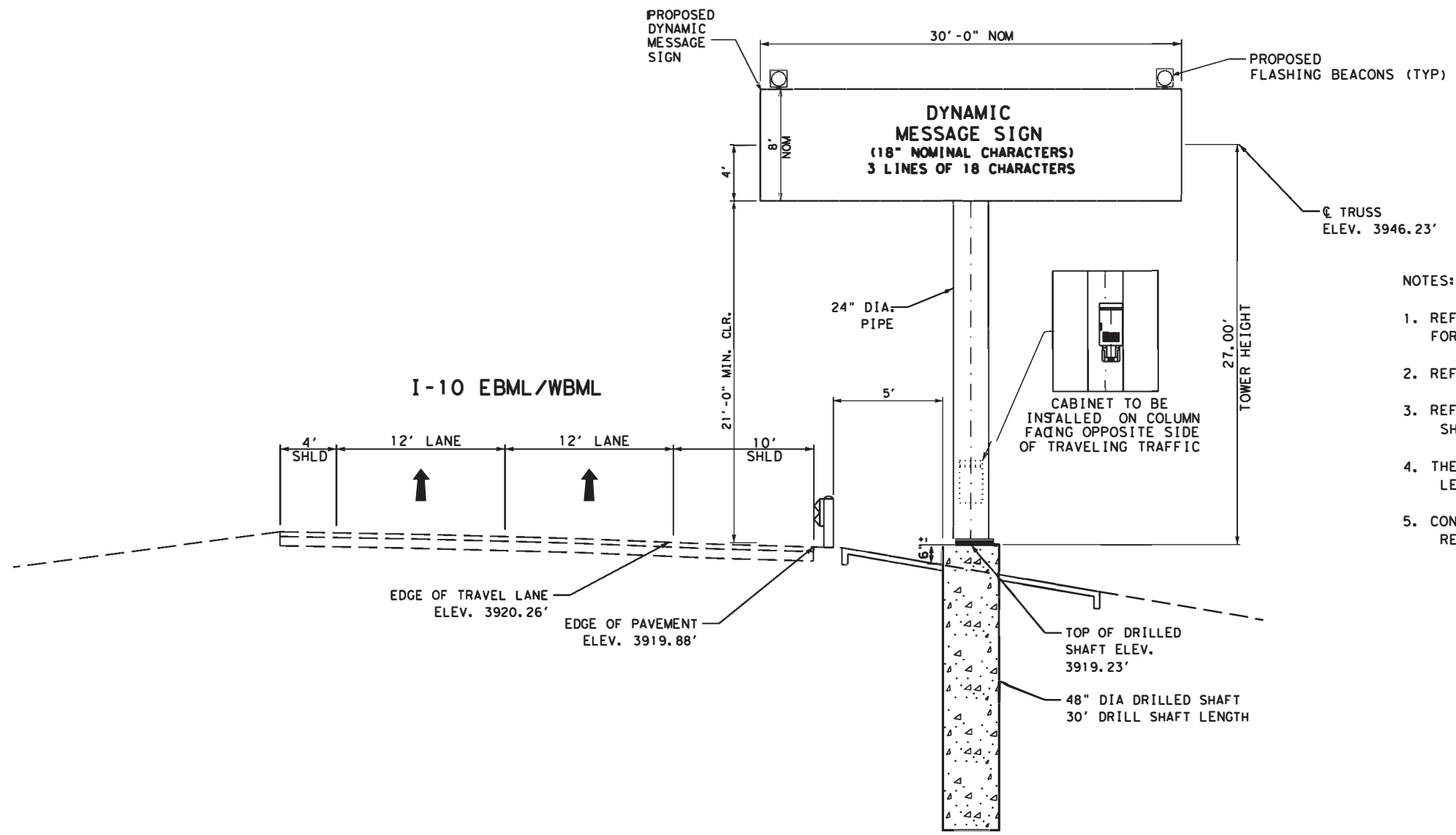


IH 10  
**DMS  
 ELEVATION**

SHEET 1 OF 3

©2022			
Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		63

CK:  
DN:  
DN:  
DN:



NOTES:

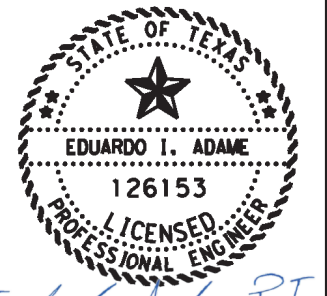
1. REFER TO COSS-SE, HCOSS-Z1-21, COSSD, COSSF-21, AND COSS-FD FOR ADDITIONAL SUPPORT DETAILS.
2. REFER TO ITS(7)-15 FOR RIPRAP APRON/STEP DETAILS.
3. REFER TO ITS LAYOUT FOR OFFSET DIMENSIONS. OFFSET FROM MBGF SHALL NOT BE LESS THAN 5 FEET.
4. THE ACTUAL TRUSS LENGTH SHALL BE 1 FOOT (6 INCHES EACH SIDE) LESS THAN THE ACTUAL DMS LENGTH.
5. CONTROL SHEET INFORMATION CAN BE PROVIDED BY THE ENGINEER AS REQUESTED BY THE CONTRACTOR.

(\* ) CONTRACTOR TO VERIFY DIMENSION BEFORE CONSTRUCTING THE PROPOSED FOUNDATION.

**PROPOSED DMS STRUCTURE**

PROPOSED DMS #2  
IH-10 EB & MM 143.18  
SHEET 3 OF 8

<b>DESIGN DATA</b>	
DESIGN TOWER HEIGHT	27.00 LF
DESIGN SPAN LENGTH	30.00 LF
DESIGN DMS AREA	240 SF
<b>DESIGN LOADS</b>	
SHEAR	18.25 K
TORSION	250.41 K-FT
MOMENT	467.86 K-FT
<b>STRUCTURE DATA</b>	
STRUCTURE CODE	HCOSS-Z1-21
TRUSS SIZE	4.5' X 4.5'
TOWER SIZE	24" DIA
<b>SUMMARY OF DRILLED SHAFT</b>	
30' OF 48" DIA DRILLED SHAFT	
TOP DRILLED SHAFT ELEVATION	3919.23 FT
GROUND ELEVATION	3918.73 FT
PENETROMETER VALUE (N)	N=12



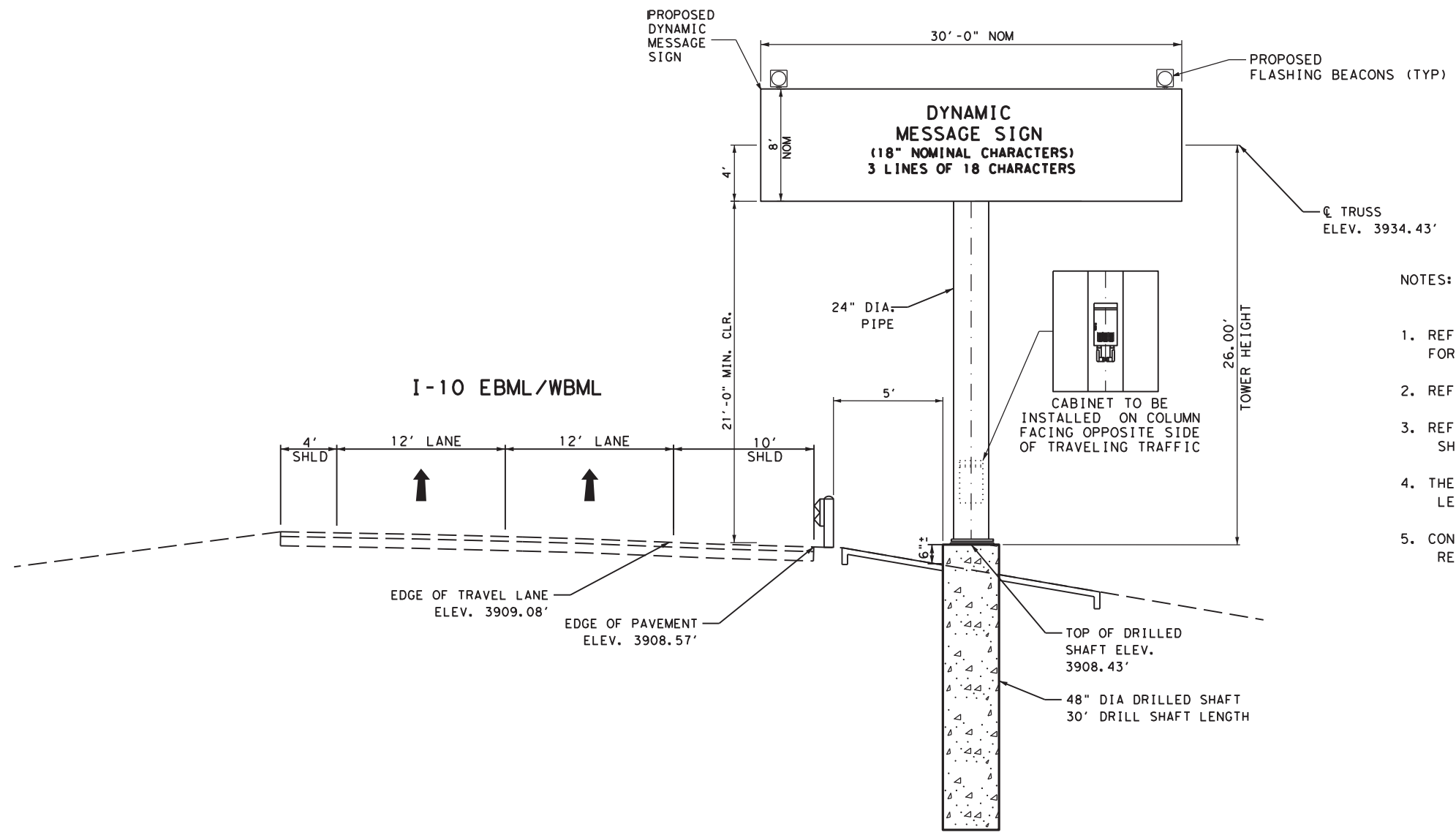
*Eduardo I. Adame P.E.*  
10/18/2023

IH 10  
**DMS  
ELEVATION**

DATE: 10/18/2023 2:07:00 PM  
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SHEET 2 OF 3  
©2022

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		64



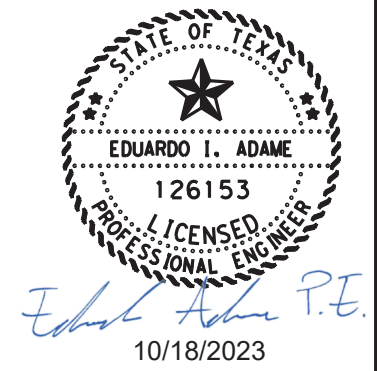
- NOTES:
1. REFER TO COSS-SE, HCOSS-Z1-21, COSSD, COSSF-21, AND COSS-FD FOR ADDITIONAL SUPPORT DETAILS.
  2. REFER TO ITS(7)-15 FOR RIPRAP APRON/STEP DETAILS.
  3. REFER TO ITS LAYOUT FOR OFFSET DIMENSIONS. OFFSET FROM MBGF SHALL NOT BE LESS THAN 5 FEET.
  4. THE ACTUAL TRUSS LENGTH SHALL BE 1 FOOT (6 INCHES EACH SIDE) LESS THAN THE ACTUAL DMS LENGTH.
  5. CONTROL SHEET INFORMATION CAN BE PROVIDED BY THE ENGINEER AS REQUESTED BY THE CONTRACTOR.

(\*) CONTRACTOR TO VERIFY DIMENSION BEFORE CONSTRUCTING THE PROPOSED FOUNDATION.

**PROPOSED DMS STRUCTURE**

PROPOSED DMS #3  
IH-10 WB & WILD HORSE MM 147.48  
SHEET 7 OF 8

<u>DESIGN DATA</u>	
DESIGN TOWER HEIGHT	26.00 LF
DESIGN SPAN LENGTH	30.00 LF
DESIGN DMS AREA	240 SF
<u>DESIGN LOADS</u>	
SHEAR	18.25 K
TORSION	250.41 K-FT
MOMENT	467.86 K-FT
<u>STRUCTURE DATA</u>	
STRUCTURE CODE	HCOSS-Z1-21
TRUSS SIZE	4.5' X 4.5'
TOWER SIZE	24" DIA
<u>SUMMARY OF DRILLED SHAFT</u>	
30' OF 48" DIA DRILLED SHAFT	
TOP DRILLED SHAFT ELEVATION	3908.43 FT
GROUND ELEVATION	3907.93 FT
PENETROMETER VALUE (N)	N=12



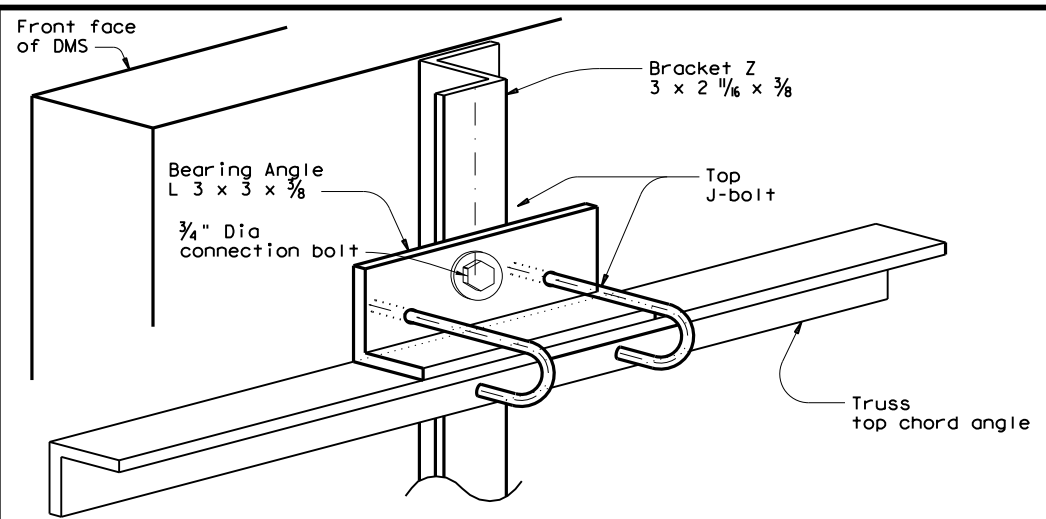
IH 10  
**DMS  
ELEVATION**

SHEET 3 OF 3  
©2022

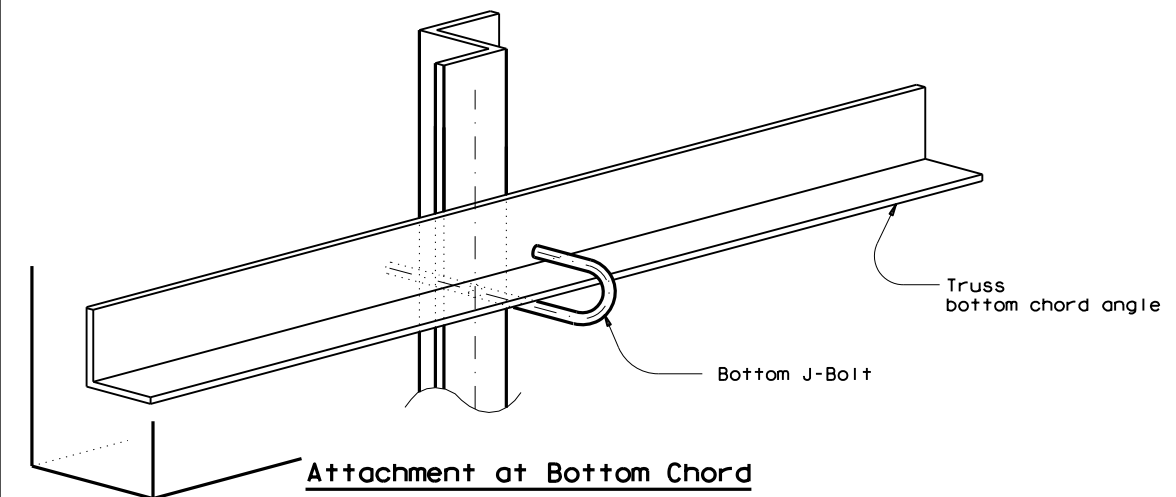
Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		65

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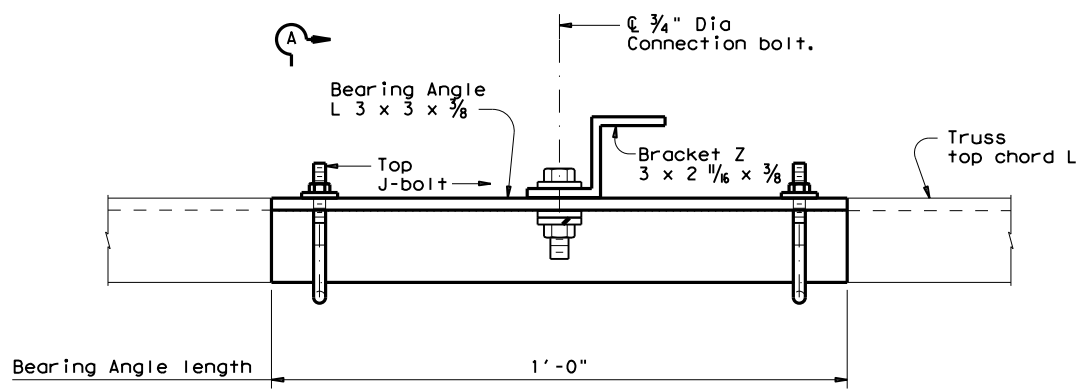
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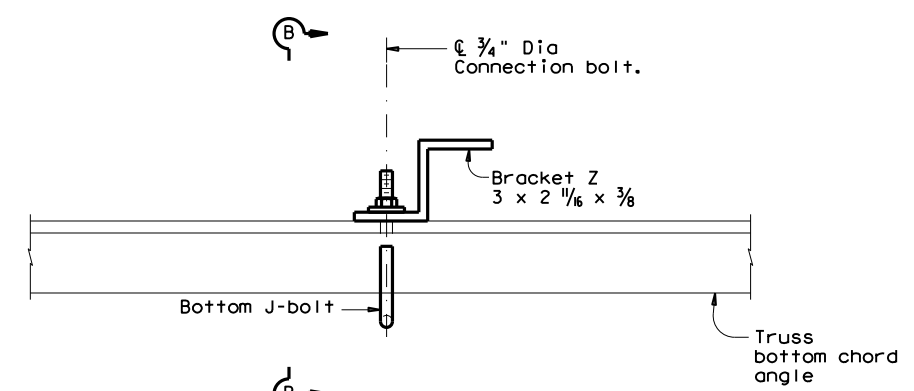
**Attachment at Top Chord**  
 (Showing Chord Angle 3")



**Attachment at Bottom Chord**  
**ISOMETRIC VIEW**



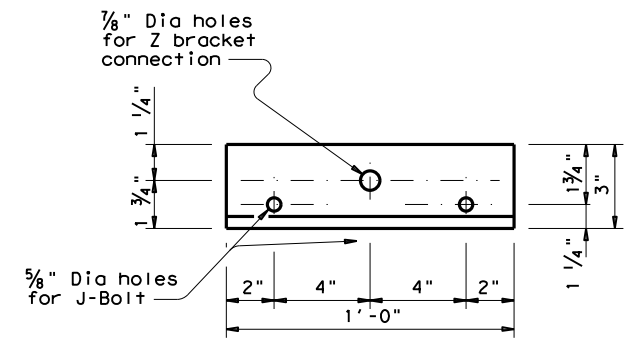
**Attachment at Top Chord**  
 (Showing Chord Angle 3")



**Attachment at Bottom Chord**  
**PLAN VIEW**

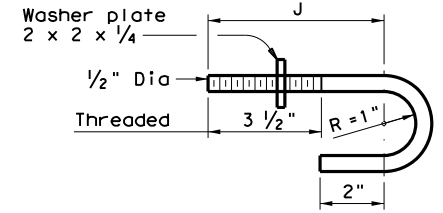
**GENERAL NOTES:**

- Application of the mounting detailed on Sheet 1 of 3 is limited to a dynamic message sign (DMS) attachment that is not in conflict with the truss connection bolts at the point(s) of attachment. The overhead sign structure must have adequate capacity to support the DMS. A determination of adequacy shall be made prior to attaching the DMS supports to the truss.
- Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. The Design Sustained Wind Velocity is 100 mph with a gust factor of 1.3. Connections are designed for a DMS weight of 3600 lbs and a design Effective Projected Area (EPA) of 441 sq ft, with the EPA based on a DMS nominal width of 30.5 feet and nominal depth of 8.25 feet plus four top and bottom 1'-8" square flashing beacons. The EPA includes drag coefficients of 1.7 (applied to sign area) and 1.2 (applied to flashing beacon area). A horizontal eccentricity of 1.0 ft from the face of the truss to the center of gravity of the DMS for attachment of DMS is assumed. An even number of Z brackets, spaced at 5 ft max., is assumed to transfer forces through the connection.
- All structural steel shall conform to ASTM A36, A572 Gr 50 or A588. Connection bolts shall conform to ASTM A325 or A449. Each connection bolt shall be provided with 1 heavy hex nut, 2 flat washers, and 1 lock washer. J bolts and washer plate both shall be Type 304 stainless steel, with bolt minimum yield strength of 50 ksi and an elongation of 16 percent in 2 inches. All parts except stainless steel shall be galvanized.
- Contractor shall verify applicable field dimensions before fabrication.

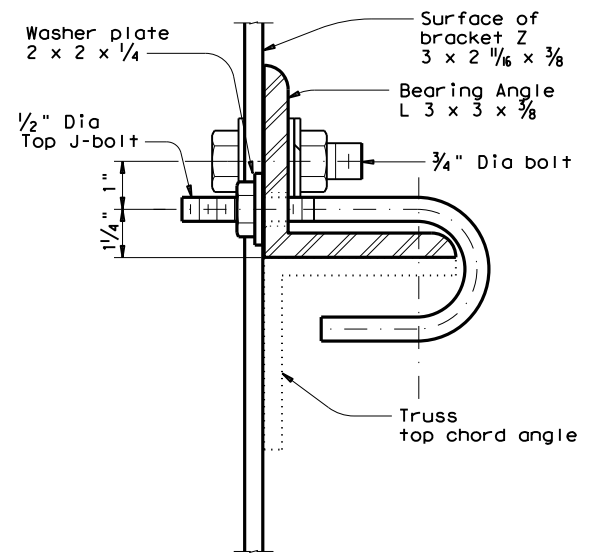


**BEARING ANGLE 3 x 3 x 3/8**

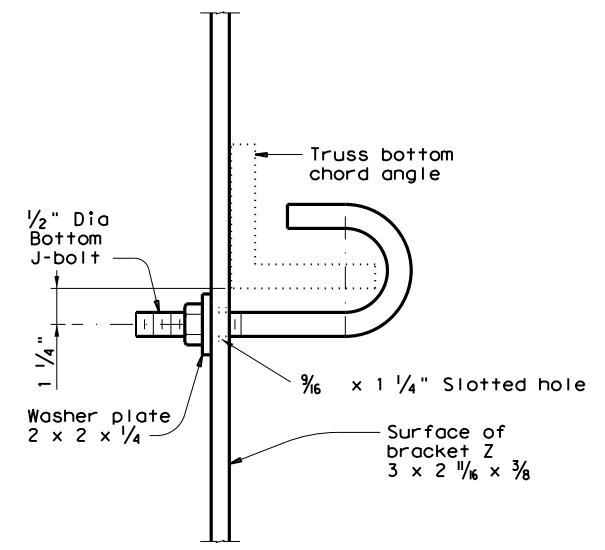
Chord Angle	J
3", 3 1/2", 4"	5 1/2"
5" and 6"	7 1/2"



**TOP & BOTTOM J-BOLT**



**SECTION A-A**



**SECTION B-B**

SHEET 1 OF 3

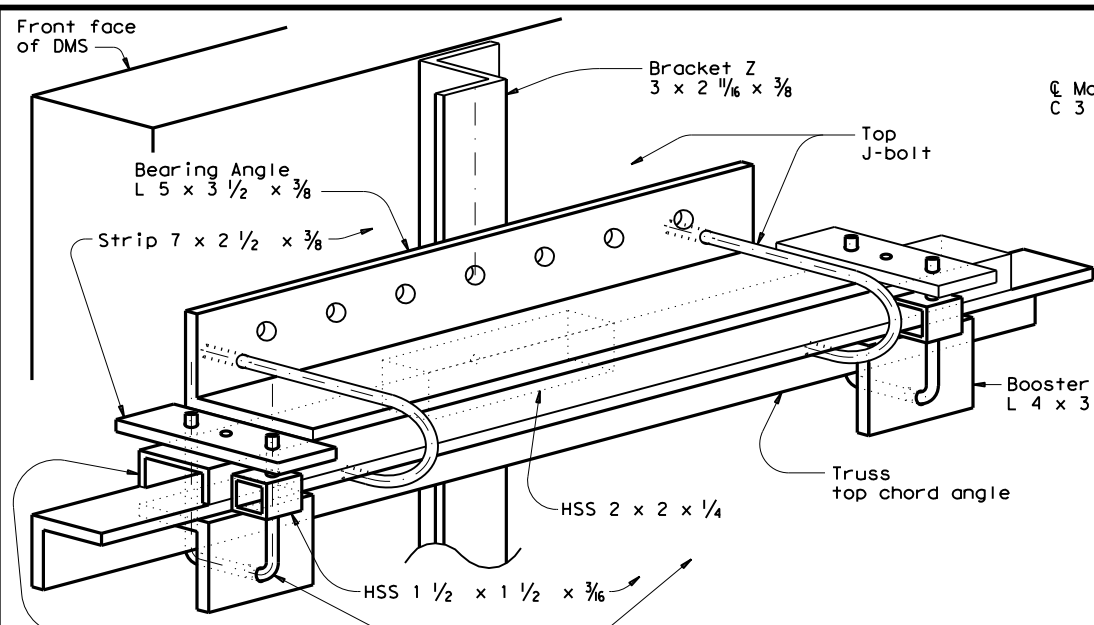


**DMS-TO-TRUSS MOUNTING AT OVERHEAD SIGN SUPPORTS (NON BUILD-UP) DMS(TM-1)-16**

FILE: dms-tm-16.dgn	DN: TxDOT	CK:	DW: TxDOT	CK:
©TxDOT June 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
	DIST	COUNTY	SHEET NO.	
	ELP	CULBERSON	66	

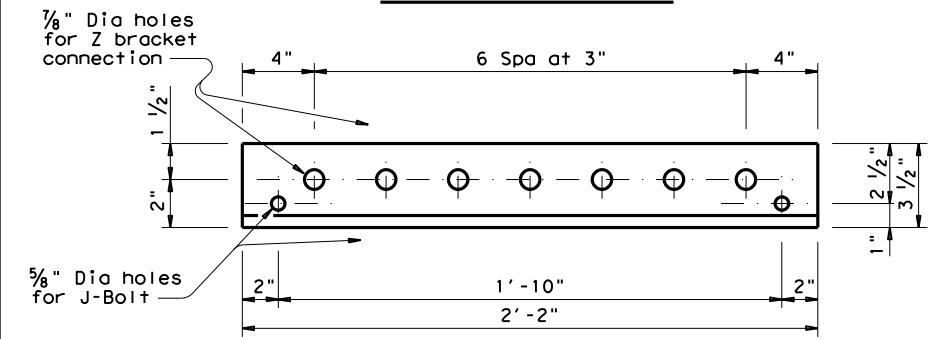
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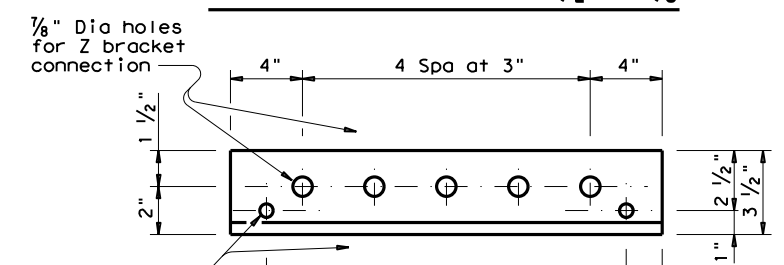


**Built-up Attachment at Top Chord**  
 (Showing Chord Angle 3")

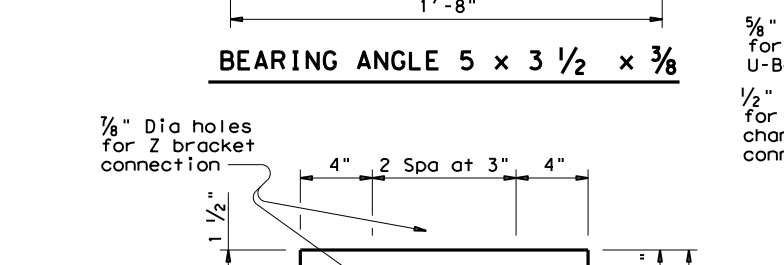
**ISOMETRIC VIEW**



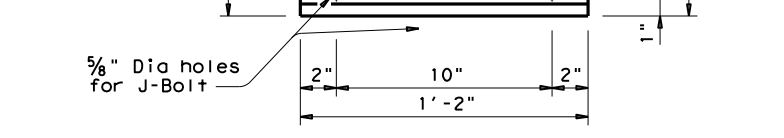
**BEARING ANGLE 5 x 3 1/2 x 3/8**



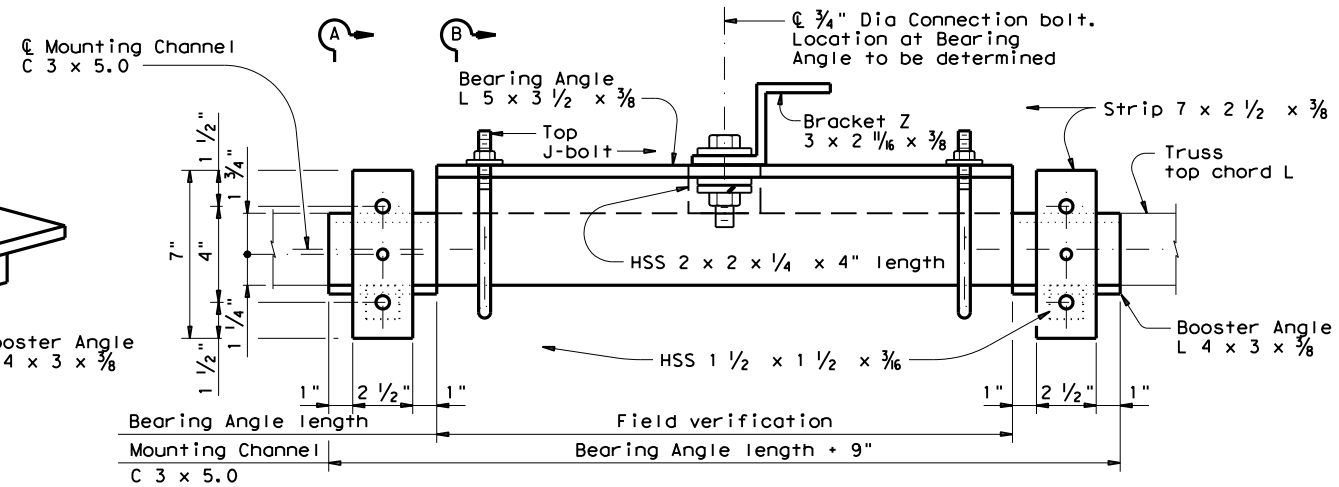
**BEARING ANGLE 5 x 3 1/2 x 3/8**



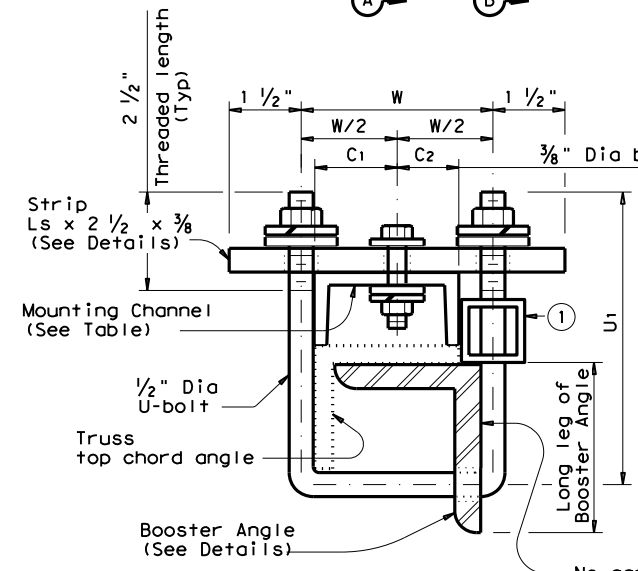
**BEARING ANGLE 5 x 3 1/2 x 3/8**



**BEARING ANGLE 5 x 3 1/2 x 3/8**

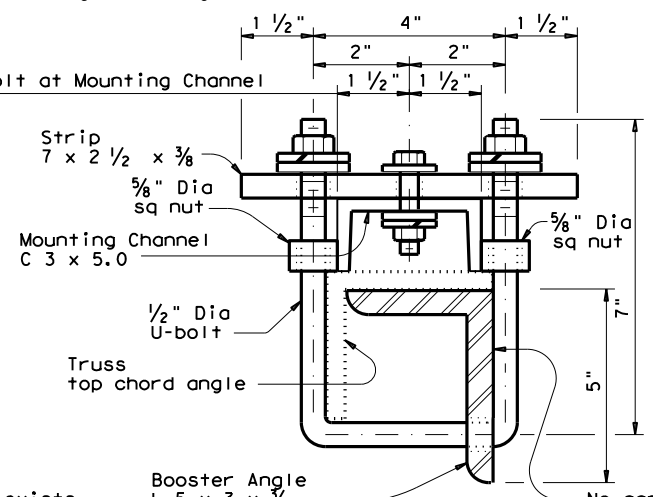


**PLAN VIEW (AT TOP CHORD)**  
 (Showing Chord Angle 3")

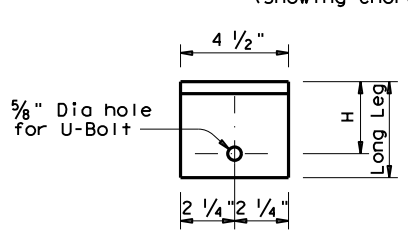


**SECTION A-A**  
 (Showing Chord Angle 3", 4", 5" & 6")

Chord Angle	U1	W	C1	C2	Mounting Channel
3"	7"	4"	1 3/4"	1 1/4"	C3 x 5.0
4"	8"	5"	2 1/4"	1 3/4"	C4 x 7.25
5"	9"	6"	2 3/4"	2 1/4"	C5 x 9.0
6"	10 1/2"	7"	3 1/4"	2 3/4"	C6 x 13

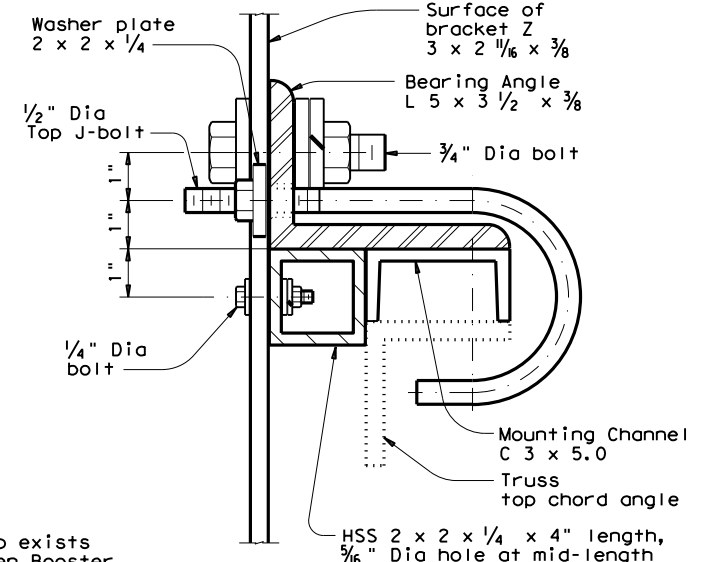


**SECTION A-A**  
 (Showing Chord Angle 3 1/2")

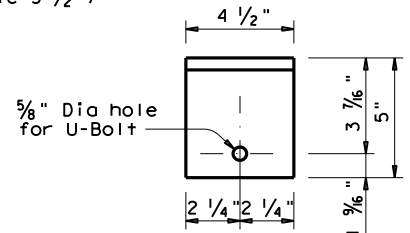


**BOOSTER ANGLE**  
 (For Chord Angle 3", 4", 5" and 6")

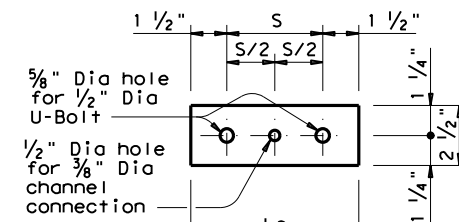
Chord Angle	Booster Angle	H
3"	4 x 3 x 3/8	3"
4"	5 x 3 1/2 x 3/8	3 13/16"
5"	6 x 4 x 3/8	4 13/16"
6"	7 x 4 x 3/8	5 5/8"



**SECTION B-B**

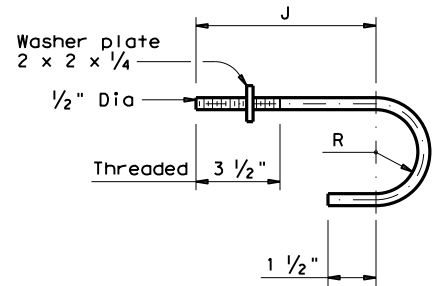


**BOOSTER ANGLE 5 x 3 x 3/8**  
 (For Chord Angle 3 1/2")



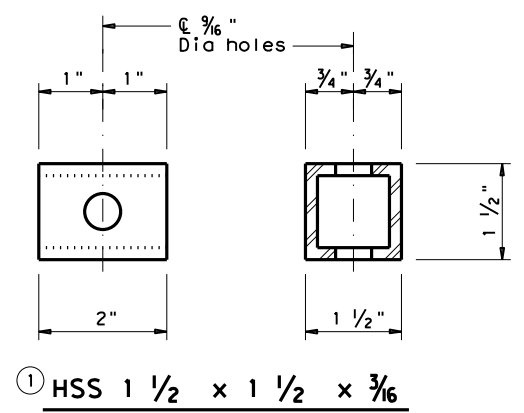
**Strip Ls x 2 1/2 x 3/8**

Chord Angle	S	Ls
3"	4"	7"
3 1/2"	4"	7"
4"	5"	8"
5"	6"	9"
6"	7"	10"



**TOP J-BOLT**

Chord Angle	J	R
3 & 3 1/2"	7"	1 3/4"
4 & 5"	8"	2"
6"	9"	2 1/4"



**HSS 1 1/2 x 1 1/2 x 3/6**

SHEET 2 OF 3

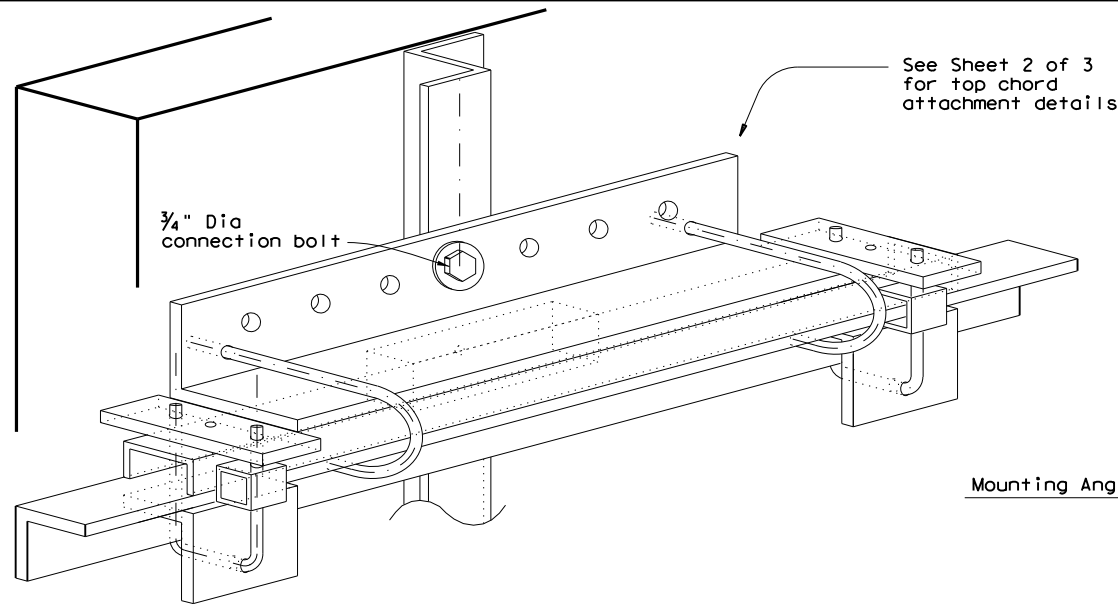
Texas Department of Transportation  
 Traffic Operations Division Standard

**DMS-TO-TRUSS MOUNTING AT OVERHEAD SIGN SUPPORTS (WITH BUILD-UP)**  
**DMS (TM-2) - 16**

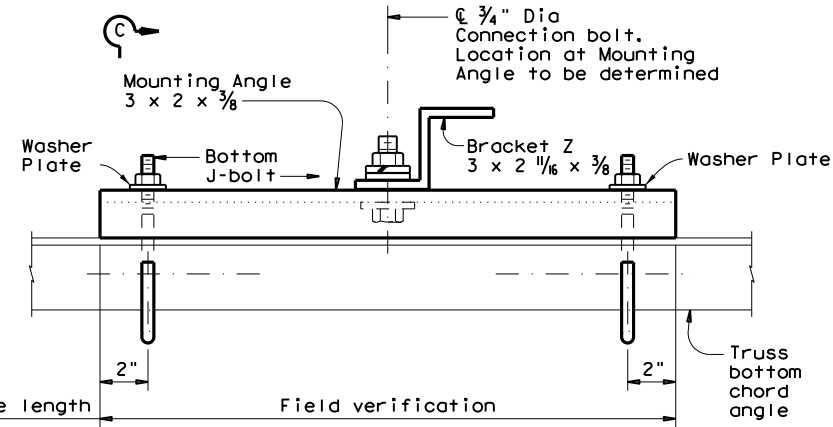
FILE: dms-tm-16.dgn	DW: TxDOT	CK: DW: TxDOT	CK:
© TxDOT JUNE 2016	CONT	SECT	JOB
REVISIONS	0003	01	064, ETC
DIST	COUNTY	SHEET NO.	
ELP	CULBERSON	67	

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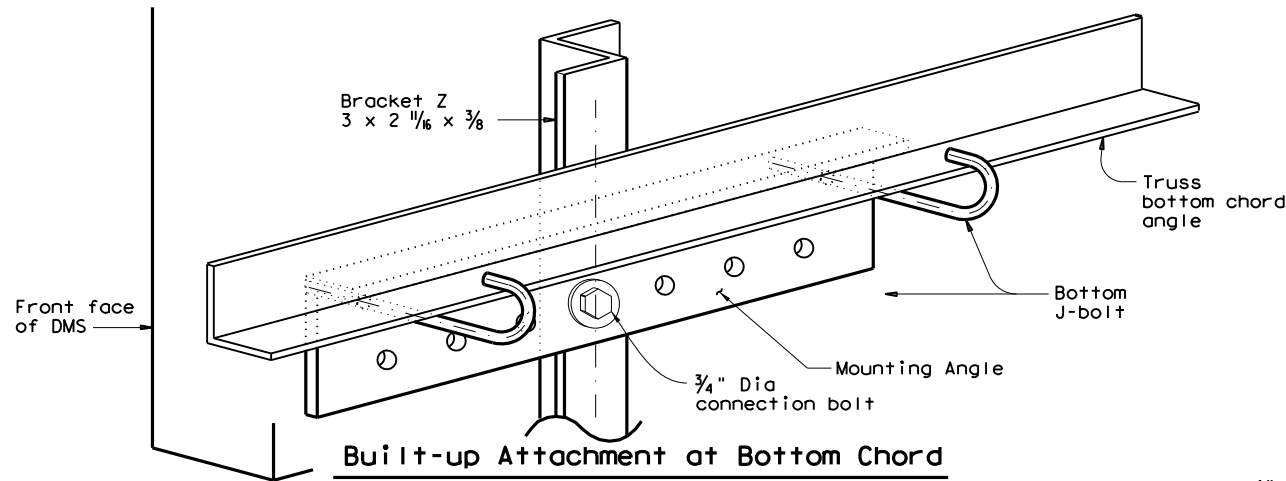
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**Built-up Attachment at Top Chord**

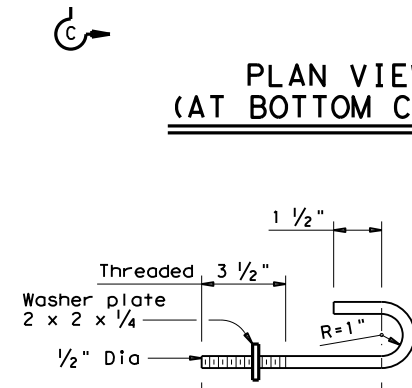


**PLAN VIEW (AT BOTTOM CHORD)**

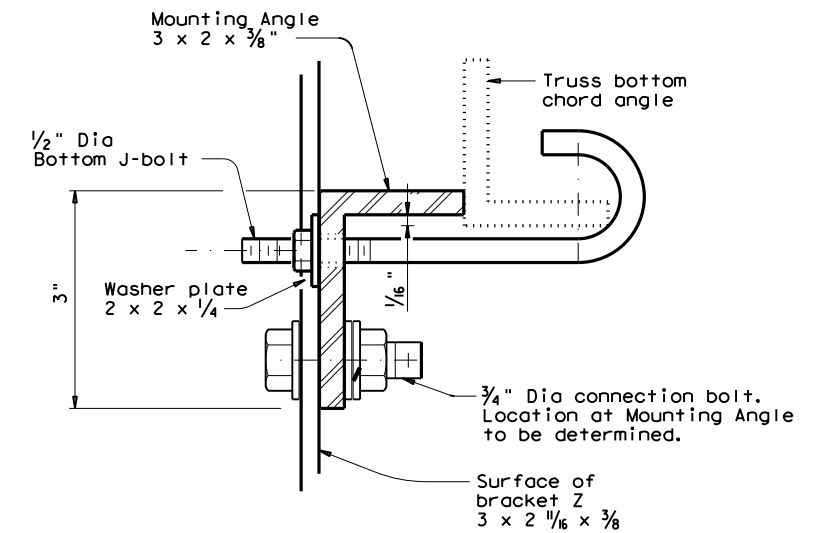


**Built-up Attachment at Bottom Chord**

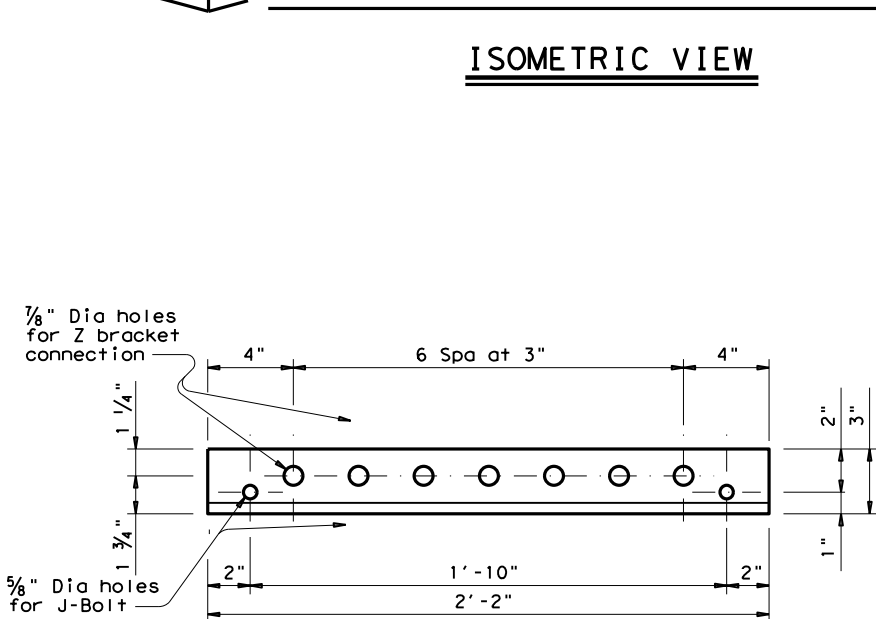
**ISOMETRIC VIEW**



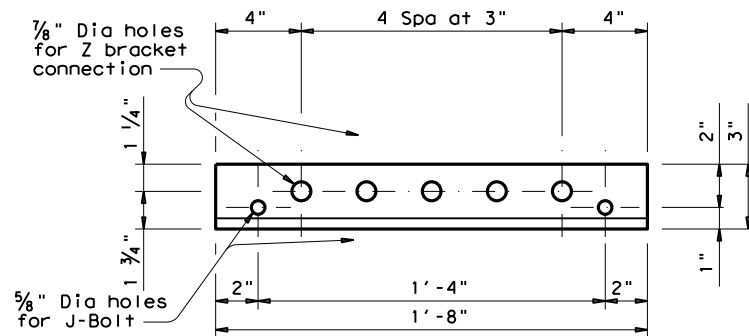
**BOTTOM J-BOLT**



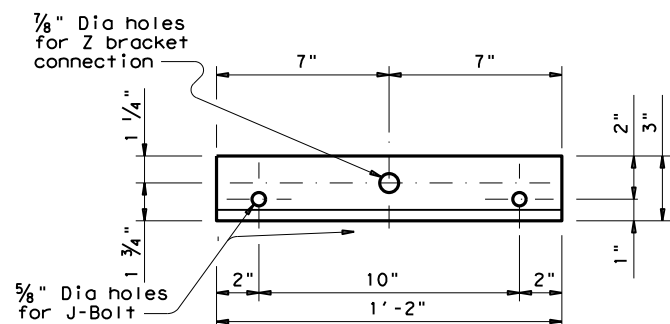
**SECTION C-C**



**MOUNTING ANGLE 3 x 2 x 3/8**



**MOUNTING ANGLE 3 x 2 x 3/8**



**MOUNTING ANGLE 3 x 2 x 3/8**

**GENERAL NOTES:**

1. Application of the built-up detailed on Sheet 2 and 3 of 3 is limited to the dynamic message sign (DMS) attachment which is in conflict with the truss connection bolts at the point(s) of attachment. The overhead sign structure must have adequate capacity to support the DMS. A determination of adequacy shall be made prior to attaching the DMS supports to the truss.
2. Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. The Design Sustained Wind Velocity is 100 mph with a gust factor of 1.3. Connections are designed for a DMS weight of 3600 lbs and a design Effective Projected Area (EPA) of 441 sq ft, with the EPA based on a DMS nominal width of 30.5 feet and nominal depth of 8.25 feet plus four top and bottom 1'-8" square flashing beacons. The EPA includes drag coefficients of 1.7 (applied to sign area) and 1.2 (applied to flashing beacon area). A horizontal eccentricity of 1.0 ft from the face of the truss to the center of gravity of the DMS for attachment of DMS is assumed. An even number of Z brackets, spaced at 5 ft max., is assumed to transfer forces through the connection.
3. All structural steel shall conform to ASTM A36, A572 Gr 50 or A588. Connection bolts shall conform to ASTM A325 or A449. Each connection bolt shall be provided with 1 heavy hex nut, 2 flat washers, and 1 lock washer. U bolts shall conform to ASTM A307 with 2 hex nuts, 2 flat washers and 2 lock washers. Hollow structural section (HSS) shall conform to ASTM A500, A501, or A847. J bolts and washer plate both shall be Type 304 stainless steel, with bolt minimum yield strength of 50 ksi and an elongation of 16 percent in 2 inches. All parts, except stainless steel shall be galvanized.
4. Contractor shall verify applicable field dimensions before fabrication. Various lengths of bearing and mounting angle are provided for suitable mounting. Contractor shall determine the proper bearing and mounting angle length, and the connection along the length at Z bracket to accommodate J-bolt hook. Contractor may substitute HSS for the mounting channel as long as the HSS has equal or greater thickness at the mounting channel. Limit HSS height to achieved mounting clearance.

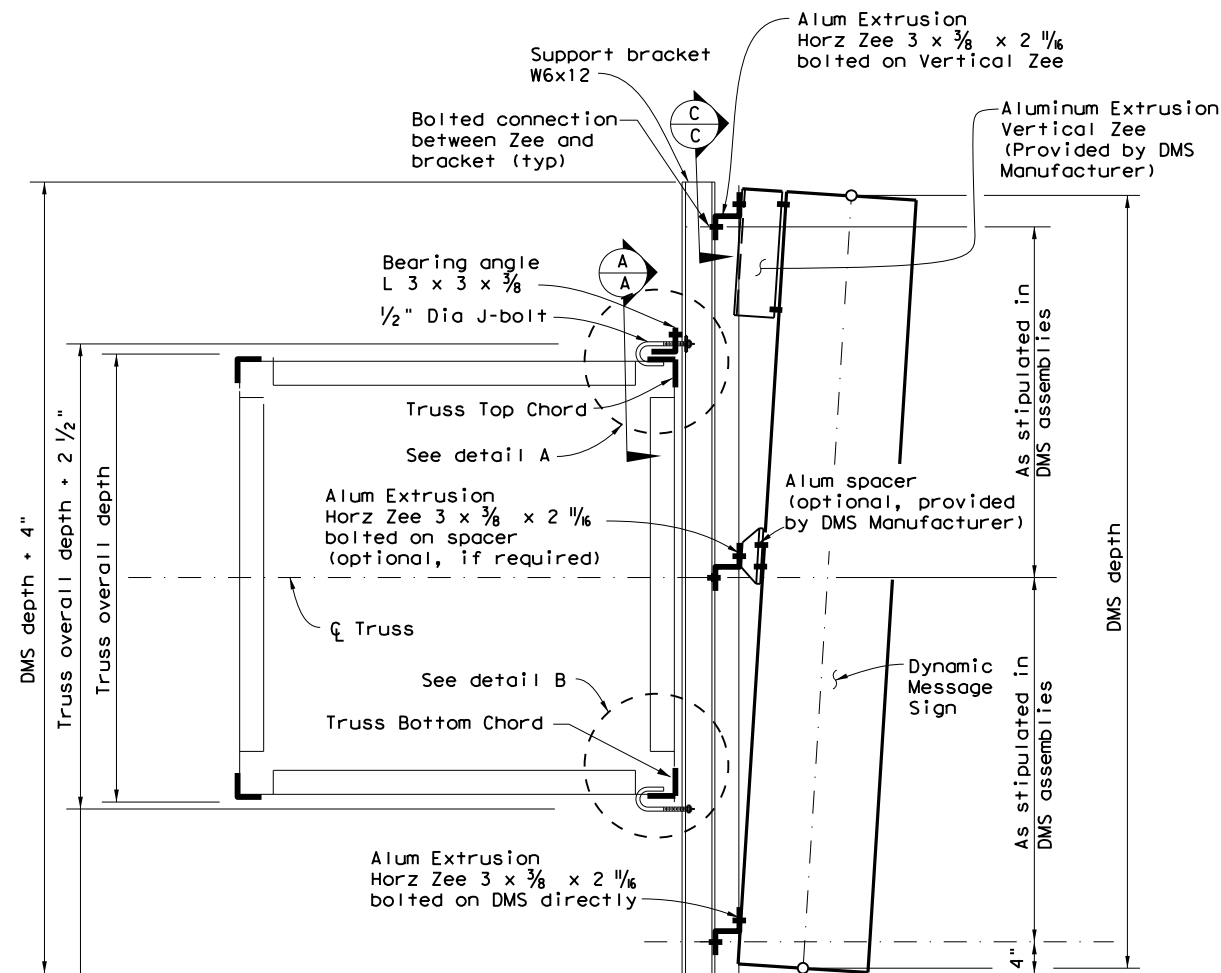
SHEET 3 OF 3

		Traffic Operations Division Standard	
<b>DMS-TO-TRUSS MOUNTING AT OVERHEAD SIGN SUPPORTS (WITH BUILD-UP)</b>			
<b>DMS (TM-3) - 16</b>			
FILE: dms-tm-16.dgn	DN: TxDOT	CK: DW: TxDOT	CK:
© TxDOT JUNE 2016	CONT SECT	JOB	HIGHWAY
REVISIONS	0003 01	064, ETC	IH 10
DIST	COUNTY	SHEET NO.	
ELP	CULBERSON	68	

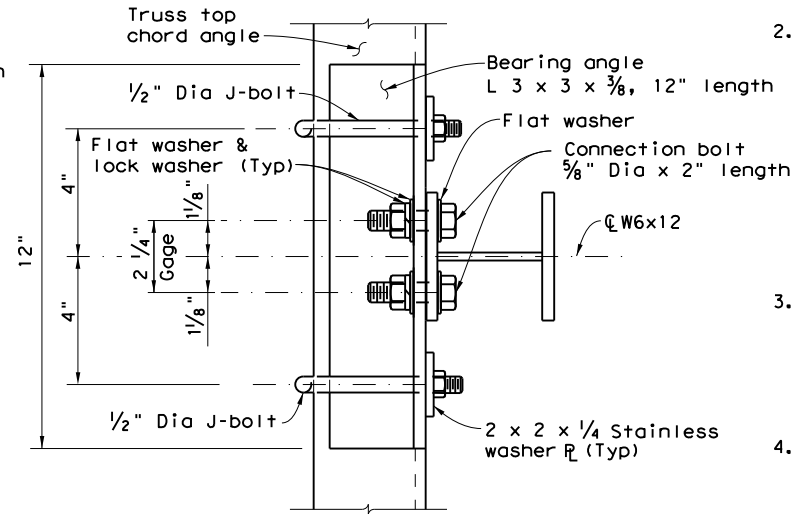


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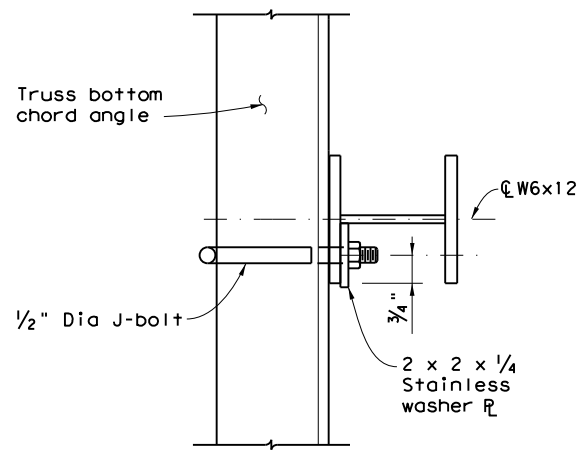
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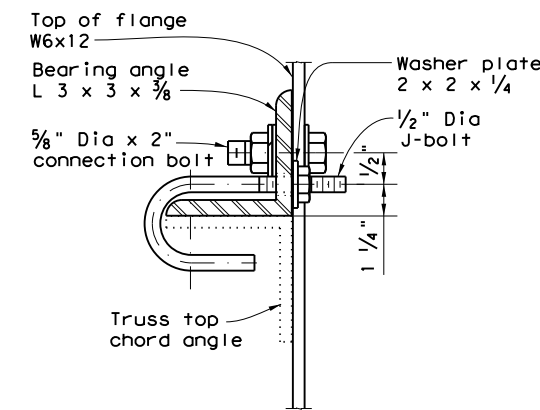
**MOUNTING DETAILS**  
(Skyline DMS)



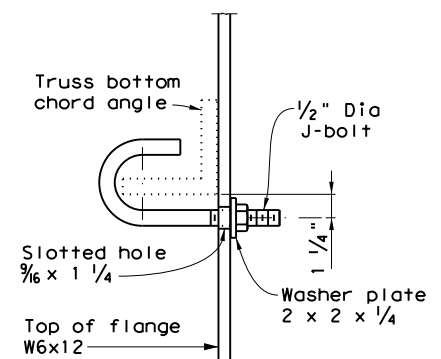
**TOP VIEW TRUSS TOP CONNECTION**



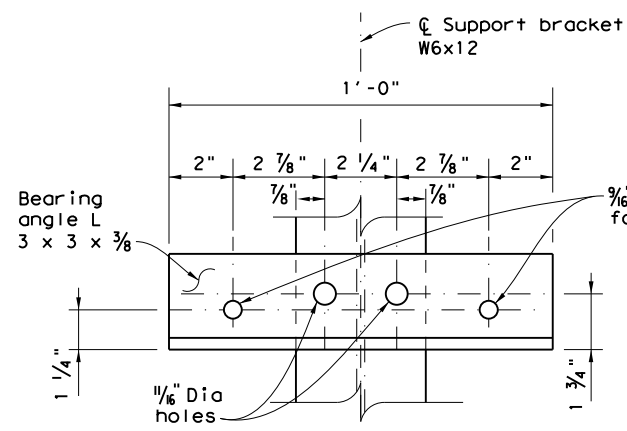
**TOP VIEW TRUSS BOTTOM CONNECTION**



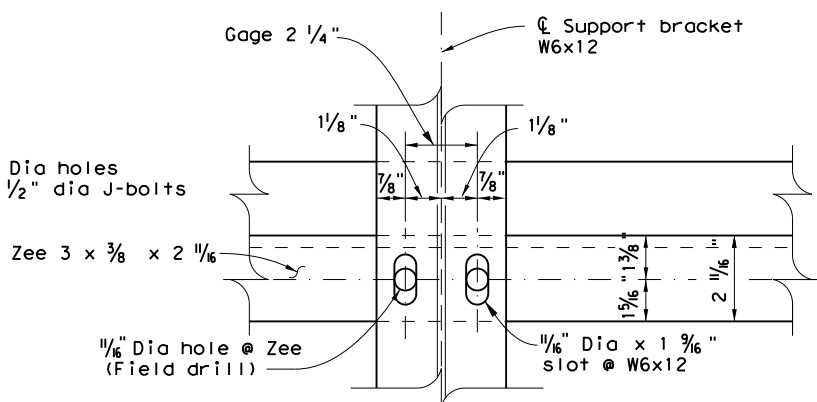
**DETAIL A**



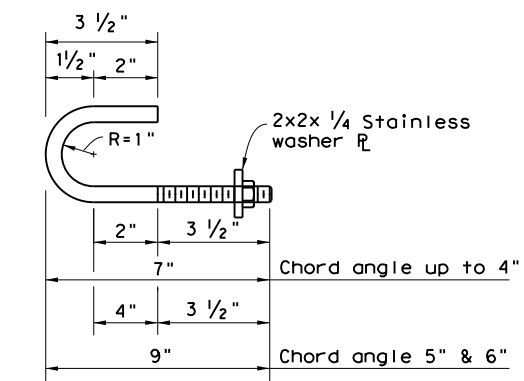
**DETAIL B**



**SECTION A-A**  
(Truss chord angle not shown)



**SECTION C-C**



**1/2" Dia J-BOLT**

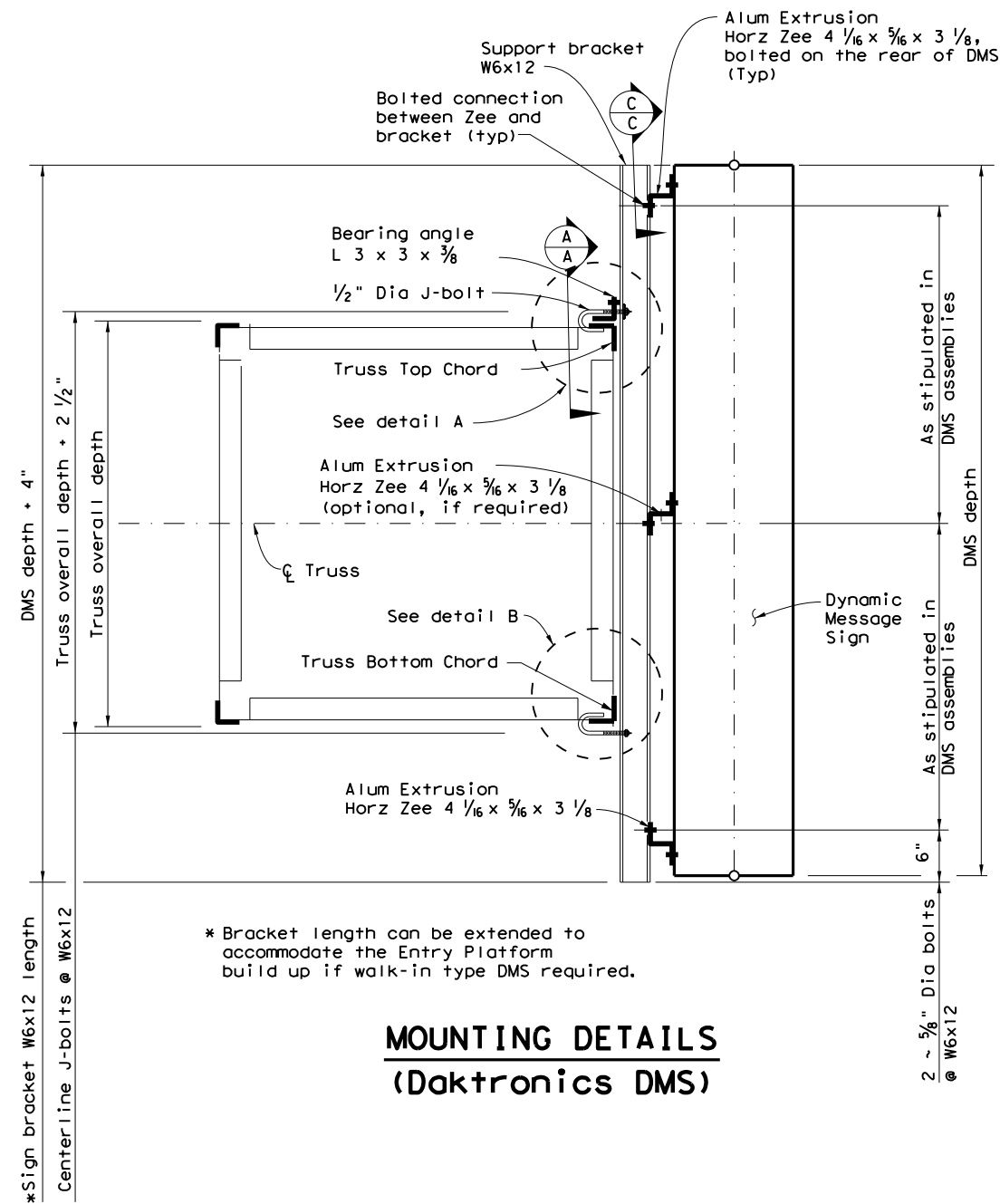
**GENERAL NOTES:**

- Determine the adequacy of the overhead sign support structure to support the dynamic message sign (DMS) prior to attaching the sign to the truss.
- Designed according to the 1994 edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions. Designed for a Sustained (Fastest Mile) Wind Velocity of 100 mph with a gust factor of 1.3. Connections are designed for a DMS weight of 3800 lbs. The structural support is designed for an Effective Projected Area (EPA) of 441 sq. ft. based on a DMS nominal width of 30.5 feet and nominal depth of 8.25 feet, with a drag coefficient of 1.7 applied, plus four 1'-8" square flashing beacons with a drag coefficient of 1.2. DMS attachment is designed for a horizontal eccentricity of 1.3 ft. from the face of the truss to the center of gravity of the DMS. Provide an even number of sign supporting brackets (6 minimum), W6x12, spaced at 5'-6" max. The maximum distance between the sign edge to the nearest supporting bracket is 2'-3".
- Verify applicable field dimensions before fabrication. Determine the required number and spacing of sign support brackets, along with the Aluminum Extrusion Vertical and Horizontal Zees provided by the DMS manufacturer, to connect the DMS to the truss. For the J-bolt connection of DMS to overhead sign structure, align each arranged sign bracket with its bearing angle to avoid conflict with the truss connection bolts at the point of attachment.
- Provide structural steel meeting the requirements of ASTM A36, A572 Gr 50 or A588. Provide connection bolts meeting the requirements of ASTM F3125, Grade A325 or A449 with 1 heavy hex nut, 2 flat washers, and 1 lock washer. Provide Type 304 stainless steel J bolt and washer plate, with bolt minimum yield strength of 50 ksi and an elongation of 16 percent in 2 inches. Galvanize all parts except stainless steel.
- Prior to the initialization of DMS mounting, the DMS manufacturer must provide and install the 6061-T6 Aluminum Extrusion Vertical and Horizontal Zees, 3 x 3/8 x 2 1/16, and the specified Aluminum Spacers (if any) to the back of the DMS.
- The sign support bracket attached to the truss shown here is an example only. Adjust the bracket position along the truss depth to achieve the required vertical clearance to be confirmed by the Engineer.
- When the structure is to be exposed to a highly corrosive environment, provide elastomeric spacer to separate aluminum alloy parts from direct contact with steel.

<b>DMS-TO-TRUSS MOUNTING WITH HORIZONTAL ZEE EXTRUSIONS</b>			
<b>DMS (HZ-1) - 21</b>			
FILE: dms(hz-1)-21.dgn	DN: TxDOT	CK: TxDOT	CR: TxDOT
© TxDOT February 2021	CONT	SECT	JOB
REVISIONS	0003	01	064, ETC
DIST	COUNTY	SHEET NO.	
ELP	CULBERSON	69	

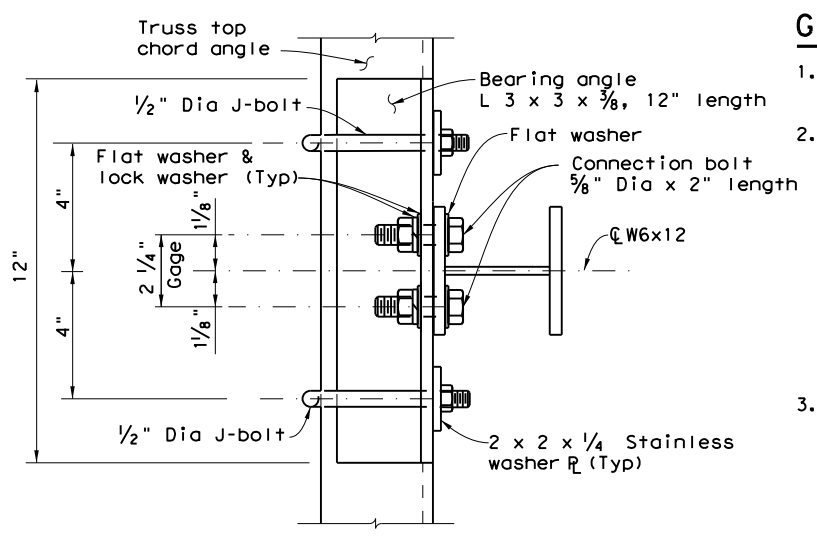
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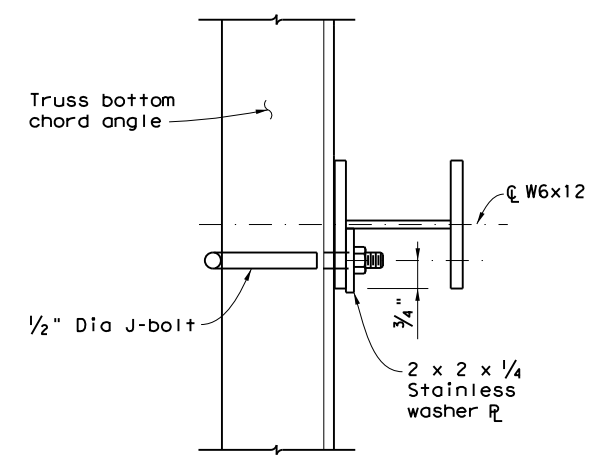


\* Bracket length can be extended to accommodate the Entry Platform build up if walk-in type DMS required.

**MOUNTING DETAILS  
(Daktronics DMS)**



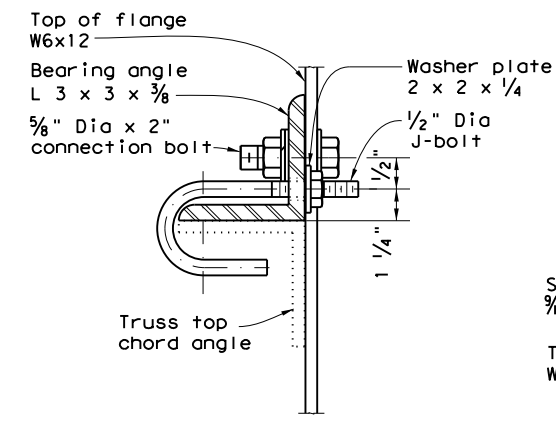
**TOP VIEW  
TRUSS TOP CONNECTION**



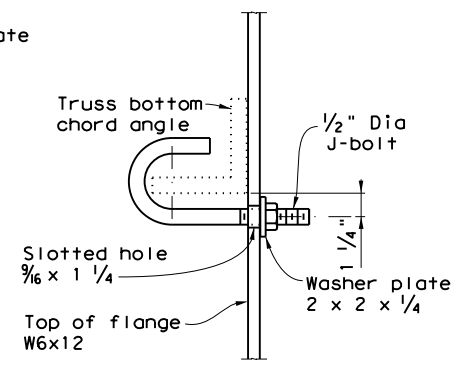
**TOP VIEW  
TRUSS BOTTOM CONNECTION**

**GENERAL NOTES:**

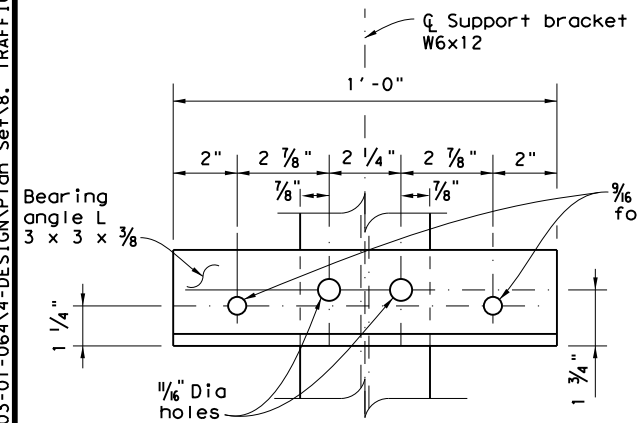
- Determine the adequacy of the overhead sign support structure to support the dynamic message sign (DMS) prior to attaching the sign to the truss.
- Designed according to the 1994 edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions. Designed for a Sustained (Fastest Mile) Wind Velocity of 100 mph with a gust factor of 1.3. Connections are designed for a DMS weight of 3800 lbs. The structural support is designed for an Effective Projected Area (EPA) of 399 sq. ft. based on a DMS nominal width of 29.1 feet and nominal depth of 7.8 feet, with a drag coefficient of 1.7 applied, plus four 1'-8" square flashing beacons with a drag coefficient of 1.2. DMS attachment is designed for a horizontal eccentricity of 2.4 ft. from the face of the truss to the center of gravity of the DMS. Provide an even number of sign supporting brackets (6 minimum), W6x12, spaced at 5'-6" max. The maximum distance between the sign edge to the nearest supporting bracket is 2'-3".
- Verify applicable field dimensions before fabrication. Determine the required number and spacing of sign support brackets, along with the Aluminum Extrusion Horizontal Zees provided by the DMS manufacturer, to connect the DMS to the truss. For the J-bolt connection of DMS to overhead sign structure, align each arranged sign bracket with its bearing angle to avoid conflict with the truss connection bolts at the point of attachment.
- Provide structural steel meeting the requirements of ASTM A36, A572 Gr 50 or A588. Provide connection bolts meeting the requirements of ASTM F3125, Grade A325 or A449 with 1 heavy hex nut, 2 flat washers, and 1 lock washer. Provide Type 304 stainless steel J bolt and washer plate, with bolt minimum yield strength of 50 ksi and an elongation of 16 percent in 2 inches. Galvanize all parts except stainless steel.
- Prior to the initialization of DMS mounting, the DMS manufacturer must provide and install the 6061-T6 Aluminum Extrusion Horizontal Zees, 4 1/16 x 5/16 x 3 1/8.
- The sign support bracket attached to the truss shown here is an example only. Adjust the bracket position along the truss depth to achieve the required vertical clearance to be confirmed by the Engineer.
- When the structure is to be exposed to a highly corrosive environment, provide elastomeric spacer to separate aluminum alloy parts from direct contact with steel.



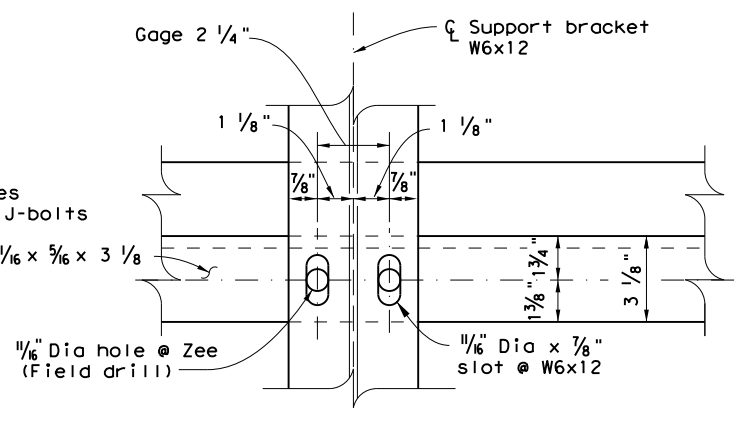
**DETAIL A**



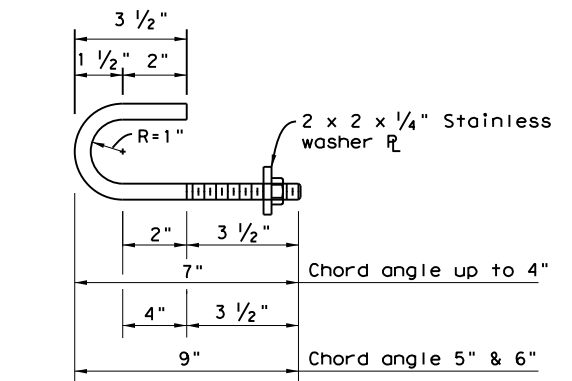
**DETAIL B**



**SECTION A-A  
(Truss chord angle not shown)**



**SECTION C-C**



**1/2\"/>**

		<b>Texas Department of Transportation</b>		<b>Traffic Safety Division Standard</b>	
<b>DMS-TO-TRUSS MOUNTING WITH HORIZONTAL ZEE EXTRUSIONS</b>					
<b>DMS (HZ-2) - 21</b>					
FILE: dms(hz-2) - 21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT	
© TxDOT February 2021	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0003	01	064, ETC	IH 10	
	DIST	COUNTY		SHEET NO.	
	ELP	CULBERSON		70	

DATE: 10/11/2023 10:41:44 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Wind Velocity and Ice Line\8-14-23\WV & IZ-14.dwg

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APPLICABLE STANDARDS SHEETS

OVERHEAD SIGN BRIDGE STANDARDS:

- OSB-SE
- OSB-Z#
- OSB-Z#1
- HOSB-Z#
- HOSB-Z1L
- HOSB-Z#1
- OSBT
- OSBC
- OSBC-SC-Z#
- OSBS-SC
- OSB-FD
- OSB-FD-SC

CANTILEVER OVERHEAD SIGN SUPPORT STANDARDS:

- COSS-SE
- COSS-Z#-10
- HCOSS-Z#-10
- COSS-Z21-10
- COSS-Z#&Z#1-10
- COSSD
- COSSF
- COSS-FD

Note: # = Wind Zone number 1, 2, 3 or 4

HIGH MAST ILLUMINATION POLE STANDARDS:

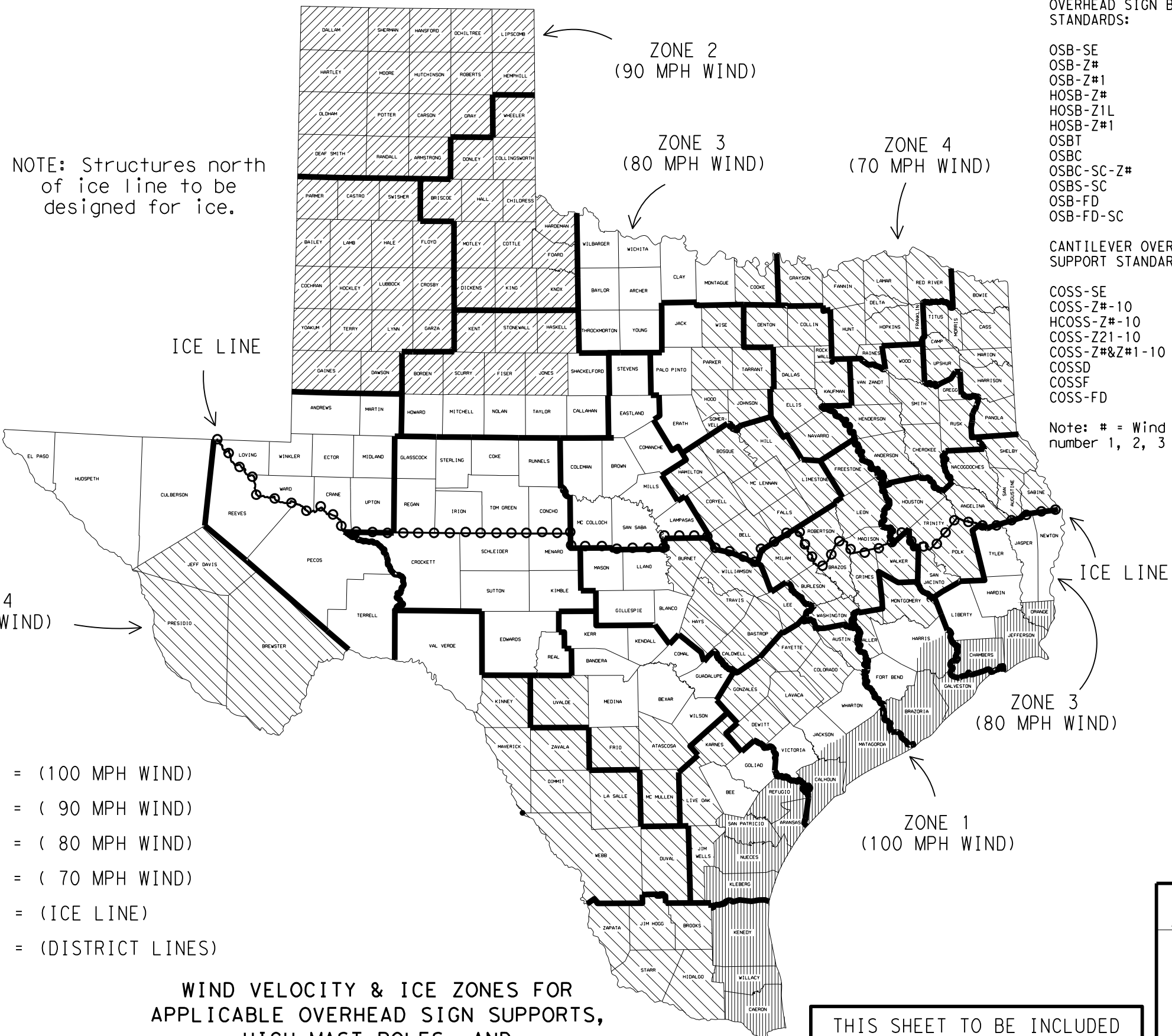
- HMIP-98
- HMIF-98

WALKWAYS AND BRACKETS STANDARDS:

- SWW
- SB(SWL-1)

TRAFFIC SIGNAL POLE STANDARDS:

- SP-80
- SP-100
- SMA-80
- SMA-100
- DMA-80
- DMA-100
- MA-C
- MAC (ILSN)
- MAD-D
- TS-FD
- LUM-A
- CFA
- LMA
- TS-C
- MA-DPD



NOTE: Structures north of ice line to be designed for ice.

LEGEND

- ZONE 1 - [diagonal lines] = (100 MPH WIND)
- ZONE 2 - [diagonal lines] = ( 90 MPH WIND)
- ZONE 3 - [white box] = ( 80 MPH WIND)
- ZONE 4 - [diagonal lines] = ( 70 MPH WIND)
- [dashed line with circles] = (ICE LINE)
- [solid black line] = (DISTRICT LINES)

WIND VELOCITY & ICE ZONES FOR APPLICABLE OVERHEAD SIGN SUPPORTS, HIGH MAST POLES, AND TRAFFIC SIGNAL POLES

Based on 50 Year Mean Recurrence Interval of Fastest Mile Wind Velocity at 33 feet height.

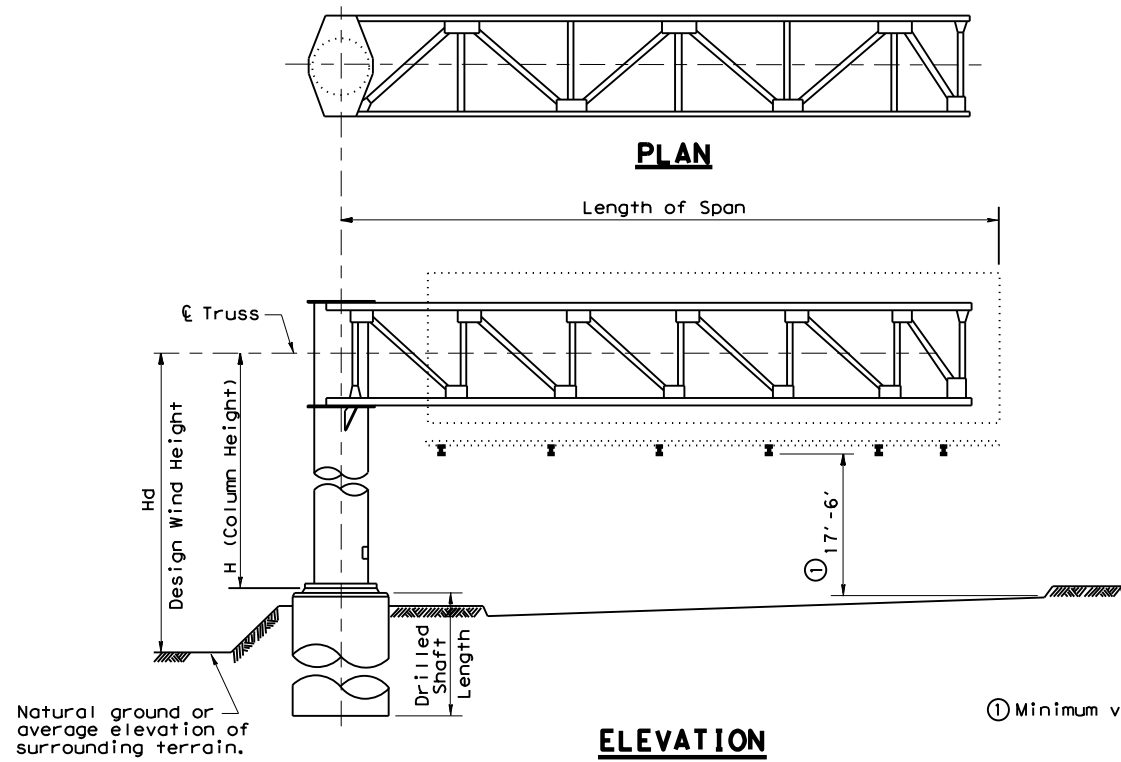
THIS SHEET TO BE INCLUDED IN ALL P.S.&E. PACKAGES CONTAINING ONE OR MORE OF THE APPLICABLE STANDARD SHEETS LISTED HEREON

FOR HARRIS CO. ONLY  
 Zone line is just North of US 90, around on the North, West and South sides of IH 610 and down the West side of SH 288.

FOR JACKSON CO. ONLY  
 Zone line is just North of SH 616.

		Traffic Operations Division Standard	
<h2>WIND VELOCITY AND ICE ZONES</h2> <h3>WV &amp; IZ-14</h3>			
FILE:	windice.dgn	DN: TxDOT	CK: TxDOT
© TxDOT	April 1996	CONT	SECT
REVISIONS	0003	01	064, ETC
8-14-Added list of applicable standards, restricting use to structures designed for Fastest Mile wind speeds.	DIST	COUNTY	SHEET NO.
	ELP	CULBERSON	71

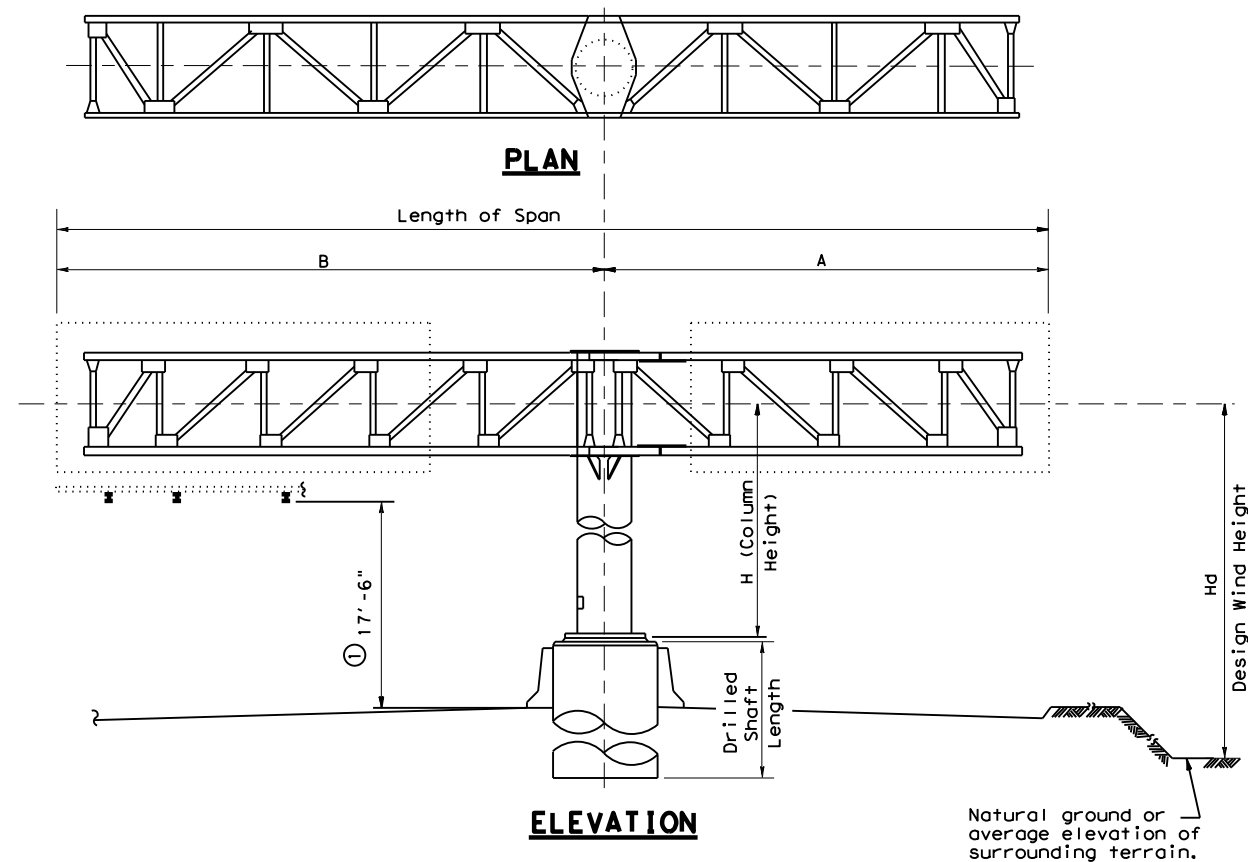
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**SELECTION EXAMPLE CANTILEVER SPAN**

Given: Cantilever Span = 33'; Column Height, H = 23.3'; Design Wind Height, Hd = 27'; Avg. Penetrometer Value, N = 15 (clay type soil); Hill County

- Step 1:** Select applicable COSS standard. From Wind Velocity and Ice Zone sheet (WV & IZ-96) determine that Hill County is in Zone 4 (70 mph) and is above the ice line. Since Design Wind Height is less than 30', use standard COSS-Z4 & Z4I. If Design Wind Height is more than 30', use COSS-Z3 & Z3I. NOTE: In Zone 1 if Design Wind Height is greater than 30' use HCOSS-Z1.
- Step 2:** Determine tower details from COSS-Z4 & Z4I. Use column height to nearest tabulated value, i.e., 23'. Round span length up to the nearest tabulated value, i.e., 35'. Tower details are:  
 Tower pipe 24" Dia with min. wall thickness = 0.312"  
 Base plate 33 3/4" Dia x 1 3/4"  
 Anchor bolts 8-1 3/4" Dia on 29 3/8" bolt circle  
 Horizontal deflection of tower at  $\bar{C}$  truss = 0.889". During installation, double nuts at base plate may be used to plumb tower to compensate for horizontal deflection.  
 Design Moment = 244 Kip-ft  
 Design Torsion = 162 Kip-ft
- Step 3:** Determine truss details from COSS-Z4 & Z4I. Read from small table at bottom of sheet for span = 35'. Truss design width, W and depth, D = 4.0' x 4.0'.  
 Chord L 3 x 3 x 3/8 (HYC) with 6 bolt connection at tower  
 D.L. Diag. L 2 x 2 x 3/8 (HYC) with 2 bolt connection  
 W.L. Diag. L 3 x 3 x 3/8 (HYC) with 2 bolt connection  
 D.L. Vert. L 2 x 2 x 3/8 (HYC) with 2 bolt connection  
 W.L. Strut. L 2 x 2 x 3/8 (HYC) with 1 bolt connection  
 Bolts are 3/8" Dia high strength with 5-3/4" Dia bolt alternate for chord connection at tower.  
 D.L. of truss = 50 lb/ft  
 Truss deflection at free end = 3.2". The fabricator shall compensate for this deflection by offsetting bolt holes between the upper and lower chords at the truss-to-tower connection.
- Step 4:** Determine foundation details. Use standard COSSF. From COSSF with 24" Dia pipe and 1 3/4" Dia anchor bolts:  
 Anchor Bolts 1 3/4" Dia x 3'-10"  
 Drilled Shaft Dia 42"  
 Vertical Reinforcing 12 ~ #10 bars  
 Spiral C = #4 at 6" pitch Grade 60.  
 Misc. handhole, base plate, anchor bolt, and foundation details are shown on COSSF.
- Step 5:** Determine drilled shaft length from COSS-FD. Enter the appropriate graph (for 42" Dia drilled shaft in clay soil) from the bottom with N = 15. Proceed upward interpolating moment curves (solid lines) to locate 244 Kip-ft. Project to the left side of the graph to determine the required embedment length, i.e., 12'. Repeat the procedure for torsion curves (dashed lines) to locate 162 Kip-ft. The embedment length required to satisfy torsion is 14'. Add 3'-0" to the longer length to obtain a required drilled shaft length of 17'.



**SELECTION EXAMPLE DOUBLE CANTILEVER SPAN**

Given: Short span, A = 9'; Long Span, B = 25'; Total Cantilever Span = 34'; Column Height, H = 24'; Design Wind Height, Hd = 26'; Avg. Penetrometer Value, N = 20 (clay type soil); Wheeler County.

- Step 1:** Select applicable COSS standard. From Wind Velocity and Ice Zone sheet determine that Wheeler County is in Zone 2 (90 mph) and is above the ice line. Since Design Wind Height is less than 30' use standard COSS-Z2I. If Design Wind Height is more than 30', use HCOSS-Z1.
- Step 2:** Determine tower details from COSS-Z2I. Use column height = 24'. Round total span length up to the next longer tabulated length span, i.e., 35'. If total span length is greater than 40', a special design would be required. Tower details are:  
 Tower pipe 30" Dia with min. wall thickness = 0.310"  
 Base Plate 40 1/2" Dia x 1 3/4"  
 Anchor bolts 8 ~ 2" Dia on 35 3/4" bolt circle  
 Horizontal deflection of tower at  $\bar{C}$  truss = 0.574-0.316 = 0.26". During installation, double nuts at base plate may be used to plumb tower and compensate for horizontal deflection.  
 Design Moment = 403 Kip-ft (use total span = 35')  
 Design Torsion = 136 Kip-ft (use long span = 25')
- Step 3:** Determine truss details from COSS-Z2I. Read from small table at bottom of sheet 2 of 2 for Span A = 9' (use 10'):  
 Chord L 3 x 3 x 3/8 (HYC) with 3 bolt connection at splice  
 D.L. Diag. L 2 x 2 x 3/8 (HYC) with 2 bolt connection  
 W.L. Diag. L 3 x 3 x 3/8 (HYC) with 2 bolt connection  
 D.L. Vert. L 2 x 2 x 3/8 (HYC) with 2 bolt connection  
 W.L. Strut. L 2 x 2 x 3/8 (HYC) with 1 bolt connection  
 Bolts are 3/8" Dia high strength.  
 D.L. of truss = 42 lb/ft.  
 Span B = 25':  
 Chord L 3 x 3 x 1/4 (HYC) with 4 bolt connection at tower  
 D.L. Diag. L 2 x 2 x 3/8 (HYC) with 2 bolt connection  
 W.L. Diag. L 3 x 3 x 3/8 (HYC) with 2 bolt connection  
 D.L. Vert. L 2 x 2 x 3/8 (HYC) with 2 bolt connection  
 W.L. Strut. L 2 x 2 x 3/8 (HYC) with 1 bolt connection  
 Bolts are 3/8" Dia high strength with 3 ~ 3/4" Dia bolt alternate for chord connection at tower.  
 D.L. of truss = 47 lb/ft.  
 Truss defl. at free end = 0.2" for Span A, = 1.3" for Span B. The fabricator shall compensate for deflections by offsetting bolt holes between upper and lower chords at splice and at truss-to-tower connection. Top chord shall be shortened between the tower and the splice to achieve the required offset.

- Step 4:** Determine foundation details. Use standard COSSF. From COSSF with 30" Dia pipe and 2" Dia anchor bolts:  
 Anchor bolts 2" Dia x 4'-3"  
 Drilled shaft Dia 54"  
 Vertical Reinforcing 18 ~ #10 bars  
 Spiral C = #4 at 6" pitch Grade 60  
 Misc. handhole, base plate, anchor bolt, and foundation details are shown on COSSF.
- Step 5:** Determine drilled shaft length from COSS-FD. Enter the appropriate graph (for 54" Dia drilled shaft in clay type soil) from the bottom with N = 20. Proceed upward interpolating moment curves (solid lines) to locate 403 Kip-ft. Project to the left side of graph to determine required embedment length, i.e., 13'. Repeat the procedure for the torsion curves (dashed lines) to locate 136 Kip-ft. Embedment length required to satisfy torsion is 9'. Add 3' to the longer length to obtain required drilled shaft length of 16'.

**CANTILEVER  
OVERHEAD SIGN SUPPORTS  
SELECTION EXAMPLES**

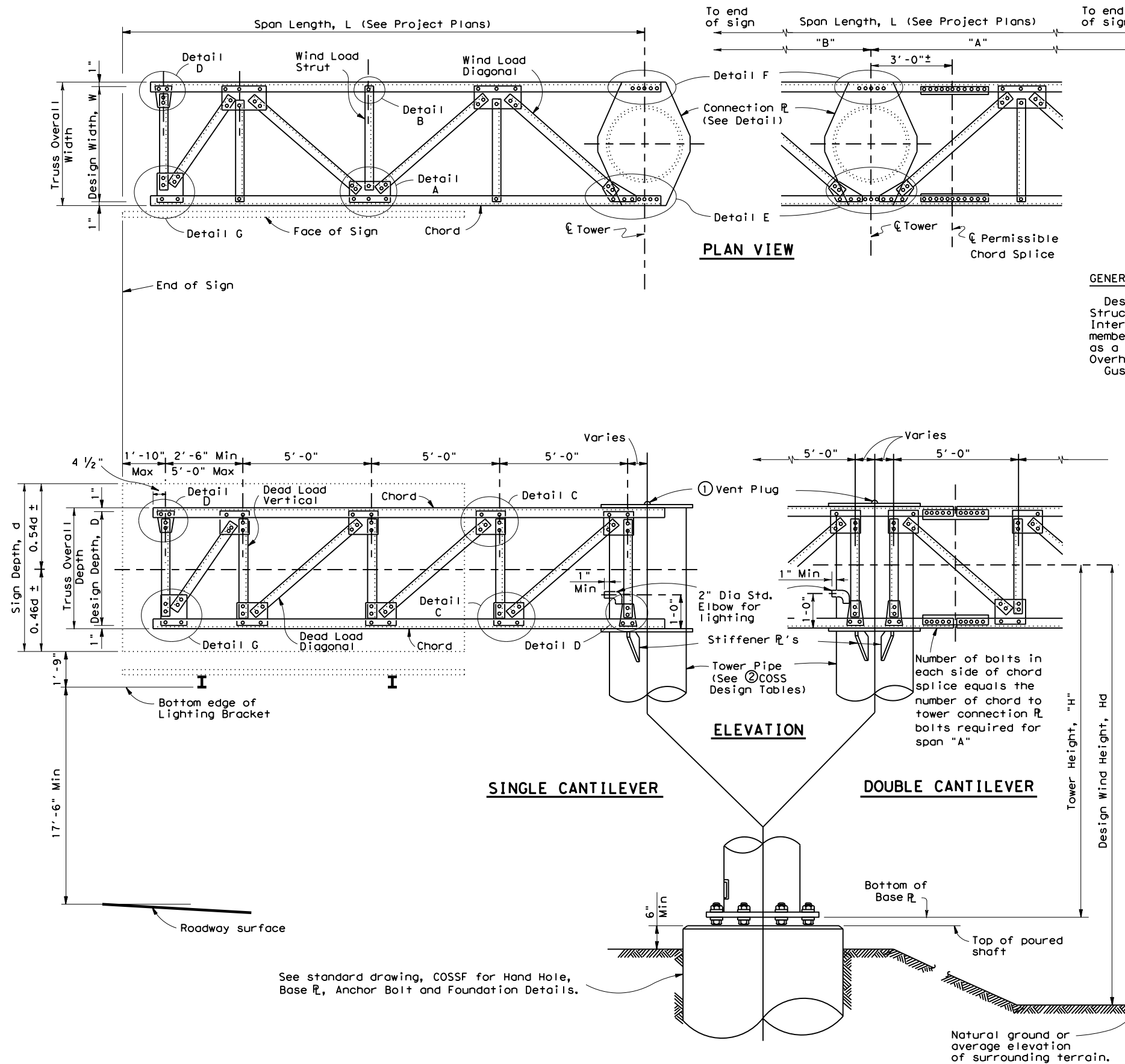
**COSS-SE**

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REVISIONS					
CONT	SECT	JOB		HIGHWAY	
0003	01	064, ETC		IH 10	
DIST		COUNTY		SHEET NO.	
ELP		CULBERSON		72	



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**GENERAL NOTES:**

Design conforms to 1975 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and Interim revisions thereto. Connection details are typical only. Actual size of member and number of bolts will vary. The details on this sheet are intended as a guide only. See "Cantilever Overhead Sign Supports" or "High Level Cantilever Overhead Sign Supports" sheets for number of bolts and size of members. Gusset plates to be same thickness as thickest web member in connection.

- ① Note: Cap shall be solid steel sheet  $\frac{3}{8}$ " nominal thickness. Drill, tap and plug galvanizing vent. Weld plate to pipe with  $\frac{3}{8}$ " weld all around.
- ② For COSS design tables see standard drawing, "Cantilever Overhead Sign Supports" or "High Level Cantilever Overhead Sign Supports".

SHEET 1 OF 2

Texas Department of Transportation  
 Traffic Operations Division

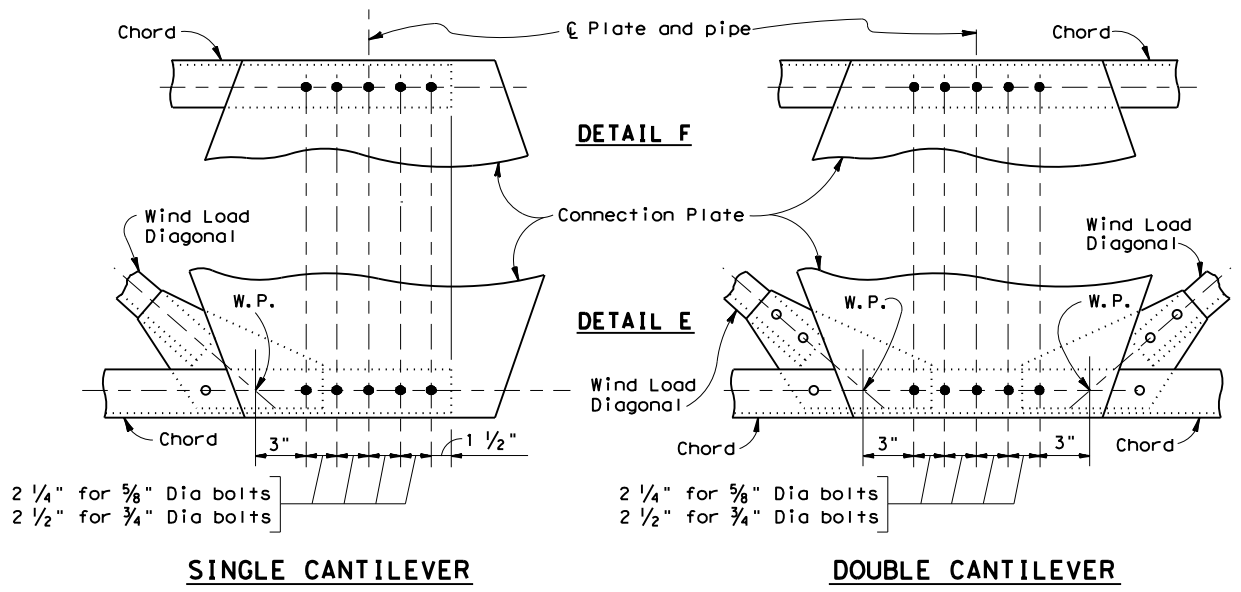
**CANTILEVER OVERHEAD  
 SIGN SUPPORT DETAILS**

**COSSD**

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REVISIONS					
CONT	SECT	JOB		HIGHWAY	
0003	01	064, ETC		IH 10	
DIST		COUNTY		SHEET NO.	
ELP		CULBERSON		74	

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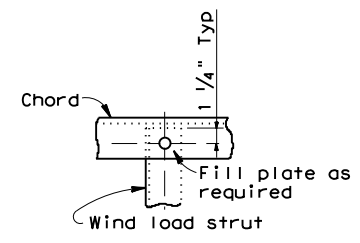


2 1/4" for 5/8" Dia bolts  
 2 1/2" for 3/4" Dia bolts

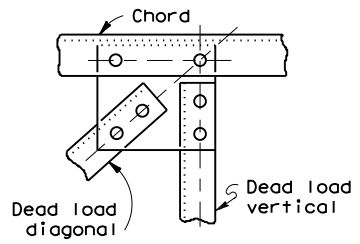
**SINGLE CANTILEVER**

**DOUBLE CANTILEVER**

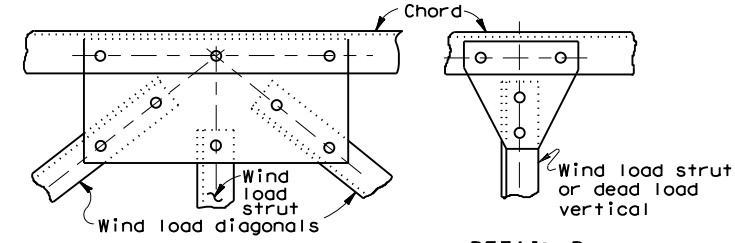
**CONNECTION DETAILS**



**DETAIL B**

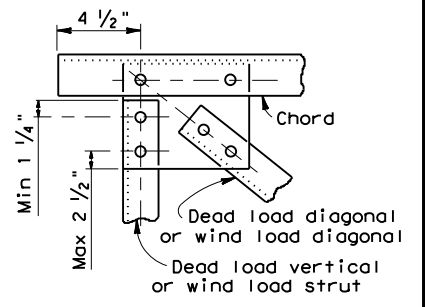


**DETAIL C**



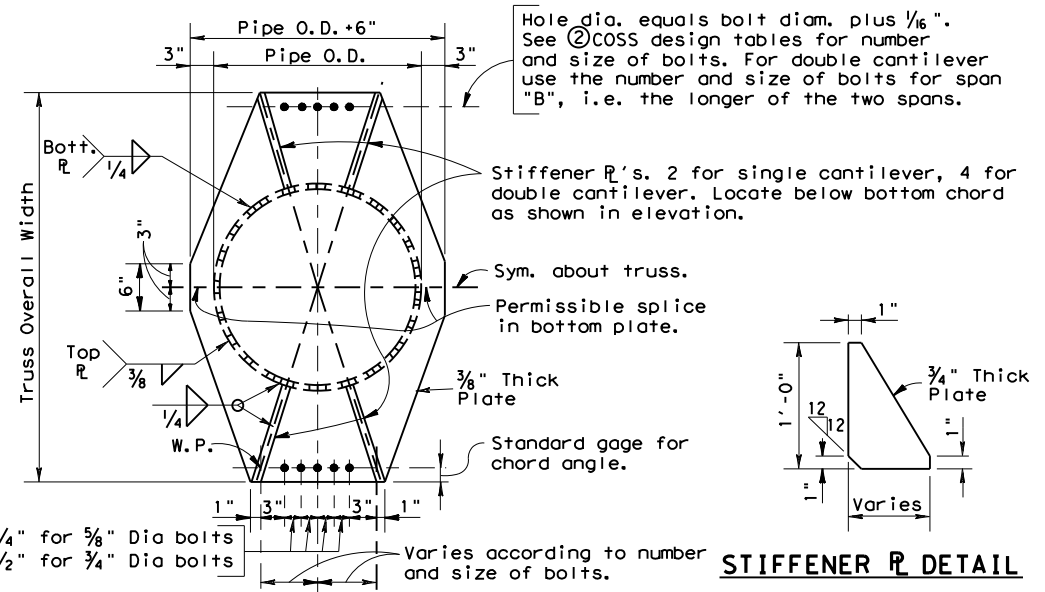
**DETAIL A**

**DETAIL D**



**DETAIL G**

NUMBER OF BOLTS REQD. IN GUSSET PLATE TO CHORD CONNECTION	
TOTAL NO. OF BOLTS IN DIAG'S. IN JOINT	
0	2
2	2
3	3
4	3
5	4
6	4
8	5
10	6



Hole dia. equals bolt diam. plus 1/16". See ② COSS design tables for number and size of bolts. For double cantilever use the number and size of bolts for span "B", i.e. the longer of the two spans.

Stiffener P's. 2 for single cantilever, 4 for double cantilever. Locate below bottom chord as shown in elevation.

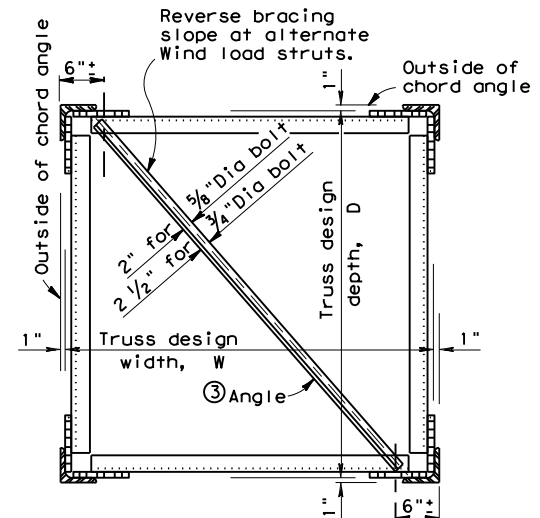
Sym. about truss.  
 Permissible splice in bottom plate.

3/8" Thick Plate  
 Standard gage for chord angle.

2 1/4" for 5/8" Dia bolts  
 2 1/2" for 3/4" Dia bolts

Varies according to number and size of bolts.

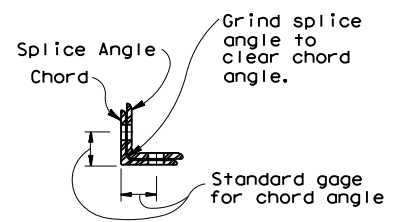
**STIFFENER PLATE DETAIL**



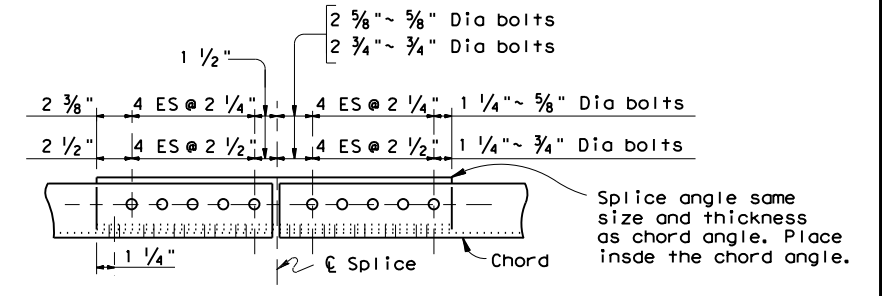
③ 2" x 2" x 3/16" angle for 5/8" Dia bolts [1]  
 2 1/2" x 2" x 3/16" angle for 3/4" Dia bolts [1]

**TRUSS SECTION**

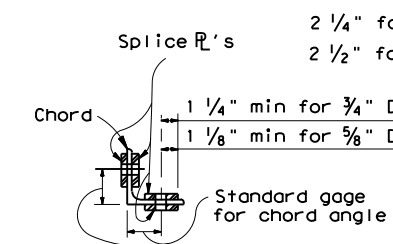
(DIAGONALS NOT SHOWN)



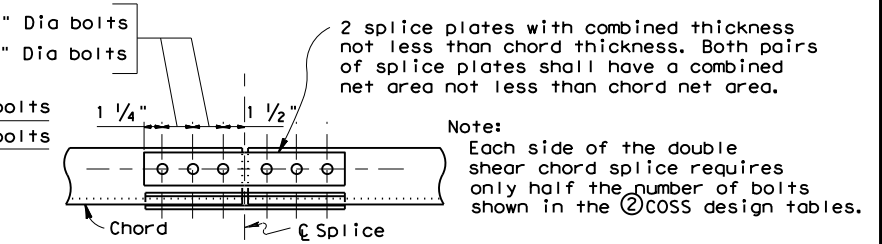
**SECTION ON C SPLICE**



**SINGLE SHEAR CHORD SPLICE**



**SECTION ON C SPLICE**

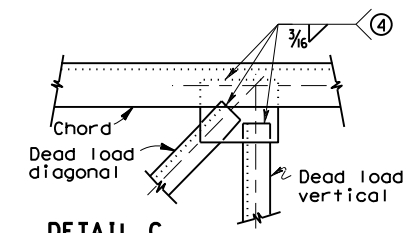


**DOUBLE SHEAR CHORD SPLICE**

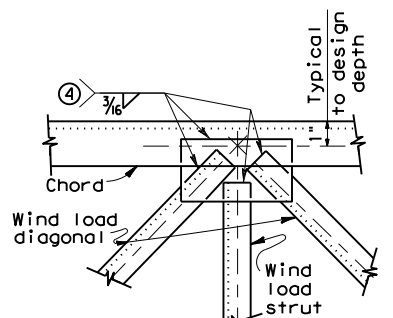
**SPLICE DETAILS**

Note:  
 Each side of the double shear chord splice requires only half the number of bolts shown in the ② COSS design tables.

**CONNECTION PLATE DETAIL**



**DETAIL C**  
 (Gusset plates in other details to be similar)



**DETAIL A**

**ALTERNATE WELDED CONNECTION DETAILS**

④ MINIMUM LENGTH OF 3/16" FILLET WELD REQUIRED		
NUMBER OF BOLTS	TO REPLACE 5/8" DIA BOLTS	TO REPLACE 3/4" DIA BOLTS
1	2"	3"
2	4"	6"
3	6"	9"
4	8"	11 1/2"
5	10"	14 1/2"
6	12"	17 1/2"
7	14"	20"

**CANTILEVER OVERHEAD SIGN SUPPORT DETAILS**

**COSSD**

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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	
REVISIONS		CONTRACT	SECTION	JOB
		0003	01	064, ETC
		DISTRICT	COUNTY	HIGHWAY
		ELP	CULBERSON	IH 10
				SHEET NO.
				75

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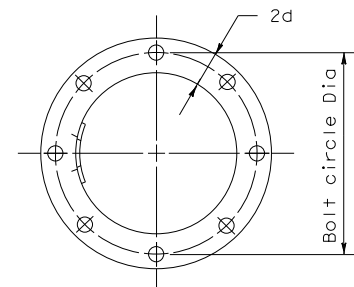
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Washers shall conform to ASTM F436.

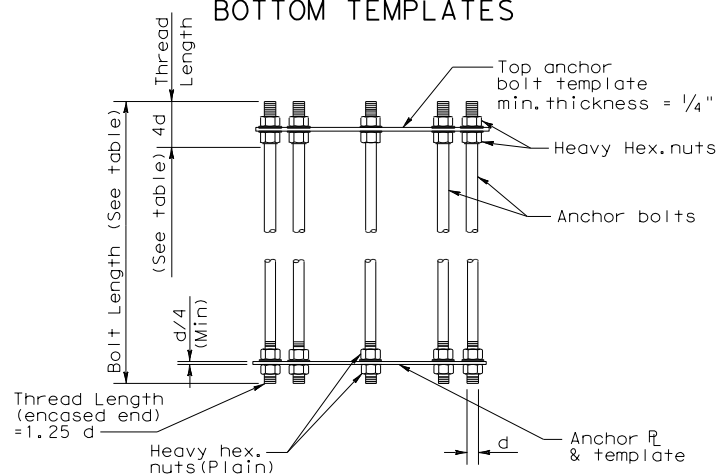
ANCHOR BOLT DIA.	WASHER DIMENSIONS			HOLE IN BASE PLATE	
	OUTSIDE DIAMETER	HOLE DIAMETER	THICKNESS		
			MIN.		MAX.
d	2d	d + 1/8"	0.136"	0.177"	d + 1/4"
1 1/2" or less	2d	d + 1/8"	0.178"	0.280"	d + 5/16"
1 3/4"	2d - 1/8"	d + 1/8"	0.178"	0.280"	d + 5/16"
2"	2d - 1/4"	d + 1/8"	0.178"	0.280"	d + 5/16"
Over 2"	2d - 1/2"	d + 1/8"	0.240"	0.340"	d + 5/16"

ANCHOR BOLT SIZE				
DIA	BOLT LENGTH	THREAD LENGTH	PROJECTION LENGTH	GALVAN. LENGTH
1 1/4"	2'-11"	5"	5 1/4"	11 1/4"
1 3/8"	3'-1"	5 1/2"	5 3/4"	11 3/4"
1 1/2"	3'-4"	6"	6 1/4"	1'-0 1/4"
1 3/4"	3'-10"	7"	7 1/4"	1'-1 1/4"
2"	4'-3"	8"	8 1/4"	1'-2 1/4"
2 1/4"	4'-9"	9"	9 1/4"	1'-3 1/4"
2 1/2"	5'-2"	10"	10 1/4"	1'-4 1/4"
2 3/4"	5'-8"	11"	11 1/4"	1'-5 1/4"
3"	6'-1"	1'-0"	1'-0 1/4"	1'-6 1/4"

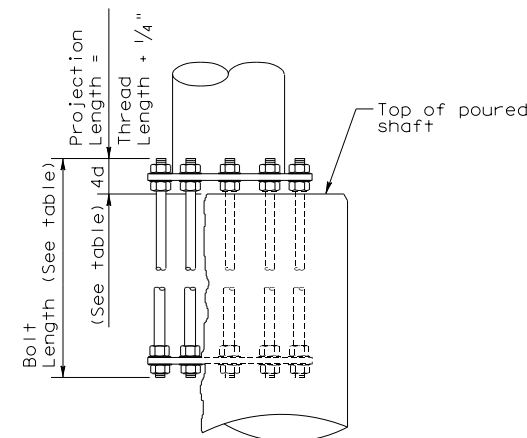
- ① Anchor Bolt Fabrication Tolerances:  
 Bolt Length ~ ±1/2"  
 Thread Length ~ ±1/2"  
 Galvanized Length ~ -1/4"
- ② Thread length applies to upper and lower threads



TOP VIEW OF TOP & BOTTOM TEMPLATES

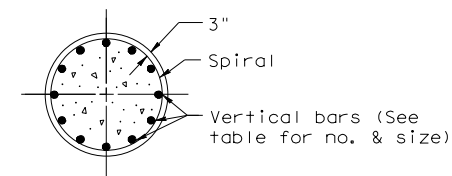


ANCHOR BOLT ASSEMBLY (PRIOR TO INSTALLATION)

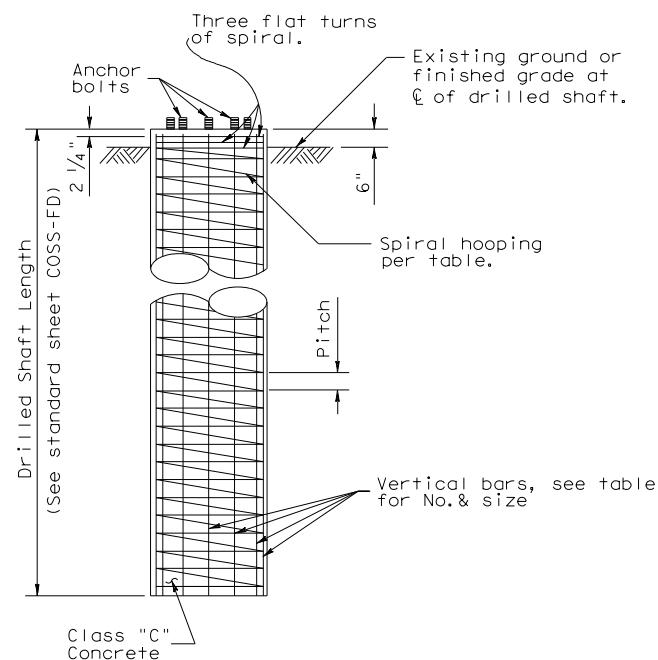


BEARING SEAT ELEVATION

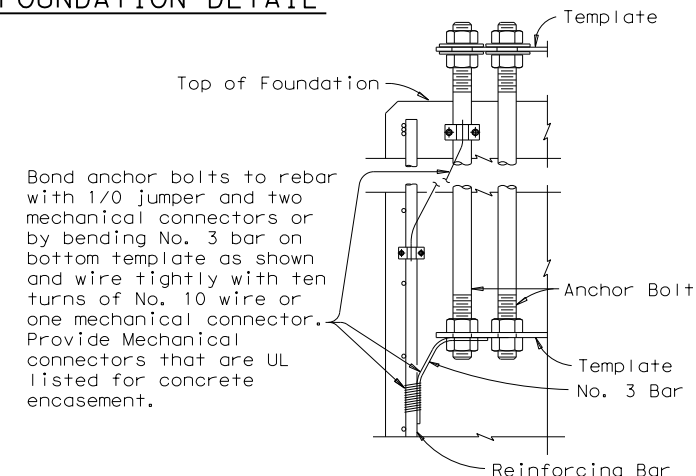
ANCHOR BOLT SIZE	PIPE OUTSIDE DIAMETER											
	16"			20"			24"			30"		
	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF
1 1/4" Dia x 2'-11"	20 1/2"	36" Dia	14-#8 (A)	24 1/2"	36" Dia	14-#8 (A)						
1 3/8" Dia x 3'-1"	20 3/4"	36" Dia	12-#9 (A)	24 3/4"	42" Dia	14-#9 (A)						
1 1/2" Dia x 3'-4"	21"	36" Dia	12-#9 (A)	25"	42" Dia	14-#9 (A)	29"	42" Dia	14-#9 (C)			
1 3/4" Dia x 3'-10"	21 1/2"	36" Dia	10-#10 (A)	25 3/8"	42" Dia	12-#10 (B)	29 3/8"	48" Dia	16-#10 (C)	35 3/8"	54" Dia	18-#10 (C)
2" Dia x 4'-3"	22"	36" Dia	12-#10 (A)	25 3/4"	42" Dia	12-#10 (B)	29 3/4"	48" Dia	16-#10 (C)	35 3/4"	54" Dia	18-#10 (C)
2 1/4" Dia x 4'-9"	22 1/2"	42" Dia	12-#11 (A)	26"	42" Dia	10-#11 (B)	30"	48" Dia	14-#11 (C)	36"	54" Dia	14-#11 (D)
2 1/2" Dia x 5'-2"				26 1/2"	42" Dia	12-#11 (B)	30 1/2"	48" Dia	16-#11 (C)	36 1/2"	54" Dia	16-#11 (D)
2 3/4" Dia x 5'-8"							31 1/2"	48" Dia	18-#11 (D)	37"	54" Dia	20-#11 (D)
3" Dia x 6'-1"										37 1/2"	54" Dia	24-#11 (D)



SECTION



FOUNDATION DETAIL



Bond anchor bolts to rebar with 1/0 jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Provide Mechanical connectors that are UL listed for concrete encasement.

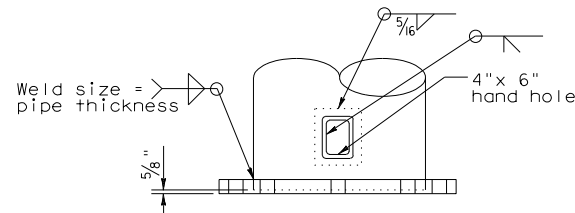
LIGHTNING PROTECTION SYSTEM

- A = #3 Plain spiral at 6" pitch (Grade 40)
- B = #4 Plain spiral at 6" pitch (Grade 40)
- C = #4 Plain spiral at 6" pitch (Grade 60)
- D = #4 Plain spiral at 3 1/2" pitch (Grade 60)

GENERAL NOTES

- Concrete shall be Class "C".
- Reinforcing shall conform to Item 440, "Reinforcing Steel".
- Anchor bolts and nuts for anchor bolts shall be "Alloy Steel" per Item 449, "Anchor Bolts".
- Anchor bolts shall be rigidly held in position during concrete placement using steel templates at the top and bottom. The top templates shall be removed after the concrete has set.
- Lubricate and tighten anchor bolts when erecting the structure per Item 449, "Anchor Bolts". After the structure has been aligned in its final position and the anchor bolts have been properly tightened, tack weld anchor bolt nuts to washer, and tack weld washers to base plate. Galvanizing in tack welded areas shall be repaired in accordance with Item 445, "Galvanizing".
- All vertical reinforcing shall be carried to the bottom of the Drilled Shaft.

- ② Place first anchor bolt
- ② See "Cantilever Overhead Sign Support" or "High Level Cantilever Overhead Sign Support" sheets for number and size.



VIEW A-A

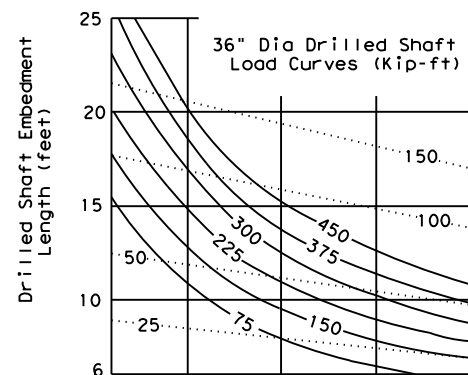
③ BASE PLATE & HANDHOLE DETAILS

- ③ See "Cantilever Overhead Sign Support" or "High Level Cantilever Overhead Sign Support" sheets for Diameter and thickness of base plate.

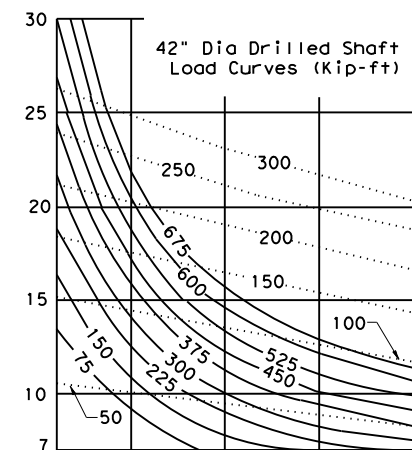
<h2>CANTILEVER OVERHEAD SIGN SUPPORT FOUNDATION</h2> <h3>COSSF-21</h3>					
FILE:	cosssf-21.dgn	DN:	CK:	DW:	CK:
© TxDOT	November 2007	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.	
	ELP	CULBERSON		76	



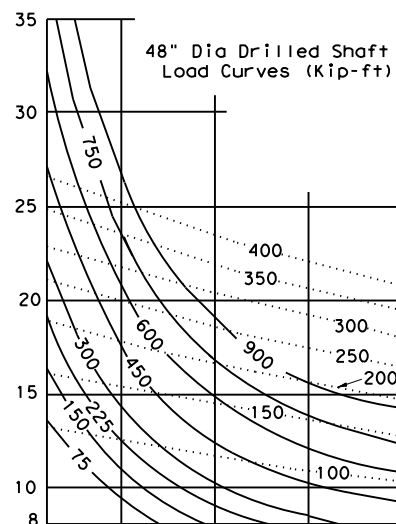
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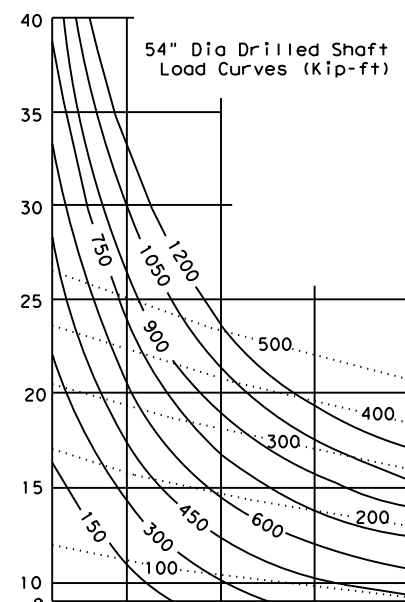
①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65



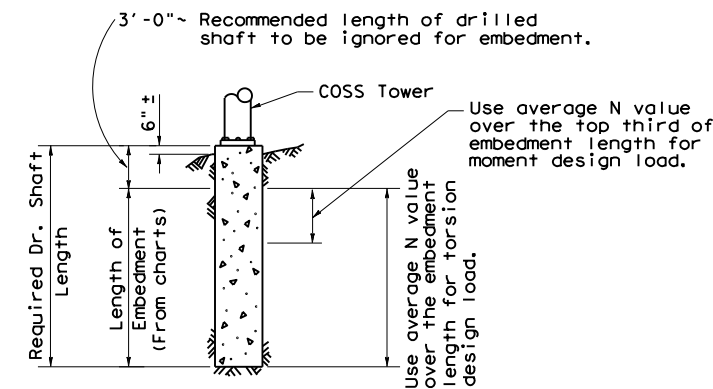
①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65



①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65



①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65



**PROCEDURE:**

- Determine design moment and torsion, and the required drilled shaft diameter as outlined in the selection example sheet COSS-SE.
- Make an initial estimate of the required embedment length.
- From soil exploration data determine type of soil and average N value or soil property along the upper third of the drilled shaft.
- Enter chart (for the correct shaft diameter and soil type) from the bottom at the average N value or soil property determined in step 3.
- Proceed vertically into chart and locate intersection with design moment. Interpolate between moment curves (solid lines) as needed.
- From intersection point turn 90° to left and read embedment length along vertical scale.
- If embedment length differs significantly from estimated value return to step 3 with the embedment length determined in step 6.
- From soil exploration data determine average N value or soil property over the entire length of the embedment.
- Enter chart (for correct shaft diameter and soil type) from the bottom at the average N value or soil property determined in step 8.
- Proceed vertically into chart and locate intersection with design torsion. Interpolate between torsion curves (dashed lines) as needed.
- From intersection point turn 90° to left and read embedment length along vertical scale.
- Compute the required length of drilled shaft by adding 3'-0" to longer embedment length required for moment or torsion.

- ①  $\phi$  = Angle of internal friction of soil (degrees)
- ② N = Texas cone penetrometer value (blows per ft)
- ④ C(psi) = Cohesive shear strength of soil (psi)
- ⑤ C(psf) = Cohesive shear strength of soil (psf)

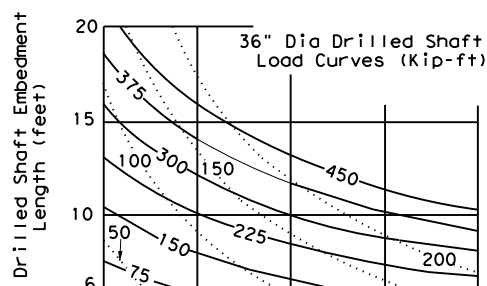
**③ SUBMERGED SAND SOIL (COHESIONLESS)**

Moment \_\_\_\_\_  
Torsion .....

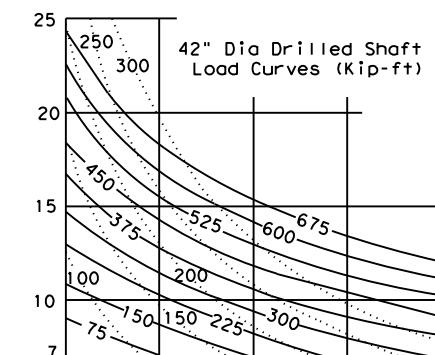
③ Note:  
For unsubmerged sands and clayey sands the charts for clay soil will give a conservative foundation design.

**GENERAL NOTES:**

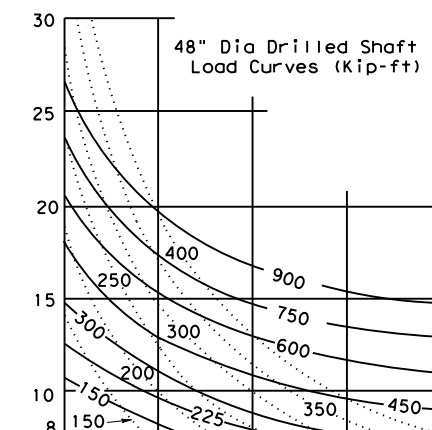
These charts are for use with Cantilever Overhead Sign Supports with one shaft per tower.  
 Solid curves are base moment in Kip-ft.  
 Dash curves are base torsion in Kip-ft.  
 Minimum embedment of drilled shaft is two diameters.  
 Add 3'-0" to the required embedment length to determine the required length of drilled shaft.



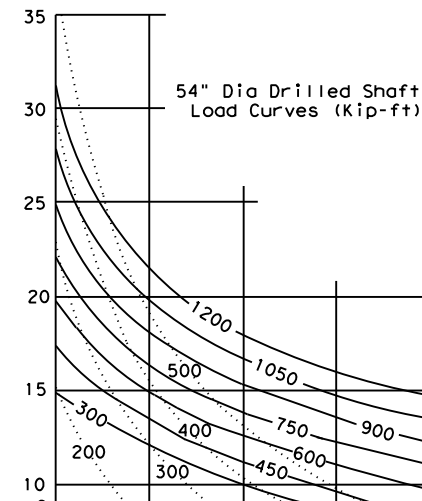
④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50



④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50



④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50



④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50

**CLAY SOIL (COHESIVE)**

Moment \_\_\_\_\_  
Torsion .....



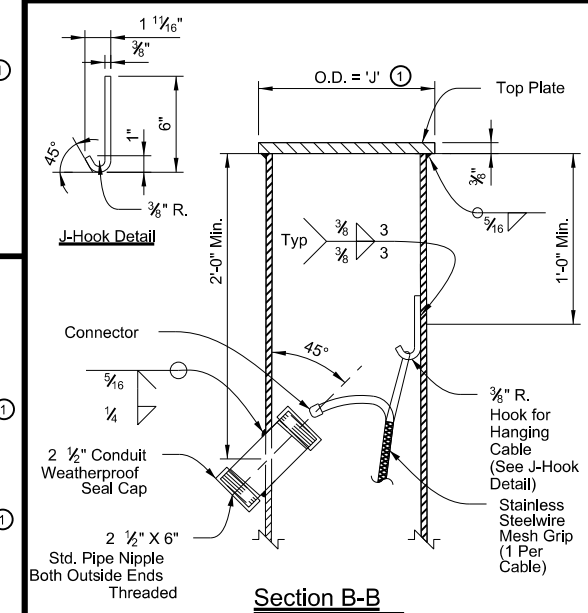
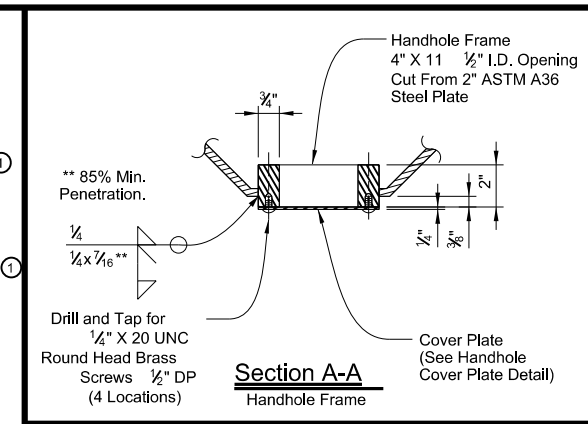
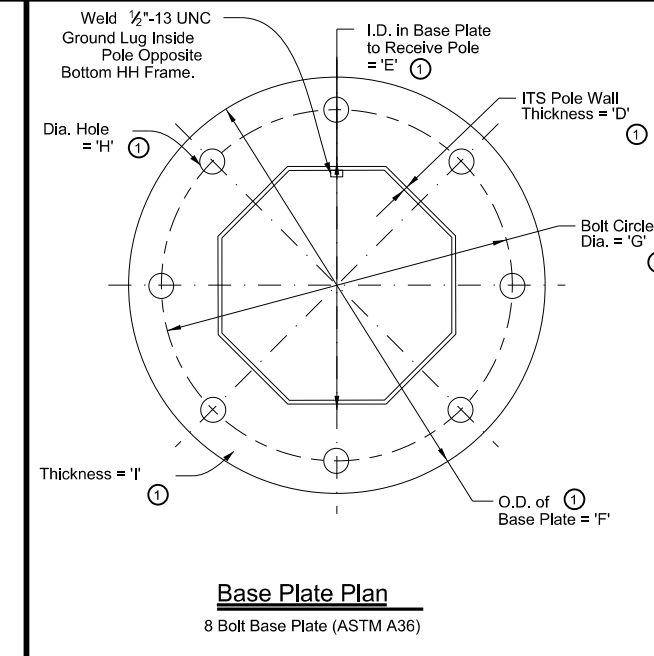
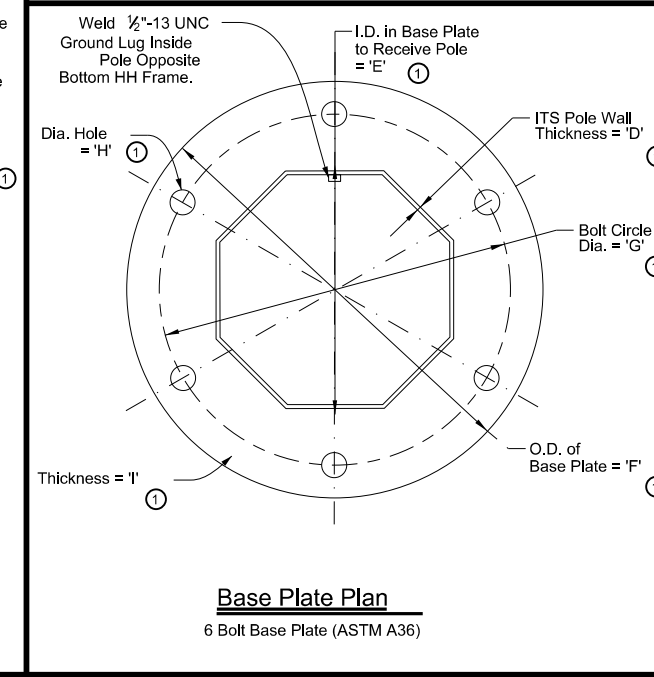
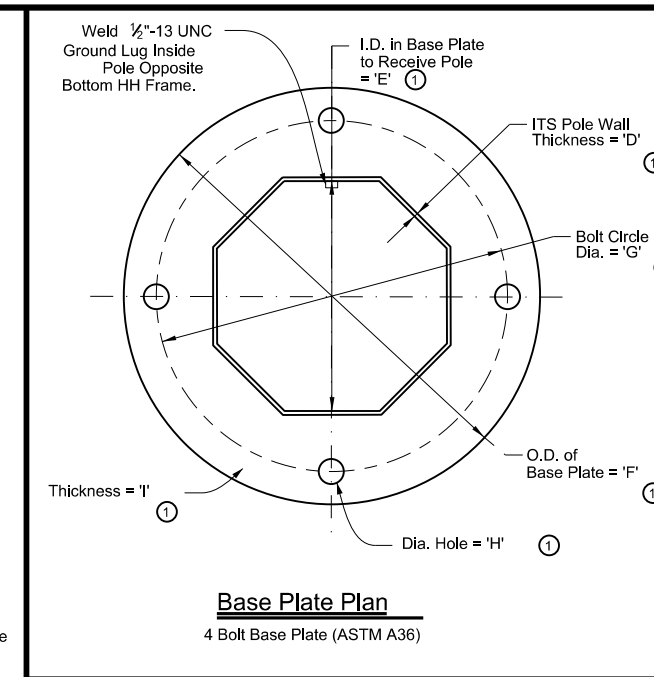
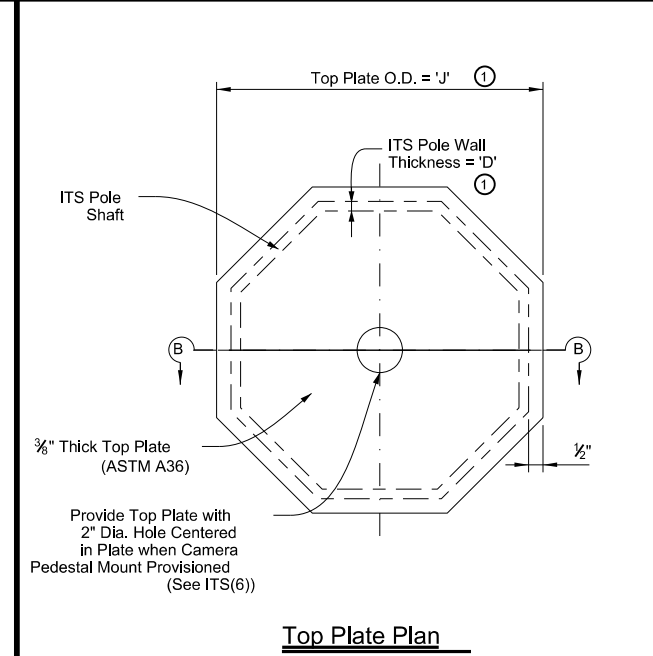
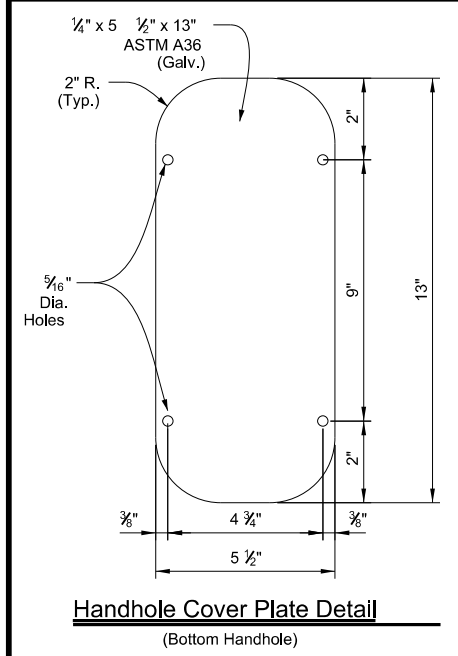
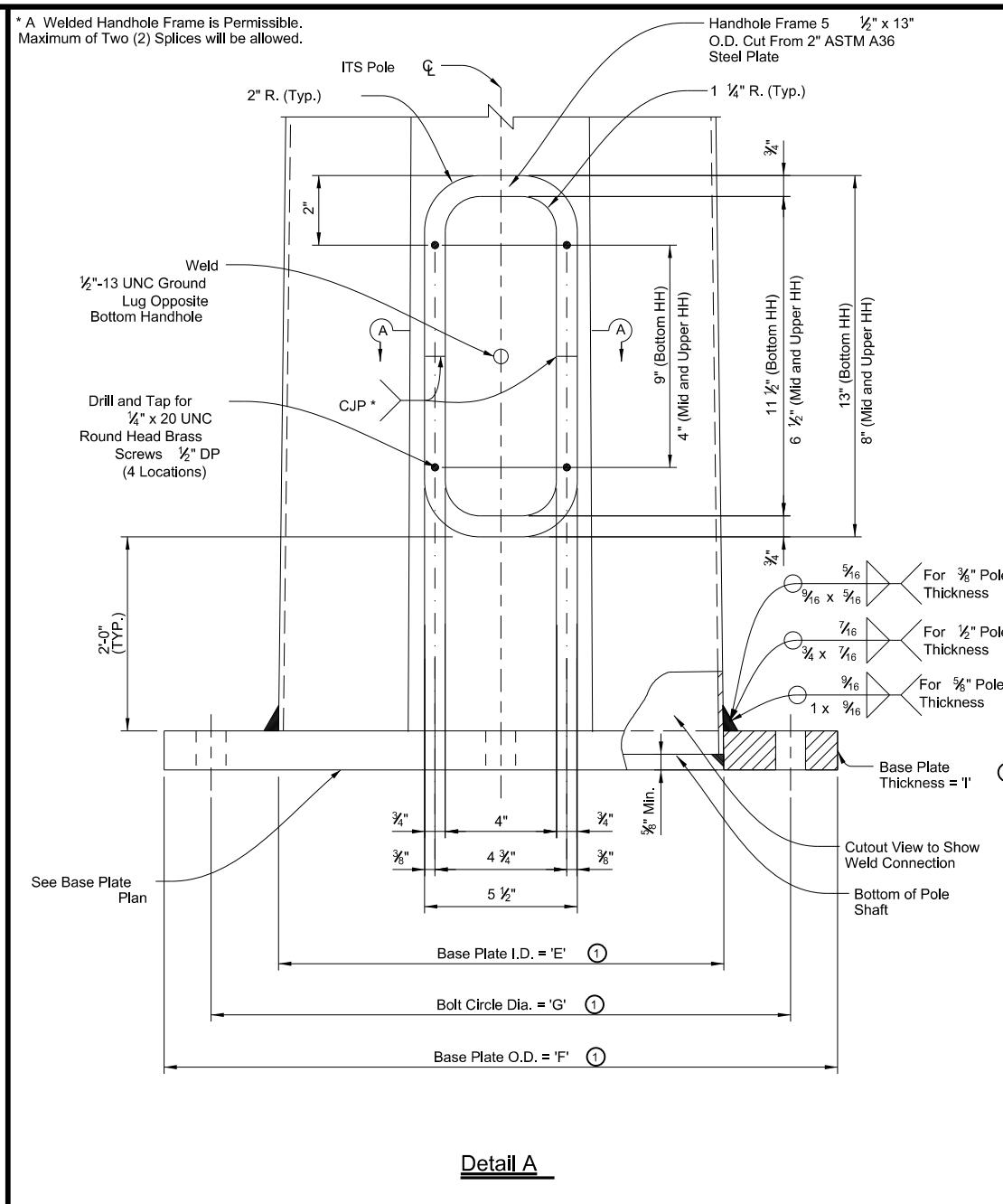
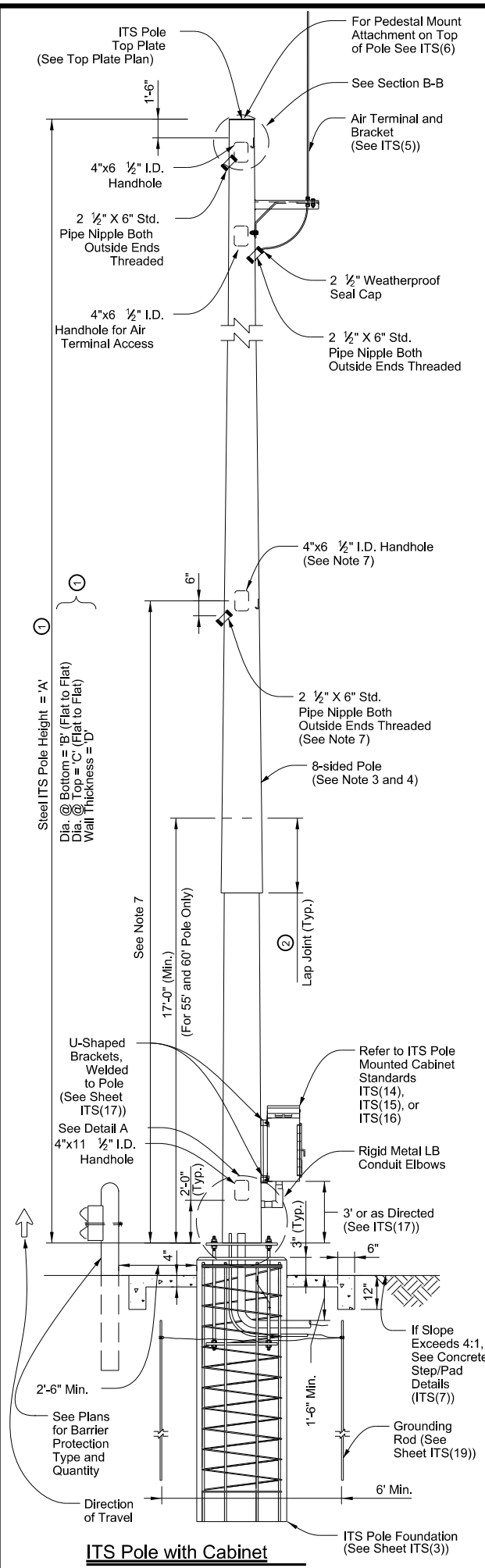
**FOUNDATION EMBEDMENT SELECTION CHARTS**

**COSS-FD**

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**General Notes**

1. Designed according to Sixth Edition 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications.
2. Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
3. Deviation from the design criteria, values, and dimensions shown herein and on ITS(4), constitutes an alternative design and will require submission of shop drawings and calculations for approval, sealed by a Texas Professional Engineer.
4. Direct substitution of twelve sided or round poles, matching the design criteria, values, and dimensions shown herein, require submission of shop drawings for approval to confirm design criteria and values on ITS(4) is met.
5. Locate handholes opposite of the direction of travel.
6. Appropriate number of anchor bolts for base plate determined by height of pole. See 'L' on sheet ITS(4).
7. Location for ITS equipment mount may vary by device. Locate mid span handhole and pipe nipple to accommodate location for ITS equipment as identified in the plans or per manufacturer recommendations. Identify location for mid span handhole and pipe nipple on shop drawings for approval.

**Reference Notes:**

- 1 See tables on Sheet ITS(4) for values of dimension variables.
- 2 See lap joint note for 55' and 60' pole heights on ITS(4) at the bottom of each table.

Texas Department of Transportation

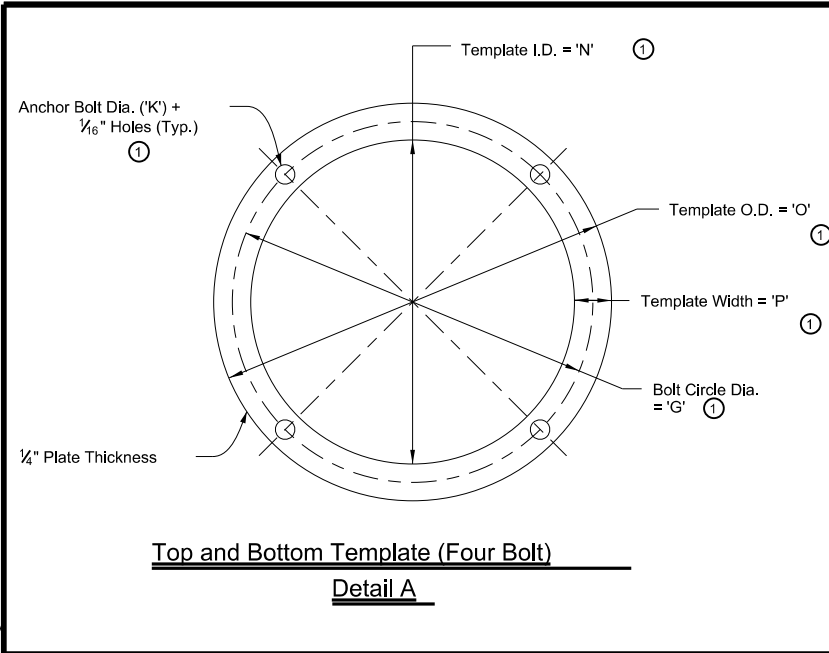
Traffic Operations Division Standard

**ITS POLE DETAILS OCTAGONAL POLE (EIGHT SIDED POLE)**

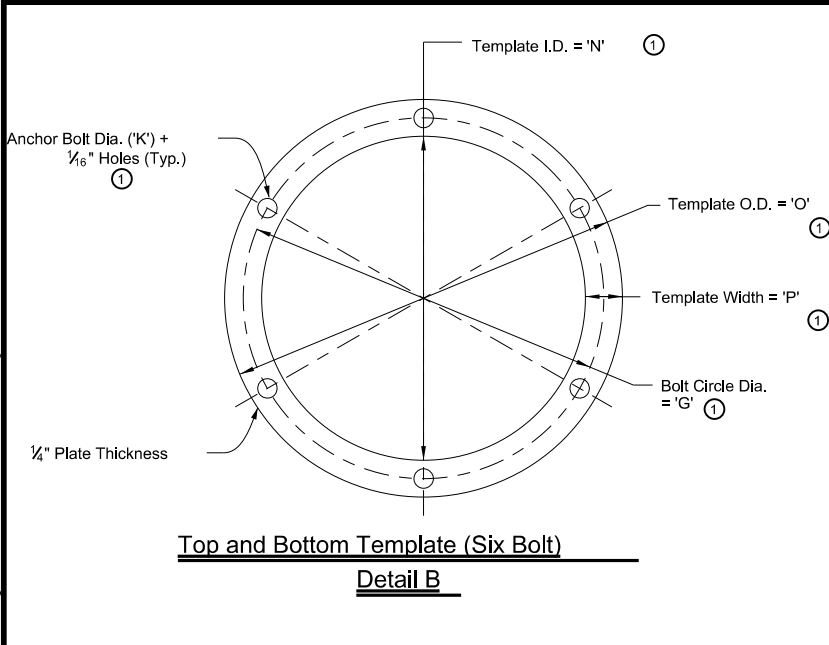
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© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
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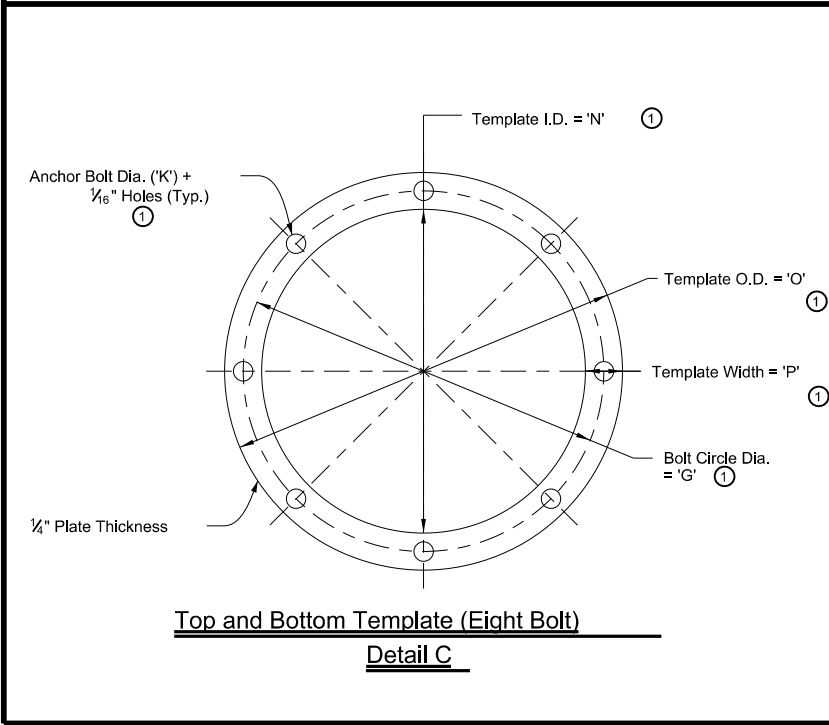
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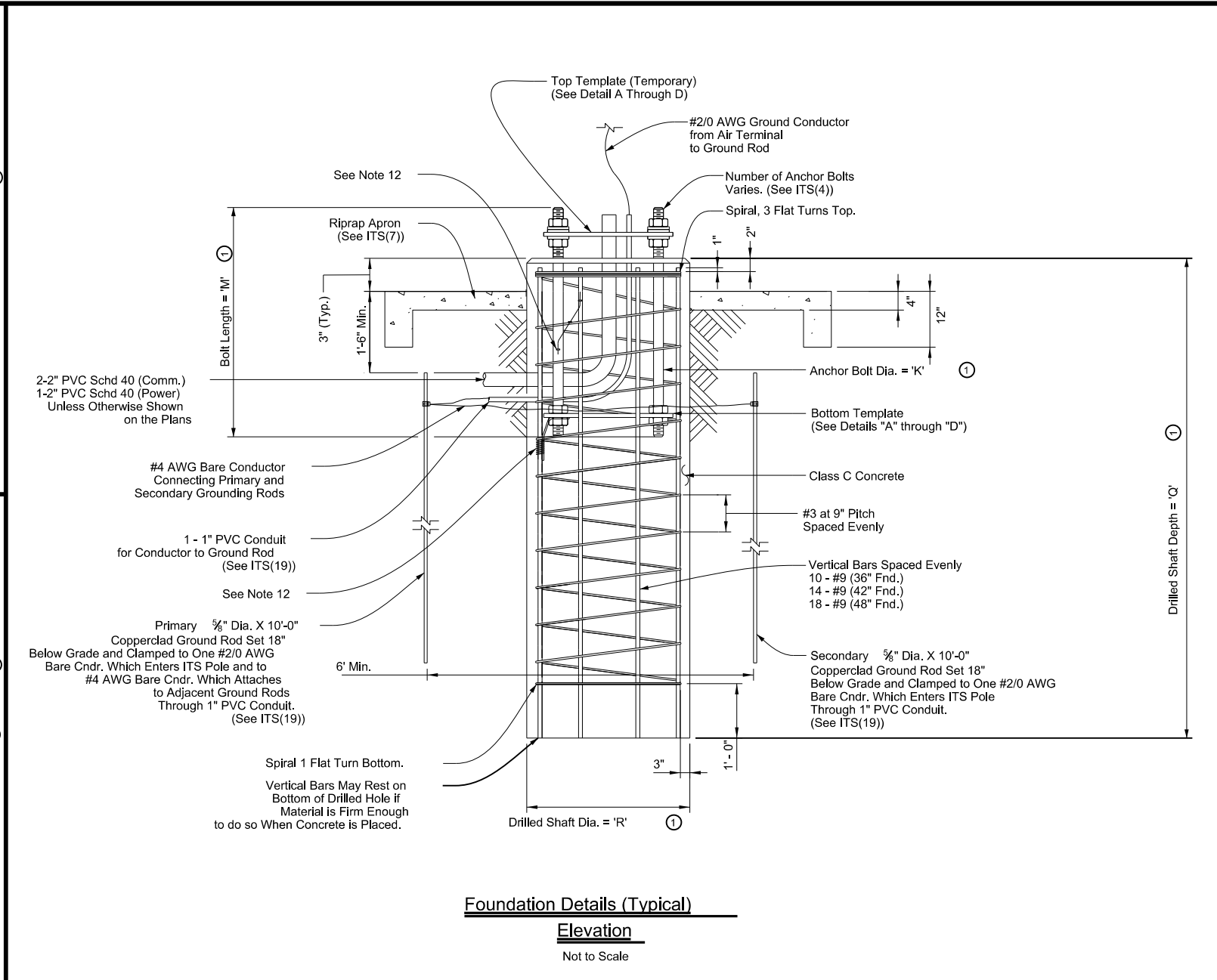
**Top and Bottom Template (Four Bolt)**  
**Detail A**



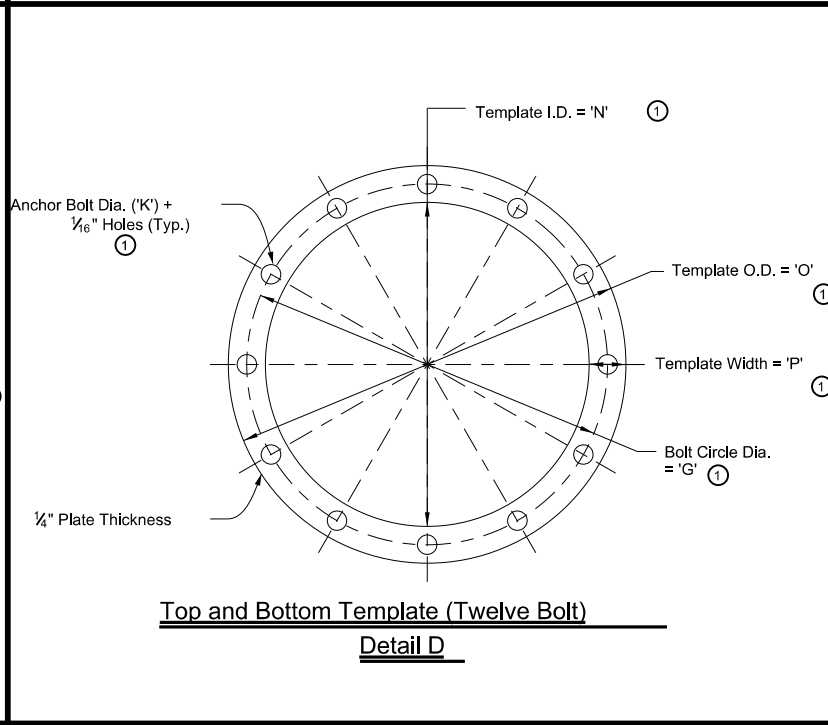
**Top and Bottom Template (Six Bolt)**  
**Detail B**



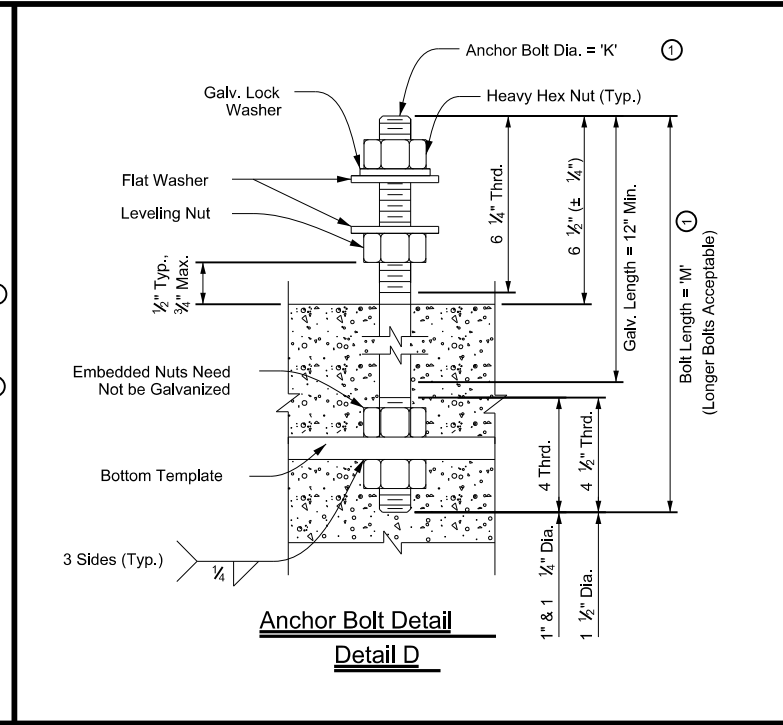
**Top and Bottom Template (Eight Bolt)**  
**Detail C**



**Foundation Details (Typical)**  
**Elevation**  
Not to Scale



**Top and Bottom Template (Twelve Bolt)**  
**Detail D**




**Anchor Bolt Detail**  
**Detail D**

- General Notes:**
1. Drilled shaft concrete shall be Class "C" (f<sub>c</sub> = 3,600 PSI) in accordance with Item 416, "Drilled Shaft Foundations."
  2. Reinforcing bars shall be Grade 60 (F<sub>y</sub> = 60 KSI) and conform to ASTM A-615. All reinforcing shall conform to Item 440, "Reinforcing Steel."
  3. Provide ASTM A-36 steel for templates. Top and bottom templates need not be galvanized.
  4. Anchor bolts shall be rigidly held in position during concrete placement using steel templates at the top and bottom. Top templates shall remain in place until the concrete has cured in place beyond initial set time.
  5. Lubricate and tighten anchor bolts, when erecting pole, in accordance with Item 449, "Anchor Bolts."
  6. Anchor bolts shall conform to ASTM F1554 Grade 55, or ASTM A193 B7 with ASTM A194 Grade 2H or A563 heavy hex nuts with F436 washers. Galvanize a minimum of the top end thread length plus 6 inches 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."
  7. All vertical reinforcement shall be carried to the bottom of the drilled shaft.
  8. Place three flat turns of the spiral bar at the top and one flat turn at the bottom of the drilled shaft.
  9. Drilled shaft shall be measured by the linear foot and paid under Item 416, "Drill Shaft Foundations."
  10. If rock is encountered, the drilled shaft to extend a minimum of two diameters into solid rock.
  11. Location for conduit entering foundation may vary. Orient conduit entering foundation to coincide with location of ground boxes and primary ground rod.
  12. Bond anchor bolts to rebar with #2/0 AWG jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Mechanical connectors shall be UL Listed for concrete encasement.

**Reference Notes:**

1. See tables on Sheet ITS(4) for values of dimension variables.



**Texas Department of Transportation**

**Traffic Operations Division Standard**

## ITS POLE FOUNDATION DETAILS

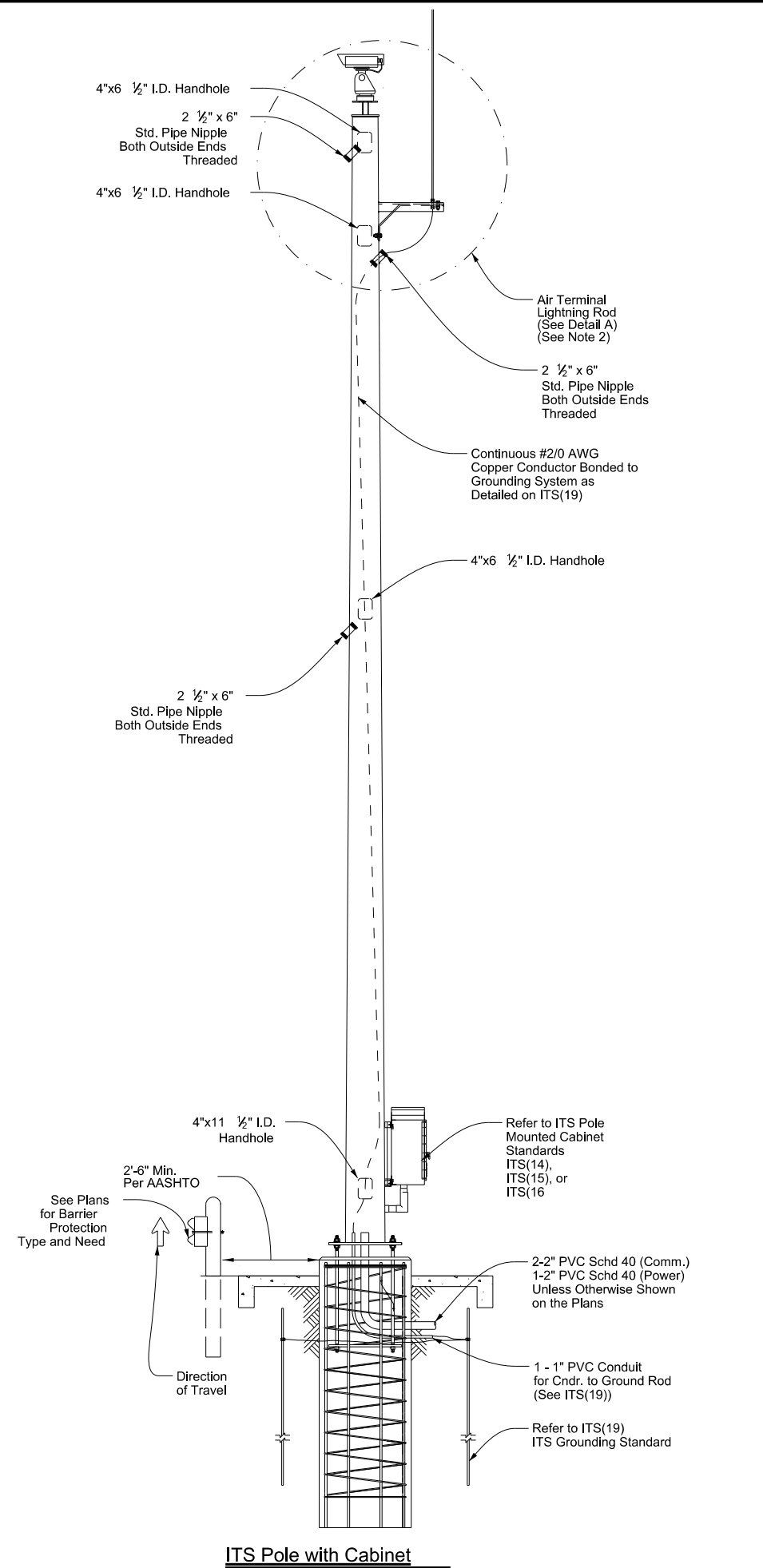
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	ELP	CULBERSON	79	

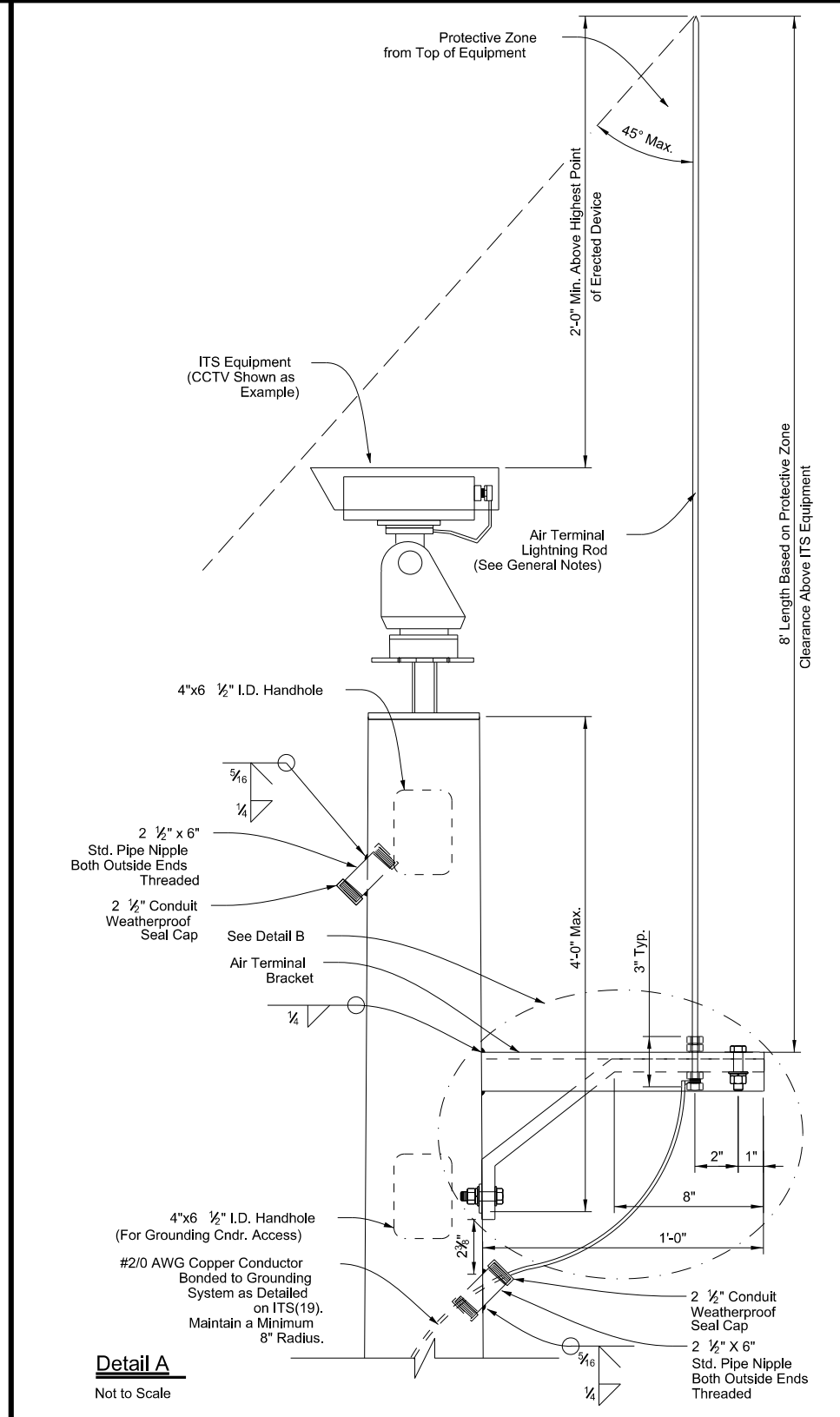


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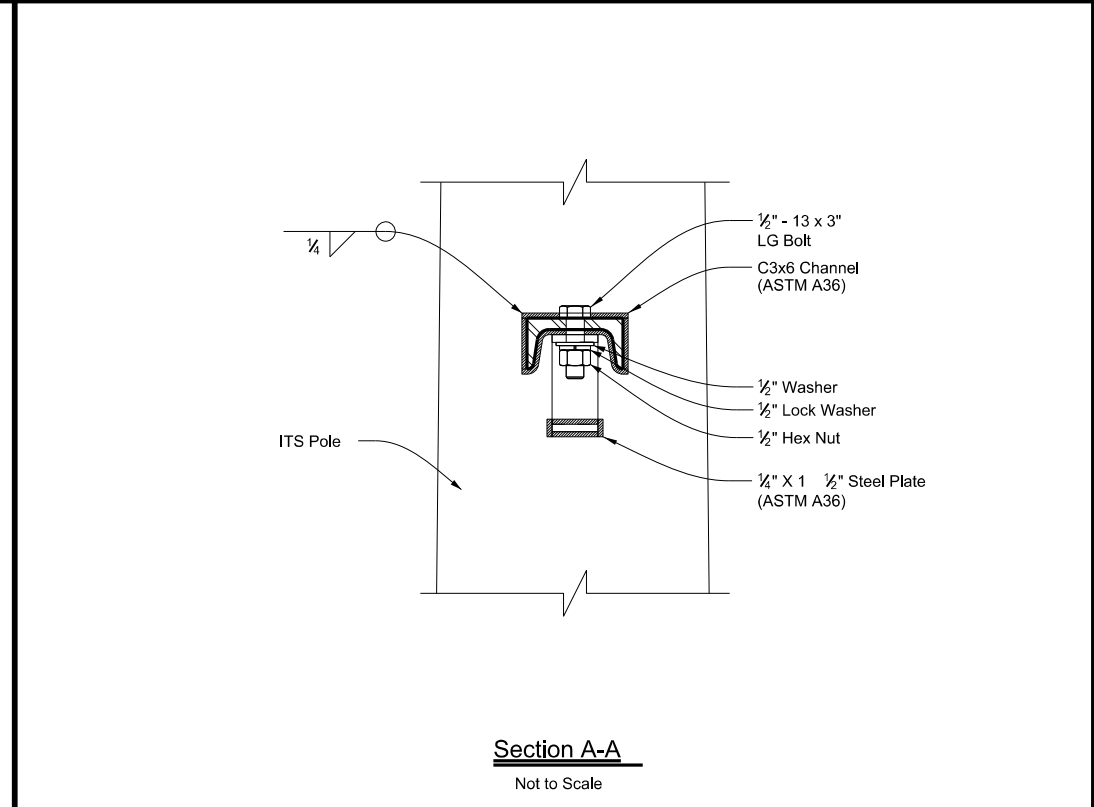
ITS Pole with Cabinet



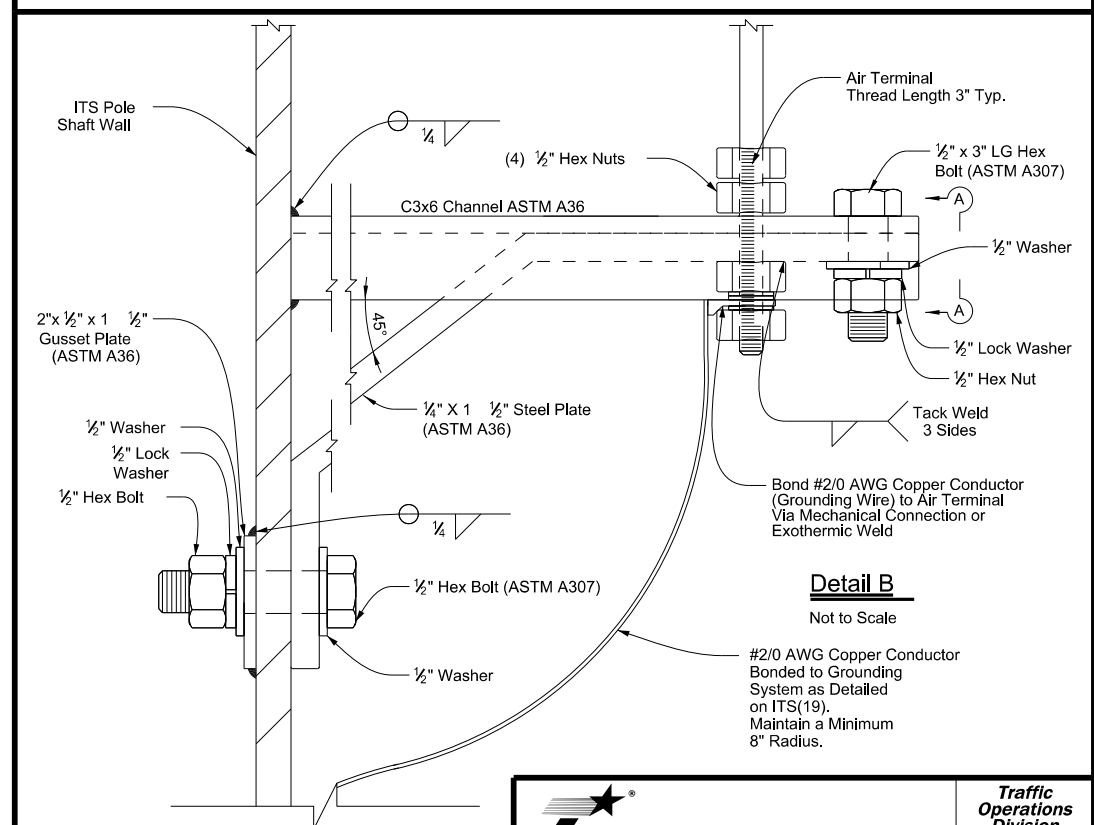
Detail A  
Not to Scale

**General Notes:**

- Provide lightning protection using air terminals on structures utilizing the rolling sphere method. Provide lightning protection system consisting of air terminals, down conductor, and grounding system installed in accordance with NFPA 780 and tested in accordance with IEEE 142. Meet the following requirements:
  - Position - in center of least utilized field of view.
  - Height - camera equipment to be within 45 degree protective zone of air terminal.
  - Material - 1/2" ETP alloy 110 copper air terminal (Class II)
  - Clearance - 24" minimum height above highest point of ITS equipment.
  - Bonding - attach air terminal to bracket by exothermic weld or with approved clamping.
  - Structure wind rating in accordance with TxDOT WV & IZ (LTS2013).
  - Galvanize air terminal bracket in accordance with Item 445, "Galvanizing."
- Alternative orientation for air terminal and pole mounted cabinet due to project specific needs to be indicated on the plans and detailed in shop drawing submittal for approval.
- Weld air terminal bracket to ITS pole in accordance with Item 448 "Structural Field Welding." Bracket may be welded by the fabricator in the shop prior to delivery. A bolted connection for the air terminal bracket is acceptable in lieu of a welded connection with approval by the Engineer and detailed in the shop drawings.



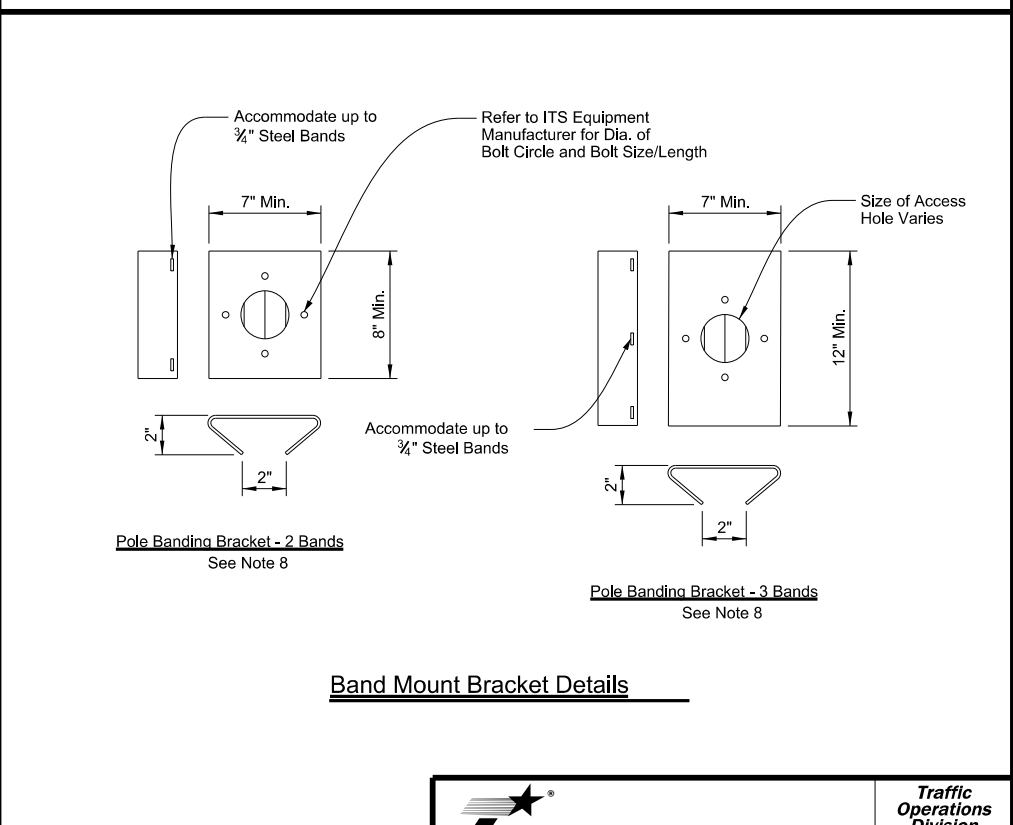
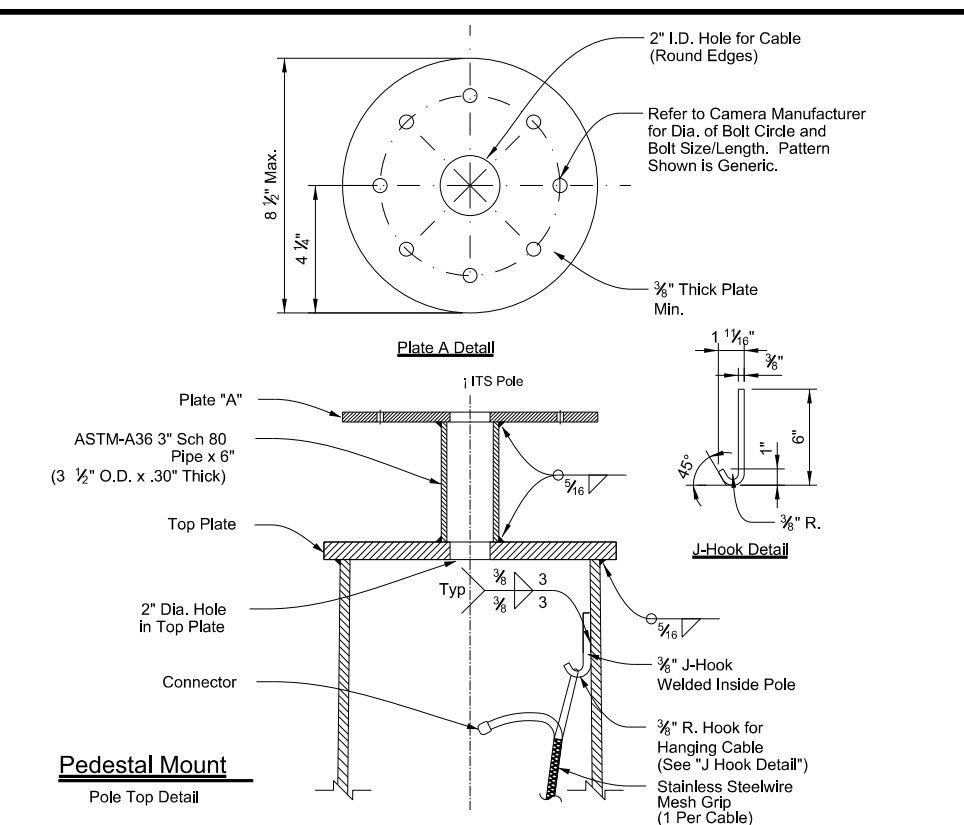
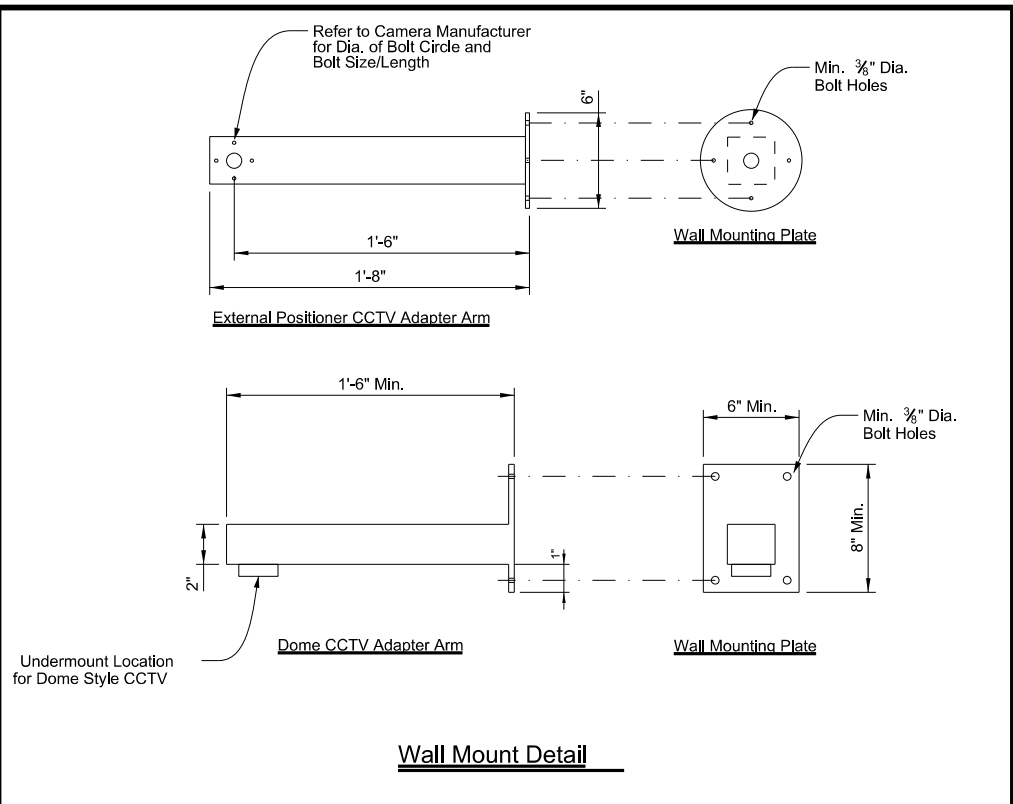
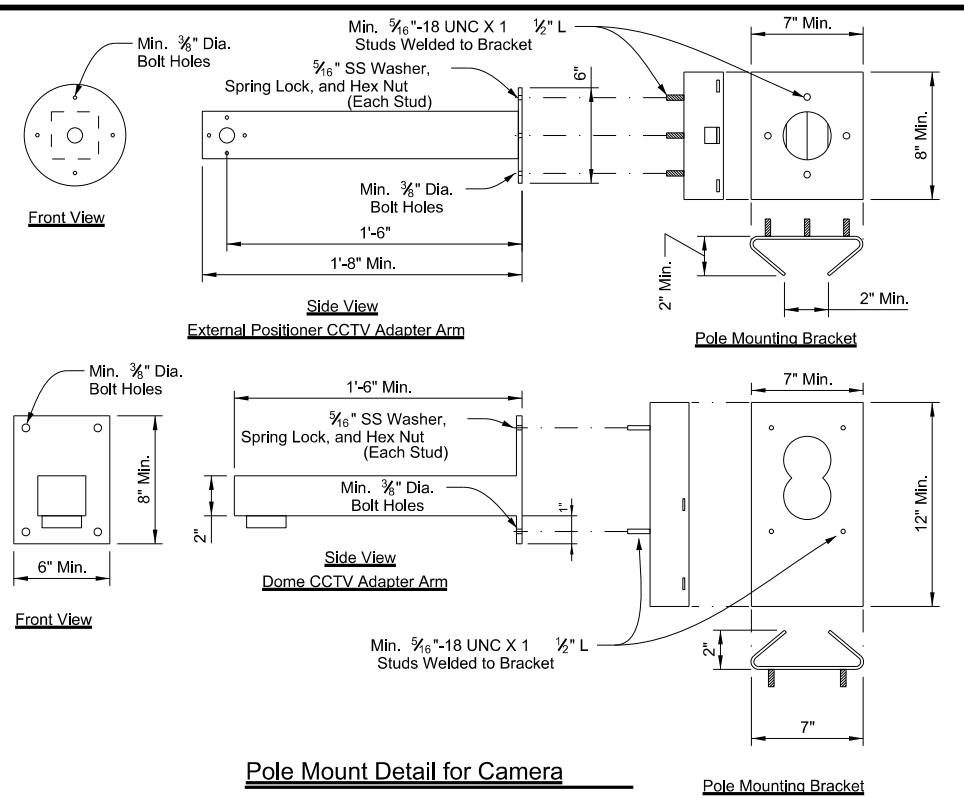
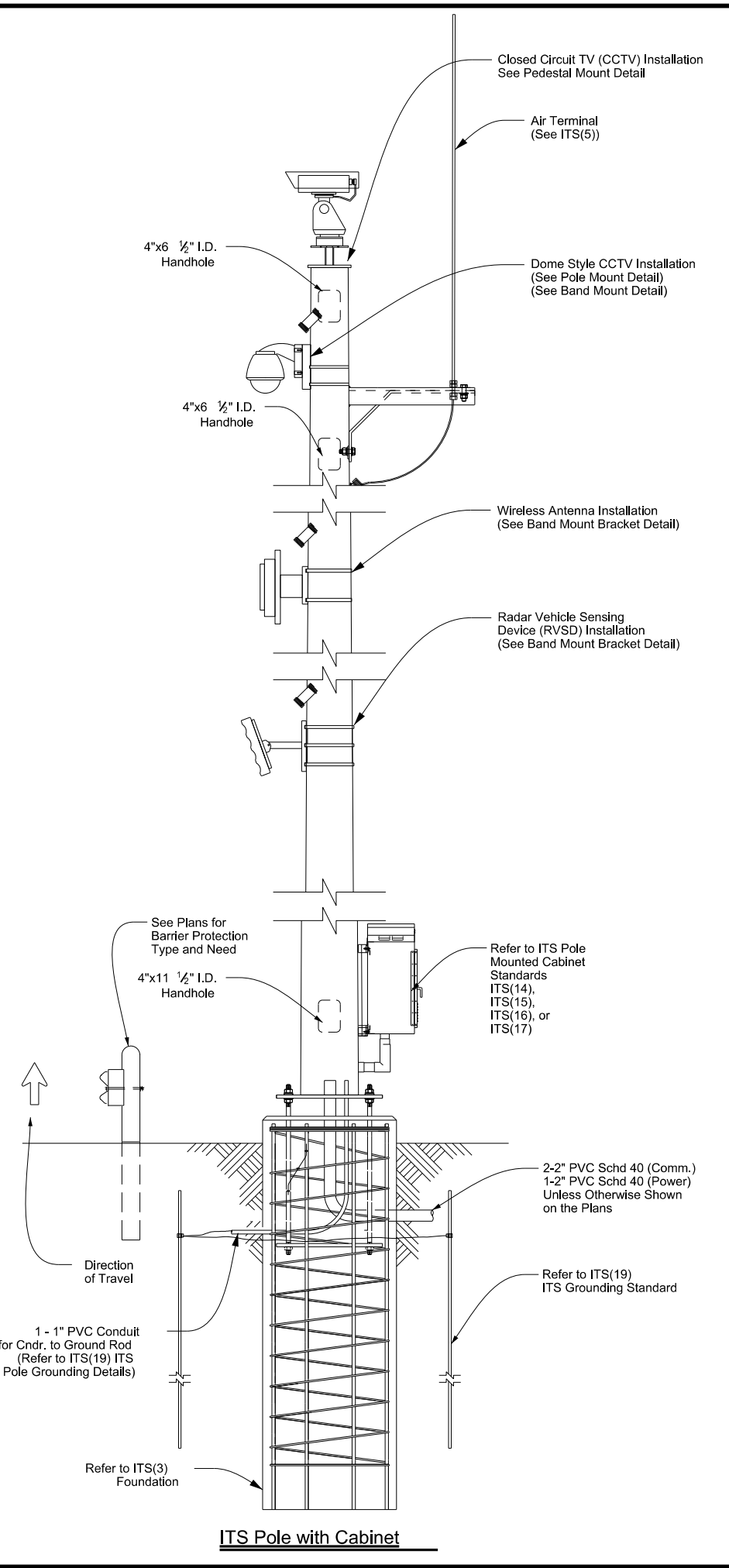
Section A-A  
Not to Scale



Detail B  
Not to Scale

		<b>Traffic Operations Division Standard</b>	
<h2>ITS POLE AIR TERMINAL DETAILS</h2>			
<h3>ITS(5) - 15</h3>			
FILE: its(5) - 15.dgn	DW: TxDOT	CK: TxDOT	DW: TxDOT
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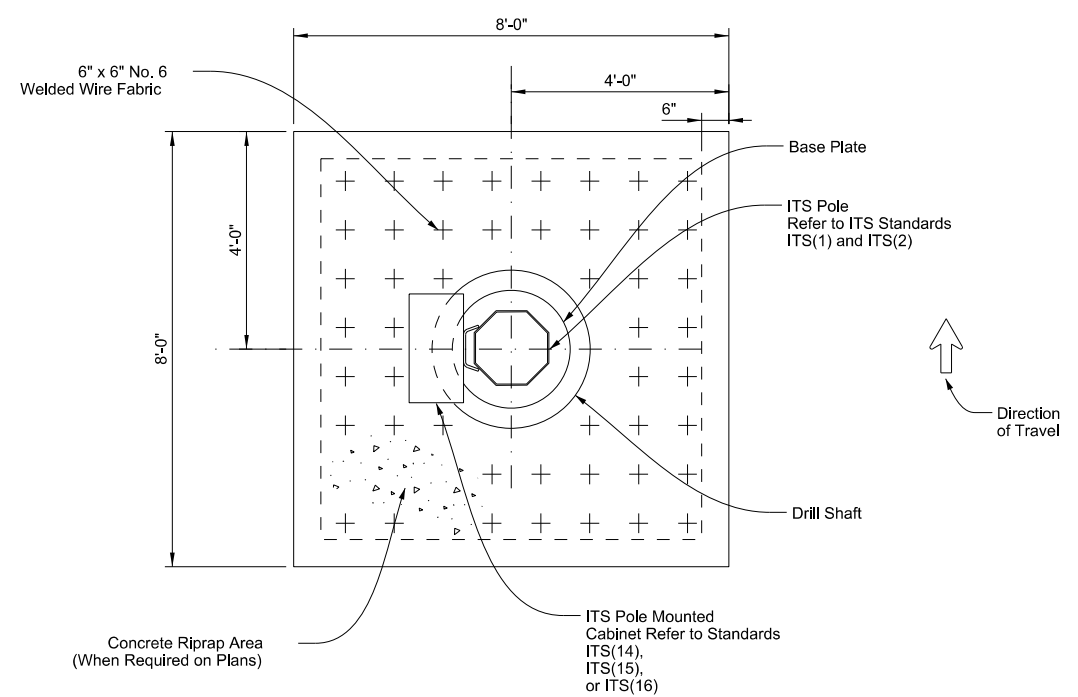
**General Notes:**

1. Designed according to Sixth Edition AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications.
2. Hang all cabling inside ITS pole structure with stainless steel wire mesh grips.
3. Bolt positioning in the pedestal top plate (Plate "A") for the pan/tilt base must be determined in the field per camera manufacturers recommendations. This will allow positioning of the camera to maximize coverage area. The Engineer will determine the camera's blind zone at each location.
4. Provide pedestal top plate and Plate "A" that conform to ASTM A36.
5. Make all welds conform to Item 441 and AWS D1.1 (Structural Welding). Repair damaged galvanized coating per Item 445, "Galvanizing."
6. Galvanize parts in accordance with Item 445, "Galvanizing" unless otherwise noted.
7. The type of ITS equipment shown to be mounted to the ITS pole is intended to represent the most common ITS equipment applications and should not be treated as all inclusive. Other ITS equipment applications may exist that are project specific.
8. Mounting brackets are intended to be diagrammatic and for information only, and are not all inclusive. Contractor responsible for submitting mounting bracket design for approval by the Engineer prior to fabrication. Mounting bracket designed to support a maximum 35 Lbs. Off-the-shelf mounting brackets are acceptable and shall be submitted by shop drawing for approval.
9. Mounting heights to be determined in the field based on manufacturer recommendations.

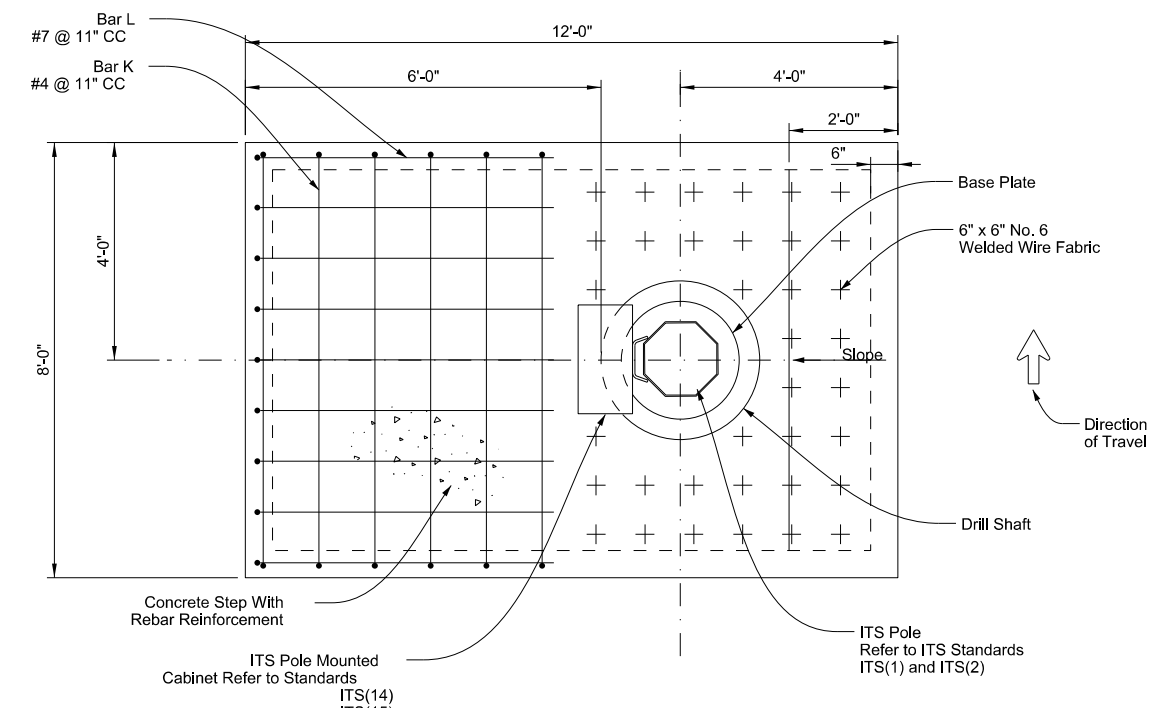
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<h1>ITS POLE EQUIPMENT MOUNTING DETAILS</h1> <h2>ITS(6) - 15</h2>			
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	ELP	CULBERSON	82

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DATE: 10/11/2023 10:41:59 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Intelligent Traffic Systems\ITS Pole Riprap.dgn



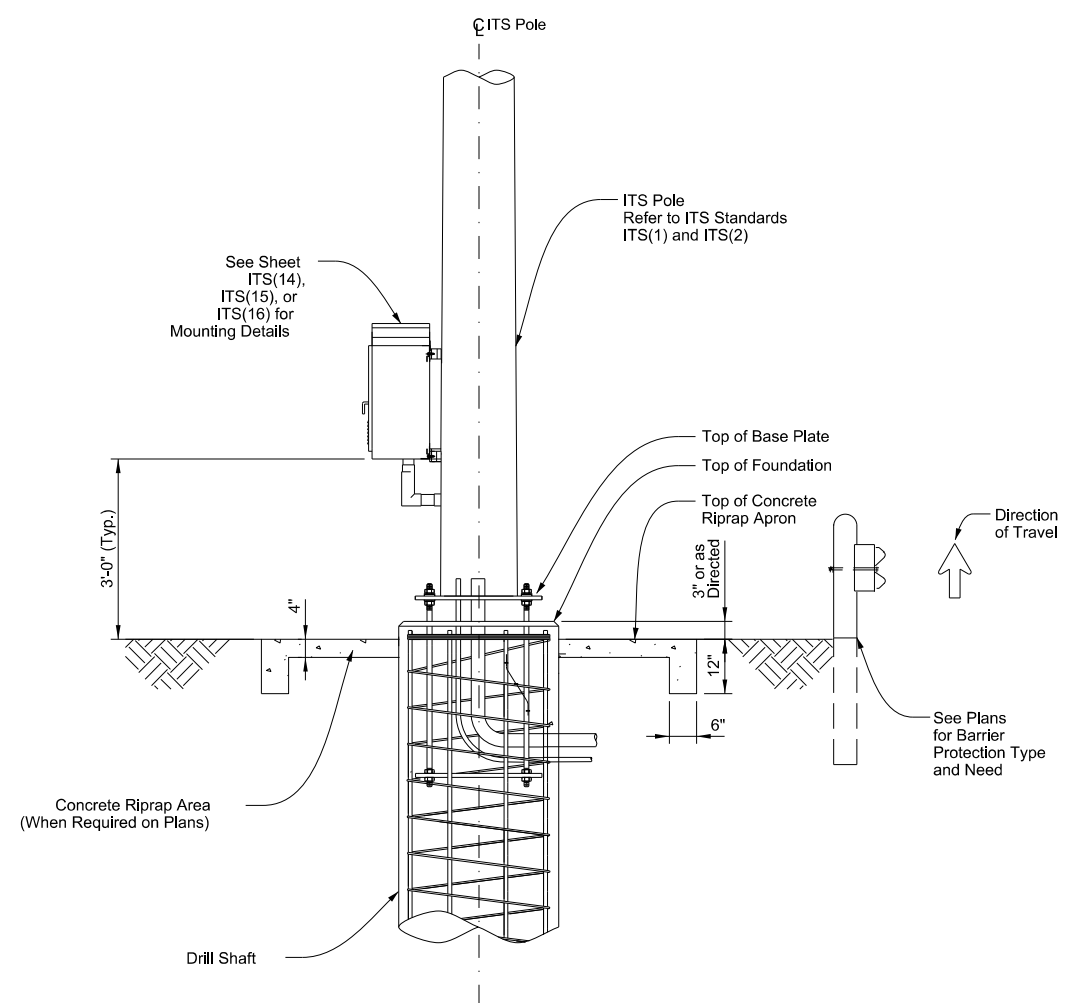
Top View  
 Riprap - Non-Sloped Conditions



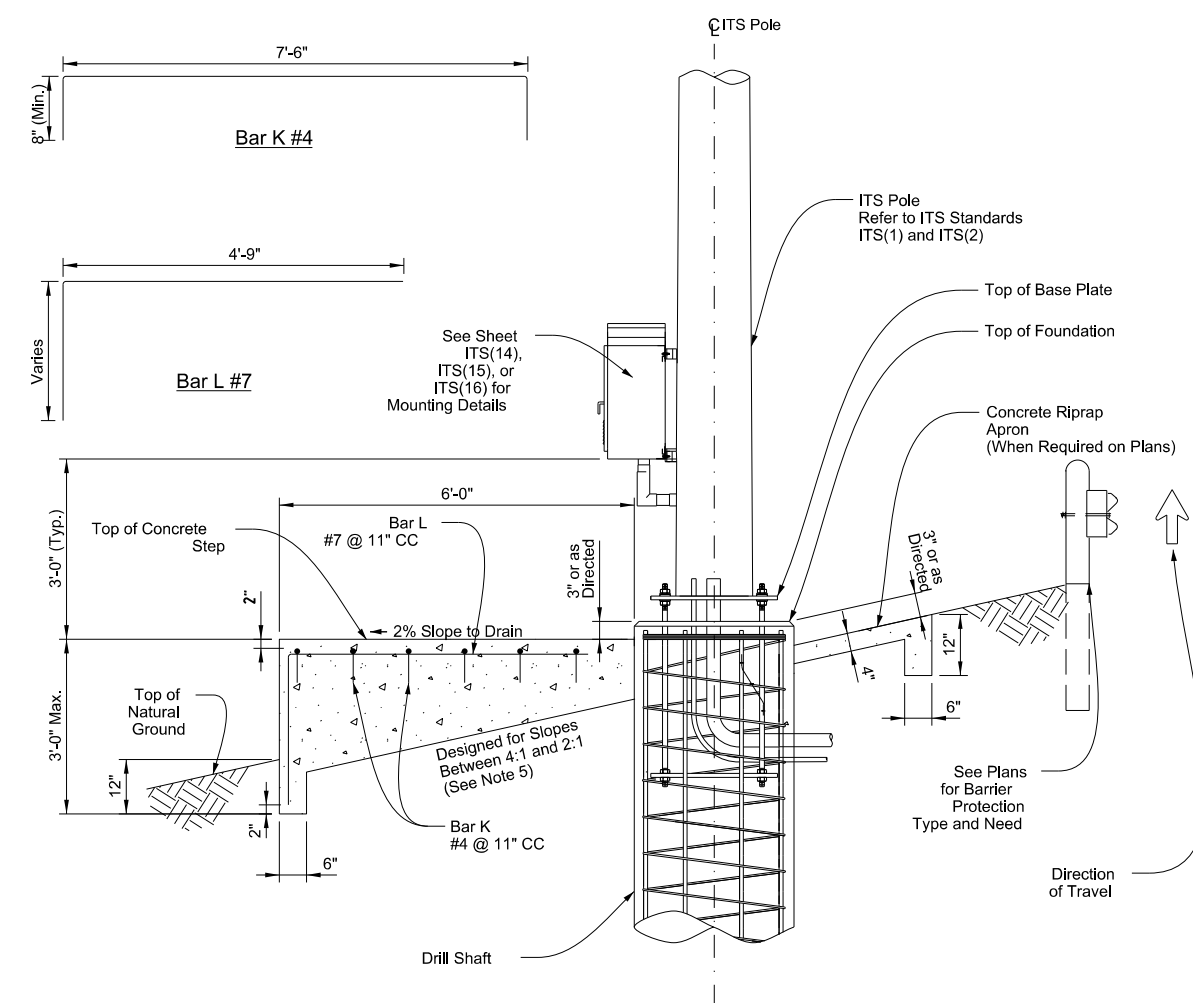
Top View  
 Step and Riprap - Sloped Conditions

**General Notes:**

- For non-sloped grassy areas, an 8' x 8' concrete riprap apron shall be poured around ITS pole foundations (see detail on this sheet), estimated at 1.25 CY per site, paid for under Item 432 "Riprap."
- For sloped grassy areas, a concrete "step" (for maintenance personnel to access cabinet) shall be poured as part of the riprap apron. The step shall vary in height depending on slope, but shall extend 6' horizontally from ITS pole drilled shaft foundation and be the same width as riprap apron (8'). Step shall be poured at same time as riprap apron (see detail on this sheet). Any additional concrete necessary to fabricate step (over and above the 1.25 CY) shall be considered subsidiary to the various bid items and no direct payment shall be made.
- For sloped areas where riprap exists, a 6' (horizontal from drilled shaft foundation) x 4' wide step shall be installed (see detail this sheet). Concrete for step shall be considered subsidiary to the various bid items and no direct payment shall be made.
- Cabinet orientation may vary depending on field conditions or project constraints. Accommodate configuration of platform according to cabinet orientation.
- Slopes greater than a 2:1 or when 3'-0" Max. step wall height is exceeded, an alternative design with safety railing is required and shall be detailed in the shop drawings for approval.



Elevation View  
 Riprap Apron Detail - Non-Sloped Conditions



Elevation View  
 Riprap Apron/Step Detail - Sloped Conditions  
 (Slopes Exceeding 4:1)



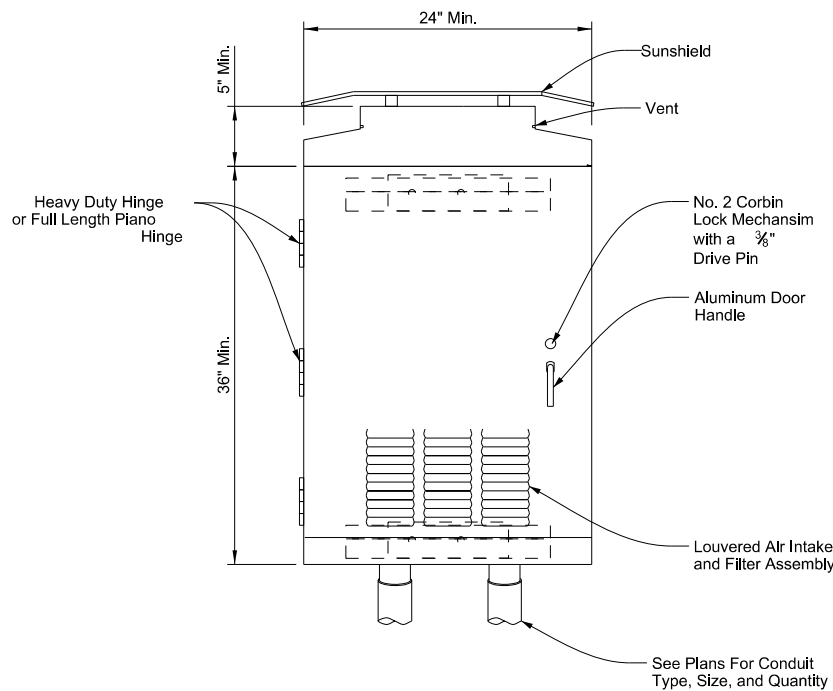
**ITS POLE  
 RIPRAP DETAILS**

**ITS(7) - 15**

FILE: its(7)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
DIST	COUNTY	SHEET NO.		
ELP	CULBERSON			83

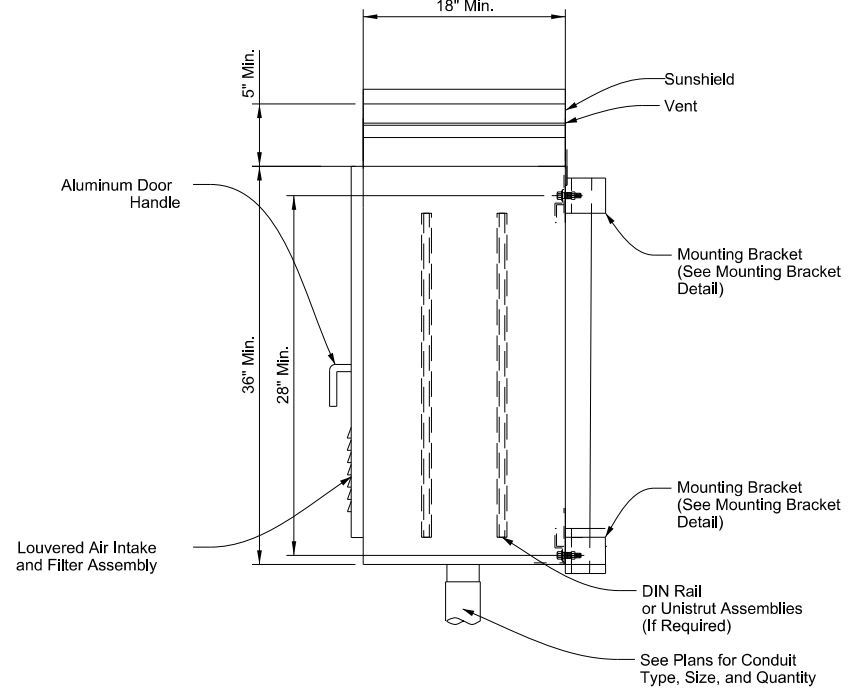
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DATE: 10/11/2023 10:42:00 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Intelligent Transportation Systems\ITS Pole Mounted Cabinet Type 2.dgn



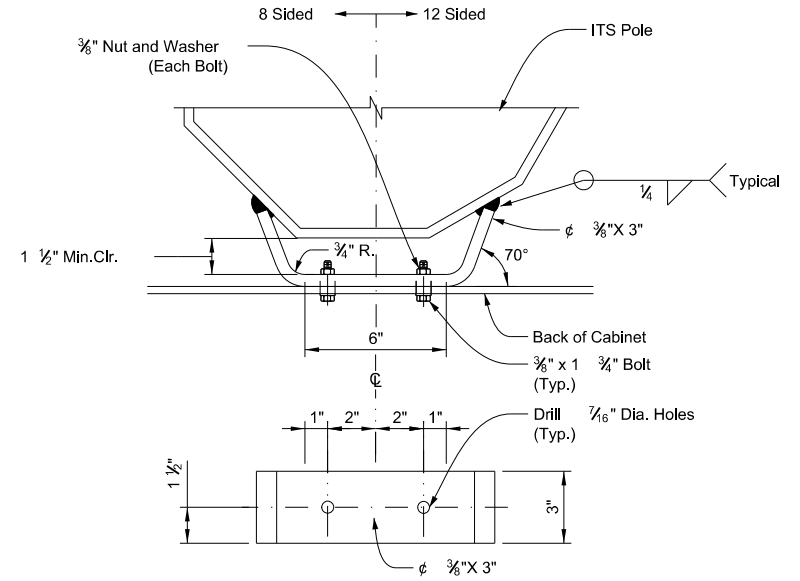
**Pole Mounted Cabinet - Type 2 Front View**

Not to Scale



**Pole Mounted Cabinet - Type 2 Side View**

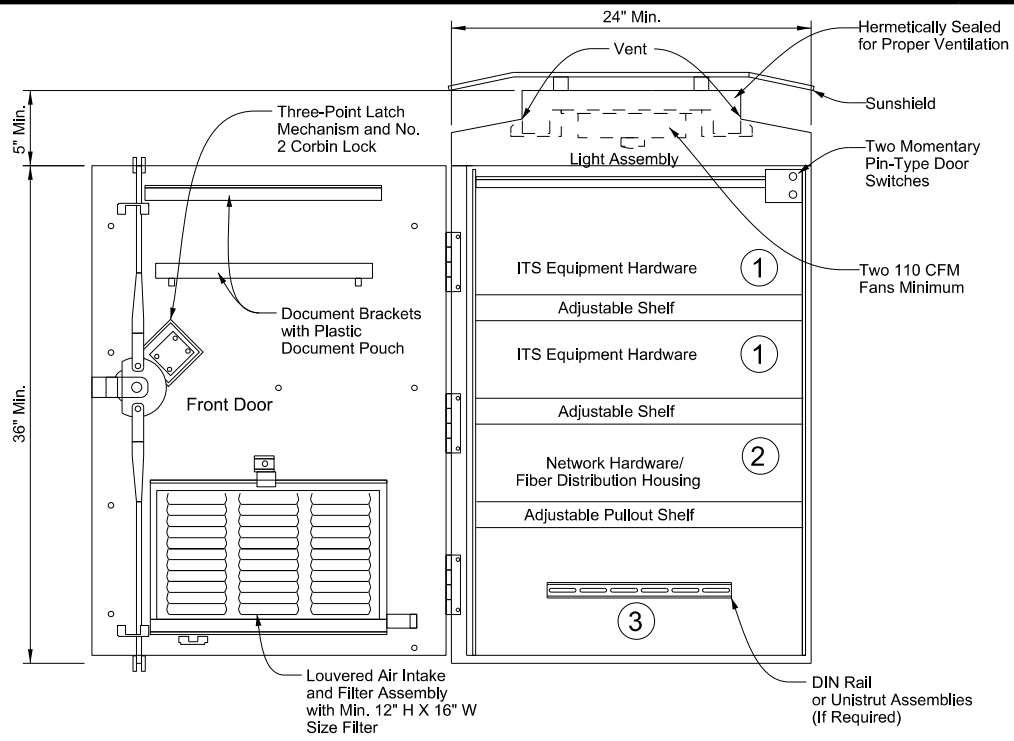
Not to Scale



Note:  
 ITS Pole May be Round, Octagonal (8 Sided), or Dodecahedron (12 Sided).  
 See ITS(1), and ITS(2) for Details.

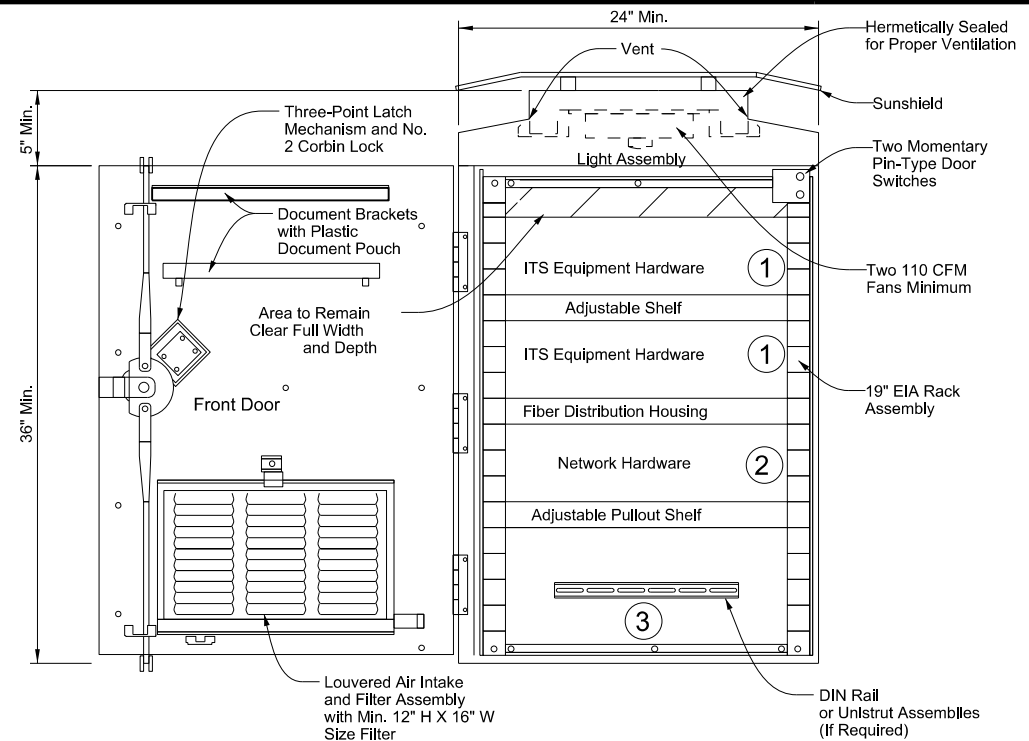
**Mounting Bracket Detail**

Not to Scale



**Interior - Type 2 Without 19" EIA Rack - Front View**

Not to Scale



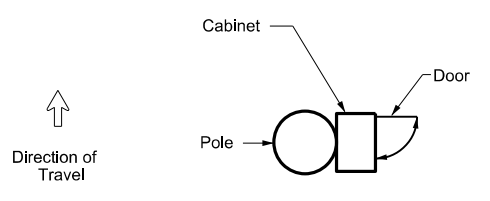
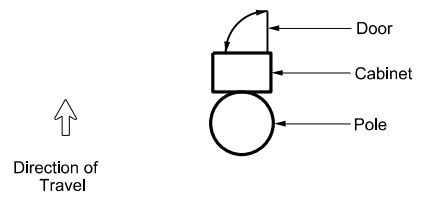
**Interior - Type 2 With 19" EIA Rack - Front View**

Not to Scale

Typical Equipment Layout Legend	
Example Equipment	
①	CCTV Interface Panel, Radar Vehicle Sensing Device (RVSD) Equipment, DMS/LCS Controller, Environmental Sensor Station (ESS) Equipment, Bluetooth Equipment, or ITS Radio Equipment (See General Note 1)
②	Ethernet Switch, Video Encoder, Terminal Server, Fiber Optic Transceivers, or Media Conversion Equipment (See General Note 1)
③	Power Distribution Assembly, Service Entrance Breakers, Primary AC Power, Auxiliary Power Strip, Ground Bus Bar, Surge Protection Equipment

**General Notes:**

- Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred Type 2 pole mounted cabinet setup. Hardware needed for each Type 2 cabinet varies and not all cabinet equipment may be shown. The contractor will be responsible for configuring cabinets with all appropriate ITS hardware and power supplies in accordance with the plans and specifications. The contractor may alter the cabinet configuration shown to maximize space and ensure easy access for maintenance.
- Mount cabinet as detailed on ITS(15) or ITS(17). Orientation of cabinet on ITS pole may vary depending on field conditions. Mount the pole mounted cabinet to the backside of the ITS pole, to allow maintenance personnel to access the cabinet while being able to view oncoming traffic.
- For ITS pole sites located on slopes greater than 4H:1V, mount the cabinet to the backside of the ITS pole as detailed on ITS(7). Mounting height to accommodate maintenance pad for easy access.
- All dimensions are approximate and represent minimum cabinet dimensions.
- Provide conduit entrances at the bottom of the cabinet.
- Paid under Special Specification "ITS Pole with Cabinet" (Configuration 1) without 19" EIA rack.  
 Paid under Special Specification "ITS Pole with Cabinet" (Configuration 2) with 19" EIA rack.



**Orientation of Type 2 Cabinet on ITS Pole (Typical)**

Not to Scale

Texas Department of Transportation  
 Traffic Operations Division Standard

## ITS POLE MOUNTED CABINET TYPE 2 DETAILS

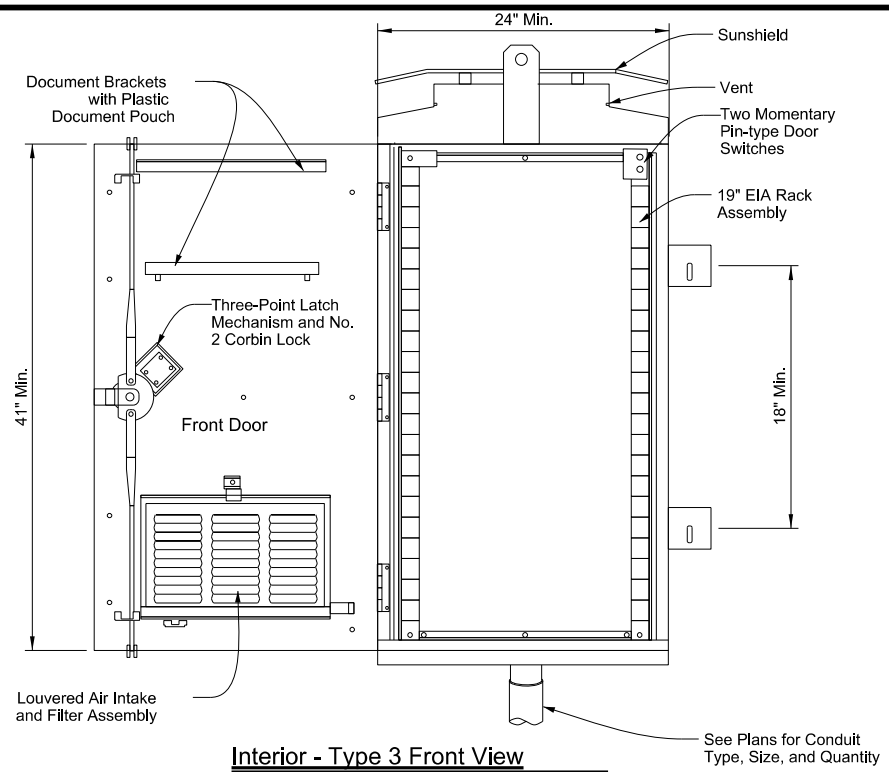
### ITS(15)-15

FILE: its(15)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.	
ELP	CULBERSON		84	



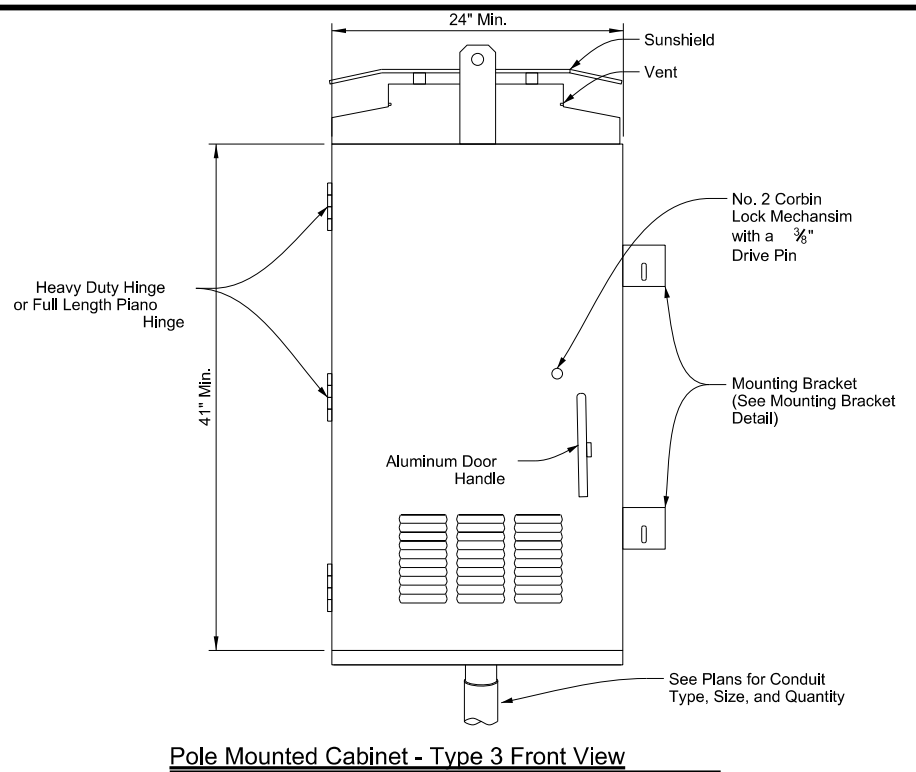
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DATE: 10/11/2023 10:42:02 AM  
 FILE: M:\0003-01-064.4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Intelligent Transportation Systems\ITS Pole Mounted Cabinet Type 3.dwg



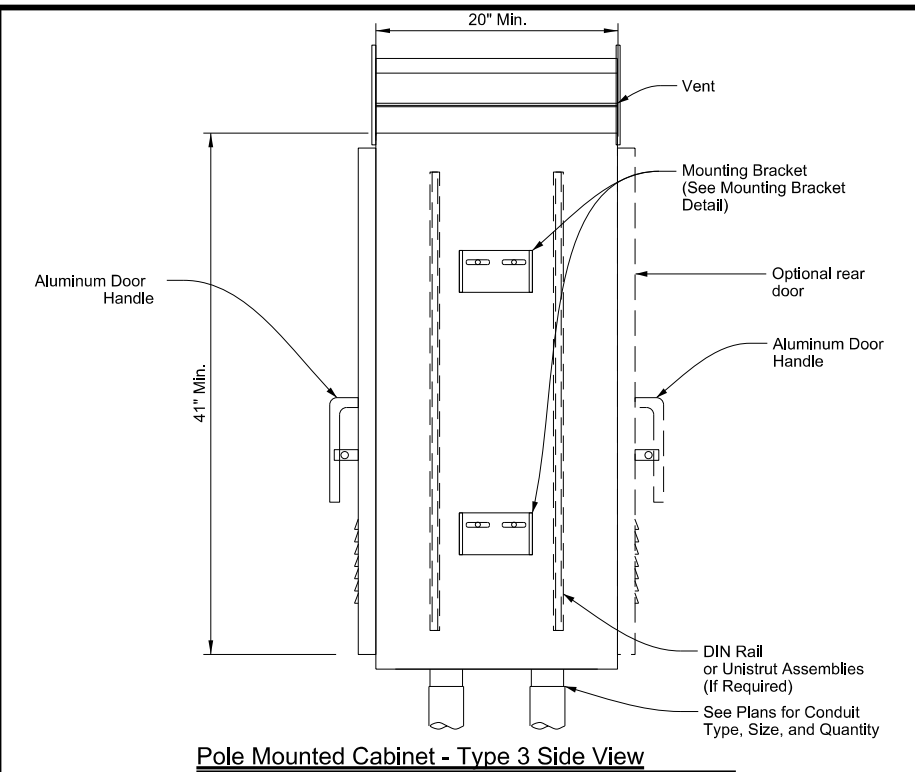
**Interior - Type 3 Front View**

Not to Scale



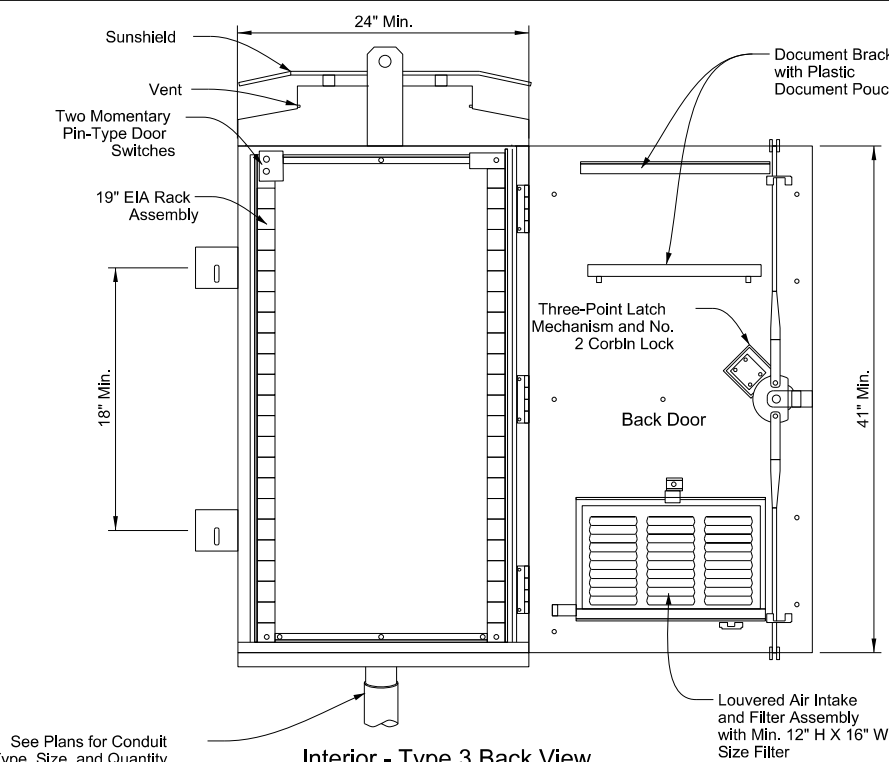
**Pole Mounted Cabinet - Type 3 Front View**

Not to Scale



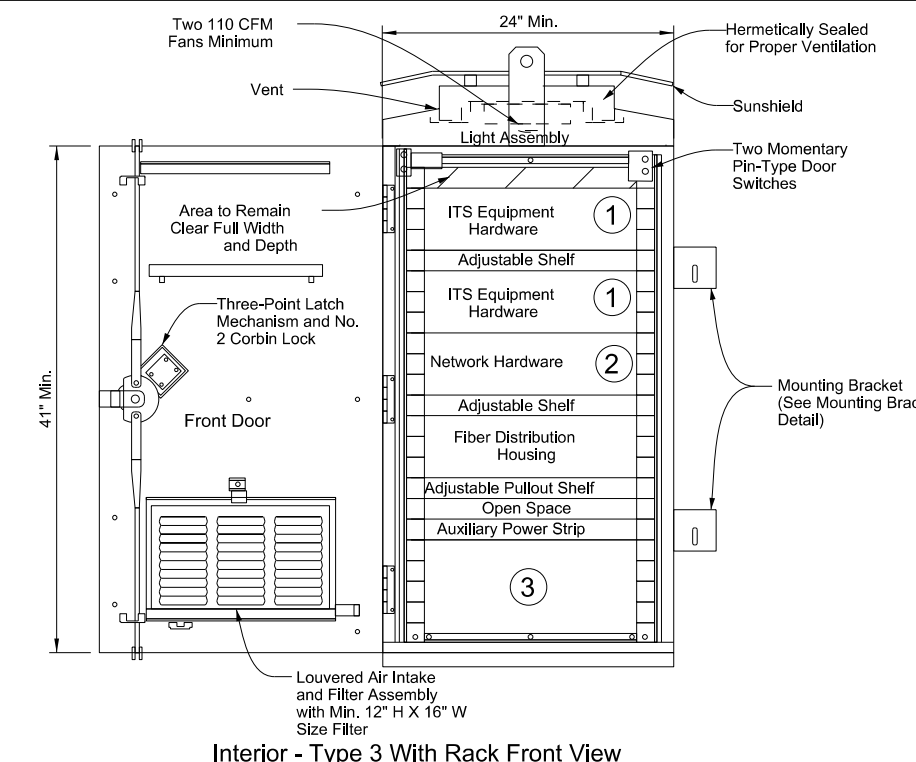
**Pole Mounted Cabinet - Type 3 Side View**

Not to Scale



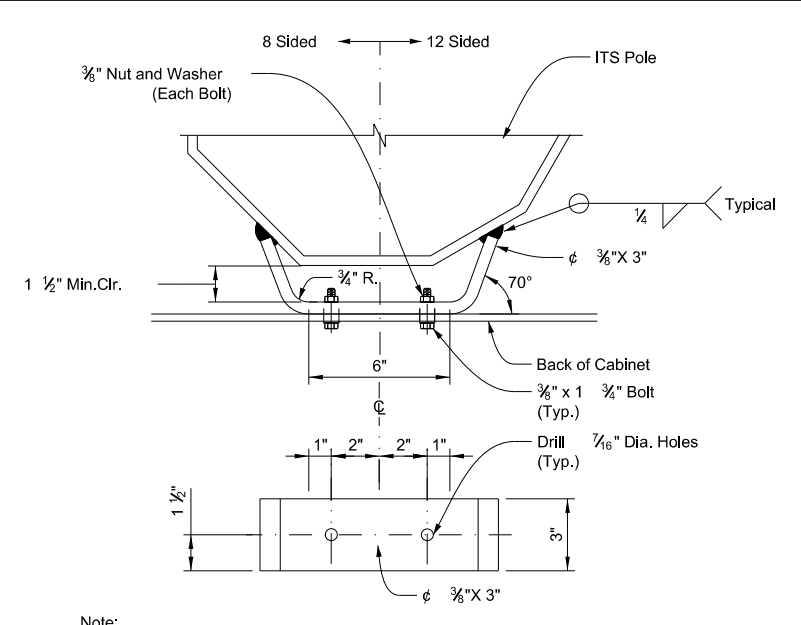
**Interior - Type 3 Back View**

Not to Scale



**Interior - Type 3 With Rack Front View**

Not to Scale



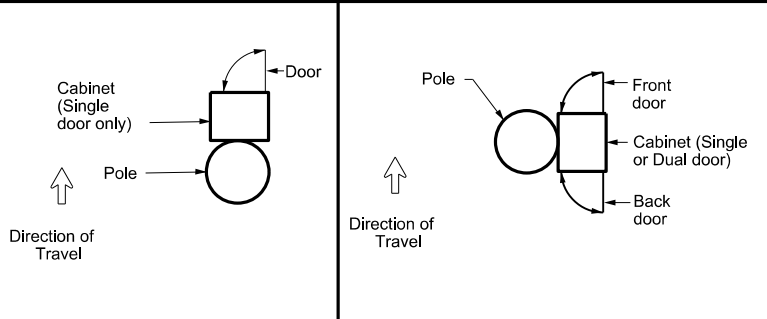
Note: ITS Pole May be Round, Octagonal (8 Sided), or Dodecahedron (12 Sided). See ITS(1), and ITS(2) for Details.

**Mounting Bracket Detail**

Not to Scale

**General Notes:**

- Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred Type 3 pole mounted cabinet setup. Hardware needed for each Type 3 cabinet varies and not all cabinet equipment may be shown. The contractor will be responsible for configuring cabinets with all appropriate ITS hardware and power supplies in accordance with the plans and specifications. The contractor may alter the cabinet configuration shown to maximize space and ensure easy access for maintenance.
- Mount cabinet as detailed on ITS(16) or ITS(17). Orientation of cabinet on ITS pole may vary depending on field conditions. Mount the pole mounted cabinet to the backside of the ITS pole, to allow maintenance personnel to access the cabinet while being able to view oncoming traffic. A dual door configuration (configuration 2) is detailed above.
- For ITS pole sites located on slopes greater than 4H:1V, Mount the cabinet to the backside of the ITS pole as detailed on ITS(7). Mounting height to accommodate maintenance pad for easy access.
- All dimensions are approximate and represent minimum cabinet dimensions.
- Provide conduit entrances at the bottom of the cabinet.
- Paid under Special Specification "ITS Pole with Cabinet" (Configuration 1) with single door.  
 Paid under Special Specification "ITS Pole with Cabinet" (Configuration 2) with dual door



**Orientation of Type 3 Cabinet on ITS Pole (Typical)**

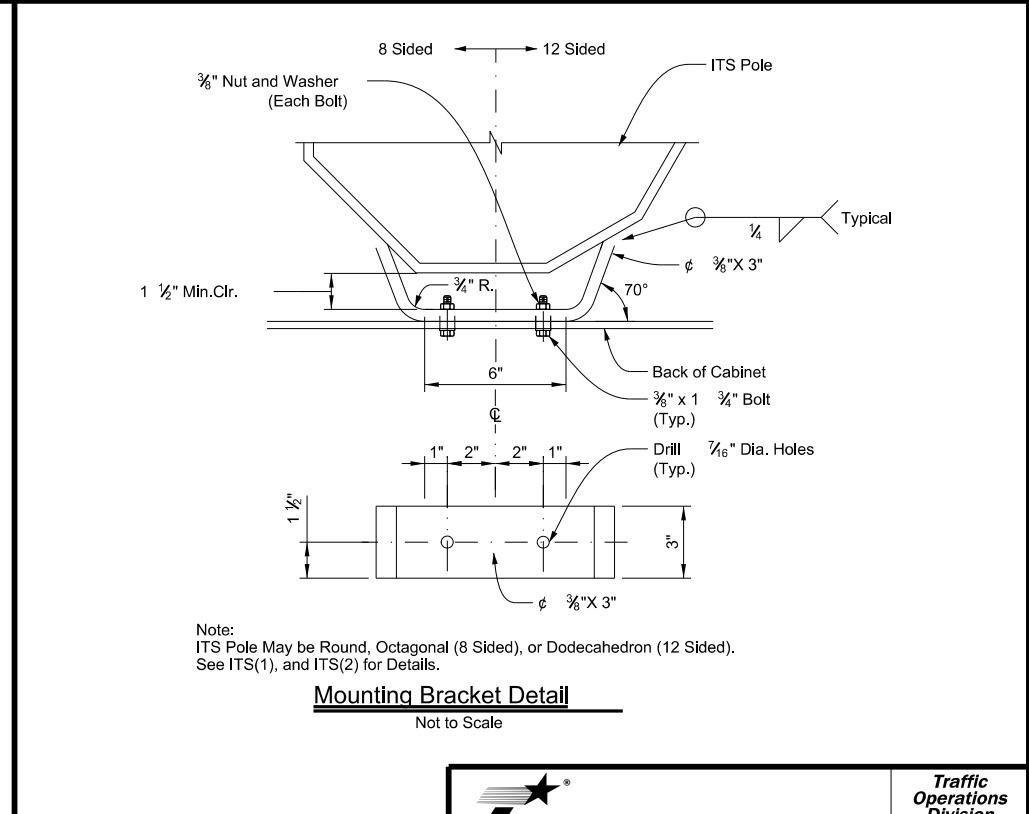
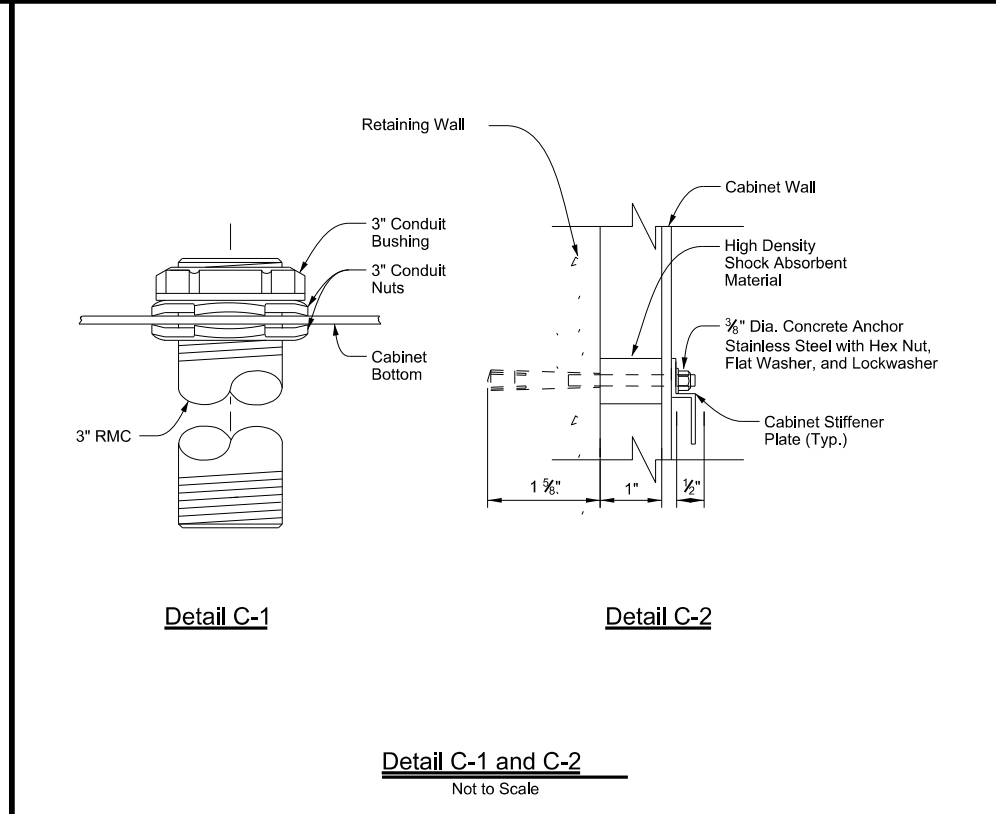
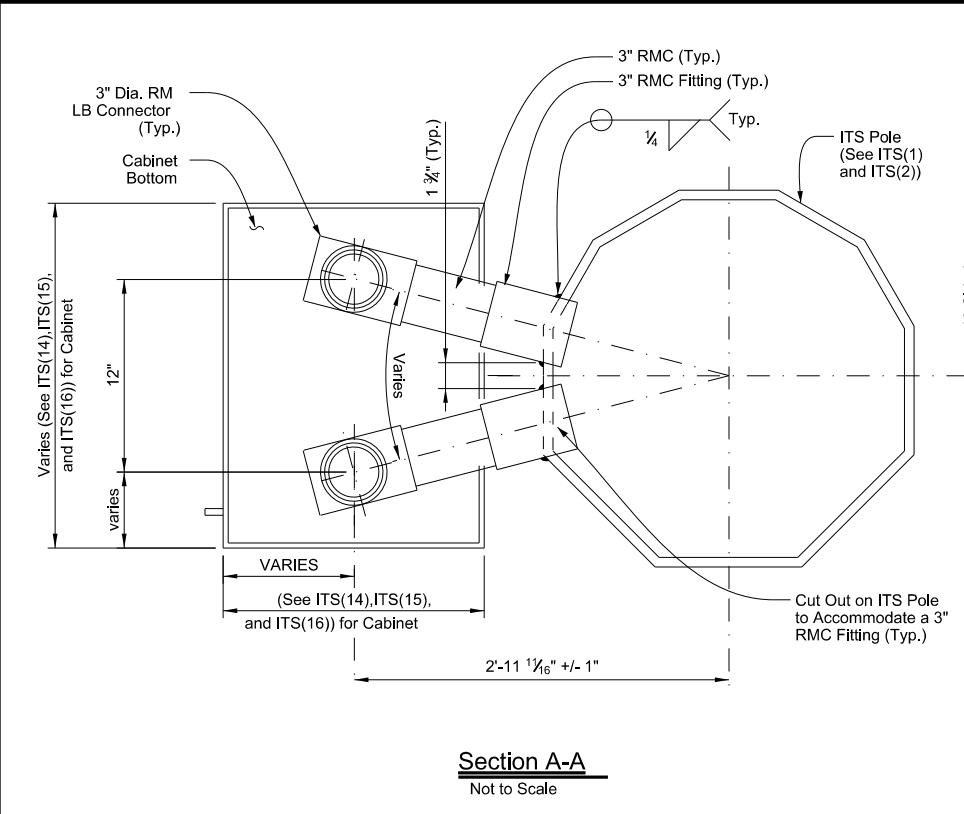
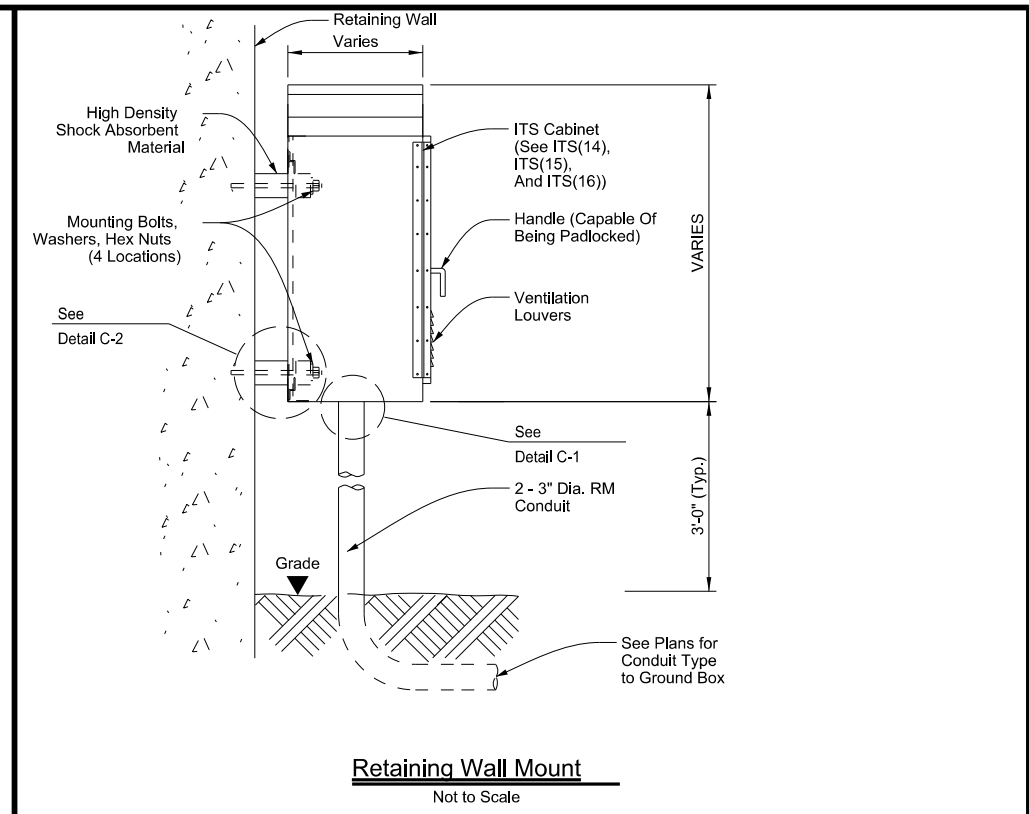
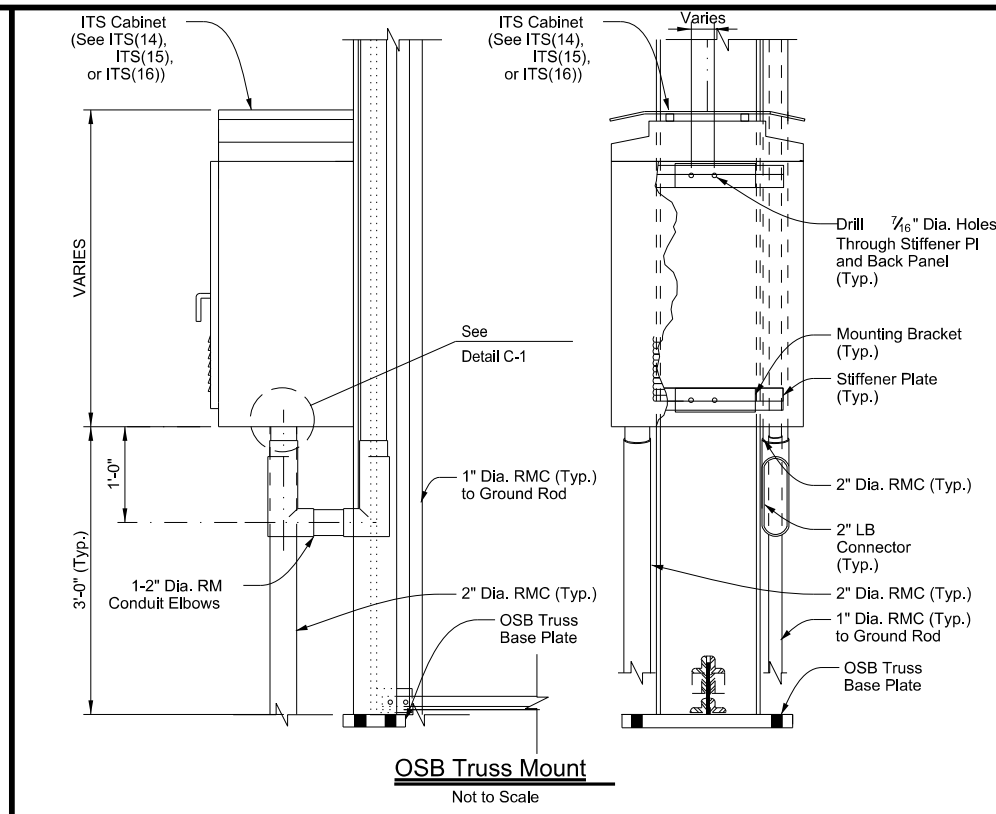
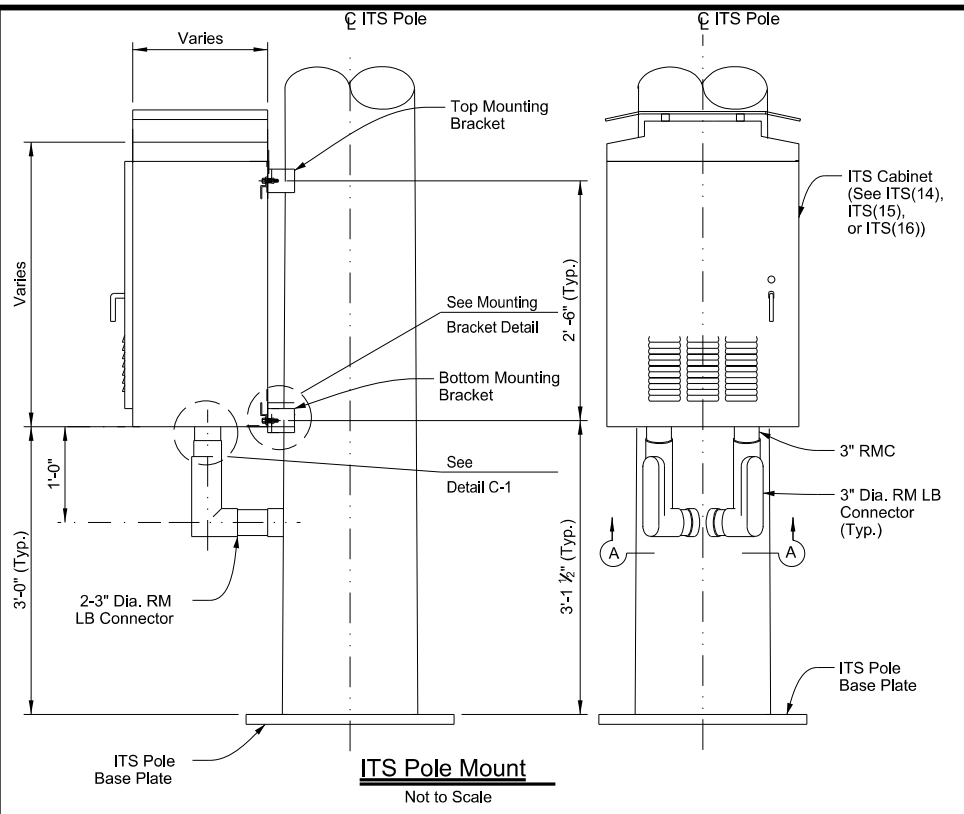
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**Typical Equipment Layout Legend**

Example Equipment	
①	CCTV Interface Panel, Radar Vehicle Sensing Device (RVSD) Equipment, DMS/LCS Controller, Environmental Sensor Station (ESS) Equipment, Bluetooth Equipment, or ITS Radio Equipment (See General Note 1)
②	Ethernet Switch, Video Encoder, Terminal Server, Fiber Optic Transceivers, or Media Conversion Equipment (See General Note 1)
③	Power Distribution Assembly, Service Entrance Breakers, Primary AC Power, Auxiliary Power Strip, Ground Bus Bar, Surge Protection Equipment

		<b>Traffic Operations Division Standard</b>	
<h1>ITS POLE MOUNTED CABINET TYPE 3 DETAILS</h1> <h2>ITS(16)-15</h2>			
FILE: its(16)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Intelligent Transportation Systems\ITS Pole Mounting Details.dwg  
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- General Notes:**
1. Mount cabinet as detailed on ITS(14), ITS(15), ITS(16), or ITS(17). Orientation of cabinet on ITS pole may vary depending on field conditions. Mount the pole mounted cabinet to the backside of the ITS pole, to allow maintenance personnel to access the cabinet while being able to view oncoming traffic.
  2. For ITS pole sites located on slopes greater than 4V:1H, mount the cabinet to the backside of the ITS pole as detailed on ITS(7). Mounting height to accommodate maintenance pad for easy access.
  3. All dimensions are approximate and represent minimum dimensions.
  4. Provide conduit entrances at the bottom of the cabinet.

Texas Department of Transportation  
 Traffic Operations Division Standard

## ITS POLE MOUNTED CABINET MISC. MOUNTING DETAILS

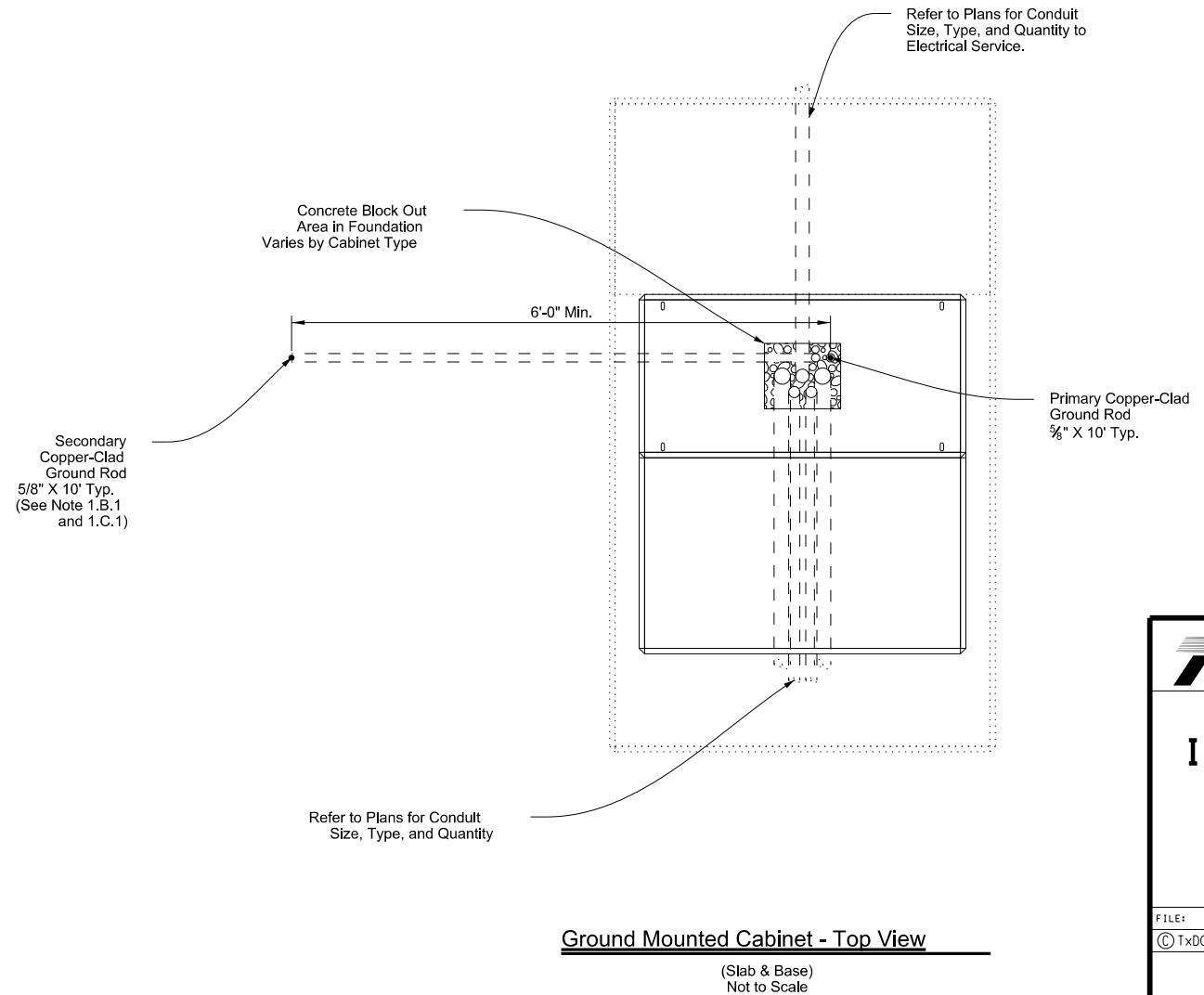
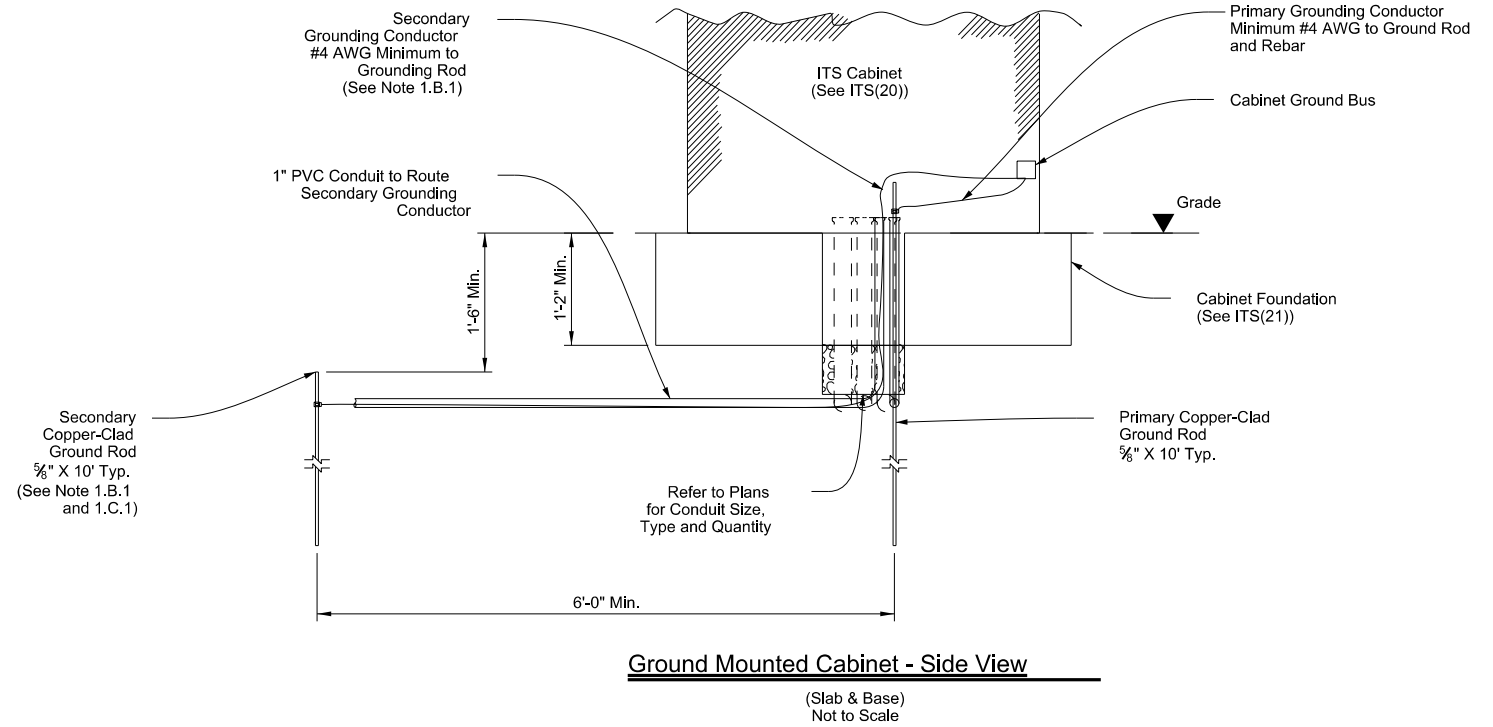
### ITS(17)-15

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REVISIONS	0003	01	064, ETC	IH 10
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ELP	CULBERSON		86	

DATE: 10/11/2023 10:42:04 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Intelligent Traffic Systems\ITS Cabinet Grounding.dwg  
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**General Notes:**

1. Grounding System:
  - A. Description:
    1. Provide ground system consisting of copper wires, ground rods, and concrete-encased grounding electrodes (Ufers), of the configuration shown to minimize potential gradient irregularities, drain leakage, and fault currents to earth.
  - B. Performance:
    1. Provide a grounding system, consisting of a minimum one ground rod, having a resistance not greater than 5 Ohms to ground. Additional ground rods may be added to the system to achieve less than 5 Ohms resistance.
  - C. Design Criteria:
    1. The combined ground resistance of separate systems bonded together below grade may be used to meet the specified ground resistance, but the minimum number of rods indicated shall still be provided.
    2. Measure the resistance of systems requiring separate ground resistance separately before bonding below grade.
    3. Only provide UL-approved materials listed for grounding systems.
    4. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.
    5. Submit product data for the materials and products used to perform the work of this section.
  - D. Materials:
    1. Conductors:
      - a. Bare Ground Conductor:
        - 1) For No. 8 AWG or larger bare ground wire sizes, provide soft drawn copper, Class A or Class B, stranded wire meeting the requirements of ASTM B 8.
      2. Ground Compression Connectors:
        - a. Provide molds, thermite packages, and other material for ground compression connectors that are full-rated to carry 100% of the cable rating and which meet IEEE 837.
          - 1) Provide the compression materials from a single manufacturer throughout the project.
          2. Provide the items necessary for connecting cable to ground rods.
      3. Ground Rods:
        - a. Provide copper-clad steel ground rods conforming to the requirements specified in UL 467.
          - 1) Diameter: 5/8 in.
          - 2) Length: 10 Ft.
2. Installation:
  - A. Install grounding components and systems in accordance with the requirements specified in UL 467, IEEE 81, and IEEE 142.
  - B. System Grounding:
    1. Ground Rods:
      - a. Drive ground rods into the ground until the tops of the rods are approximately 18 in. below finished grade.
      - b. If multiple ground rods are needed to meet the minimum resistance of 5 Ohms, space ground rods as evenly as possible, at least 6 feet apart, and so conductors will be connected below grade.
    2. Conductors:
      - a. Provide minimum No. 4 AWG ground wire for system and equipment grounding.
      - b. Using suitable fasteners, securely attach exposed ground wires to structural supports at not more than 2 ft. intervals, where applicable.
      - c. Bends in ground wires greater than 45 degrees are unacceptable.
    3. Cable Connections:
      - a. Use approved exothermic-welded connections for conductor splices and connections between conductors and other components.
3. Testing:
  - A. Resistance Test:
    1. Test Procedure:
      - a. The ground-resistance measurements of each ground Rod shall be taken.
        - 1) The resistance to ground shall be measured in accordance with the fall-of-potential method specified in IEEE 81 and IEEE 142.
        - 2) Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.
      - b. Test reports shall be prepared that indicate the location of the ground rod, the grounding system, and the resistance and soil conditions at the time the test was performed.
    2. Acceptance Criteria:
      - a. The grounding system must have a resistance not greater than 5 Ohms.
      - b. Do not energize any part of the electrical distribution system prior to the resistance testing of that system's ground rods and grounding system, and submission of the test results for approval.
    3. Inspections:
      - a. Prepare and submit as-built record drawings of the grounding system as installed and test reports for approval.

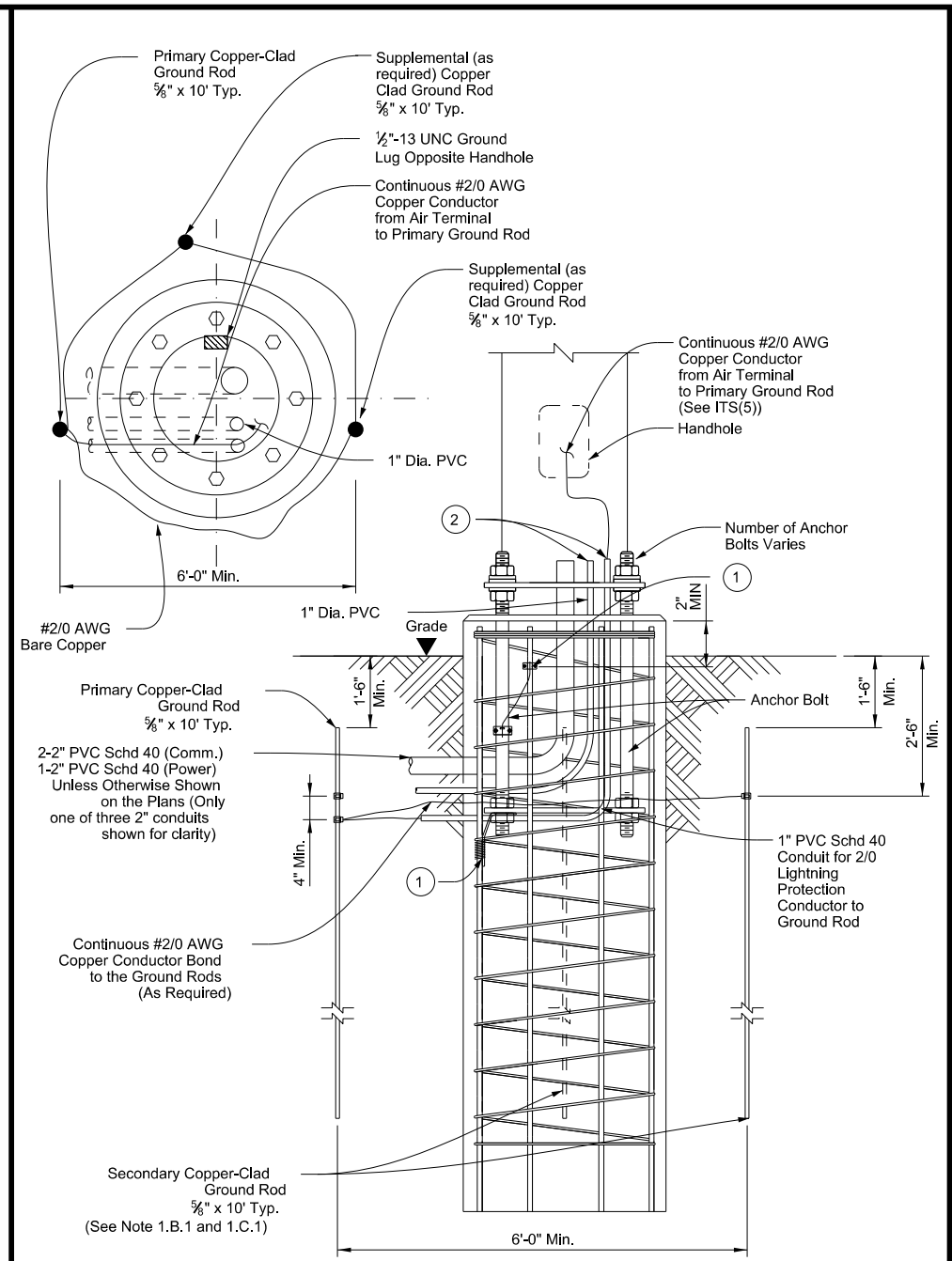


		<b>Traffic Operations Division Standard</b>	
<h2>ITS CABINET GROUNDING DETAILS</h2>			
<h3>ITS(18)-15</h3>			
FILE: its(18)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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REVISIONS	DIST: ELP	COUNTY: CULBERSON	HIGHWAY: IH 10
			SHEET NO. 87

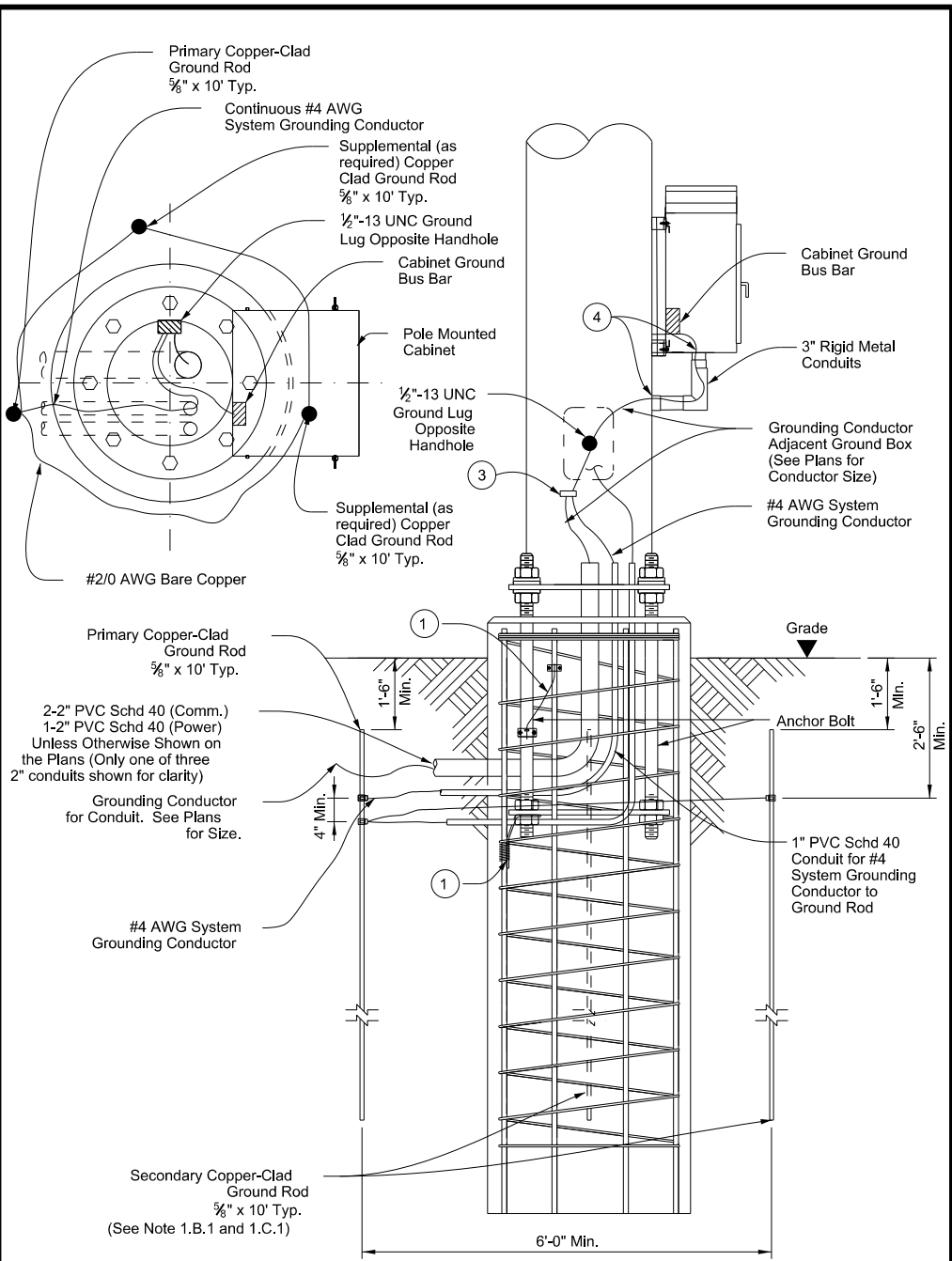
DATE: 10/11/2023 10:42:06 AM  
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**General Notes:**

1. Grounding System:
  - A. Description:
    1. Provide ground system consisting of copper wires, ground rods, and concrete-encased grounding electrodes (Ufers), of the configuration shown to minimize potential gradient irregularities, drain leakage, and fault currents to earth.
  - B. Performance:
    1. Provide a grounding system, consisting of a minimum one ground rod, having a resistance not greater than 5 Ohms to ground. Provide up to 2 additional supplemental ground rods if necessary to achieve a resistance not greater than 5 Ohms to ground. If a total of 3 ground rods is needed then install as part of a ground ring.
    2. If a ground ring is required, provide a minimum conductor length of 20 ft. placed at a minimum depth of 30 in..
  - C. Design Criteria:
    1. The grounding system of the ITS pole may be bonded below grade to the grounding systems of other nearby equipment to meet the specified grounding resistance. A minimum of one ground rod for the ITS pole is still required.
    2. Separately measure the grounding resistance of each system before bonding together below grade.
    3. Only provide UL-approved materials listed for grounding systems.
    4. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.
    5. Submit product data for the materials and products used to perform the work of this section.
  - D. Materials:
    1. Conductors:
      - a. Bare Ground Conductor:
        - 1) Provide prequalified copper conductors appearing on the Material Producers List according to Item 618.
      - b. Ground Compression Connectors:
        - a. Provide molds, thermite packages, and other material for exothermic welding of grounding connections.
        - b. Provide listed compression connectors fully rated to carry 100% of the cable rating and that meet IEEE 837. Provide compression materials from a single manufacturer throughout the project.
      - c. Ground Rods:
        - a. Provide copper-clad steel ground rods conforming to the requirements specified in DMS 11040.
          - 1) Diameter: 5/8 in.
          - 2) Length: 10 ft.
2. Installation:
  - A. Install grounding components and systems in accordance with the requirements specified in IEEE 142.
  - B. System Grounding:
    1. Ground Rods:
      - a. Drive ground rods into the ground until the tops of the rods are a minimum of 18 in. below finished grade.
      - b. If multiple ground rods are needed to meet the minimum resistance of 5 Ohms, space ground rods as evenly as possible, at least 6 feet apart, so conductors will be connected below grade.
    2. Conductors:
      - a. Provide minimum No. 2/0 AWG ground wire for lightning protection from air terminal.
      - b. Provide minimum No. 4 AWG ground wire for system and equipment grounding.
      - c. Using suitable fasteners, securely attach exposed ground wires to structural supports at not more than 2 ft. intervals, where applicable.
      - d. Bends in ground wires greater than 45 degrees are unacceptable.
    3. Cable Connections:
      - a. Use exothermic-welded connections or listed compression connectors for conductor splices and connections between conductors and other components.
  3. Testing:
    - A. Resistance Test:
      1. Test Procedure:
        - a. The ground-resistance measurements of each ground Rod shall be taken.
          - 1) The resistance to ground shall be measured in accordance with the fall-of-potential method specified in IEEE 81 and IEEE 142.
          - 2) Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.
        - b. Test reports shall be prepared that indicate the location of the ground rod, the grounding system, and the resistance and soil conditions at the time the test was performed.
      2. Acceptance Criteria:
        - a. The grounding system must have a resistance not greater than 5 Ohms.
        - b. Do not energize any part of the electrical distribution system prior to the resistance testing of that system's ground rods and grounding system, and submission of the test results for approval.
      3. Inspections:
        - a. Prepare and submit as-built record drawings of the grounding system as installed and test reports for approval.



**Grounding System**  
Not to Scale



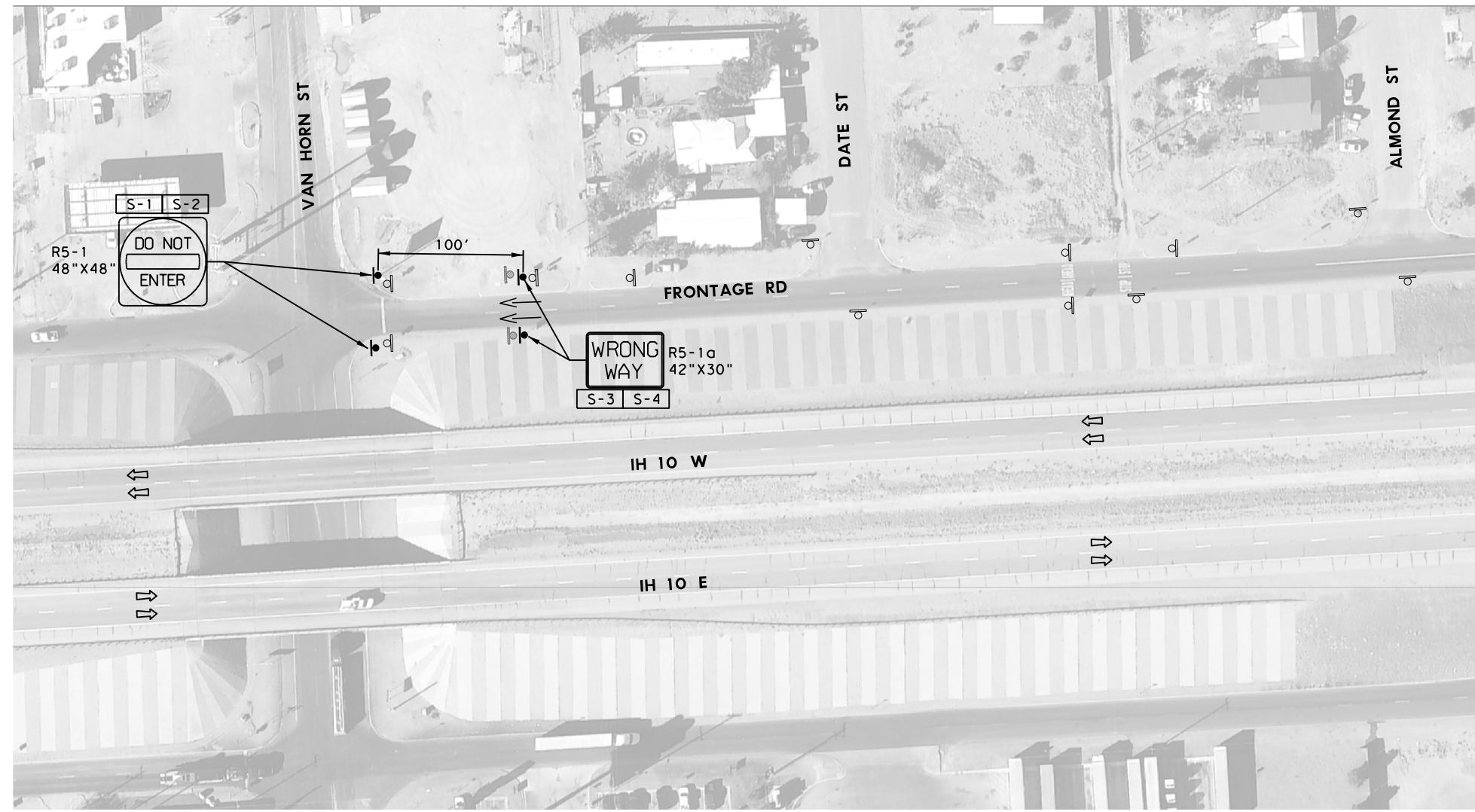
**Grounding System with Pole Mounted Cabinet**  
Not to Scale

**Reference Notes:**

- 1 Bond anchor bolts to rebar with #2/0 AWG jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Mechanical connectors shall be UL Listed for concrete encasement.
- 2 Cut PVC approximately 1 in. above concrete and install bell or bushing. Align conduit as close as possible to point of attachment to base plate to minimize bends in #2/0 wire.
- 3 Bond grounding conductors via cadweld or mechanical connector, rated for size and number of conductors.
- 4 Provide and install a grounding type bushing on 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.

		<b>Traffic Operations Division Standard</b>	
<h2>ITS POLE GROUNDING DETAILS</h2>			
<h3>ITS(19)-17</h3>			
FILE: its(19)-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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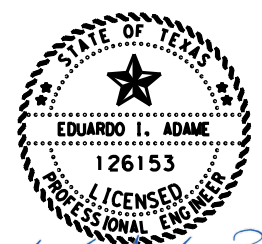
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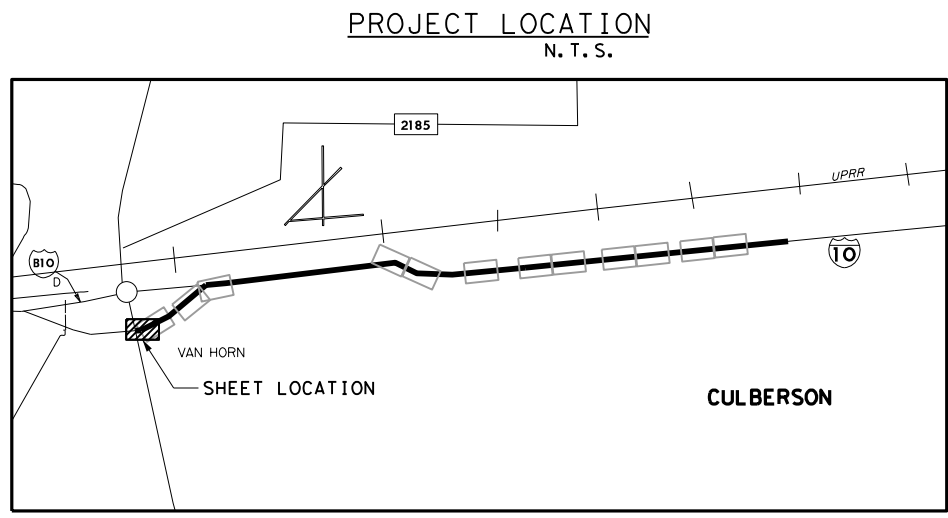
- NOTES:
- REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  - INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	4
644	6076	REMOVE SM RD SN SUP&AM	EA	2
672	6008	REFL PAV MRKR TY I-R	EA	28



*Eduardo I. Adame P.E.*  
10/18/2023



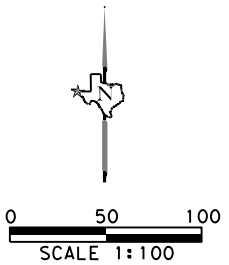
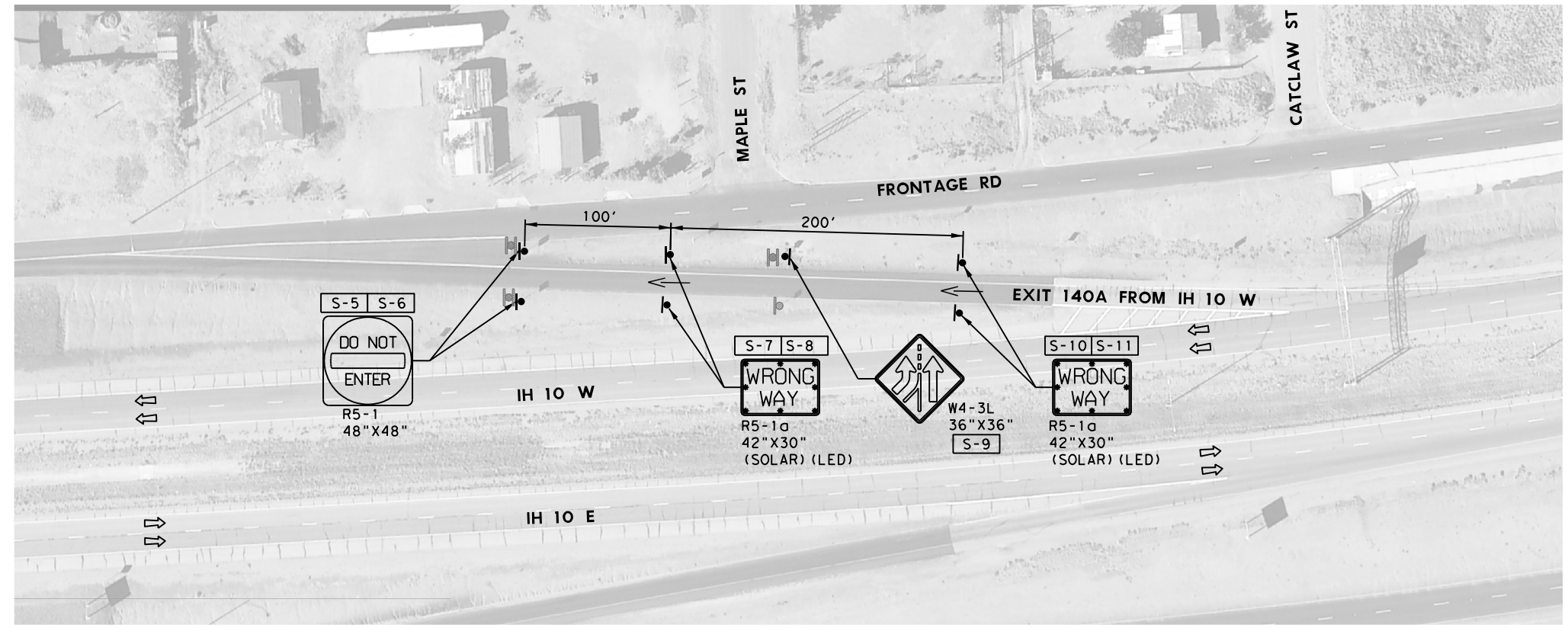
**IH 10  
WWD SIGNING  
LAYOUT**

IH 10 W & VAN HORN ST

SHEET 1 OF 13

Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		89

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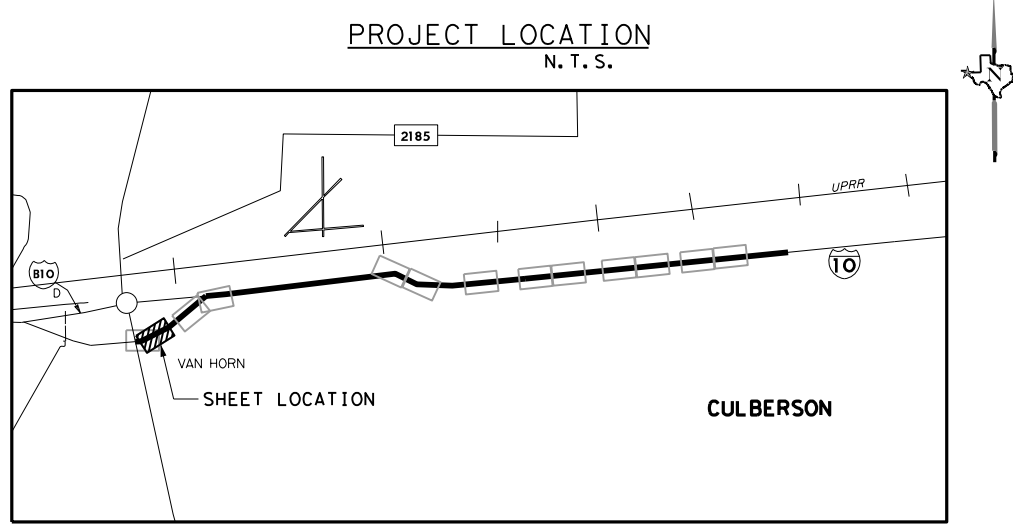


- NOTES:
1. REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  2. INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	6
644	6076	REMOVE SM RD SN SUP&AM	EA	4
672	6008	REFL PAV MRKR TY I-R	EA	28
6489	6002	BACKLIT W/PERIMETER LED RDSG SGN	EA	4

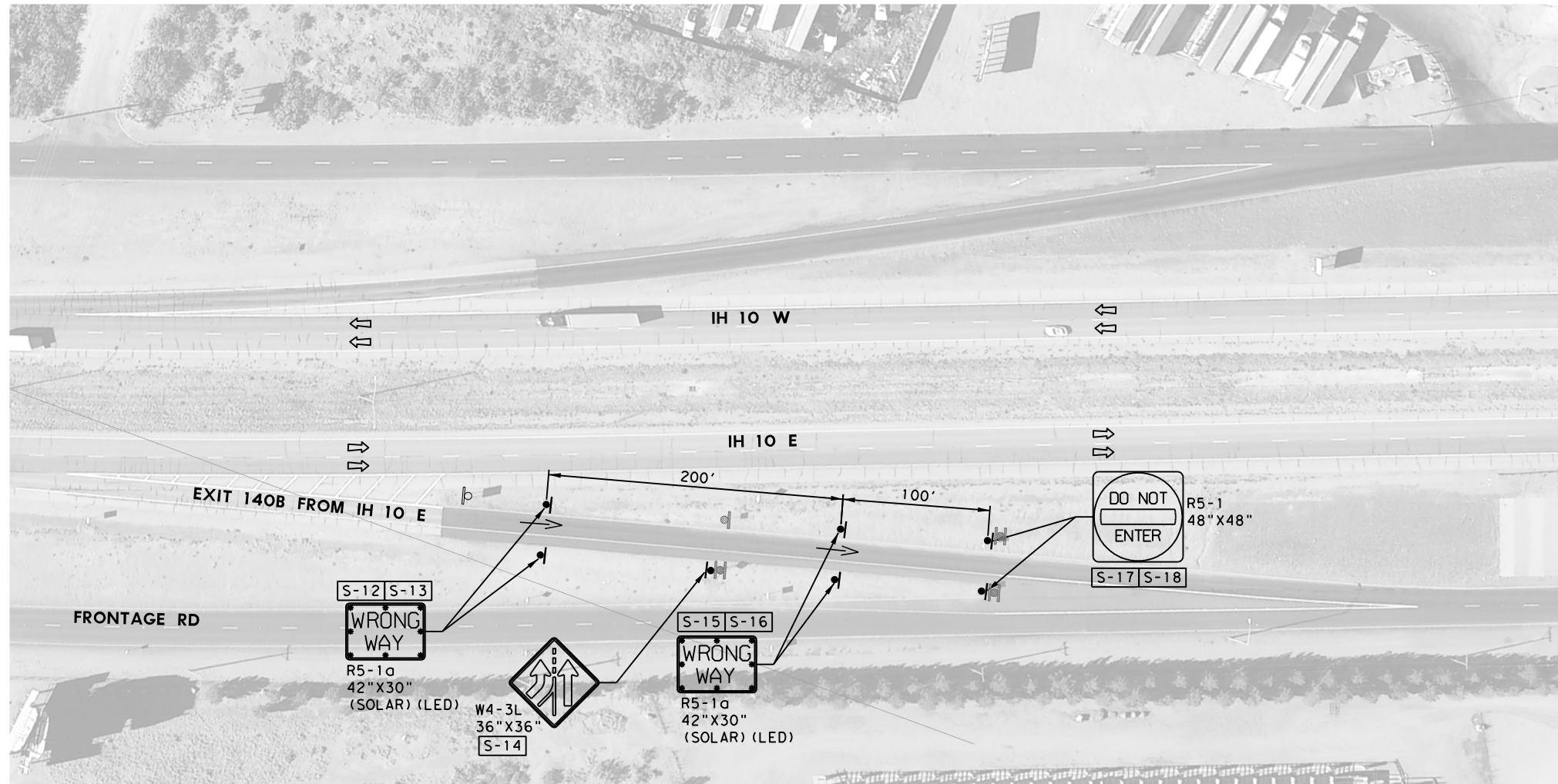
Eduardo I. Adame P.E.  
 10/18/2023



**IH 10**  
**WWD SIGNING LAYOUT**  
 IH 10 W & EXIT 140A  
 SHEET 2 OF 13  
 ©2022

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		90

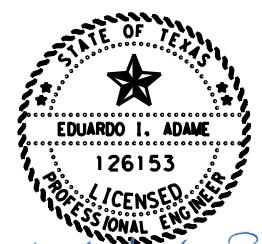
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- NOTES:
- REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  - INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

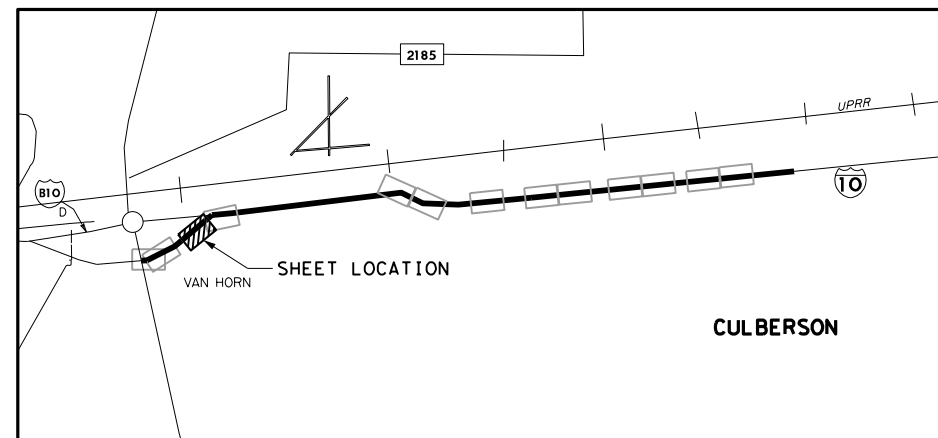
LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	6
644	6076	REMOVE SM RD SN SUP&AM	EA	4
672	6008	REFL PAV MRKR TY I-R	EA	28
6489	6002	BACKLIT W/PERIMETER LED RDSG SGN	EA	4



*Eduardo I. Adame P.E.*  
 10/18/2023

PROJECT LOCATION  
 N. T. S.



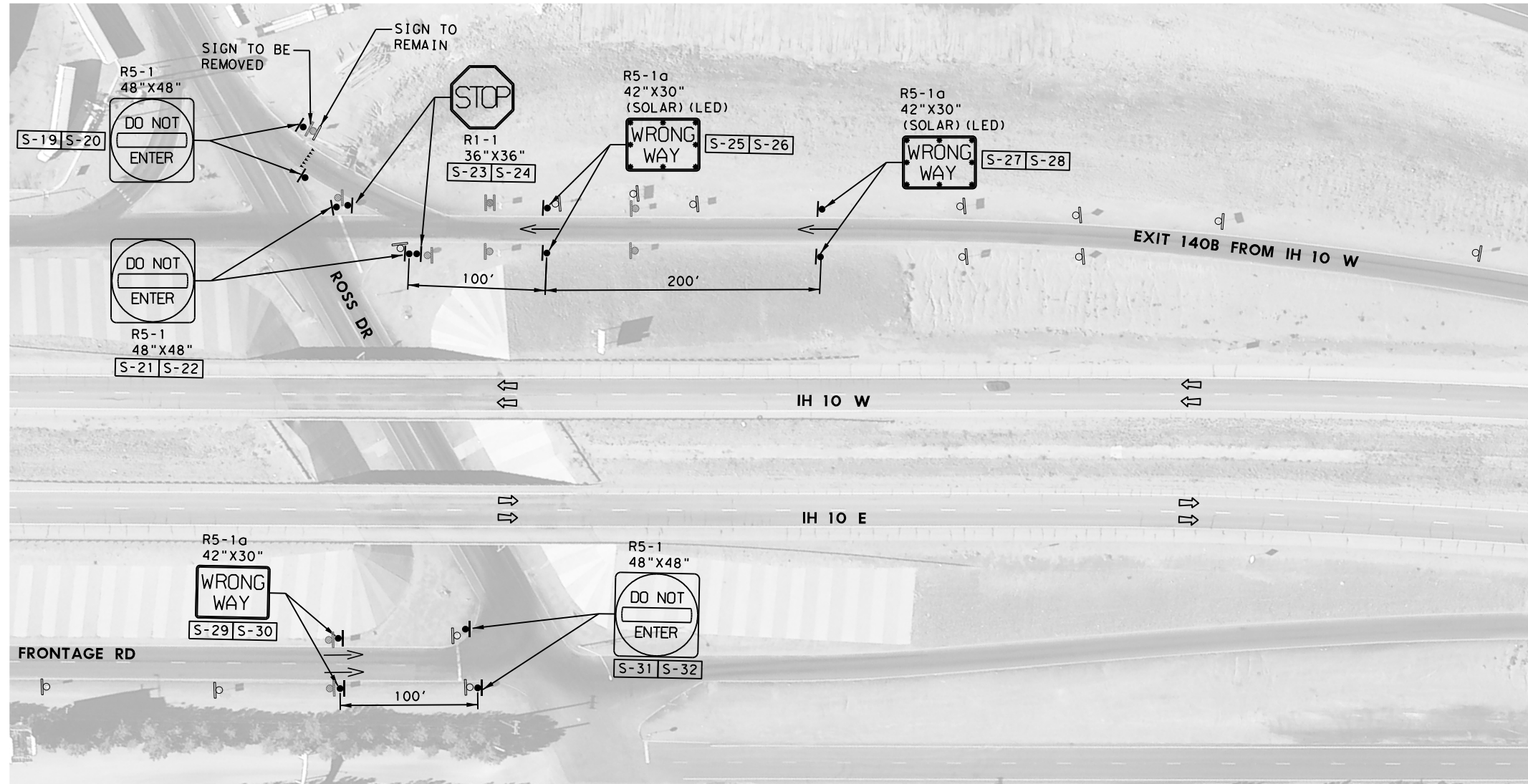
IH 10  
 WWD SIGNING  
 LAYOUT

IH 10 E & EXIT 140B

SHEET 3 OF 13

Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		91

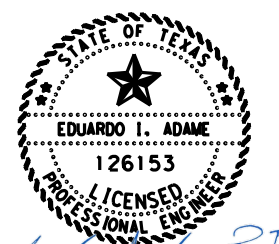
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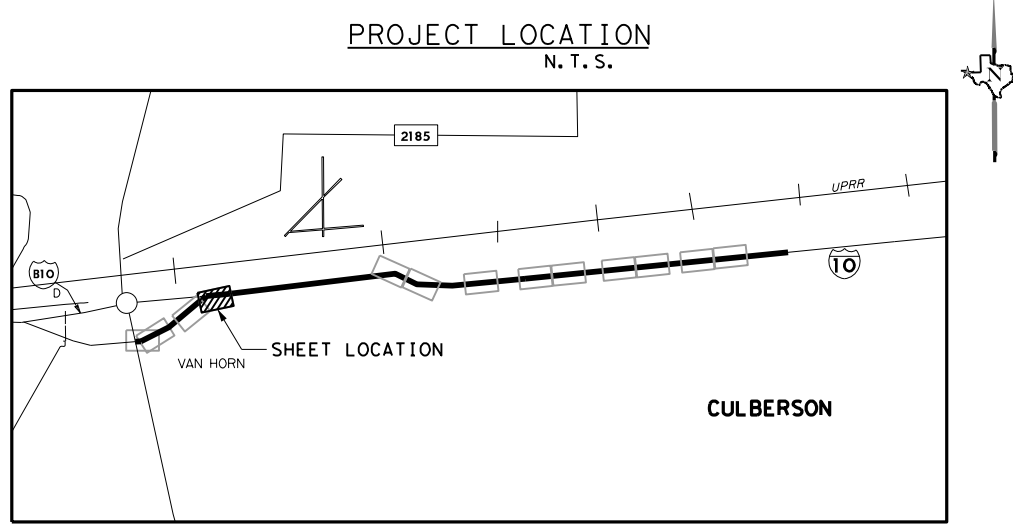
- NOTES:
- REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  - INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6002	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	EA	2
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	12
644	6076	REMOVE SM RD SN SUP&AM	EA	8
644	6078	REMOVE SM RD SN SUP&AM (SIGN ONLY)	EA	1
672	6008	REFL PAV MRKR TY I-R	EA	56
6489	6002	BACKLIT W/PERIMETER LED RDSG SGN	EA	4



*Eduardo I. Adame P.E.*  
 10/18/2023



**IH 10  
 WWD SIGNING  
 LAYOUT**

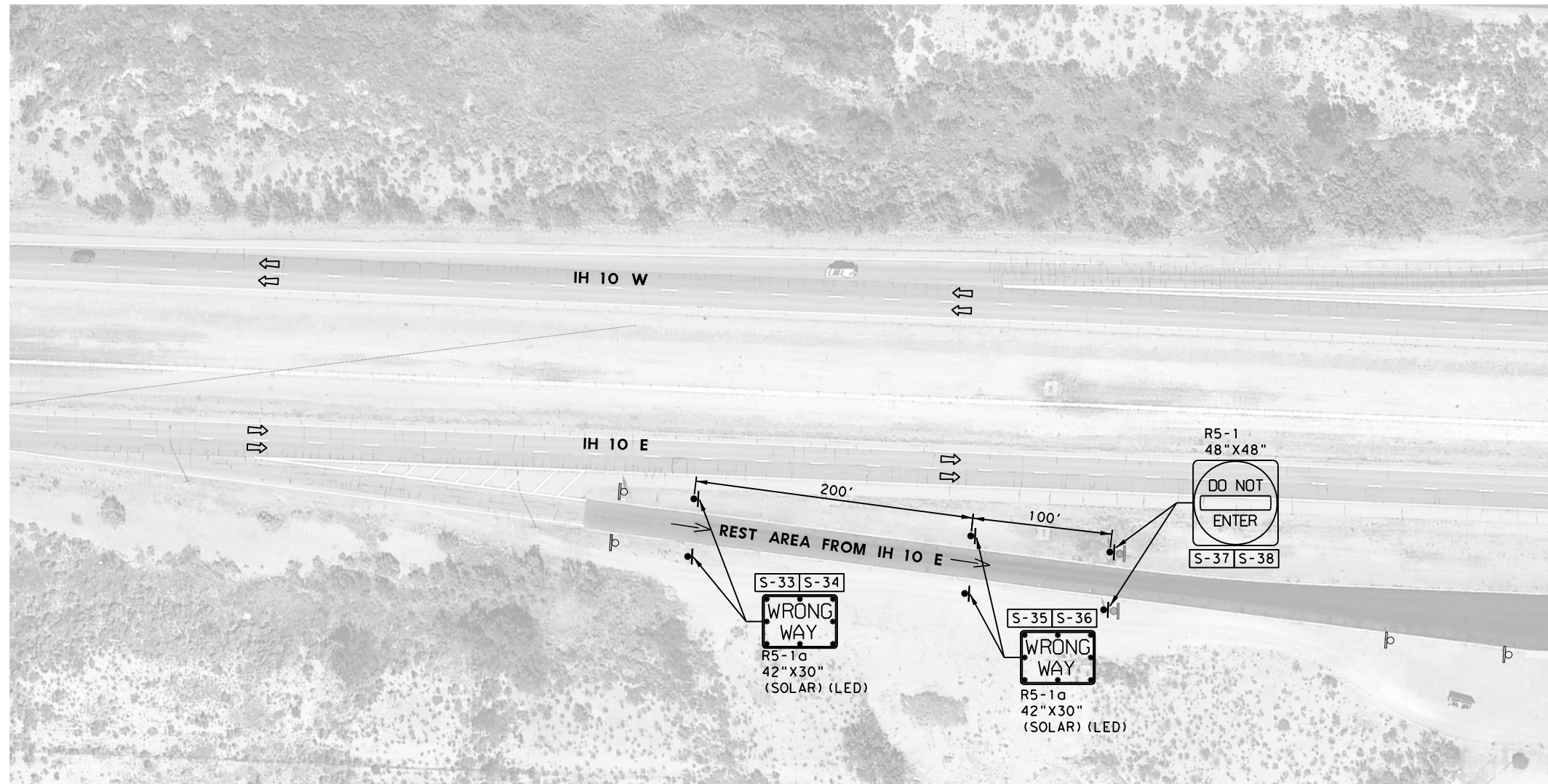
IH 10 W & EXIT 140B

SHEET 4 OF 13  
 ©2022

Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		92



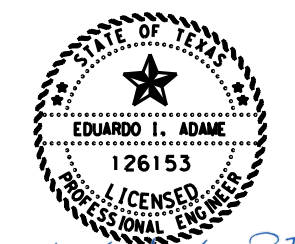
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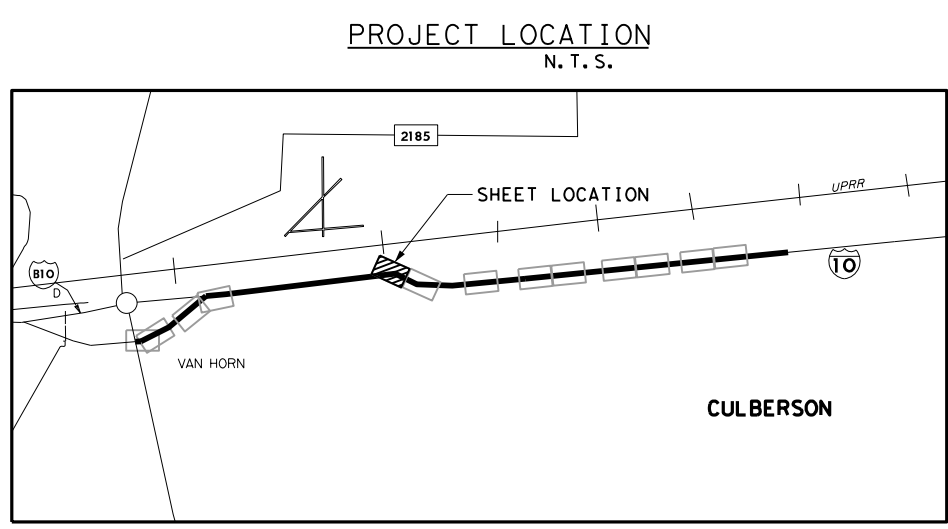
- NOTES:
- REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  - INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6004	IN SM RD SN SUP&AM TY10BWG(1) SA(T)	EA	6
644	6076	REMOVE SM RD SN SUP&AM	EA	2
672	6008	REFL PAV MRKR TY I-R	EA	28
6489	6002	BACKLIT W/PERIMETER LED RDSD SGN	EA	4



*Eduardo I. Adame P.E.*  
10/18/2023

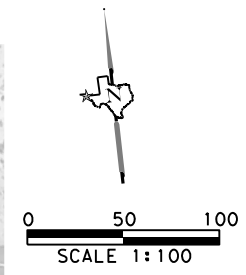
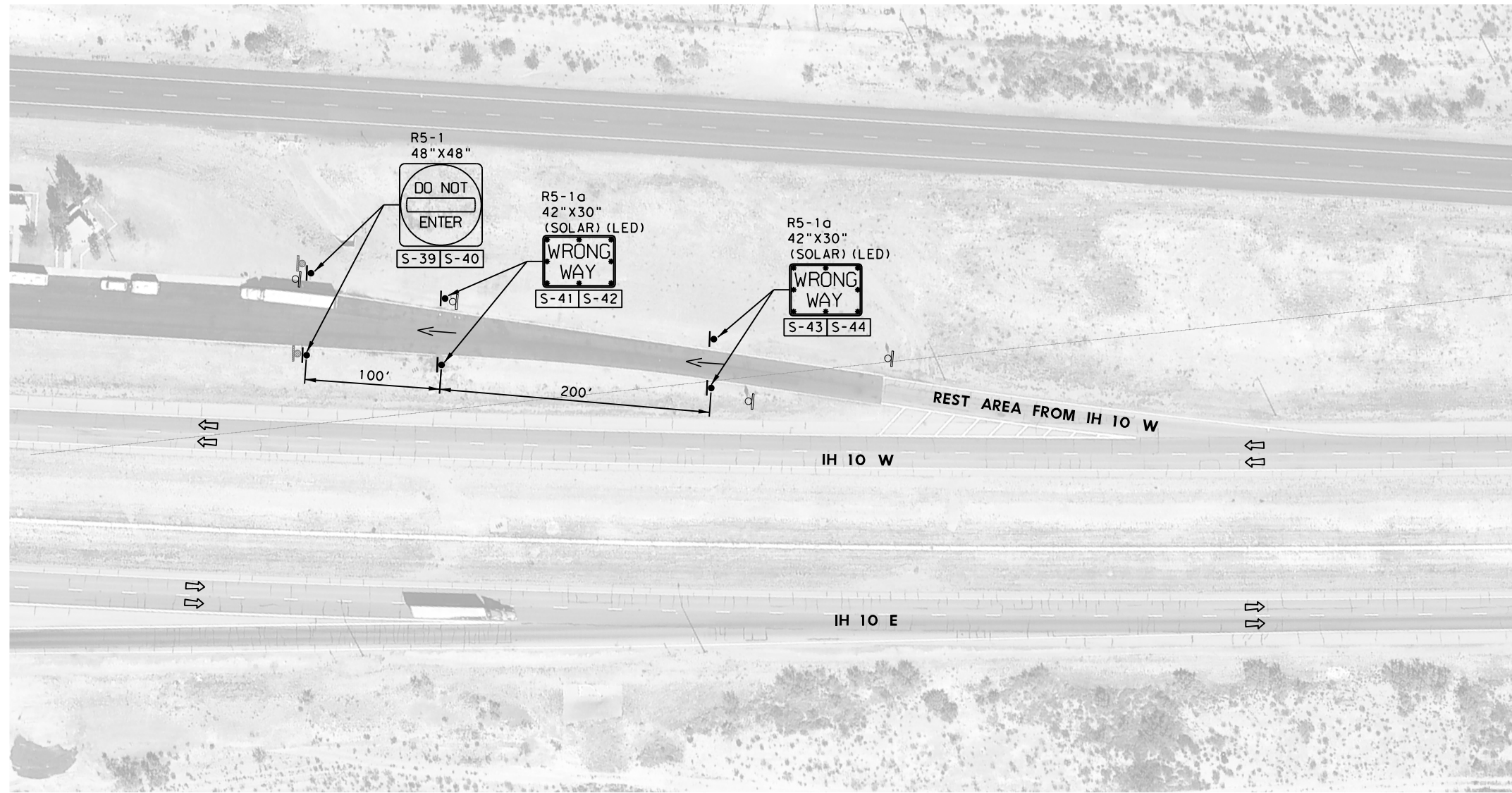


**IH 10  
WWD SIGNING  
LAYOUT**

IH 10 E & REST AREA  
AT MM 144  
SHEET 5 OF 13

Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		93

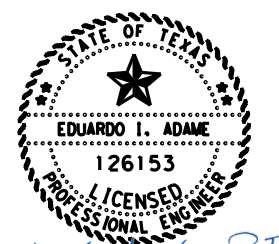
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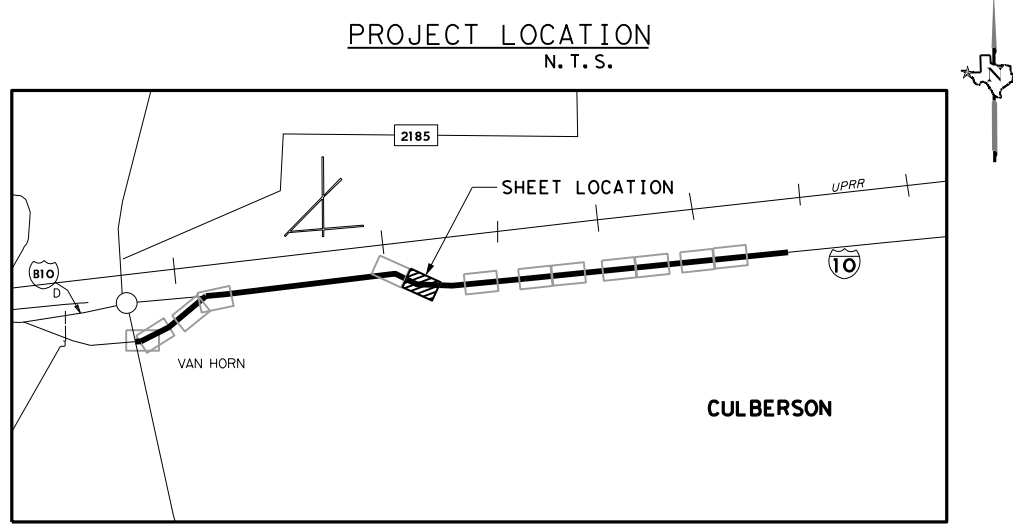
- NOTES:
1. REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  2. INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	6
644	6076	REMOVE SM RD SN SUP&AM	EA	2
672	6008	REFL PAV MRKR TY I-R	EA	28
6489	6002	BACKLIT W/PERIMETER LED RDSG SGN	EA	4



*Eduardo I. Adame P.E.*  
 10/18/2023

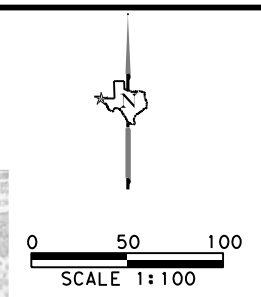
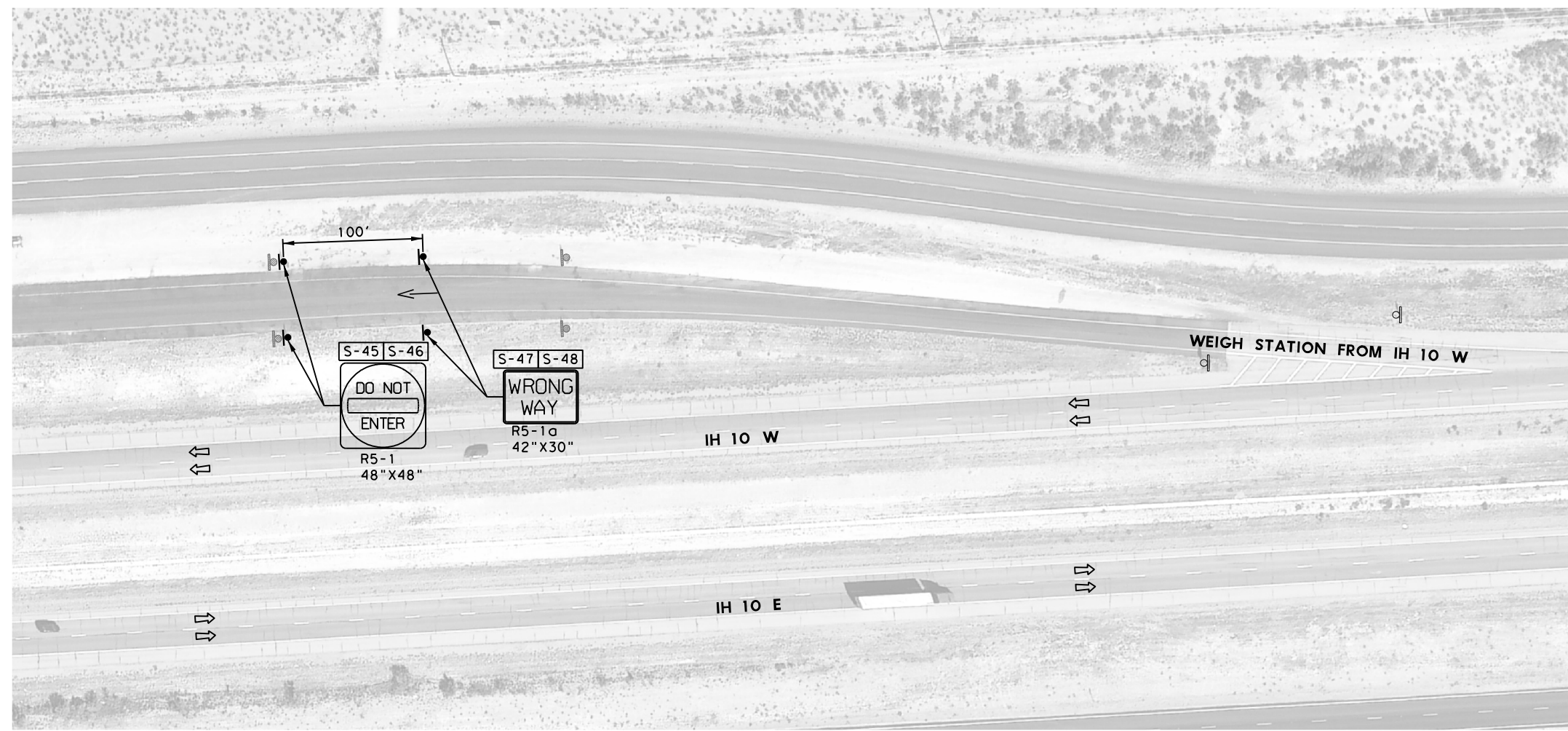


**IH 10  
 WWD SIGNING  
 LAYOUT**

IH 10 W & REST AREA  
 AT MM 145  
 SHEET 6 OF 13

Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		94

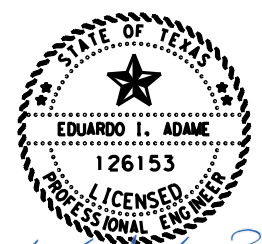
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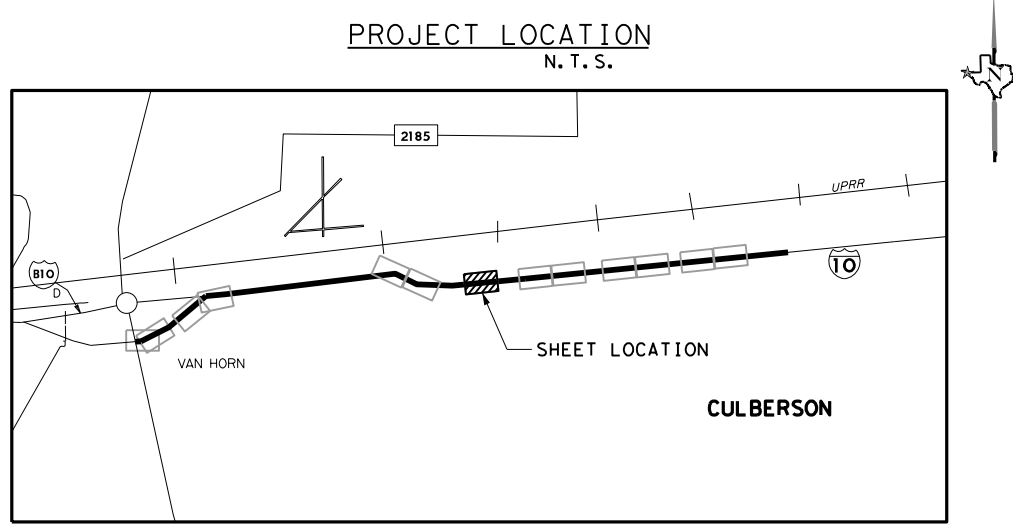
- NOTES:
1. REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  2. INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	4
644	6076	REMOVE SM RD SN SUP&AM	EA	4
672	6008	REFL PAV MRKR TY I-R	EA	14



*Eduardo I. Adame P.E.*  
 10/18/2023

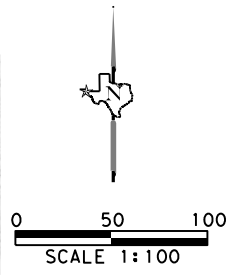
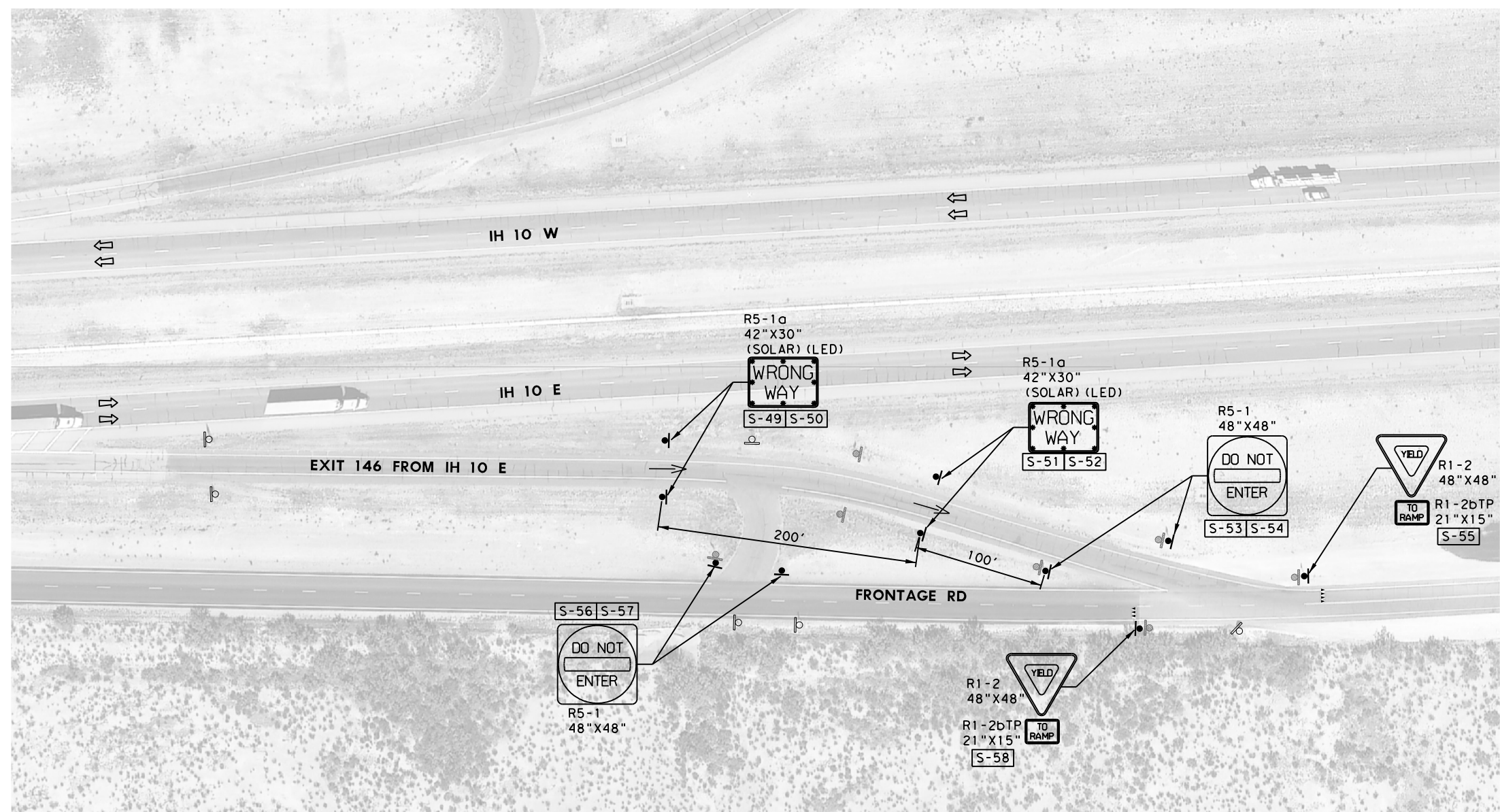


**IH 10  
 WWD SIGNING  
 LAYOUT**

IH 10 W & WEIGH STATION  
 AT MM 146  
 SHEET 7 OF 13

Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		95

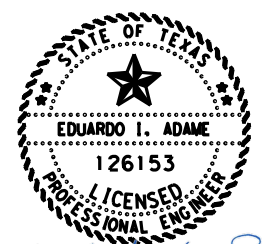
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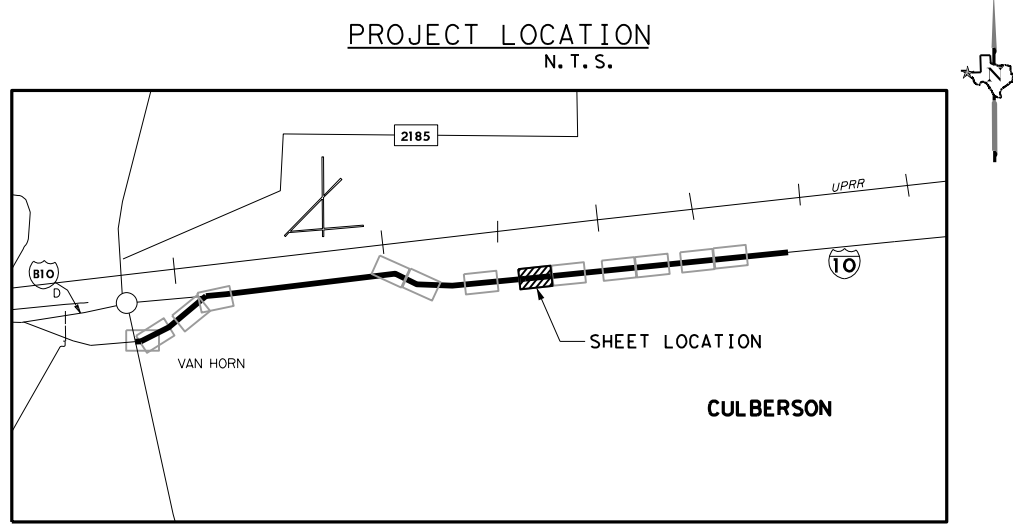
- NOTES:
- REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  - INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	10
644	6076	REMOVE SM RD SN SUP&AM	EA	7
672	6008	REFL PAV MRKR TY I-R	EA	28
6489	6002	BACKLIT W/PERIMETER LED RDSD SGN	EA	4



*Eduardo I. Adame P.E.*  
10/18/2023



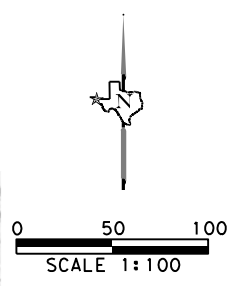
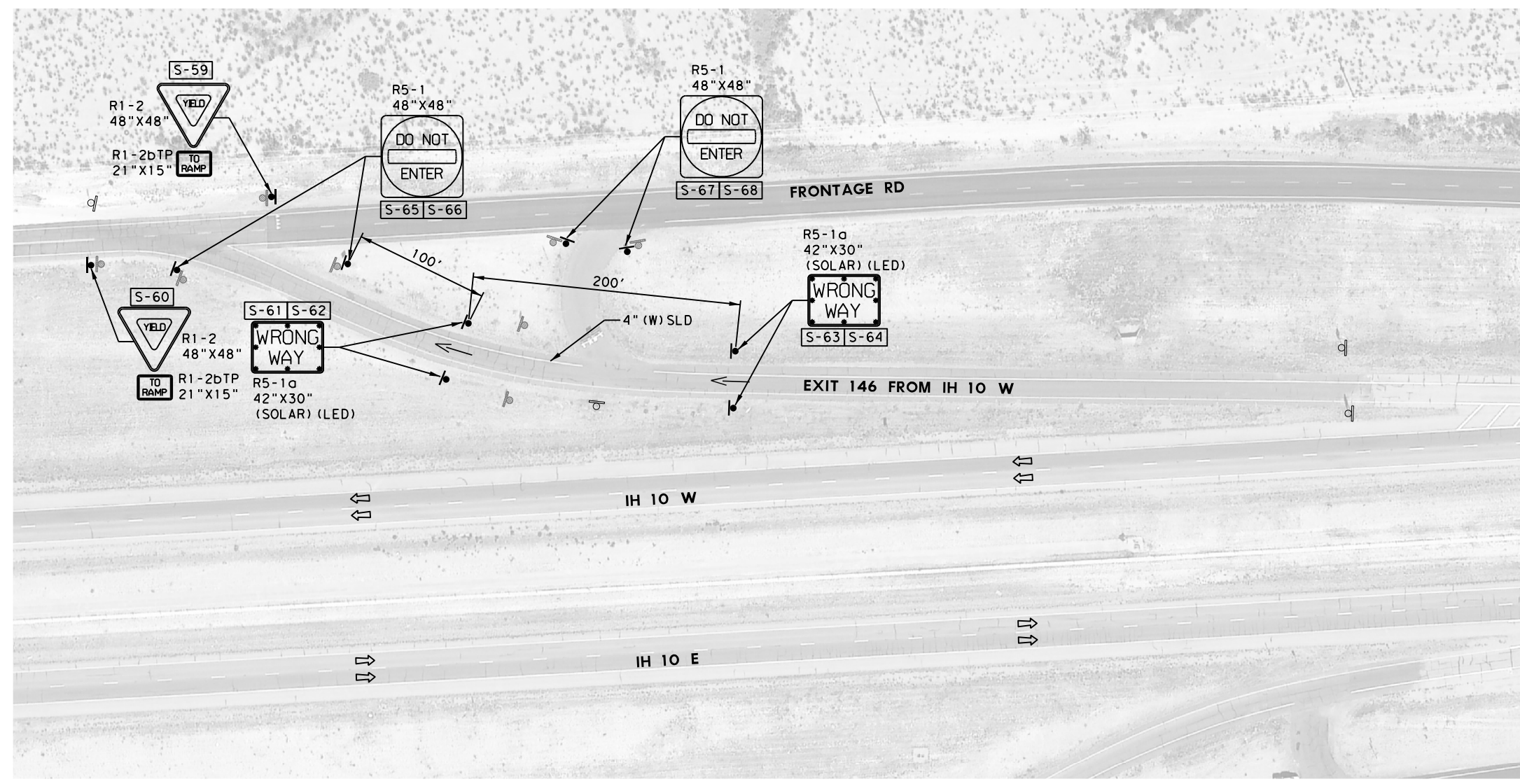
**IH 10  
WWD SIGNING  
LAYOUT**

IH 10 E & EXIT 146

SHEET 8 OF 13

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		96

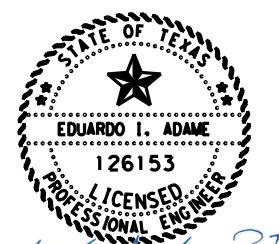
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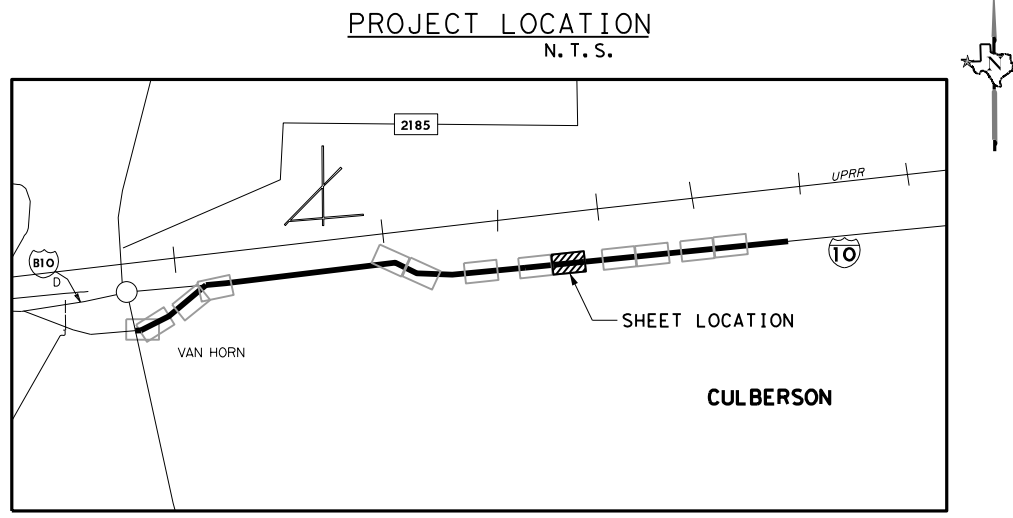
- NOTES:
- REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  - INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	10
644	6076	REMOVE SM RD SN SUP&AM	EA	8
672	6008	REFL PAV MRKR TY I-R	EA	28
6489	6002	BACKLIT W/PERIMETER LED RDSD SGN	EA	4



*Eduardo I. Adame P.E.*  
 10/18/2023



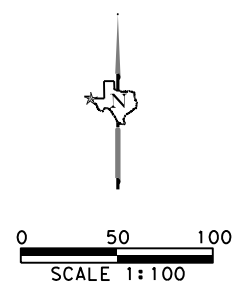
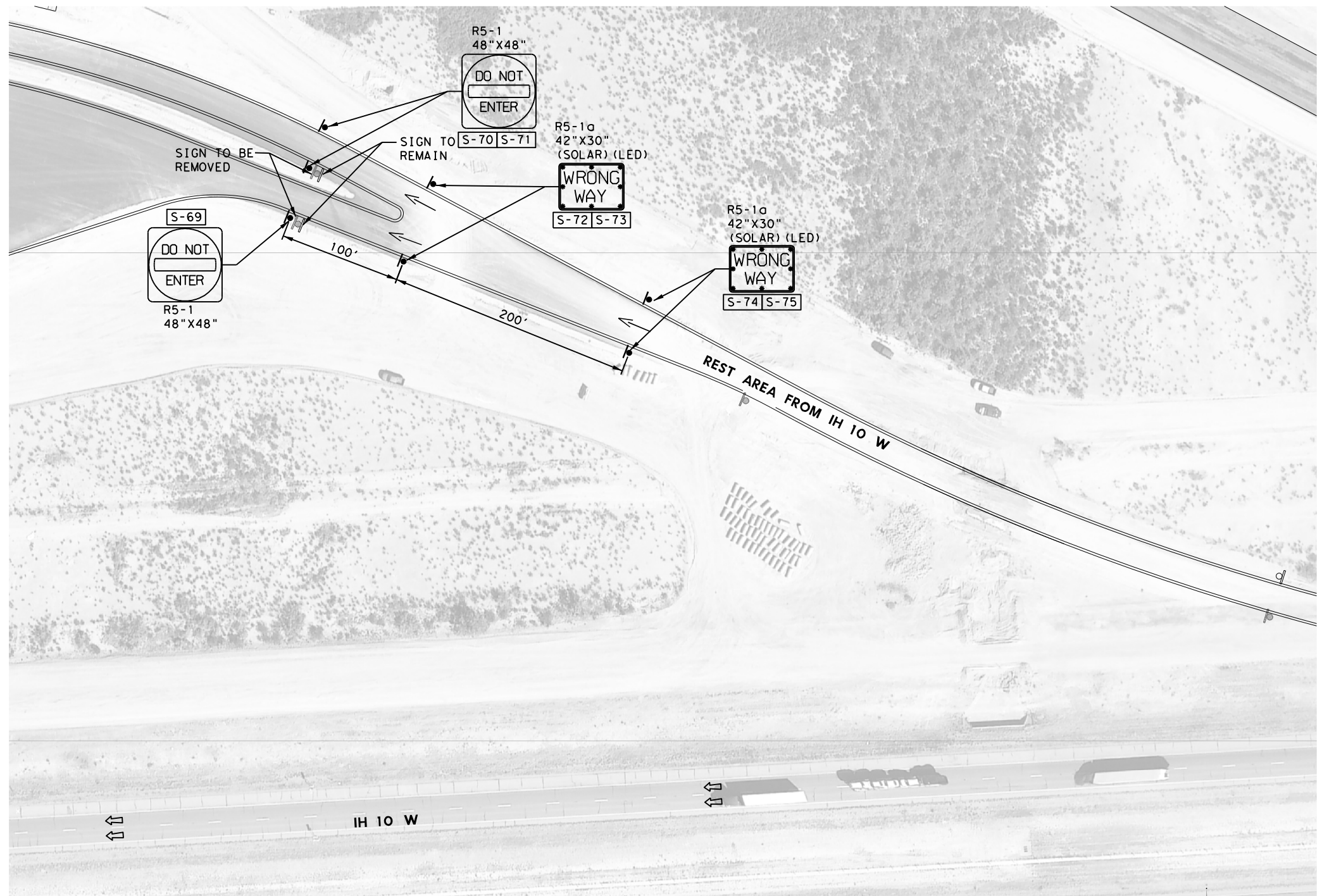
IH 10  
 WWD SIGNING  
 LAYOUT

IH 10 W & EXIT 146

SHEET 9 OF 13  
 ©2022

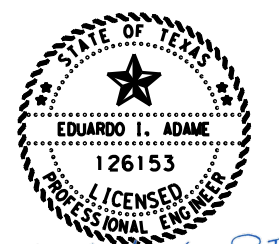
Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		97

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- NOTES:
1. REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  2. INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

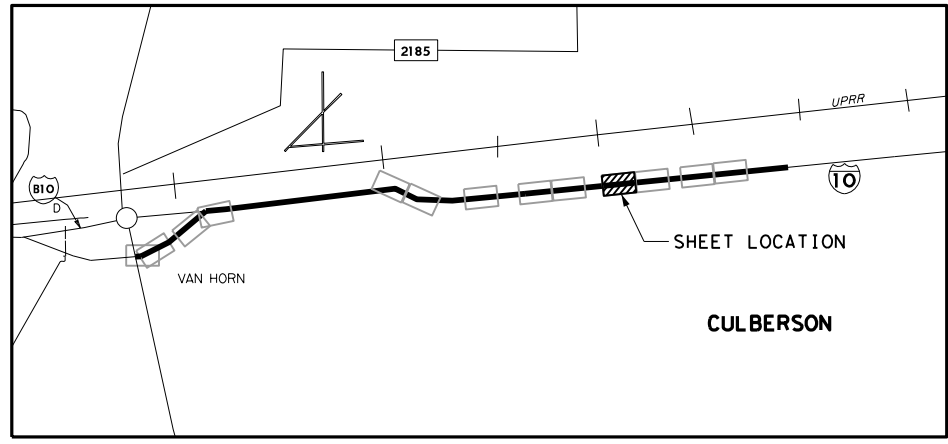
LEGEND	
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	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS



*Eduardo I. Adame P.E.*  
 10/18/2023

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	7
644	6076	REMOVE SM RD SN SUP&AM	EA	2
644	6078	REMOVE SM RD SN SUP&AM (SIGN ONLY)	EA	2
672	6008	REFL PAV MRKR TY I-R	EA	42
6489	6002	BACKLIT W/PERIMETER LED RDSD SGN	EA	4

PROJECT LOCATION  
 N. T. S.

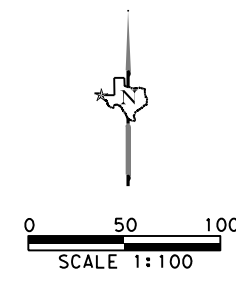
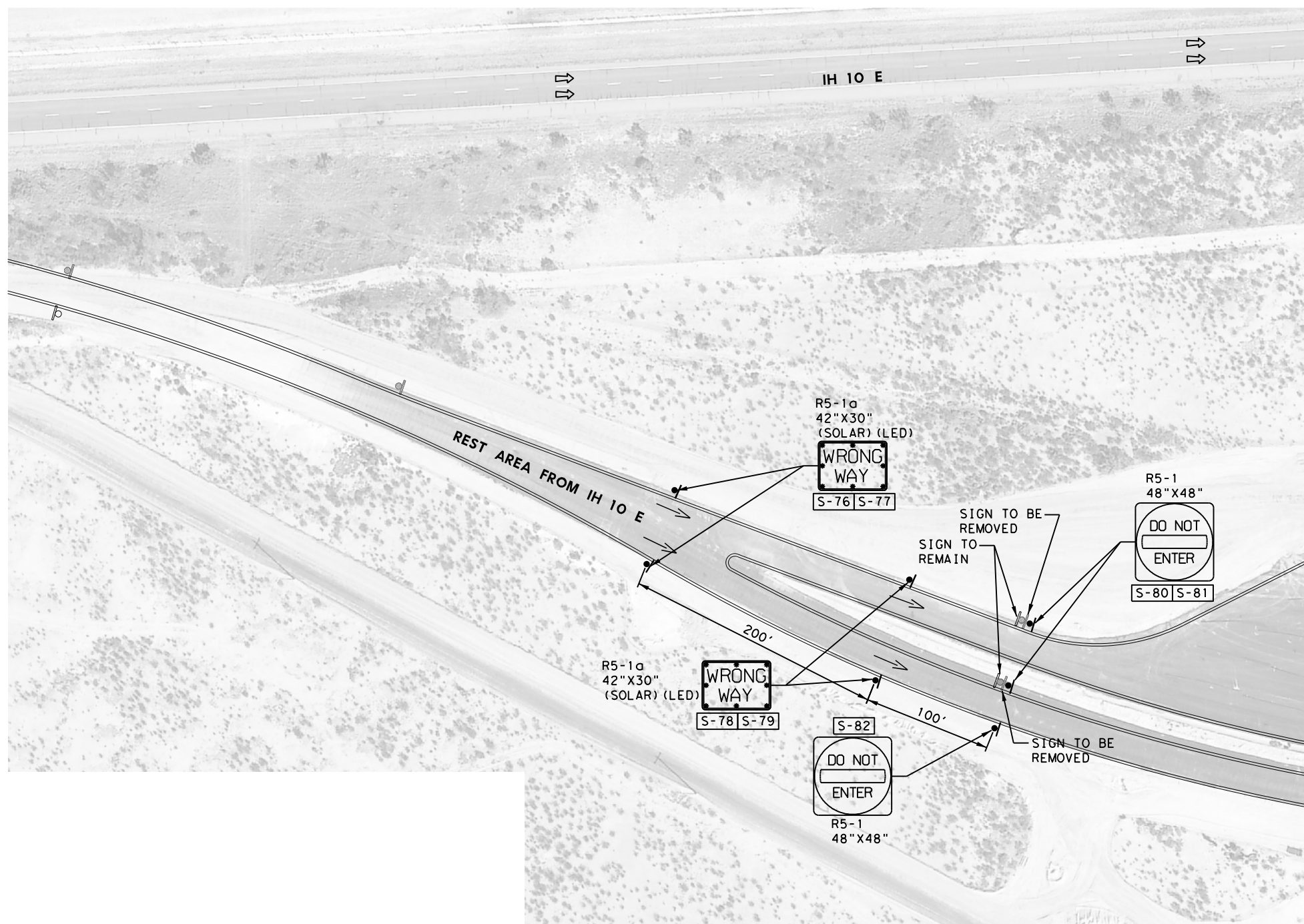


IH 10  
 WWD SIGNING  
 LAYOUT

IH 10 W & REST AREA  
 AT MM 150  
 SHEET 10 OF 13

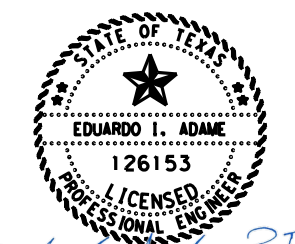
Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		98

DATE: 10/11/2023 10:45:15 AM  
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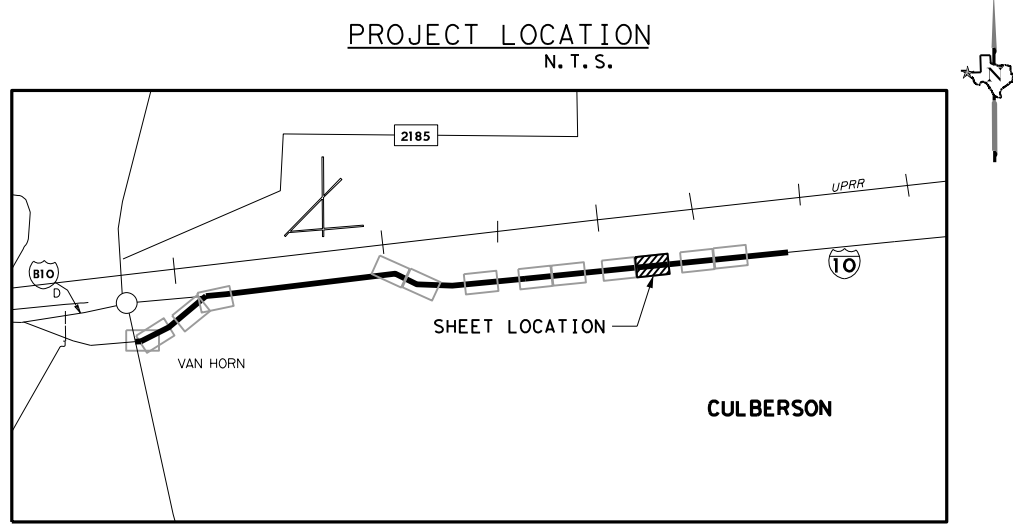
- NOTES:
- REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  - INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS



*Eduardo I. Adame P.E.*  
10/18/2023

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-01-064)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	7
644	6076	REMOVE SM RD SN SUP&AM	EA	2
644	6078	REMOVE SM RD SN SUP&AM (SIGN ONLY)	EA	2
672	6008	REFL PAV MRKR TY I-R	EA	56
6489	6002	BACKLIT W/PERIMETER LED RDSG SGN	EA	4

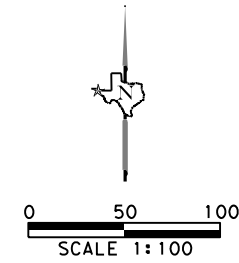
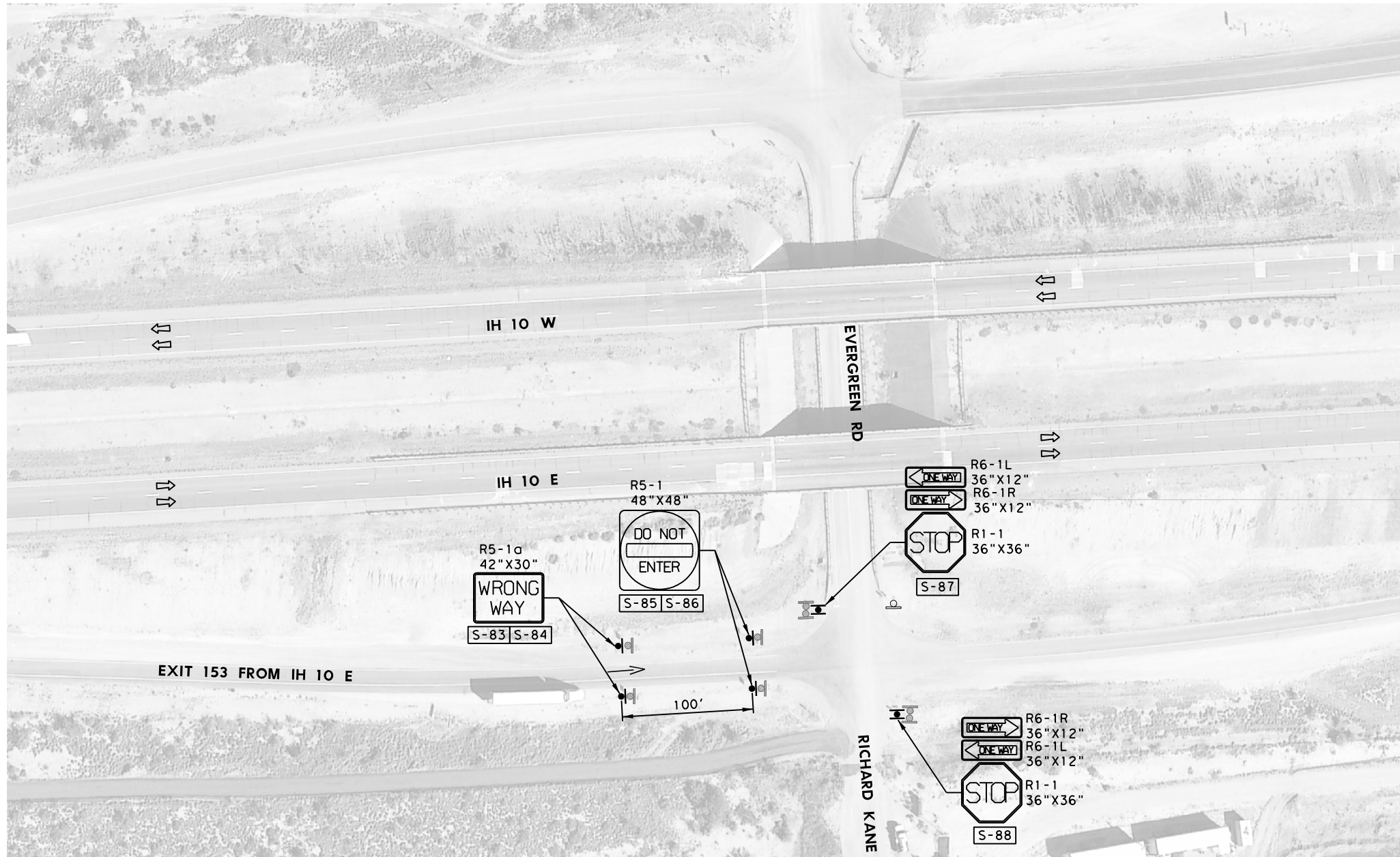


**IH 10  
WWD SIGNING  
LAYOUT**

IH 10 E & REST AREA  
AT MM 150  
SHEET 11 OF 13

Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		99

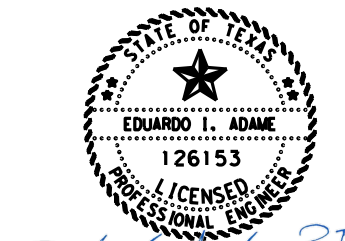
DATE: 10/11/2023 10:45:34 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC\IH0010\_TRF\_SPMO\_Layout\_12.dgn



- NOTES:
1. REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  2. INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

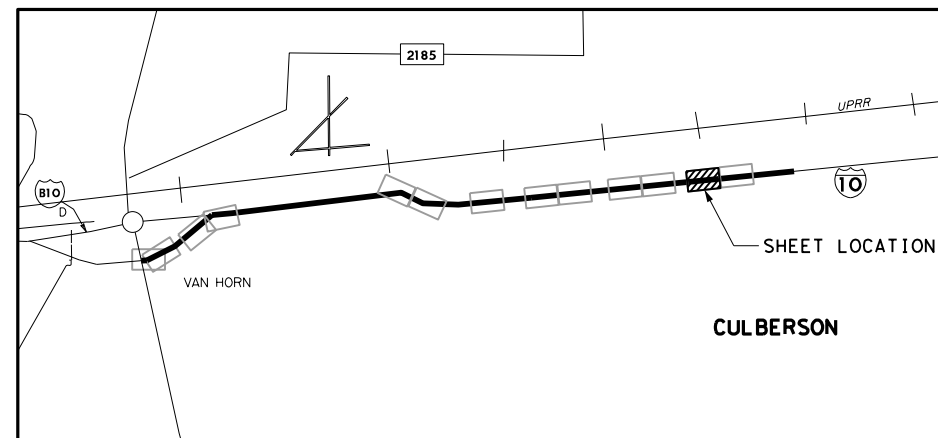
LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-02-049)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6002	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	EA	2
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	4
644	6076	REMOVE SM RD SN SUP&AM	EA	8
672	6008	REFL PAV MRKR TY I-R	EA	14



*Eduardo I. Adame P.E.*  
 10/18/2023

PROJECT LOCATION  
 N. T. S.



IH 10  
 WWD SIGNING  
 LAYOUT

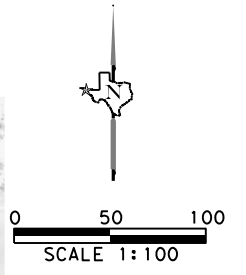
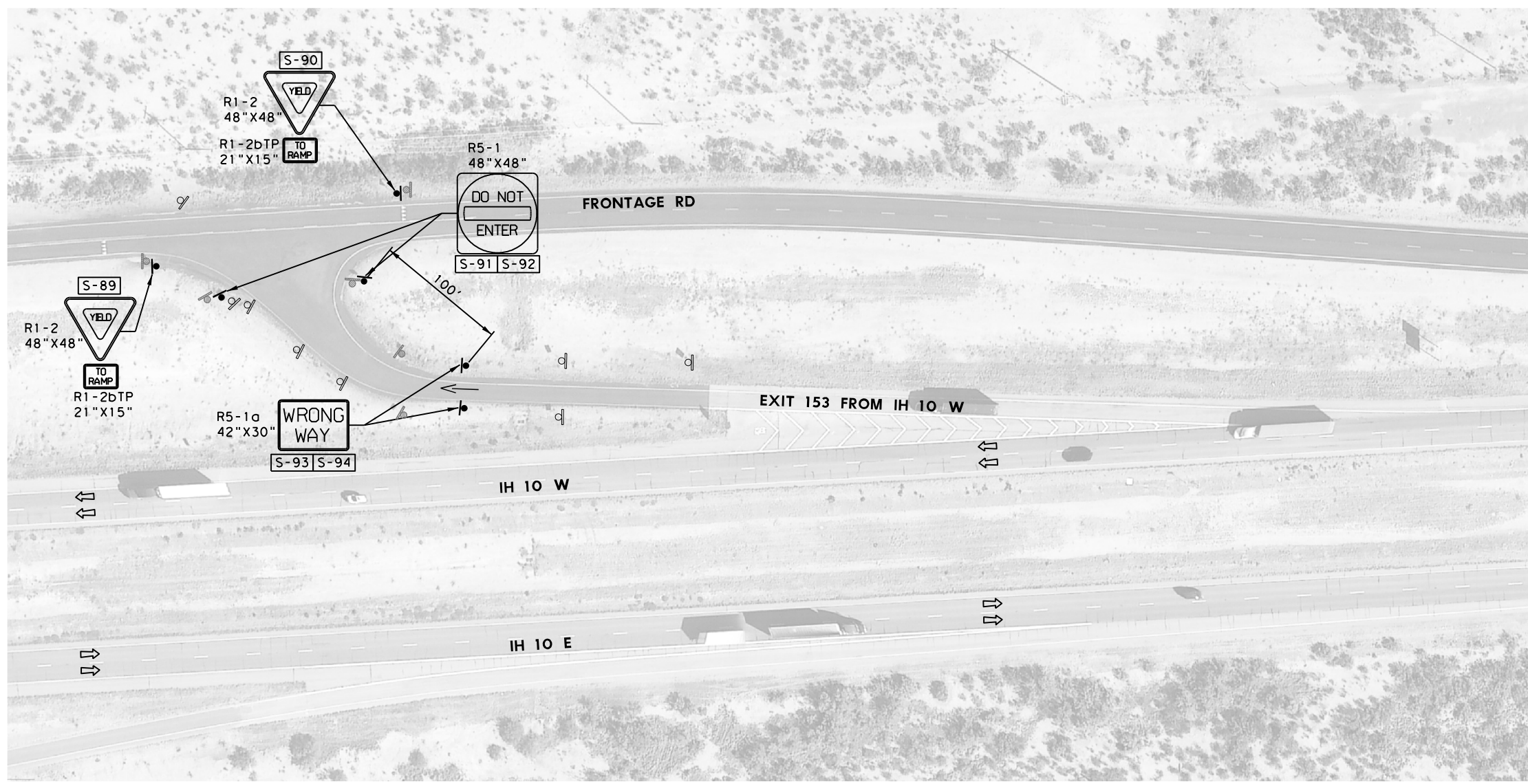
IH 10 E & EXIT 153

SHEET 12 OF 13

Texas Department of Transportation			
CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		100



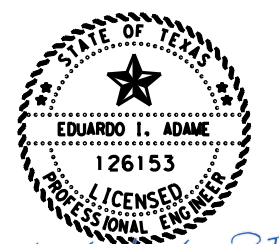
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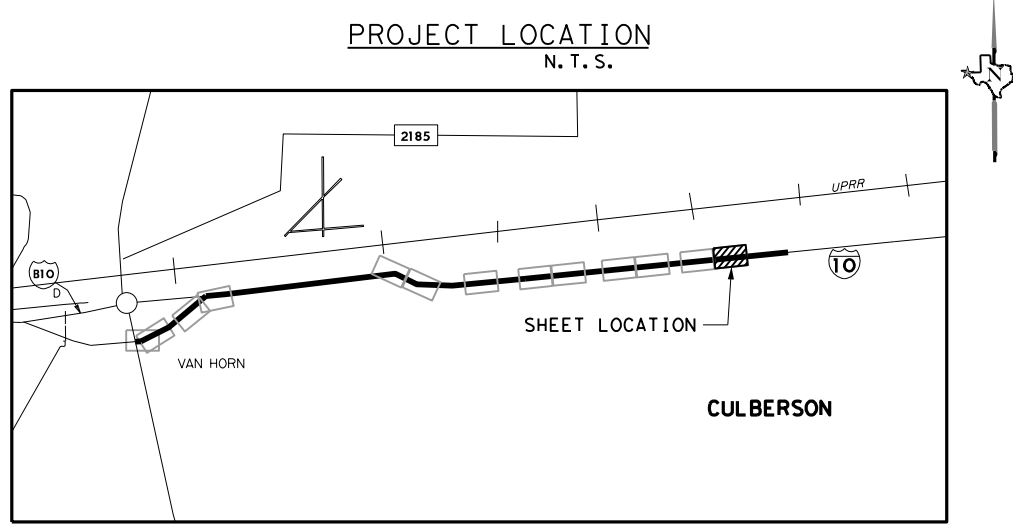
- NOTES:
1. REFER TO FPM (1)-22 FOR WRONG WAY ARROW DETAIL.
  2. INSTALL "DO NOT ENTER" & "WRONG WAY" SIGN POST WITH RED RETRO-REFLECTIVE TAPE. THIS ITEM IS SUBSIDIARY TO ITEM 644-6004.

LEGEND	
	EXISTING SIGN TO BE REMOVED
	EXISTING SIGN TO REMAIN
	INSTALL NEW SIGN AND SUPPORT ASSEMBLY
	PROPOSED WRONG WAY ARROW RPM TY I-R
	SIGN # ON SOSS

WWD SIGNING & PAVEMENT MARKINGS QUANTITIES (CSJ 0003-02-049)				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	6
644	6076	REMOVE SM RD SN SUP&AM	EA	6
672	6008	REFL PAV MRKR TY I-R	EA	14



*Eduardo I. Adame P.E.*  
10/18/2023



**IH 10  
WWD SIGNING  
LAYOUT**

IH 10 W & EXIT 153

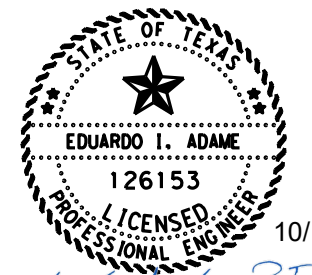
SHEET 13 OF 13

CONT	SECT	JOB	HIGHWAY
0003	01	064, ETC	IH 10
DIST	COUNTY		SHEET NO.
ELP	CULBERSON		101

# 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.  
 DATE: 10/11/2023 10:46:17 AM  
 FILE: M:\0003-01-0644-DESIGN\Plan Set\10. Miscellaneous\Misc. Traffic\sums16.dgn

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
89	S-1	R5-1		48" X 48"	X		10BWG	1	SA	T		
89	S-2	R5-1		48" X 48"	X		10BWG	1	SA	T		
89	S-3	R5-1a		42" X 30"	X		10BWG	1	SA	T		
89	S-4	R5-1a		42" X 30"	X		10BWG	1	SA	T		
90	S-5	R5-1		48" X 48"	X		10BWG	1	SA	T		
90	S-6	R5-1		48" X 48"	X		10BWG	1	SA	T		
90	S-7	R5-1a		42" X 30"	X		10BWG	1	SA	T		
90	S-8	R5-1a		42" X 30"	X		10BWG	1	SA	T		
90	S-10	R5-1a		42" X 30"	X		10BWG	1	SA	T		
90	S-11	R5-1a		42" X 30"	X		10BWG	1	SA	T		
90	S-9	W4-3L		36" X 36"	X		10BWG	1	SA	P		
91	S-12	R5-1a		42" X 30"	X		10BWG	1	SA	T		
91	S-13	R5-1a		42" X 30"	X		10BWG	1	SA	T		
91	S-15	R5-1a		42" X 30"	X		10BWG	1	SA	T		
91	S-16	R5-1a		42" X 30"	X		10BWG	1	SA	T		
91	S-14	W4-3L		36" X 36"	X		10BWG	1	SA	P		
91	S-17	R5-1		48" X 48"	X		10BWG	1	SA	T		
91	S-18	R5-1		48" X 48"	X		10BWG	1	SA	T		
92	S-19	R5-1		48" X 48"	X		10BWG	1	SA	T		
92	S-20	R5-1		48" X 48"	X		10BWG	1	SA	T		
92	S-21	R5-1		48" X 48"	X		10BWG	1	SA	T		
92	S-22	R5-1		48" X 48"	X		10BWG	1	SA	T		
92	S-23	R1-1		36" X 36"	X		10BWG	1	SA	P	BM	
92	S-24	R1-1		36" X 36"	X		10BWG	1	SA	P	BM	
92	S-25	R5-1a		42" X 30"	X		10BWG	1	SA	T		
92	S-26	R5-1a		42" X 30"	X		10BWG	1	SA	T		
92	S-27	R5-1a		42" X 30"	X		10BWG	1	SA	T		
92	S-28	R5-1a		42" X 30"	X		10BWG	1	SA	T		
92	S-29	R5-1a		42" X 30"	X		10BWG	1	SA	T		
92	S-30	R5-1a		42" X 30"	X		10BWG	1	SA	T		



Eduardo I. Adame P.E.

10/18/2023

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).



## SUMMARY OF SMALL SIGNS

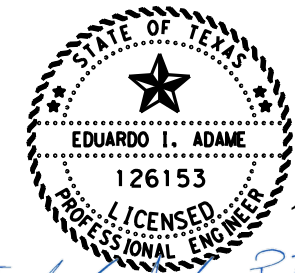
### SOSS

FILE: slums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
4-16	DIST	COUNTY	SHEET NO.	
8-16	ELP	CULBERSON	102	

# 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.  
 DATE: 10/11/2023 10:46:18 AM  
 FILE: M:\0003-01-0644-DESIGN\Plan Set\10. Miscellaneous\Misc. Traffic\sums16.dgn

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
92	S-31	R5-1		48" X 48"	X		10BWG	1	SA	T		
92	S-32	R5-1		48" X 48"	X		10BWG	1	SA	T		
93	S-33	R5-1a	 (SOLAR) (LED)	42" X 30"	X		10BWG	1	SA	T		
93	S-34	R5-1a		42" X 30"	X		10BWG	1	SA	T		
93	S-35	R5-1a		42" X 30"	X		10BWG	1	SA	T		
93	S-36	R5-1a		42" X 30"	X		10BWG	1	SA	T		
93	S-37	R5-1		48" X 48"	X		10BWG	1	SA	T		
93	S-38	R5-1		48" X 48"	X		10BWG	1	SA	T		
94	S-39	R5-1		48" X 48"	X		10BWG	1	SA	T		
94	S-40	R5-1		48" X 48"	X		10BWG	1	SA	T		
94	S-41	R5-1a	 (SOLAR) (LED)	42" X 30"	X		10BWG	1	SA	T		
94	S-42	R5-1a		42" X 30"	X		10BWG	1	SA	T		
94	S-43	R5-1a		42" X 30"	X		10BWG	1	SA	T		
94	S-44	R5-1a		42" X 30"	X		10BWG	1	SA	T		
95	S-45	R5-1		48" X 48"	X		10BWG	1	SA	T		
95	S-46	R5-1		48" X 48"	X		10BWG	1	SA	T		
95	S-47	R5-1a		42" X 30"	X		10BWG	1	SA	T		
95	S-48	R5-1a		42" X 30"	X		10BWG	1	SA	T		
96	S-49	R5-1a	 (SOLAR) (LED)	42" X 30"	X		10BWG	1	SA	T		
96	S-50	R5-1a		42" X 30"	X		10BWG	1	SA	T		
96	S-51	R5-1a		42" X 30"	X		10BWG	1	SA	T		
96	S-52	R5-1a		42" X 30"	X		10BWG	1	SA	T		
96	S-53	R5-1		48" X 48"	X		10BWG	1	SA	T		
96	S-54	R5-1		48" X 48"	X		10BWG	1	SA	T		
96	S-56	R5-1		48" X 48"	X		10BWG	1	SA	T		
96	S-57	R5-1		48" X 48"	X		10BWG	1	SA	T		
96	S-55	R1-2		48" X 48"	X		10BWG	1	SA	T		
96	S-55	R1-2bTP		21" X 15"	X		10BWG	1	SA	T		
96	S-58	R1-2		48" X 48"	X		10BWG	1	SA	T		
96	S-58	R1-2bTP		21" X 15"	X		10BWG	1	SA	T		
97	S-59	R1-2		48" X 48"	X		10BWG	1	SA	T		
97	S-59	R1-2bTP		21" X 15"	X		10BWG	1	SA	T		
97	S-60	R1-2		48" X 48"	X		10BWG	1	SA	T		
97	S-60	R1-2bTP		21" X 15"	X		10BWG	1	SA	T		
97	S-61	R5-1a	 (SOLAR) (LED)	42" X 30"	X		10BWG	1	SA	T		
97	S-62	R5-1a		42" X 30"	X		10BWG	1	SA	T		
97	S-63	R5-1a		42" X 30"	X		10BWG	1	SA	T		
97	S-64	R5-1a		42" X 30"	X		10BWG	1	SA	T		



Eduardo I. Adame P.E.

10/18/2023

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:**
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  - For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).



## SUMMARY OF SMALL SIGNS

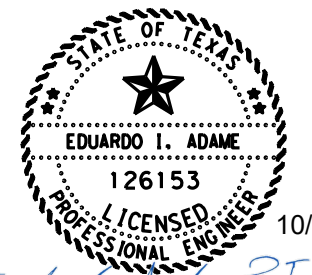
**SOSS**

FILE: slums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
4-16	DIST	COUNTY	SHEET NO.	
8-16	ELP	CULBERSON	103	

# SUMMARY OF SMALL SIGNS

DATE: 10/11/2023 10:46:19 AM  
 FILE: M:\0003-01-0644-DESIGN\Plan Set\10. Miscellaneous\Misc. Traffic\sums16.dgn  
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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
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"	BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY = TYPE TY N TY S
97	S-65	R5-1		48" X 48"	X		10BWG	1	SA	T		
97	S-66	R5-1		48" X 48"	X		10BWG	1	SA	T		
97	S-67	R5-1		48" X 48"	X		10BWG	1	SA	T		
97	S-68	R5-1		48" X 48"	X		10BWG	1	SA	T		



Eduardo I. Adame P.E.

10/18/2023

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:  
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  - For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).



## SUMMARY OF SMALL SIGNS

### SOSS

FILE: slums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
4-16	DIST	COUNTY	SHEET NO.	
8-16	ELP	CULBERSON	104	

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: 10/11/2023 10:46:20 AM  
 FILE: U:\000301064\MASTER DESIGN FILES\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	DEVICE	SINGLE	DOUBLE	INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX (XX)	
								NUMBER OF REFLECTORS S = Single D = Double COLOR OF REFLECTORS W = White Y = Yellow R = Red REFLECTOR UNIT SIZE 1 or 2 TYPE OF POST OR DELINEATOR WC = Wing Channel Post YFLX = Yellow Flexible Post WFLX = White Flexible Post BRFL = Barrier Reflector TYPE OF MOUNT GND = Embedded (drivable or set in concrete) CTB = Concrete Barrier Mount GF1 or GF2 = Guard Fence Attachment SRF = Surface Mount	
SHEETING: Yellow, White or Red Type B or C reflective sheeting				SHEETING: Yellow, White or Red Type B or C Reflective Sheeting				DIRECTION: If Required BI = Bi-Directional BR = Bi-Directional with red on back	
POST TYPE: WC, YFLX, WFLX				MOUNT TYPE: GND, SRF				INSTL OM ASSM (OM-XX) (XXXX)XXX (XX)	

OBJECT MARKERS								D & OM DESCRIPTIVE CODES			
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)	INSTL OM ASSM (OM-XX) (XXXX)XXX (XX)		
		OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4	TYPE OF OBJECT MARKER 1, 2, 3, or 4 NUMBER OF REFLECTORS OR DIRECTION X = 3-Size 2 reflector unit (Type 2 only) Y = 1-Size 3 reflector unit (Type 2 only) Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only) L = Left Side (Type 3 Object Marker only) R = Right Side (Type 3 Object Marker only) C = Center (Type 3 Object Marker only) TYPE OF POST WC = Wing Channel Post WFLX = White Flexible Post TWT = Thin Walled Tubing TYPE OF MOUNT GND = Embedded (drivable) SRF = Surface Mount WAS = Wedge Anchor Steel WAP = Wedge Anchor Plastic DIRECTION: If Required BI = Bi-Directional	
SHEETING: Yellow-Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting		SHEETING: Yellow - Type B or C Sheeting			SHEETING: Alternating acrylic black and retroreflective yellow - Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting			SHEETING: Red -Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting		DEPARTMENTAL MATERIAL SPECIFICATIONS FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES) DMS-4400 SIGN FACE MATERIALS DMS-8300 DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS DMS-8600	
POST TYPE: TWT		POST TYPE: WC			POST TYPE: WFLX			POST TYPE: TWT		NOTE: Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.	
MOUNT TYPE: WAS, WAP		MOUNT TYPE: GND			MOUNT TYPE: GND, SRF			MOUNT TYPE: WAS, WAP		Texas Department of Transportation Traffic Safety Division Standard	

BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW		NOTE:			
DEVICE	GF1	GF2	CTB	W1-8				W1-6		Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.		
SHEETING: Yellow, White, Red			SHEETING: Yellow, White, Red				SHEETING: Yellow, White, Red		DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION D & OM(1)-20			
NOTE: 1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.			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).				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"			MOUNTING HEIGHT: 7'-0" Only				MOUNTING HEIGHT: 7'-0"		REVISIONS 0003 01 064, ETC IH 10 10-09 3-15 4-10 7-20			
FILE: dom1-20.dgn			DNE: TxDOT				CK: TxDOT		DW: TxDOT		CR: TxDOT	
DIST: CULBERSON			COUNTY: CULBERSON				JOB: 064, ETC		HIGHWAY: IH 10		SHEET NO.: 105	

DATE: 10/11/2023 10:46:21 AM  
 FILE: U:\000301064\MASTER DESIGN FILES\dom2-20.dgn

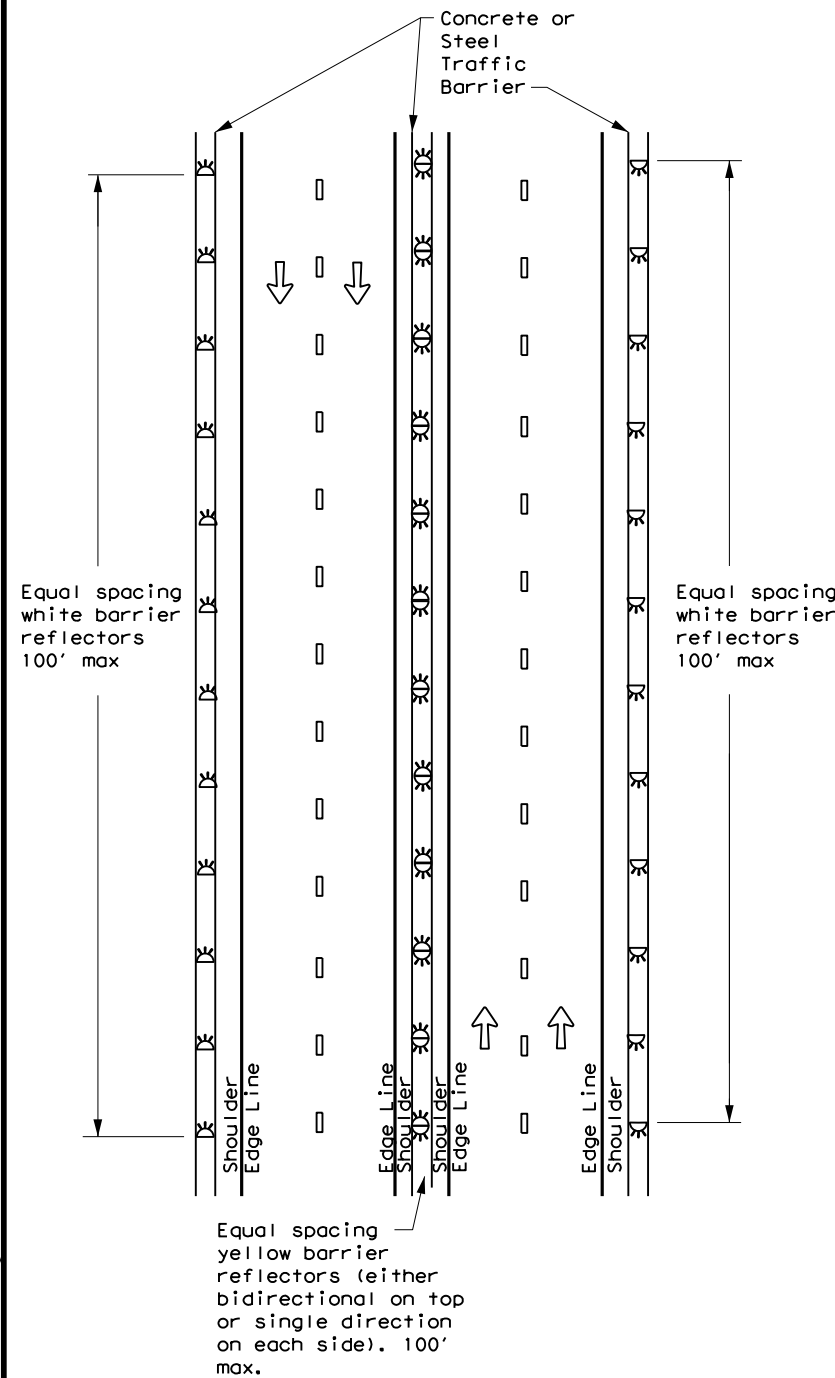
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POST TYPE AND SUPPORT FOUNDATION DETAILS				TYPE OF BARRIER MOUNTS																											
WING CHANNEL (WC)	FLEXIBLE POSTS (YFLX, WFLX)		WEDGE ANCHOR SYSTEMS		GUARD FENCE ATTACHMENT																										
GND	GND	SRF	WAS	WAP	GF 1																										
<p>Ground Line</p> <p>2'-0" Usual</p>	<p>Reflective material</p> <p>Post</p> <p>Stub</p>	<p>Reflective material</p> <p>Post</p> <p>Base</p>	<p>12" Dia.</p> <p>12" 27" 30"</p>	<p>3" (Approx.)</p> <p>15" 17" 20"</p> <p>12" Dia.</p> <p>3.5" 17" 30° 2" 1"</p>	<p>Centerline of MBCF rail element</p>	<p>Attached to post or block</p> <p>2'-6" Min.</p> <p>4" Min.</p> <p>4'-0"</p>																									
	EMBEDDED		SURFACE MOUNT	STEEL	PLASTIC																										
<b>NOTES</b> 1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only. 2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.	<b>NOTES</b> 1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices. 2. Install per manufacturer's recommendations. 3. Post length may vary to meet field conditions. 4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.		<b>NOTE</b> 1. Install per manufacturer's recommendations.																												
<b>TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS</b>		<b>CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN</b>		<b>DELINEATORS AND TYPE 2 OBJECT MARKERS</b>																											
<p>4'-0"</p> <p>Pavement surface</p> <p>Ground Line</p>		<p>7'-0"</p> <p>Pavement surface</p> <p>Ground Line</p>		<p>Approximately 4'-0"</p> <p>Pavement surface</p> <p>Ground Line</p> <p>2'-0" to 8'-0" or in front of object being marked</p>																											
<b>NOTE</b> Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)		<b>NOTE</b> Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.		See general notes 1, 2 and 3.																											
<b>CONCRETE TRAFFIC BARRIER (CTB)</b>																															
<p>Place Barrier Reflector on top or on side(s) of CTB.</p>																															
<b>GENERAL NOTES</b>																															
1. Place delineators on a section of roadway at a consistent distance from the edge of pavement. 2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction. 3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible. 4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation. 5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface. 6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.																															
<p>Texas Department of Transportation</p> <p>Traffic Safety Division Standard</p>																															
<b>DELINEATOR &amp; OBJECT MARKER INSTALLATION</b>																															
<b>D &amp; OM(2)-20</b>																															
<table border="1"> <tr> <td>FILE: dom2-20.dgn</td> <td>DN: TxDOT</td> <td>CK: TxDOT</td> <td>DW: TxDOT</td> <td>CK: TxDOT</td> </tr> <tr> <td>© TxDOT August 2004</td> <td>CONT</td> <td>SECT</td> <td>JOB</td> <td>HIGHWAY</td> </tr> <tr> <td>REVISIONS</td> <td>0003</td> <td>01</td> <td>064, ETC</td> <td>IH 10</td> </tr> <tr> <td>10-09 3-15</td> <td>DIST</td> <td>COUNTY</td> <td colspan="2">SHEET NO.</td> </tr> <tr> <td>4-10 7-20</td> <td>ELP</td> <td>CULBERSON</td> <td colspan="2">106</td> </tr> </table>						FILE: dom2-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY	REVISIONS	0003	01	064, ETC	IH 10	10-09 3-15	DIST	COUNTY	SHEET NO.		4-10 7-20	ELP	CULBERSON	106		
FILE: dom2-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT																											
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY																											
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4-10 7-20	ELP	CULBERSON	106																												
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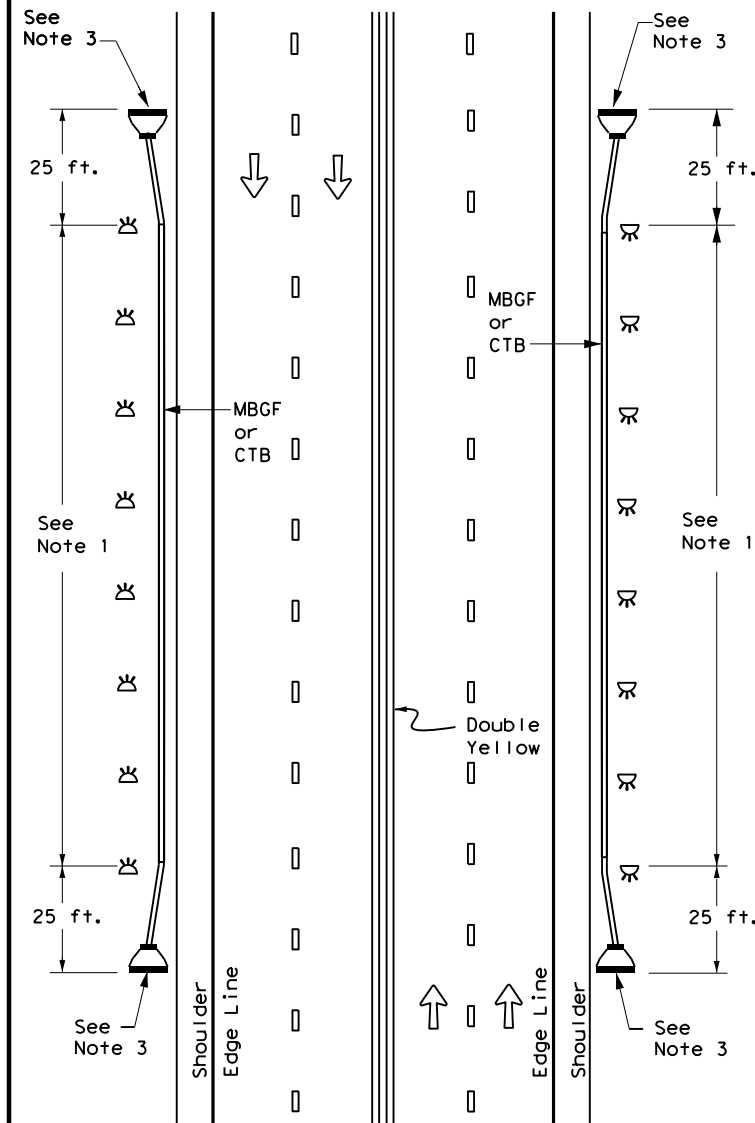
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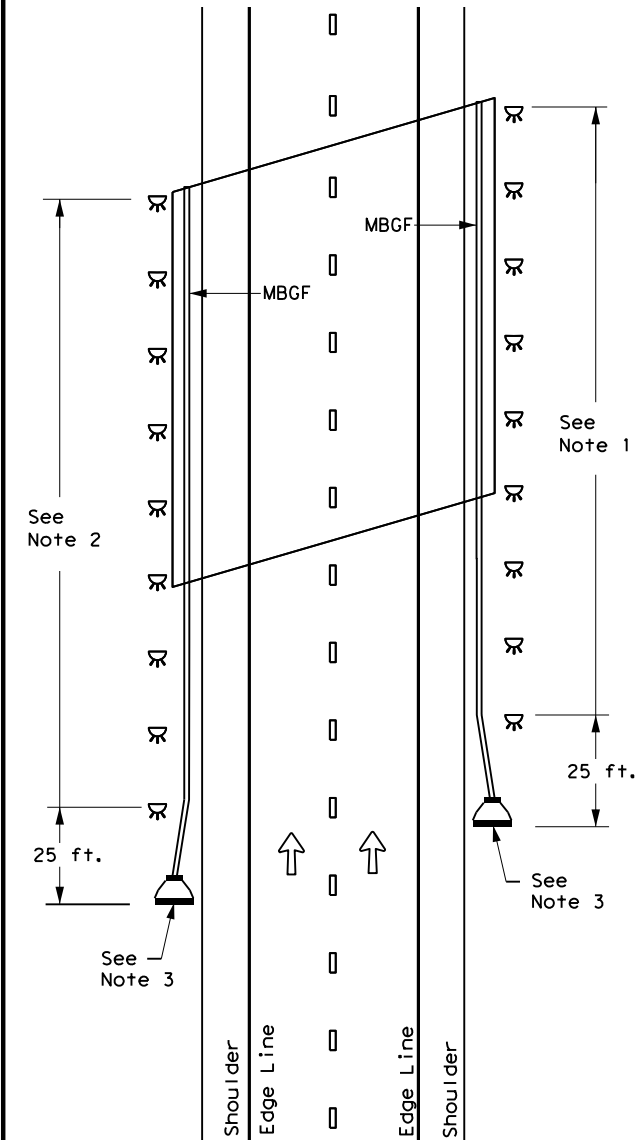
### CONTINUOUS CONCRETE OR STEEL BARRIER



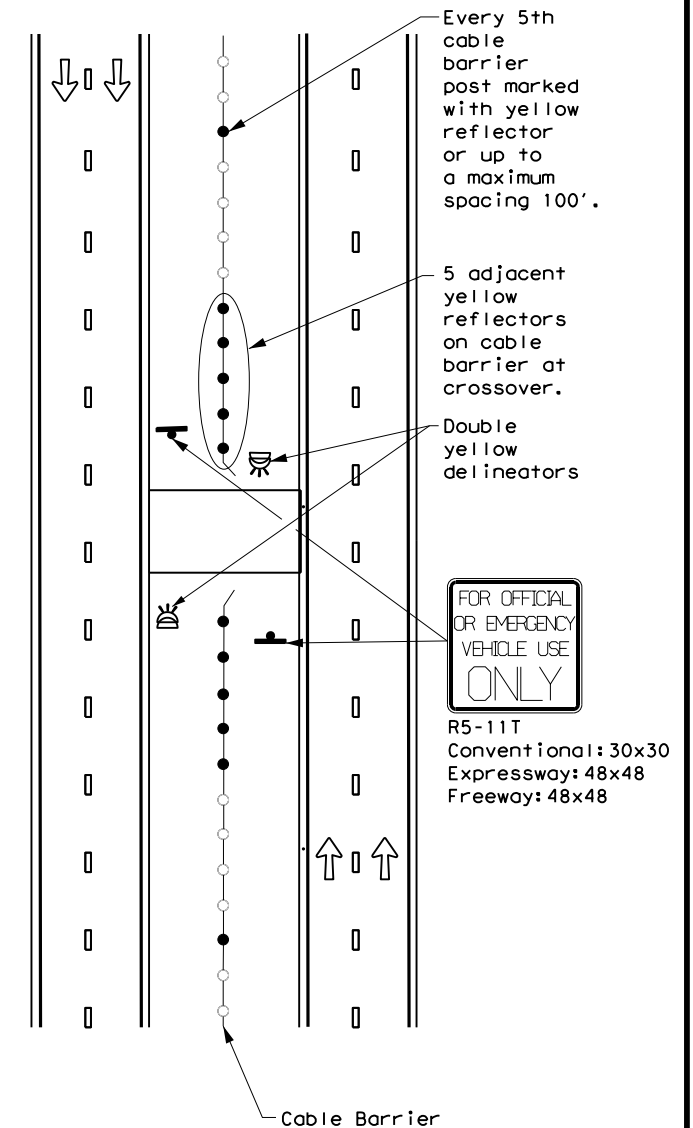
### MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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



### EMERGENCY CROSSOVER



#### NOTES

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

#### LEGEND

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

Texas Department of Transportation  
 Traffic Safety Division Standard

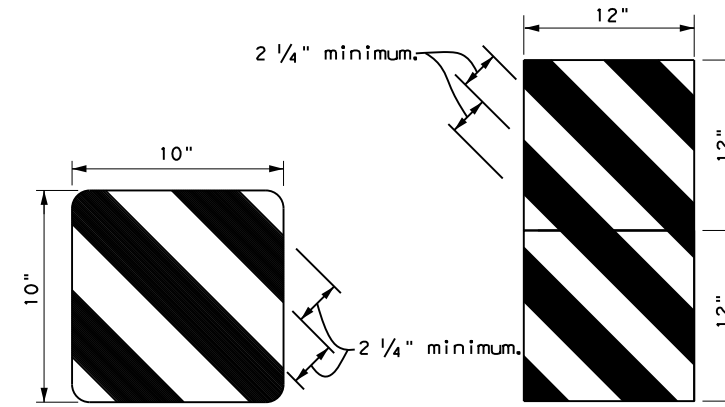
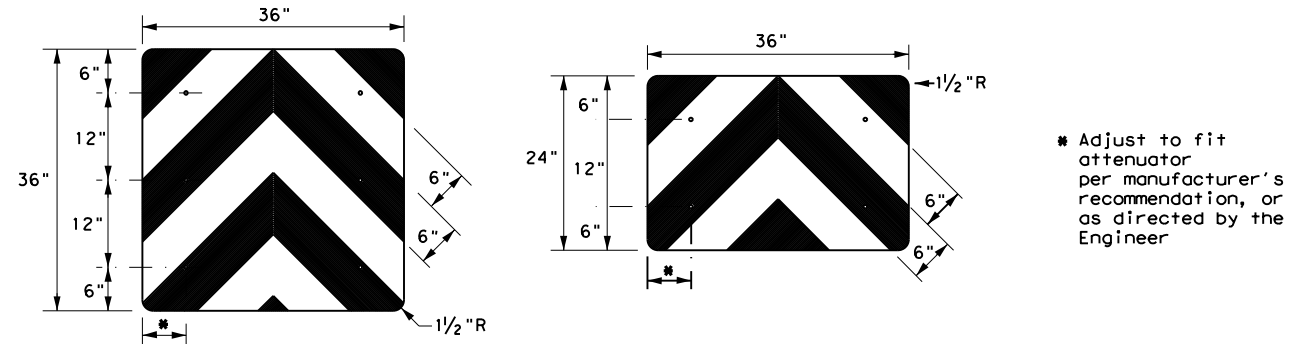
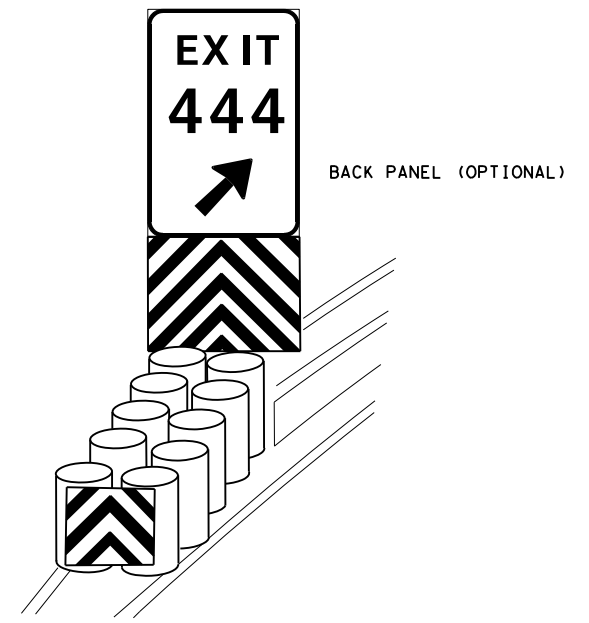
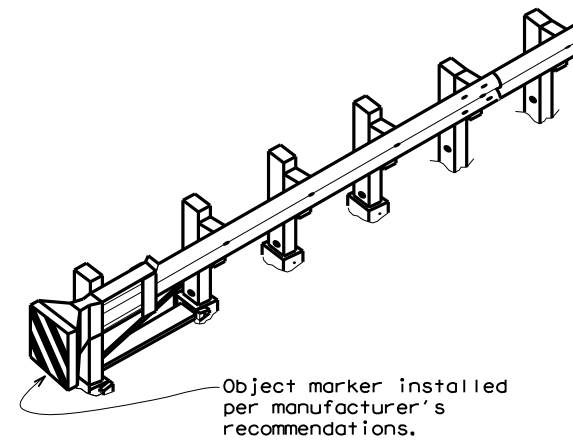
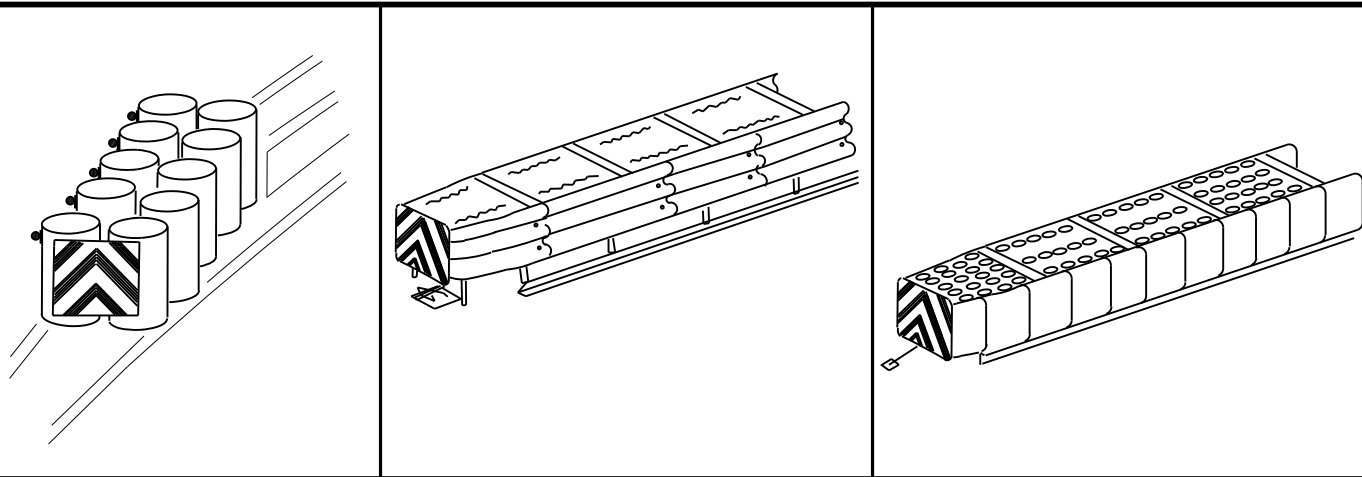
## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

### D & OM(6)-20

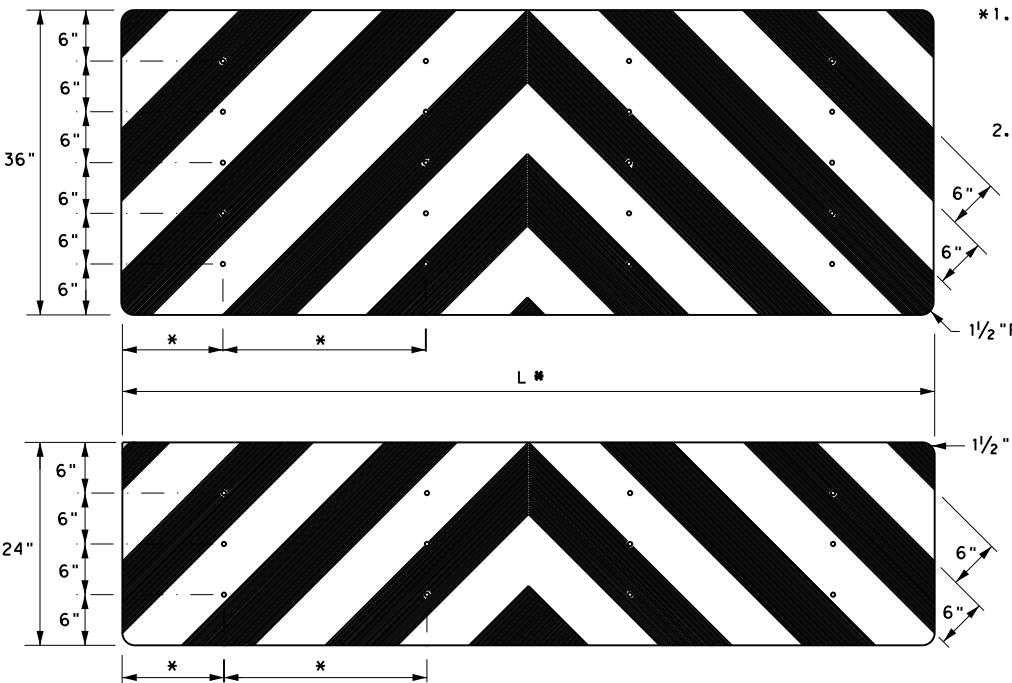
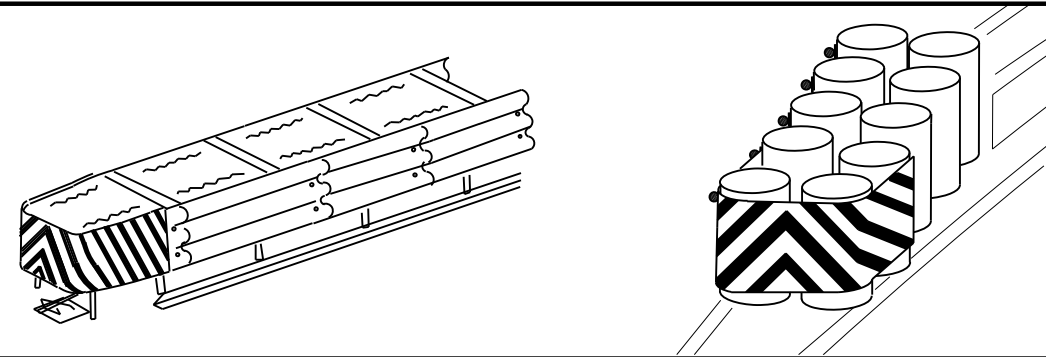
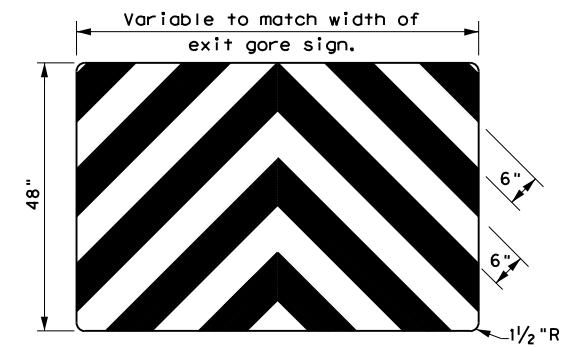
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©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	01	064, ETC	IH 10
7-20	DIST	COUNTY	SHEET NO.	
	ELP	CULBERSON	107	

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



**NOTES**

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

**NOTES**

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

		<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	OW: TXDOT
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4-98 7-20	SHEET NO.		108
20G			



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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)**

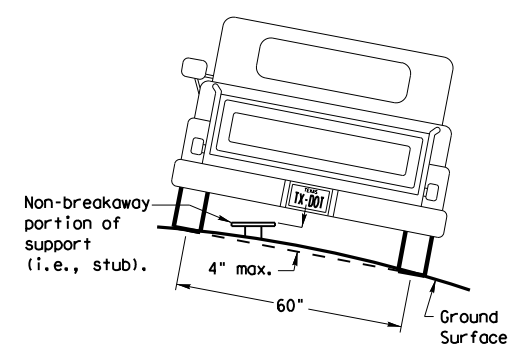
**Anchor Type**

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**

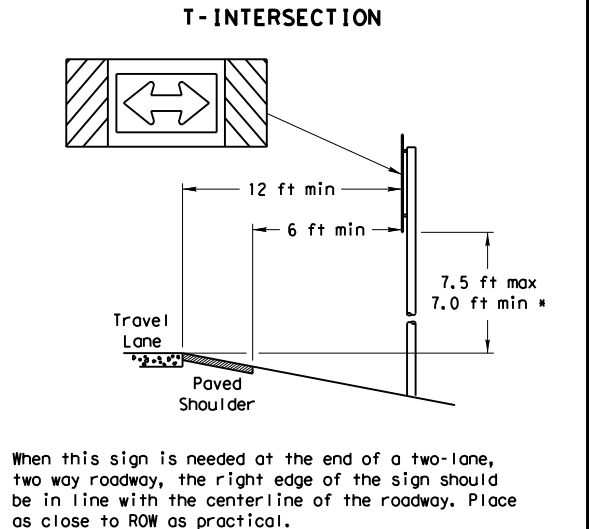
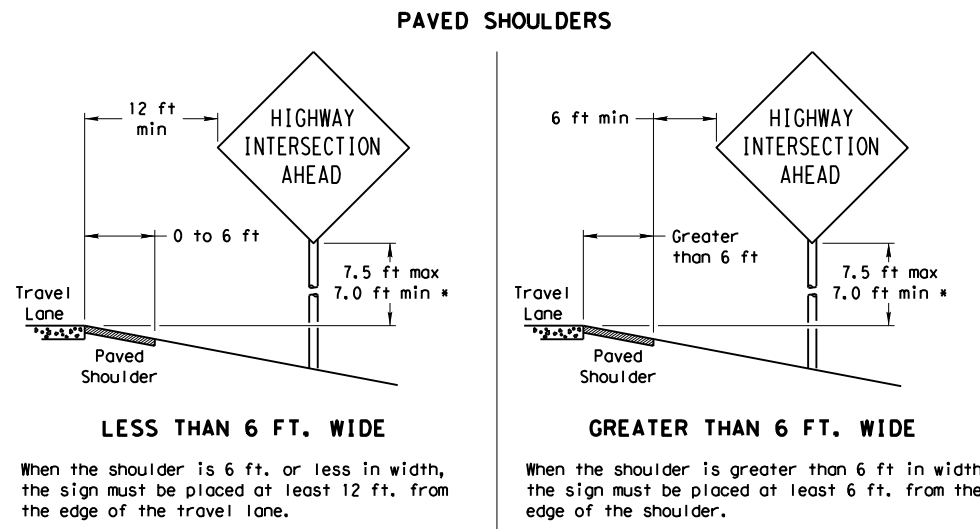
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))  
 T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))  
 U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))  
 IF REQUIRED  
 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))  
 BM = Extruded Wind Beam (see SMD(SLIP-1) 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

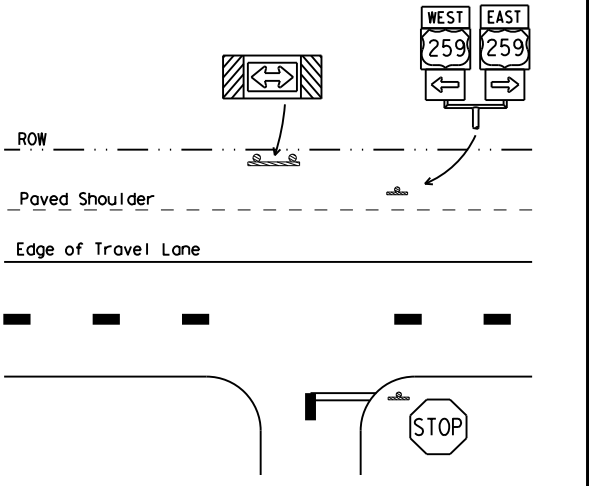
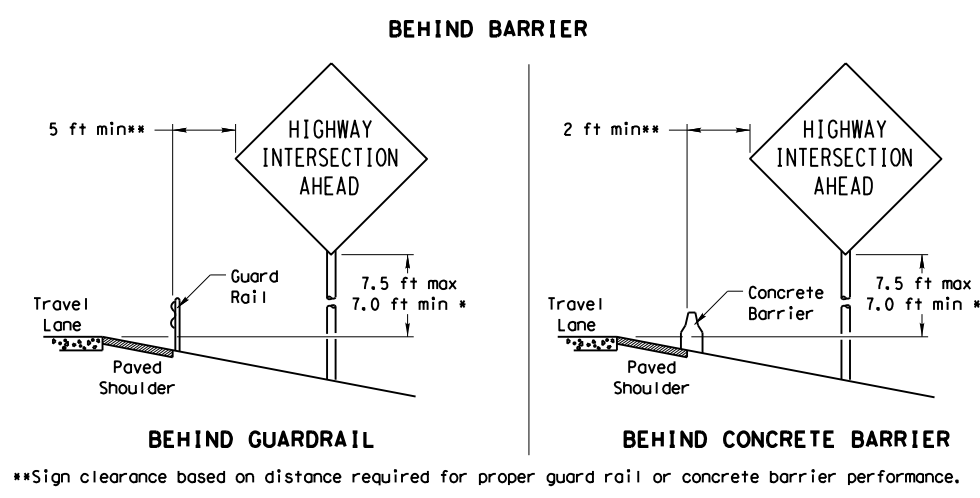
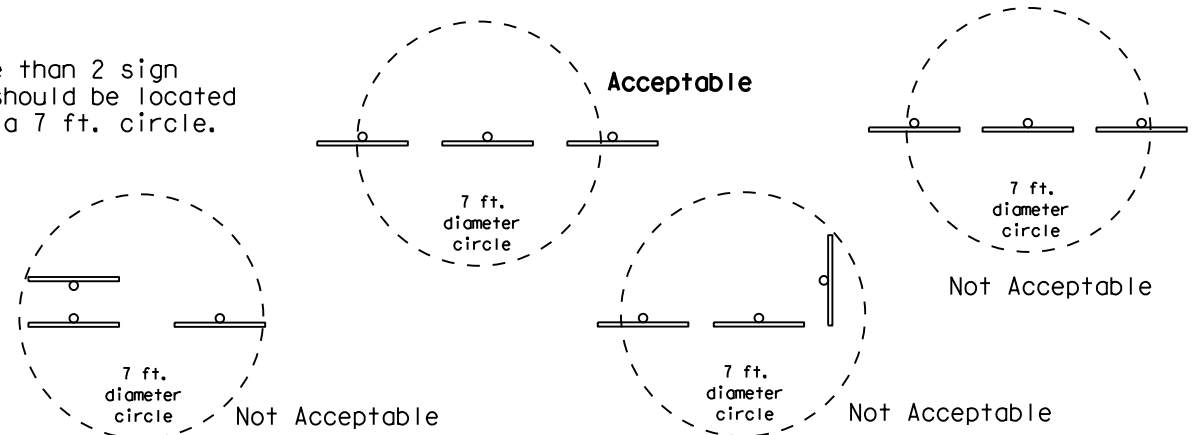


To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

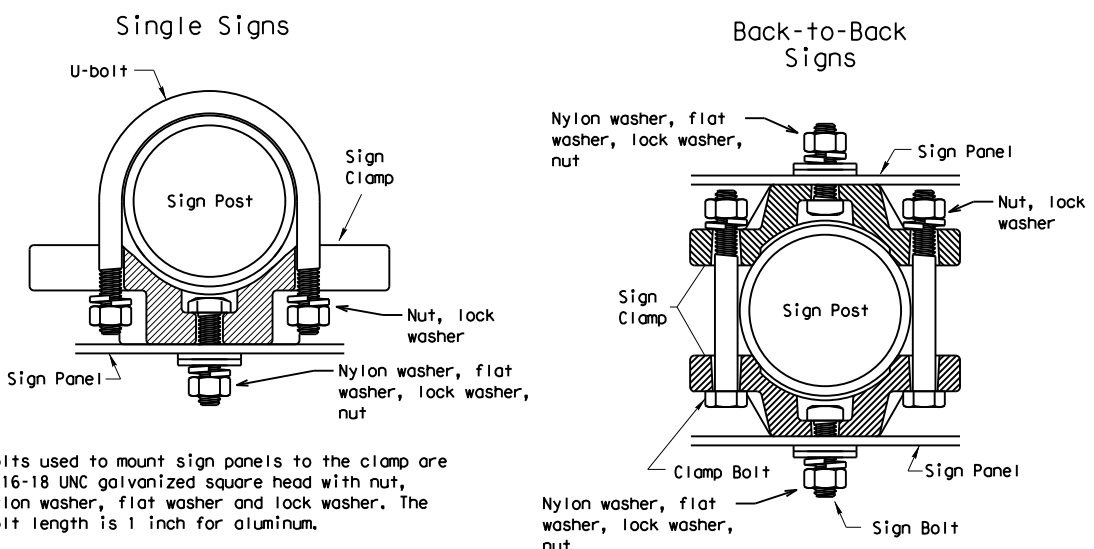
## SIGN LOCATION



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



## TYPICAL SIGN ATTACHMENT DETAIL



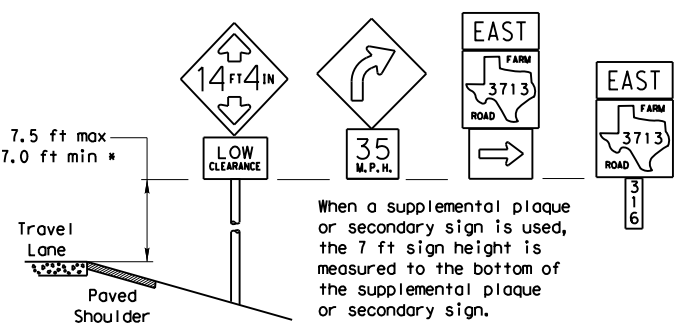
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

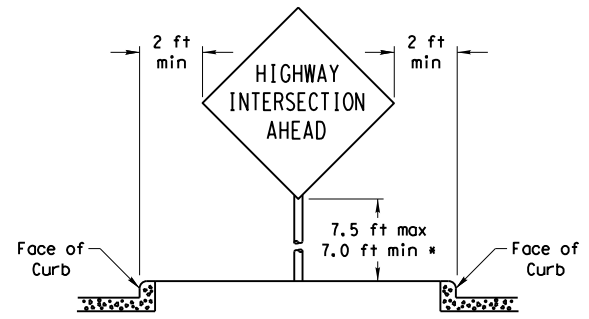
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

## SIGNS WITH PLAQUES

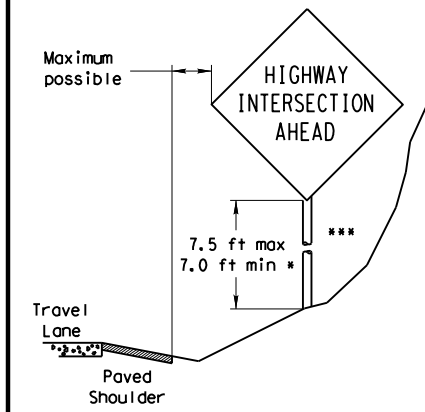


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

## 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>



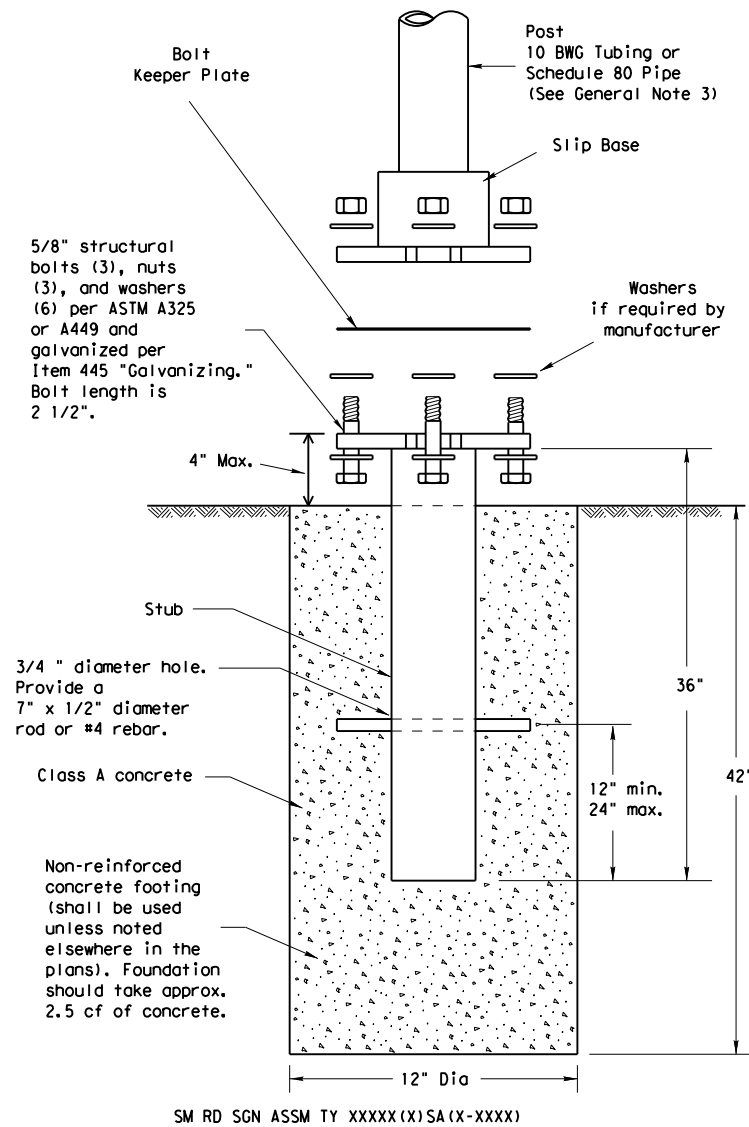
## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD (GEN) - 08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
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		ELP	CULBERSON		109

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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

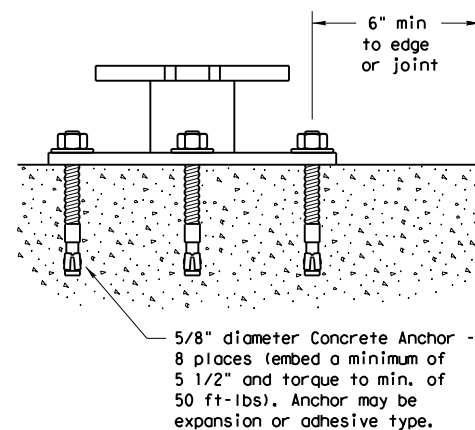
#### Foundation

- 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.



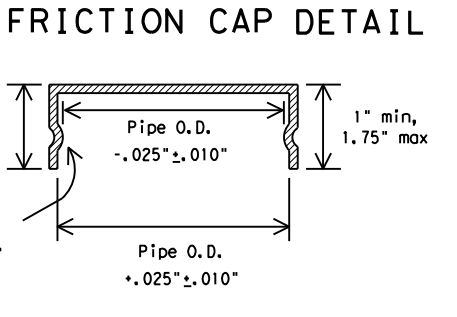
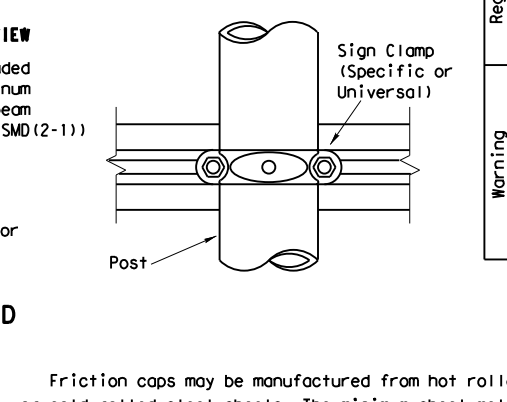
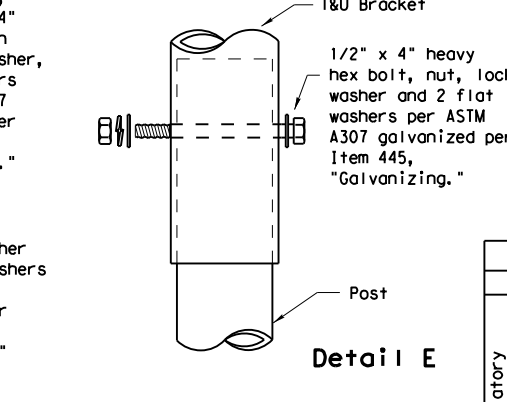
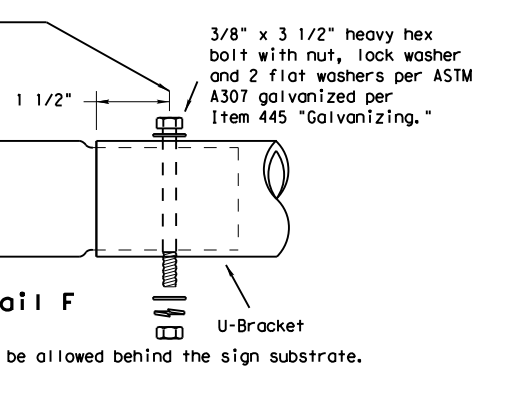
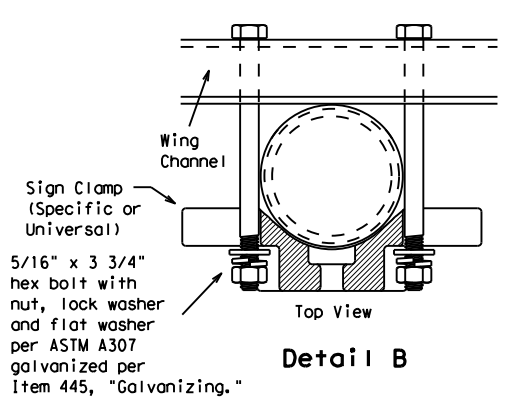
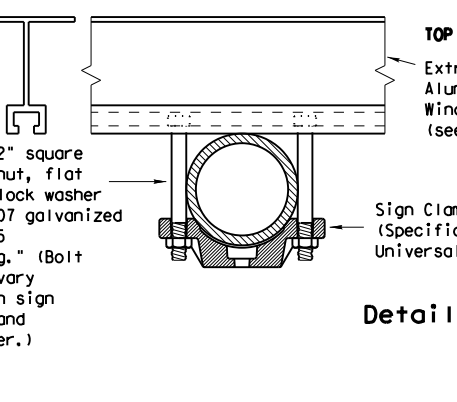
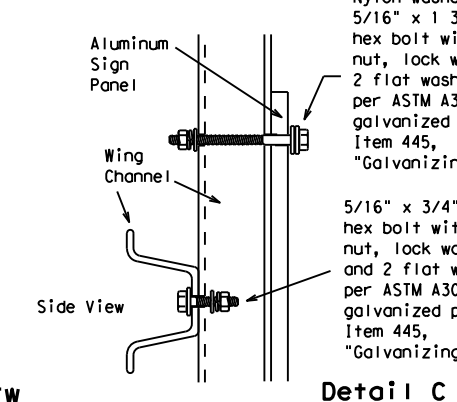
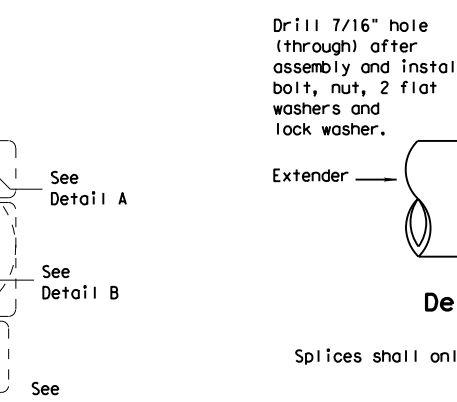
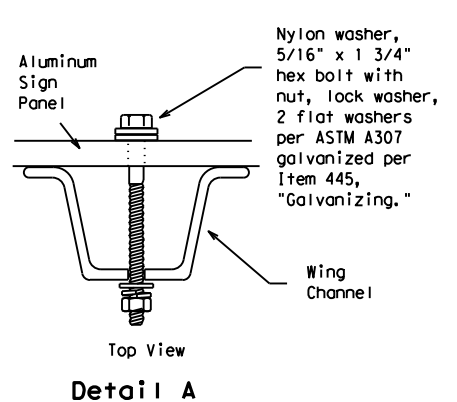
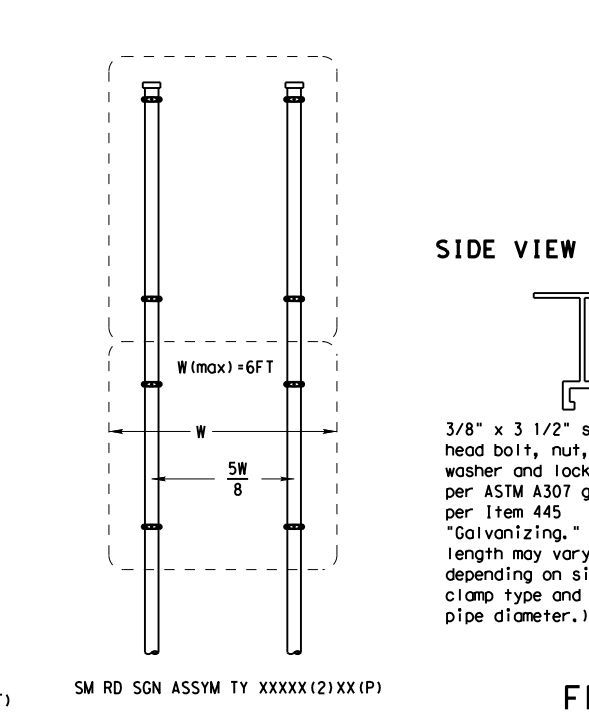
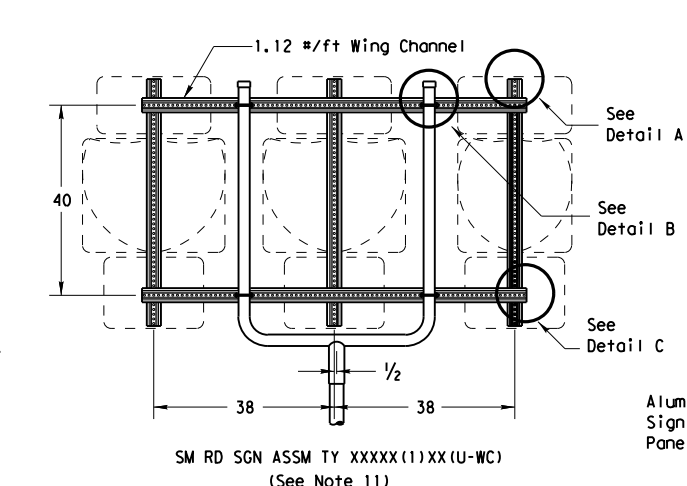
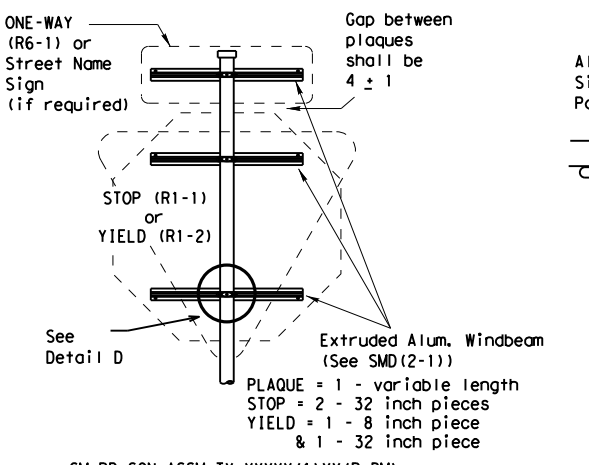
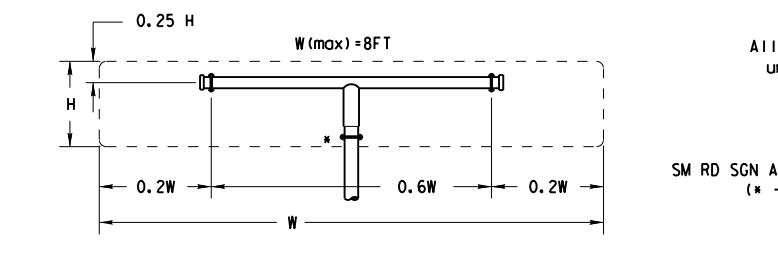
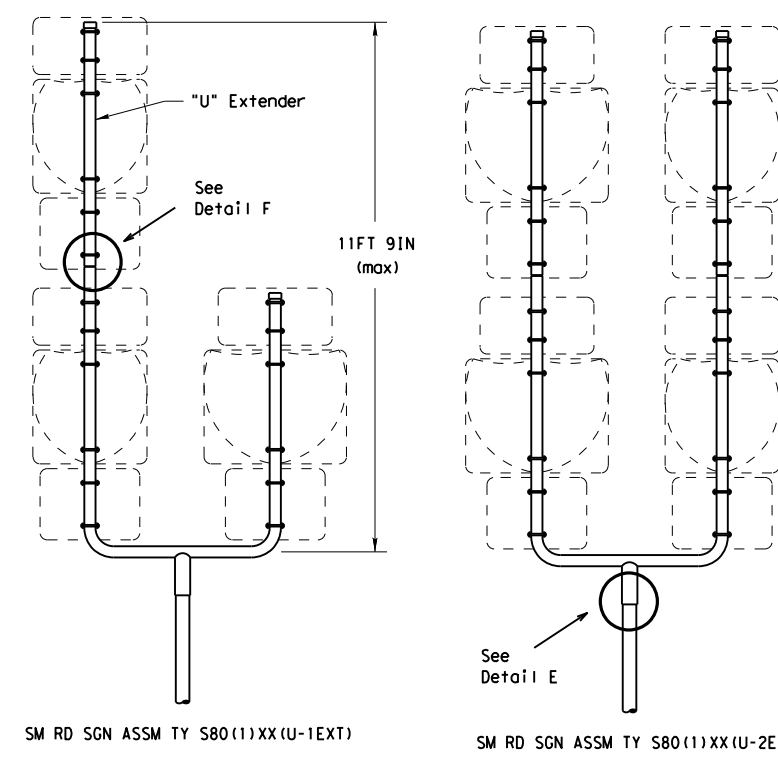
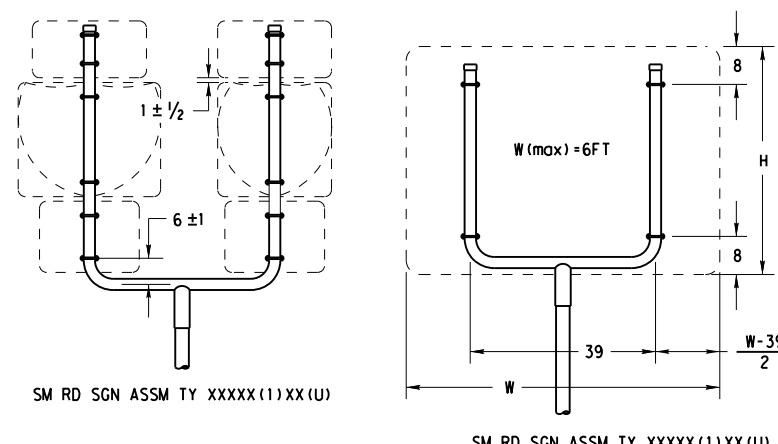
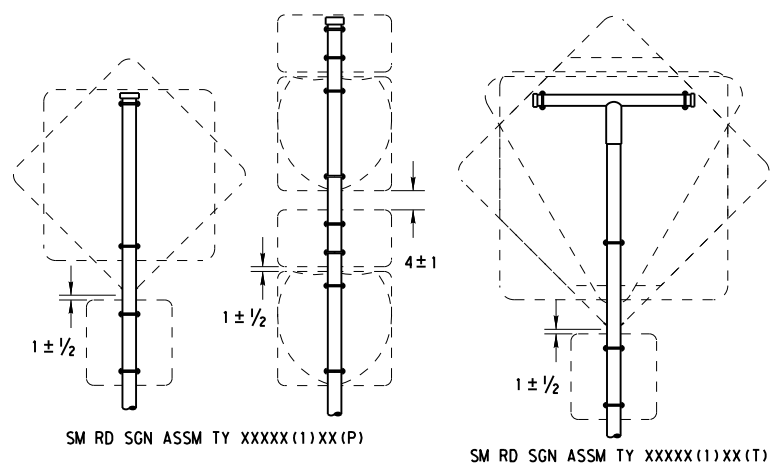
## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

© TxDOT July 2002		DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT	
9-08	REVISIONS		CONT	SECT	JOB	HIGHWAY
			0003	01	064, ETC	IH 10
			DIST	COUNTY		SHEET NO.
		ELP	CULBERSON		110	

DATE: 10/11/2023 10:46:27 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Signing & Pavement Marking\_Standards\smds2.dgn

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All dimensions are in english unless detailed otherwise.

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

GENERAL NOTES:

1. SIGN SUPPORT # OF POSTS MAX. SIGN AREA
 

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

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

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.

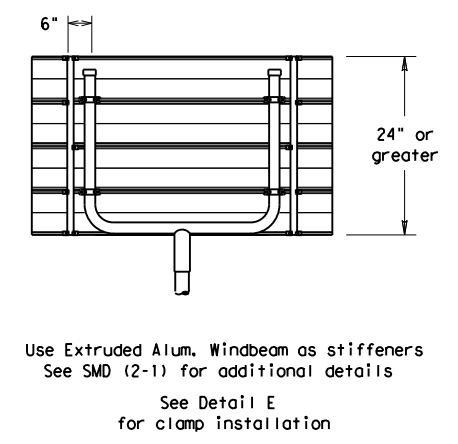
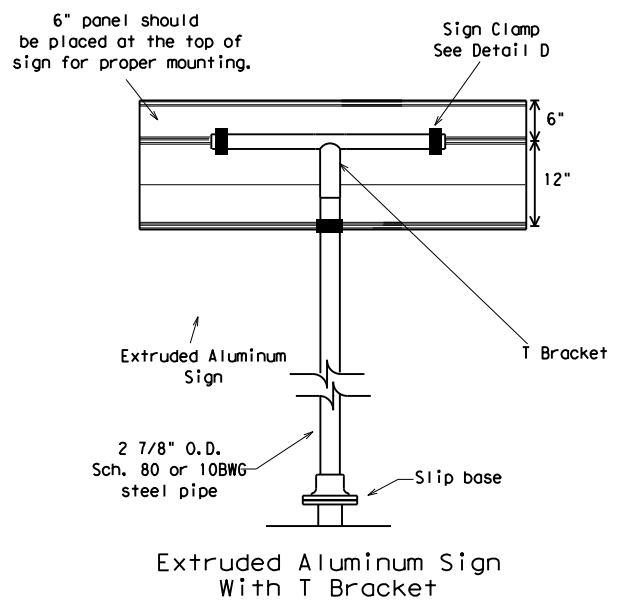
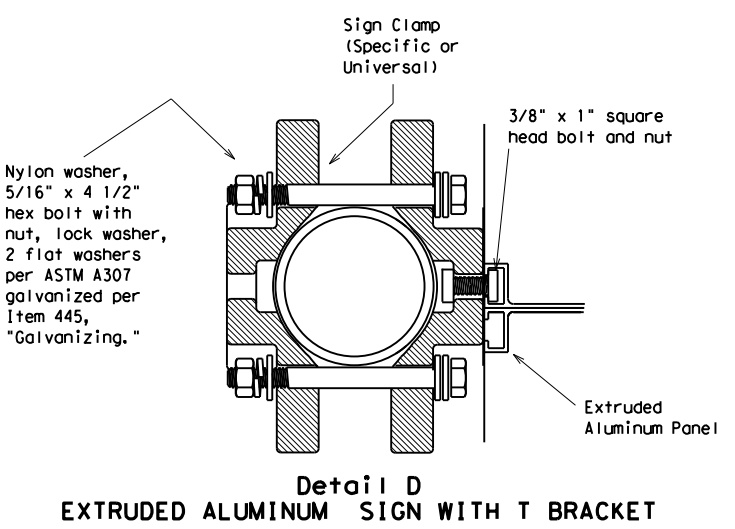
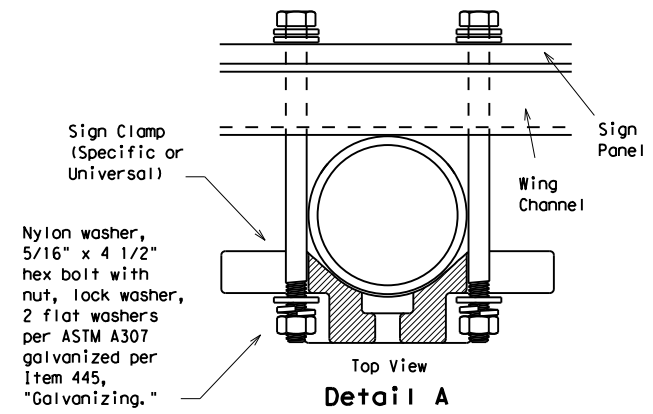
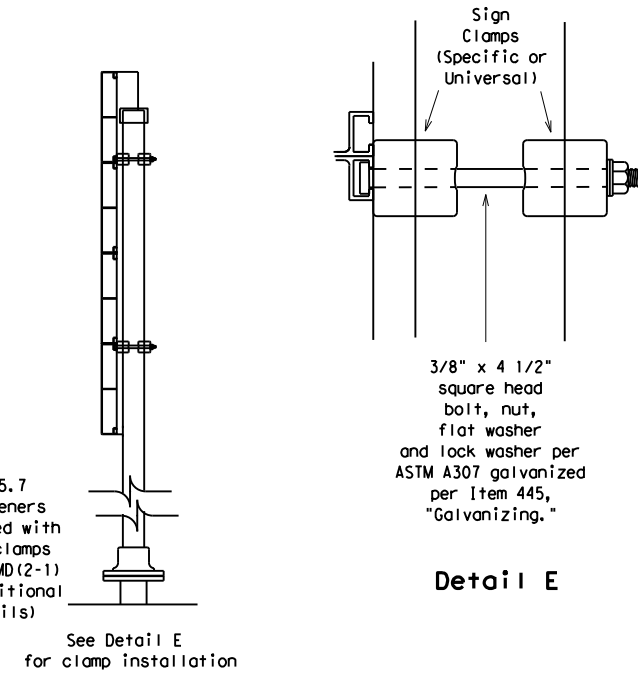
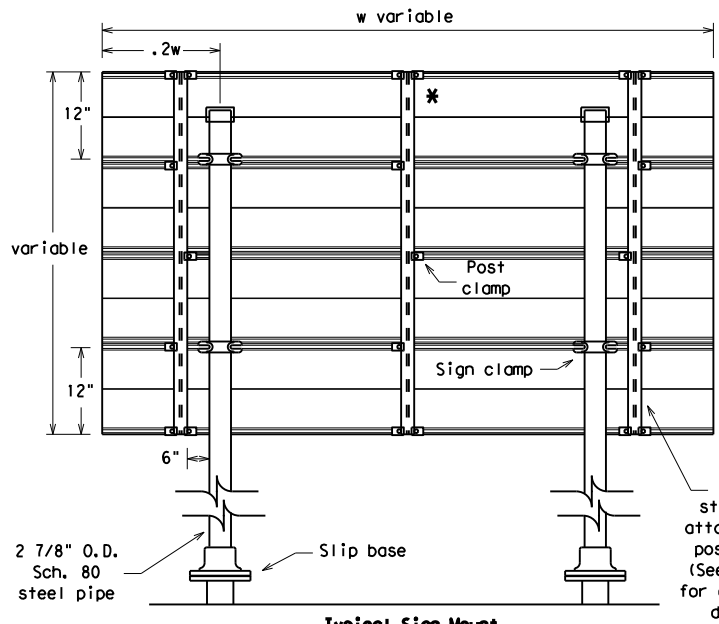
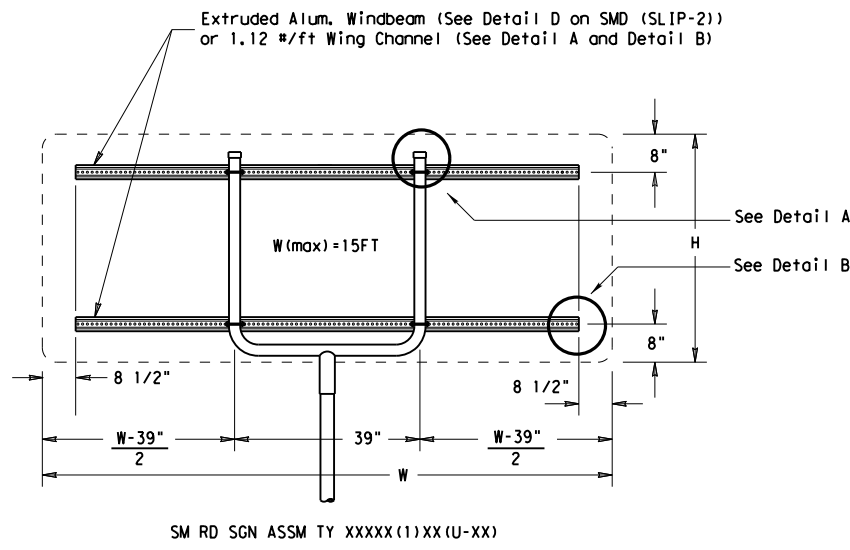
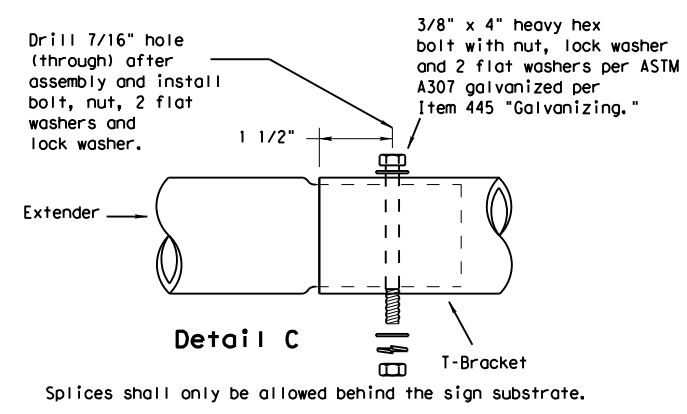
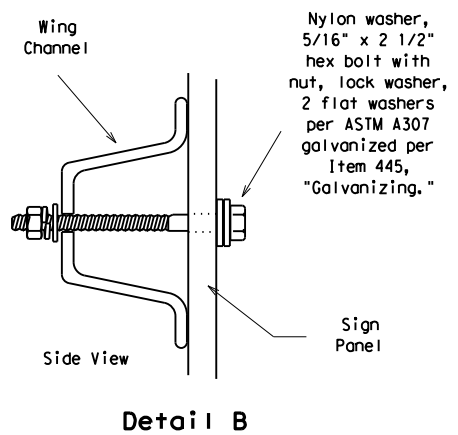
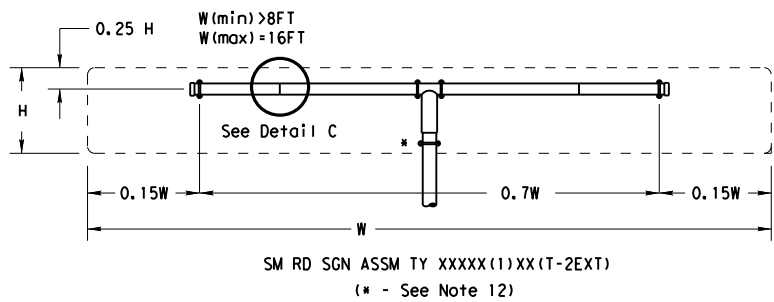


SIGN MOUNTING DETAILS  
 SMALL ROADSIDE SIGNS  
 TRIANGULAR SLIPBASE SYSTEM  
 SMD(SLIP-2)-08

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9-08	REVISIONS	CON: 01	SECT: 01	JOB: 064, ETC	HIGHWAY: IH 10
		DIST: ELP	COUNTY: CULBERSON	SHEET NO. 111	

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 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Signing & Pavement Marking\_Standards\smas3.dgn



**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."
- 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)

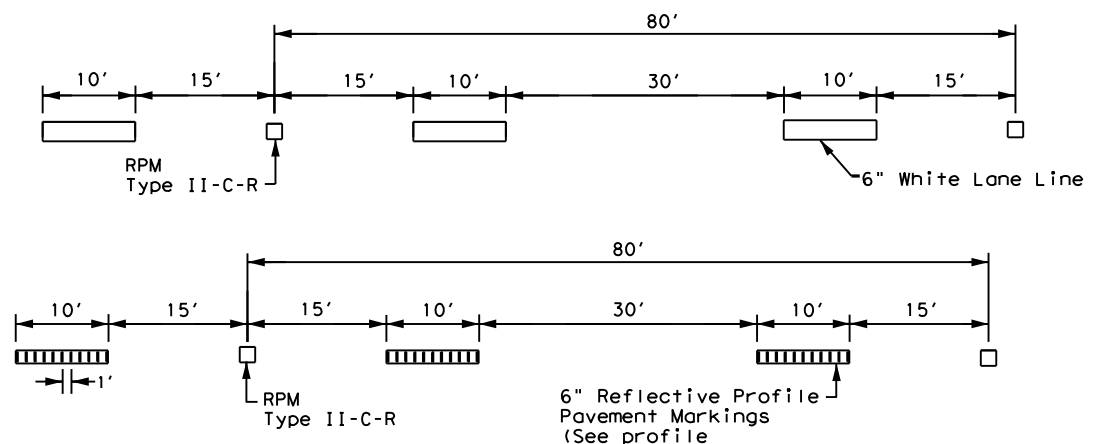


**SIGN MOUNTING DETAILS  
 SMALL ROADSIDE SIGNS  
 TRIANGULAR SLIPBASE SYSTEM  
 SMD(SLIP-3)-08**

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
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		ELP	CULBERSON		112

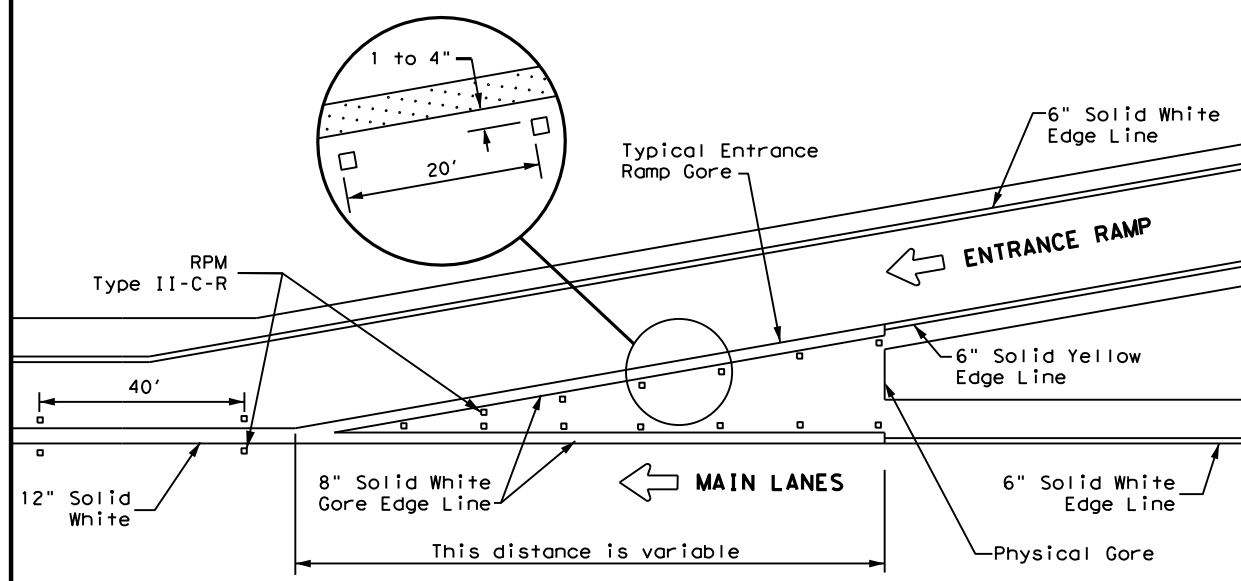
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DATE: 10/11/2023 10:46:29 AM  
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**NOTE**  
 ReflectORIZED raised pavement markers Type II-C-R shall be spaced on 80' centers with the clear face toward normal traffic and the red face toward wrong way traffic. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.

**TRAFFIC LANE LINES PAVEMENT MARKING**



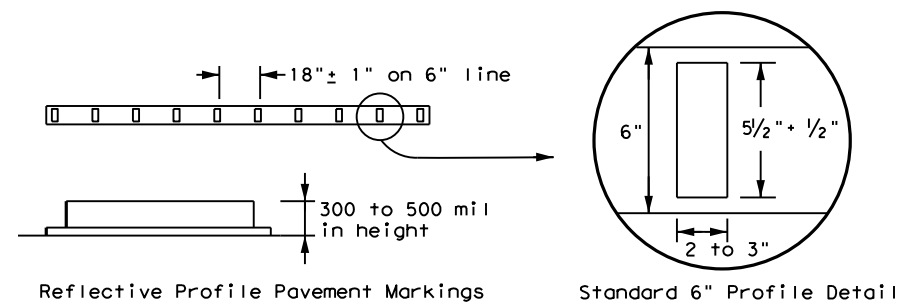
**TYPICAL ENTRANCE RAMP GORE MARKING**

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.

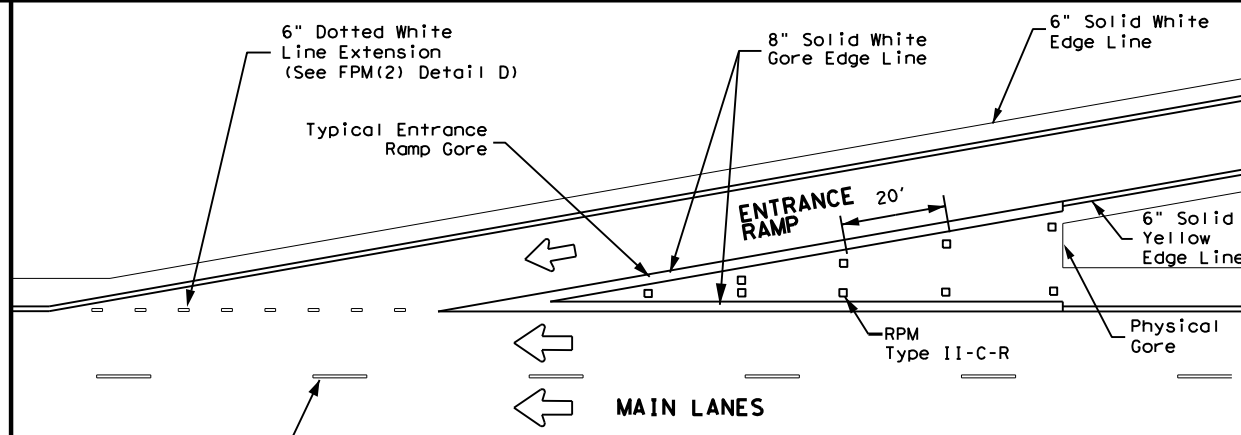
LEGEND	
	Traffic flow
	Pavement marking arrows (white)
	ReflectORIZED Raised Markers (RPM) Type II-C-R

**GENERAL NOTE**  
 On concrete pavements the raised pavement markers shall be placed to one side of the longitudinal joints.



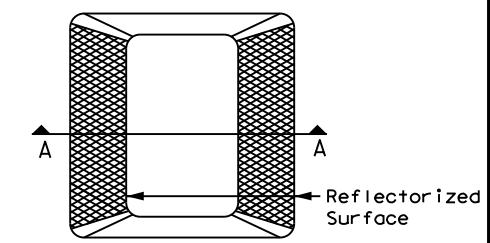
**NOTE**  
 Edge lines should typically be 6" wide and the materials shall be as specified in the plans. See details above if reflective profile pavement markings are to be used.

**EDGE LINE PAVEMENT MARKINGS**

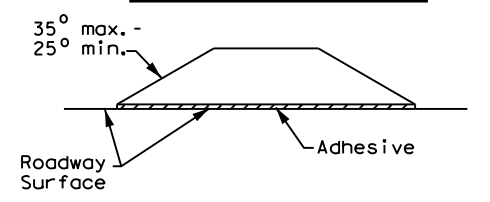


**NOTE**  
 See the Roadway Design Manual Chapter 3 to determine if a tapered acceleration lane may be used.

**TAPERED ACCELERATION LANE**

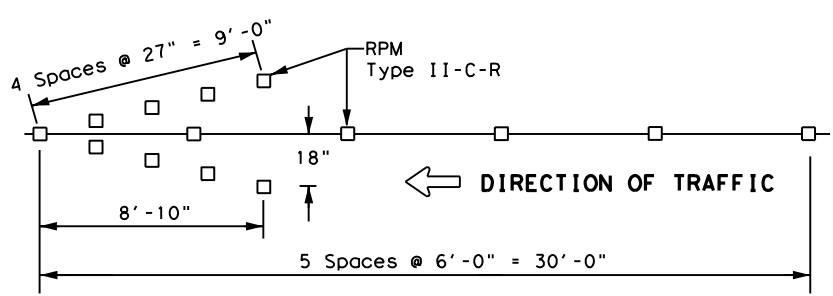


Type II (Top View)



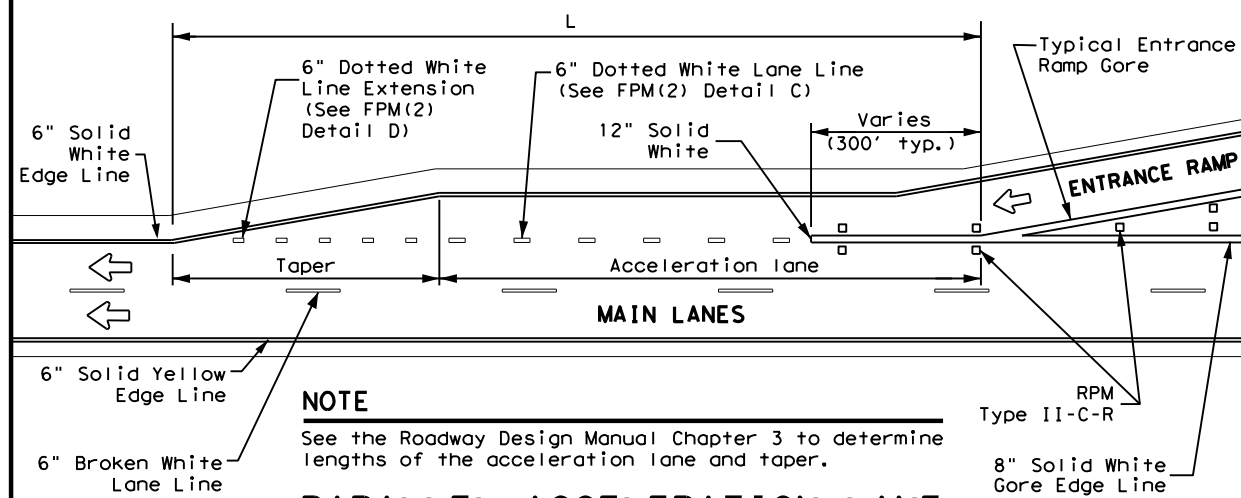
SECTION A

**REFLECTORIZED RAISED PAVEMENT MARKER (RPM)**



**NOTES**  
 1. ReflectORIZED raised pavement markers Type-II-C-R in the wrong way arrow shall have the clear face toward normal traffic and the red face toward the wrong way traffic.  
 2. Red reflectORIZED wrong way arrows, not to exceed two, may be placed on exit ramps. Locations of the arrows shall be as shown in the plans or as directed by the engineer.

**WRONG WAY ARROW**



**NOTE**  
 See the Roadway Design Manual Chapter 3 to determine lengths of the acceleration lane and taper.

**PARALLEL ACCELERATION LANE**

Texas Department of Transportation  
 Traffic Safety Division Standard

**TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS WITH RAISED PAVEMENT MARKERS FPM(1)-22**

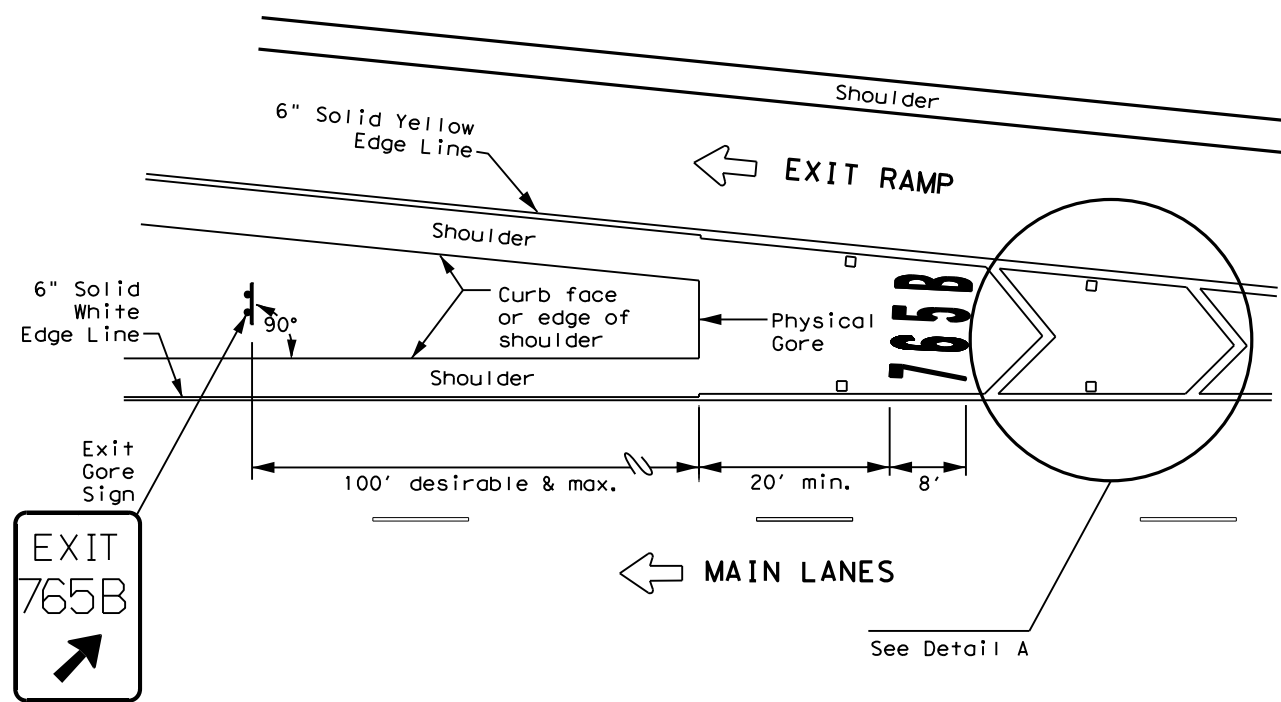
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©TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	SI	064JETC	IHWYO
5-74 8-00 2-12	DIST	COUNTY	SHEET NO.	
4-92 2-08 10-22	BSF	CULBERSON	113	
5-00 2-10				

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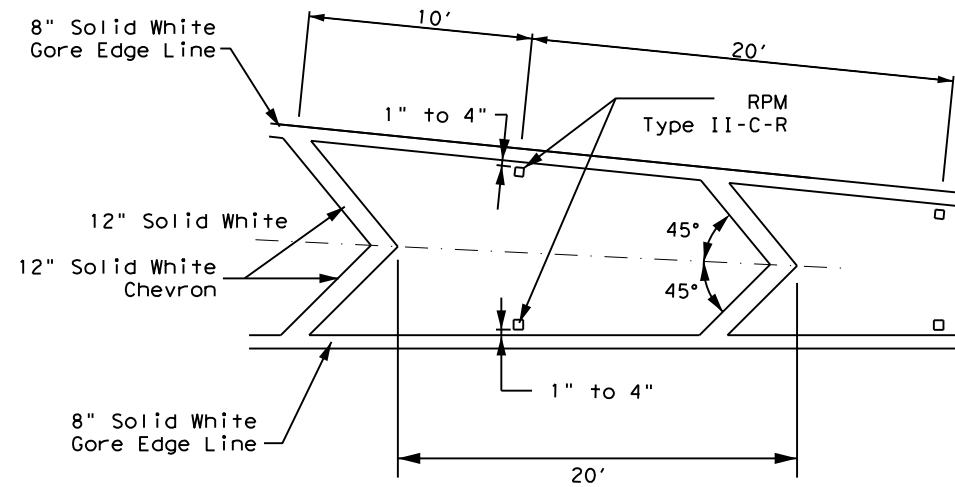
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**EXIT NUMBER PAVEMENT MARKING NOTES**

1. Minimum 8 foot white exit number pavement markings should be used, unless otherwise noted.
2. Spacing between letters and numbers should be approximately 4 inches.
3. Pavement markings are to be located as specified elsewhere in the plans.
4. Numbers and Letters details can be found in the Standard Highway Design for Texas (SHSD) Section 12 at <http://www.txdot.gov>



**MARKINGS WITH EXIT NUMBER**



**NOTES**

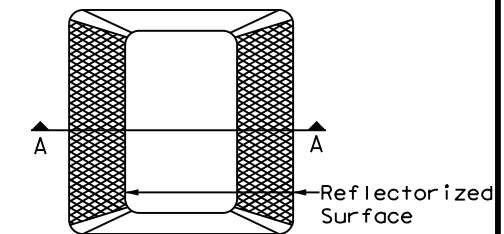
1. Raised pavement markers shall be centered between each chevron or neutral area line.
2. For more information, see ReflectORIZED Raised Pavement Marker Detail.

**DETAIL A**

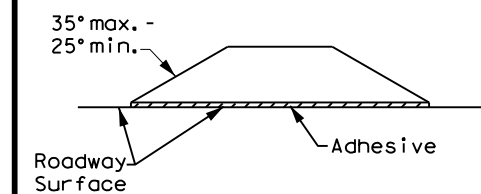
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

LEGEND	
←	Traffic flow
□	ReflectORIZED Raised Markers (RPM) Type II-C-R



Type II (Top View)



SECTION A

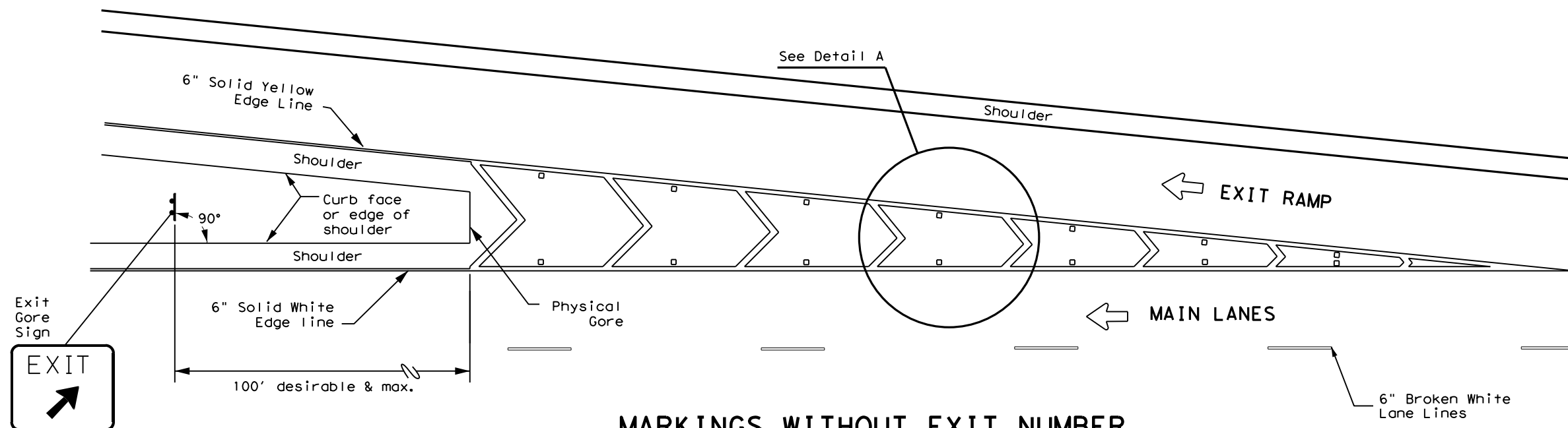
**REFLECTORIZED RAISED PAVEMENT MARKER (RPM)**



**EXIT GORE PAVEMENT MARKINGS**

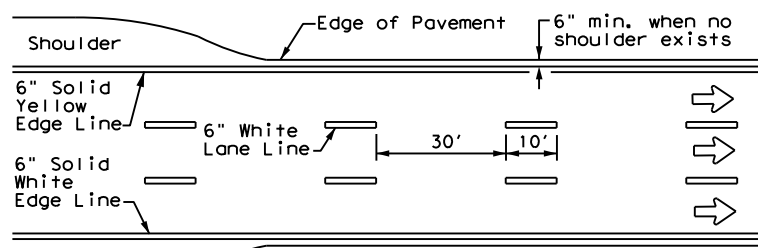
**FPM(5) -22**

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©TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
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9-19	DIST	COUNTY	SHEET NO.	
10-22	ELP	CULBERSON	114	

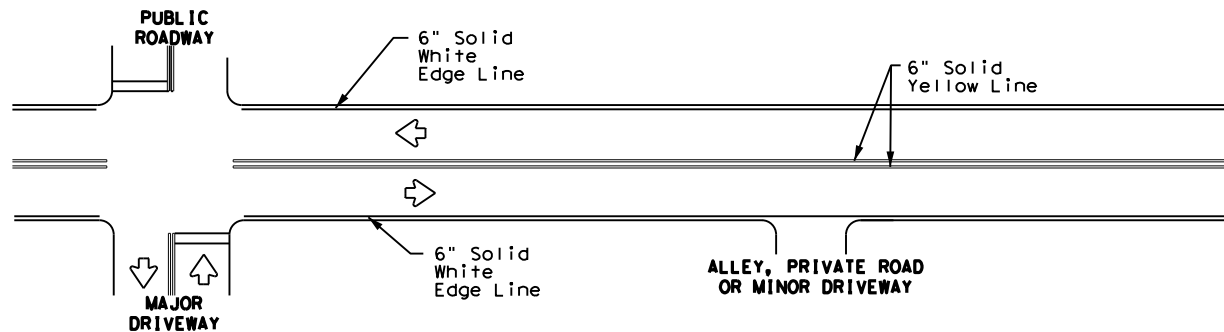


**MARKINGS WITHOUT EXIT NUMBER**

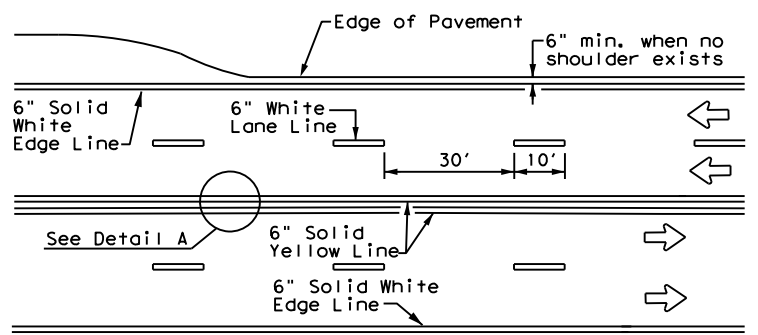
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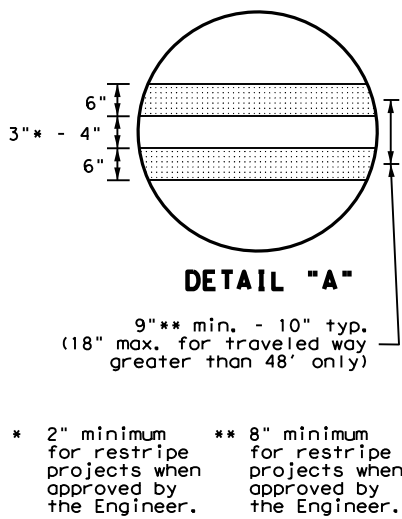
**EDGE LINE AND LANE LINES  
ONE-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**



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

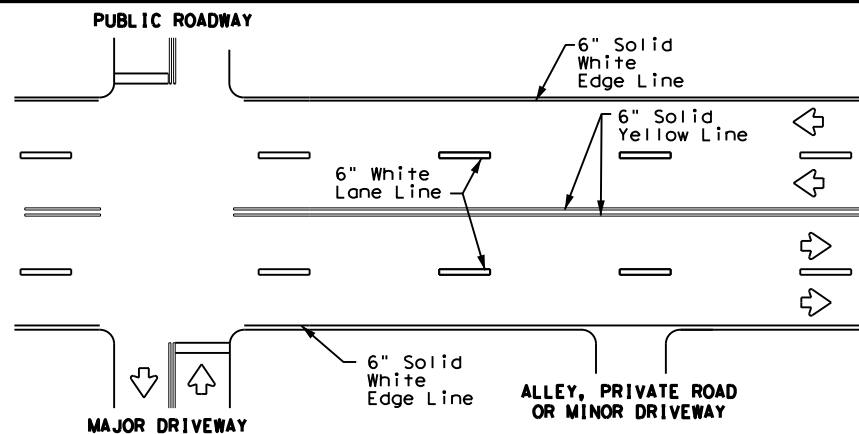


**CENTERLINE AND LANE LINES  
FOUR LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**

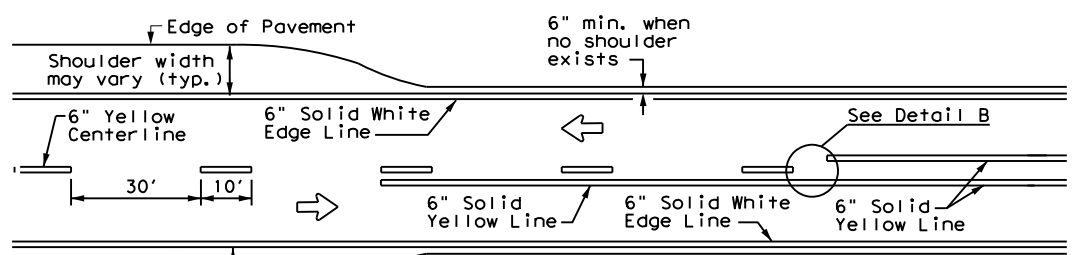


**DETAIL "A"**  
 9" min. - 10" typ.  
 (18" max. for traveled way greater than 48' only)

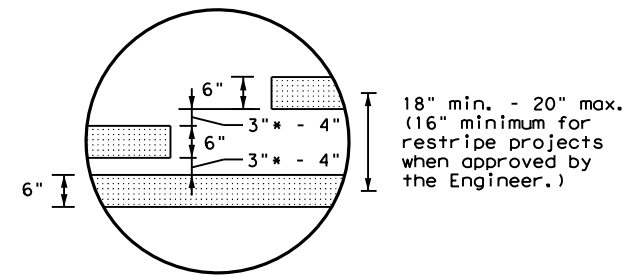
\* 2" minimum for restripe projects when approved by the Engineer.  
 \*\* 8" minimum for restripe projects when approved by the Engineer.



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

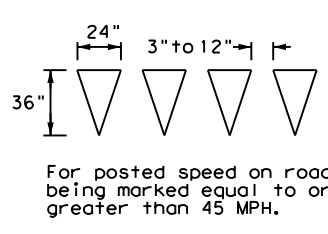


**TWO LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**

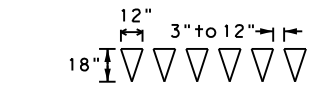


**DETAIL "B"**  
 18" min. - 20" max.  
 (16" minimum for restripe projects when approved by the Engineer.)

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



**YIELD LINES**

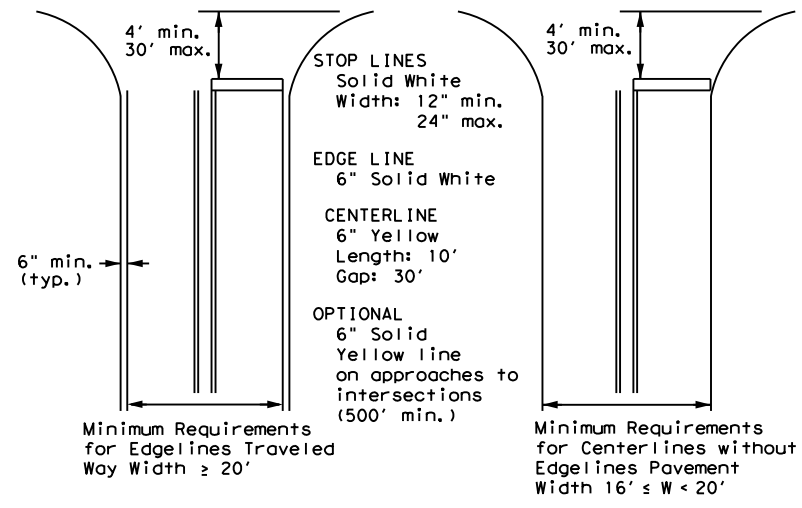


For posted speed on road being marked equal to or less than 40 MPH.

- 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

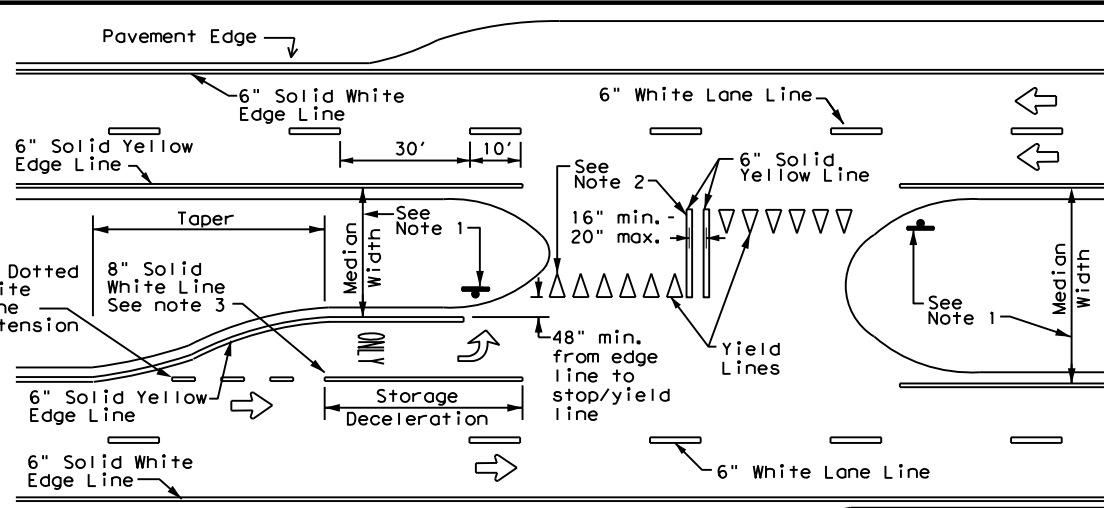
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



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

- 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.



**FOUR LANE DIVIDED ROADWAY CROSSOVERS**

Texas Department of Transportation  
 Traffic Safety Division Standard

**TYPICAL STANDARD  
PAVEMENT MARKINGS**

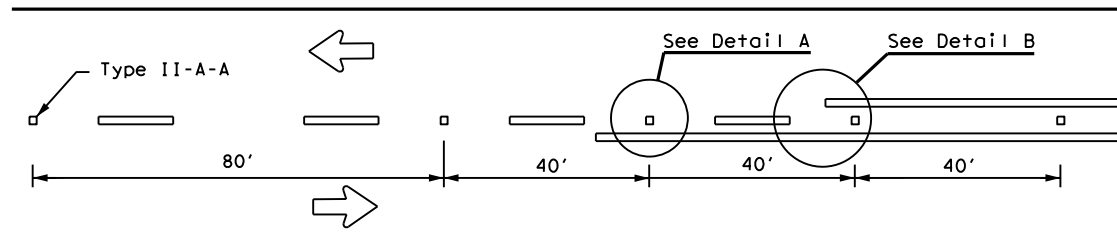
**PM(1) - 22**

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
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8-95 3-03 12-22	ELP	CULBERSON	115	
5-00 2-12				

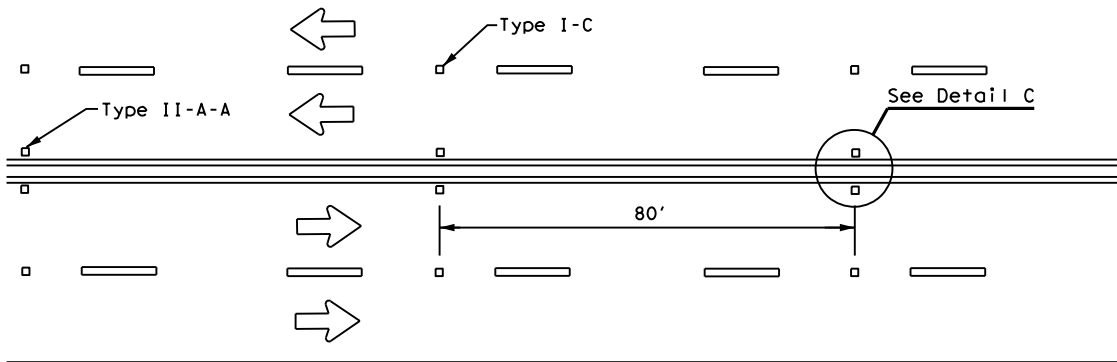
22A

# REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

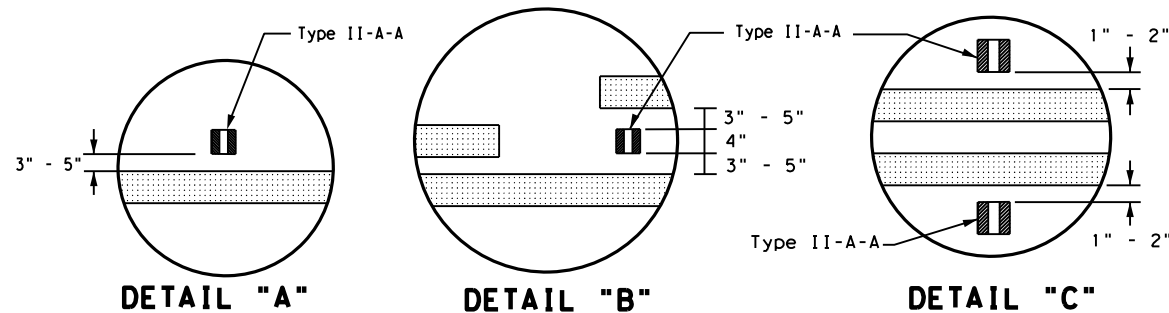
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**CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS**



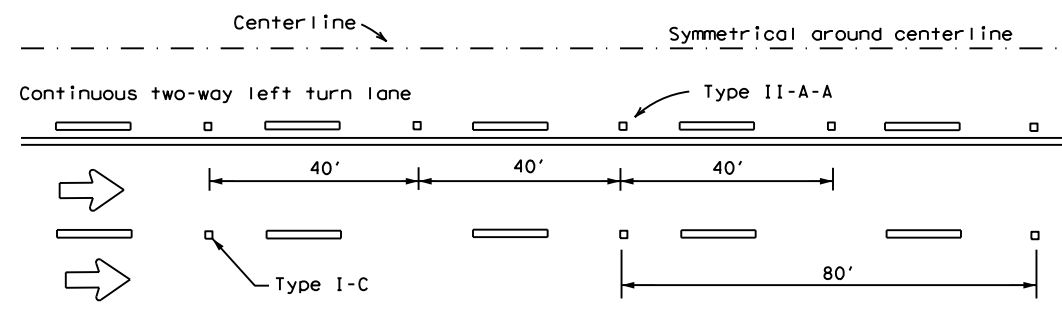
**CENTERLINE & LANE LINES  
FOR FOUR LANE TWO-WAY ROADWAYS**



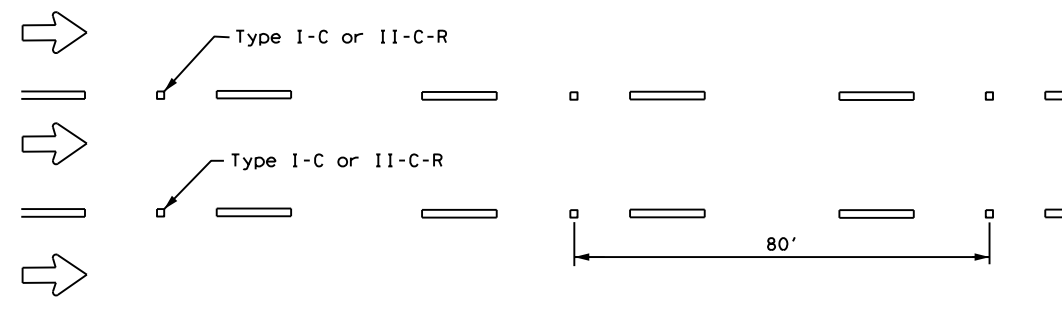
**DETAIL "A"**

**DETAIL "B"**

**DETAIL "C"**

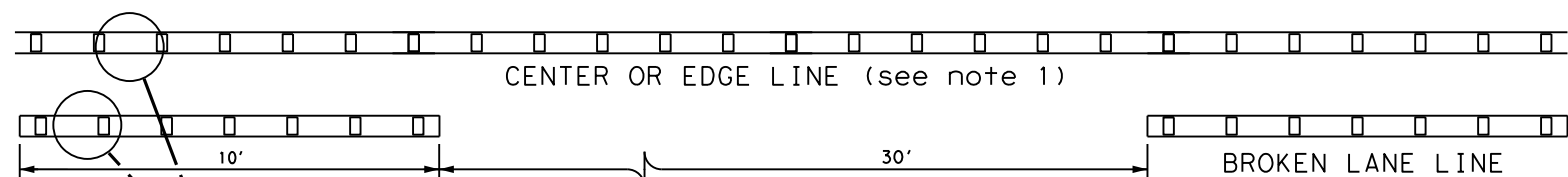


**CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE**



**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

6" EDGE LINE, 6" CENTERLINE  
 OR 6" LANE LINE

**NOTES**

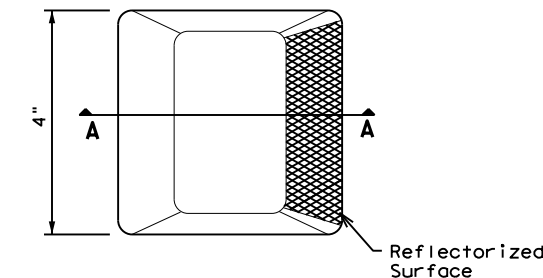
1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

**GENERAL NOTES**

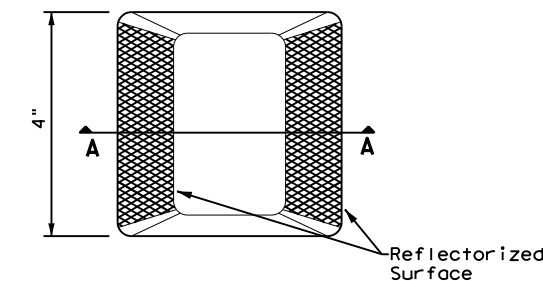
1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians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

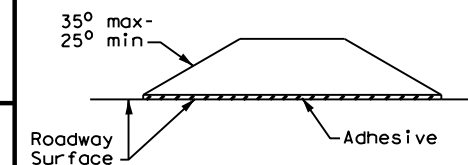
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



**Type I (Top View)**



**Type II (Top View)**



**SECTION A**

**RAISED PAVEMENT MARKERS**



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

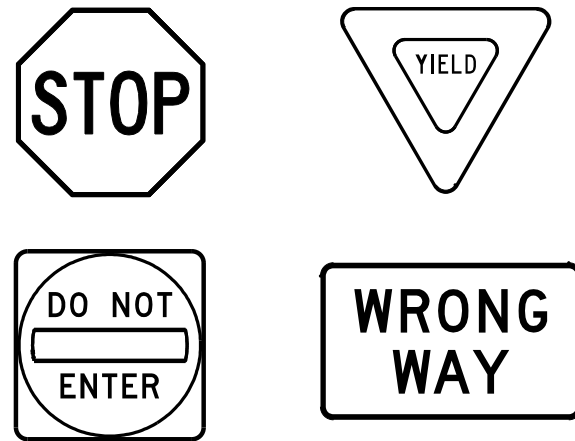
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© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
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4-77 8-00 6-20	DIST	COUNTY	SHEET NO.	
4-92 2-10 12-22	ELP	CULBERSON	116	
5-00 2-12				



DATE: 10/11/2023 10:46:34 AM  
 FILE: M:\0003-01-064-4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Signing & Pavement\Highway\Signs\054.dgn  
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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

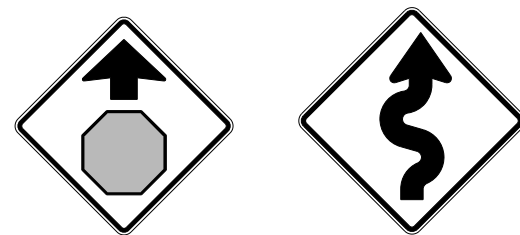
(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



#### 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

### 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

### 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/>



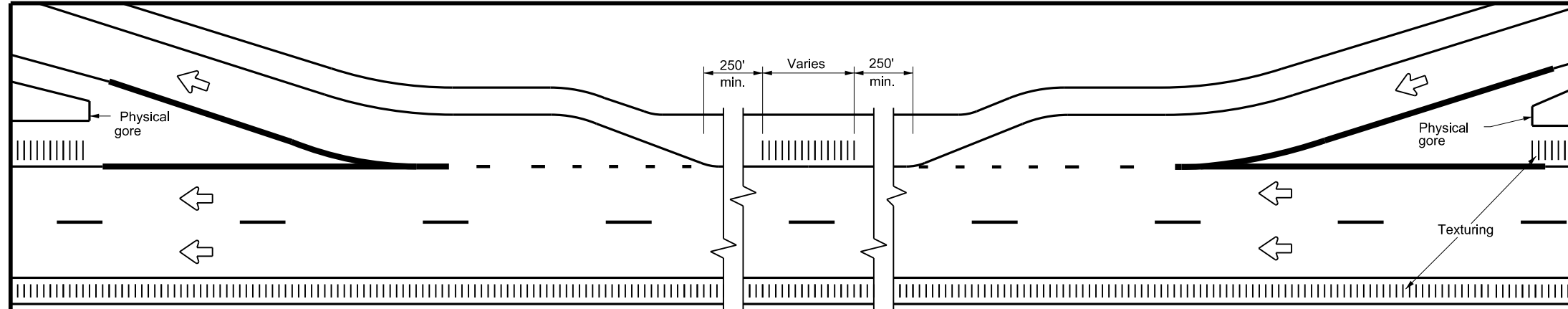
## TYPICAL SIGN REQUIREMENTS

### TSR(4) - 13

FILE:	tsr4-13.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0003	01	064, ETC	IH 10				
12-03	7-13	DIST	COUNTY	SHEET NO.					
9-08		ELP	CULBERSON	117					

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TYPICAL RUMBLE STRIP PLACEMENT AT EXIT AND ENTRANCE RAMP

GENERAL NOTES

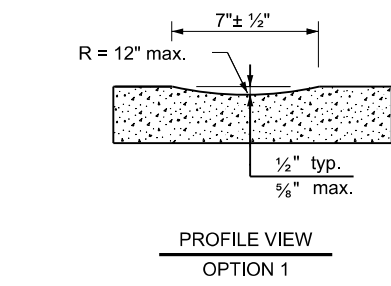
1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall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

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

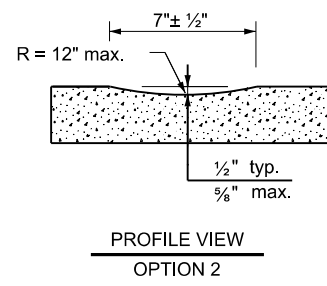
9. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
10. Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble stripe.

WHEN INSTALLING RAISED OR PROFILE EDGE LINE RUMBLE STRIPS:

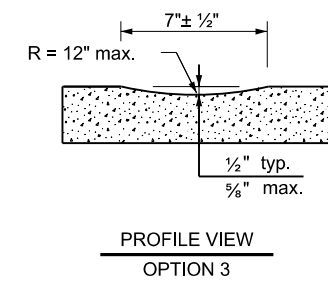
11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the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



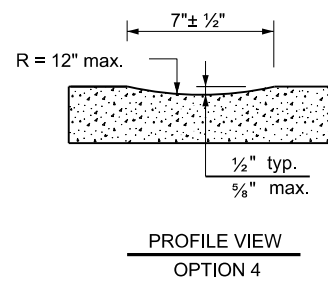
PROFILE VIEW  
OPTION 1



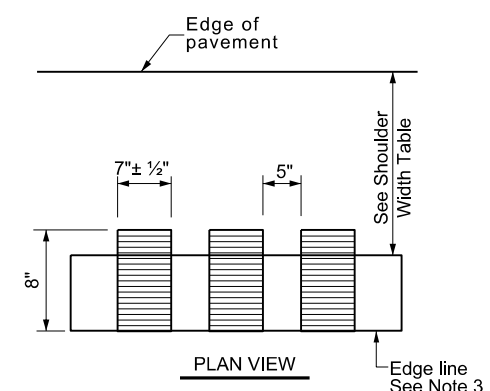
PROFILE VIEW  
OPTION 2



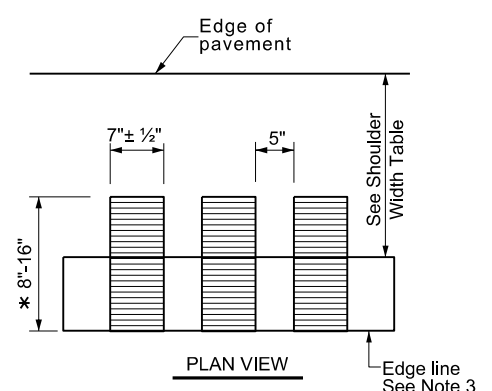
PROFILE VIEW  
OPTION 3



PROFILE VIEW  
OPTION 4

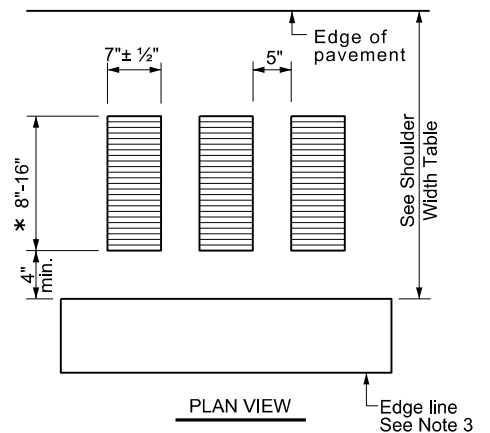


CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



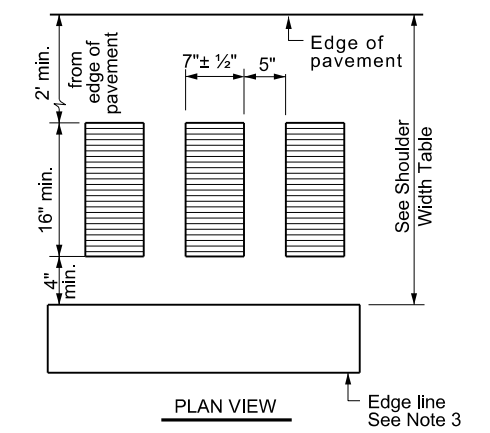
CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

\* This distance may vary based on width of shoulder

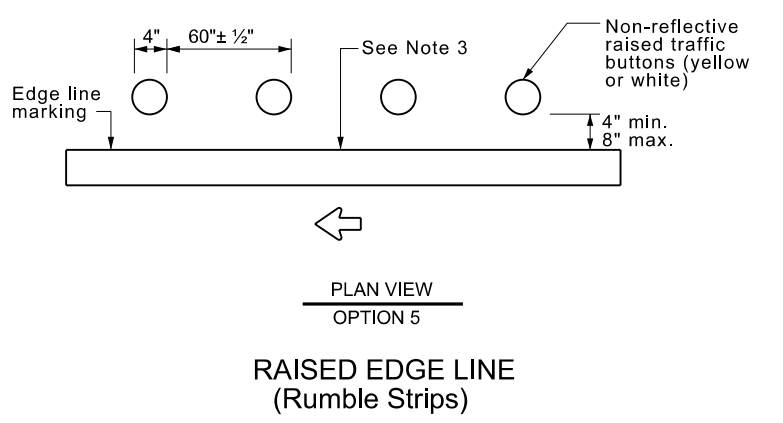


CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

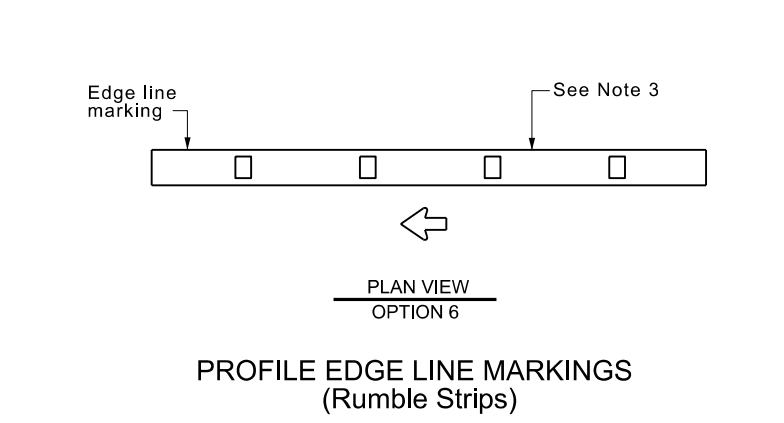
\* This distance may vary based on width of shoulder



CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



RAISED EDGE LINE (Rumble Strips)



PROFILE EDGE LINE MARKINGS (Rumble Strips)

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

Texas Department of Transportation  
 Traffic Safety Division Standard

### EDGE LINE RUMBLE STRIPS ON FREEWAYS AND DIVIDED HIGHWAYS

#### RS(1)-23

FILE: rs(1)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	January 2023	CONT 0003	SECT 01	JOB 064, ETC
4-06 1-23	REVISIONS	2-10	DIST	COUNTY
10-13	ELP	CULBERSON	SHEET NO.	118

DATE: 10/11/2023 10:46:37 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Electrical and of 11 This reference shall be used for all electrical work.  
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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.

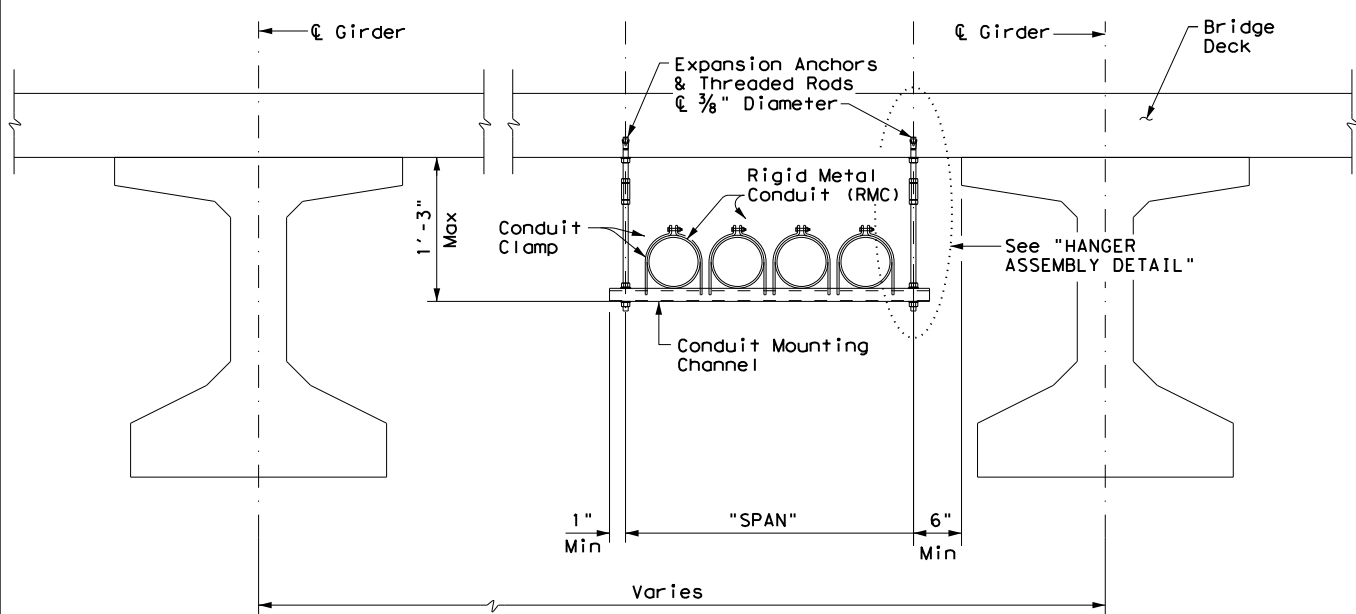
**B. CONSTRUCTION METHODS**

- 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.

			
<p><b>ELECTRICAL DETAILS CONDUITS &amp; NOTES</b></p> <p><b>ED(1) - 14</b></p>			
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REVISIONS		0003 01	064, ETC
DIST	COUNTY	SHEET NO.	
ELP	CULBERSON	119	

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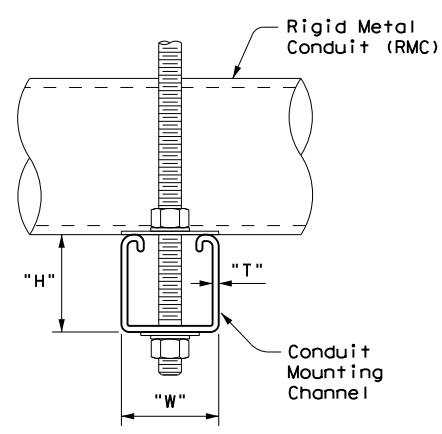
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CONDUIT HANGING DETAIL

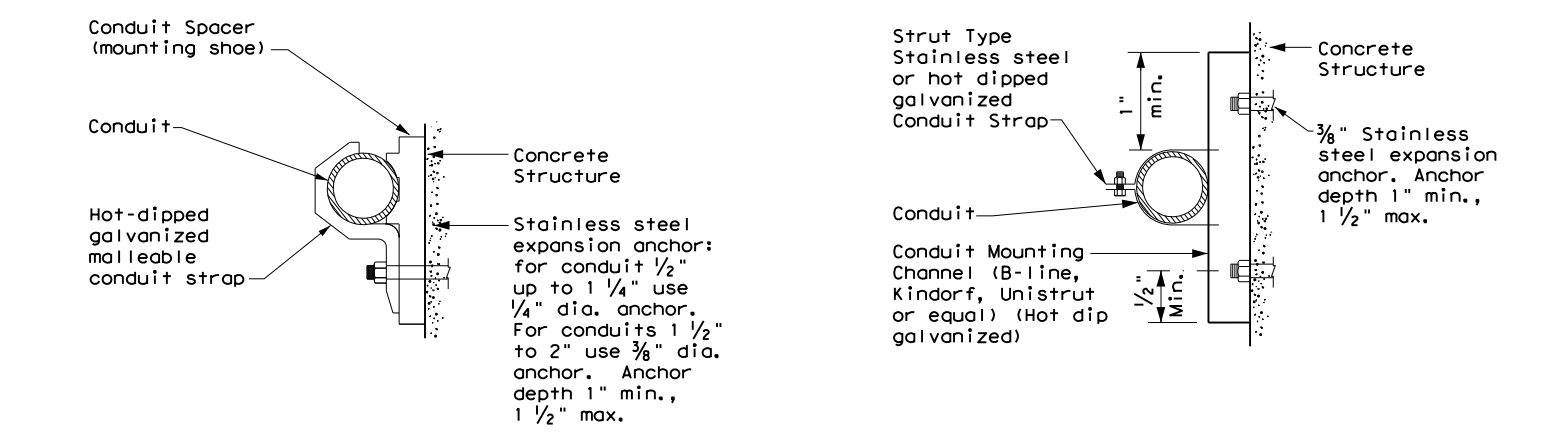
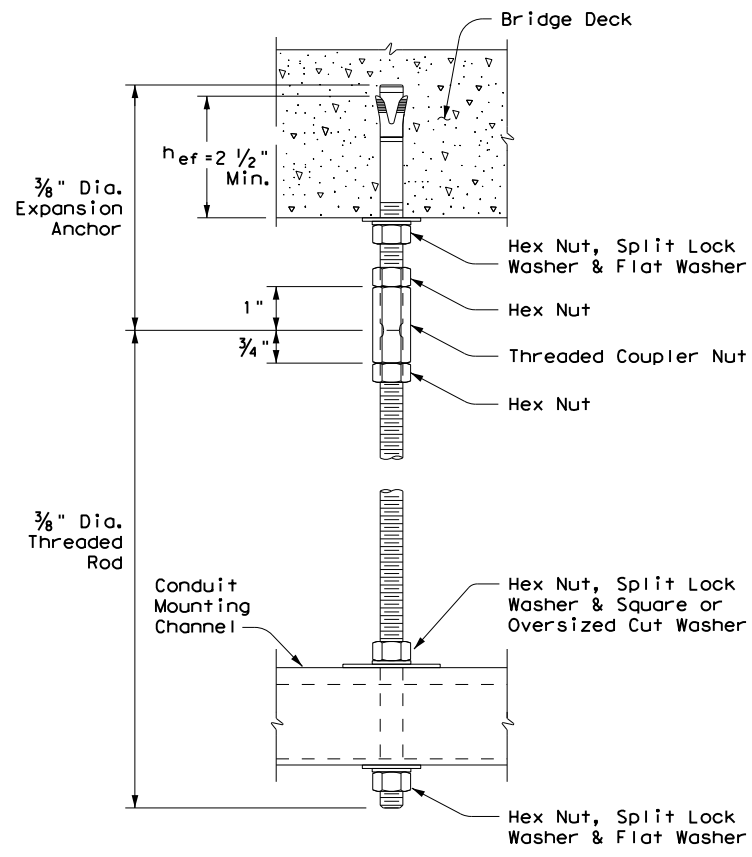
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 1/16"	12 Ga.

Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.



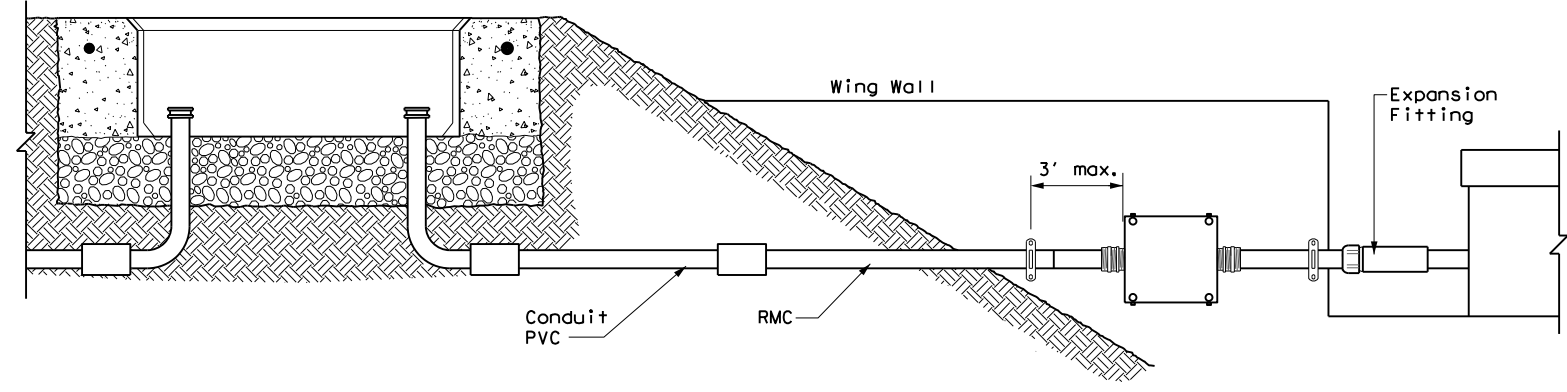
HANGER ASSEMBLY DETAIL

ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT



CONDUIT MOUNTING OPTIONS

Attachment to concrete surfaces  
 See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.
2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.
3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.
4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.
5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h<sub>ef</sub>), as shown. Increase (h<sub>ef</sub>) as needed to ensure sufficient thread length for proper torquing and tightening of anchors.
6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h<sub>ef</sub>). No lateral loads shall be introduced after conduit installation.

		Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS CONDUIT SUPPORTS</h2>			
<h3>ED(2) - 14</h3>			
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CONT:	0003	CK:	TxDOT
SECT:	01	DW:	TxDOT
JOB:	064, ETC	CK:	TxDOT
REVISIONS:		HIGHWAY:	IH 10
DIST:	ELP	COUNTY:	CULBERSON
SHEET NO.:			120

# 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.

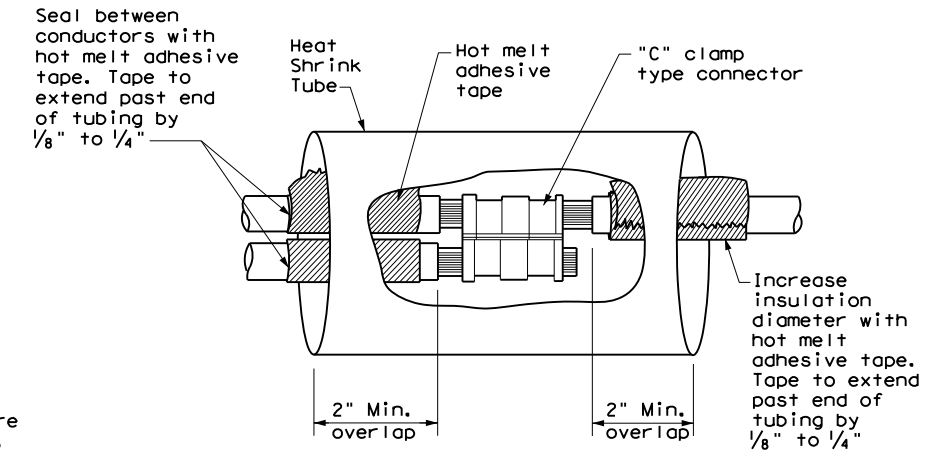
## B. CONSTRUCTION METHODS

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 seal. 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**

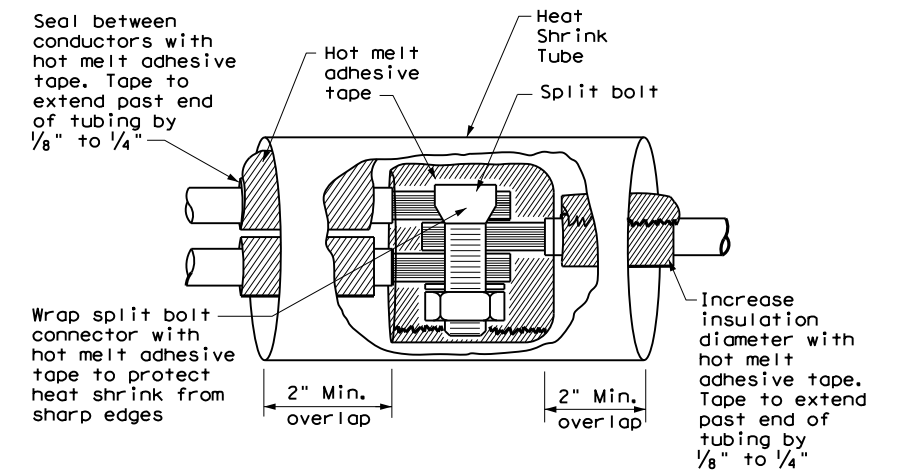
## GROUND RODS & GROUNDING ELECTRODES

### A. MATERIAL INFORMATION

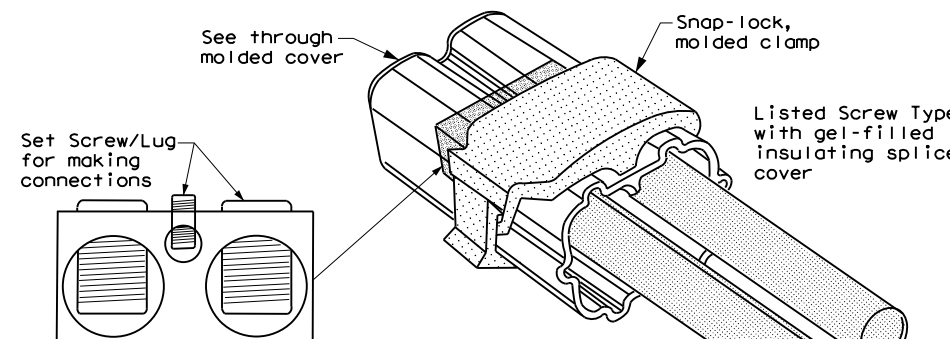
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in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

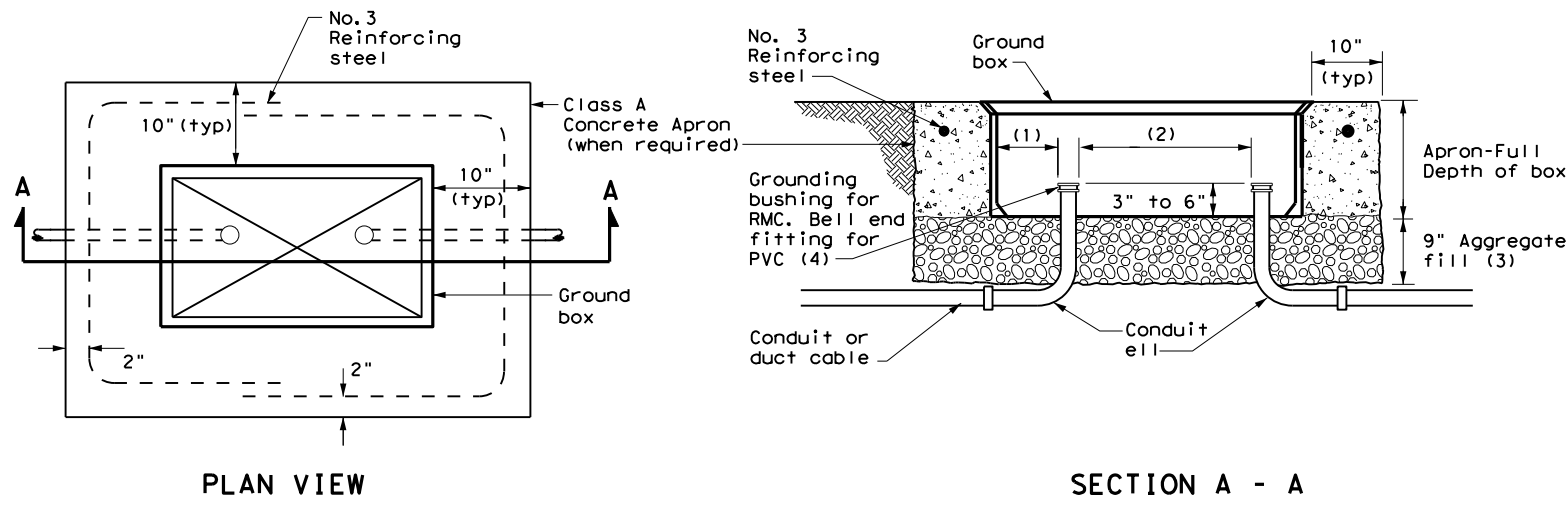


**SPLICE OPTION 3  
Listed Screw Type**

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		Traffic Operations Division Standard	
<h1>ELECTRICAL DETAILS CONDUCTORS</h1>			
<h2>ED(3) - 14</h2>			
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		COUNTY:	
		SHEET NO.:	121

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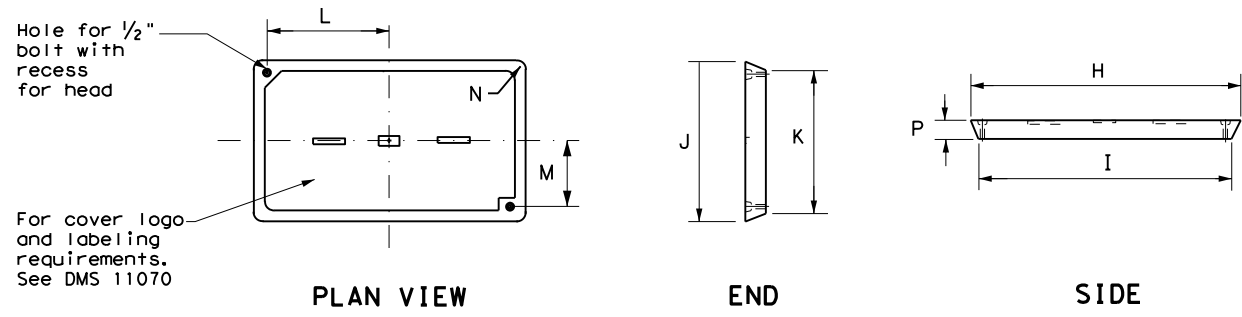


**APRON FOR GROUND BOX**

- (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**
- 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."
  - 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.
  - Ensure ground box cover is correctly labeled in accordance with DMS 11070.
  - Provide larger ground boxes in accordance with Item 624 and as shown in the plans.
- B. CONSTRUCTION METHODS**
- 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.
  - 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.
  - Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.
  - 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.
  - Temporarily seal all conduits in the ground box until conductors are installed.
  - 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.
  - When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.
  - 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.
  - 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.
  - 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.
  - Bond metal ground box covers to the grounding conductor with a tank ground type lug.

				Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS GROUND BOXES</b>					
<b>ED(4) - 14</b>					
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REVISIONS		0003	01	064, ETC	IH 10
DIST	COUNTY			SHEET NO.	
ELP	CULBERSON			122	

**ELECTRICAL SERVICES NOTES**

- Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.
- Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services," DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.
- Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.
- Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.
- The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.
- Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.
- When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
- Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.
- All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.
- Provide rigid metal conduit (RMC) for all conduits on service, except for the 1/2 in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.
- Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.
- Ensure all mounting hardware and installation details of services conform to utility company specifications.
- For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.
- When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.
- Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

**SERVICE ASSEMBLY ENCLOSURE**

- Provide threaded hub for all conduit entries into the top of enclosure.
- Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photoceII or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.
- Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.
- Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

**MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS**

- Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.
- When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

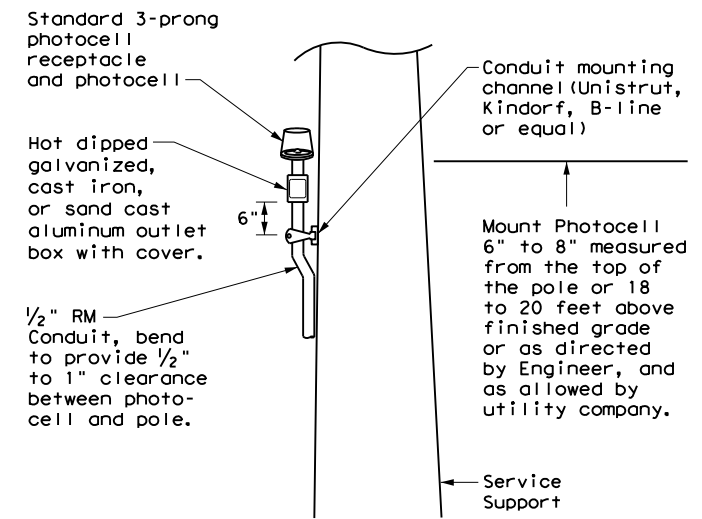
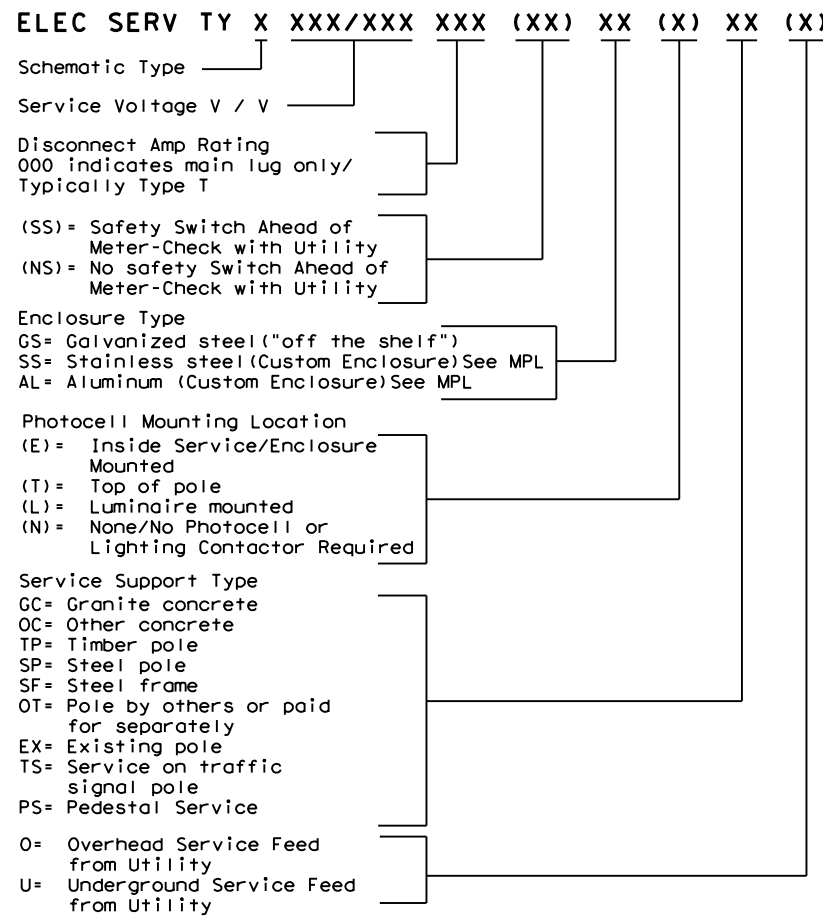
**PHOTOELECTRIC CONTROL**

- Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA												
Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit *xSize	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 1/4"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminares	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 1/4"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

\* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.  
 \*\* Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National Electrical Code.

**EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE**



**TOP MOUNTED PHOTOCELL**

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation Traffic Operations Division Standard

**ELECTRICAL DETAILS SERVICE NOTES & DATA**

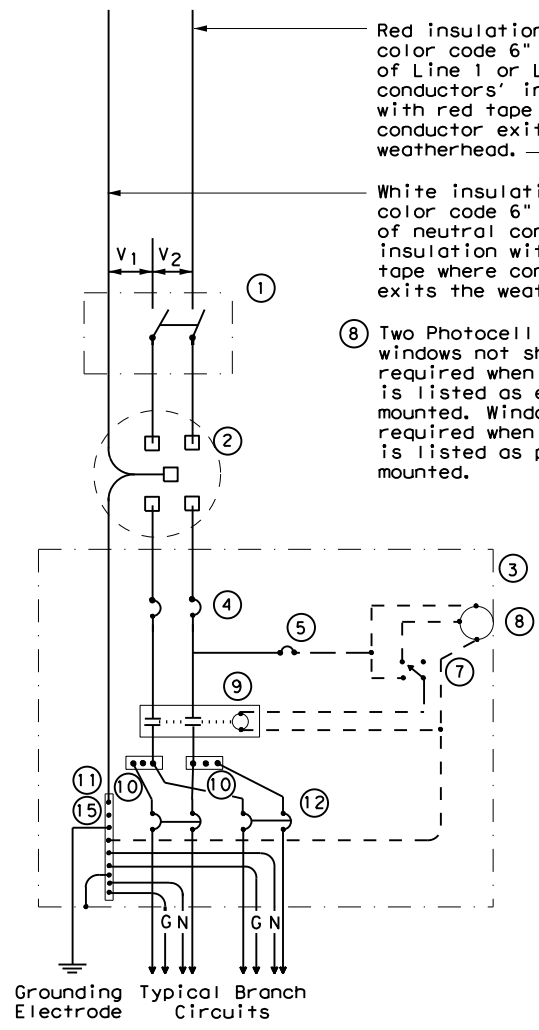
**ED(5) - 14**

FILE: ed5-14.dgn	DWG: TxDOT	CHK: TxDOT	DWG: TxDOT	CHK: TxDOT
© TxDOT October 2014		CONT	SECT	JOB
REVISIONS		0003 01	064, ETC	
DIST	COUNTY	SHEET NO.		
ELP	CULBERSON	123		

DATE: 10/11/2023 10:46:42 AM  
 FILE: M:\0003-01-064-14-DESIGN\Plan Set\8. TRAFFIC\STANDARDS\Electrical and of this revision to be placed in the enclosure data pocket for incorrect results or damages resulting from its use.  
 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 metric units.

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 metric units or for any errors or omissions in this standard or for damages resulting from its use.

DATE: 10/11/2023 10:46:44 AM  
 FILE: M:\0003-01-064\4-DESIGN\Plan Set\8. TRAFFIC STANDARDS\Electrical and of 11/11/2023 10:46:44 AM



**SCHEMATIC TYPE A  
THREE WIRE**

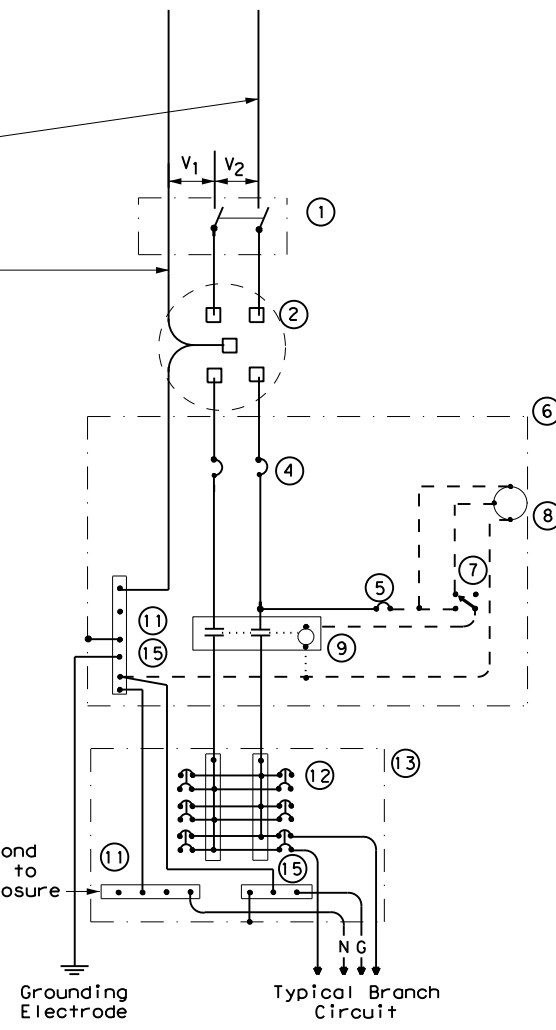
Red insulation or color code 6" length of Line 1 or Line 2 conductors' insulation with red tape where conductor exits the weatherhead.

White insulation or color code 6" length of neutral conductors' insulation with white tape where conductor exits the weatherhead.

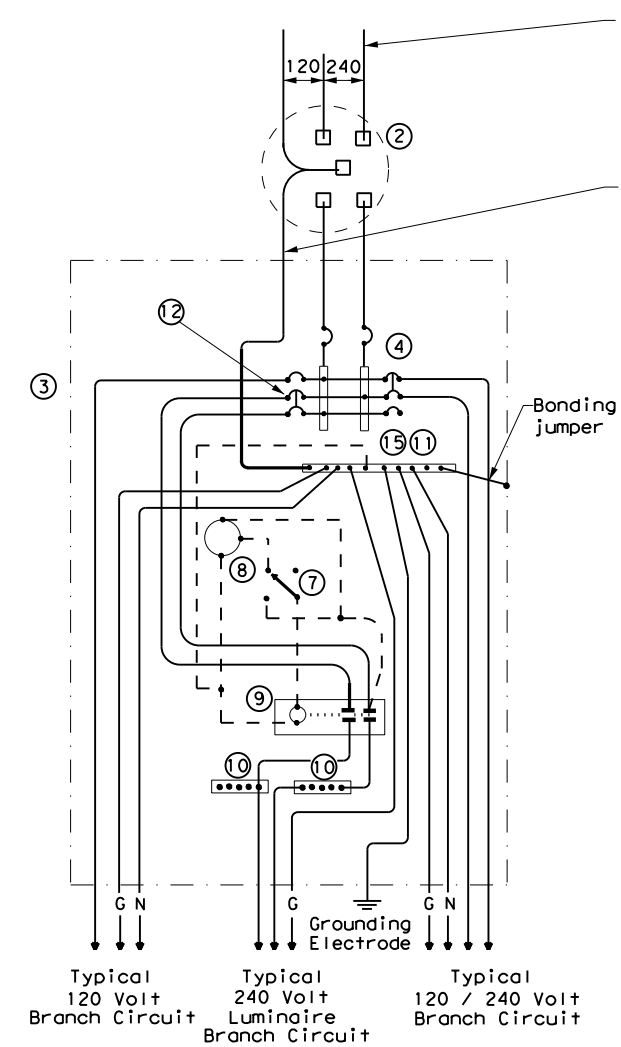
⑧ Two Photocell viewing windows not shown but required when photocell is listed as enclosure mounted. Windows not required when photocell is listed as pole top mounted.

Do not bond this bus to the enclosure

WIRING LEGEND	
—	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required



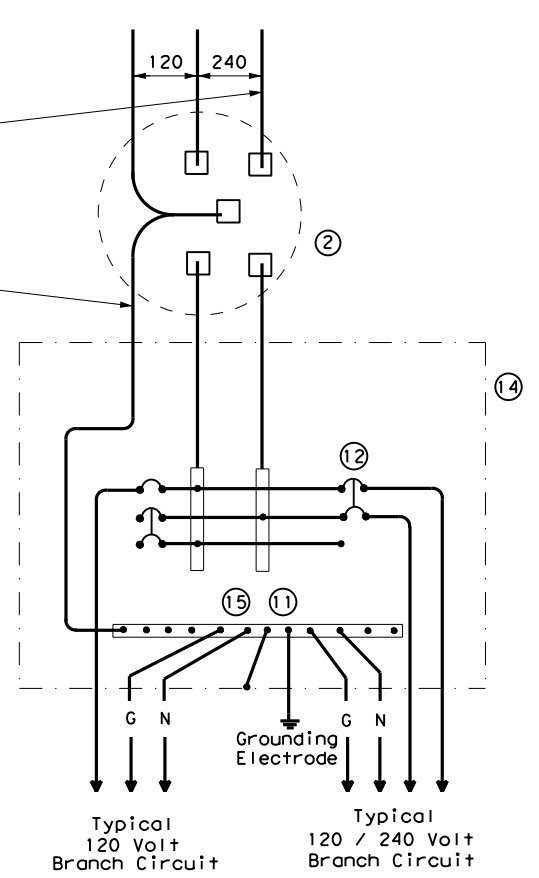
**SCHEMATIC TYPE C  
THREE WIRE**



**SCHEMATIC TYPE D - CUSTOM  
120/240 VOLTS - THREE WIRE**

Red insulation or color code 6" length of Line 1 or Line 2 conductors' insulation with red tape where conductor exits the weatherhead.

White insulation or color code 6" length of neutral conductors' insulation with white tape where conductor exits the weatherhead.



**SCHEMATIC TYPE T  
120/240 VOLTS - THREE WIRE**  
 Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

				Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES</b>					
<b>ED(6) - 14</b>					
FILE:	ed6-14.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2014	CONT:	0003	SECT:	01
REVISIONS		JOB:	064, ETC	HIGHWAY:	IH 10
DIST:	ELP	COUNTY:	CULBERSON	SHEET NO.:	124



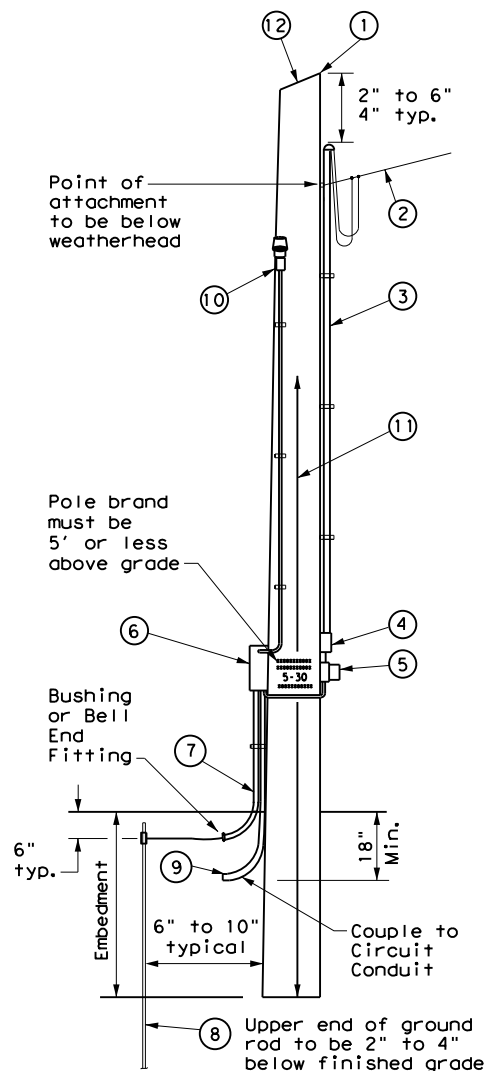
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of units or for the use of this standard in any project. This standard is not intended to be used for any project not specifically approved by TxDOT.

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### TIMBER POLE (TP) SERVICE SUPPORT NOTES

- Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
- Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrical service.
- Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
- Gain pole as required to provide flat surface for each channel. Gain timber pole to  $\frac{3}{8}$  in. max. depth and  $1\frac{1}{8}$  in. max. height. Gain pole in a neat and workmanlike manner.
- Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to  $3\frac{3}{4}$  in. maximum depth, and  $1\frac{1}{2}$  in. to  $1\frac{5}{8}$  in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts,  $\frac{1}{4}$  in. minimum diameter by  $1\frac{1}{2}$  in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
- When excess length must be trimmed from poles, trim from the top end only.

- Class 5 pole, height as required
- Service drop from utility company (attached below weatherhead)
- Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)
- Safety switch (when required)
- Meter (when required)
- Service enclosure
- 6 AWG bare grounding electrode conductor in  $\frac{1}{2}$  in. PVC to ground rod - extend  $\frac{1}{2}$  in. PVC 6 in. underground.
- $\frac{5}{8}$  in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.
- RMC same size as branch circuit conduit.
- See pole-top mounted photocell detail on ED(5).
- When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.
- When required by utility, cut top of pole at an angle to enhance rain run off.

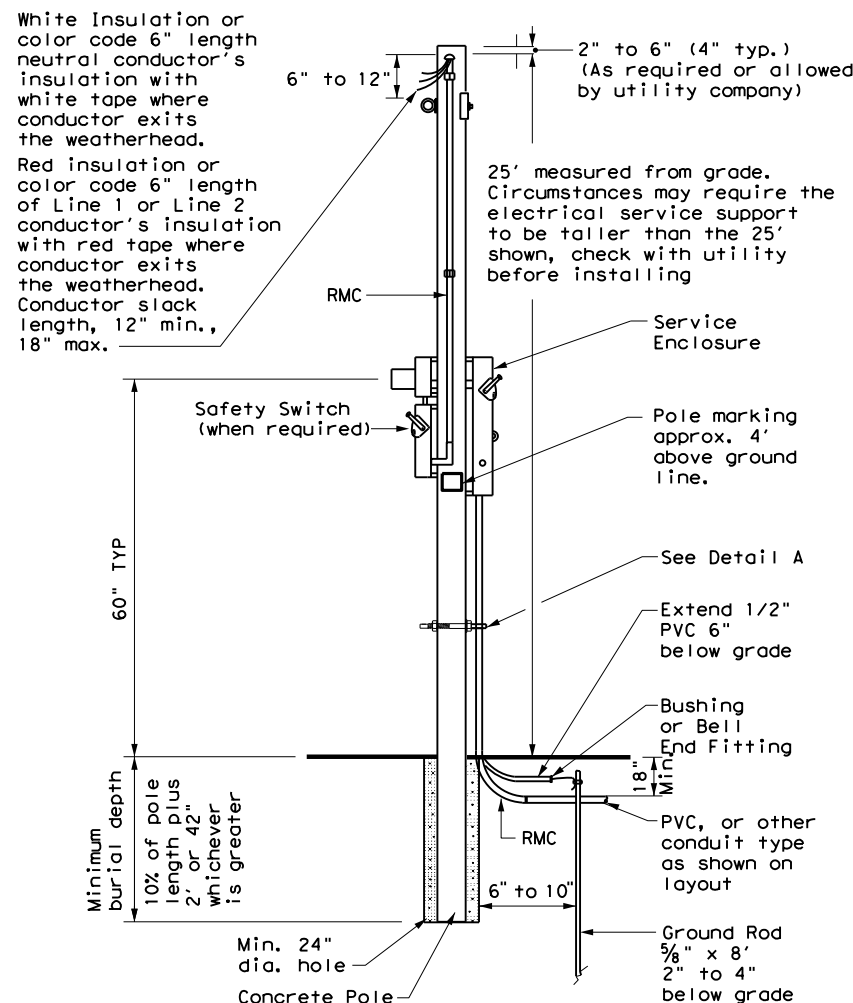


SERVICE SUPPORT TYPE TP (O)

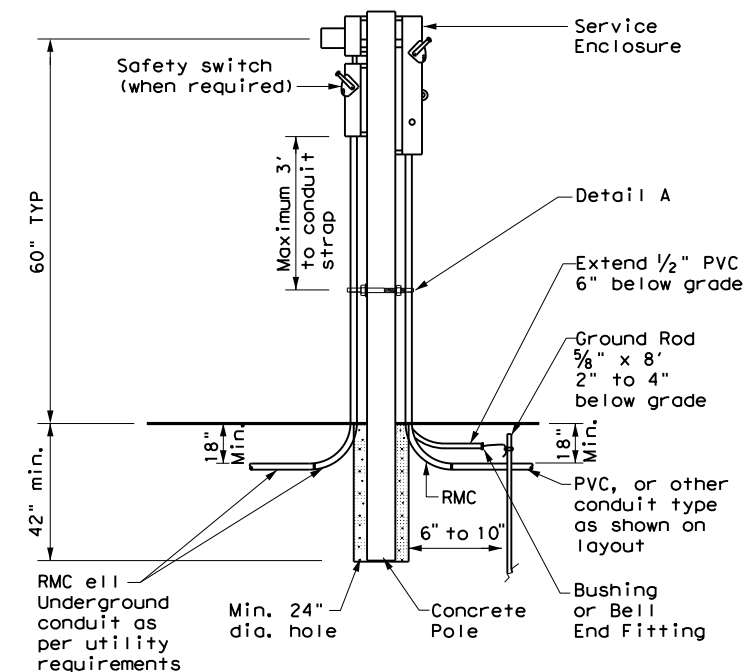
### GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

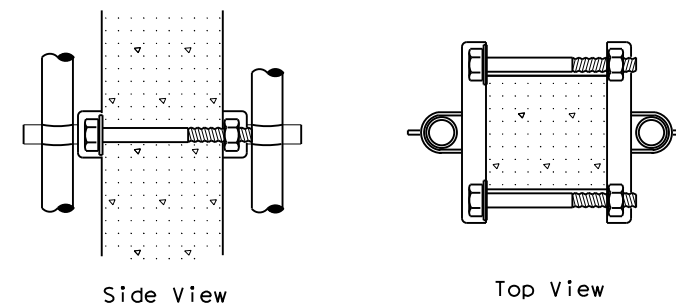
- Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
- Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
- Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
- Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
- Ensure all installation details of services are in accordance with utility company specifications.
- Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
- Furnish and install galvanized or stainless steel channel strut  $1\frac{1}{2}$  in. or  $1\frac{5}{8}$  in. wide by 1 in. up to  $3\frac{3}{4}$  in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
- Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



CONCRETE SERVICE SUPPORT  
Overhead (O)



CONCRETE SERVICE SUPPORT  
Underground (U)



#### DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.

		Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, &amp; TP</b>			
<b>ED(10)-14</b>			
FILE:	ed10-14.dgn	DN:	TxDOT
CONT:	0003	CK:	TxDOT
REVISIONS:	01	DW:	TxDOT
		CR:	TxDOT
		JOB:	064, ETC
		HIGHWAY:	IH 10
		COUNTY:	CULBERSON
		SHEET NO.:	125

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

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

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

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

**1.0 SITE/PROJECT DESCRIPTION**

**1.1 PROJECT CONTROL SECTION JOB (CSJ):**  
0003-01-064

**1.2 PROJECT LIMITS:**  
From: **LIMITS FROM: 0.014 MI E OF US 90**  
**TO: 13.3 MI E OF US 90**  
To: **LIMITS FROM: 13.30 MI E OF US 90**  
**TO: 15.4 MI E OF US 90**

**1.3 PROJECT COORDINATES:**  
BEGIN: (Lat) **31.0368717**, (Long) **-104.8309058**  
END: (Lat) **31.0562467**, (Long) **-104.5735109**

**1.4 TOTAL PROJECT AREA (Acres):** 40.0

**1.5 TOTAL AREA TO BE DISTURBED (Acres):** 0

**1.6 NATURE OF CONSTRUCTION ACTIVITY:**  
Due to the nature of the work, no soil disturbance will be performed.

**1.7 MAJOR SOIL TYPES:**

Soil Type	Description
N/A	N/A

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

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

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

Type	Sheet #s
N/A	N/A

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

**1.9 CONSTRUCTION ACTIVITIES:**

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

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

**1.10 POTENTIAL POLLUTANTS AND SOURCES:**

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

**1.11 RECEIVING WATERS:**

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

Tributaries	Classified Waterbody
N/A	N/A

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

**1.12 ROLES AND RESPONSIBILITIES: TxDOT**

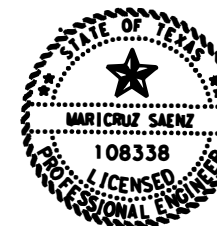
- Development of plans and specifications
- Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- Post Construction Site Notice
- Submit NOI/CSN to local MS4
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Complete and submit Notice of Termination to TCEQ
- Maintain SWP3 records for 3 years
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR**

- Day To Day Operational Control
- Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- Post Construction Site Notice
- Submit NOI/CSN to local MS4
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Complete and submit Notice of Termination to TCEQ
- Maintain SWP3 records for 3 years
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:**

MS4 Entity
N/A



*Maricruz Saenz*

10/19/2023

**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**

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Sheet 1 of 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			126
STATE	STATE DIST.	COUNTY	
TEXAS	ELP	CULBERSON	
CONT.	SECT.	JOB	HIGHWAY NO.
0003	01	064, ETC	IH 10

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

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

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

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

**T / P**

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

**2.2 SEDIMENT CONTROL BMPs:**

**T / P**

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

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

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

**T / P**

- Sediment Trap
  - Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - 3,600 cubic feet of storage per acre drained
- Sedimentation Basin
  - Not required (<10 acres disturbed)
  - Required (>10 acres) and implemented.
    - Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - 3,600 cubic feet of storage per acre drained
  - Required (>10 acres), but not feasible due to:
    - Available area/Site geometry
    - Site slope/Drainage patterns
    - Site soils/Geotechnical factors
    - Public safety
    - Other: \_\_\_\_\_

**2.3 PERMANENT CONTROLS:**

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

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
N/A	N/A	N/A

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

**2.4 OFFSITE VEHICLE TRACKING CONTROLS:**

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

**2.5 POLLUTION PREVENTION MEASURES:**

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

**2.6 VEGETATED BUFFER ZONES:**

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

Type	Stationing	
	From	To
N/A	N/A	N/A

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

**2.7 ALLOWABLE NON-STORMWATER DISCHARGES:**

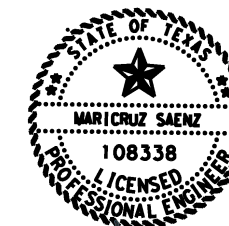
- Fire hydrant flushings
- Irrigation drainage
- Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- Potable water sources
- Springs
- Uncontaminated groundwater
- Water used to wash vehicles or control dust
- Other allowable non-stormwater discharges as allowed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

**2.8 INSPECTIONS:**

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

**2.9 MAINTENANCE:**

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.



*Maricruz Saenz P.E.*

10/27/2023

**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**

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Sheet 2 of 2

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
				127
STATE	STATE DIST.	COUNTY		
TEXAS	ELP	CULBERSON		
CONT.	SECT.	JOB	HIGHWAY NO.	
0003	01	064, ETC	IH 10	