RED. RR DIV. NO.	PROJECT NO.	SHEET NO.
6	STP 2024(381)TP	1
STATE	STATE DIST.	COUNTY
TEXAS	ODA	ECTOR
CONT SECT	JOB	HIGHWAY
0906 00	271	VARIOUS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT
FEDERAL AID PROJECT NO. STP 2024(381)TP

ECTOR COUNTY

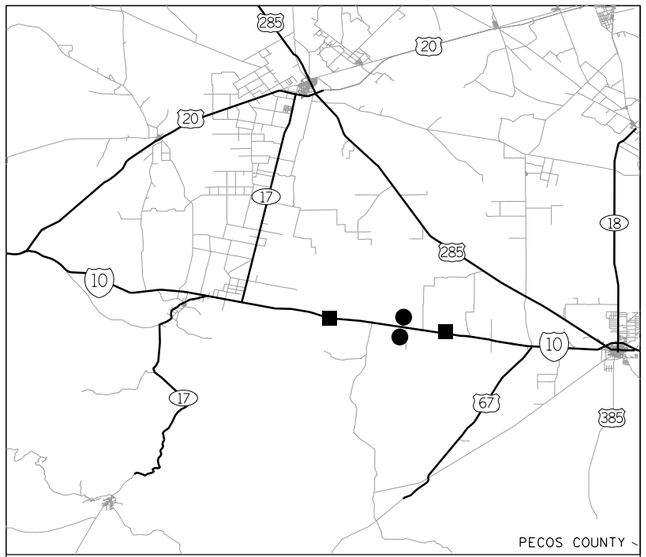
PROJECT LENGTH: NO PROJECT LENGTH

LIMITS: IH-10 - 2.2 MI W OF PECOS COUNTY LINE TO IH-10 - 4.2 MI W OF FM 1776

FOR THE CONSTRUCTION OF A TRUCK PARKING AVAILABILITY SYSTEM CONSISTING OF INSTALLATION OF ITS EQUIPMENT

INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS



EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE

FINAL PLANS

LETTING DATE: _____
DATE CONTRACTOR BEGAN WORK: _____
DATE WORK WAS ACCEPTED: _____
FINAL CONTRACT COST: $ _____
CONTRACTOR: _____

FINAL PLANS STATEMENT:

THE CONSTRUCTION WORK WAS PERFORMED IN ACCORDANCE WITH THE PLANS.

_____ P.E. _____
AREA ENGINEER DATE

TEXAS DEPARTMENT OF TRANSPORTATION

STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER
3/19/2024

STATE OF TEXAS
CHARLES D. KOONCE III
87785
LICENSED
PROFESSIONAL ENGINEER
3/19/2024

PROJ. NO. _____
COUNTY _____ LETTING DATE _____
HWY. NO. _____
DATE ACCEPTED _____

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
TBPE Firm Registration No. 420

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 2023)

Texas Department of Transportation

RECOMMENDED FOR LETTING: 3/22/2024
DocuSigned by: CC90611B31C54B1...
AREA ENGINEER

RECOMMENDED FOR LETTING: 3/22/2024
DocuSigned by: 3...
DIRECTOR OF TRANSPORTATION
PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 3/22/2024
DocuSigned by: 9CC...
DISTRICT ENGINEER

pw:\\pw-int.hntb.org:PWCentralDiv\Documents\San Antonio Projects\73627 SAT Traffic-ITS\WA03\Design and Engineering\ODA\02_General\Sheet DGN\73627_WA03_ODA_01_S_GEN_TITL.dgn

3/20/2024 5:33:59 AM

I. GENERAL

II. TRAFFIC CONTROL PLAN STANDARDS

III. ROADWAY STANDARDS

IV. ITS ITEMS

V. TRAFFIC STANDARDS

VI. ENVIRONMENTAL ISSUES

STATE OF TEXAS
CHARLES D. KOONCE III
87785
LICENSED
PROFESSIONAL ENGINEER

3/18/2024

CHARLES D. KOONCE III — DATE

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

STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER

3/18/2024

SAI GEETHA KOGANTI — DATE

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

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

INDEX OF SHEETS

SHEET 1 OF 1

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	2

3/18/2024 10:39:41 AM

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

ODA-PreLettingQuestions@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 contractor questions will be reviewed by the Engineer. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page.

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

Work under this contract shall consist of the installation of ITS equipment for a Truck Parking Availability System at various locations along I-10.

Abbreviations:
"TPAS" – Truck Parking Availability System
"DPAS" – Dynamic Parking Availability Sign
"ITS" – Intelligent Transportation System
"SRA" – Safety Rest Area
"TIC" – Travel Information Center

The following TPAS equipment will be furnished by the Department and shall be installed by the contractor at each SRA/TIC site as shown on the plans:

- Pole mounted integrated enclosures (Dimensions approx 295.5mm x 351mm x 150mm (WxHxD))
- Parking area PTZ cameras (Axis, PN01146-001, M5525-E PTZ Axis Surveillance Camera)
- Vehicle detectors (Omnisight MEGARADAR-V4; Dimensions approx 102mm x 151.3mm x 25.56 mm (WxHxD))
- All cabling/connectors from PTZ camera to pole mounted integrated enclosure
- All cabling/connectors from vehicle detector to pole mounted integrated enclosure
- All mounting hardware

TxDOT's TPAS vendor, EX2 Technology, LLC, will ship the equipment to the contractor. Do not begin installation work until the vendor representative is on-site. The vendor will provide on-site installation oversight, calibration, and system acceptance testing. The contractor shall coordinate scheduling of the installation and testing work with the vendor. Please contact Bill Loghry with EX2 Technology, LLC at (402) 506-9649 to coordinate shipping the equipment, scheduling the work, and

for any questions about the above listed equipment. The contractor shall mount the Department supplied cameras, vehicle detectors, and integrated enclosure cabinets on the ITS poles per the vendor recommendations.

Overhead and underground utilities exist in the vicinity of this project. The exact location of underground utilities is not known. Locate and verify all overhead and underground utilities in the project area prior to beginning work so that conflicts are avoided. Provide all equipment necessary for locating the utilities, locate and mark the utilities prior to doing any earthwork in the area. Consider this work incidental to the various bid items. Coordinate with the utility companies and notify the Engineer of any possible conflicts.

As-builts or plans of the safety rest areas, that were available at the time these plans were developed, were used to make some adjustments to locations of the proposed ITS infrastructure including conduit, ground boxes, and poles in order to avoid utilities. However, the exact location of underground utilities is not known. The contractor shall verify and locate all utilities before beginning construction. These as-builts and plans may not reflect the current site conditions. The contractor may request a copy of these as-builts and plans from the district office.

Caution should be taken prior to excavation where underground utilities may exist and run in conflict with the proposed route of the new conduits. It is the contractor's responsibility to locate all of them before excavation. In the event that any part of the existing underground utilities are damaged during construction, the contractor will repair or replace the damaged equipment immediately at no cost to the Department. Consider the cost for locating existing underground utilities subsidiary to various bid items.

In accordance with the Underground Facility Damage Prevention Act (One Call Bill) the phone number for a utility locator is 811. It is the Contractor's responsibility to call and plan for utility locators.

Location of overhead utilities shown on the plans are approximate and are not based on survey data. The contractor shall ensure that all work meets requirements for minimum clearance to overhead utilities.

Utility contact information is as follows:

Location Name	Rest Area or DPAS	Utility Company Name	Contact Person	Email	Phone	Address
Pecos County EB	Rest Area	Rio Grande Electric	Larry Powell	lpowell@rgec.coop	830-563-6178	778 E US HWY 90, Brackettville, TX 78832
Pecos County EB	DPAS	Rio Grande Electric				
Pecos County WB	Rest Area	Rio Grande Electric				
Pecos County WB	DPAS	Texas-New Mexico-Power	Mike Lawrence	Mike.laurence@tnmp.com	432-940-0426	1400 N Main St, Fort Stockton, TX 79735

The contractor shall limit all work activities to within the right of way. The contractor shall ensure that all infrastructure installation is within the right of way.

ITS equipment and conduit locations are approximate; the precise location is to be determined in the field, therefore the Contractor should not scale equipment off of plan sheets. Plan sheets are to be used for visual location (vicinity). Equipment locations may have to be adjusted due to conflicts with utilities or other structures, as approved by the Engineer
Assume full responsibility for the preservation of all sod, shrubbery, and trees at the site during construction. Carefully preserve and replace, in their original position, all sod and shrubbery removed. Replace all Contractor damaged sod or shrubbery at the Contractor's own expense.

Item 2. Instructions to Bidders

This project includes technical qualification for ITS work. See special provision to Item 2 for more information.

Item 6: Control of Materials

Restrict storage of equipment and materials to approved areas. The Engineer will not approve storage in any TxDOT yard.

Promptly and properly dispose of any waste generated from servicing equipment on 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.

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

The Buy America Material Classification Sheet is located at the below link.
https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

Item 7: Legal Relations and Responsibilities

If access to the project is required through a new or unapproved driveway (i.e. Material source, stockpile location, field office, etc.), obtain an approved "Permit to Construct Access Driveway Facilities on Highway Right Of Way" (TxDOT Form 1058) before beginning any construction operations.

Utilities (public, private and TxDOT) exist throughout the project. Prior to any excavation, investigate to determine the utility locations within the project right of way. Contact the TxDOT

Odessa Traffic Operations shop at 432-498-4690 to investigate and determine the location of any TxDOT utility that may exist within the project right of way. Exercise caution when excavating in areas where investigations have determined that utilities exist. The contractor is responsible for maintaining utility markings.

No significant traffic generator events identified.

As an element of ensuring public safety and convenience under Article 7.2.4, the Contractor is hereby directed to open all closed lanes and shoulder and remove all traffic control devices from any areas where work is not being actively performed unless overnight traffic control is required and approved by the engineer. Removed devices must be stored outside of the clear zones near the right of way line or removed from the right of way line entirely.

Item 8: Prosecution and Progress

Maintain ingress and egress to side streets and private property at all times.

Maintain ingress and egress to the frontage roads at all times.

Initiate the installation of Item 628 "Electrical Services" as part of the initial work sequence to allow TxDOT the lead-time necessary for coordination with utility companies to establish and provide for electrical service(s) proposed for this project.

Working days will be computed and charged in accordance with Article 8. 3.1.4. "Standard Workweek."

90 day lead time is needed to allow for sufficient time to obtain and produce materials needed for various bid items in this project.

Item 416: Drilled Shaft Foundations

Stake all Foundations, for approval, before beginning drilling operations. Obtain approval of placement prior to placing concrete.

Remove spoils from site at the end of each work day.

Cover drilled shafts with plywood and delineate them with cones, to the satisfaction of the Engineer, when not working in them and after work hours.

Item 432: Riprap

Use approved expansion joint material and place between the proposed riprap and curb and gutter.

Reinforce all riprap on this project with no. 3 bars spaced 12 inches O.C.B.W. or no. 4 bars spaced at 18 inches O.C.B.W.

Broom finish all riprap on this project unless otherwise directed.
In addition to reinforcing steel, polypropylene fiber is required at a rate of 1.5 lbs. /cy.

Item 502: Barricades, Signs, and Traffic Handling

Place orange fencing around sidewalk, wheelchair ramps and other pedestrian areas that pose a hazard to pedestrian traffic as directed.

Place chevrons, at a minimum, on every other drum used for outsides of curves, merging tapers and shifting tapers.

Vertical panels shall be self-righting.

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

Provide orange construction fencing as approved at all work locations, including but not limited to all bore pit locations, to protect pedestrians. This material and its placement will be considered subsidiary to Item 502.

Item 506: Temporary Erosion, Sedimentation, and Environmental Controls

It is not anticipated that erosion control devices will be needed on this project. In the event that devices are needed, payment for the work may be determined in accordance with Item 4, Article 4. "Changes in the Work".

Item 540: Metal Beam Guard Fence

Provide steel post for this project.

Complete the installation of metal beam guard fence before installing DPAS and cabinet.

Item 618: Conduit

Place a single continuous piece of warning tape in accordance with this item along the entire length of each underground conduit installation. Locate warning tape approximately twelve inches above conduit as indication that a buried electrical line exists below the tape. Cement stabilized backfilled conduit is exempt from this requirement. Comply with warning tape requirements for any installation of buried conduit, including portions of conduit located outside of cement stabilized backfill.

When shown on the plans as bored conduit, install conduit by an approved directional boring method.

Ensure open trenches and excavations are filled at the end of each work day.

Close the bore pit holes during non-working hours.

Maintain a minimum 24" depth from finish grade to top of conduit for conduit proposed beneath pavement.

Use an approved ditching method.

Prevent dirt and debris from entering raceways during construction by temporarily capping both ends of open raceways. Other than conduit raceways that are intended to remain unused, fit each exposed end of raceways with a bushing. Where steel raceway is used, install a ground-type bushing and connect the bushing and ground rod with a bonding jumper.

The locations of conduit and ground boxes are diagrammatic and may be shifted, as directed, to accommodate field conditions.

Item 620: Electrical Conductors

Note the requirements of Item 7, Article 18. Electrical Requirements, of the standard specifications.

Do not exceed four hundred and fifty feet between ground boxes where conduit and conductor is used.

Electrical conductor sizes and quantities are based on estimated location of power source. Final location of utility provider power source to be approved by TxDOT to ensure location is within allowable distance.

Item 624: Ground Boxes

Location and estimated number of ground boxes are diagrammatic only and may vary to accommodate field conditions as directed.

Item 628: Electrical Services

Before construction or installation of any electrical service(s) on this project, contact TxDOT Odessa Traffic Operations shop at 432-498-4690 to facilitate coordination with the appropriate energy company or companies.

Physically identify the location for each proposed electrical service on the project, and request the physical address for each proposed electrical service identified from the electric utility company. Permanently mark the physical address of any proposed electrical service on the respective meter base lid. Use one of two methods for permanent marking. For the preferred method of marking, use an approved die-stamp, with a minimum ½" height of alpha-numeric characters and stamp physical address on meter base lid. After stamping, apply coating of zinc-rich paint to the stamped area. Do not damage meter base. Replace meter base if determined by the Engineer as damaged or

unacceptable. No additional compensation will be made for replacement of meter bases in the event an unacceptable determination is made. When approved, use an alternate method of marking by providing a brass or aluminum plate tag with the physical address embossed by a machine-stamp process. Affix this tag to the meter base by a method approved by the Engineer. Provide a sample of a stamped plate tag for approval of this alternate method. The permanent physical address is required to be marked on the meter base prior to initiation of electrical service. Materials, labor, tools, equipment and incidentals necessary to complete this work will be considered as subsidiary to Item 628, "Electrical Services".

Use materials from the Prequalified Material Producer Lists as shown on the Texas Department of Transportation (TxDOT) – Construction Division's (CST) Material Producer List. See TxDOT website (www.TxDOT.gov) - business > resources > material producer list - for list of prequalified manufacturers. Category is "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials found on this list."

For incidental material and parts necessary for construction of electrical services, including the service entrance weather-head, rigid metal conduit (RMC) and PVC conduit, conduit fittings, service conductors, circuit breakers, ground rods and clamps, grounding bushing(s), and mounting hardware including straps and channel brackets for conduit support, furnish products and/or materials that comply with the plans and specifications. Prior to construction of any electrical service, submit to the Engineer respective catalog cut sheets for incidental materials and parts. Electrical services constructed of materials or parts which do not comply with the plans and specifications will be cause for rejection of a portion or all of the work.

The location of the service poles as shown are approximate.

Primary line extensions, connection charges, meter charges, and other charges by the utility company providing power to the location shown, when required, are paid for by force account work. Obtain the Engineer's approval for the costs associated with these charges before engaging the utility company to perform the work.

Item 636: Signs

Use established industry and utility safety practices and comply with Federal, State and Local regulations when erecting signs near any overhead or underground utility. Consult with the appropriate utility company prior to beginning such work.

Item 647: Large Roadside Sign Supports and Assemblies

The post lengths shown on the Summary Of Large Signs are approximations only. Verify the post lengths to meet the existing field conditions, and submit actual post lengths to the Engineer for approval. Post lengths and size shall be approved the Engineer before fabrication.

Stake all new ground mounted large sign supports locations and obtain approval from the Engineer before beginning construction of sign supports and assemblies.

Proposed DPAS sign location coordinates shown on the plans are approximate. Verify proposed locations to meet existing field conditions.

Ensure lateral placement and sign heights for all proposed signs are in accordance the TMUTCD (2A.18) and TxDOT standards.

Item 658: Delineator and Object Marker Assemblies

Delineator and object marker assembly posts shall be composed of post-consumer recycled materials. Embedded stub shall be perforated square tubing.

Item 6028: Dynamic Message Sign System

All three-character dynamic message sign modules and cabinets for the DPAS signs will be furnished by TxDOT. Three-character dynamic message sign modules will be Daktronics VM-1020-7X15-66. DPAS cabinet will be Daktronics type 334 ground mount. Contact Scott Benavidez with the Odessa District at 432-498-4686 or 432-634-7226 in advance to schedule pick up. All costs associated with pick up and transport of the sign modules and cabinets from the storage site to the final project locations shall be considered incidental to this Item.

See ITS (21)-15 for ground mounted cabinet foundation.

Item 6064: Intelligent Transportation System (ITS) Pole with Cabinet

ITS poles within the Safety Rest Areas shall be located a minimum of 10 ft from the edge of pavement as shown in the plans or as directed by the Engineer.

Item 6185: Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

The Contractor will be responsible for determining if one or more operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

Items 6123 Ethernet Switch (Install Only) and 6511 Cellular Modem (Install Only)

Cellular modems and Ethernet switches with power supplies will be furnished by the department. Equipment provided by the department shall be stored by the department for pick up at the Odessa District Office.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0906-00-271 **DISTRICT** Odessa **COUNTY** Ector
HIGHWAY Various

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0906-00-271**			
		PROJECT ID		**A00193658**			
		COUNTY		**Ector**			
		HIGHWAY		**Various**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	416-6004	DRILL SHAFT (36 IN)	LF	60.000		60.000	
	416-6006	DRILL SHAFT (48 IN)	LF	42.000		42.000	
	416-6018	DRILL SHAFT (SIGN MTS) (24 IN)	LF	58.000		58.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	7.500		7.500	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	42.930		42.930	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	6.000		6.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	725.000		725.000	
	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	3,110.000		3,110.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	140.000		140.000	
	618-6070	CONDT (RM) (2")	LF	80.000		80.000	
	620-6003	ELEC CONDR (NO.12) BARE	LF	115.000		115.000	
	620-6004	ELEC CONDR (NO.12) INSULATED	LF	230.000		230.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF	400.000		400.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	3,275.000		3,275.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	975.000		975.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	1,390.000		1,390.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	3,600.000		3,600.000	
	620-6015	ELEC CONDR (NO.2) BARE	LF	2,165.000		2,165.000	
	620-6016	ELEC CONDR (NO.2) INSULATED	LF	3,830.000		3,830.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	20.000		20.000	
	628-6152	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	EA	5.000		5.000	
	636-6002	ALUMINUM SIGNS (TY G)	SF	364.000		364.000	
	647-6001	INSTALL LRSS (STRUCT STEEL)	LB	2,066.540		2,066.540	
	658-6015	INSTL DEL ASSM (D-SW)SZ (BRF)GF1	EA	28.000		28.000	
	6010-6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	2.000		2.000	
	6010-6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	2.000		2.000	
	6028-6002	INSTALL DMS (FOUNDATION MTD CABINET)	EA	2.000		2.000	
	6064-6010	ITS POLE (30 FT)(90 MPH)	EA	4.000		4.000	
	6064-6055	ITS POLE (60 FT)(90 MPH)	EA	2.000		2.000	
	6064-6080	ITS POLE MNT CAB (TY 2)(CONF 1)	EA	2.000		2.000	
	6064-6097	ITS POLE MNT CAB (SPL)(INTEGRATED)(INS)	EA	6.000		6.000	
	6123-6001	ETHERNET SWITCH (INSTALL ONLY)	EA	4.000		4.000	
	6185-6002	TMA (STATIONARY)	DAY	12.000		12.000	
	6511-6001	CELLULAR MODEM (INSTALL ONLY)	EA	4.000		4.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0906-00-271 **DISTRICT** Odessa **COUNTY** Ector
HIGHWAY Various

		CONTROL SECTION JOB		**0906-00-271**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00193658**			
		COUNTY		**Ector**			
		HIGHWAY		**Various**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	6513-6001	TPAS VEH DET SYS (INSTALL ONLY)	EA	4.000		4.000	
	16	MATERIAL FURNISHED BY THE STATE (PARTICIPATING)	LS	1.000		1.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		ELECTRICAL: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

SUMMARY OF QUANTITIES	416 6004	416 6006	416 6018	432 6001	432 6045	540 6002	540 6016	544 6001	618 6023	618 6047	618 6070	620 6003
SHEET NAME	DRILL SHAFT (36 IN)	DRILL SHAFT (48 IN)	DRILL SHAFT (SIGN MTS) (24 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 80) (2") (BORE)	CONDT (RM) (2")	ELEC CONDR (NO.12) BARE
	LF	LF	LF	CY	CY	LF	EA	EA	LF	LF	LF	LF
PECOS DPAS EB SHT 1 OF 1			29		11.41	212.50	1	1	95		40	60
PECOS EB SHT 1 OF 3	15			1.25					145			
PECOS EB SHT 2 OF 3		21		1.25					730			
PECOS EB SHT 3 OF 3	15			1.25					145			
PECOS DPAS WB SHT 1 OF 1			29		10.42	187.50	1	1	55	85	40	55
PECOS WB SHT 1 OF 4	15			1.25					255	55		
PECOS WB SHT 2 OF 4									500			
PECOS WB SHT 3 OF 4		21		1.25	21.10	325.00	1	1	745			
PECOS WB SHT 4 OF 4	15			1.25					440			
TOTAL	60	42	58	7.5	42.93	725.00	3	3	3110	140	80	115

SUMMARY OF QUANTITIES	620 6004	620 6007	620 6008	620 6009	620 6010	620 6012	620 6015	620 6016	624 6002	628 6152	636 6002	647 6001
SHEET NAME	ELEC CONDR (NO.12) INSULATED	ELEC CONDR (NO.8) BARE	ELEC CONDR (NO.8) INSULATED	ELEC CONDR (NO.6) BARE	ELEC CONDR (NO.6) INSULATED	ELEC CONDR (NO.4) INSULATED	ELEC CONDR (NO.2) BARE	ELEC CONDR (NO.2) INSULATED	GROUND BOX TY A (122311)W/APRON	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	ALUMINUM SIGNS (TY G)	INSTALL LRSS (STRUCT STEEL)
	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	SF	LB
PECOS DPAS EB SHT 1 OF 1	120	85	255						2	1	182	1052.74
PECOS EB SHT 1 OF 3		175	350						2	1		
PECOS EB SHT 2 OF 3			1640	810	1060				4	1		
PECOS EB SHT 3 OF 3				165	330				1			
PECOS DPAS WB SHT 1 OF 1	110	140	420						2	1	182	1013.80
PECOS WB SHT 1 OF 4			610			640	370	320	4	1		
PECOS WB SHT 2 OF 4						2080	520	1040	1			
PECOS WB SHT 3 OF 4						880	805	1530	2			
PECOS WB SHT 4 OF 4							470	940	2			
TOTAL	230	400	3275	975	1390	3600	2165	3830	20	5	364	2066.54

SUMMARY OF QUANTITIES	658 6015	6010 6002	6010 6011	6028 6002	6064 6010	6064 6055	6064 6080	6064 6097	6123 6001	6185 6002
SHEET NAME	INSTL DEL ASSM (D-SW)SZ (BRF)GF1	CCTV FIELD EQUIPMENT (DIGITAL)	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	INSTALL DMS (FOUNDATION MTD CABINET)	ITS POLE (30 FT) (90 MPH)	ITS POLE (60 FT) (90 MPH)	ITS POLE MNT CAB (TY 2) (CONF 1)	ITS POLE MNT CAB (SPL) (INTEGRATED) (INS)	ETHERNET SWITCH (INSTALL ONLY)	TMA (STATIONARY)
	EA	EA	EA	EA	EA	EA	EA	EA	EA	DAY
PECOS DPAS EB SHT 1 OF 1	8			1					1	
PECOS EB SHT 1 OF 3					1			1		
PECOS EB SHT 2 OF 3		1	1			1	1	1	1	
PECOS EB SHT 3 OF 3					1			1		
PECOS DPAS WB SHT 1 OF 1	7			1					1	
PECOS WB SHT 1 OF 4					1			1		
PECOS WB SHT 2 OF 4										
PECOS WB SHT 3 OF 4	13	1	1			1	1	1	1	
PECOS WB SHT 4 OF 4					1			1		
TOTAL	28	2	2	2	4	2	2	6	4	12

SUMMARY OF QUANTITIES	6511 6001	6513 6001	*	*	*	*	*	*	*
SHEET NAME	CELLULAR MODEM (INSTALL ONLY)	TPAS VEH DET SYS (INSTALL ONLY)	CELLULAR ROUTER	FIELD ETHERNET SWITCH	TPAS VEHICLE DETECTION SYSTEM	AXIS PTZ CAMERA	POLE MOUNTED INTEGRATED ENCLOSURE CABINET	SINGLE LINE DMS 3-CHARACTER (AMBER)	CONTROLLER AND GROUND MOUNT CABINET
	EA	EA	EA	EA	EA	EA	EA	EA	EA
PECOS DPAS EB SHT 1 OF 1	1		1	1				3	1
PECOS EB SHT 1 OF 3		1			1		1		
PECOS EB SHT 2 OF 3	1		1	1		1	1		
PECOS EB SHT 3 OF 3		1			1		1		
PECOS DPAS WB SHT 1 OF 1	1		1	1				3	1
PECOS WB SHT 1 OF 4		1			1		1		
PECOS WB SHT 2 OF 4									
PECOS WB SHT 3 OF 4	1		1	1		1	1		
PECOS WB SHT 4 OF 4		1			1		1		
TOTAL	4	4	4	4	4	2	6	6	2

NOTES:
* ITEM TO BE FURNISHED BY TXDOT AND INSTALLED BY THE CONTRACTOR.

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

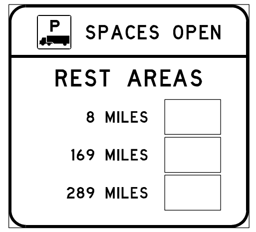
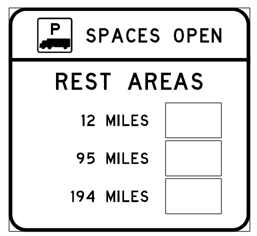
SUMMARY OF QUANTITIES

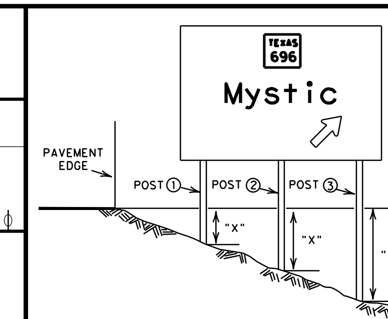
SHEET 1 OF 1

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	5

3/18/2024 10:39:57 AM

SUMMARY OF LARGE SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN BACK-GROUND COLOR	SIGN TEXT	SIGN DIMENSIONS	PLAQUES, & OTHER ATTACHMENTS		BACKGROUND SUBSTRATE (SQ FT)				TYPE OF MOUNT	"X" DIMENSION ◒			GALVANIZED STRUCTURAL STEEL					DRILLED SHAFT			
					DIRECT APPLY	✱ ALUMINUM (TYPE A)	GROUND MOUNT (TYPE G)		OVERHEAD (TYPE O)			post ①	post ②	post ③	SIZE	LINEAR FEET			TOTAL WEIGHT LBS.	LINEAR FEET			
							REPLACE	INSTALL	REPLACE	INSTALL						post ①	post ②	post ③		NON-REINF 12"ϕ	REINFORCED 24"ϕ	30"ϕ	36"ϕ
		BLUE		2'0'' X 2'0''	4.00																		
40	DPAS #1	BLUE		14'0'' X 14'0''				196.00			221	0.48	1.19		W10X22	21.48	22.19		1052.74		29.00		
		BLUE		2'0'' X 2'0''	4.00																		
45	DPAS #2	BLUE		14'0'' X 13'0''				182.00			221	0.62	1.28		W10X22	20.62	21.28		1013.80		29.00		
PAGE TOTALS								378.00											2066.54		58.00		



◒ The "X" dimension is the elevation difference at the post between the ground and the edge of pavement or top of curb.

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.

The post lengths listed here are approximations, The corrected post lengths will be furnished by the Contractor after the stud posts are placed.

Tower heights shall be verified with the Engineer before fabrication.

✱ This column is for aluminum Type A and not direct apply. Direct apply is subsidiary to the sign.

SIGN TYPE

SIGN TYPE 1 3 0
- 1 — Wind Design Zone
- 3 — No. of Posts
- 0 — Series No.: 0 Aluminum/Fiberglass, 1 Aluminum, 2 Fiberglass

SCALE : NTS

See sheet SMD(8W1)

I-10

SHEET 1 OF 1

SUMMARY OF LARGE SIGNS

SOLS

DN.: TxDOT	REVISIONS	
CK.: TxDOT	11-93	1-04
DW.: TxDOT	8-95	9-08
CK.: TxDOT	5-01	

CONT	SECT	JOB	HIGHWAY
0906	00	271	VARIOUS
DIST	COUNTY		SHEET NO.
ODA	ECTOR, ETC		6

LOC NO.	DPAS LOCATION	FURNISH TMA/TA	RELOCATE/REUSE TMA/TA	TOTAL TMA/TA PER SET UP	DURATION OF TMA/TA SET UP	6185 6002 TMA (STATIONARY)
		EA	EA	EA	DAYS PER TMA/TA USE	DAY
DPAS #1	PECOS COUNTY EB	1		1	6	6
DPAS #2	PECOS COUNTY WB	1		1	6	6
	TOTALS	2				12

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TRUCK MOUNTED ATTENUATOR (TMA) AND TRAILER ATTENUATOR (TA) SUMMARY SHEET

SHEET 1 OF 1

STATE	DISTRICT	COUNTY	HWY NUMBER
TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
CONTROL	SECTION	JOB	SHEET NUMBER
0906	00	271	7

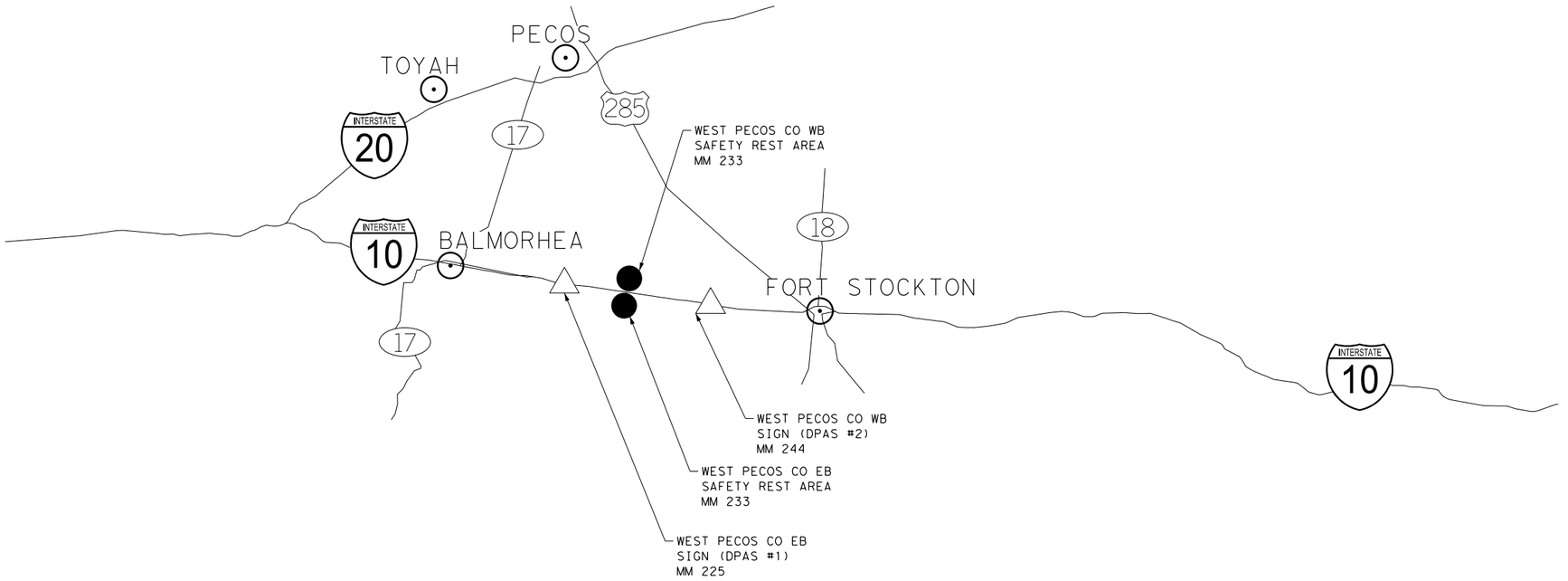
3/18/2024 10:40:03 AM

PDF Filename: 0023 - EL PASO COUNTY/FABENS SAFETY REST AREA I-10 EASTBOUND ITS LAYOUT SHEET 2 OF 2.pdf

pw:\\pw-int.hntb.org:PWCentralDiv\Documents\San Antonio Projects\73627 SAT Traffic-ITS\WA03\Design and Engineering\ODA\02_General\Sheet DGN\73627_WA03_ODA_TMA_01.dgn

LEGEND

- EXISTING SAFETY REST AREA
- PROPOSED SIGN
- CITY LOCATION



STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER
3/18/2024

SCALE : NTS

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

I-10 TPAS
LOCATION MAP

SHEET 1 OF 1

STATE	DISTRICT	COUNTY	HWY NUMBER
TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
CONTROL	SECTION	JOB	SHEET NUMBER
0906	00	271	8

3/18/2024 10:40:05 AM

PDF Filename: 0010 - FORT STOCKTON SAFETY SAFETY REST AREA I-10 WESTBOUND LOCATION MAP SHEET 1 OF 1.pdf

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

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

Texas Department of Transportation

Traffic Safety Division Standard

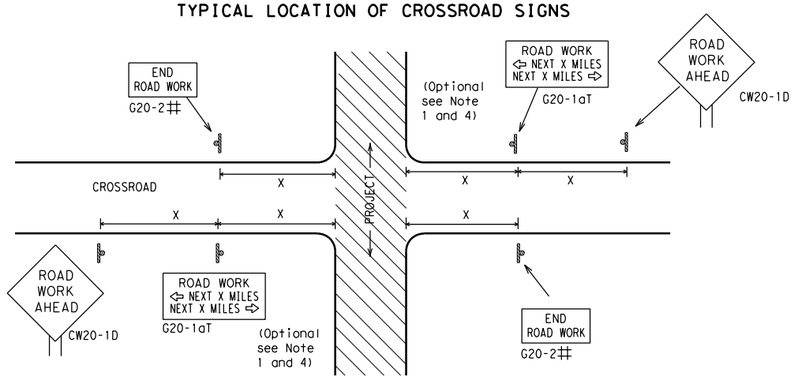
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13	0906	00	271	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	ODA	ECTOR, ETC.		9

DATE: 3/18/2024 12:00:53 PM
FILE: bc-21.dgn

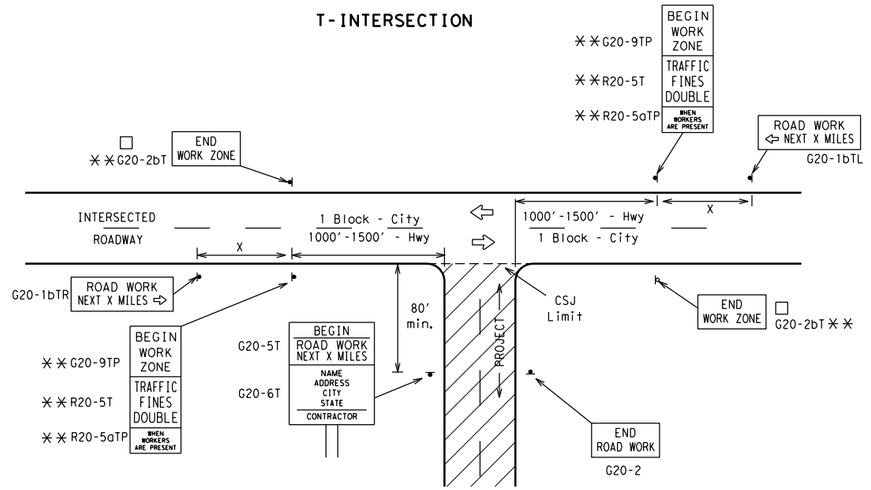
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

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

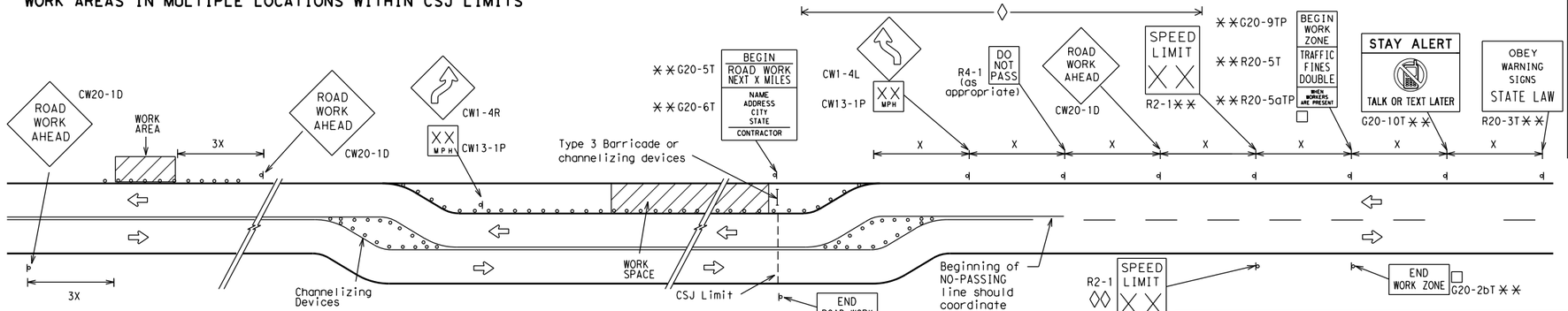
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

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

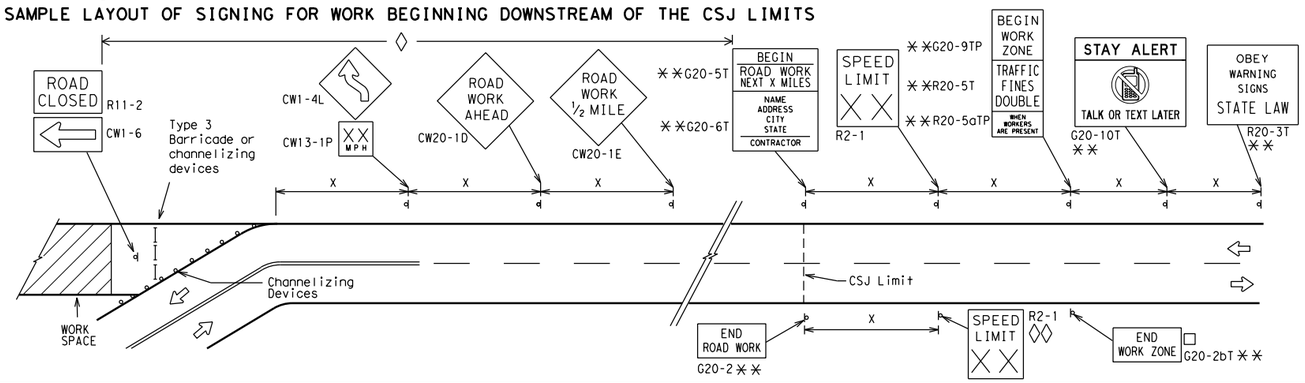
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE 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



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.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	ECTOR, ETC.		10

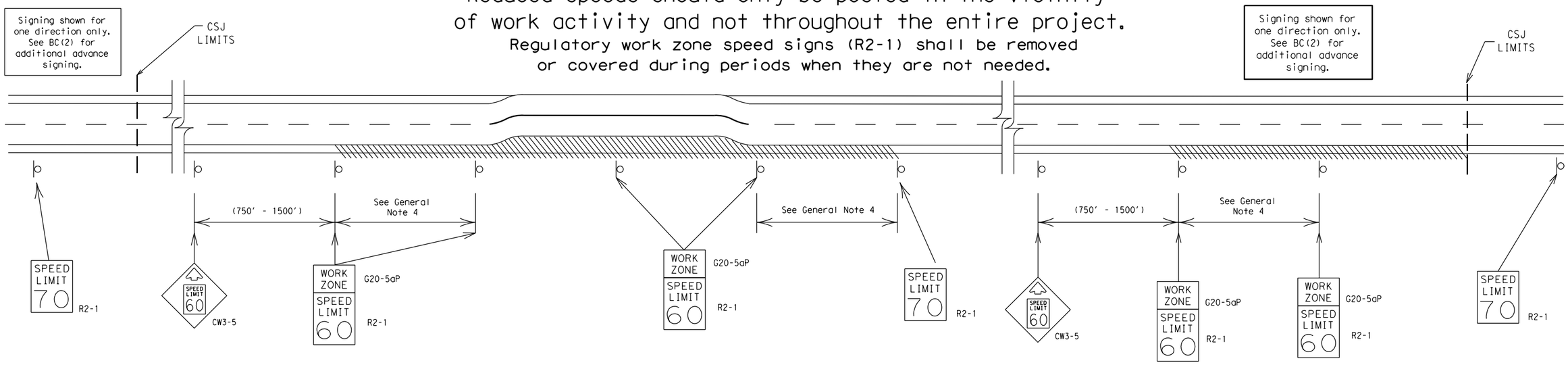
DATE: 3/18/2024 12:00:55 PM
FILE: bc-21.dgn

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

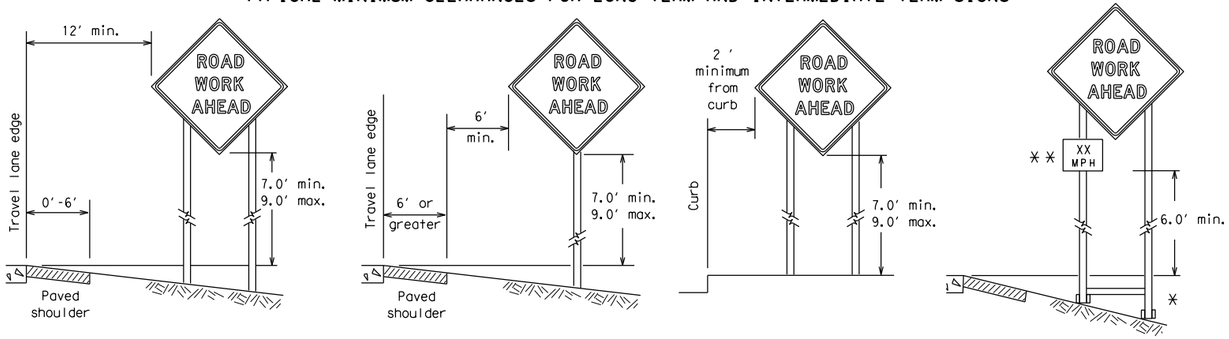
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	ECTOR, ETC.		11

DATE: 3/18/2024 12:00:58 PM
FILE: bc-21.dgn

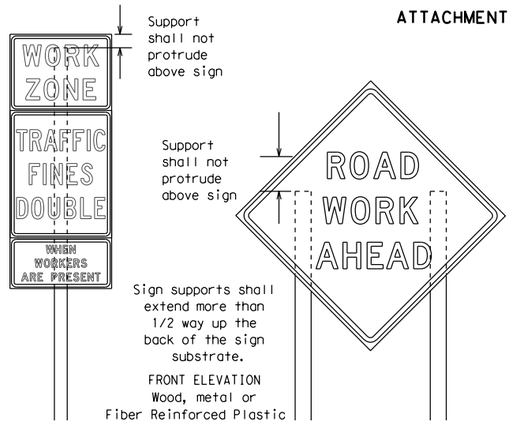
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



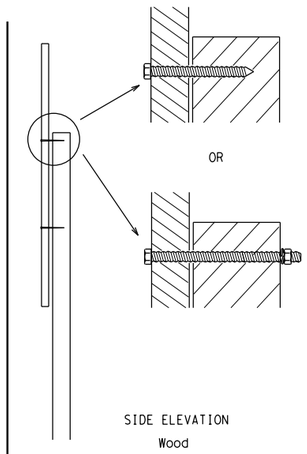
⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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



FRONT ELEVATION
Wood, metal or
Fiber Reinforced Plastic



SIDE ELEVATION
Wood

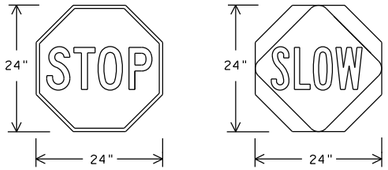
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	ECTOR, ETC.		12

DATE: 3/18/2024 12:01:00 PM
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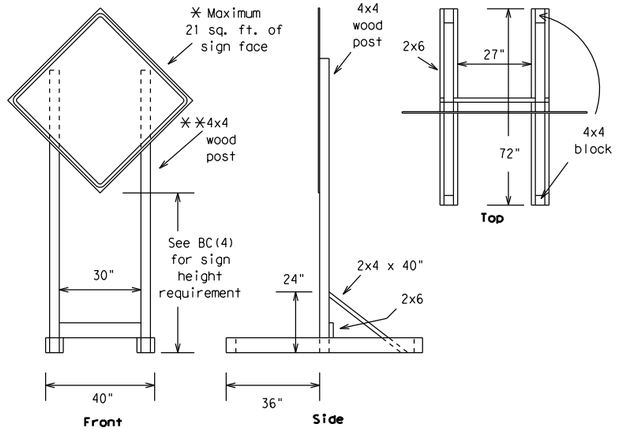
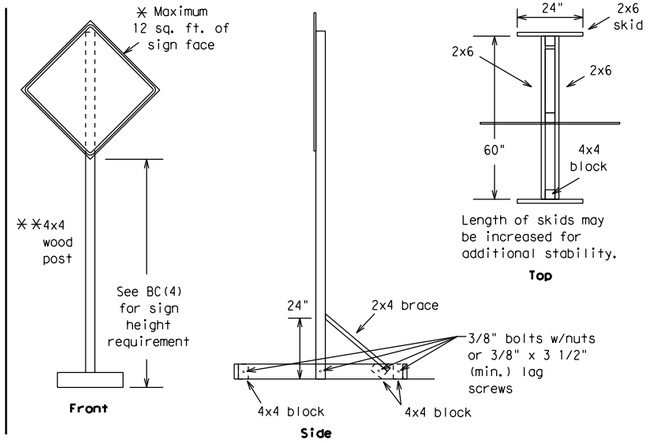
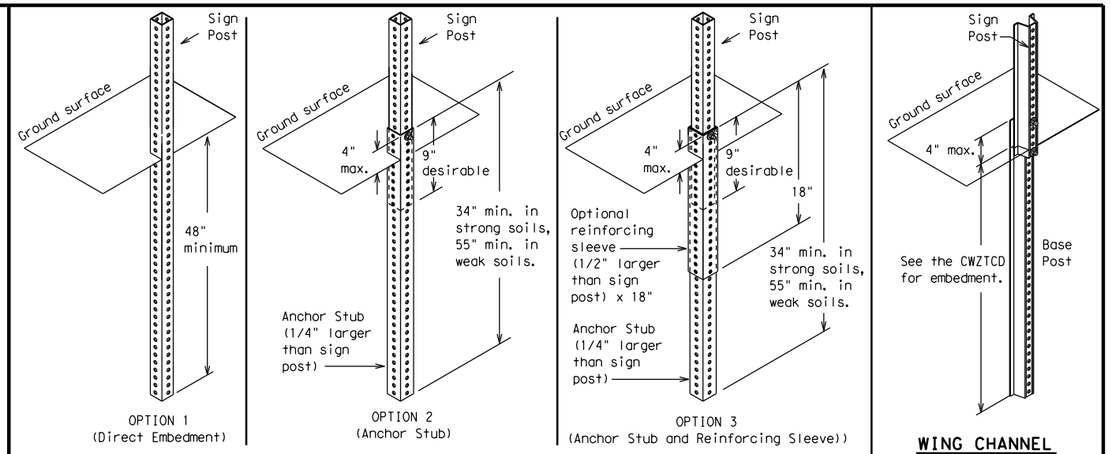




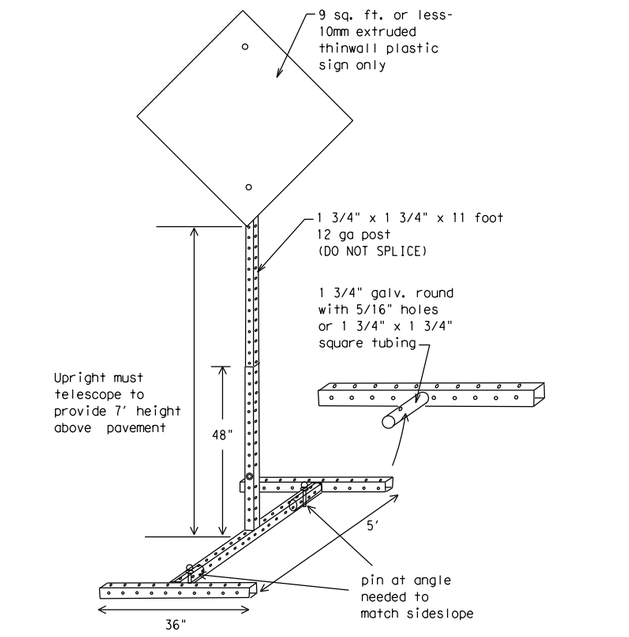
SKID MOUNTED WOOD SIGN SUPPORTS

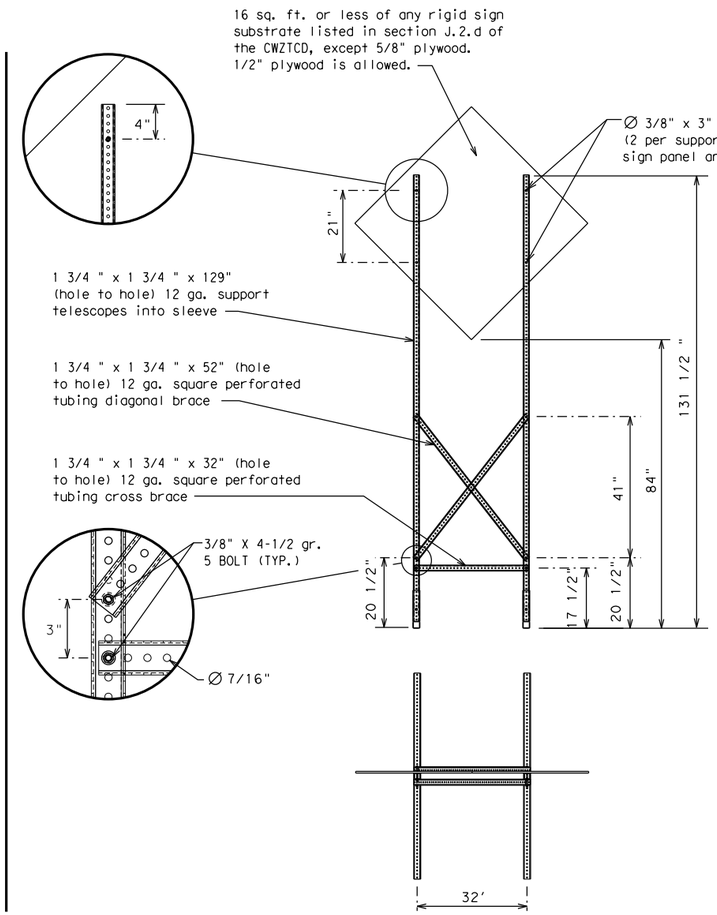
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

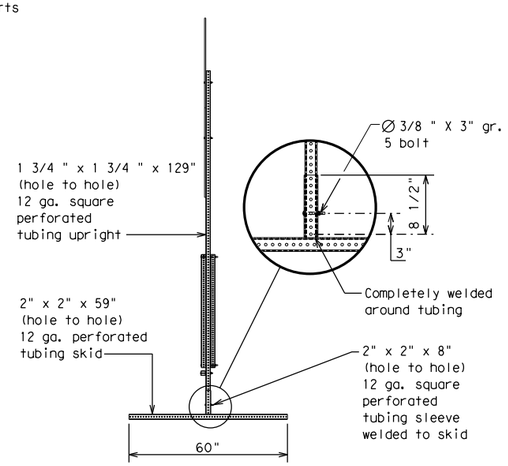


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	ECTOR, ETC.		13

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

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	ECTOR, ETC.		14

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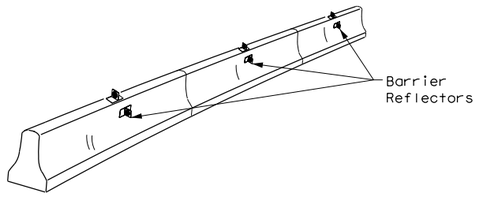
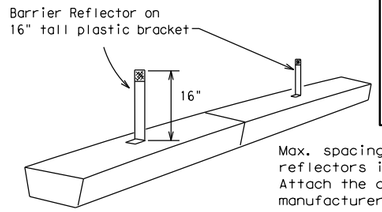
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



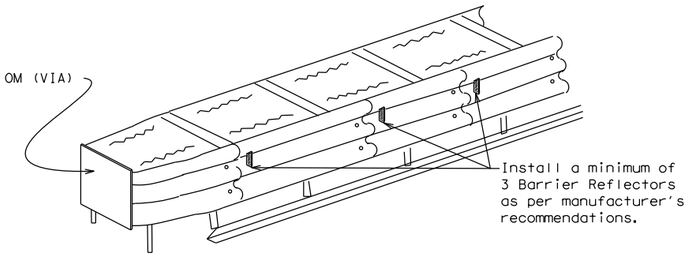
CONCRETE TRAFFIC BARRIER (CTB)

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



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

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

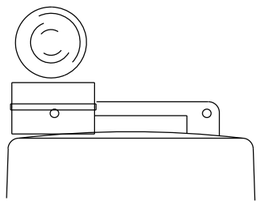
LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

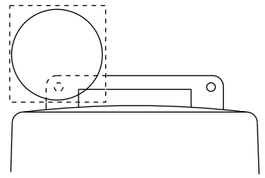
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

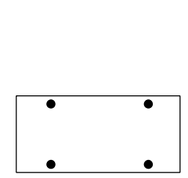
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

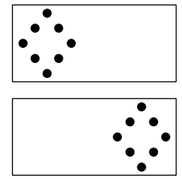
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

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

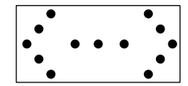


4 CORNER CAUTION

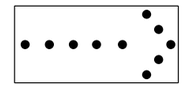
OR



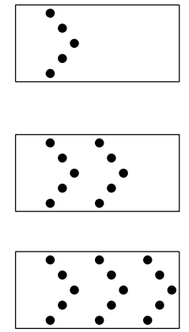
ALTERNATING DIAMOND CAUTION



DOUBLE ARROW



RIGHT/LEFT ARROW
(right arrow shown; left is similar)



RIGHT/LEFT SEQUENTIAL CHEVRON
(right chevron shown; left is similar)

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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	ECTOR, ETC.		15

101

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

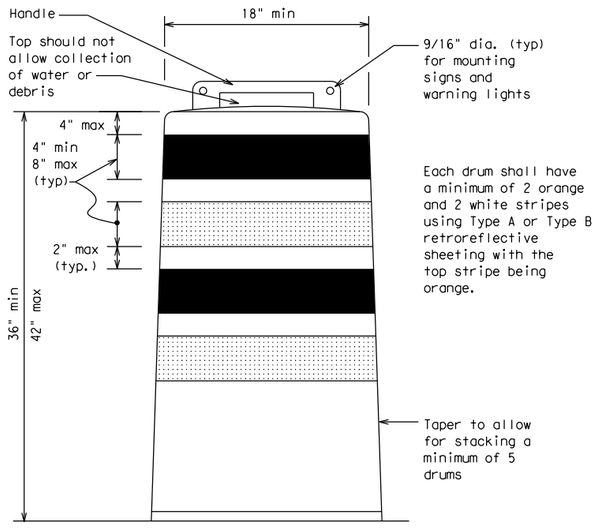
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

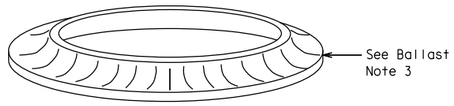
RETROREFLECTIVE SHEETING

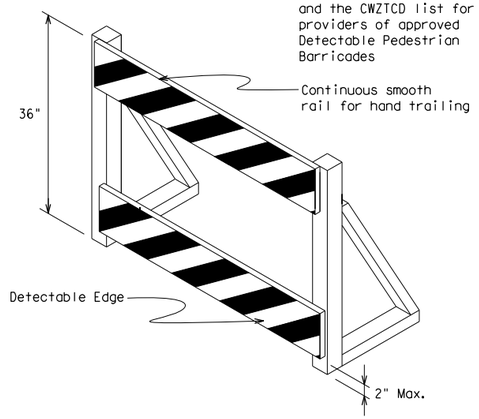
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

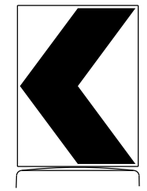




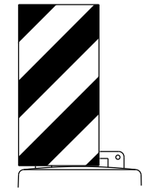


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	ODA	ECTOR, ETC.		16
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102

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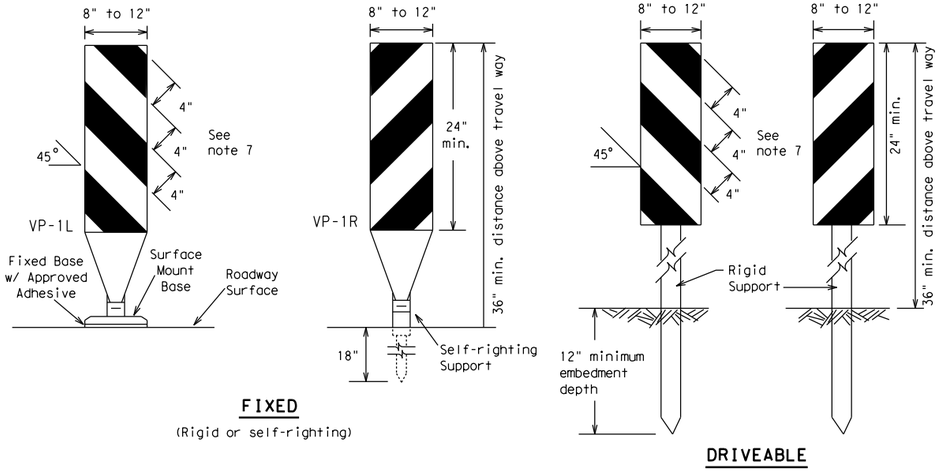
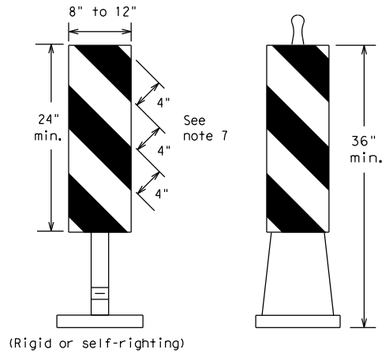


FIXED
(Rigid or self-righting)

DRIVEABLE

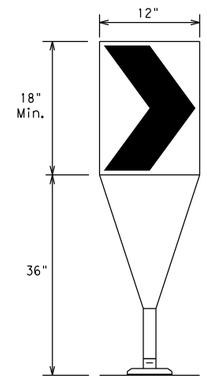


(Rigid or self-righting)

PORTABLE

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

VERTICAL PANELS (VPs)



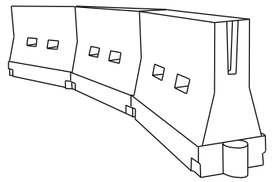
Fixed Base w/ Approved Adhesive
(Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

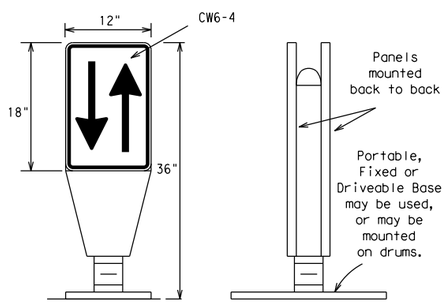
1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-13 5-21	ODA	ECTOR, ETC.		17

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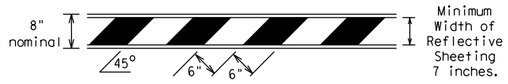
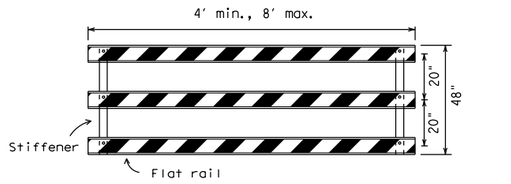
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



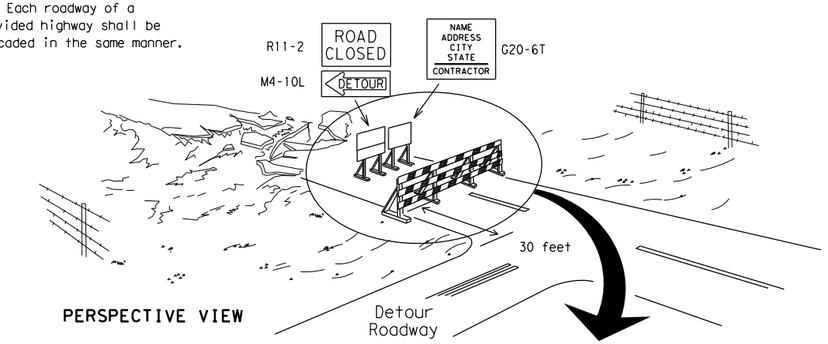
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

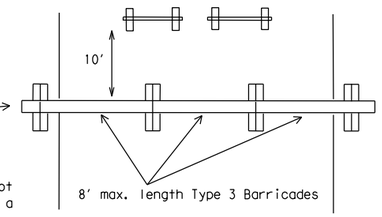
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

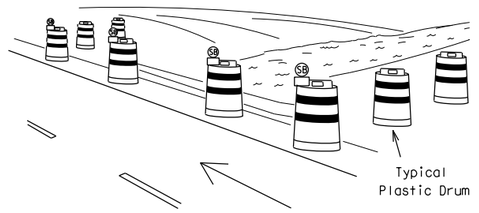
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

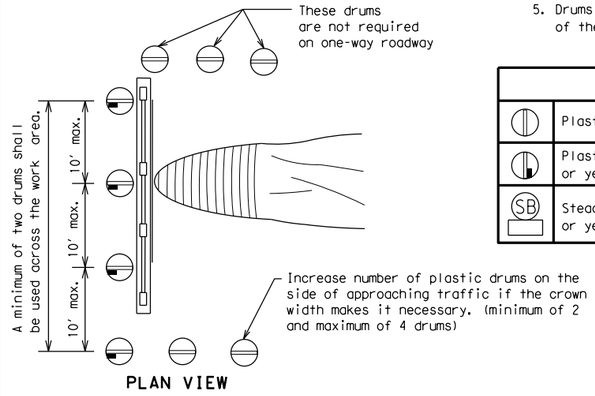
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

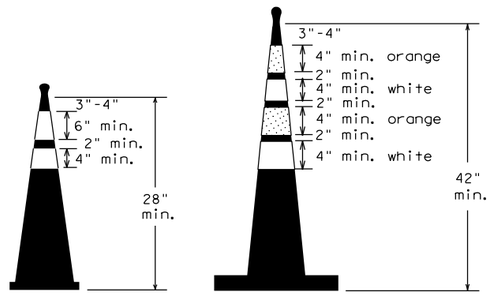
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

PLAN VIEW

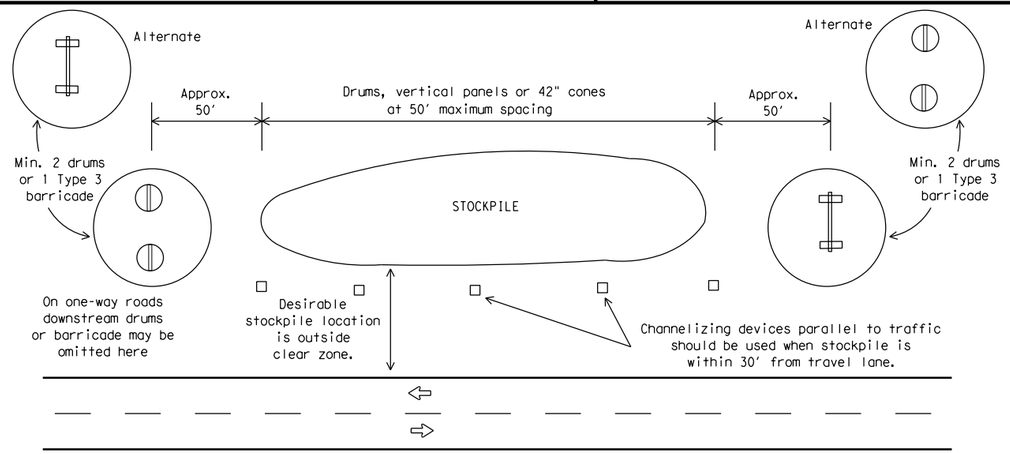
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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7-13 5-21	ODA	ECTOR, ETC.		18

WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

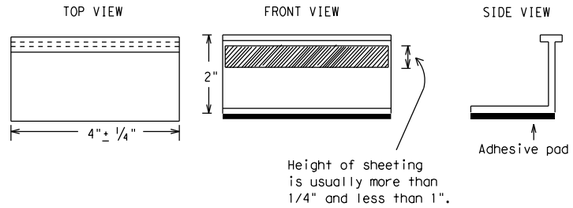
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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REVISIONS	0906	00	271	VARIOUS
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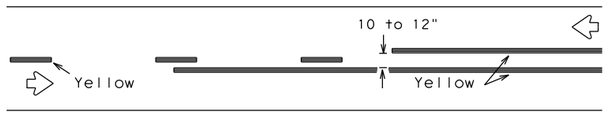
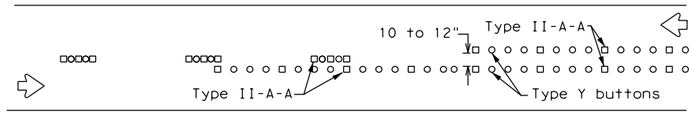
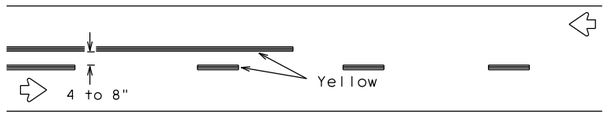
PAVEMENT MARKING PATTERNS



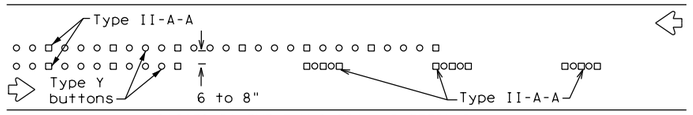
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



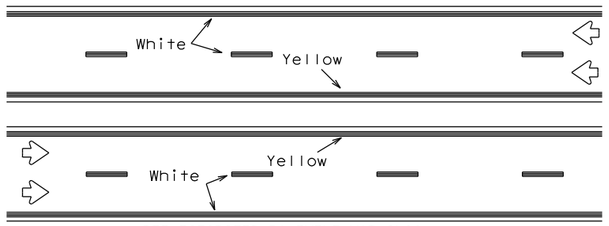
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



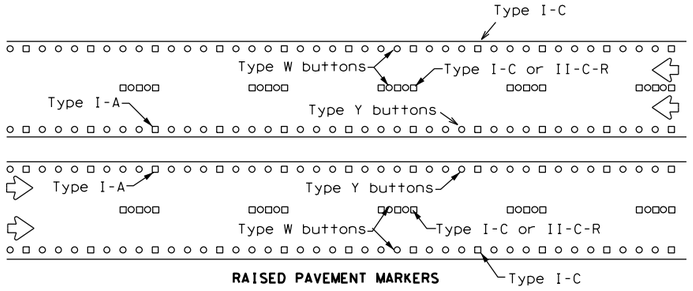
RAISED PAVEMENT MARKERS - PATTERN B

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

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



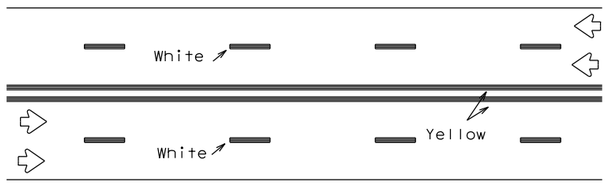
REFLECTORIZED PAVEMENT MARKINGS



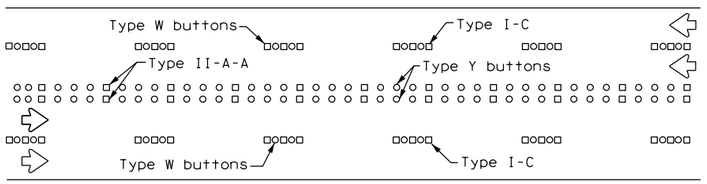
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



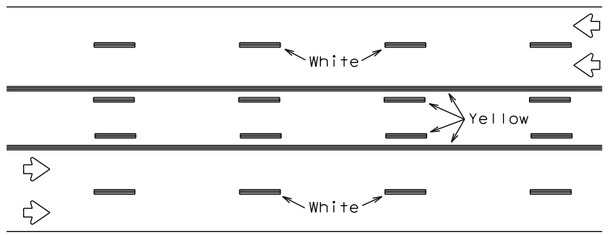
REFLECTORIZED PAVEMENT MARKINGS



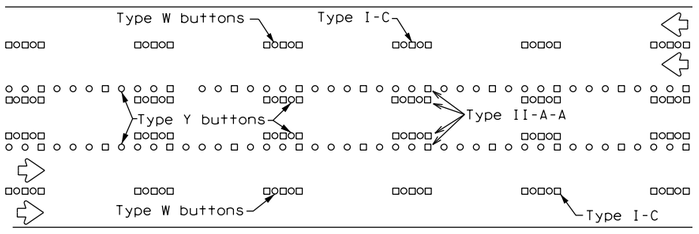
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

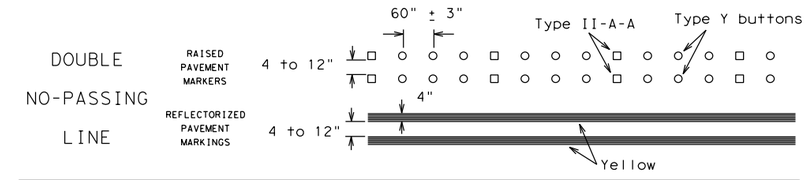
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

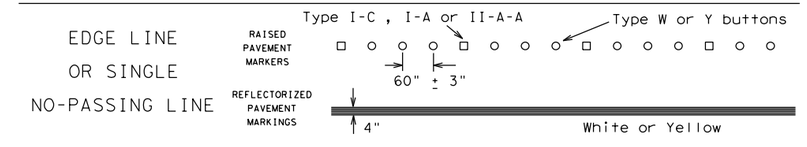
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

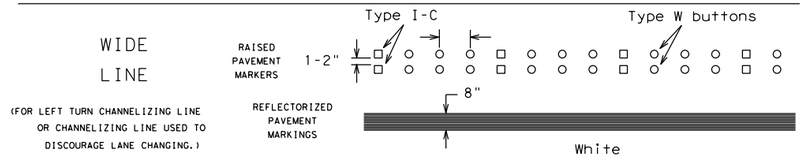


EDGE LINE OR SINGLE NO-PASSING LINE



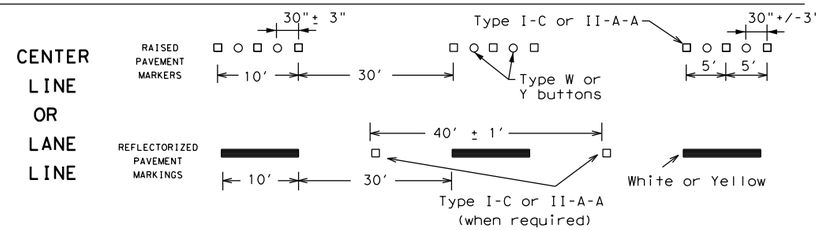
WIDE LINE

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

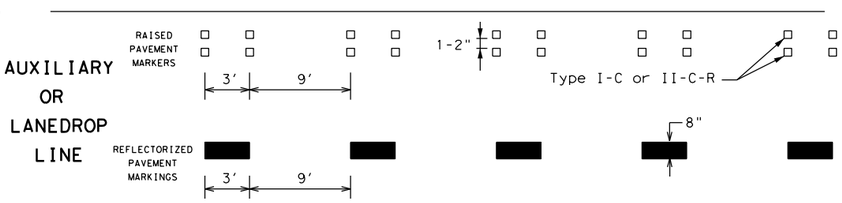


BROKEN LINES

CENTER LINE OR LANE LINE

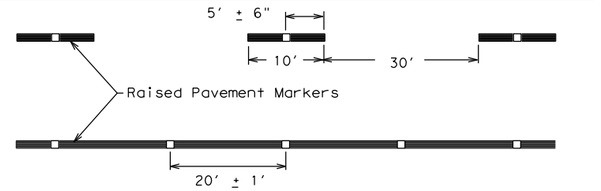


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		20

106

DATE: 3/18/2024 12:01:15 PM
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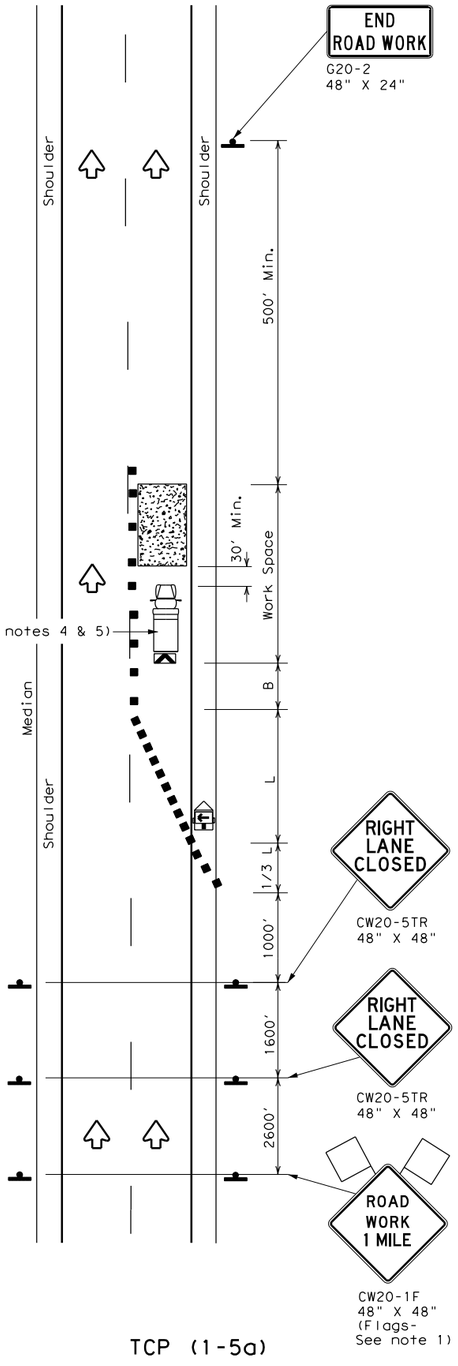
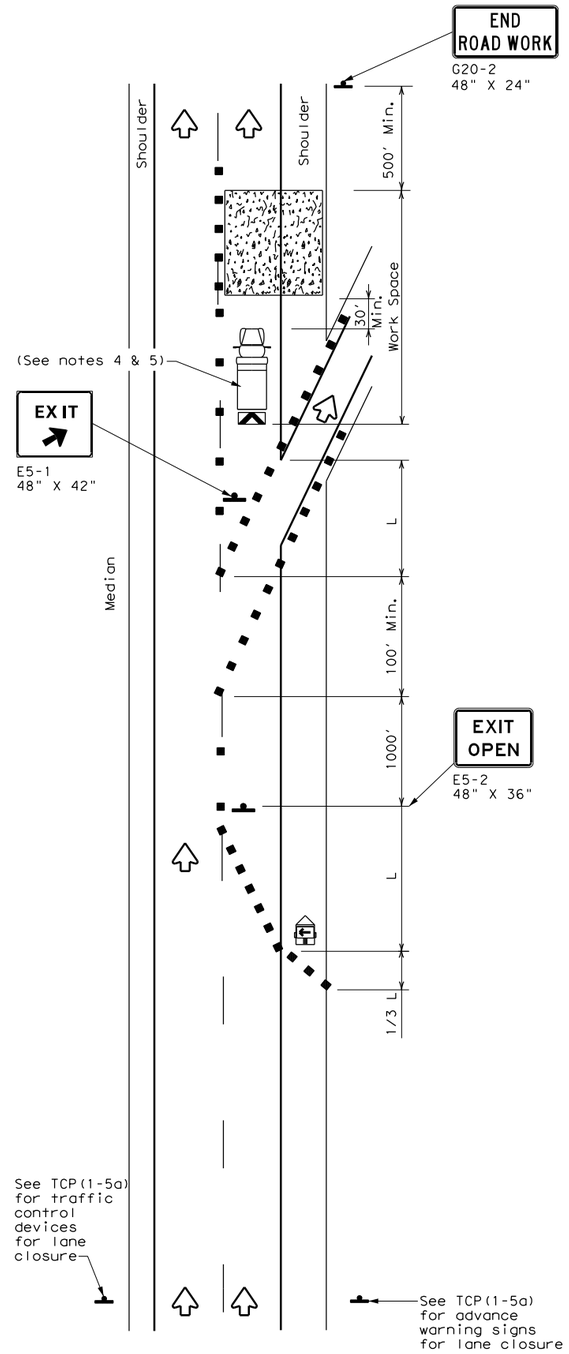


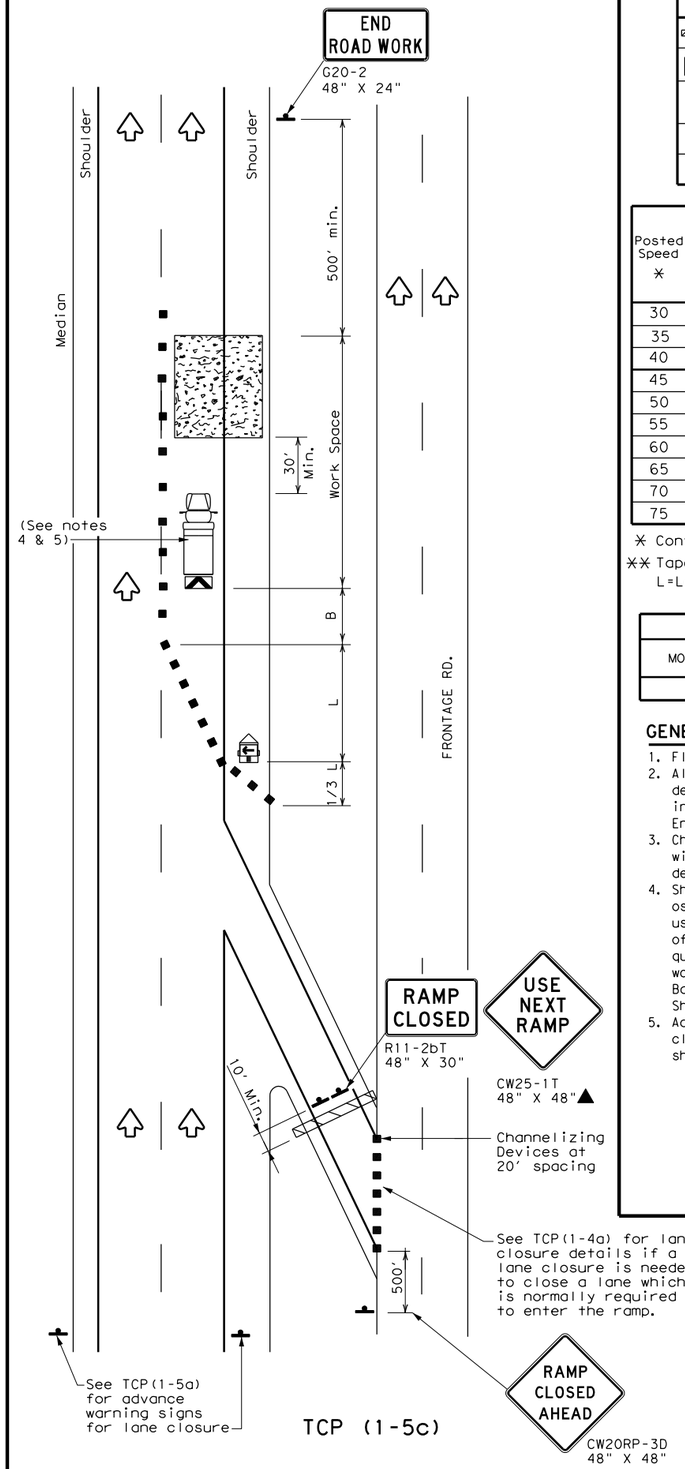
TCP (1-5a)

ONE LANE CLOSURE



TCP (1-5b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (1-5c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP(1-5)-18

FILE: tcp1-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		21

DATE: 3/18/2024 12:01:19 PM
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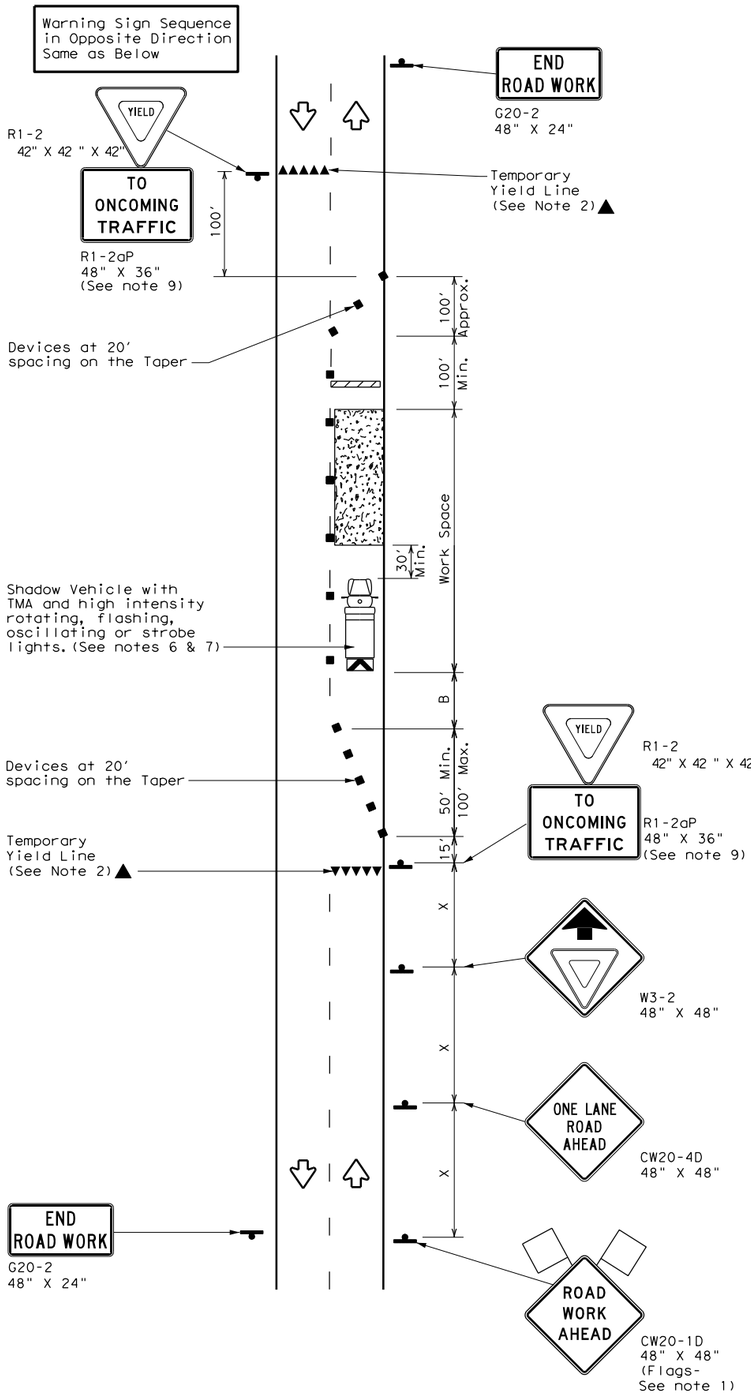
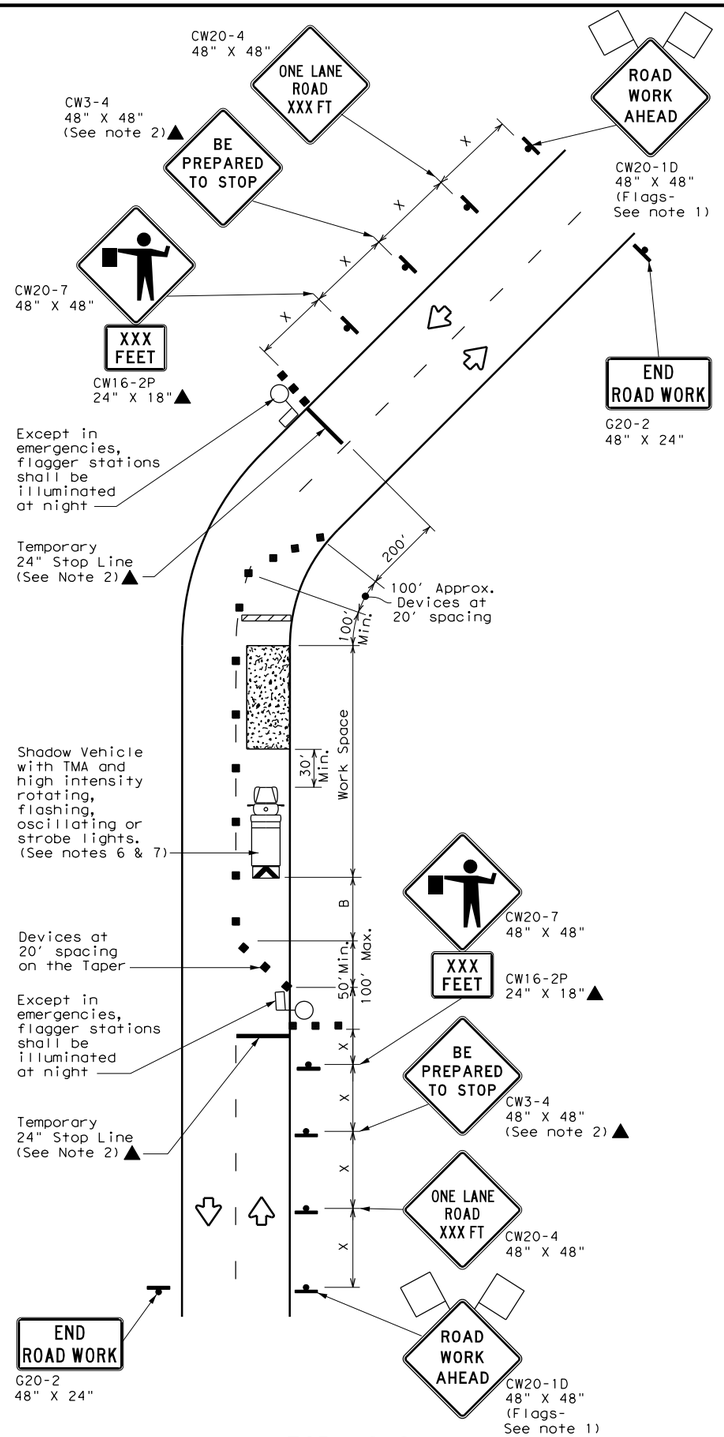


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		22

DATE: 3/18/2024 12:01:22 PM
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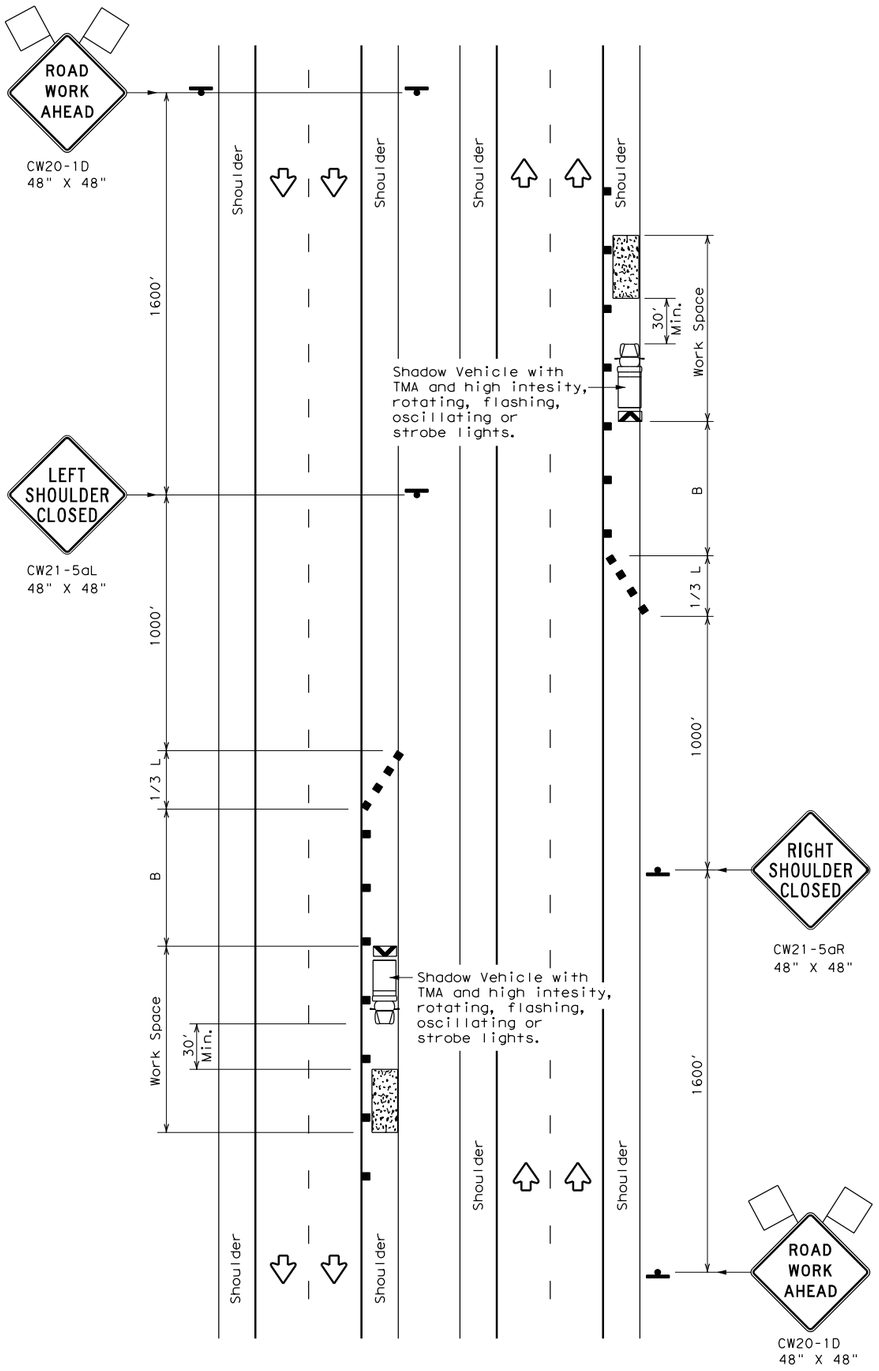
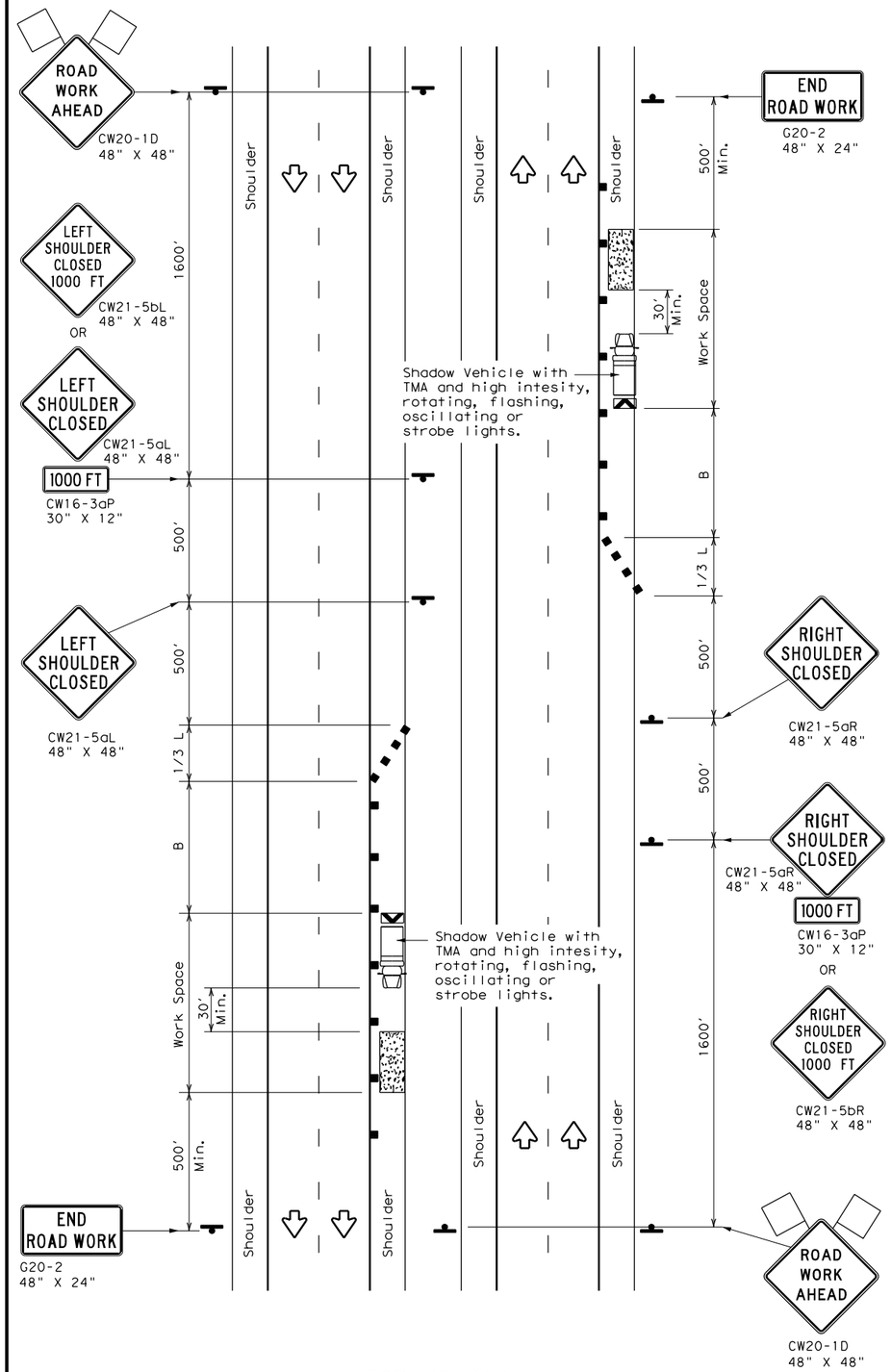


TCP (5-1a)

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	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	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 effecting 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.

Texas Department of Transportation

Traffic Operations Division Standard

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
REVISIONS 2-18	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		23

DATE: 3/18/2024 12:01:25 PM
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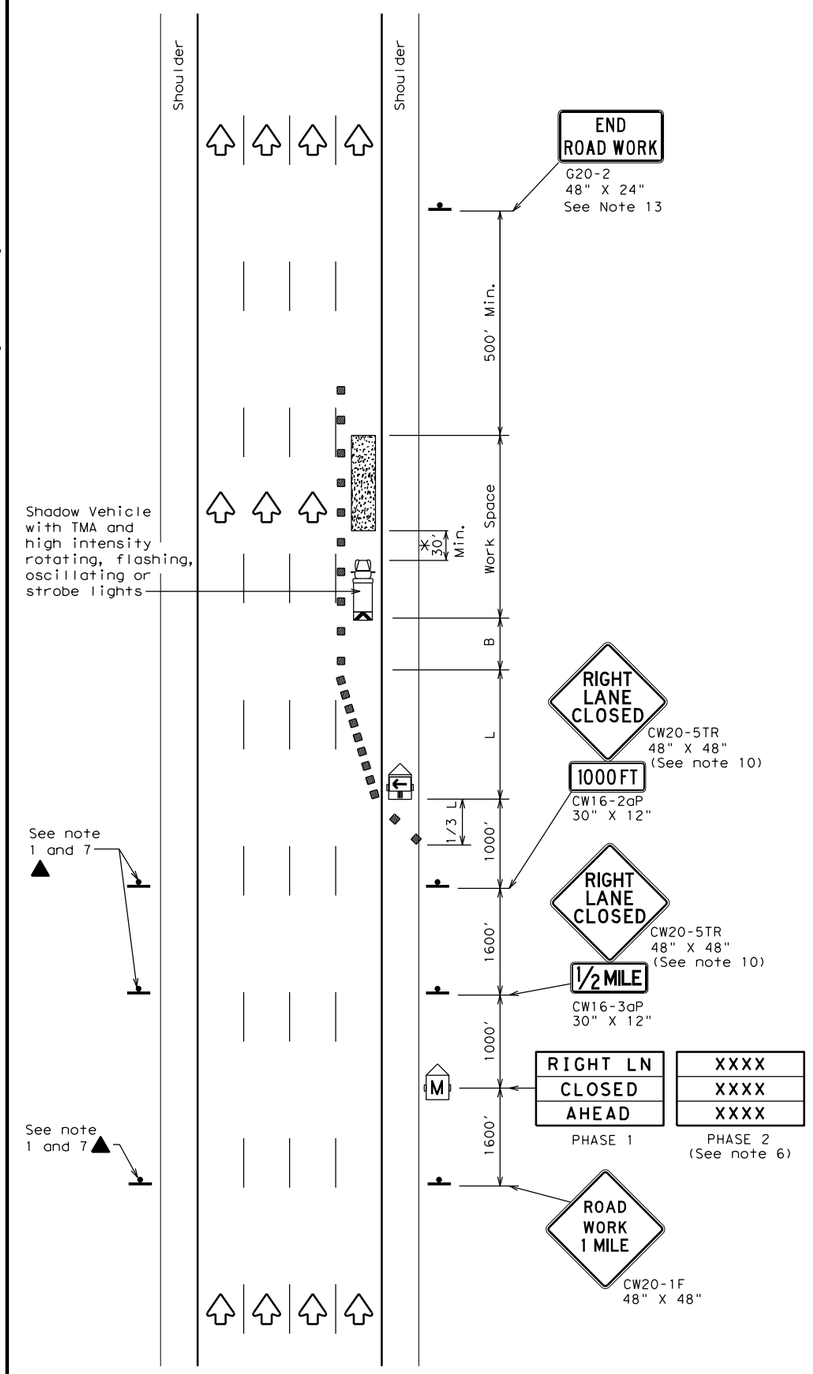
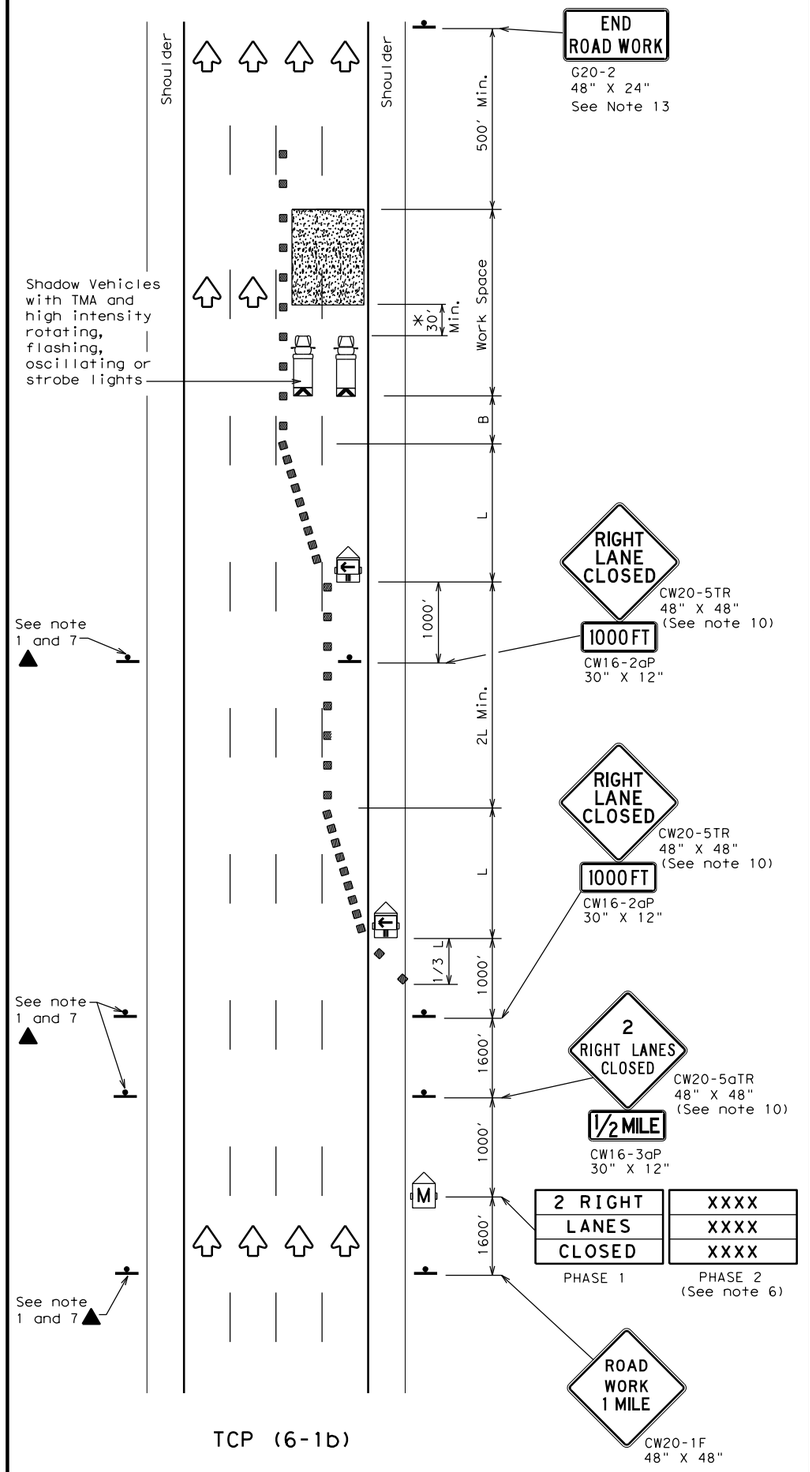


TCP (6-1a)

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	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
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

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. 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.
3. All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
4. The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
5. 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.
6. 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.
7. Duplicate construction warning signs should be erected on the medians side of freeways where median width will permit and traffic volume justifies the signing.
8. 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.
9. Warning signs for intermediate term stationary work should be mounted at 7' to the bottom of the sign.
10. 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.
11. 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.
12. 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.
13. 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.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN FREEWAY LANE CLOSURES

TCP(6-1)-12

FILE: tcp6-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-12	0906	00	271	VARIOUS
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	ODA	ECTOR, ETC.		24

201

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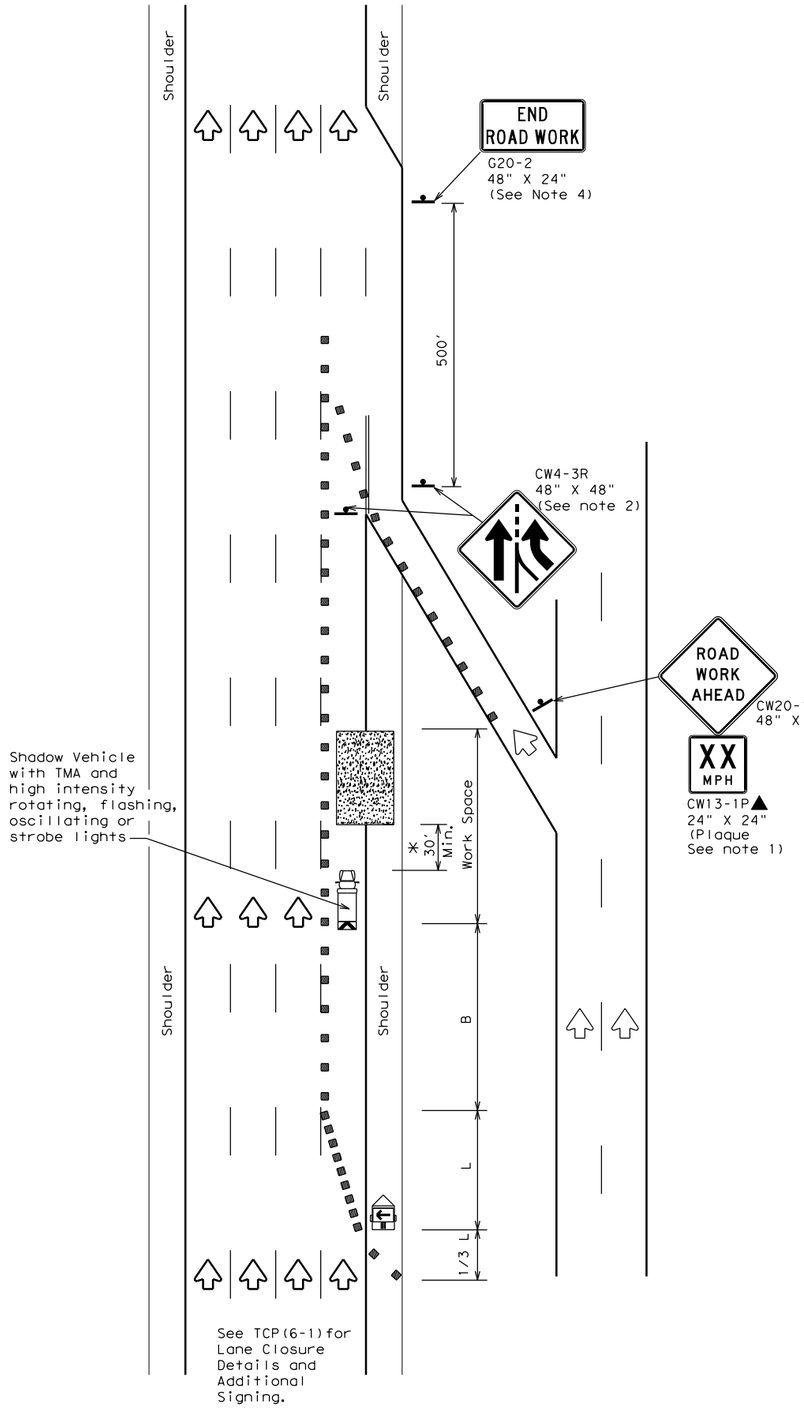
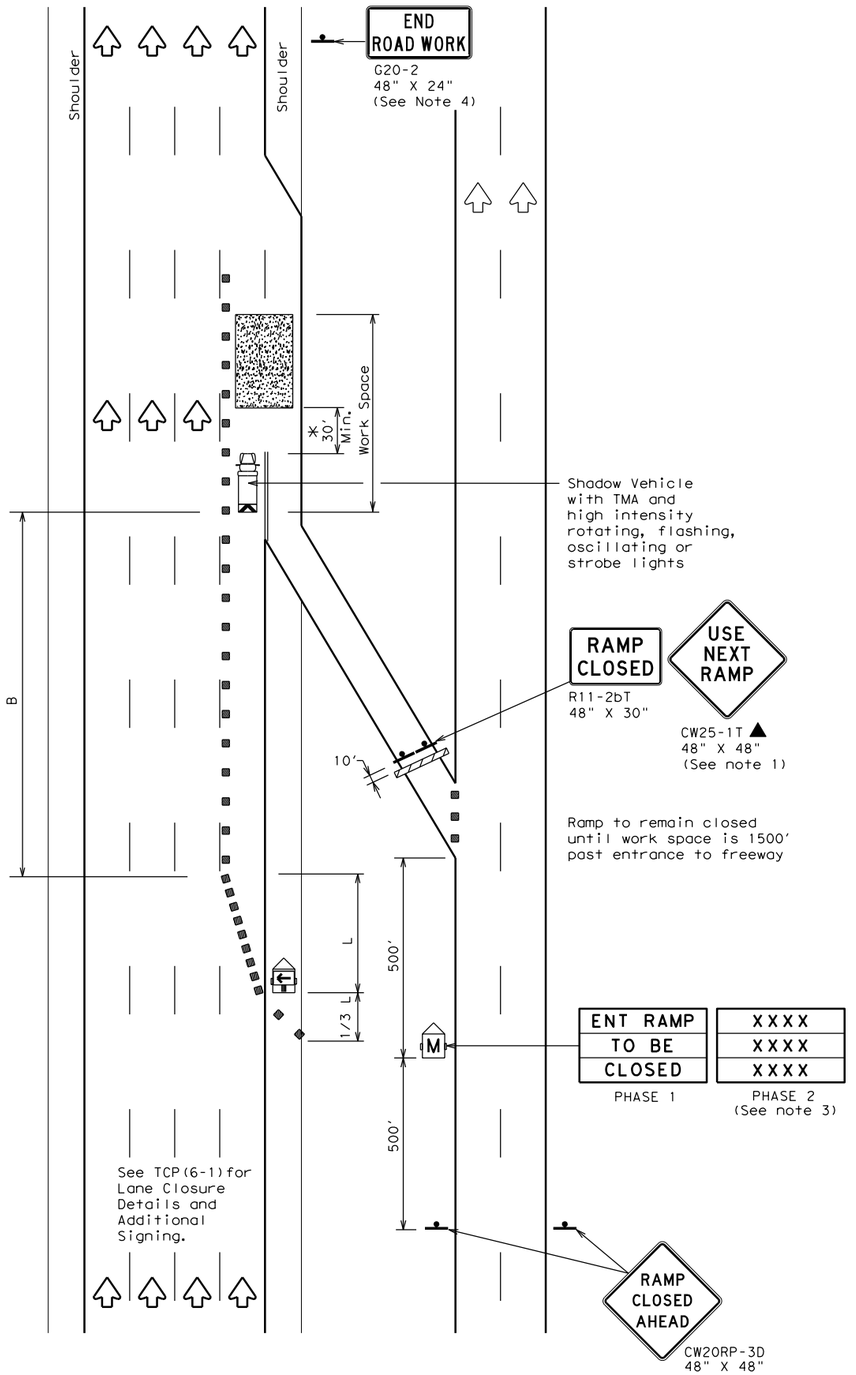


TCP (6-2a)

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	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
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

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. ADDED LANE Symbol (CW4-3) sign may be omitted when sign between ramp and mainlane can be seen from both roadways.
3. See "Advance Notice List" on BC(6) for recommended date and time formatting options for PCMS Phase 2 message.
4. 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

FILE: tcp6-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	ODA	ECTOR, ETC.		25

202

DATE: 3/18/2024 12:01:30 PM
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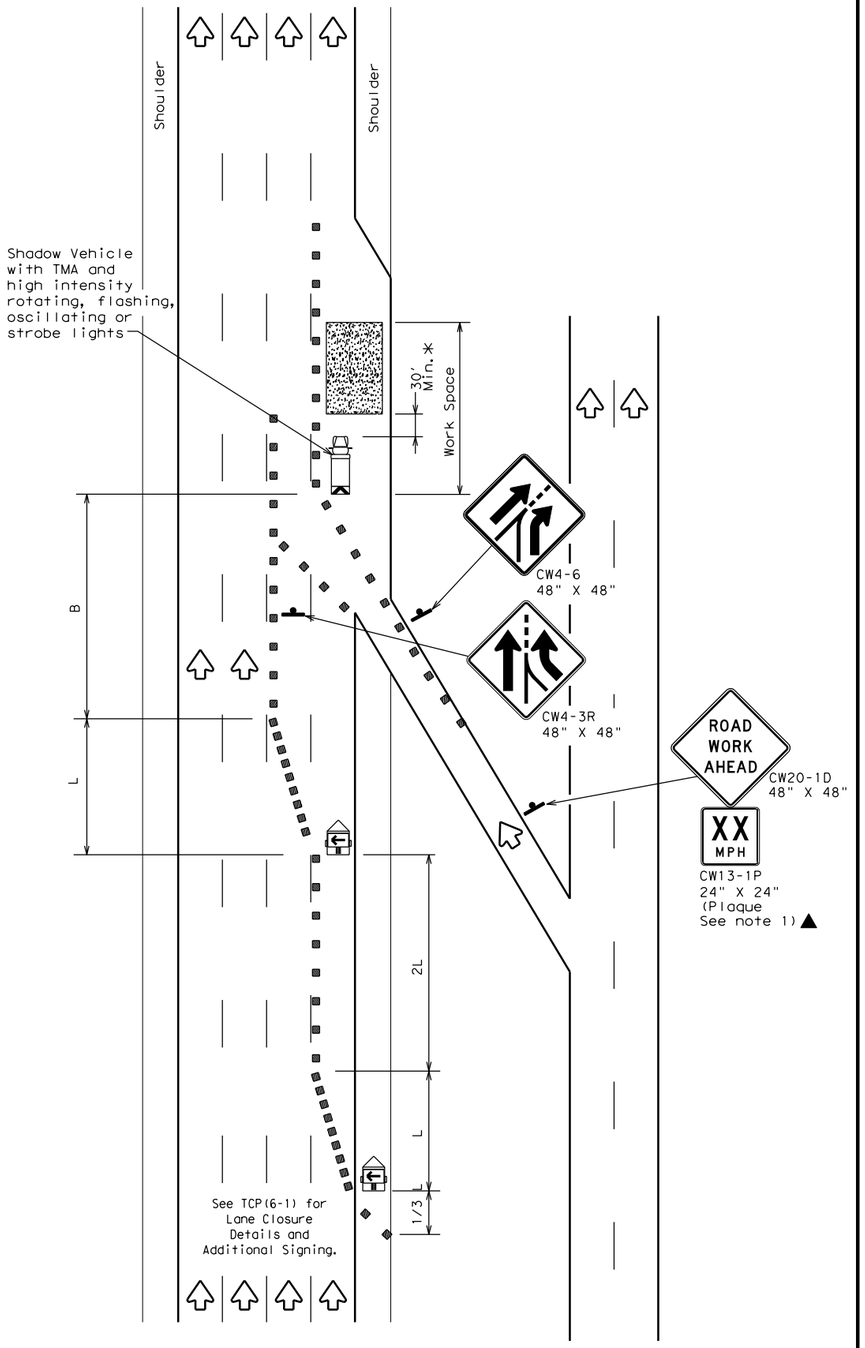
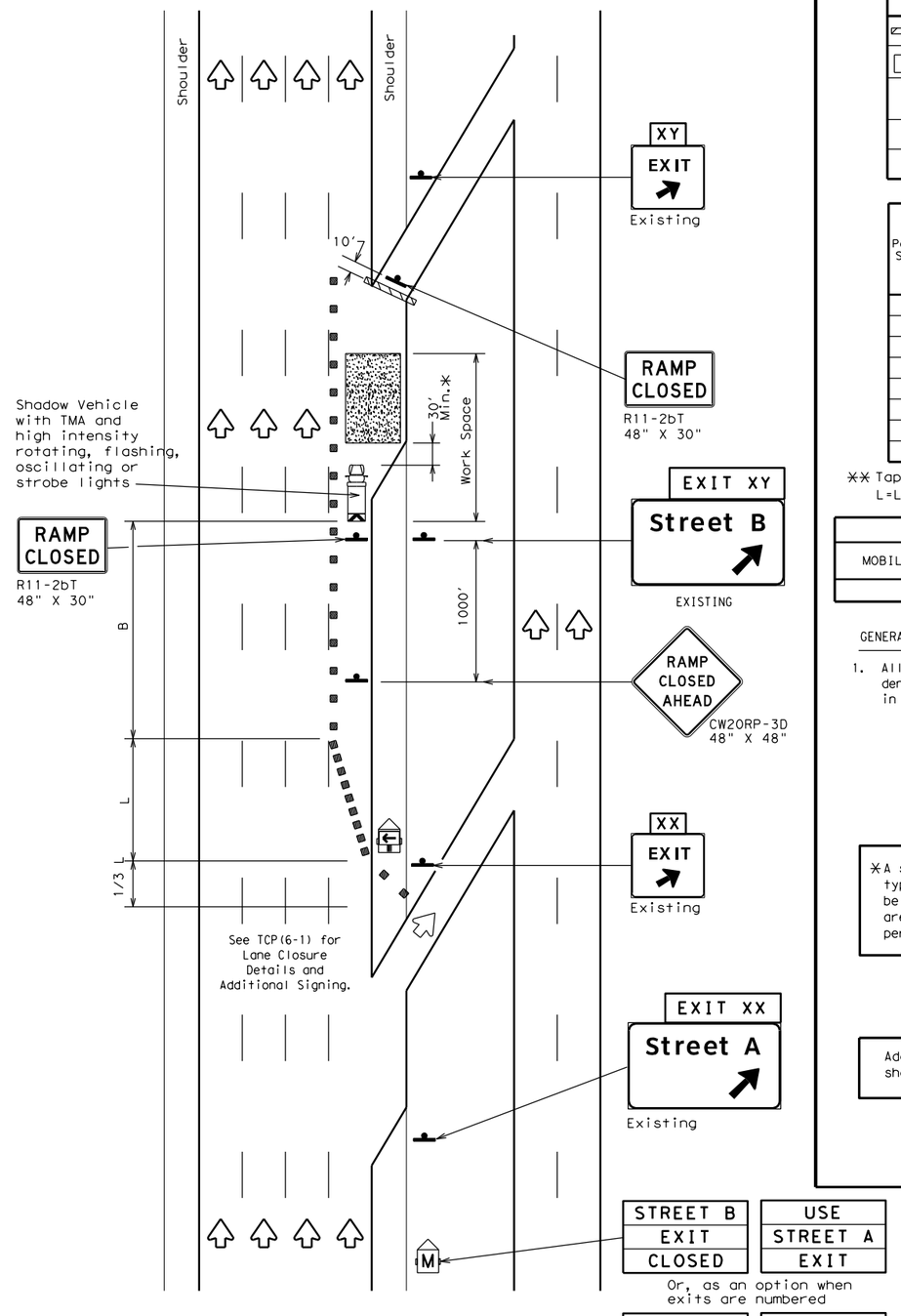


TCP (6-3a)

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	M	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:

1. 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

FILE: tcp6-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	ODA	ECTOR, ETC.		26

203

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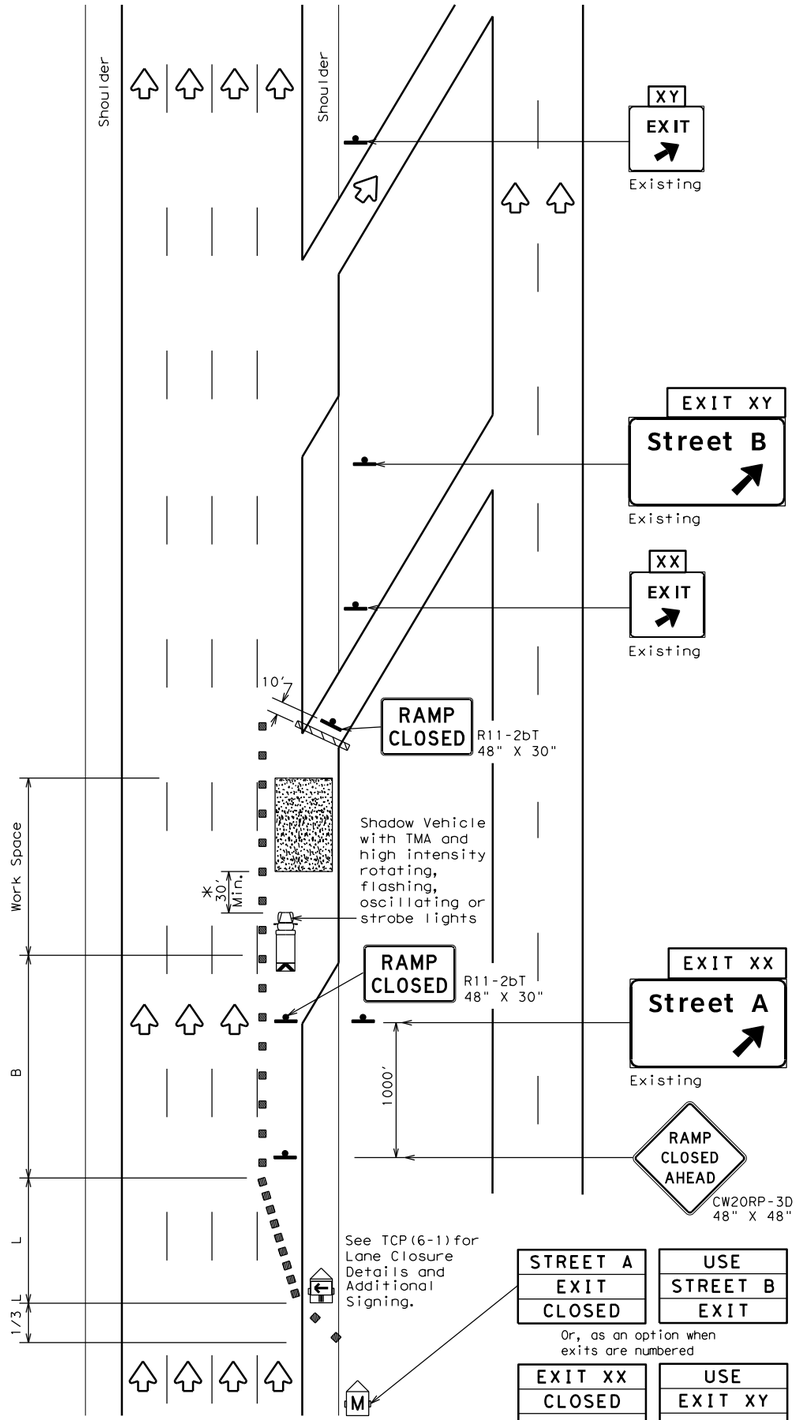
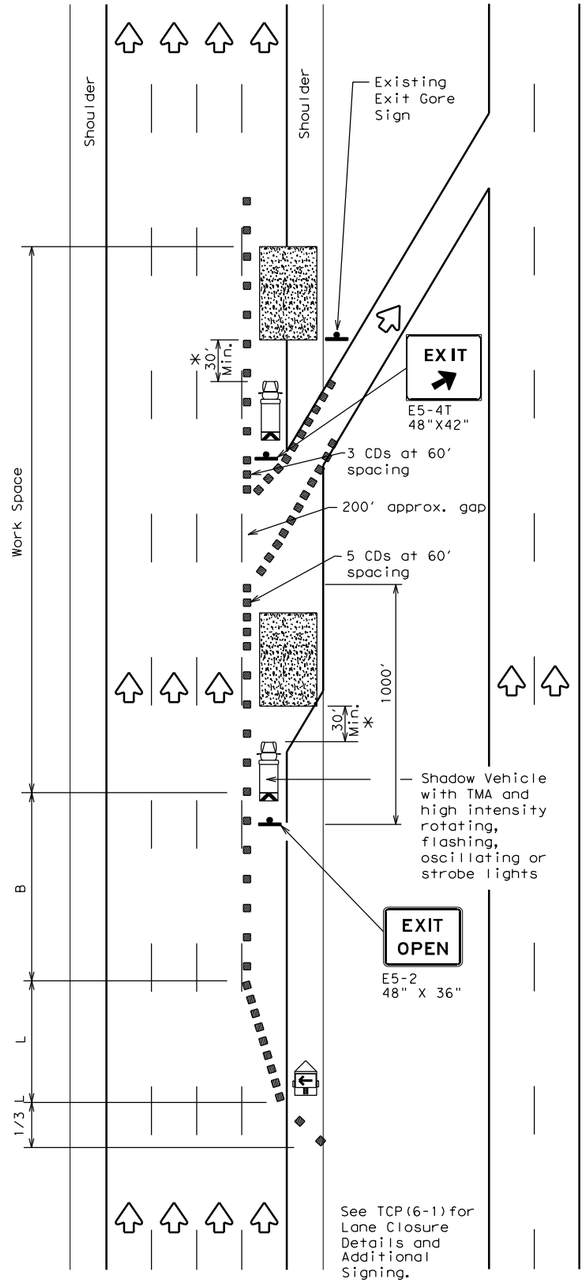


TCP (6-4a)

EXIT RAMP CLOSED
TRAFFIC EXITS PAST CLOSED RAMP



TCP (6-4b)

EXIT RAMP OPEN

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

Posted Speed	Formula	Minimum Desirable Taper Lengths "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
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

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. 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.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA AT EXIT RAMP

TCP(6-4)-12

FILE: tcp6-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT Feburary 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	ODA	ECTOR, ETC.		27

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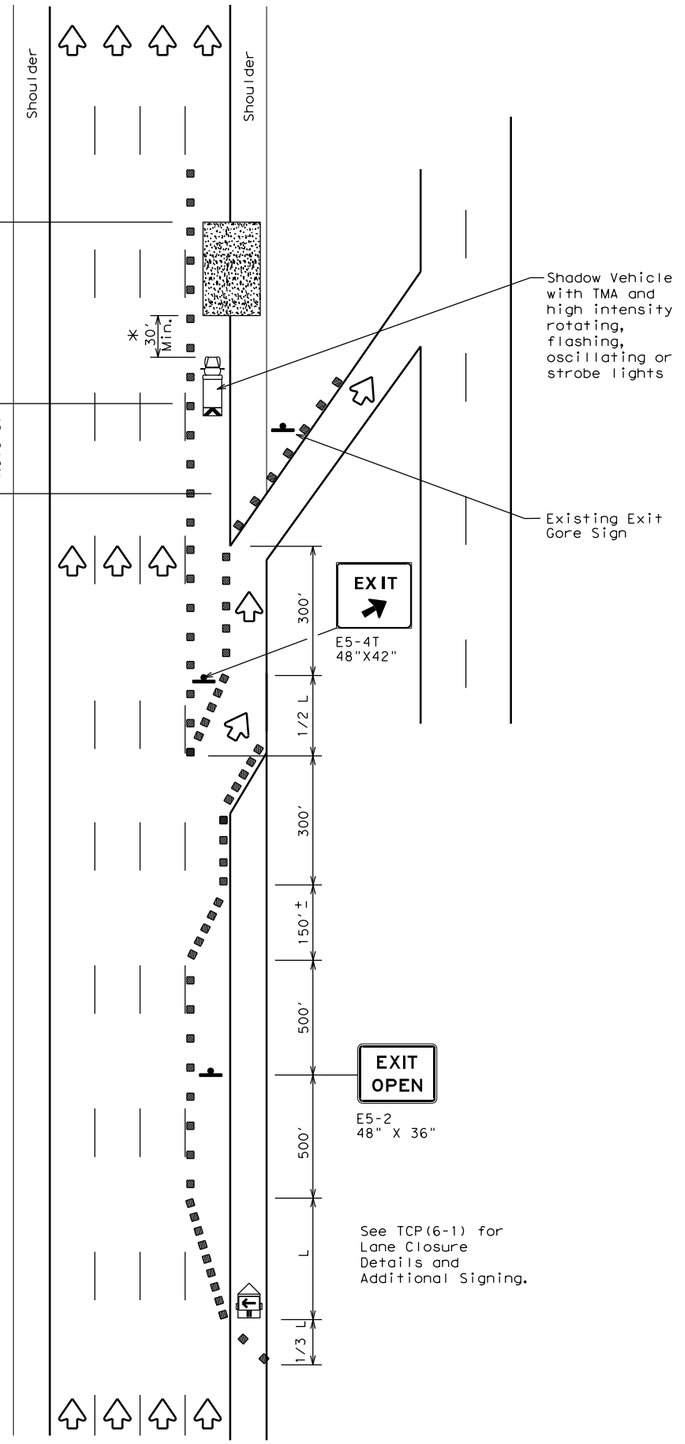
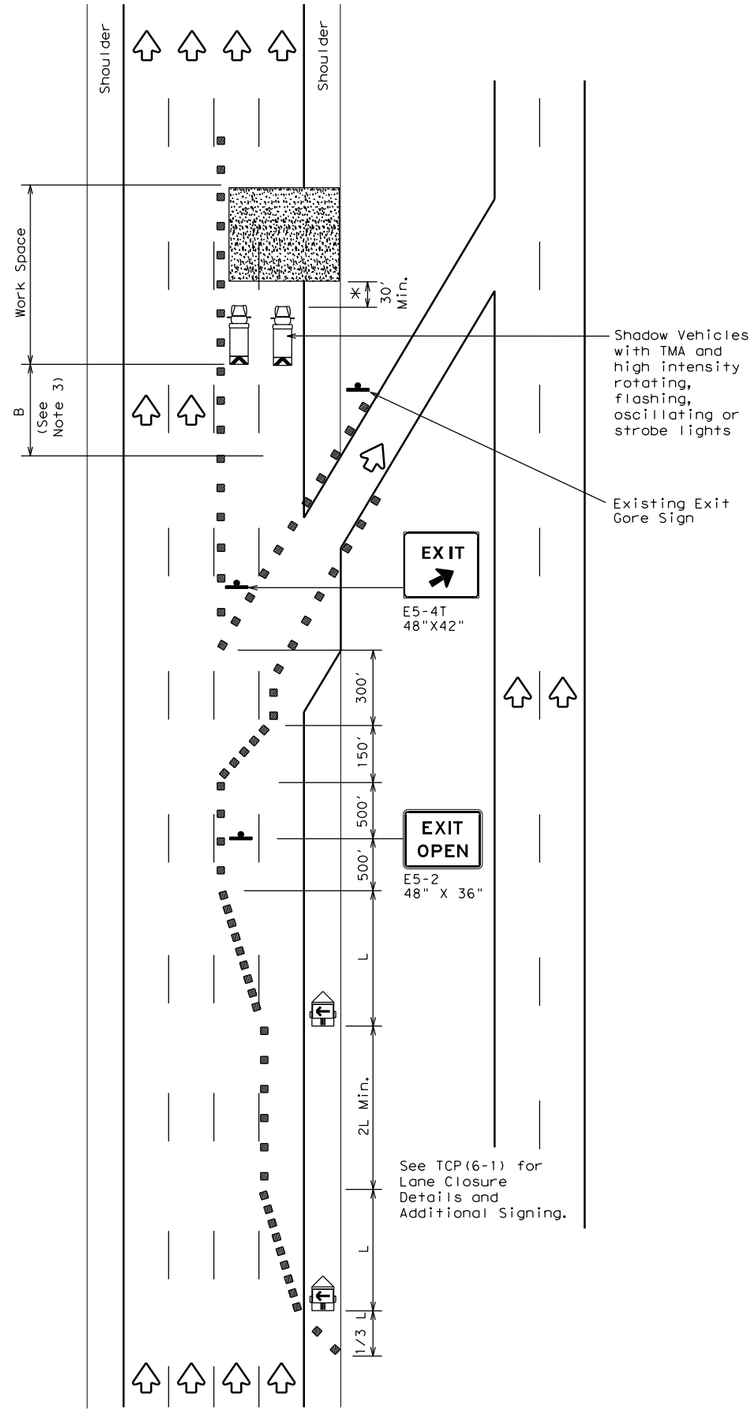


TCP (6-5a)

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	(M)	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
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

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. See BC standards for sign details.
3. 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

FILE: tcp6-5.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT Feburary 1998	CONT	SECT	JOB	HIGHWAY
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1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	ODA	ECTOR, ETC.		28

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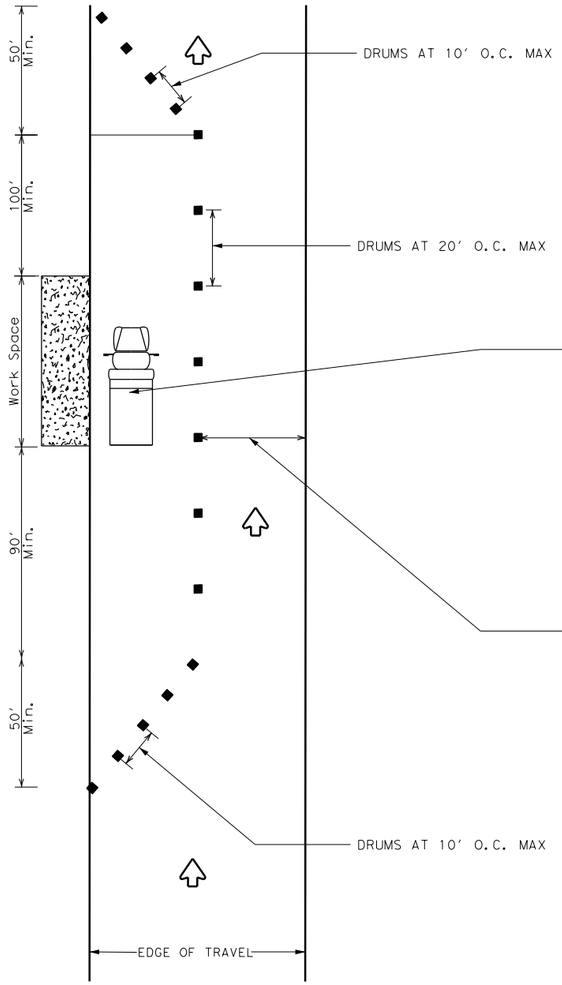
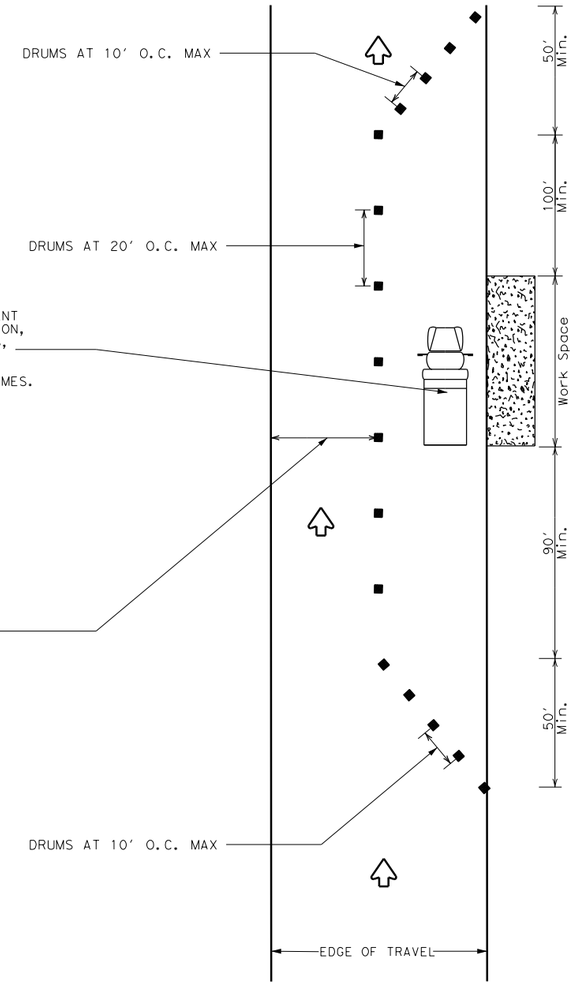
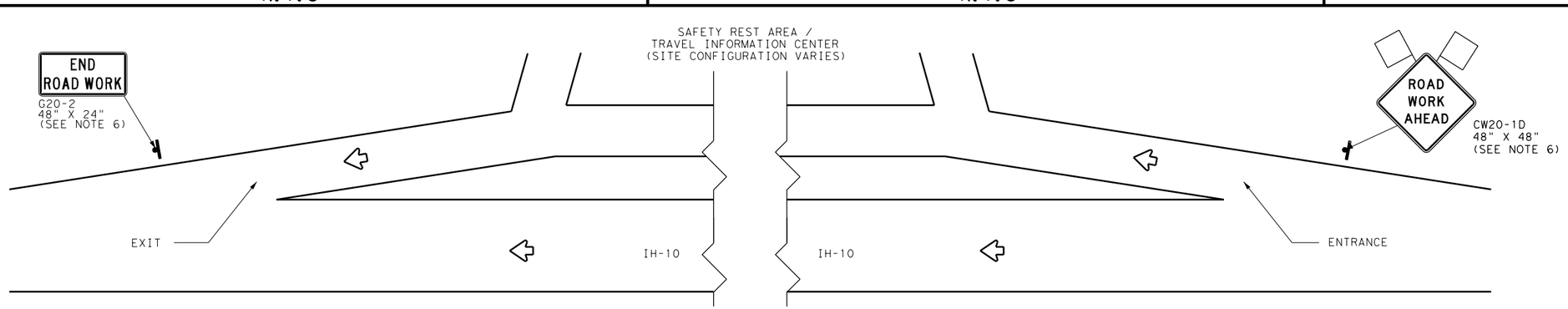


PROPOSED TCP AT DRIVEWAY OR PARKING AREA
WORK SPACE ON LEFT SIDE
N.T.S



PROPOSED TCP AT DRIVEWAY OR PARKING AREA
WORK SPACE ON RIGHT SIDE
N.T.S



PROPOSED TCP SIGNING AT SRA/TIC

LEGEND	
	Heavy Work Vehicle
	Channelizing Devices
	Sign
	Traffic Flow
	Flag

NOTES:

1. THESE TYPICAL DETAILS ARE INTENDED FOR WORK AT VARIOUS LOCATIONS WITHIN THE SAFETY REST AREAS (SRA) OR TRAVEL INFORMATION CENTERS (TIC)WHERE WORK VEHICLES AND/OR EQUIPMENT MAY NEED TO BE TEMPORARILY LOCATED IN THE DRIVEWAY AND PARKING LOT AREAS.
2. FURNISH, PLACE AND MAINTAIN ALL TRAFFIC CONTROL DEVICES IN ACCORDANCE WITH THE TMUTCD AND THE BC STANDARDS.
3. SEE THE GENERAL NOTES FOR ADDITIONAL WORK ZONE REQUIREMENTS.
4. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE REQUIREMENTS OF ITEM 7, "LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC", ITEM 502, "BARRICADES, SIGNS, AND TRAFFIC HANDLING" AND TO THE GENERAL NOTES.
5. THE ASSUMED POSTED SPEED IS 15 MPH. FOR OTHER POSTED SPEEDS, ADJUST SPACING AND LENGTHS FOR THE TRAFFIC CONTROL DEVICES SHOWN ON THIS SHEET IN ACCORDANCE WITH THE TMUTCD AND THE BC STANDARDS.
6. SEE BC STANDARDS FOR ADDITIONAL REQUIRED SIGNS.

STATE OF TEXAS
CHARLES D. KOONCE III
87785
LICENSED
PROFESSIONAL ENGINEER
3/18/2024

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

TYPICAL TCP WITHIN SRA / TIC FOR TPAS

SHEET 1 OF 1

DESIGNED:	DSGN	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	DSGN-CHK	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	DRWN	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	DRWN-CHK	0906	00	271	29

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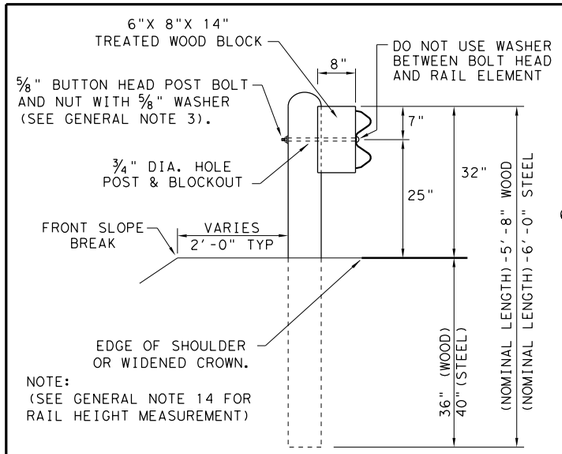
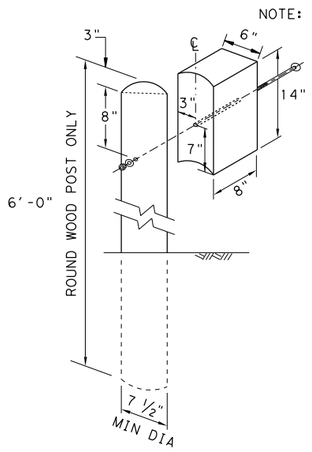
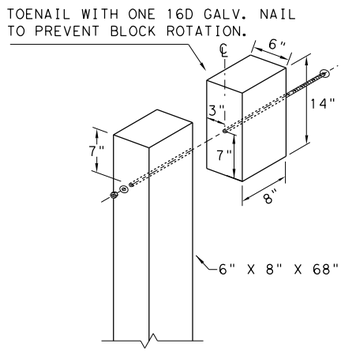


TYPICAL POST PLACEMENT

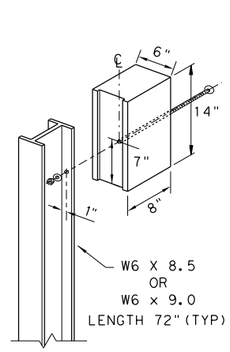


WOOD BLOCK TO ROUND WOOD POST

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

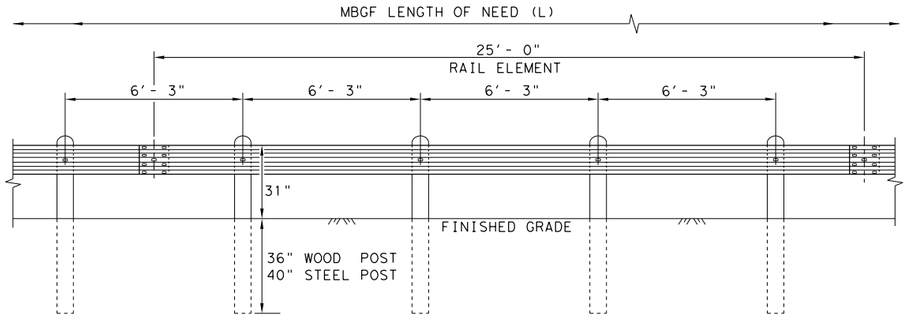


WOOD BLOCK TO RECTANGULAR WOOD POST



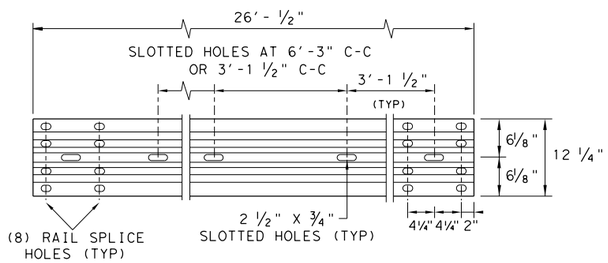
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



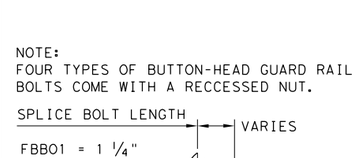
ELEVATION
MID-SPAN RAIL SPLICE

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



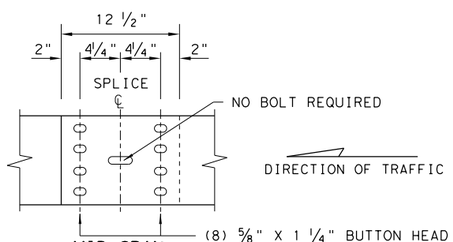
ELEVATION 25'- 0"(NOM.) W-BEAM SECTION

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



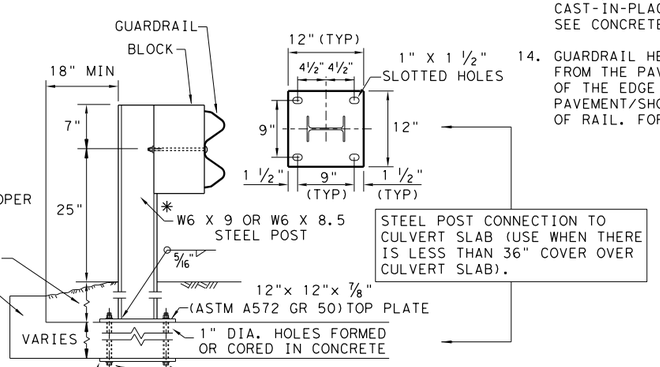
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



STEEL POST CONNECTION TO CULVERT SLAB (USE WHEN THERE IS LESS THAN 36" COVER OVER CULVERT SLAB).

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 ½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210,"COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

Texas Department of Transportation

Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	00	271	VARIOUS	
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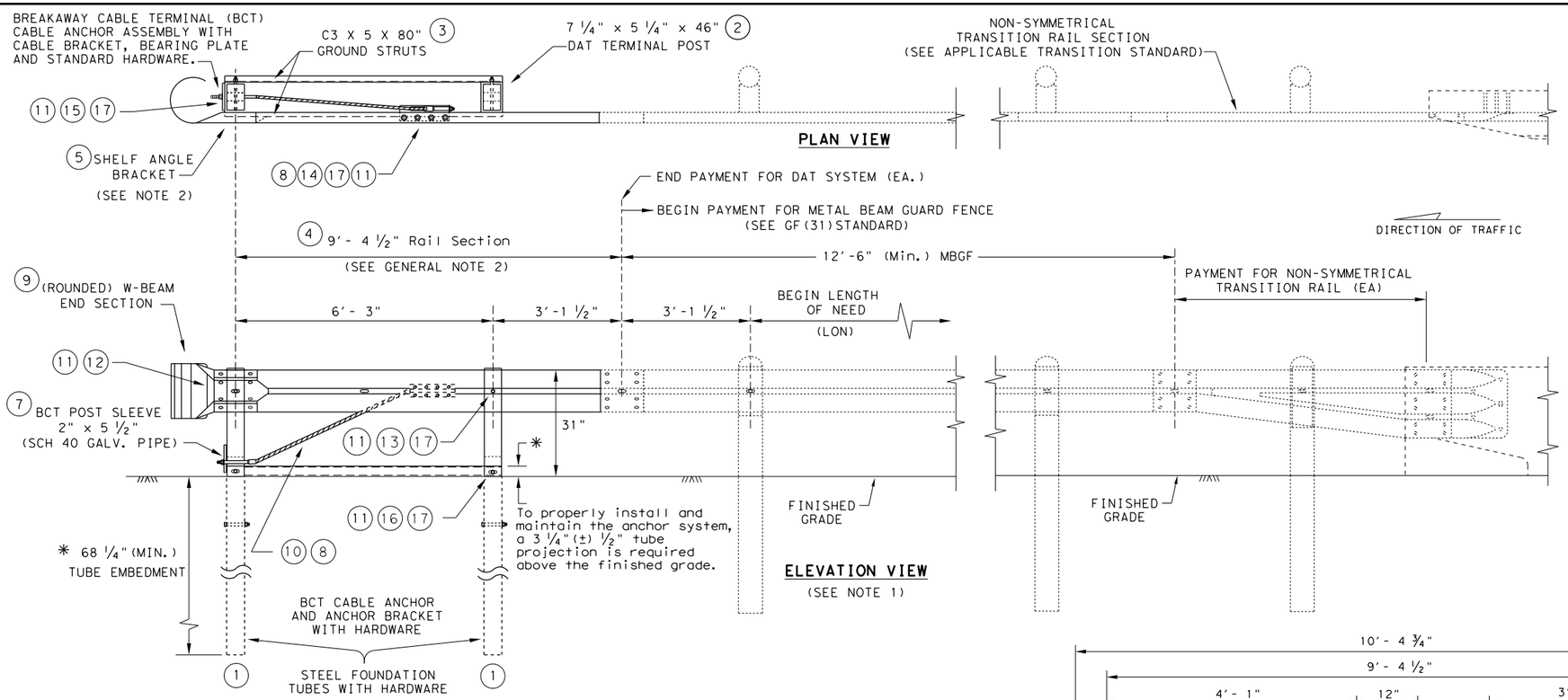


DOWNSTREAM ANCHOR TERMINAL (DAT)

NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

GENERAL NOTES

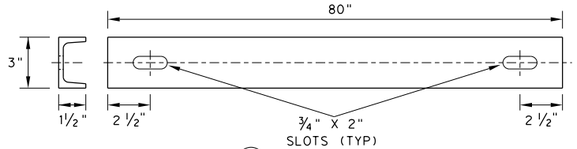
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 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

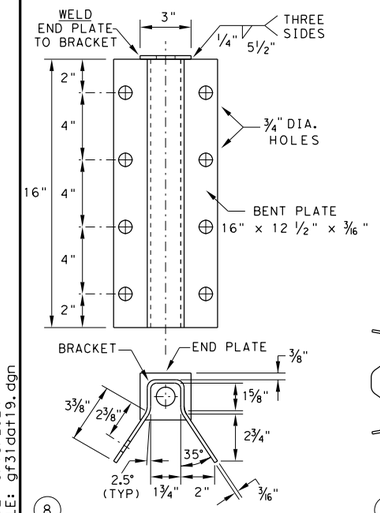
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(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

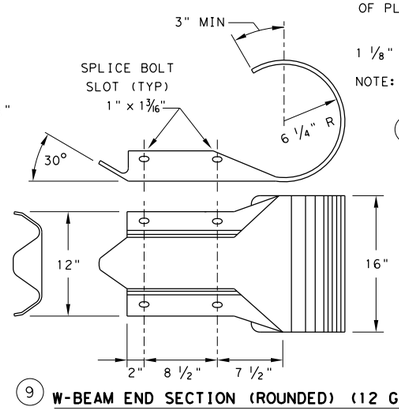
(4) **TERMINAL RAIL ELEMENT FOR DAT**



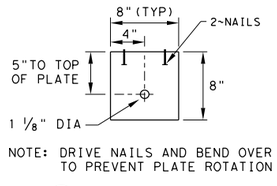
(3) **CHANNEL STRUT**
C3 X 5 X 80", GRADE A36



(8) **GUARDRAIL ANCHOR BRACKET**

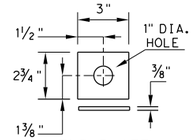


(9) **W-BEAM END SECTION (ROUNDED) (12 GA.)**

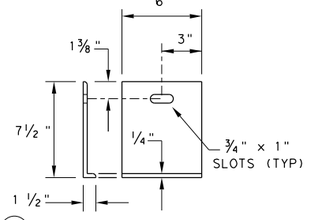


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

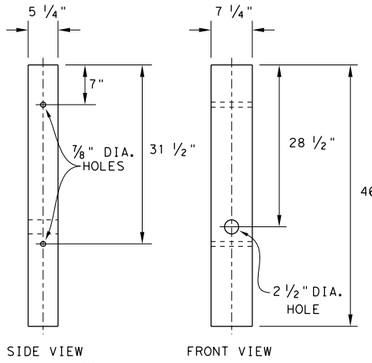
(6) **BEARING PLATE**
8"x 8"x 5/8" R



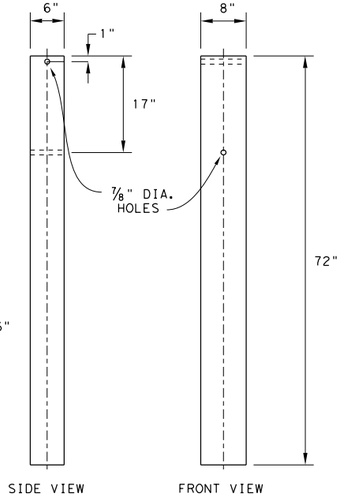
END PLATE



(5) **SHELF ANGLE BRACKET**



(2) **TERMINAL POST**
7 1/4"x 5 1/4"x 46" WOOD POST



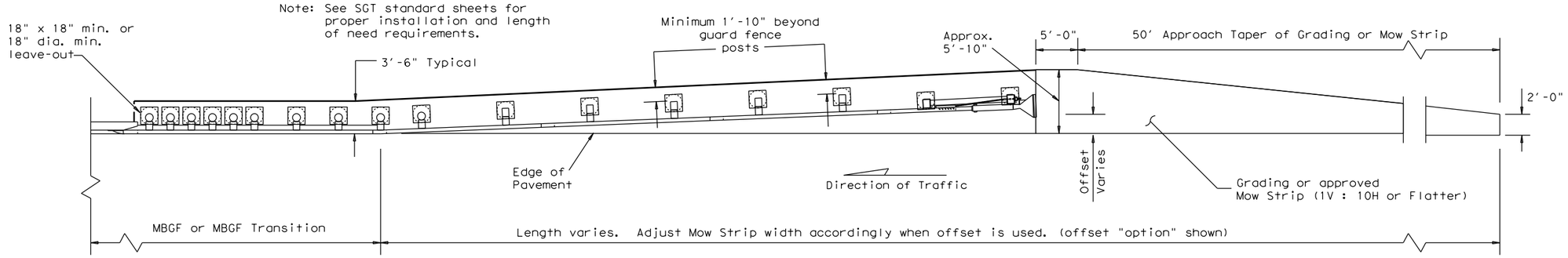
(1) **STEEL FOUNDATION TUBE**
6"x 8"x 1/8" x 72" STEEL TUBE

Texas Department of Transportation — Design Division Standard

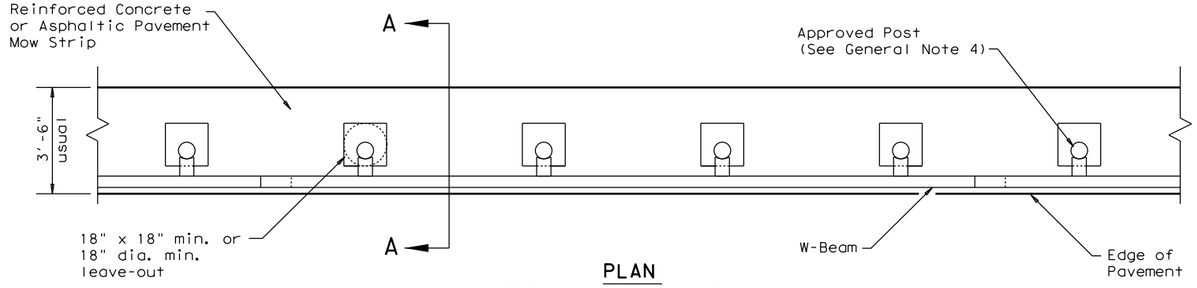
METAL BEAM GUARD FENCE
(DOWNSTREAM ANCHOR TERMINAL)
TL-3 MASH COMPLIANT

GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	00	271	VARIOUS	
	DIST	COUNTY		SHEET NO.	
	ODA	ECTOR, ETC.		31	

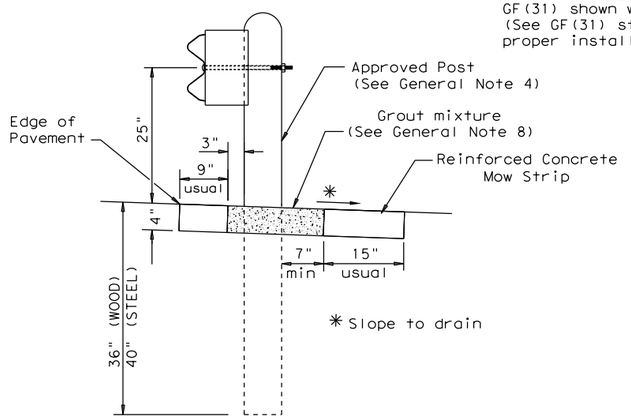


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



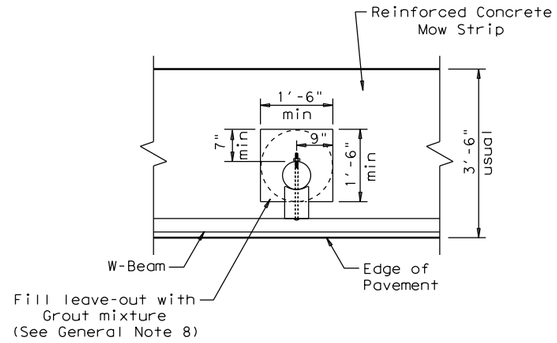
PLAN

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



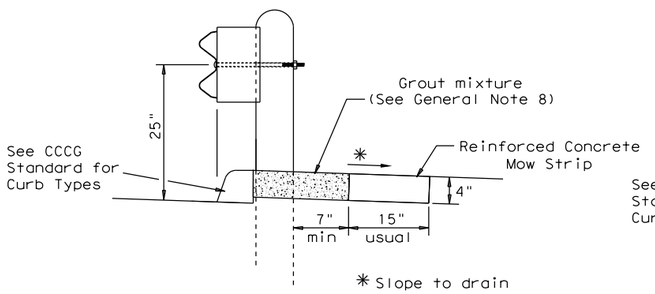
SECTION A-A

Typical



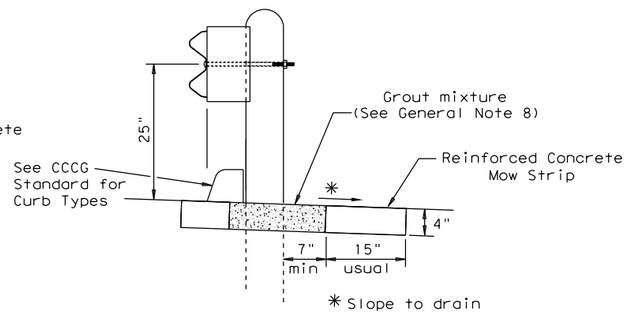
MOW STRIP DETAIL

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



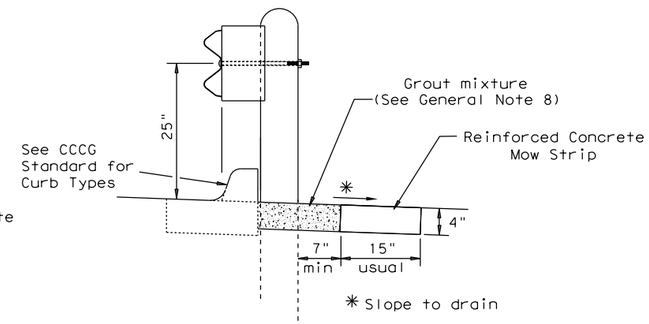
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

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

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

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 ½" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 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.

Texas Department of Transportation

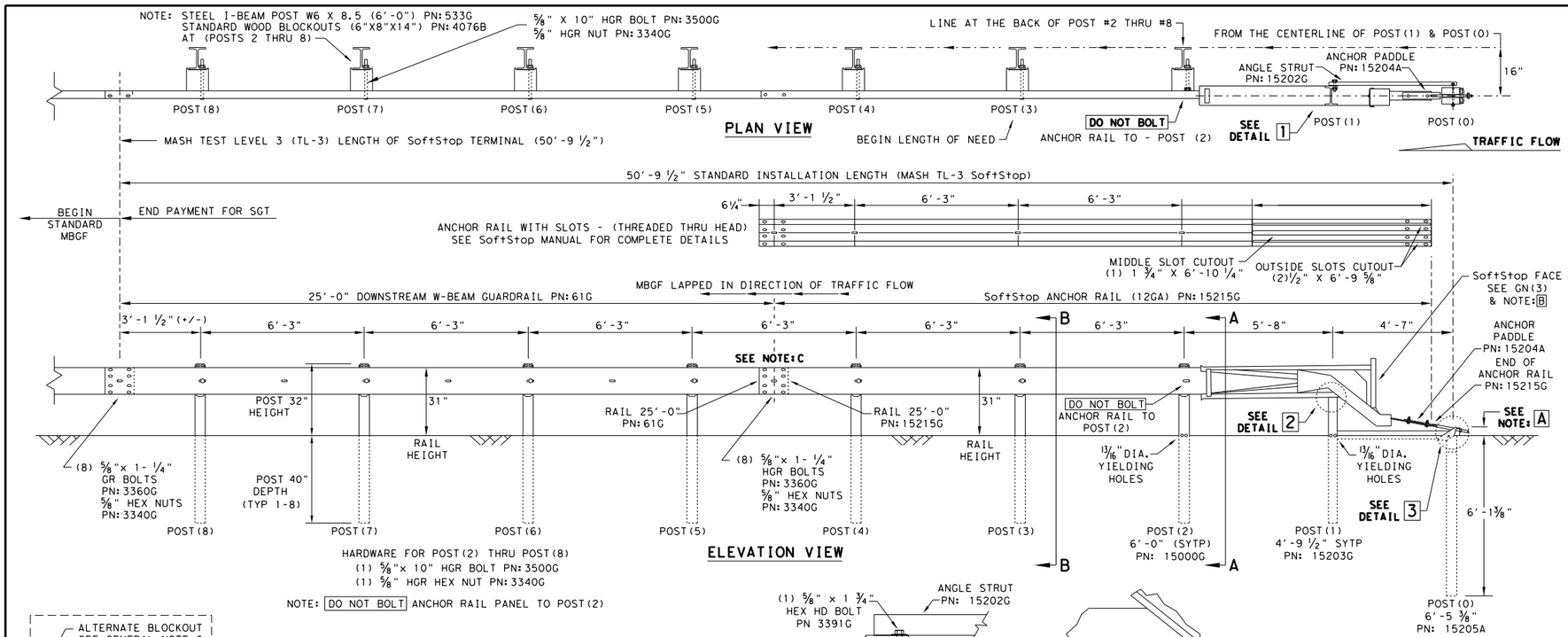
Design Division Standard

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

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		32

DATE: 3/18/2024
FILE: gf31ms19 (1).dgn



GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP		
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0906	00	271	VARIOUS		
	DIST	COUNTY		SHEET NO.		
	ODA	ECTOR, ETC.		33		

DATE: 3/18/2024
FILE: sgt10s3116.dgn

(SEE GN NOTE 15)
STANDARD 31" MBGF

ITEM (6)
INNER SIDE SLIDER
(ISS) PANEL FOR RAIL 3

FIELD-SIDE
(RAIL 3)

NOTE:
RECESSED HEX NUTS FACING
TRAFFIC-SIDE **SEE DETAIL (C)**

REFERENCE LINE USED TO INSTALL
LINE POST(9) THRU POST(2)

POST 1 OFFSET DISTANCE MEASURED
7-5/8" FROM REFERENCE LINE

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2

RAIL 4 | RAIL 3 | RAIL 2 | RAIL 1

ITEM (10)
CABLE ASSEMBLY

ITEM (2)
GROUNDSTRUT

NO BLOCKOUT
AT (POST 1)

CABLES

ITEM (5)
TRAFFIC SIDE SLIDER
(TSS) PANEL FOR RAIL 2

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

NOTES:
1. ITEM (12) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(9) THRU LINE POST(2).
2. DO NOT INSTALL A BLOCKOUT AT LINE POST(1).

PLAN VIEW

MBGF
RAIL 2

INSTALL GUARD FENCE RECESSED
HEX NUTS ON TRAFFIC-SIDE

MBGF
RAIL 1

DETAIL (C)

TRAFFIC FLOW

END PAYMENT (SGT) BY EACH

DO NOT BOLT
RAIL TO POST 6

BEGIN LENGTH OF NEED

INSTALLATION LENGTH 55'- 1/2"

49'-8 5/16"

6'-3" | 6'-3" | 6'-3" | 6'- 3/4" | 6'-3" | 6'-3" | 6'-3" | 37 1/2" | 5'-3 11/16"

ITEM (25)
MAX-TENSION HEAD
SEE DETAIL (A)

RAIL
HEIGHT
31"

ARROWS

RAIL
HEIGHT
31"

HEAD
HEIGHT

DETAIL (B)

ITEM (13) RAIL 4 | ITEM (13) RAIL 3 | ITEM (13) RAIL 2 | ITEM (13) RAIL 1

DETAIL (D)

CABLES

FINISHED
GRADE

FINISHED
GRADE

ITEM (10)
CABLE
ASSEMBLY

ITEM (2)
GROUNDSTRUT

32-1/4"

68-1/8"

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2 | POST 1

ITEM (4)
I-BEAM
W6 X 9

NO BLOCKOUT
AT (POST 1)

(8) X-LITE LINE POST - ITEM (11)

**SOIL
ANCHOR POST**
ITEM (1)

ELEVATION VIEW

A

A

TSS PANEL
GALVANIZED
ITEM (5)

RSS PLATE
GALVANIZED
ITEM (8)

INSTALL THE TSS AND RSS
WITH THE ARROWS POINTING
TOWARDS THE MAX-HEAD

TSS PANEL AND RSS PLATE
DETAIL (D)

HEAD
HEIGHT
32-1/4"

TOP OF POST

31-7/8"

FINISHED
GRADE

40-1/8"

68-1/8"
ANCHOR POST
DEPTH

ITEM (1)
ANCHOR

ITEM (11)
LINE POSTS
2 THRU 9
(NOTE: ITEM (4) POST 1 (NOT SHOWN),
TO BE INSTALLED AT SAME DEPTH
AS LINE POSTS.)

**SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9**

SECTION VIEW A-A

NOTE:
USE THE MASH APPROVED
X-TENSION CABLE ASSEMBLY.

7 5/16"

2 1/8"

UPPER CABLE
(BACK SIDE)

LOWER CABLE
(TRAFFIC SIDE)

DETAIL (B)

CABLE
FRICTION PLATE
HEAD UNIT
ITEM (9)

NOTE:
INSTALL 5/8" RECESSED HEX
NUTS ON TRAFFIC SIDE.

ITEM (24)

ITEM (21)

ITEM (20)
8X

ITEM (17)
8X

ITEM (23)
6X
3 SCREWS
EACH SIDE

(RAIL 1)

ITEM (22)
BRACKET
SHIPPED FLAT

ITEM (3)

ITEM (16)
4X

* ITEM (25)
HIGH INTENSITY
REFLECTIVE SHEETING

NOTE: DELINEATION MARKER IN
ACCORDANCE WITH TEXAS MUTCD.

SPLICE FOR IMPACT-HEAD
TO GUARD FENCE (RAIL1)

DETAIL (A)

GENERAL NOTES

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

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	5/8" 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	5/8" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-17O1063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
* 25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
** 26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
** 27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

STANDARD
MBGF

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

EDGE OF PAVEMENT

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

2'-0" MAX.
RAIL OFFSET

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

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL	
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0906	00	271	VARIOUS	
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DATE: 3/18/2024
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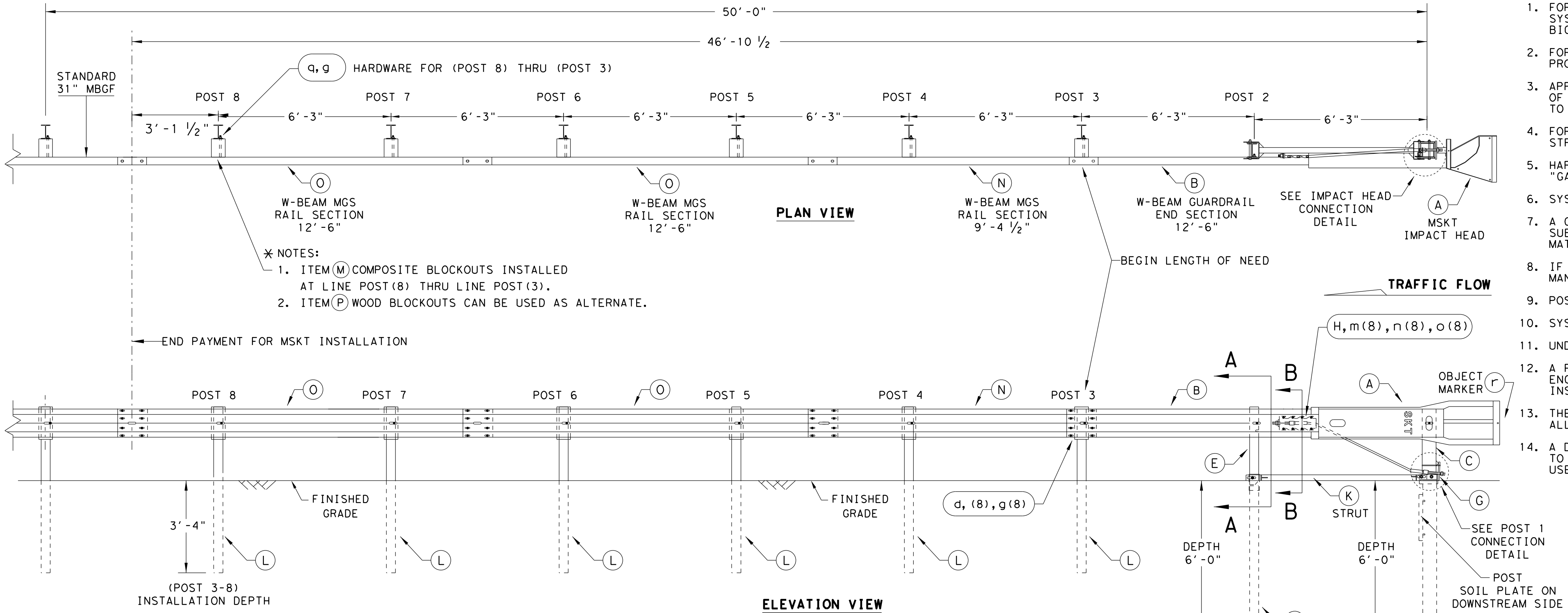
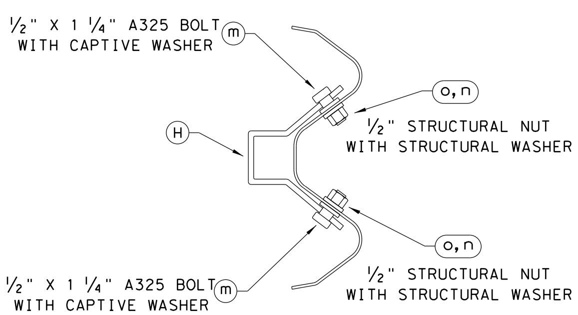
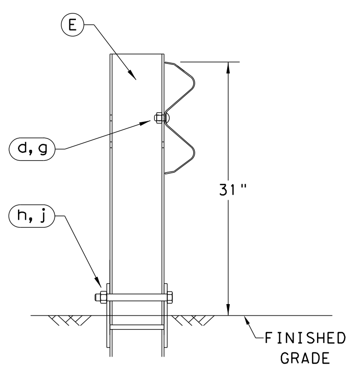


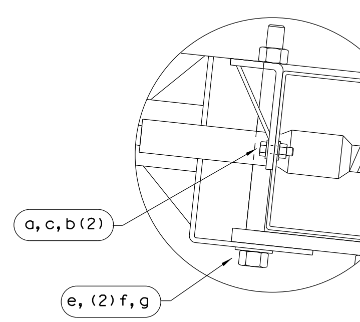
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



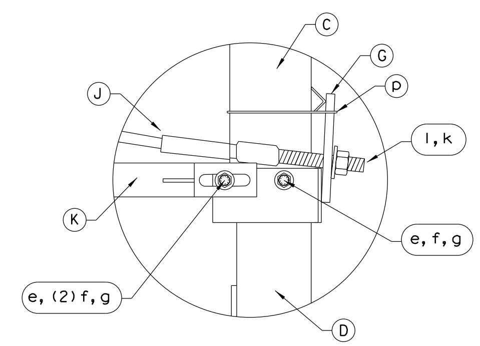
SECTION B-B
ANCHOR BRACKET



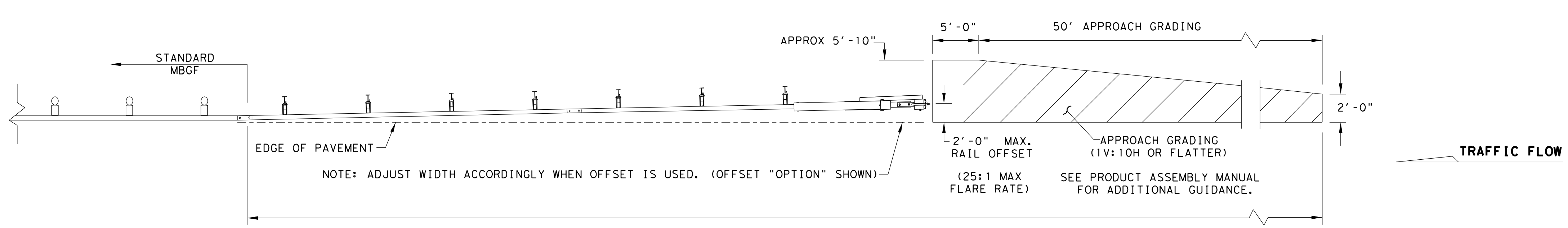
POST 2
SECTION A-A



IMPACT HEAD CONNECTION DETAIL



POST 1 CONNECTION DETAIL



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

GENERAL NOTES

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

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

SEE NOTES: ✻ (M)

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

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

Texas Department of Transportation | Design Division Standard

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

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		35

DATE: 3/18/2024
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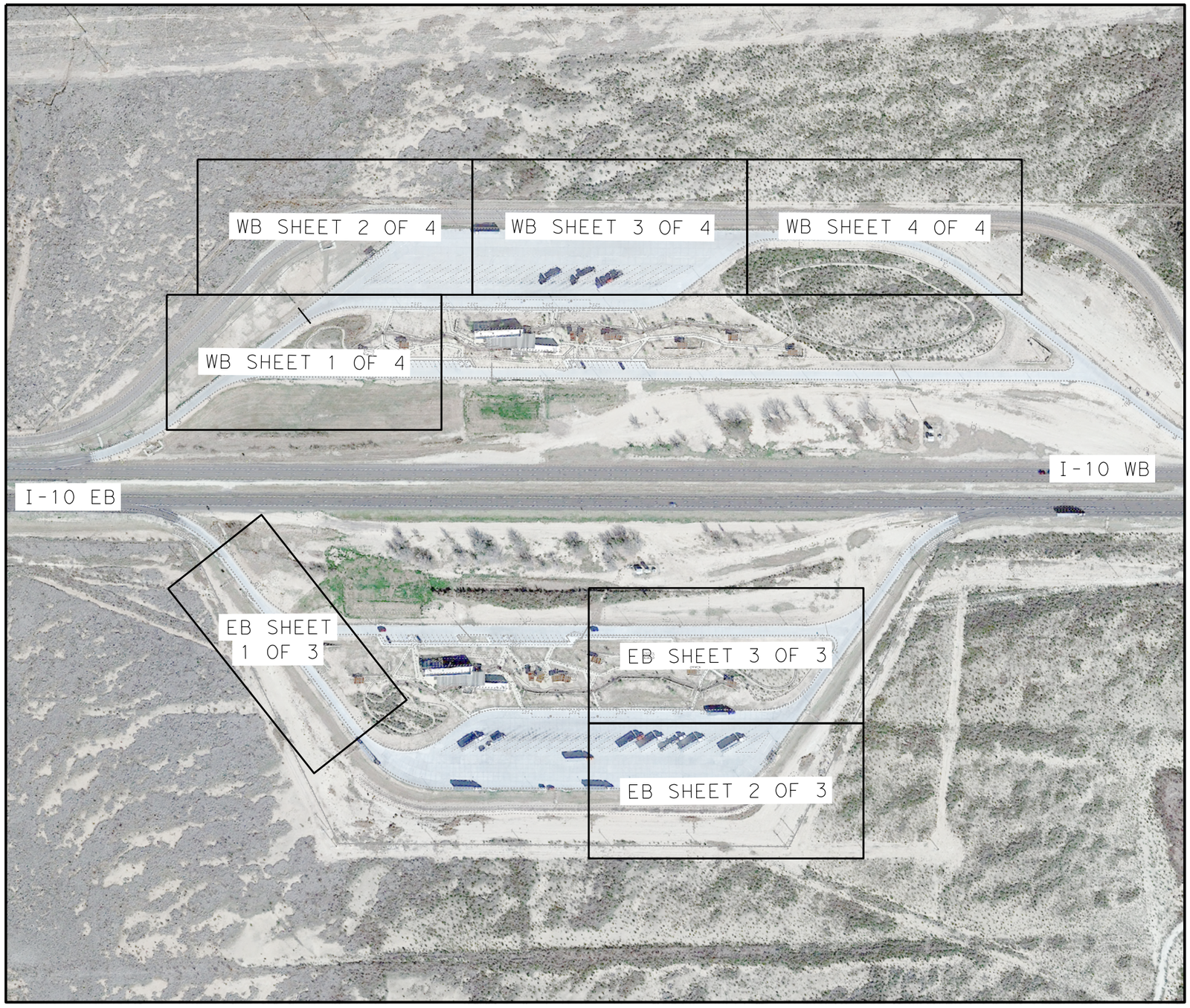

0′ 150′ 300′
SCALE : 1"=300′

STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER
3/18/2024

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation ©2024

PECOS WEST COUNTY SAFETY REST AREAS LAYOUT SHEET ID

SHEET 1 OF 1

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	36

3/18/2024 10:52:54 AM

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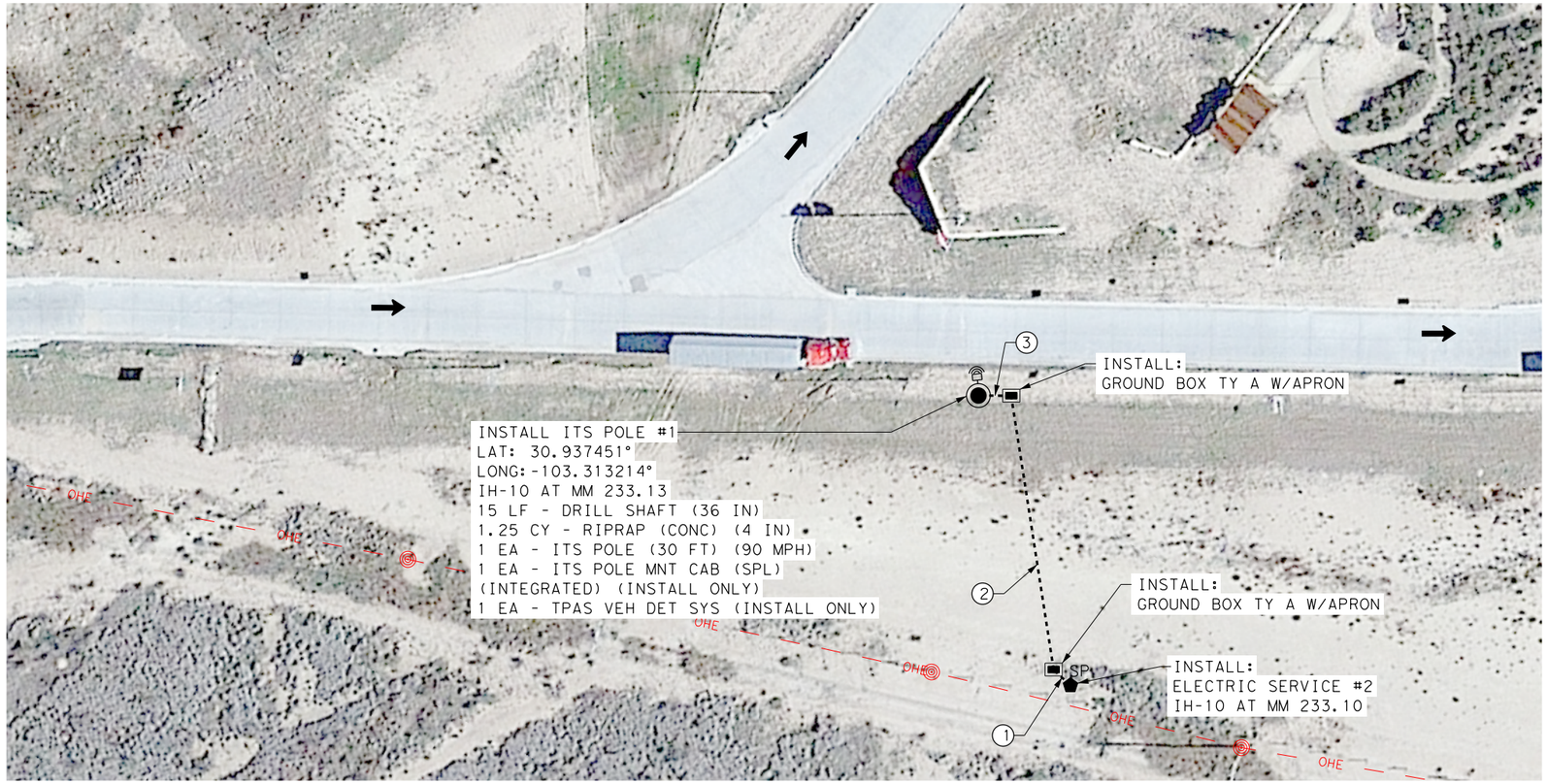

LEGEND

- EXIST CONDUIT
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- SP — PROP ELECTRICAL SERVICE
- PROP GROUND BOX TY A
- PROP GROUND BOX TY A W/ APRON
- PROP VEHICLE DETECTOR
- PROP CCTV
- PROP ITS POLE W/ POLE MOUNTED CABINET
- OHE — EXIST OVER HEAD ELECTRIC LINE
- EXIST POWER POLE

SUMMARY OF QUANTITIES			
BID ITEM & DESC CODE	DESCRIPTION	UNITS	QTY
416 6004	DRILL SHAFT (36 IN)	LF	15
432 6001	RIPRAP (CONC) (4 IN)	CY	1.25
618 6023	CONDT (PVC) (SCH 40) (2")	LF	145
620 6007	ELEC CONDR (NO.8) BARE	LF	175
620 6008	ELEC CONDR (NO.8) INSULATED	LF	350
624 6002	GROUND BOX TY A (122311)W/APRON	EA	2
628 6152	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	EA	1
6064 6010	ITS POLE (30 FT) (90 MPH)	EA	1
6064 6097	ITS POLE MNT CAB (SPL) (INTEGRATED) (INS)	EA	1
6513 6001	TPAS VEH DET SYS (INSTALL ONLY)	EA	1
*	TPAS VEHICLE DETECTION SYSTEM	EA	1
*	POLE MOUNTED INTEGRATED ENCLOSURE CABINET	EA	1

* ITEM TO BE FURNISHED BY TXDOT AND INSTALLED BY THE CONTRACTOR.

PECOS EB SHT 1 OF 3 CONDUIT & CABLE CHART				
RUN NUMBER	618 6023 CONDT (PVC) (SCH 40) (2")	620 6007 ELEC CONDR (NO.8) BARE	620 6008 ELEC CONDR (NO.8) INSULATED	RUN LENGTH FEET
1	1	1	2	10
2	1	1	2	125
3	1	1	2	10
WIRE SLACK		3	6	10
TOTAL	LF	LF	LF	
	145	175	350	

NOTES:

1. CONTRACTOR SHALL LOCATE AND VERIFY ALL EXISTING UTILITIES BEFORE BEGINNING CONSTRUCTION. ANY DAMAGE TO UTILITIES SHALL BE REPAIRED AT NO COST TO THE DEPARTMENT. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL POTHOLE INFRASTRUCTURE LOCATIONS AS NECESSARY PRIOR TO CONSTRUCTION. SUE WAS NOT PERFORMED FOR THIS PROJECT. CONTRACTOR SHALL EXERCISE CAUTION AND COORDINATE ALL REQUIRED UTILITY ADJUSTMENTS WITH THE ENGINEER.
2. CABLING AND CONNECTORS FROM POWER SOURCE AND COMMUNICATIONS SOURCE TO VEHICLE DETECTION SYSTEM SHALL BE AS SPECIFIED BY THE MANUFACTURER.
3. LOCATION OF PROPOSED ITS INFRASTRUCTURE ON THE PLAN SHEETS IS SHOWN DIAGRAMMATIC ONLY. THESE LOCATIONS MAY BE ADJUSTED BY THE ENGINEER TO SECURE A MORE DESIRABLE LOCATION OR AVOID CONFLICT WITH UTILITIES.
4. CONTRACTOR SHALL ENSURE THAT ALL PROPOSED ITS INFRASTRUCTURE WORK INCLUDING, BUT NOT LIMITED TO CONDUIT, ITS POLES, CABINETS, DPAS, AND ELECTRICAL SERVICES MEET MINIMUM CLEARANCE REQUIREMENTS TO EXISTING UNDERGROUND AND OVERHEAD UTILITY LINES AND INFRASTRUCTURE.

STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER

3/18/2024

0′ 30′ 60′
SCALE : 1"=60′

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

PECOS WEST COUNTY SAFETY REST AREA I-10 EASTBOUND

ITS LAYOUT

SHEET 1 OF 3

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
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CHECKED:	0906	00	271	37

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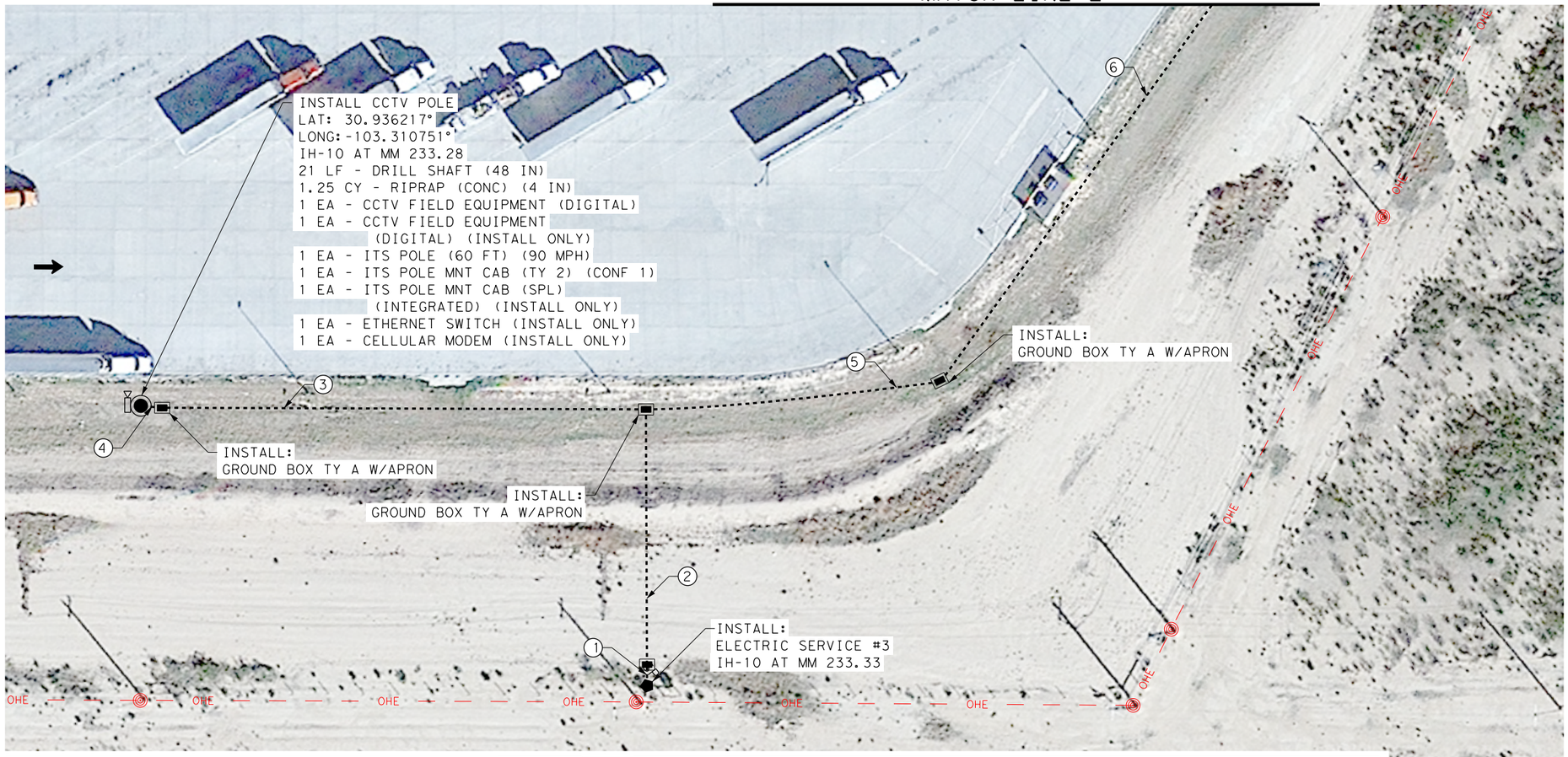
MATCH LINE E



LEGEND

- EXIST CONDUIT
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- SP — PROP ELECTRICAL SERVICE
- PROP GROUND BOX TY A
- PROP GROUND BOX TY A W/ APRON
- PROP VEHICLE DETECTOR
- PROP CCTV
- PROP ITS POLE W/ POLE MOUNTED CABINET
- OHE — EXIST OVER HEAD ELECTRIC LINE
- EXIST POWER POLE

N

STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER
3/18/2024

0′ 30′ 60′
SCALE : 1"=60′

SUMMARY OF QUANTITIES

BID ITEM & DESC CODE	DESCRIPTION	UNITS	QTY
416 6006	DRILL SHAFT (48 IN)	LF	21
432 6001	RIPRAP (CONC) (4 IN)	CY	1.25
618 6023	CONDT (PVC) (SCH 40) (2")	LF	730
620 6008	ELEC CONDR (NO.8) INSULATED	LF	1640
620 6009	ELEC CONDR (NO.6) BARE	LF	810
620 6010	ELEC CONDR (NO.6) INSULATED	LF	1060
624 6002	GROUND BOX TY A (122311)W/APRON	EA	4
628 6152	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	EA	1
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	1
6064 6055	ITS POLE (60 FT) (90 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2) (CONF 1)	EA	1
6064 6097	ITS POLE MNT CAB (SPL) (INTEGRATED) (INS)	EA	1
6123 6001	ETHERNET SWITCH (INSTALL ONLY)	EA	1
6511 6001	CELLULAR MODEM (INSTALL ONLY)	EA	1
*	CELLULAR ROUTER	EA	1
*	FIELD ETHERNET SWITCH	EA	1
*	AXIS PTZ CAMERA	EA	1
*	POLE MOUNTED INTEGRATED ENCLOSURE CABINET	EA	1

* ITEM TO BE FURNISHED BY TXDOT AND INSTALLED BY THE CONTRACTOR.

PECOS EB SHT 2 OF 3
CONDUIT & CABLE CHART

RUN NUMBER	618 6023 CONDT (PVC) (SCH 40) (2")	620 6008 ELEC CONDR (NO.8) INSULATED	620 6009 ELEC CONDR (NO.6) BARE	620 6010 ELEC CONDR (NO.6) INSULATED	RUN LENGTH FEET
1	1	4	1	2	10
2	1	4	1	2	120
3	1	4	1		230
4	1	4	2		10
5	1		1	2	220
6	1		1	2	140
WIRE SLACK		16	7	8	10
TOTAL	LF 730	LF 1640	LF 810	LF 1060	

NOTES:

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2. CABLING AND CONNECTORS FROM POWER SOURCE AND COMMUNICATIONS SOURCE TO VEHICLE DETECTION SYSTEM SHALL BE AS SPECIFIED BY THE MANUFACTURER.
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4. CONTRACTOR SHALL ENSURE THAT ALL PROPOSED ITS INFRASTRUCTURE WORK INCLUDING, BUT NOT LIMITED TO CONDUIT, ITS POLES, CABINETS, DPAS, AND ELECTRICAL SERVICES MEET MINIMUM CLEARANCE REQUIREMENTS TO EXISTING UNDERGROUND AND OVERHEAD UTILITY LINES AND INFRASTRUCTURE.

HNTB
HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

PECOS WEST COUNTY SAFETY REST AREA I-10 EASTBOUND
ITS LAYOUT

SHEET 2 OF 3

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
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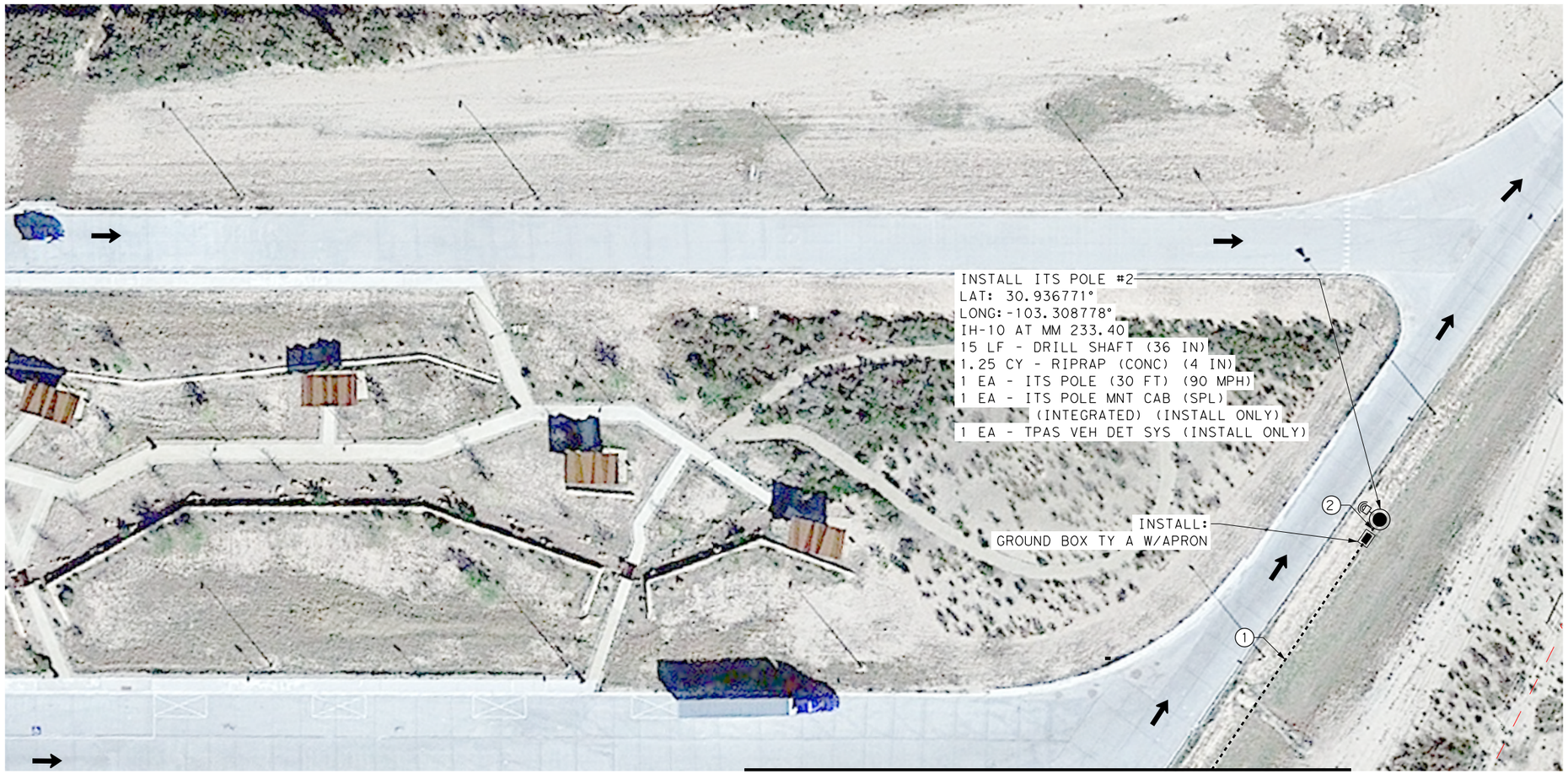

LEGEND

- EXIST CONDUIT
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- SP — PROP ELECTRICAL SERVICE
- PROP GROUND BOX TY A
- PROP GROUND BOX TY A W/ APRON
- PROP VEHICLE DETECTOR
- PROP CCTV
- PROP ITS POLE W/ POLE MOUNTED CABINET
- OHE — EXIST OVER HEAD ELECTRIC LINE
- EXIST POWER POLE

MATCH LINE E

SUMMARY OF QUANTITIES			
BID ITEM & DESC CODE	DESCRIPTION	UNITS	QTY
416 6004	DRILL SHAFT (36 IN)	LF	15
432 6001	RIPRAP (CONC) (4 IN)	CY	1.25
618 6023	CONDT (PVC) (SCH 40) (2")	LF	145
620 6009	ELEC CONDR (NO.6) BARE	LF	165
620 6010	ELEC CONDR (NO.6) INSULATED	LF	330
624 6002	GROUND BOX TY A (122311)W/APRON	EA	1
6064 6010	ITS POLE (30 FT) (90 MPH)	EA	1
6064 6097	ITS POLE MNT CAB (SPL) (INTEGRATED) (INS)	EA	1
6513 6001	TPAS VEH DET SYS (INSTALL ONLY)	EA	1
*	TPAS VEHICLE DETECTION SYSTEM	EA	1
*	POLE MOUNTED INTEGRATED ENCLOSURE CABINET	EA	1

* ITEM TO BE FURNISHED BY TXDOT AND INSTALLED BY THE CONTRACTOR.

PECOS EB SHT 3 OF 3 CONDUIT & CABLE CHART				
RUN NUMBER	618 6023 CONDT (PVC) (SCH 40) (2")	620 6009 ELEC CONDR (NO.6) BARE	620 6010 ELEC CONDR (NO.6) INSULATED	RUN LENGTH FEET
1	1	1	2	135
2	1	1	2	10
WIRE SLACK		2	4	10
TOTAL	LF 145	LF 165	LF 330	

NOTES:

1. CONTRACTOR SHALL LOCATE AND VERIFY ALL EXISTING UTILITIES BEFORE BEGINNING CONSTRUCTION. ANY DAMAGE TO UTILITIES SHALL BE REPAIRED AT NO COST TO THE DEPARTMENT. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL POTHOLE INFRASTRUCTURE LOCATIONS AS NECESSARY PRIOR TO CONSTRUCTION. SUE WAS NOT PERFORMED FOR THIS PROJECT. CONTRACTOR SHALL EXERCISE CAUTION AND COORDINATE ALL REQUIRED UTILITY ADJUSTMENTS WITH THE ENGINEER.
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STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER
3/18/2024

0′ 30′ 60′
SCALE : 1"=60′

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation ©2024

PECOS WEST COUNTY SAFETY REST AREA I-10 EASTBOUND

ITS LAYOUT

SHEET 3 OF 3

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	39

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LEGEND

- EXIST CONDUIT
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- SP — PROP ELECTRICAL SERVICE
- PROP GROUND BOX TY A
- PROP GROUND BOX TY A W/ APRON
- PROP DYNAMIC PARKING AVAILABILITY SIGN
- PROP GROUND MOUNTED DMS CABINET
- OHE — EXIST OVER HEAD ELECTRIC LINE
- EXIST POWER POLE

N

STATE OF TEXAS
CHARLES D. KOONCE III
87785
LICENSED
PROFESSIONAL ENGINEER

3/18/2024

0' 30' 60'
SCALE : 1"=60'

NOTES:
1. CONTRACTOR SHALL LOCATE AND VERIFY ALL EXISTING UTILITIES BEFORE BEGINNING CONSTRUCTION. ANY DAMAGE TO UTILITIES SHALL BE REPAIRED AT NO COST TO THE DEPARTMENT. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL POTHOLE INFRASTRUCTURE LOCATIONS AS NECESSARY PRIOR TO CONSTRUCTION. SUE WAS NOT PERFORMED FOR THIS PROJECT. CONTRACTOR SHALL EXERCISE CAUTION AND COORDINATE ALL REQUIRED UTILITY ADJUSTMENTS WITH THE ENGINEER.
2. CABLING AND CONNECTORS FROM POWER SOURCE AND COMMUNICATIONS SOURCE TO DMS CONNECTION POINTS SHALL BE AS SPECIFIED BY THE MANUFACTURER.
3. LOCATION OF PROPOSED ITS INFRASTRUCTURE ON THE PLAN SHEETS IS SHOWN DIAGRAMMATIC ONLY. THESE LOCATIONS MAY BE ADJUSTED BY THE ENGINEER TO SECURE A MORE DESIRABLE LOCATION OR AVOID CONFLICT WITH UTILITIES.
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SUMMARY OF QUANTITIES

BID ITEM & DESC CODE	DESCRIPTION	UNITS	QTY
416 6018	DRILL SHAFT (SIGN MTS) (24 IN)	LF	29
432 6045	RIPRAP (MOW STRIP) (4 IN)	CY	11.41
540 6002	MTL W-BEAM GD FEN (STEEL POST)	LF	212.50
540 6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1
544 6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1
618 6023	CONDT (PVC) (SCH 40) (2")	LF	95
618 6070	CONDT (RM) (2")	LF	40
620 6003	ELEC CONDR (NO.12) BARE	LF	60
620 6004	ELEC CONDR (NO.12) INSULATED	LF	120
620 6007	ELEC CONDR (NO.8) BARE	LF	85
620 6008	ELEC CONDR (NO.8) INSULATED	LF	255
624 6002	GROUND BOX TY A (122311)W/APRON	EA	2
628 6152	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	EA	1
636 6002	ALUMINUM SIGNS (TY G)	SF	182
647 6001	INSTALL LRSS (STRUCT STEEL)	LB	1052.74
658 6015	INSTL DEL ASSM (D-SW)SZ (BRF)GF1	EA	8
6028 6002	INSTALL DMS (FOUNDATION MTD CABINET)	EA	1
6123 6001	ETHERNET SWITCH (INSTALL ONLY)	EA	1
6511 6001	CELLULAR MODEM (INSTALL ONLY)	EA	1
*	CELLULAR ROUTER	EA	1
*	FIELD ETHERNET SWITCH	EA	1
*	SINGLE LINE DMS 3-CHARACTER (AMBER)	EA	3
*	CONTROLLER AND GROUND MOUNT CABINET	EA	1

* ITEM TO BE FURNISHED BY TXDOT AND INSTALLED BY THE CONTRACTOR.

PECOS DPAS EB SHT 1 OF 1
CONDUIT & CABLE CHART

RUN NUMBER	618 6023 CONDT (PVC) (SCH 40) (2")	618 6070 CONDT (RM) (2")	620 6003 ELEC CONDR (NO.12) BARE	620 6004 ELEC CONDR (NO.12) INSULATED	620 6007 ELEC CONDR (NO.8) BARE	620 6008 ELEC CONDR (NO.8) INSULATED	RUN LENGTH FEET
1	1				1	3	10
2	1				1	3	30
3	1				1	3	15
4	2		1	2			20
5		2	1	2			20
WIRE SLACK			2	4	3	9	10
TOTAL	LF 95	LF 40	LF 60	LF 120	LF 85	LF 255	

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

PECOS WEST COUNTY SAFETY REST AREA I-10 EASTBOUND
SIGN LAYOUT

SHEET 1 OF 1

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	40

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PDF Filename: 0022 - FORT STOCKTON SAFETY SAFETY REST AREA I-10 EASTBOUND SIGN LAYOUT SHEET 1 OF 2.pdf

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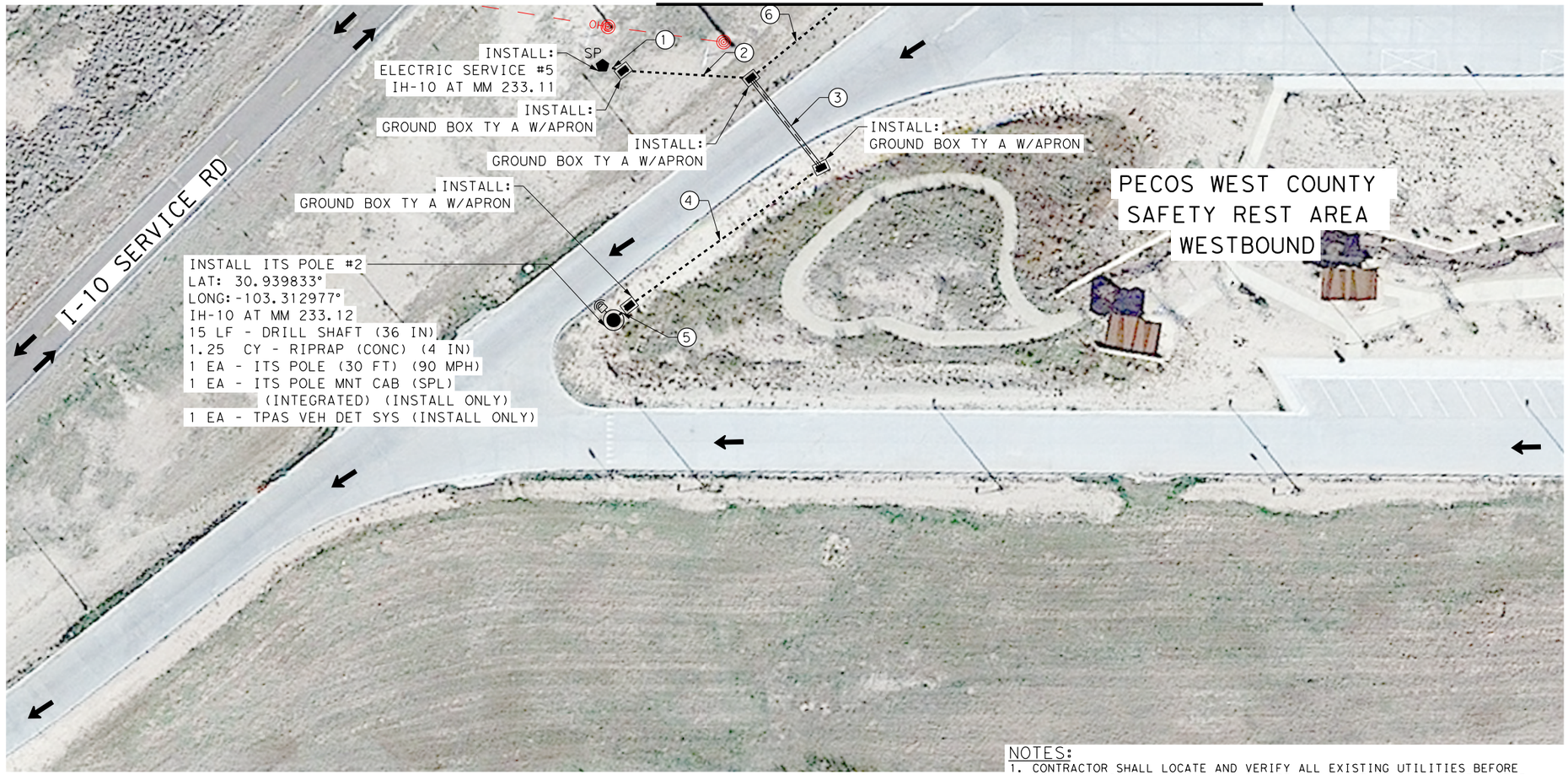
MATCH LINE B



LEGEND

- EXIST CONDUIT
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- SP — PROP ELECTRICAL SERVICE
- PROP GROUND BOX TY A
- PROP GROUND BOX TY A W/ APRON
- PROP VEHICLE DETECTOR
- PROP CCTV
- PROP ITS POLE W/ POLE MOUNTED CABINET
- OHE — EXIST OVER HEAD ELECTRIC LINE
- EXIST POWER POLE

NOTES:

1. CONTRACTOR SHALL LOCATE AND VERIFY ALL EXISTING UTILITIES BEFORE BEGINNING CONSTRUCTION. ANY DAMAGE TO UTILITIES SHALL BE REPAIRED AT NO COST TO THE DEPARTMENT. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL POTHOLE INFRASTRUCTURE LOCATIONS AS NECESSARY PRIOR TO CONSTRUCTION. SUE WAS NOT PERFORMED FOR THIS PROJECT. CONTRACTOR SHALL EXERCISE CAUTION AND COORDINATE ALL REQUIRED UTILITY ADJUSTMENTS WITH THE ENGINEER.
2. CABLING AND CONNECTORS FROM POWER SOURCE AND COMMUNICATIONS SOURCE TO VEHICLE DETECTION SYSTEM SHALL BE AS SPECIFIED BY THE MANUFACTURER.
3. LOCATION OF PROPOSED ITS INFRASTRUCTURE ON THE PLAN SHEETS IS SHOWN DIAGRAMMATIC ONLY. THESE LOCATIONS MAY BE ADJUSTED BY THE ENGINEER TO SECURE A MORE DESIRABLE LOCATION OR AVOID CONFLICT WITH UTILITIES.
4. CONTRACTOR SHALL ENSURE THAT ALL PROPOSED ITS INFRASTRUCTURE WORK INCLUDING, BUT NOT LIMITED TO CONDUIT, ITS POLES, CABINETS, DPAS, AND ELECTRICAL SERVICES MEET MINIMUM CLEARANCE REQUIREMENTS TO EXISTING UNDERGROUND AND OVERHEAD UTILITY LINES AND INFRASTRUCTURE.

SUMMARY OF QUANTITIES

BID ITEM & DESC CODE	DESCRIPTION	UNITS	QTY
416 6004	DRILL SHAFT (36 IN)	LF	15
432 6001	RIPRAP (CONC) (4 IN)	CY	1.25
618 6023	CONDT (PVC) (SCH 40) (2")	LF	255
618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	55
620 6008	ELEC CONDR (NO.8) INSULATED	LF	610
620 6012	ELEC CONDR (NO.4) INSULATED	LF	640
620 6015	ELEC CONDR (NO.2) BARE	LF	370
620 6016	ELEC CONDR (NO.2) INSULATED	LF	320
624 6002	GROUND BOX TY A (122311)W/APRON	EA	4
628 6152	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	EA	1
6064 6010	ITS POLE (30 FT) (90 MPH)	EA	1
6064 6097	ITS POLE MNT CAB (SPL) (INTEGRATED) (INS)	EA	1
6513 6001	TPAS VEH DET SYS (INSTALL ONLY)	EA	1
*	TPAS VEHICLE DETECTION SYSTEM	EA	1
*	POLE MOUNTED INTEGRATED ENCLOSURE CABINET	EA	1

* ITEM TO BE FURNISHED BY TXDOT AND INSTALLED BY THE CONTRACTOR.

PECOS WB SHT 1 OF 4
CONDUIT & CABLE CHART

RUN NUMBER	618 6023 CONDT (PVC) (SCH 40) (2")	618 6047 CONDT (PVC) (SCH 80) (2") (BORE	620 6008 ELEC CONDR (NO.8) INSULATED	620 6012 ELEC CONDR (NO.4) INSULATED	620 6015 ELEC CONDR (NO.2) BARE	620 6016 ELEC CONDR (NO.2) INSULATED	RUN LENGTH FEET
1	1		2	4	1	2	10
2	1		2	4	1	2	65
3		1	2		1		55
4	1		2		1		115
5	1		2		1		10
6	1			4	1	2	55
WIRE SLACK			10	12	6	6	10
TOTAL	LF 255	LF 55	LF 610	LF 640	LF 370	LF 320	

SAI GEETHA KOGANTI
125265
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
3/18/2024

0′ 30′ 60′
SCALE : 1"=60′

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation ©2024

PECOS WEST COUNTY SAFETY REST AREA I-10 WESTBOUND
ITS LAYOUT

SHEET 1 OF 4

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	41

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LEGEND

- EXIST CONDUIT
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE) SP
- PROP ELECTRICAL SERVICE
- PROP GROUND BOX TY A
- PROP GROUND BOX TY A W/ APRON
- PROP VEHICLE DETECTOR
- PROP CCTV
- PROP ITS POLE W/ POLE MOUNTED CABINET
- OHE EXIST OVER HEAD ELECTRIC LINE
- EXIST POWER POLE

N

STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER
3/18/2024

0' 30' 60'
SCALE : 1"=60'

SUMMARY OF QUANTITIES			
BID ITEM & DESC CODE	DESCRIPTION	UNITS	QTY
618 6023	CONDT (PVC) (SCH 40) (2")	LF	500
620 6012	ELEC CONDR (NO.4) INSULATED	LF	2080
620 6015	ELEC CONDR (NO.2) BARE	LF	520
620 6016	ELEC CONDR (NO.2) INSULATED	LF	1040
624 6002	GROUND BOX TY A (122311)W/APRON	EA	1

PECOS WB SHT 2 OF 4 CONDUIT & CABLE CHART					
	618 6023	620 6012	620 6015	620 6016	RUN LENGTH
RUN NUMBER	CONDT (PVC) (SCH 40) (2")	ELEC CONDR (NO.4) INSULATED	ELEC CONDR (NO.2) BARE	ELEC CONDR (NO.2) INSULATED	FEET
1	1	4	1	2	315
2	1	4	1	2	185
WIRE SLACK		8	2	4	10
TOTAL	LF	LF	LF	LF	
	500	2080	520	1040	

NOTES:

1. CONTRACTOR SHALL LOCATE AND VERIFY ALL EXISTING UTILITIES BEFORE BEGINNING CONSTRUCTION. ANY DAMAGE TO UTILITIES SHALL BE REPAIRED AT NO COST TO THE DEPARTMENT. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL POTHOLE INFRASTRUCTURE LOCATIONS AS NECESSARY PRIOR TO CONSTRUCTION. SUE WAS NOT PERFORMED FOR THIS PROJECT. CONTRACTOR SHALL EXERCISE CAUTION AND COORDINATE ALL REQUIRED UTILITY ADJUSTMENTS WITH THE ENGINEER.
2. CABLING AND CONNECTORS FROM POWER SOURCE AND COMMUNICATIONS SOURCE TO VEHICLE DETECTION SYSTEM SHALL BE AS SPECIFIED BY THE MANUFACTURER.
3. LOCATION OF PROPOSED ITS INFRASTRUCTURE ON THE PLAN SHEETS IS SHOWN DIAGRAMMATIC ONLY. THESE LOCATIONS MAY BE ADJUSTED BY THE ENGINEER TO SECURE A MORE DESIRABLE LOCATION OR AVOID CONFLICT WITH UTILITIES.
4. CONTRACTOR SHALL ENSURE THAT ALL PROPOSED ITS INFRASTRUCTURE WORK INCLUDING, BUT NOT LIMITED TO CONDUIT, ITS POLES, CABINETS, DPAS, AND ELECTRICAL SERVICES MEET MINIMUM CLEARANCE REQUIREMENTS TO EXISTING UNDERGROUND AND OVERHEAD UTILITY LINES AND INFRASTRUCTURE.

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

PECOS WEST COUNTY SAFETY REST AREA I-10 WESTBOUND

ITS LAYOUT

SHEET 2 OF 4

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	42

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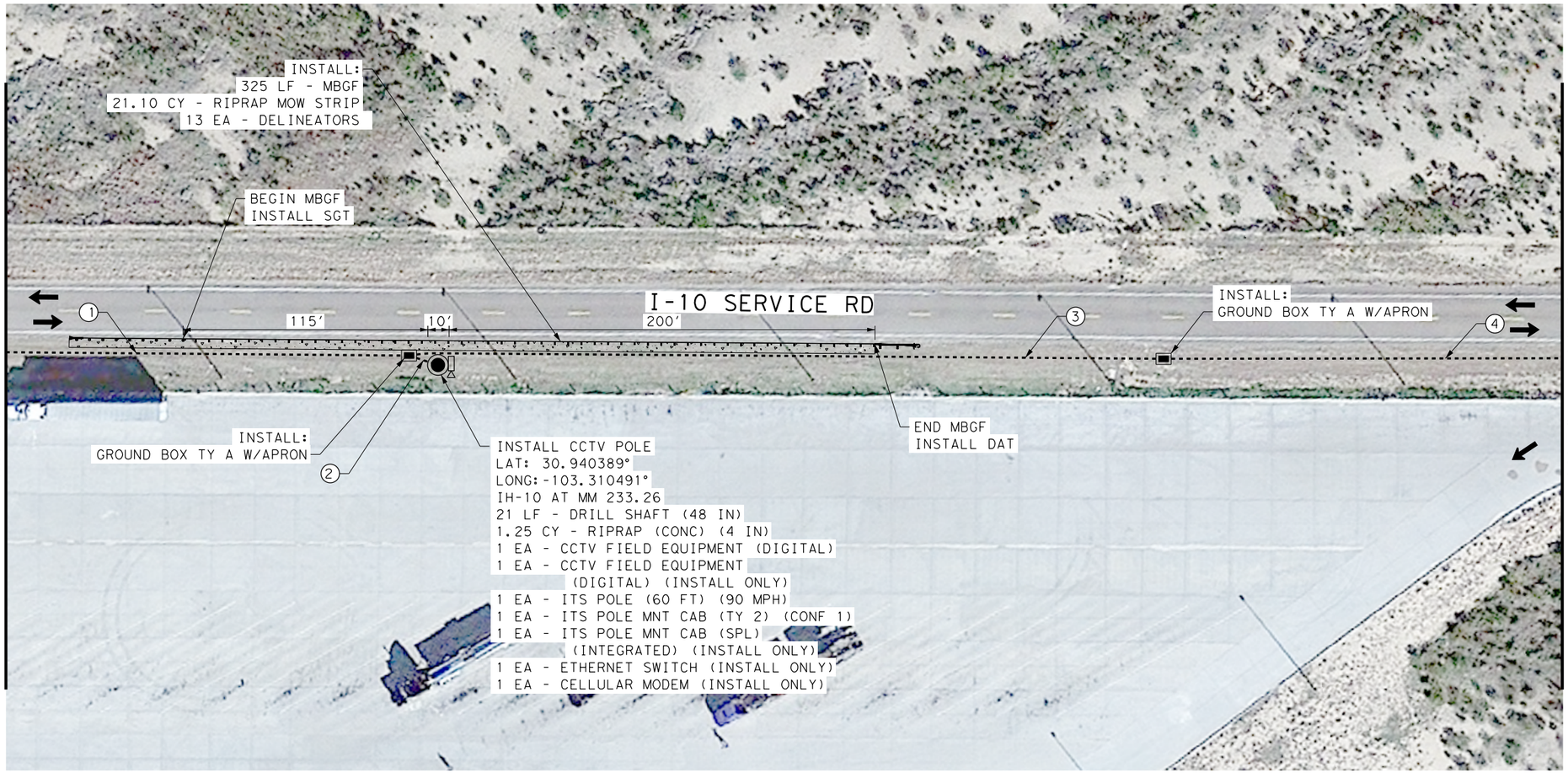

LEGEND

- EXIST CONDUIT
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- SP — PROP ELECTRICAL SERVICE
- PROP GROUND BOX TY A
- PROP GROUND BOX TY A W/ APRON
- PROP VEHICLE DETECTOR
- PROP CCTV
- PROP ITS POLE W/ POLE MOUNTED CABINET
- OHE — EXIST OVER HEAD ELECTRIC LINE
- EXIST POWER POLE

SUMMARY OF QUANTITIES			
BID ITEM & DESC CODE	DESCRIPTION	UNITS	QTY
416 6006	DRILL SHAFT (48 IN)	LF	21
432 6001	RIPRAP (CONC) (4 IN)	CY	1.25
432 6045	RIPRAP (MOW STRIP) (4 IN)	CY	21.10
540 6002	MTL W-BEAM GD FEN (STEEL POST)	LF	325
540 6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1
544 6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1
618 6023	CONDT (PVC) (SCH 40) (2")	LF	745
620 6012	ELEC CONDR (NO.4) INSULATED	LF	880
620 6015	ELEC CONDR (NO.2) BARE	LF	805
620 6016	ELEC CONDR (NO.2) INSULATED	LF	1530
624 6002	GROUND BOX TY A (122311)W/APRON	EA	2
658 6015	INSTL DEL ASSM (D-SW)SZ (BRF)GF1	EA	13
6010 6002	CCTV FIELD EQUIPMENT (DIGITAL)	EA	1
6010 6011	CCTV FIELD EQUIP (DIGITAL) (INSTL ONLY)	EA	1
6064 6055	ITS POLE (60 FT) (90 MPH)	EA	1
6064 6080	ITS POLE MNT CAB (TY 2) (CONF 1)	EA	1
6064 6097	ITS POLE MNT CAB (SPL) (INTEGRATED) (INS)	EA	1
6123 6001	ETHERNET SWITCH (INSTALL ONLY)	EA	1
6511 6001	CELLULAR MODEM (INSTALL ONLY)	EA	1
*	CELLULAR ROUTER	EA	1
*	FIELD ETHERNET SWITCH	EA	1
*	AXIS PTZ CAMERA	EA	1
*	POLE MOUNTED INTEGRATED ENCLOSURE CABINET	EA	1

* ITEM TO BE FURNISHED BY TXDOT AND INSTALLED BY THE CONTRACTOR.

PECOS WB SHT 3 OF 4
CONDUIT & CABLE CHART

RUN NUMBER	618 6023 CONDT (PVC) (SCH 40) (2")	620 6012 ELEC CONDR (NO.4) INSULATED	620 6015 ELEC CONDR (NO.2) BARE	620 6016 ELEC CONDR (NO.2) INSULATED	RUN LENGTH FEET
1	1	4	1	2	190
2	1	4	2		10
3	1		1	2	355
4	1		1	2	190
WIRE SLACK		8	5	6	10
TOTAL	LF	LF	LF	LF	
	745	880	805	1530	

NOTES:

1. CONTRACTOR SHALL LOCATE AND VERIFY ALL EXISTING UTILITIES BEFORE BEGINNING CONSTRUCTION. ANY DAMAGE TO UTILITIES SHALL BE REPAIRED AT NO COST TO THE DEPARTMENT. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL POTHOLE INFRASTRUCTURE LOCATIONS AS NECESSARY PRIOR TO CONSTRUCTION. SUE WAS NOT PERFORMED FOR THIS PROJECT. CONTRACTOR SHALL EXERCISE CAUTION AND COORDINATE ALL REQUIRED UTILITY ADJUSTMENTS WITH THE ENGINEER.
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STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER
3/18/2024

0' 30' 60'
SCALE : 1"=60'

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

PECOS WEST COUNTY SAFETY REST AREA I-10 WESTBOUND
ITS LAYOUT

SHEET 3 OF 4

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
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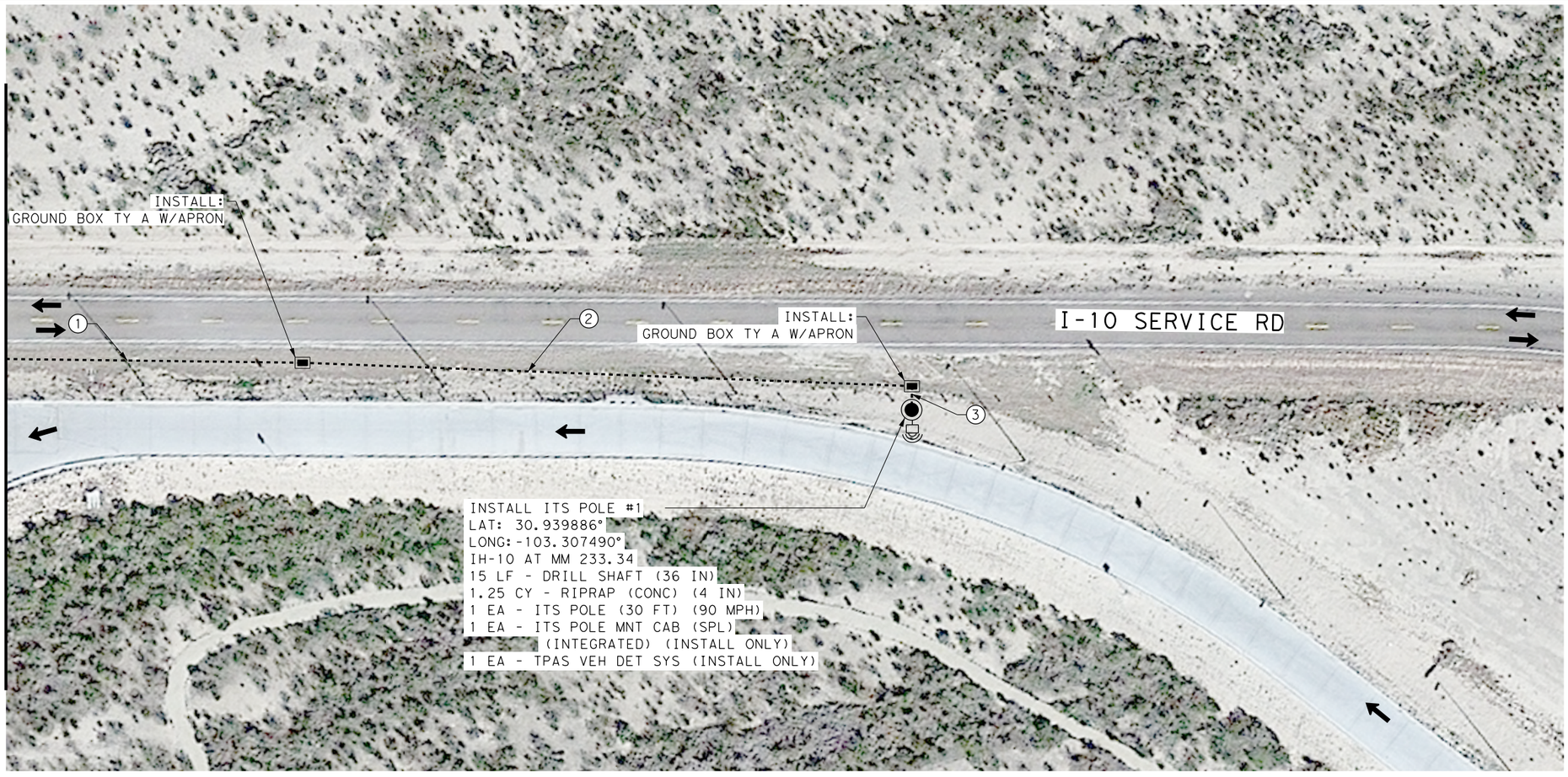

LEGEND

- EXIST CONDUIT
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- SP — PROP ELECTRICAL SERVICE
- PROP GROUND BOX TY A
- PROP GROUND BOX TY A W/ APRON
- PROP VEHICLE DETECTOR
- PROP CCTV
- PROP ITS POLE W/ POLE MOUNTED CABINET
- OHE — EXIST OVER HEAD ELECTRIC LINE
- EXIST POWER POLE

N

STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER

3/18/2024

0′ 30′ 60′
SCALE : 1"=60′

SUMMARY OF QUANTITIES

BID ITEM & DESC CODE	DESCRIPTION	UNITS	QTY
416 6004	DRILL SHAFT (36 IN)	LF	15
432 6001	RIPRAP (CONC) (4 IN)	CY	1.25
618 6023	CONDT (PVC) (SCH 40) (2")	LF	440
620 6015	ELEC CONDR (NO.2) BARE	LF	470
620 6016	ELEC CONDR (NO.2) INSULATED	LF	940
624 6002	GROUND BOX TY A (122311)W/APRON	EA	2
6064 6010	ITS POLE (30 FT) (90 MPH)	EA	1
6064 6097	ITS POLE MNT CAB (SPL) (INTEGRATED) (INS)	EA	1
6513 6001	TPAS VEH DET SYS (INSTALL ONLY)	EA	1
*	TPAS VEHICLE DETECTION SYSTEM	EA	1
*	POLE MOUNTED INTEGRATED ENCLOSURE CABINET	EA	1

* ITEM TO BE FURNISHED BY TXDOT AND INSTALLED BY THE CONTRACTOR.

PECOS WB SHT 4 OF 4 CONDUIT & CABLE CHART

RUN NUMBER	618 6023 CONDT (PVC) (SCH 40) (2")	620 6015 ELEC CONDR (NO.2) BARE	620 6016 ELEC CONDR (NO.2) INSULATED	RUN LENGTH FEET
1	1	1	2	140
2	1	1	2	290
3	1	1	2	10
WIRE SLACK		3	6	10
TOTAL	LF	LF	LF	
	440	470	940	

NOTES:

1. CONTRACTOR SHALL LOCATE AND VERIFY ALL EXISTING UTILITIES BEFORE BEGINNING CONSTRUCTION. ANY DAMAGE TO UTILITIES SHALL BE REPAIRED AT NO COST TO THE DEPARTMENT. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL POTHOLE INFRASTRUCTURE LOCATIONS AS NECESSARY PRIOR TO CONSTRUCTION. SUE WAS NOT PERFORMED FOR THIS PROJECT. CONTRACTOR SHALL EXERCISE CAUTION AND COORDINATE ALL REQUIRED UTILITY ADJUSTMENTS WITH THE ENGINEER.
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HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

PECOS WEST COUNTY SAFETY REST AREA I-10 WESTBOUND

ITS LAYOUT

SHEET 4 OF 4

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
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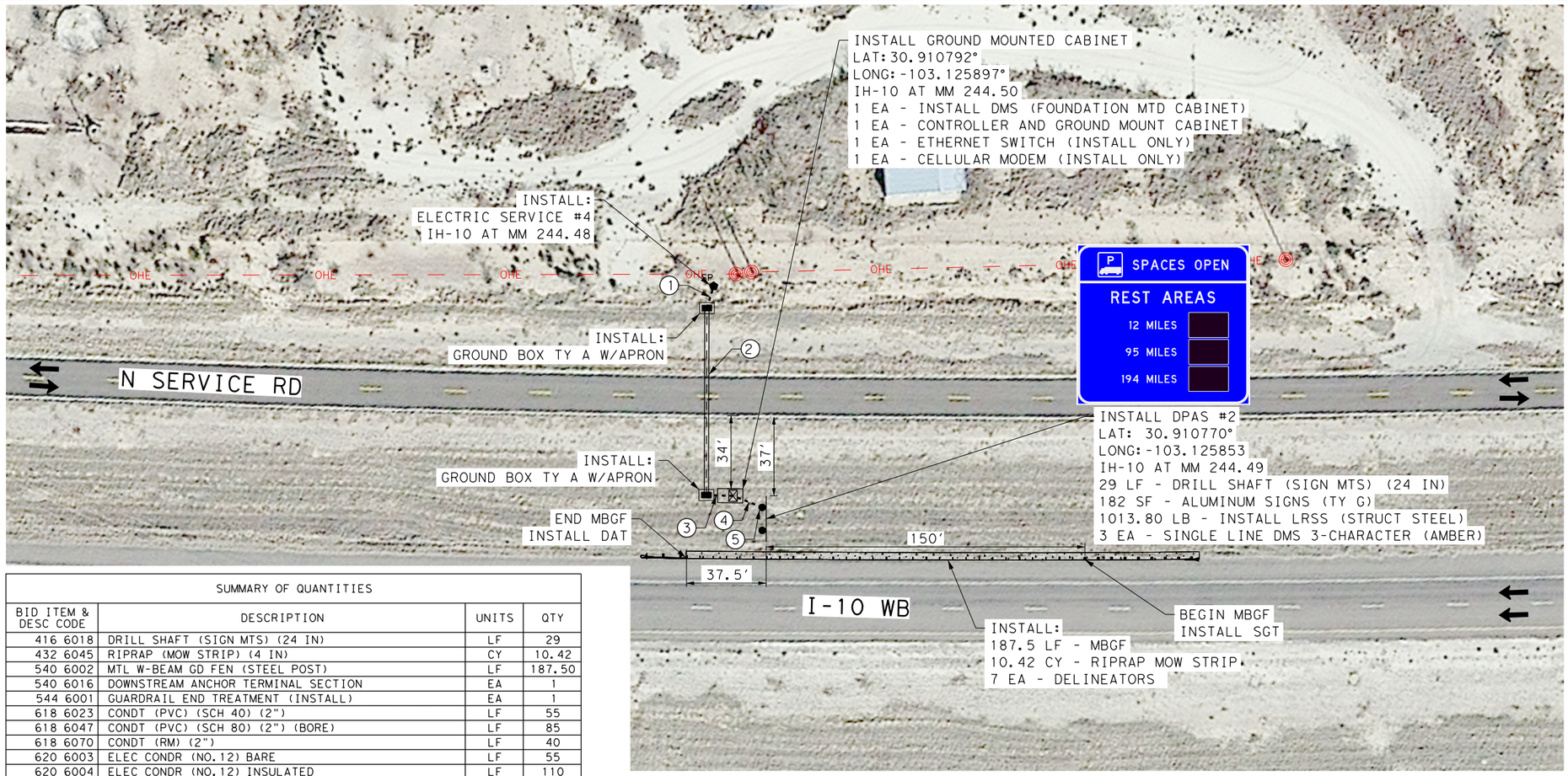

LEGEND

- EXIST CONDUIT
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- SP — PROP ELECTRICAL SERVICE
- PROP GROUND BOX TY A
- PROP GROUND BOX TY A W/ APRON
- PROP DYNAMIC PARKING AVAILABILITY SIGN
- PROP GROUND MOUNTED DMS CABINET
- OHE — EXIST OVER HEAD ELECTRIC LINE
- EXIST POWER POLE

SUMMARY OF QUANTITIES			
BID ITEM & DESC CODE	DESCRIPTION	UNITS	QTY
416 6018	DRILL SHAFT (SIGN MTS) (24 IN)	LF	29
432 6045	RIPRAP (MOW STRIP) (4 IN)	CY	10.42
540 6002	MTL W-BEAM GD FEN (STEEL POST)	LF	187.50
540 6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1
544 6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1
618 6023	CONDT (PVC) (SCH 40) (2")	LF	55
618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	85
618 6070	CONDT (RM) (2")	LF	40
620 6003	ELEC CONDR (NO.12) BARE	LF	55
620 6004	ELEC CONDR (NO.12) INSULATED	LF	110
620 6007	ELEC CONDR (NO.8) BARE	LF	140
620 6008	ELEC CONDR (NO.8) INSULATED	LF	420
624 6002	GROUND BOX TY A (122311)W/APRON	EA	2
628 6152	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	EA	1
636 6002	ALUMINUM SIGNS (TY G)	SF	182
647 6001	INSTALL LRSS (STRUCT STEEL)	LB	1013.80
658 6015	INSTL DEL ASSM (D-SW)SZ (BRF)GF1	EA	7
6028 6002	INSTALL DMS (FOUNDATION MTD CABINET)	EA	1
6123 6001	ETHERNET SWITCH (INSTALL ONLY)	EA	1
6511 6001	CELLULAR MODEM (INSTALL ONLY)	EA	1
*	CELLULAR ROUTER	EA	1
*	FIELD ETHERNET SWITCH	EA	1
*	SINGLE LINE DMS 3-CHARACTER (AMBER)	EA	3
*	CONTROLLER AND GROUND MOUNT CABINET	EA	1

* ITEM TO BE FURNISHED BY TXDOT AND INSTALLED BY THE CONTRACTOR.

NOTES:

1. CONTRACTOR SHALL LOCATE AND VERIFY ALL EXISTING UTILITIES BEFORE BEGINNING CONSTRUCTION. ANY DAMAGE TO UTILITIES SHALL BE REPAIRED AT NO COST TO THE DEPARTMENT. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL POTHOLE INFRASTRUCTURE LOCATIONS AS NECESSARY PRIOR TO CONSTRUCTION. SUE WAS NOT PERFORMED FOR THIS PROJECT. CONTRACTOR SHALL EXERCISE CAUTION AND COORDINATE ALL REQUIRED UTILITY ADJUSTMENTS WITH THE ENGINEER.
2. CABLING AND CONNECTORS FROM POWER SOURCE AND COMMUNICATIONS SOURCE TO DMS CONNECTION POINTS SHALL BE AS SPECIFIED BY THE MANUFACTURER.
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PECOS DPAS WB SHT 1 OF 1
CONDUIT & CABLE CHART

RUN NUMBER	618 6023 CONDT (PVC) (SCH 40) (2")	618 6047 CONDT (PVC) (SCH 80) (2") (BORE)	618 6070 CONDT (RM) (2")	620 6003 ELEC CONDR (NO.12) BARE	620 6004 ELEC CONDR (NO.12) INSULATED	620 6007 ELEC CONDR (NO.8) BARE	620 6008 ELEC CONDR (NO.8) INSULATED	RUN LENGTH FEET
1	1					1	3	10
2		1				1	3	85
3	1					1	3	15
4	2			1	2			15
5			2	1	2			20
WIRE SLACK				2	4	3	9	10
TOTAL	LF 55	LF 85	LF 40	LF 55	LF 110	LF 140	LF 420	

STATE OF TEXAS
CHARLES D. KOONCE III
87785
LICENSED
PROFESSIONAL ENGINEER

3/18/2024

0′ 30′ 60′
SCALE : 1"=60′

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

PECOS WEST COUNTY SAFETY REST AREA I-10 WESTBOUND
SIGN LAYOUT

SHEET 1 OF 1

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	45

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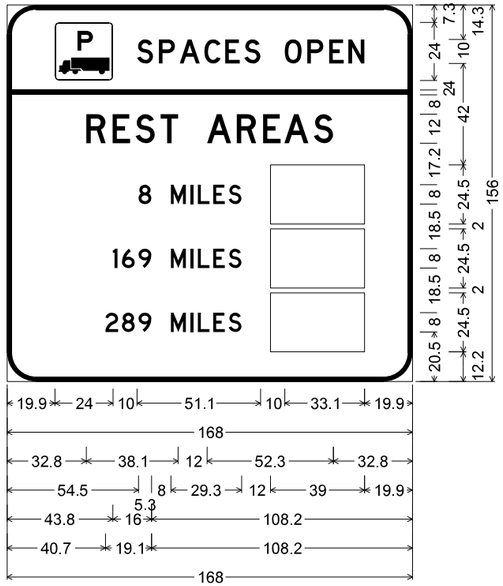
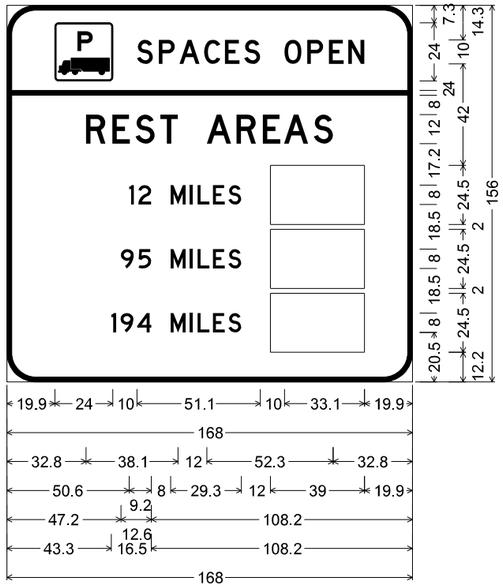


DPAS #1; PECOS CO. EB;
12.0" Radius, 2.0" Border, White on Blue;
D9-16; "SPACES OPEN", D; "REST AREAS", D;
"8 MILES", D; Rectangle Black; "169 MILES", D;
Rectangle Black; "289 MILES", D;
Rectangle Black;



DPAS #2; PECOS CO. WB;
12.0" Radius, 2.0" Border, White on Blue;
D9-16; "SPACES OPEN", D; "REST AREAS", D;
"12 MILES", D; Rectangle Black; "95 MILES", D;
Rectangle Black; "194 MILES", D;
Rectangle Black;

3/18/2024

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

PECOS WEST COUNTY LARGE SIGN DETAILS

SHEET 1 OF 1

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	46

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PDF Filename: 0019 - PECOS WEST COUNTY LARGE SIGN DETAILS SHEET 1 OF 1.pdf

ELECTRIC SERVICE SUMMARY															
LOCATION	SHEET NO.	ITEM & CODE	SERVICE NUMBER	ELECTRICAL SERVICE DESCRIPTION DATA (SEE ED(5) - 14 AND ED(6) - 14)	SERVICE CONDUIT SIZE (RMC)*	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACT OR AMPS	PANEL BD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	BRANCH CIRCUIT AMPS	VOLTAGE	KVA LOAD
PECOS CO DPAS EB	40	628 6152	ELECTRIC SERVICE 1	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	1 1/4"	3/#6	N/A	2P/60	N/A	60	DPAS #1	2P/40	25	240	6
PECOS CO SRA EB	37	628 6152	ELECTRIC SERVICE 2	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	1 1/4"	3/#6	N/A	2P/60	N/A	60	ITS POLE #1	1P/20	10	120	1.2
	38	628 6152	ELECTRIC SERVICE 3	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	1 1/4"	3/#6	N/A	2P/60	N/A	70	CCTV POLE	1P/20	10	120	1.2
												1P/20	10	120	1.2
											ITS POLE #2	1P/20	10	120	1.2
PECOS CO DPAS WB	45	628 6152	ELECTRIC SERVICE 4	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	1 1/4"	3/#6	N/A	2P/60	N/A	60	DPAS #2	2P/40	25	240	6
PECOS CO SRA WB	41	628 6152	ELECTRIC SERVICE 5	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	1 1/4"	3/#6	N/A	2P/60	N/A	70	ITS POLE #1	1P/20	10	120	1.2
											CCTV POLE	1P/20	10	120	1.2
												1P/20	10	120	1.2
											ITS POLE #2	1P/20	10	120	1.2
*VERIFY SERVICE CONDUIT SIZE WITH UTILITY. SIZE MAY CHANGE DUE TO UTILITY METER REQUIREMENTS. ENSURE CONDUIT SIZE MEETS THE NATIONAL ELECTRICAL CODE.															
ITS POLE #1 = POLE AT SRA ENTRANCE; ITS POLE #2 = POLE AT SRA EXIT															

STATE OF TEXAS
KEVIN D. TYER
87924
LICENSED
PROFESSIONAL ENGINEER

02/28/2024

SCALE : NTS

NO.	REVISIONS	BY	DATE

TRAF-IQ
14811 ST. MARY'S LANE, SUITE 180
HOUSTON, TEXAS 77079
832.399.1100
TEXAS PE FIRM REG # F-18726

HNTB
HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

ELECTRICAL SERVICE SUMMARY

SHEET 1 OF 1

STATE	DISTRICT	COUNTY	HWY NUMBER
TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
CONTROL	SECTION	JOB	SHEET NUMBER
0906	00	271	47

2/28/2024 9:28:18 AM

VOLTAGE DROP CALCULATION SUMMARY

LAYOUT SHEET	ELECTRIC SERVICE ID AND BRANCH	RUN ID	RUN VOLTAGE (VOLTS)	CURRENT THIS RUN (AMPS)	LENGTH OF RUN (FEET)	ITEM NUMBER	CONDUCTOR DESCRIPTION	WIRE LOOP RESISTANCE 2 X (OHM / 1000 FT)	VOLTAGE DROP (VOLTS)	RUNNING TOTAL VOLTAGE DROP (VOLTS)	RUNNING TOTAL VOLTAGE DROP NOT TO EXCEED 5% DROP
PECOS DPAS EB SHT 1 OF 1	DPAS #1	5	240	25.00	20	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.65	3.1065	1.29%
PECOS DPAS EB SHT 1 OF 1		4	240	25.00	20	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.65	2.4525	1.02%
PECOS DPAS EB SHT 1 OF 1		3	240	25.00	15	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.49	1.7985	0.75%
PECOS DPAS EB SHT 1 OF 1		2	240	25.00	30	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.98	1.3080	0.55%
PECOS DPAS EB SHT 1 OF 1		1	240	25.00	10	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.33	0.3270	0.14%
CIRCUIT "1A" START		START	240	25.00	START					0.0000	
PECOS EB SHT 1 OF 3	ITS POLE #1	3	120	10.00	10	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.13	1.8966	1.58%
PECOS EB SHT 1 OF 3		2	120	10.00	125	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	1.64	1.7658	1.47%
PECOS EB SHT 1 OF 3		1	120	10.00	10	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.13	0.1308	0.11%
CIRCUIT "1B" START		START	120	0.00	START					0.0000	
PECOS EB SHT 2 OF 3	CCTV POLE	4	120	10.00	10	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.13	4.8396	4.03%
PECOS EB SHT 2 OF 3		3	120	10.00	230	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	3.01	4.7088	3.92%
PECOS EB SHT 2 OF 3		2	120	10.00	120	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	1.57	1.7004	1.42%
PECOS EB SHT 2 OF 3		1	120	10.00	10	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.13	0.1308	0.11%
CIRCUIT "1C" START		START	120	10.00	START					0.0000	
PECOS EB SHT 2 OF 3	CCTV POLE	4	120	10.00	10	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.13	4.8396	4.03%
PECOS EB SHT 2 OF 3		3	120	10.00	230	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	3.01	4.7088	3.92%
PECOS EB SHT 2 OF 3		2	120	10.00	120	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	1.57	1.7004	1.42%
PECOS EB SHT 2 OF 3		1	120	10.00	10	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.13	0.1308	0.11%
CIRCUIT "1D" START		START	120	10.00	START					0.0000	
PECOS EB SHT 3 OF 3	ITS POLE #2	2	120	10.00	10	620 6010	ELEC CONDR (NO.6) INSULATED	0.82	0.08	5.2070	4.34%
PECOS EB SHT 3 OF 3		1	120	10.00	135	620 6010	ELEC CONDR (NO.6) INSULATED	0.82	1.11	5.1250	4.27%
PECOS EB SHT 2 OF 3		6	120	10.00	140	620 6010	ELEC CONDR (NO.6) INSULATED	0.82	1.15	4.0180	3.35%
PECOS EB SHT 2 OF 3		5	120	10.00	220	620 6010	ELEC CONDR (NO.6) INSULATED	0.82	1.80	2.8700	2.39%
PECOS EB SHT 2 OF 3		2	120	10.00	120	620 6010	ELEC CONDR (NO.6) INSULATED	0.82	0.98	1.0660	0.89%
PECOS EB SHT 2 OF 3		1	120	10.00	10	620 6010	ELEC CONDR (NO.6) INSULATED	0.82	0.08	0.0820	0.07%
CIRCUIT "1E" START		START	120	10.00	START					0.0000	
PECOS DPAS WB SHT 1 OF 1	DPAS #2	5	240	25.00	20	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.65	4.7415	1.98%
PECOS DPAS WB SHT 1 OF 1		4	240	25.00	15	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.49	4.0875	1.70%
PECOS DPAS WB SHT 1 OF 1		3	240	25.00	15	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.49	3.5970	1.50%
PECOS DPAS WB SHT 1 OF 1		2	240	25.00	85	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	2.78	3.1065	1.29%
PECOS DPAS WB SHT 1 OF 1		1	240	25.00	10	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.33	0.3270	0.14%
CIRCUIT "2A" START		START	240	25.00	START					0.0000	
PECOS WB SHT 4 OF 4	ITS POLE #1	3	120	10.00	10	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	0.03	5.8482	4.87%
PECOS WB SHT 4 OF 4		2	120	10.00	290	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	0.94	5.8158	4.85%
PECOS WB SHT 4 OF 4		1	120	10.00	140	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	0.45	4.8762	4.06%
PECOS WB SHT 3 OF 4		4	120	10.00	190	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	0.62	4.4226	3.69%
PECOS WB SHT 3 OF 4		3	120	10.00	355	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	1.15	3.8070	3.17%
PECOS WB SHT 3 OF 4		1	120	10.00	190	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	0.62	2.6568	2.21%
PECOS WB SHT 2 OF 4		2	120	10.00	185	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	0.60	2.0412	1.70%
PECOS WB SHT 2 OF 4		1	120	10.00	315	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	1.02	1.4418	1.20%
PECOS WB SHT 1 OF 4		6	120	10.00	55	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	0.18	0.4212	0.35%
PECOS WB SHT 1 OF 4		2	120	10.00	65	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	0.21	0.2430	0.20%
PECOS WB SHT 1 OF 4		1	120	10.00	10	620 6016	ELEC CONDR (NO.2) INSULATED	0.324	0.03	0.0324	0.03%
CIRCUIT "2B" START		START	120	10.00	START					0.0000	
PECOS WB SHT 3 OF 4	CCTV POLE	2	120	10.00	10	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.05	4.2994	3.58%
PECOS WB SHT 3 OF 4		1	120	10.00	190	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.98	4.2476	3.54%
PECOS WB SHT 2 OF 4		2	120	10.00	185	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.96	3.2634	2.72%
PECOS WB SHT 2 OF 4		1	120	10.00	315	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	1.63	2.3051	1.92%
PECOS WB SHT 1 OF 4		6	120	10.00	55	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.28	0.6734	0.56%
PECOS WB SHT 1 OF 4		2	120	10.00	65	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.34	0.3885	0.32%
PECOS WB SHT 1 OF 4		1	120	10.00	10	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.05	0.0518	0.04%
CIRCUIT "2C" START		START	120	10.00	START					0.0000	

STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER
3/18/2024

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

VOLTAGE DROP

SHEET 1 OF 2

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	48

3/18/2024 11:22:02 AM

VOLTAGE DROP CALCULATION SUMMARY											
LAYOUT SHEET	ELECTRIC SERVICE ID AND BRANCH	RUN ID	RUN VOLTAGE (VOLTS)	CURRENT THIS RUN (AMPS)	LENGTH OF RUN (FEET)	ITEM NUMBER	CONDUCTOR DESCRIPTION	WIRE LOOP RESISTANCE 2 X (OHM / 1000 FT)	VOLTAGE DROP (VOLTS)	RUNNING TOTAL VOLTAGE DROP (VOLTS)	RUNNING TOTAL VOLTAGE DROP NOT TO EXCEED 5% DROP
PECOS WB SHT 3 OF 4	CCTV POLE	2	120	10.00	10	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.05	4.2994	3.58%
PECOS WB SHT 3 OF 4		1	120	10.00	190	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.98	4.2476	3.54%
PECOS WB SHT 2 OF 4		2	120	10.00	185	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.96	3.2634	2.72%
PECOS WB SHT 2 OF 4		1	120	10.00	315	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	1.63	2.3051	1.92%
PECOS WB SHT 1 OF 4		6	120	10.00	55	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.28	0.6734	0.56%
PECOS WB SHT 1 OF 4		2	120	10.00	65	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.34	0.3885	0.32%
PECOS WB SHT 1 OF 4		1	120	10.00	10	620 6012	ELEC CONDR (NO.4) INSULATED	0.518	0.05	0.0518	0.04%
CIRCUIT "2D" START		START	120	10.00	START					0.0000	
PECOS WB SHT 1 OF 4	ITS POLE #2	5	120	10.00	10	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.13	3.3354	2.78%
PECOS WB SHT 1 OF 4		4	120	10.00	115	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	1.50	3.2046	2.67%
PECOS WB SHT 1 OF 4		3	120	10.00	55	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.72	1.7004	1.42%
PECOS WB SHT 1 OF 4		2	120	10.00	65	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.85	0.9810	0.82%
PECOS WB SHT 1 OF 4		1	120	10.00	10	620 6008	ELEC CONDR (NO.8) INSULATED	1.308	0.13	0.1308	0.11%
CIRCUIT "2E" START		START	120	10.00	START					0.0000	

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

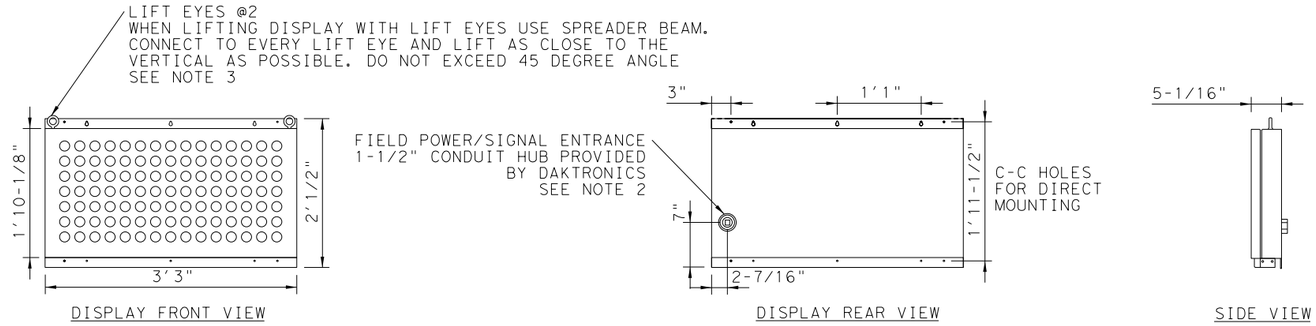
Texas Department of Transportation

VOLTAGE DROP

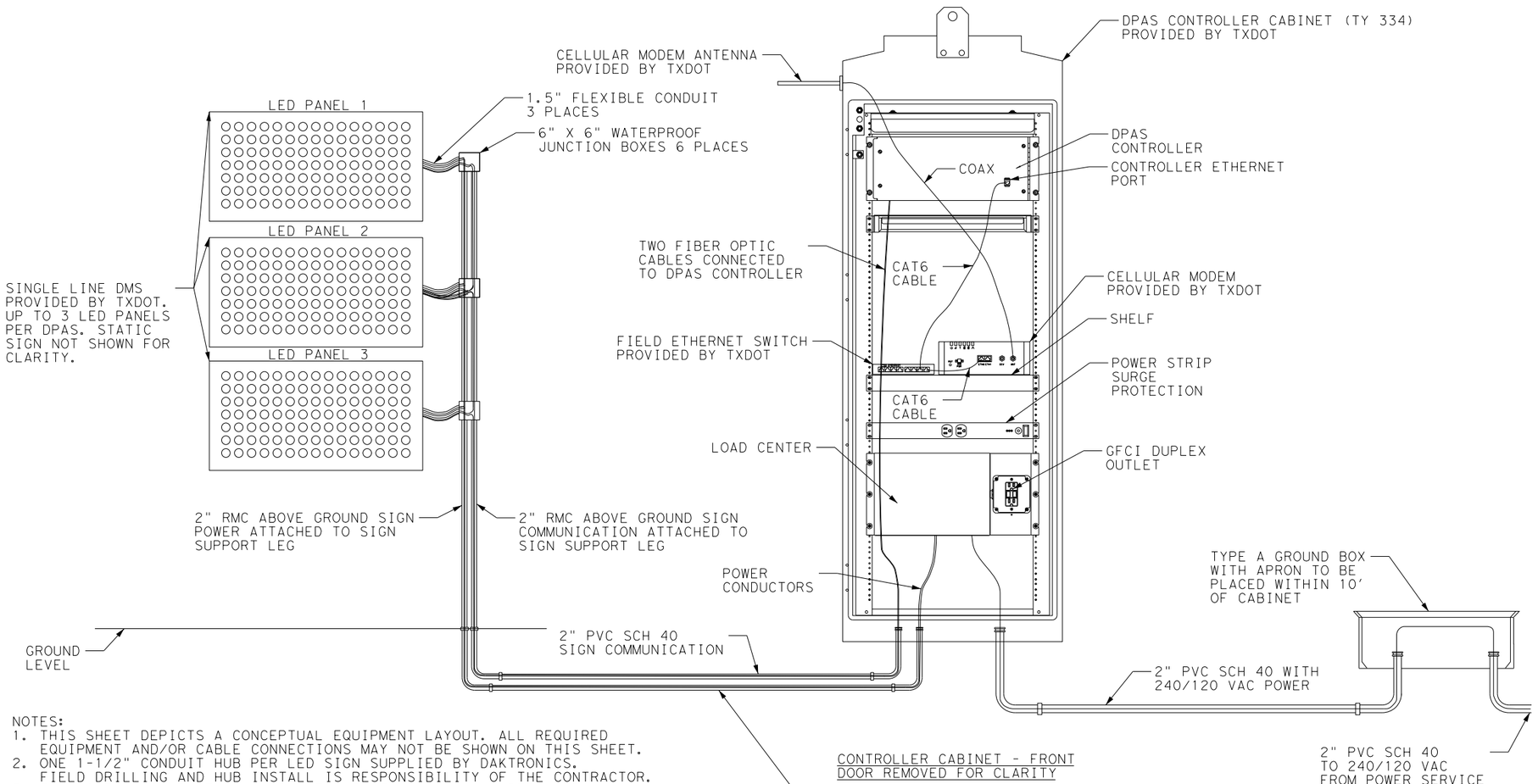
SHEET 2 OF 2

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	49

3/18/2024 11:22:13 AM



LED SIGN PANEL DETAIL (DAKTRONICS VM-1020-7X15-66)



NOTES:
1. THIS SHEET DEPICTS A CONCEPTUAL EQUIPMENT LAYOUT. ALL REQUIRED EQUIPMENT AND/OR CABLE CONNECTIONS MAY NOT BE SHOWN ON THIS SHEET.
2. ONE 1-1/2" CONDUIT HUB PER LED SIGN SUPPLIED BY DAKTRONICS. FIELD DRILLING AND HUB INSTALL IS RESPONSIBILITY OF THE CONTRACTOR.
3. EYE BOLTS SHOULD BE REMOVED AFTER INSTALLATION AND REPLACED WITH 3/8"-16 STAINLESS STEEL BOLTS.
4. NEATLY ROUTE ALL CABLES.
5. METHOD FOR ATTACHING LED SIGNS TO STATIC SIGN SHALL BE PER MANUFACTURER RECOMMENDATION. USE ALL MOUNTING HOLES FOR DIRECT MOUNT.
6. CABLING AND CONNECTORS FROM POWER SOURCE AND COMMUNICATIONS SOURCE TO DMS CONNECTION POINTS SHALL BE AS SPECIFIED BY DMS MANUFACTURER.

STATE OF TEXAS
CHARLES D. KOONCE III
87785
LICENSED
PROFESSIONAL ENGINEER
3/18/2024

NOT TO SCALE

HNTB Corporation
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Infrastructure Solutions
Firm Registration Number 420

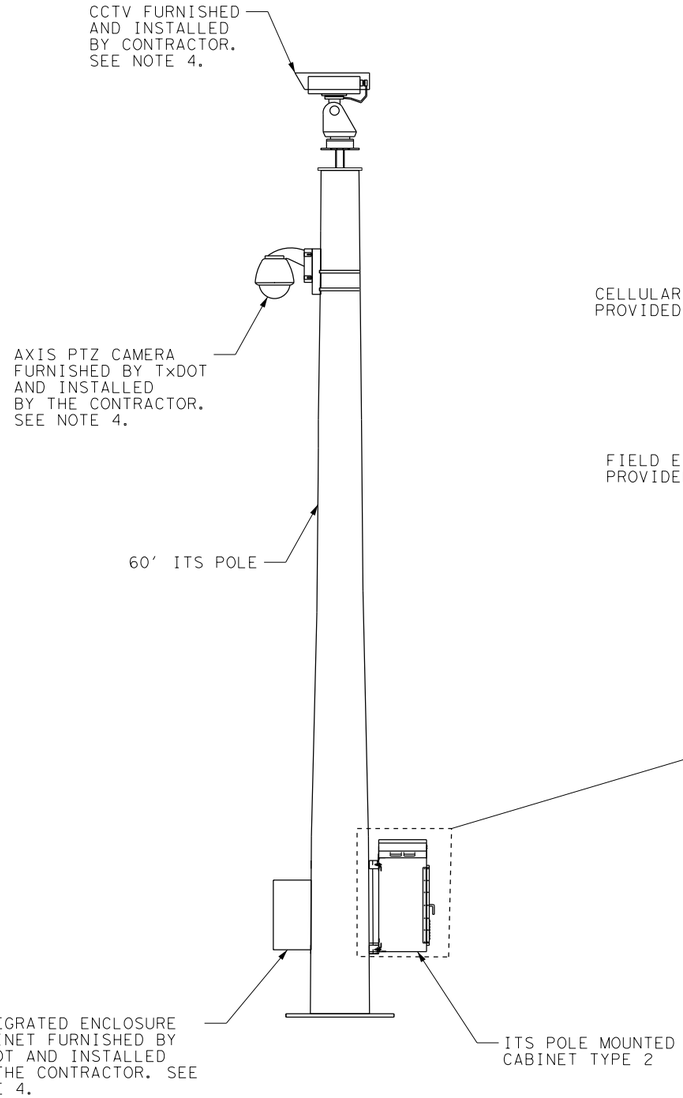
Texas Department of Transportation

TYPICAL DPAS COMMUNICATIONS DETAIL

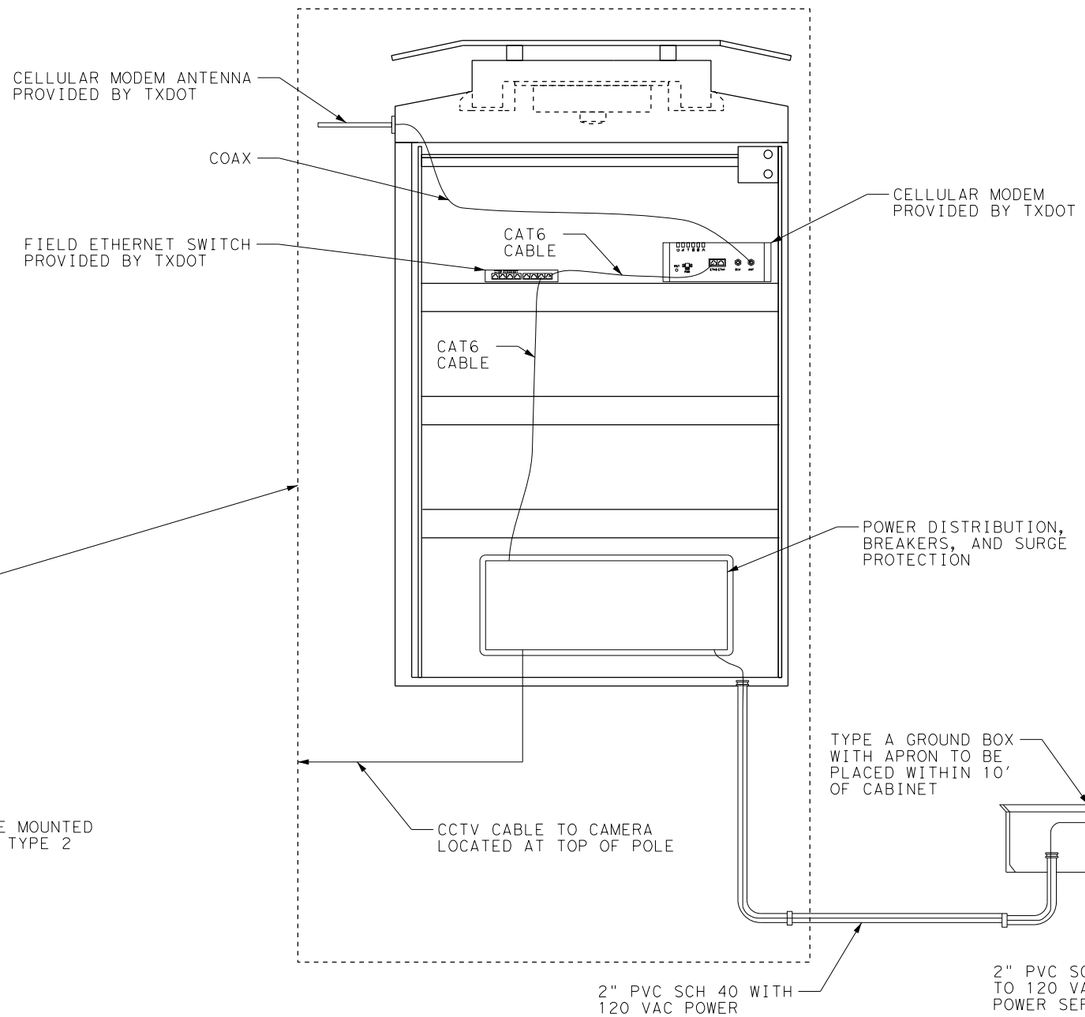
SHEET 1 OF 1

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	50

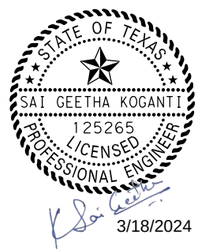
3/18/2024 11:22:16 AM



ITS POLE MOUNTED CABINET TYPE 2



NOTES:
1. CONTRACTOR IS RESPONSIBLE FOR INSTALLING ALL EQUIPMENT TO ENSURE A FULLY OPERATIONAL SYSTEM.
2. THIS SHEET DEPICTS A CONCEPTUAL EQUIPMENT LAYOUT. ALL REQUIRED EQUIPMENT AND/OR CABLE CONNECTIONS MAY NOT BE SHOWN ON THIS SHEET.
3. NEATLY ROUTE ALL CABLES.
4. THE STATE FURNISHED AXIS PTZ CAMERA AND INTEGRATED ENCLOSURE CABINET SHALL BE MOUNTED ON THE SAME POLE AS THE CONTRACTOR FURNISHED CAMERA AND TY 2 CABINET AS GIVEN ON THE LAYOUT SHEETS AND IN ACCORDINACE WITH THE VENDOR'S RECOMMENDATIONS. COORDINATE WITH THE VENDOR FOR MOUNTING AND LOCATION OF AXIS PTZ CAMERA AND INTEGRATED ENCLOSURE CABINET. INSTALLATION OF THE AXIS PTZ CAMERA WILL BE PAID UNDER ITEM 6010 6011. INSTALLATION OF THE INTEGRATED ENCLOSURE CABINET WILL BE PAID UNDER ITEM 6064-6097.



NOT TO SCALE

HNTB Corporation
The HNTB Companies
Infrastructure Solutions
Firm Registration Number 420

Texas Department of Transportation

TYPICAL CCTV COMMUNICATIONS DETAIL

SHEET 1 OF 1

DESIGNED:	STATE	DISTRICT	COUNTY	HWY NUMBER
CHECKED:	TEXAS	ODESSA	ECTOR, ETC.	VARIOUS
DRAWN:	CONTROL	SECTION	JOB	SHEET NUMBER
CHECKED:	0906	00	271	51

3/18/2024 11:22:19 AM

PDF Filename: 0021 - CCTV COMMUNICATIONS DETAIL SHEET 1 OF 1.pdf

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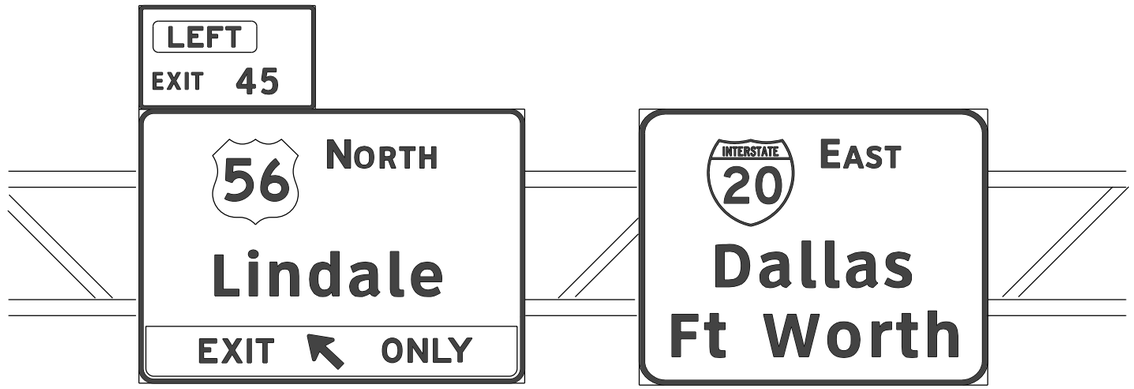
REQUIREMENTS FOR OVERHEAD AND LARGE GROUND-MOUNTED SIGNS

TYPICAL EXAMPLES



GENERAL NOTES

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

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

3. 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.
4. Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be cut-out white sheeting applied to colored background sheeting.
6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius need not be trimmed or rounded if fabricated from an extruded material.
7. Sign substrate for ground-mounted signs shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative. Sign substrate for overhead signs shall be any material that meets DMS-7110. Exit Number Panels attached above the parent sign shall be made with the same substrate and sheeting as the parent sign.
8. Mounting details of attachments to parent sign face are shown on Standard Plan Sheet TSR(5). Mounting details of exit number panels above parent sign are shown in the "SMD series" Standard Plan Sheets.
9. Background sheeting shall be applied to the substrate per sheeting manufacturer's recommendations. Sheeting will not be allowed to bridge the horizontal gap between panels.
10. Cut all legend, symbols, borders, and direct applied sign attachments at panel joints.

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/

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

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

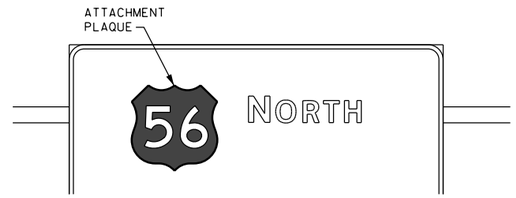
TSR(1)-13

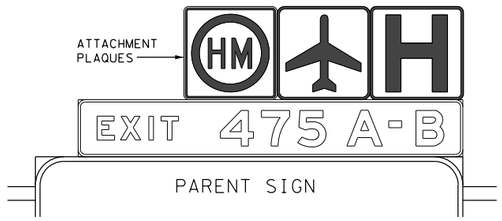
FILE: tsr1-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ODA	ECTOR, ETC.		52

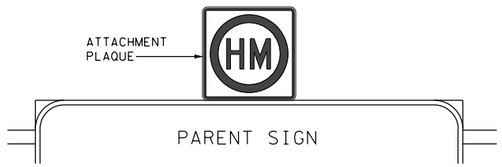
1

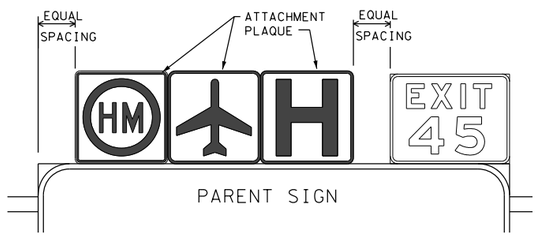
DATE: 3/18/2024 11:53:56 AM
FILE: tsr1-13.dgn

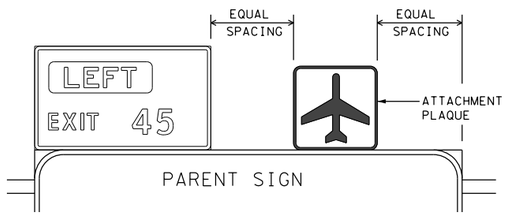
REQUIREMENTS FOR ATTACHMENTS TO OVERHEAD AND LARGE GROUND MOUNTED SIGNS











TYPICAL EXAMPLES

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

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

GENERAL NOTES

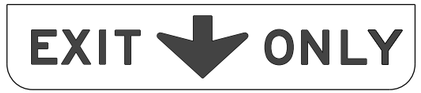
1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Route Marker legends (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F).
3. 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.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. 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.
6. Colored legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to white background sheeting, or combination thereof.
7. Route markers and other attachments within the parent sign face shall be direct applied unless otherwise specified in the plans. Attachments not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
8. General Service Plaques shall be 0.080 inch thick and Routing Plaques shall be 0.100 inch thick.
9. The priority for Routing Plaques shall be (left to right) Hazardous Material, Airport then Hospital. See examples for mounting location.
10. Mounting details of attachments to parent signs face are shown on Standard Plan Sheet TSR(5). Mounting details of sign plaque attachments above and below parent sign are shown in the "SMD series" Standard Plan Sheets.
11. Plaques shall be horizontally centered at the top of the parent sign. If an exit number panel exists, the plaque shall be centered between the edge of the parent sign and the edge of the exit number panel. The plaque may be placed above the exit number panel when there is insufficient space.

TYPICAL EXAMPLES

REQUIREMENTS FOR EXIT ONLY AND LEFT EXIT PANELS

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

SHEETING REQUIREMENTS FOR OVERHEAD EXIT PANELS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLUORESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND	BLACK	ACRYLIC NON-REFLECTIVE FILM



TYPICAL EXAMPLES

GENERAL NOTES

1. 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). Individual panel sizes shown in the plans may be adjusted to fit actual parent sign sizes if necessary.
2. Exit Panel legend shall use the Federal Highway Administration (FHWA)Standard Highway Alphabets E Series.
3. 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.
4. Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to yellow background sheeting, or combination thereof.
5. Exit Only and Left Exit panels within the parent sign face shall be direct applied unless otherwise specified in the plans. Panels not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
6. Mounting details of Exit Only and Left Exit panel attachments to parent signs face are shown on Standard Plan Sheet TSR(5).

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(2)-13

FILE: tsr2-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ODA	ECTOR, ETC.		53
2				

DATE: 3/18/2024 11:53:58 AM
FILE: tsr2-13.dgn

DATE: 3/18/2024 11:54:00 AM
FILE: tsr3-13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

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

TYPICAL EXAMPLES

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

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

TYPICAL EXAMPLES

GENERAL NOTES

1. 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).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

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

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. 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.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

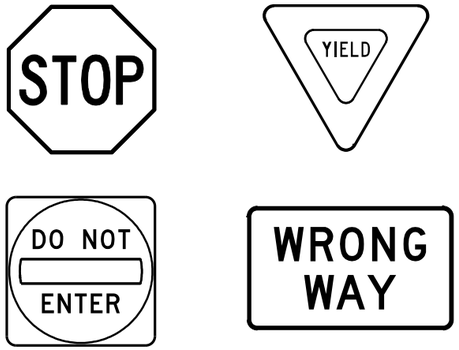
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ODA	ECTOR, ETC.		54

3

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

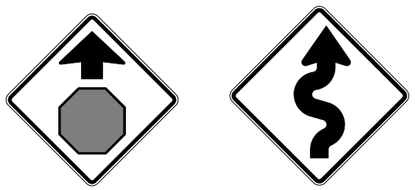
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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_{FL} OR C_{FL} 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_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. 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).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. 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.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. 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.
6. 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.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. 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/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

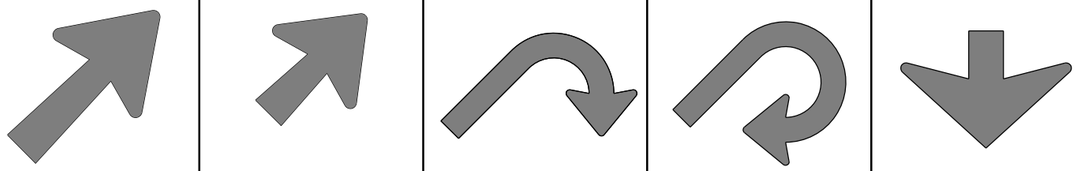
FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ODA	ECTOR, ETC.		55

4

DATE: 3/18/2024 11:54:03 AM
FILE: tsr4-13.dgn

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

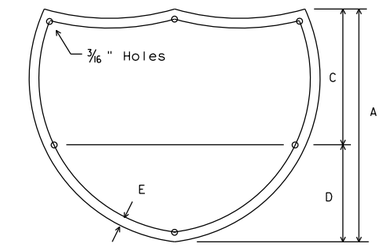
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

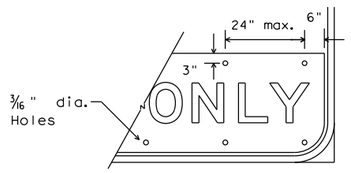
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

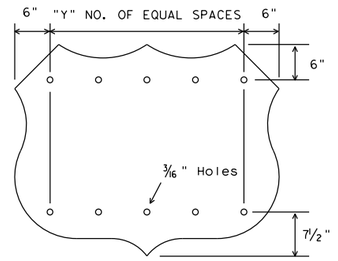


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	11/2
48	28	20	13/4

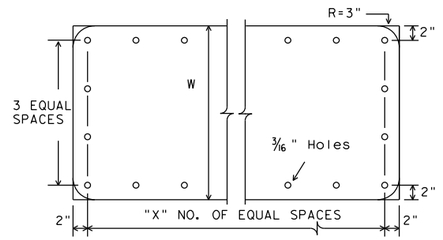


EXIT ONLY PANEL



U.S. ROUTE MARKERS

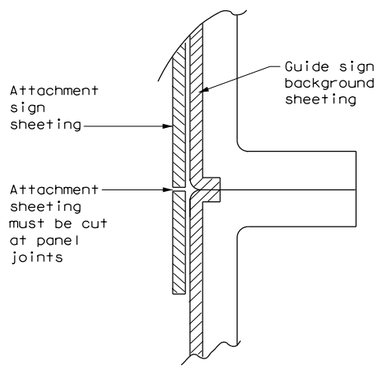
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



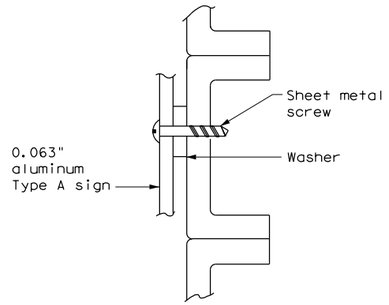
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

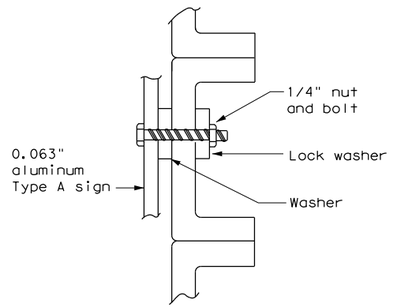
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

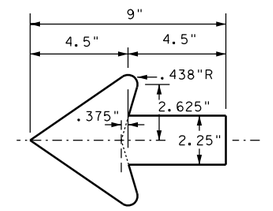
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

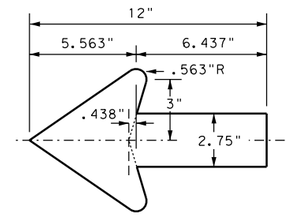
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

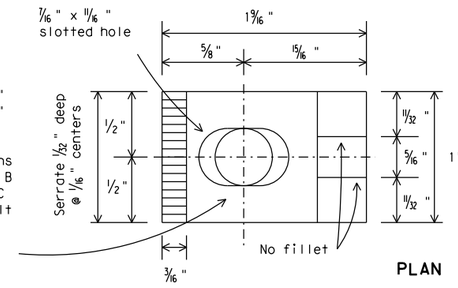
TYPICAL SIGN REQUIREMENTS

TSR(5)-13

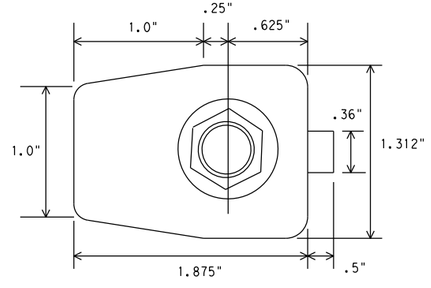
FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ODA	ECTOR, ETC.		56

DATE: 3/18/2024 11:54:05 AM
FILE: tsr5-13.dgn

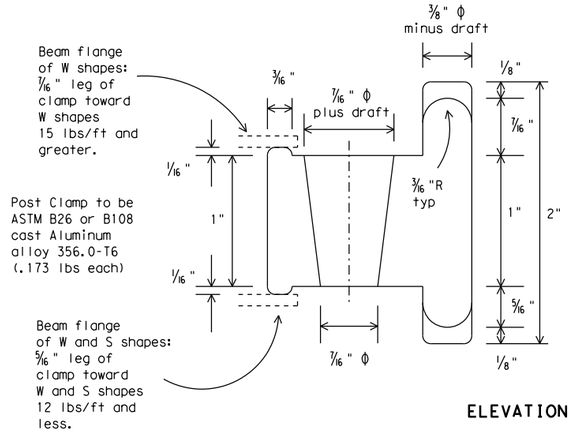
NOTE: centerline of hole for 3/8" diameter squarehead bolt x 2 1/4" long with a flat washer and self-locking nut, or lock washer and hex. nut. Bolt head dimensions shall be in accordance with ANSI B 18.2.1 as referred to in the AISC Manual of steel construction. Bolt assembly shall be galvanized.



PLAN

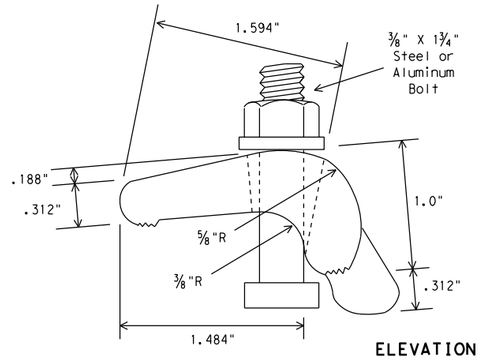


PLAN



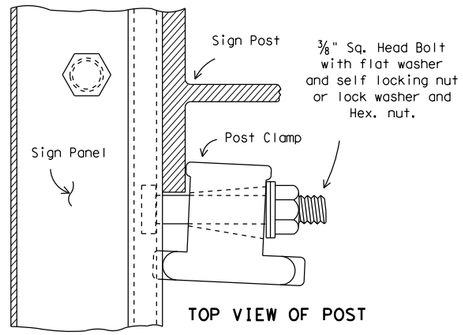
ELEVATION

POST CLAMP DETAIL

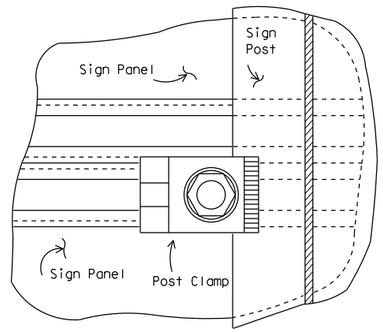


ELEVATION

ALTERNATE POST CLAMP DETAIL



TOP VIEW OF POST



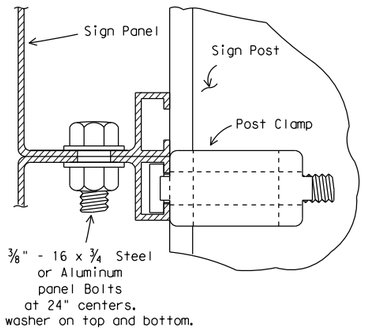
TOP VIEW OF CLAMP

DEPARTMENTAL MATERIAL SPECIFICATIONS

SIGN HARDWARE DMS-7120

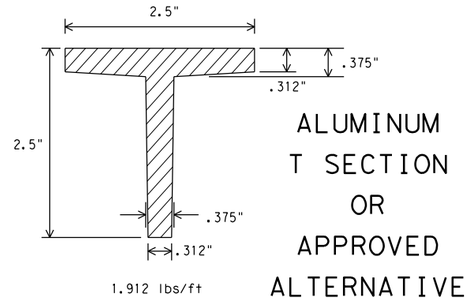
GENERAL NOTES:

1. Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
2. Materials and fabrication shall conform to the requirements of the Department material specifications.
3. Structural steel shall be "low-alloy steel" for non-bridge structures per Item 442, "Metal For Structures."
4. For fiberglass substrate connection details, see manufacturer's recommendations.



SIDE VIEW OF PANELS

CONNECTION DETAILS

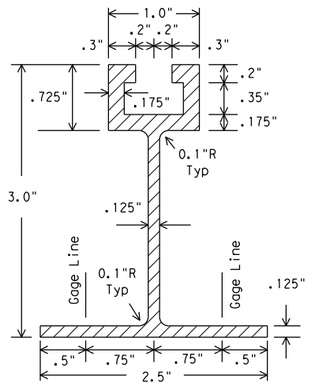


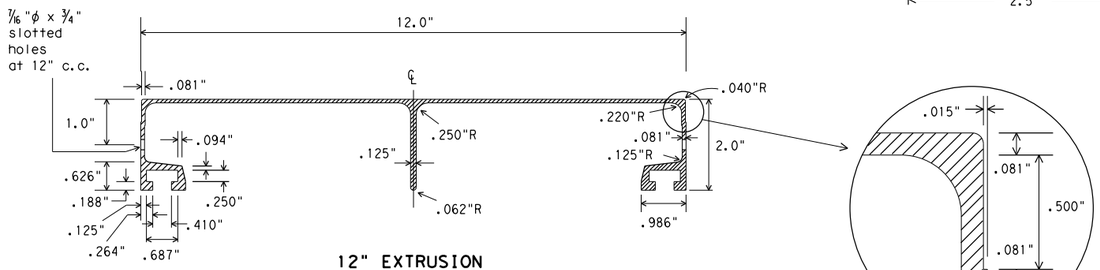
1.912 lbs/ft

ALUMINUM T SECTION OR APPROVED ALTERNATIVE

WINDBEAM CROSS SECTION

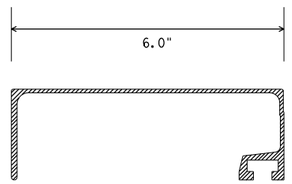
Windbeam to be extruded aluminum (1.175 lbs/ft) or approved alternative



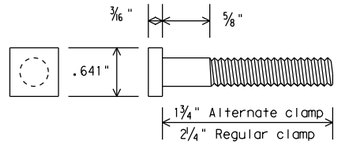


12" EXTRUSION

ALUMINUM SIGN PANEL EXTRUSION DETAILS



6" EXTRUSION



POST CLAMP BOLT DETAIL

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS- EXTRUDED ALUMINUM SIGN PANELS & HARDWARE

SMD(2-1)-08

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REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		57

27A

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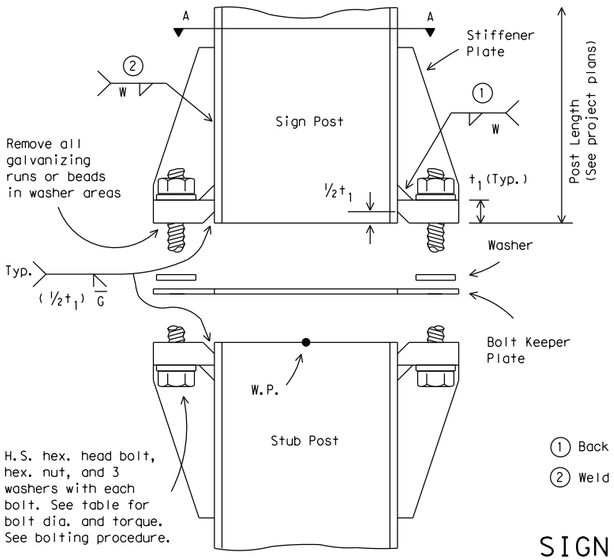
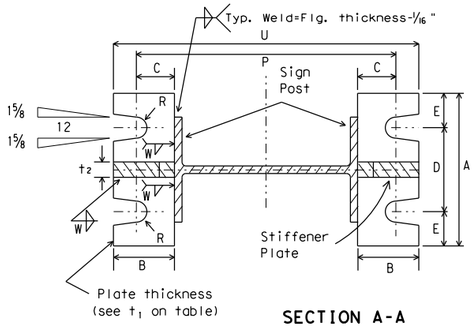
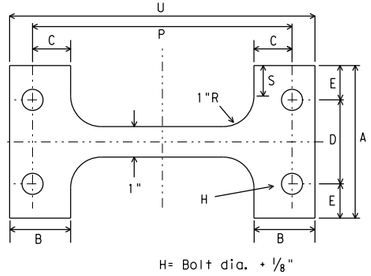


ELEVATION

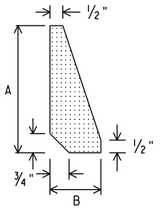


SECTION A-A



H= Bolt dia. + 1/8"

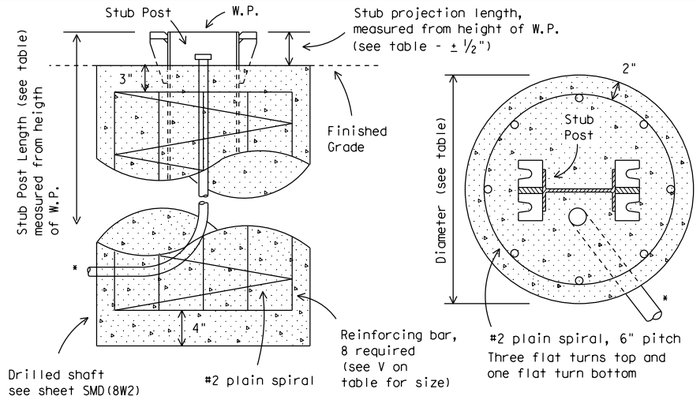
BOLT KEEPER PLATE
30 Ga galv. sheet steel



STIFFENER PLATE DETAIL

Steel Plate (thickness = t_2)

(See table for dimensions)

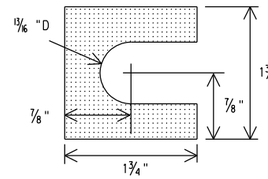


ELEVATION

PLAN

FOUNDATION DETAIL

*Note: For signs with electrical apparatus, see ED(10) for conduit required in founation.



SHIM DETAIL

Furnish two .012"+ thick and two .032"+ thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.

① Back up weld to be made before installing stiffener plate

② Weld W may be continued across clips to seal joint

SIGN POST AND STUB POST

(For W Shapes)

BOLTING PROCEDURE FOR ASSEMBLY OF BASE CONNECTION:

1. Assemble sign post, BOLT KEEPER PLATE and stub post with bolts and three flat washers per bolt as shown.
2. Shim as required to plumb post.
3. Tighten all bolts the maximum possible with a 12 to 15 inch wrench to clean bolt threads and to bed washers and shims.
4. Loosen each bolt in sequence and retighten bolts in a systematic order to the prescribed torque. Do not overtighten.
5. To prevent nut loosening, burr threads of bolt at junction with nut using a center punch.

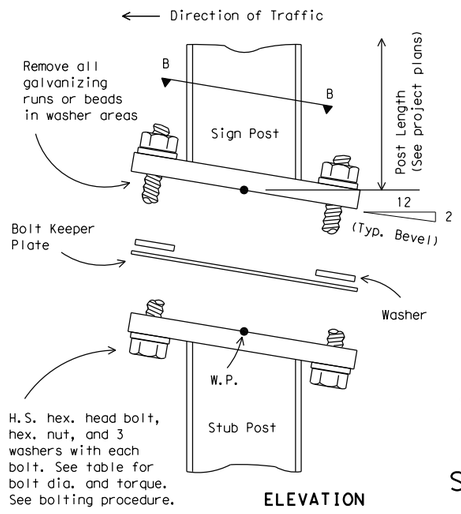
Dimensions / Post Size	Base Connection Data Table: Bolt Size & Torque	A	B	C	D	E	t_1	t_2	W	R
W6x9	5/8"ϕ x 2¾" 440-450 inch pounds 36-38 foot pounds	5"	2"	1¼"	2¾"	1⅛"	¾"	½"	¼"	11/32"
W6x12										
W6x15										
W8x18										
W8x21	¾"ϕ x 3½" 740-750 inch pounds 62-63 foot pounds	6"	2¼"	1⅜"	3½"	1¼"	1"	¾"	5/16"	13/32"
W10x22										
W10x26										
W12x26										
S3x5.7	½"ϕ x 2½" 440-450 inch pounds 36-38 foot pounds	See Detail Below								
S4x7.7										

Perforated Fuse Plate Data Table												Bolt Keeper Data			Foundation Data			
F	G	J	K	M	d_1	d_2	t_3	Bolt Dia.	Wt. (ea.) (lbs.)	Bolt length	P	S	U	Stub length	Stub projection	Dr. Shaft diameter	Bar V Size
4¼"	2"	4"	2¼"	1"	9/16"	¾"	¼"	½"	1.01	1½"	8⅜"	1"	9⅞"	2'-0"	3"	24"	#5
											8½"		10"				#5
5"	2½"	6"	3½"	1½"	11/16"	1¼"	⅜"	⅝"	2.51	2¼"	8½"		10"	2'-6"	3"		#6
5"	2½"	5¼"	2¾"	1¼"	11/16"	1 1/16"	⅜"	⅝"	2.26	2¼"	10⅝"		12⅛"	2'-6"	3"		#7
5½"	2½"	5¼"	2¾"	1¼"	13/16"	1"	½"	¾"	3.35	2¼"	11"	1½"	12¾"	3'-0"	2½"		#8
6"	3"	5¾"	2¾"	1⅜"	13/16"	1⅛"	½"	¾"	4.03	2¼"	12⅞"		14⅝"	3'-0"	2½"		#9
											13⅜"		14⅞"	3'-0"	2½"		#10
6"	3"	6½"	3½"	1⅝"	13/16"	1 5/16"	½"	¾"	4.47	2¼"	15"		16¾"	3'-0"	2½"		#11
3¾"	1½"	2⅝"	1½"	⅝"	9/16"	⅜"	¼"	½"	0.60	1½"	See Detail Below			3'-3½"	3½"	12"	Non-reinforced ③

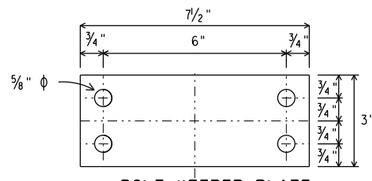
③ Foundation design shall be Type G Mount, see SMD (TY G).

PERFORATED FUSE PLATE DETAIL

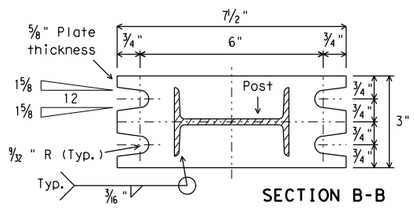
Use H.S. hex head bolts, hex head nut and bevel or flat washer (where req'd) under nut. All holes shall be drilled, sub-punched and reamed. All plate cuts shall preferably be saw cuts. However, flame cutting will be permitted provided all edges are ground. Metal projecting beyond the plane of the plate face will not be permitted. Steel fuse plates shall conform to the requirements of ASTM A36. ASTM A572 Grade 50 or ASTM A588 may be substituted for A36 at the option of the fabricator. Mill test reports shall be submitted for Fuse Plates. Steel used shall have an ultimate tensile strength not to exceed 80 KSI. For alternative Fuse Plate contact Traffic Operations Division.



ELEVATION



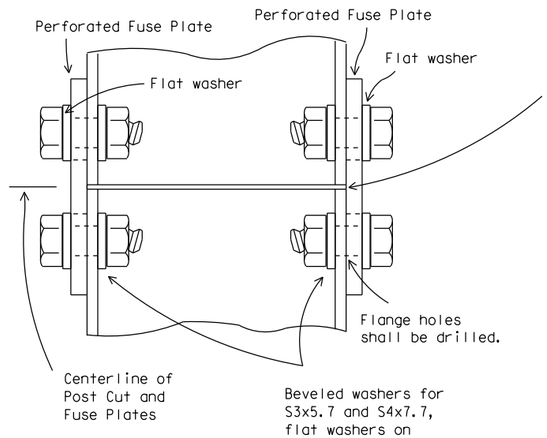
BOLT KEEPER PLATE
30 Ga galv. sheet steel



SECTION B-B

SIGN POST AND STUB POST

(For S4x7.7 and S3x5.7)



Parts shall be saw cut either before galvanizing and the galvanized cut cleaned of zinc build-up, or saw cut after galvanizing and the cut surface repaired per Item 445, "Galvanizing."

DETAIL "A"

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS- LARGE ROADSIDE SIGNS FOUNDATION & STUB

SMD(2-2)-08

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REVISIONS 4-98 9-08	CONT	SECT	JOB	HIGHWAY
	0906	00	271	VARIOUS
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27B

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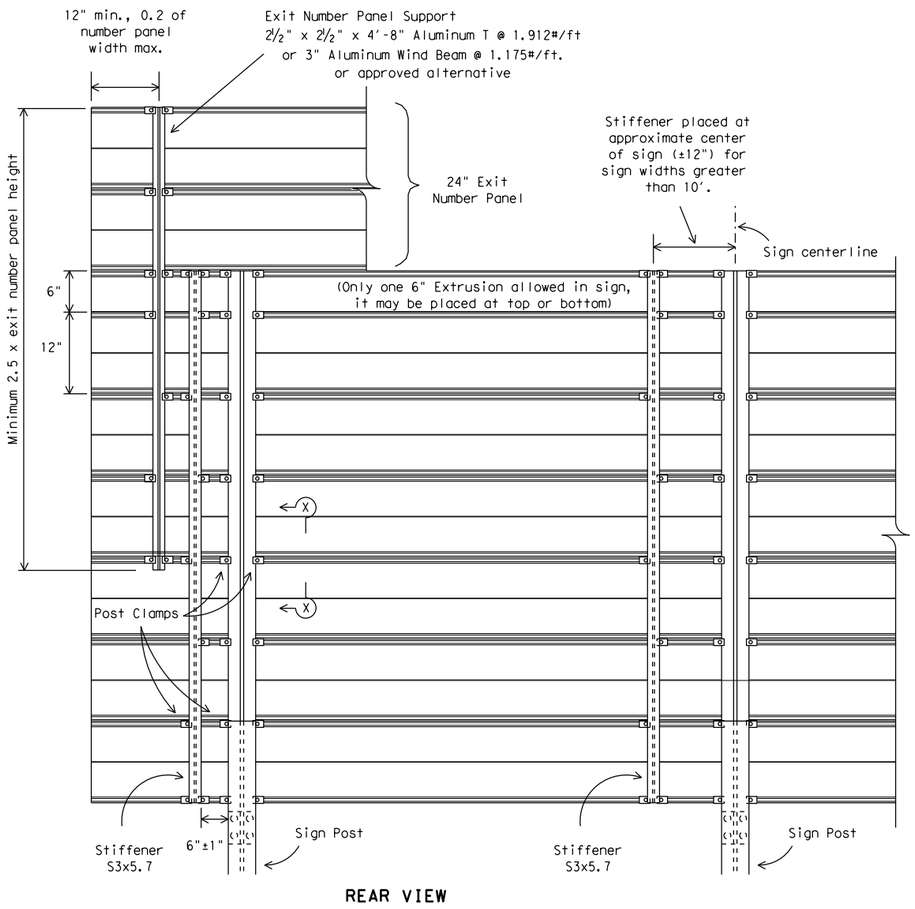
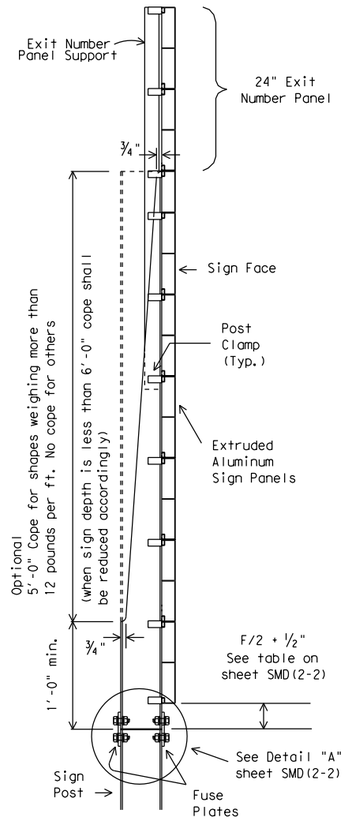
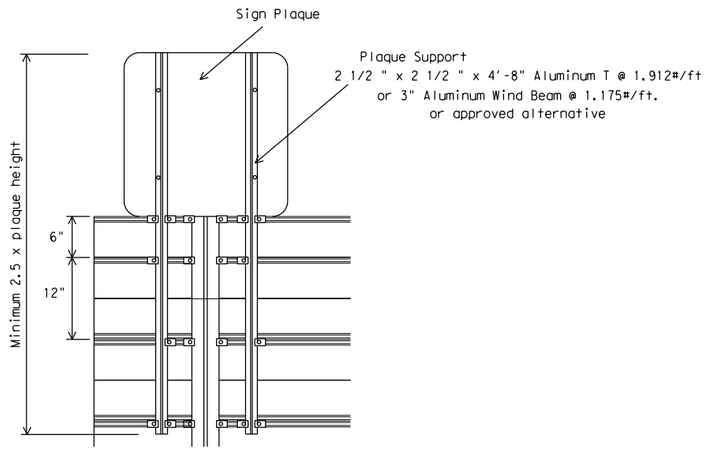


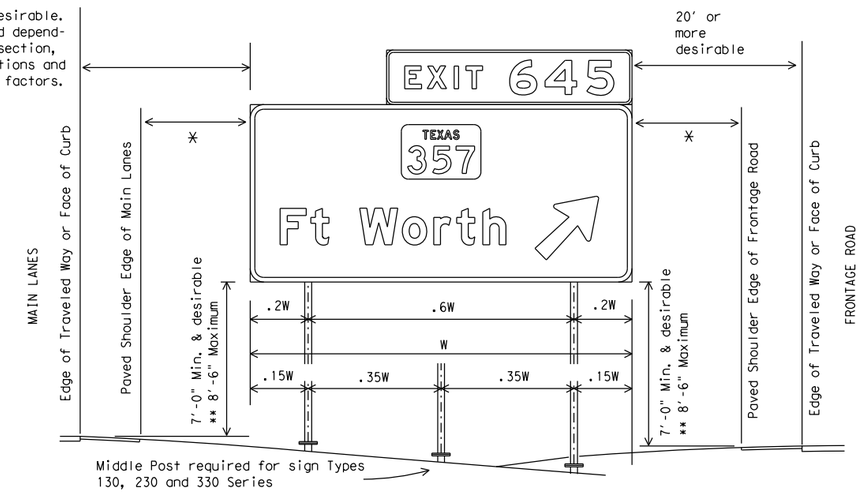


ALUMINUM PARENT SIGN & EXIT NUMBER PANEL MOUNTING DETAILS



SIGN PLAQUE MOUNTING DETAIL TO ALUMINUM PARENT SIGN

30' or more desirable. May be reduced depending on cross section, viewing conditions and other related factors.



TYPICAL SIGN INSTALLATION AND LOCATION

LATERAL CLEARANCE NOTES:

Lateral clearances of signs mounted on median side of main lanes are the same as shown above where space will permit.

Where a sign is to be located behind guardrail, an allowable minimum clearance of five feet may be used, measured from the face of the guardrail to the near edge of sign.

✳ - 6' minimum and desirable may be used only in areas of limited lateral clearance and when approved by the Engineer.

POST SPACING NOTES:

Post spacing on a two post sign may vary a maximum of plus or minus 10% of total sign width to fit field conditions.

Post spacing on a three post sign may vary a maximum of plus or minus 5% of total sign width to fit field conditions.

SIGN HEIGHT NOTES:

** The 8' 6" maximum may be exceeded when placing signs on extreme slopes. In these conditions, a 7' minimum from natural ground to bottom of sign must be maintained.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN HARDWARE	DMS-7120

GENERAL NOTES:

1. Exit number panel shall be mounted to the right hand side of the parent sign for right exits and to the left hand side for left exits. The number panel shall be mounted with two uprights so its right edge is even with the right edge of the parent sign or vice-versa for left hand exits.
2. Exit number panel support shall be symmetrical about number panel centerline.
3. Exit number panel support shall be ASTM A36 structural steel galvanized after fabrication, or ASTM B221 aluminum alloy 6061-T6 or approved alternative.
4. All bolts, nuts and washers shall be galvanized per ASTM Designation: B695 Class 50, or A153 Class C or D.
5. Posts, parent sign panels, and exit number panels shall comply with notes on sheets SMD(2-1) and SMD(2-2).
6. Signs (such as exit number panels) attached above a parent sign shall be made of the same type material as the parent sign. General Service and Routing signs may be fabricated from flat sheet aluminum.
7. Exit number panel support and other connection hardware required to fasten exit number panel to parent sign shall be subsidiary to "Aluminum Signs" or "Fiberglass Signs."
8. For fiberglass sign installation details, see manufacturer's recommendations.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS-LARGE ROADSIDE SIGNS

SMD(2-3)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0906	00	271	VARIOUS
DIST	COUNTY		SHEET NO.
ODA	ECTOR, ETC.		59

27C

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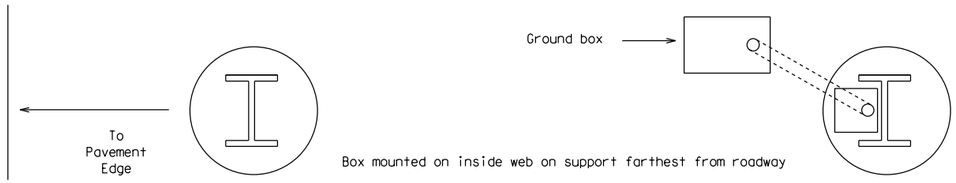
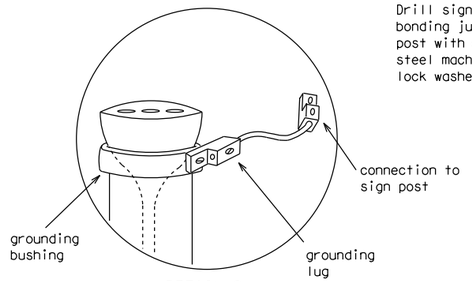


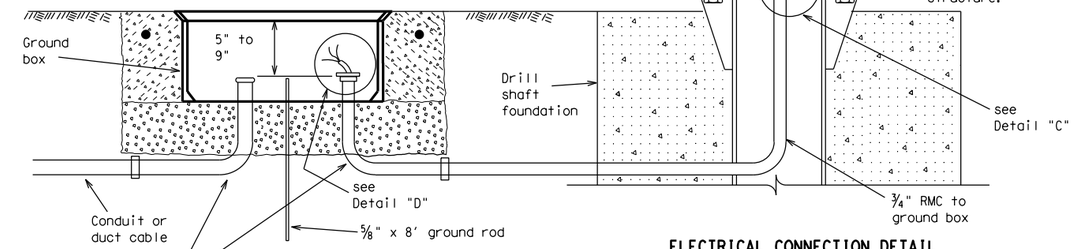
PLAN VIEW



DETAIL C

Drill sign post - structure leg, terminate bonding jumper with listed connector to post with a 10-24 (3/16") min. stainless steel machine screw, nut, flat washer and lock washer made wrench tight.

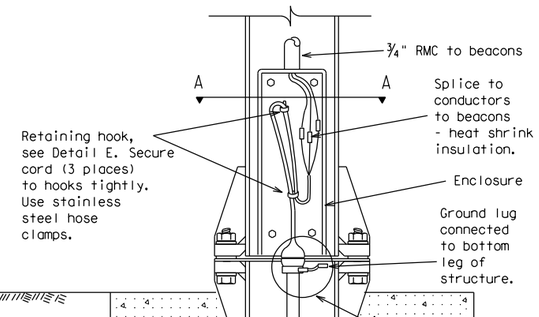
2 Pull connector down tight against conduit then clamp in ground box. See Detail "D"

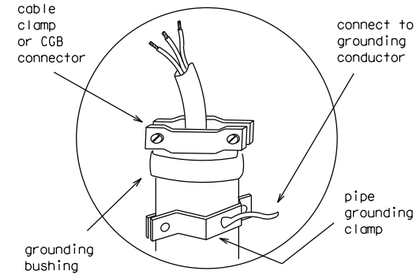


Use RMC Ells, provide grounding bushings. Terminate bonding jumper to ground rod and equipment grounding conductors.

ELECTRICAL CONNECTION DETAIL

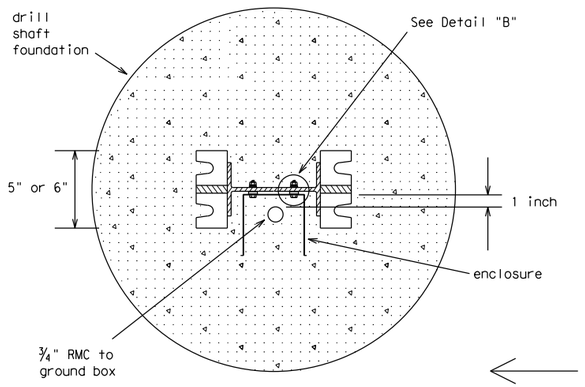
Enclosure cover not shown for clarity
Detail shows channel greater than 4 inches.
Less than 4 inches similar, see Detail A.





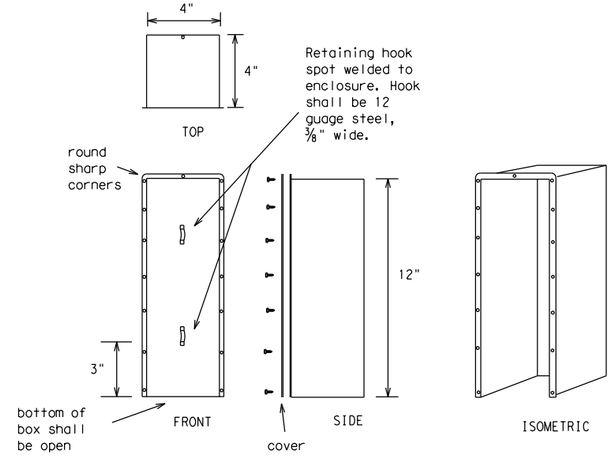
DETAIL D

Pull cable so opposite end connector is tight against conduit end, clamp cable at top of conduit as shown.



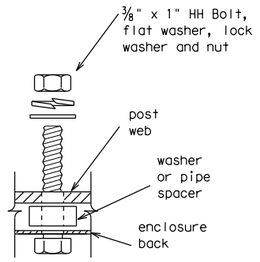
SECTION A-A

Stub-post connection
conduit, bolts and enclosure
(cover not shown)



ENCLOSURE

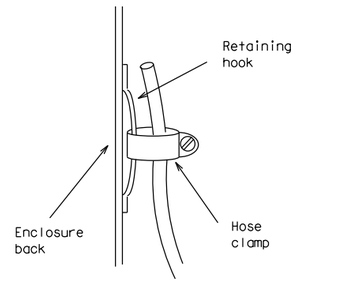
make from 12 gauge
galvanized sheet metal



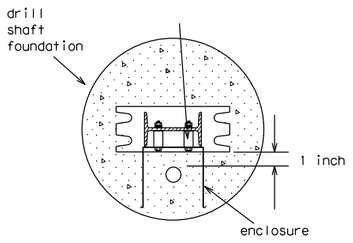
DETAIL B

enclosure connection
(4 places)

(use 2 inch bolt for
3 and 4 inch channels)



DETAIL E



DETAIL A

Stub-post connection
conduit, bolts and enclosure
for 3 and 4 inch channel
(cover not shown)

direction of
traffic

NOTES:

1. Breakaway connector shall be rated for 300 VAC, 30 amps and shall be waterproof. Connector shall be a three pole (two line conductors and neutral) polarized elastomer connector made from thermosetting synthetic polymer which remains fexible over the temperature range of -40 degrees C to 90 degrees C. The pins on the connector shall be overmolded 1 ¼" from the face of the connector toward the tips of the pins with the same material used in the construction of the connector body. This overmolding of the pins shall provide a non-conductive double taper which prevents the intrusion of water into the connection when the connectors are fully engaged. The pin receptors shall have current carrying barrels recessed 1 ½" from the face of the connector and surrounded by beryllium copper spring sleeves. The plug/receptacle combination shall be listed by an approved testing facility (UL or Factory Mutual) as suitable for outdoor use and shall have passed a rain test and a watertight (immersion) test as approved by the Engineer.
2. The female connector shall be integrally molded to a 13' length of type SO cord containing three number 10 or number 8 AWG conductors. The male connector shall be integrally molded to a 20" length of Type SO cord containing three number 10 or number 8 AWG conductors. Cord conductors shall have colored insulation, two black and one white, or shall be taped or painted to be two black and one white. Tape or paint marking shall cover entire exposed length. The contractor shall make a brochure submittal on cord connectors. Breakaway connector and cord shall not be paid for separately, but shall be subsidiary to the various items.
3. The contractor shall install in-line waterproof fuseholders for each line conductor in the ground box. Fuses shall be fast-acting 5 amp (Bussman KTK5, Gould ATM5, Littlefuse KLK5 or equal).
1 4. Conduit shall convert to ¾" liquidtight flexible metalic conduit below the fuse plate or knee joint and shall revert to ¾" RMC above the fuse plate or knee joint. The length of liquidtight flexible metal conduit shall not exceed 6".
5. Ground rod clamp shall be Blackburn GG 5/8H, Weaver W5.8 or equal.
6. Ground rod to be driven to a depth to leave between 2 to 4 inches of rod above the gravel placed under the ground box. See ED(2) standard sheet for ground box details.

11-01 Revision

1 Liquidtight conduit size corrected.
2 Editing of minor notes.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS-LARGE ROADSIDE SIGNS ELECTRICAL CONNECTION

SMD(2-6)-01

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REVISIONS	CONT	SECT	JOB	HIGHWAY
11-98	0906	00	271	VARIOUS
11-01	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		60

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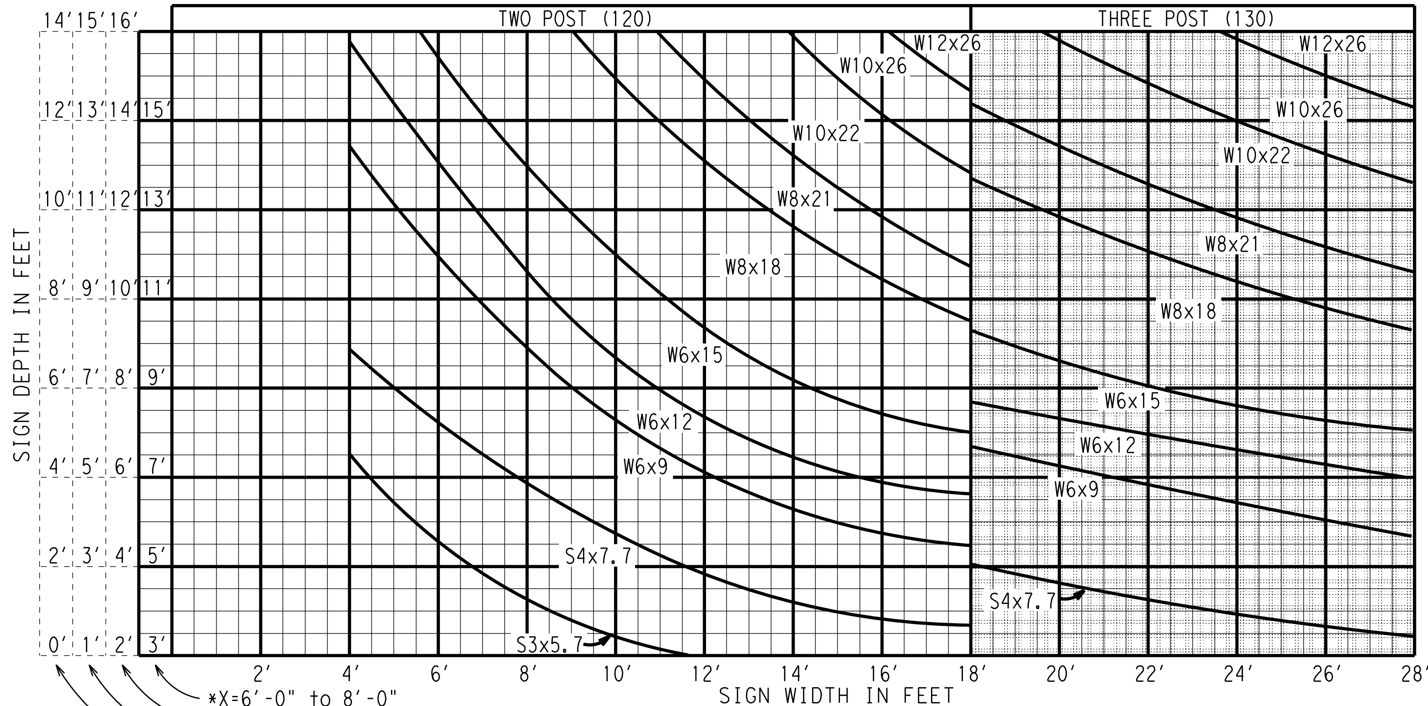
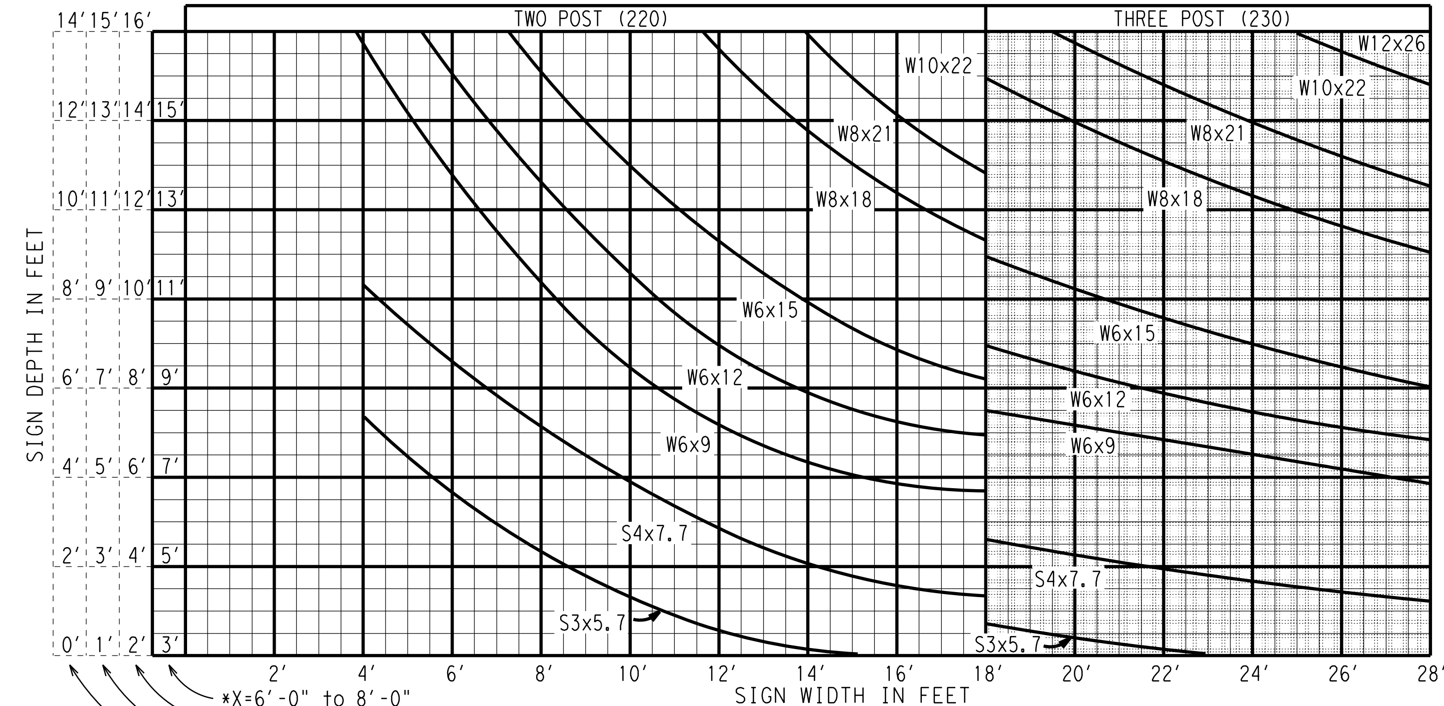


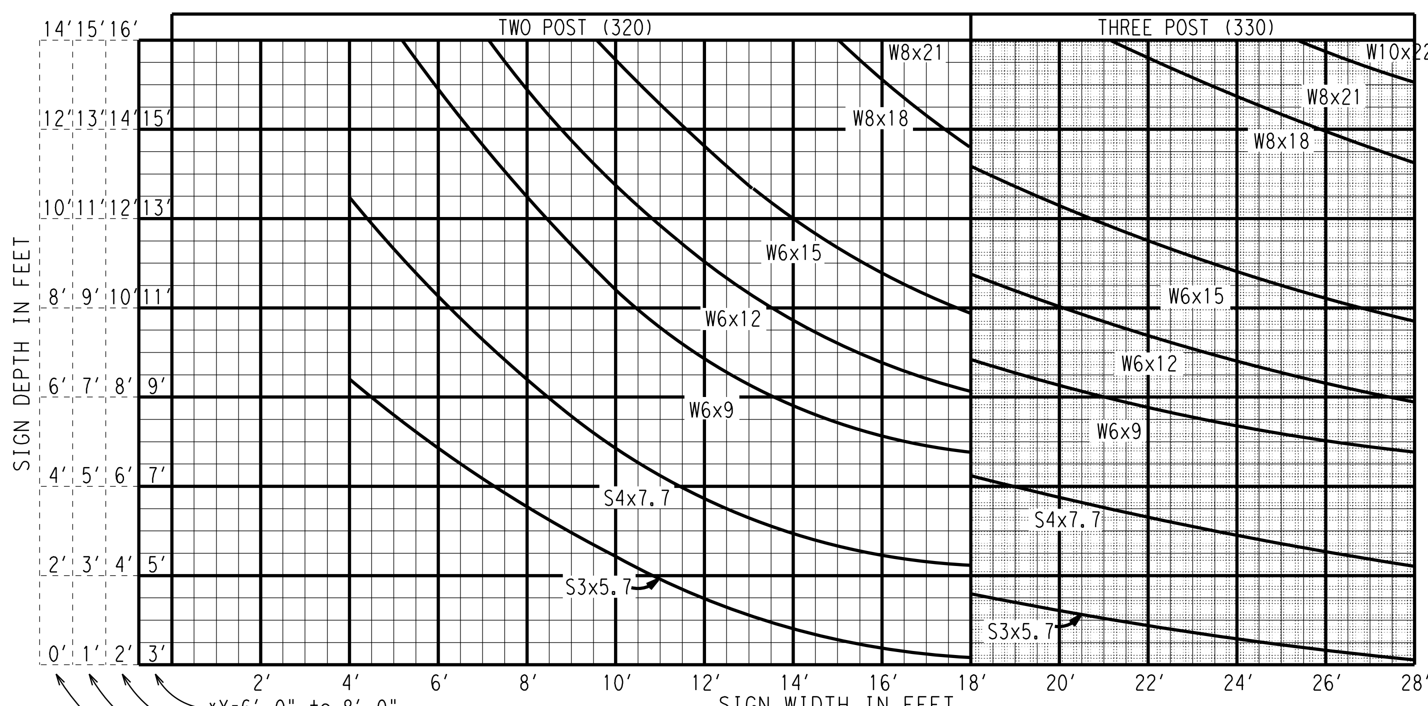
*X=6′-0" to 8′-0"
*X=8′-0" to 10′-0"
*X=10′-0" to 12′-0"
*X=12′-0" to 14′-0"

ZONE 1 (TYPES 100) 90 M.P.H. WINDS



*X=6′-0" to 8′-0"
*X=8′-0" to 10′-0"
*X=10′-0" to 12′-0"
*X=12′-0" to 14′-0"

ZONE 2 (TYPES 200) 80 M.P.H. WINDS

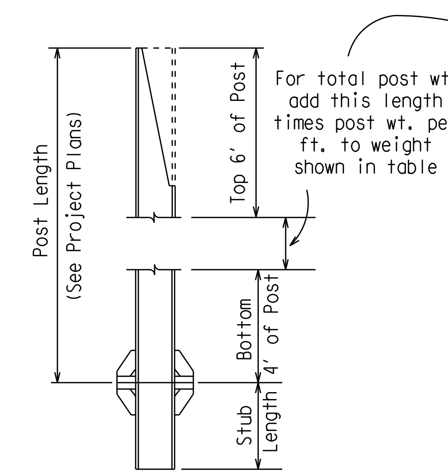


*X=6′-0" to 8′-0"
*X=8′-0" to 10′-0"
*X=10′-0" to 12′-0"
*X=12′-0" to 14′-0"

ZONE 3 (TYPES 300) 70 M.P.H. WINDS

* NOTE: "X" EQUALS THE AVERAGE HEIGHT FROM THE GROUND LINE TO THE BOTTOM EDGE OF THE SIGN.

▨ SHADED AREA DENOTES 3 POST SUPPORTS



POST WEIGHT DATA

POST SIZE	WEIGHT OF ONE POST (#)	WEIGHT OF TWO POSTS (#)	WEIGHT OF THREE POSTS (#)
W6x9*	123.2	246.4	369.6
W6x12*	160.3	320.6	480.9
W6x15*	167.8	335.6	503.4
W8x18*	201.8	403.6	605.4
W8x21*	254.7	509.4	764.1
W10x22*	266.0	532.0	798.0
W10x26*	308.0	616.0	924.0
W12x26*	308.6	617.2	925.8
S3x5.7*	85.9	171.8	257.7
S4x7.7*	112.2	224.4	336.6

*LAST FIGURES=POST WT. PER FT.

Weight Data is the weight of items shown for one, two or three posts - (includes top 6′ of post, bottom 4′ of post, post foundation stub, related base connection plates and stiffeners, friction fuse plate and all high strength bolts, nuts and washers).

SIGN TYPE

SIGN TYPE 1 3 0

- 1 — Wind Design Zone
- 3 — No. of Posts
- 0 — Series No.
  - 0 Aluminum/Fiberglass
  - 1 Aluminum
  - 2 Fiberglass

Note: Footings for S3x5.7 and S4x7.7 post sizes shall be non-reinforced with Class A concrete, while footing for all other post sizes shall be reinforced with Class C concrete.

Texas Department of Transportation
Traffic Operations Division

LARGE ROADSIDE SIGN SUPPORTS POST SELECTION WORKSHEET

SMD(8W1)-08

©TxDOT July 1978	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
1-82 5-01 9-08	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		61

29A

DATE: 3/18/2024 11:54:17 AM
FILE: smd8-08.dgn

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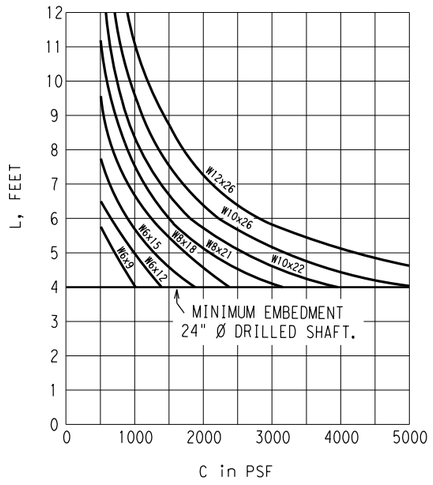
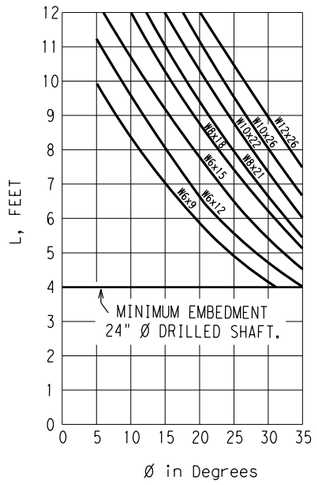
I



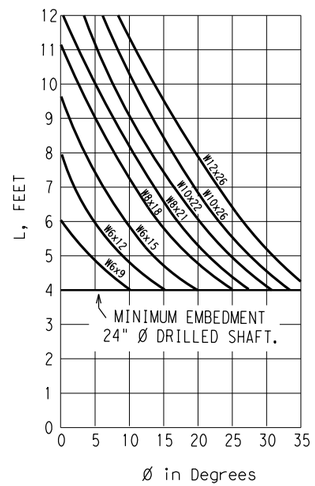
Ø = 0 Degrees

II



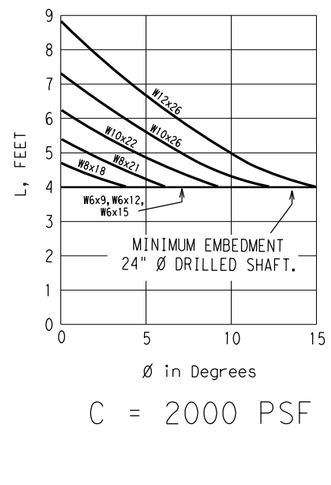
C = 0 PSF

III



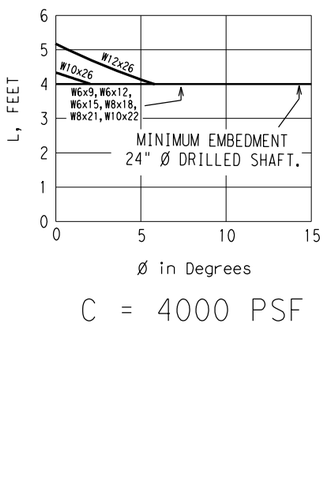
C = 500 PSF

IV



C = 2000 PSF

V



C = 4000 PSF

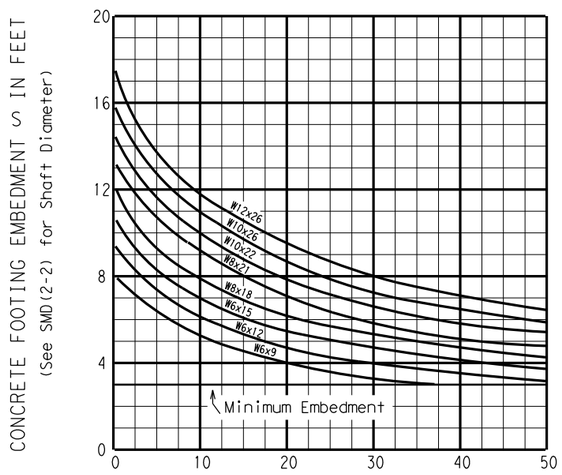
DRILLED CONCRETE FOOTING DEPTH CHART
(COHFRIC DESIGN)

NOTE: THESE CHARTS MAY BE USED AS AN ALTERNATE TO THE CHART BELOW, PROVIDED THAT SOIL COHESION AND INTERNAL FRICTION (COHFRIC) DATA ARE AVAILABLE.

LEGEND:

L = Required embedment of concrete drilled shaft, in feet
C = Cohesive shear strength of soil, in psf
Ø = Angle of internal friction of soil, in degrees

For values of C and Ø which are intermediate to those on the charts, embedments may be determined by straight - line interpolation.



DRILLED CONCRETE FOOTING DEPTH CHART
(TxDOT PENETROMETER DESIGN)

NOTE: ESTIMATED N SHOULD BE BASED AT APPROXIMATELY THE UPPER ONE-THIRD POINT OF THE DRILLED CONCRETE FOOTING BELOW THE GROUND LINE

Note:
1. Curves shown on this sheet are applicable for reinforced concrete footings only.

Texas Department of Transportation
Traffic Operations Division

LARGE ROADSIDE SIGN SUPPORTS
FOUNDATION
WORKSHEET
SMD(8W2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
5-74
4-78
9-08

CONT	SECT	JOB	HIGHWAY
0906	00	271	VARIOUS

DIST	COUNTY	SHEET NO.
ODA	ECTOR, ETC.	62

29B

DATE: 3/18/2024 11:54:19 AM
FILE: smd8-08.dgn

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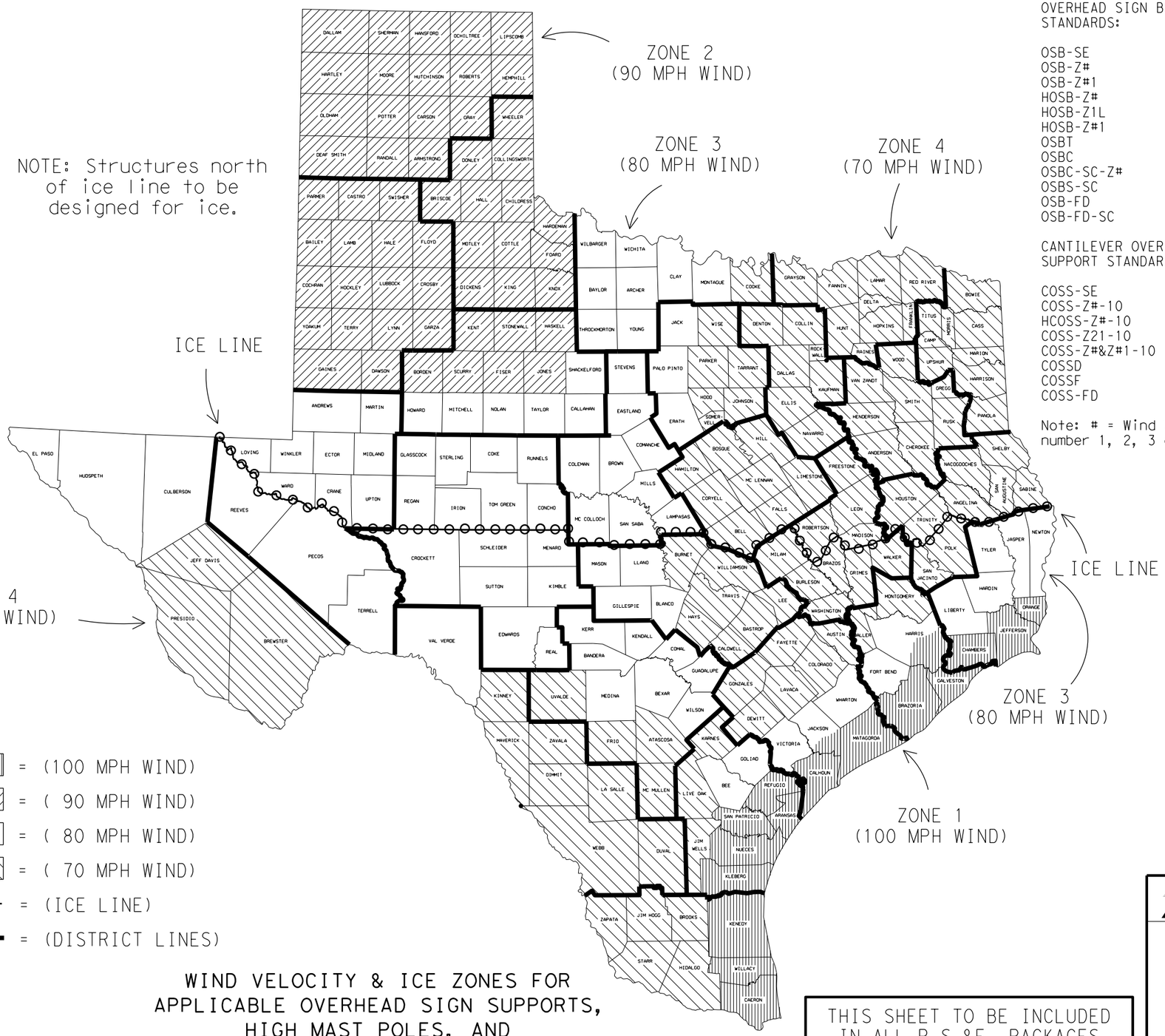
NOTE: Structures north of ice line to be designed for ice.

ZONE 2
(90 MPH WIND)

ZONE 3
(80 MPH WIND)

ZONE 4
(70 MPH WIND)

ICE LINE



ZONE 4
(70 MPH WIND)

ICE LINE

ZONE 3
(80 MPH WIND)

ZONE 1
(100 MPH WIND)

LEGEND

ZONE 1 - = (100 MPH WIND)
ZONE 2 - = (90 MPH WIND)
ZONE 3 - = (80 MPH WIND)
ZONE 4 - = (70 MPH WIND)
= (ICE 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

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

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.

Texas Department of Transportation

Traffic Operations Division Standard

WIND VELOCITY AND ICE ZONES

WV & IZ-14

FILE: windice.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
8-14-Added list of applicable standards, restricting use to structures designed for Fastest Mile wind speeds.	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		63

DATE: 3/18/2024 11:54:23 AM
FILE: windice.dgn

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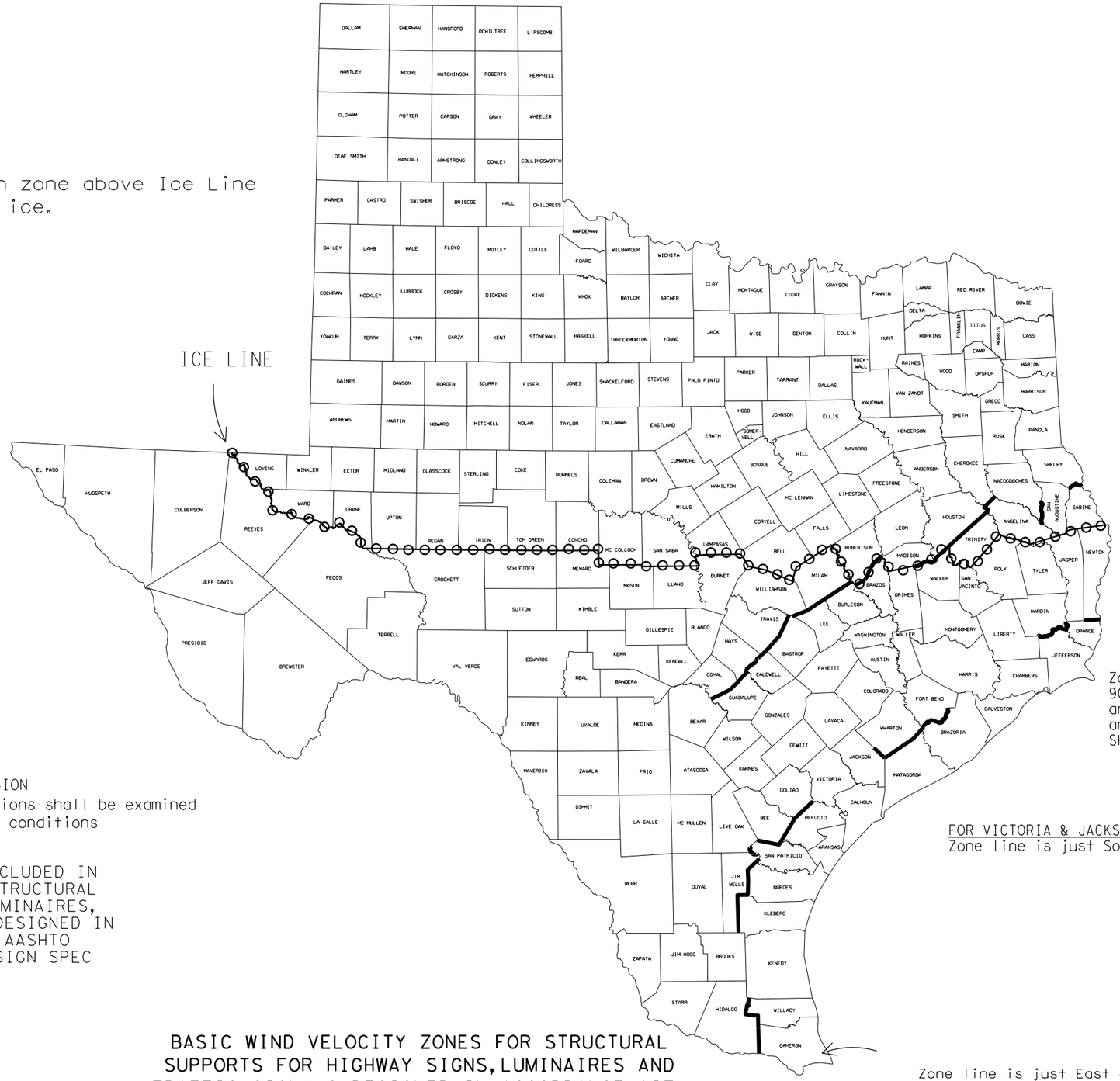
NOTE: Structures in zone above Ice Line to be designed for ice.



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.

SPECIAL WIND REGION
Special wind regions shall be examined for unusual wind conditions

FOR VICTORIA & JACKSON COUNTIES ONLY
Zone line is just South of US 59.

THIS SHEET IS TO BE INCLUDED IN ALL P.S.&E.'s HAVING STRUCTURAL SUPPORTS FOR SIGNS, LUMINAIRES, AND/OR TRAFFIC SIGNALS DESIGNED IN ACCORDANCE WITH THE AASHTO 2001 THRU 2013 LTS DESIGN SPEC

Zone line is just East of both CO 1847 & FM 511

BASIC WIND VELOCITY ZONES FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS DESIGNED IN ACCORDANCE WITH THE AASHTO 2001 THRU 2013 LTS DESIGN SPEC

Values are nominal design 3-sec gust wind speeds in mph at 33 ft above ground for Exposure C category. (50-year mean recurrence interval)

NOTE: AASHTO 2001 THRU 2013 LTS DESIGN SPEC =AASHTO Standard Specifications for Structural Supports for Highway Signs,Luminaires and Traffic Signals, 4th thru 6th Edition

Texas Department of Transportation

Traffic Operations Division Standard

WIND VELOCITY AND ICE ZONES (AASHTO 2001-2013 LTS DESIGN SPEC)

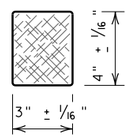
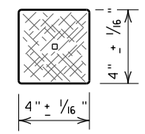
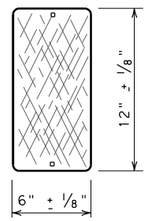
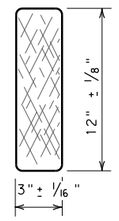
WV & IZ(LTS2013)-14

FILE:	lts2013.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		0906	00	271	VARIOUS
		DIST	COUNTY		SHEET NO.
		ODA	ECTOR, ETC.		64

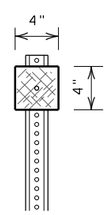
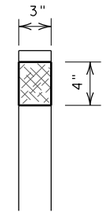
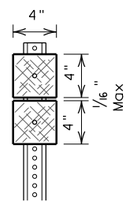
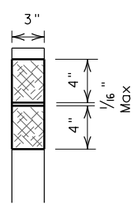
DATE: 3/18/2024 11:54:26 AM
FILE: lts2013.dgn

30B

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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

DELINEATORS

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

D & OM DESCRIPTIVE CODES

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

NUMBER OF REFLECTORS
- S = Single
- D = Double

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

REFLECTOR UNIT SIZE
- 1 or 2

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

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

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

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

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

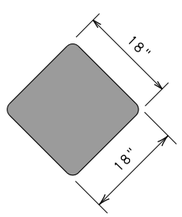
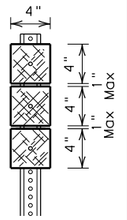
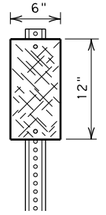
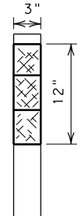
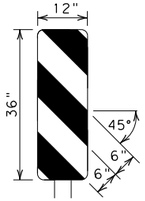
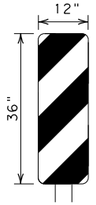
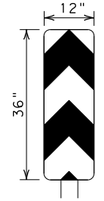
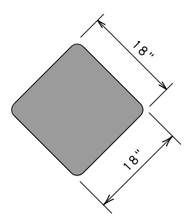
NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker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

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

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

DIRECTION
If Required
- BI = Bi-Directional

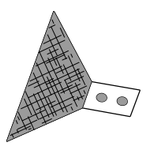
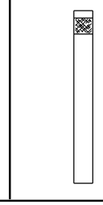
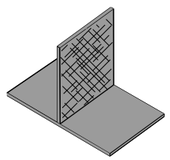
OBJECT MARKERS

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

DEPARTMENTAL MATERIAL SPECIFICATIONS

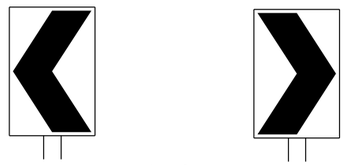
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

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

CHEVRONS

DEVICE



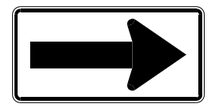
W1-8

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

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

ONE DIRECTION LARGE ARROW

DEVICE



W1-6

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

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ODA	ECTOR, ETC.		65

20A

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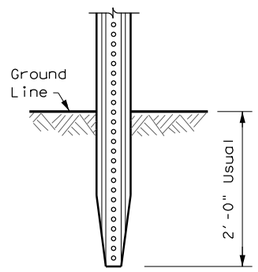
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

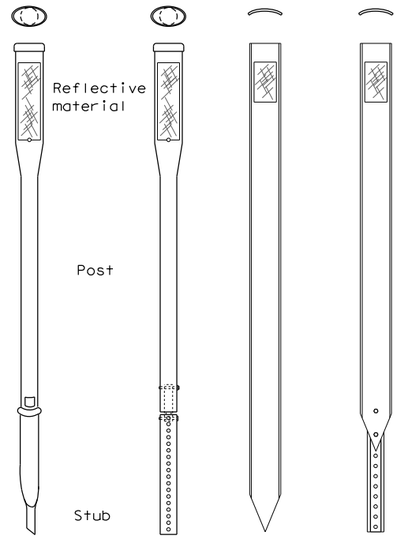


NOTES

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

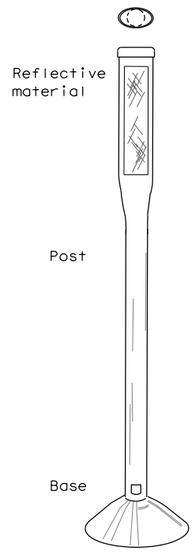
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



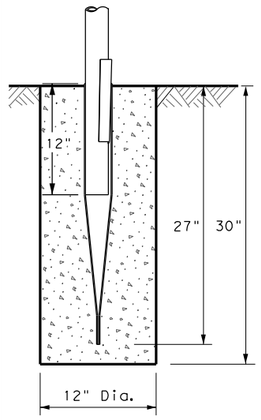
SURFACE MOUNT

NOTES

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

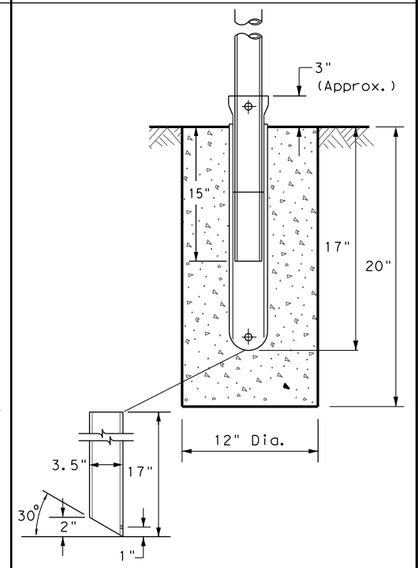
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

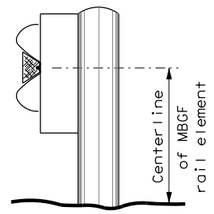
NOTE

1. Install per manufacturer's recommendations.

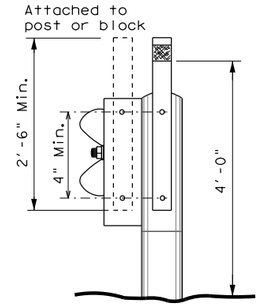
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

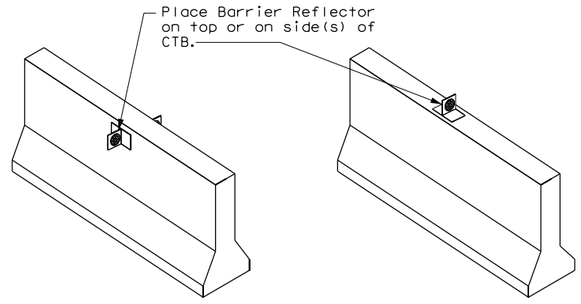
GF1



GF2



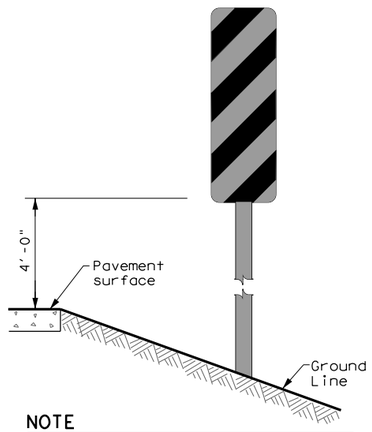
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

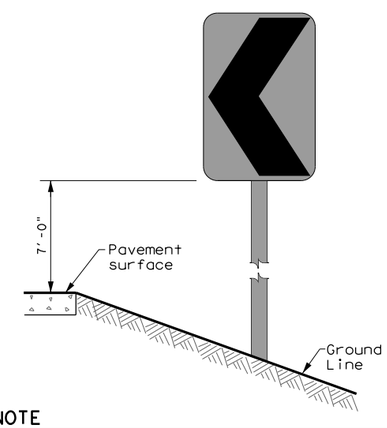
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

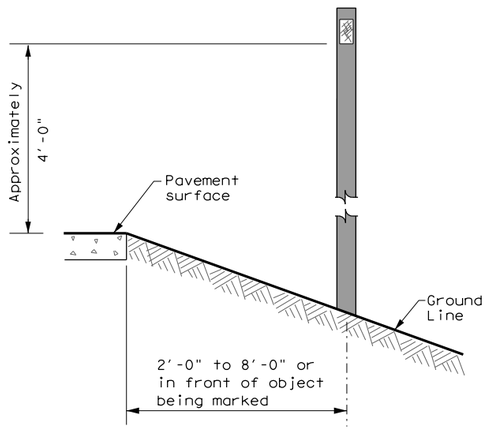
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. 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.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. 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.

5. 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.

6. 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

1. 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.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. 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"

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.

5. 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.

6. 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.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. 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.

9. 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.

10. 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

1. 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.

2. 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.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. 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.

5. 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."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. 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.

8. 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.

9. 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.

10. 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.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. 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).

13. 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.

14. 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.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

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

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.
12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

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

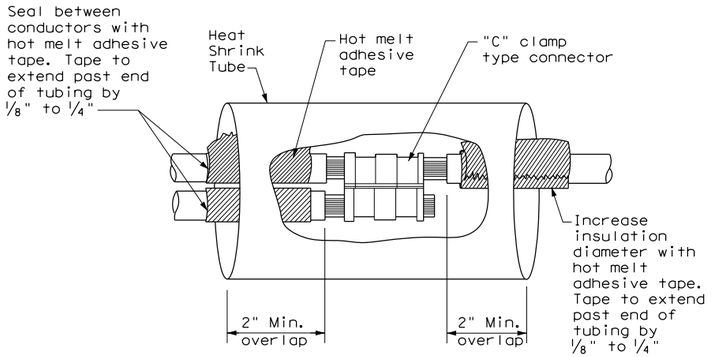
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

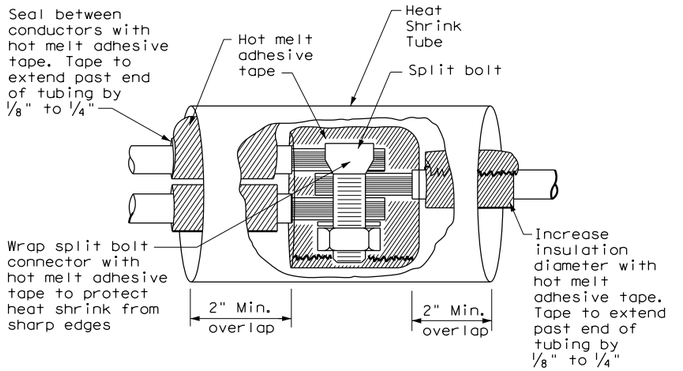
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in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

B. CONSTRUCTION METHODS

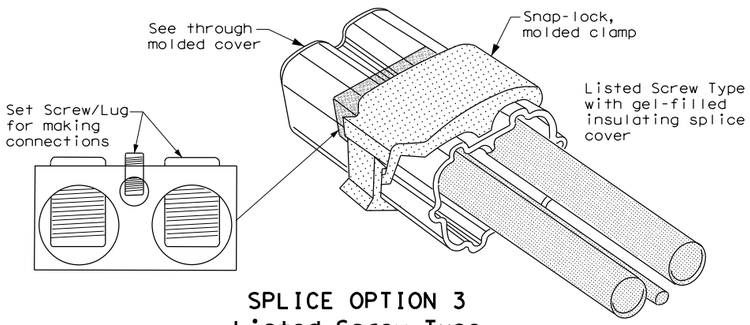
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, 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 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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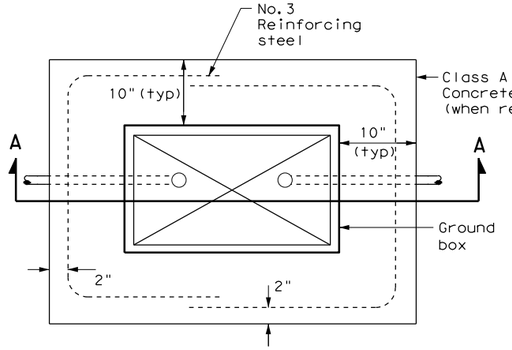
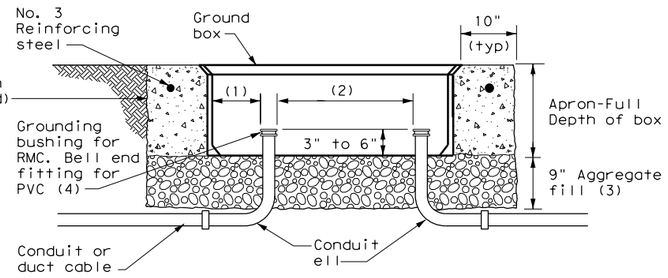


PLAN VIEW



SECTION A - A

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.

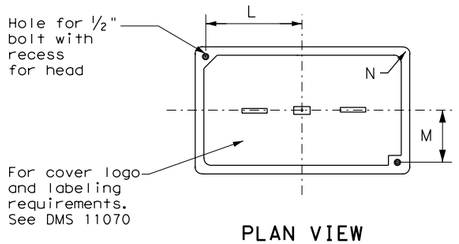
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

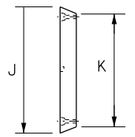
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

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



PLAN VIEW



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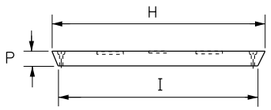

SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4)-14

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REVISIONS	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		69

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ELECTRICAL SERVICES NOTES

1. 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.

2. 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.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. 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.

5. 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.

6. 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.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. 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.

9. 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.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ 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.

11. 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.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. 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 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. 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 ½ 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.

15. 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

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. 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 photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. 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.

4. 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

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. 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

1. 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 **Size	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 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

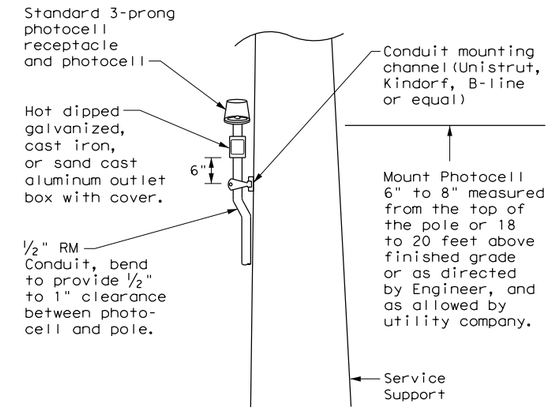
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** 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

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating
  000 indicates main lug only/
  Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
  (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  GS= Galvanized steel("off the shelf")
  SS= Stainless steel(Custom Enclosure)See MPL
  AL= Aluminum (Custom Enclosure)See MPL
- Photocell Mounting Location
  (E)= Inside Service/Enclosure Mounted
  (T)= Top of pole
  (L)= Luminaire mounted
  (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  GC= Granite concrete
  OC= Other concrete
  TP= Timber pole
  SP= Steel pole
  SF= Steel frame
  OT= Pole by others or paid for separately
  EX= Existing pole
  TS= Service on traffic signal pole
  PS= Pedestal Service
- O= Overhead Service Feed from Utility
  U= Underground Service Feed from Utility



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	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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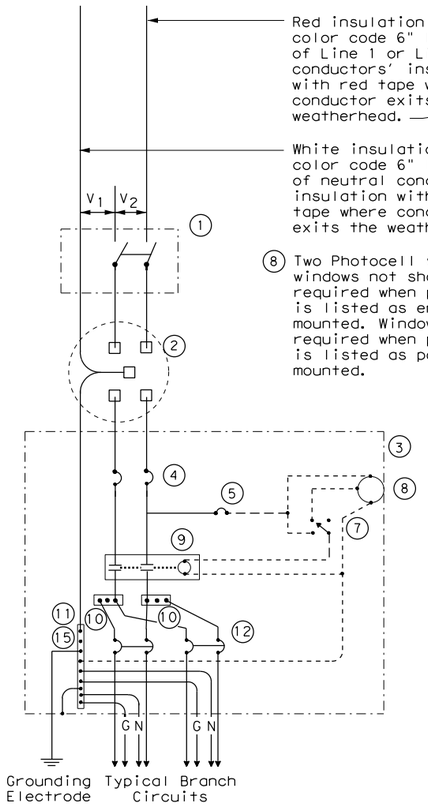
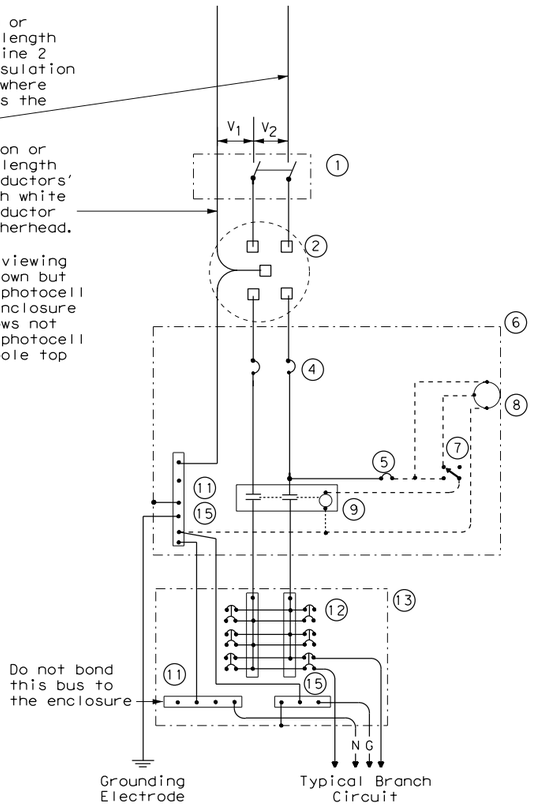
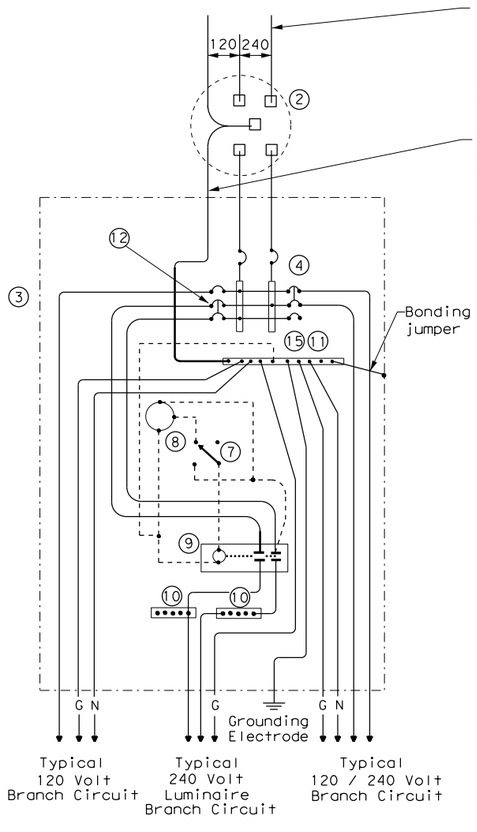


SCHEMATIC TYPE A
THREE WIRE

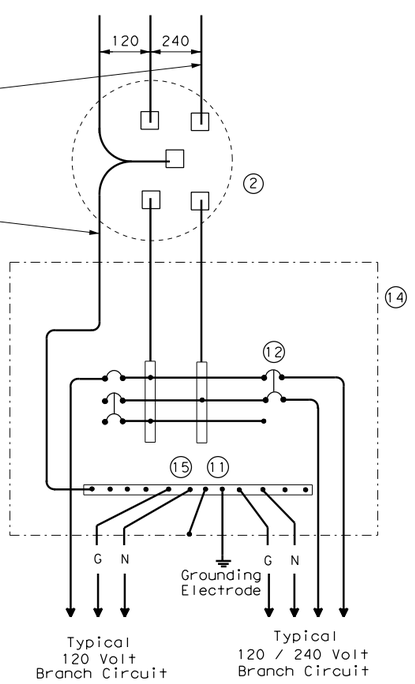
(8) Two Photocell viewing windows not shown but required when photocell is listed as enclosure mounted. Windows not required when photocell is listed as pole top mounted.



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



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.

WIRING LEGEND	
———	Power Wiring
--------	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

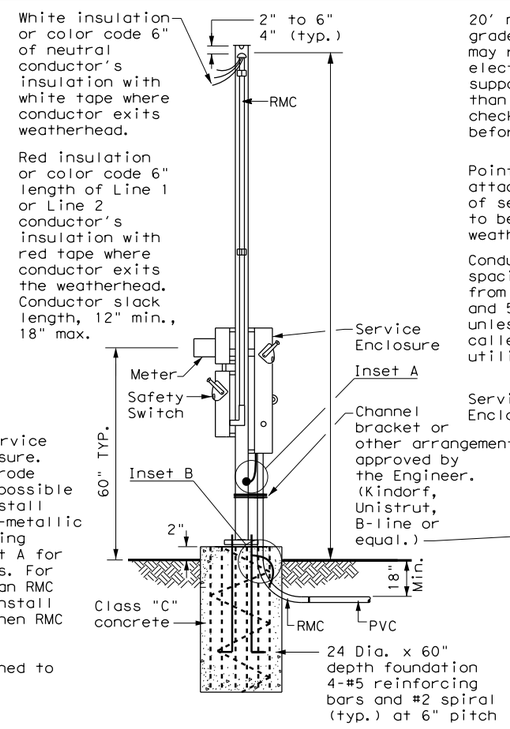
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

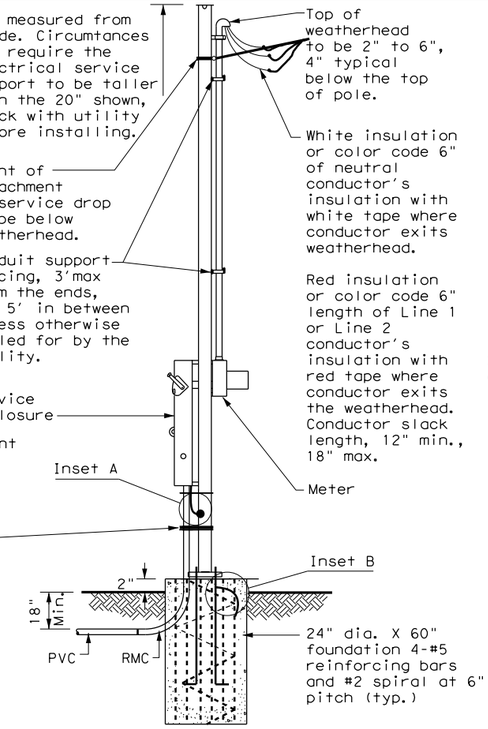
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

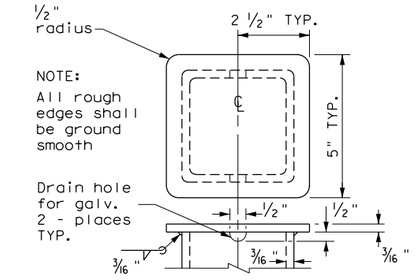


WITH SAFETY SWITCH

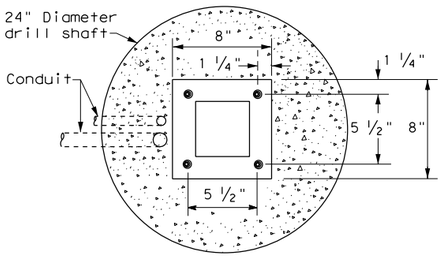


WITHOUT SAFETY SWITCH

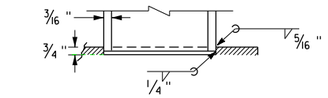
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

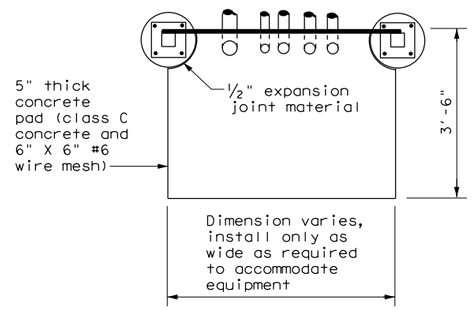


BASE PLATE DETAIL



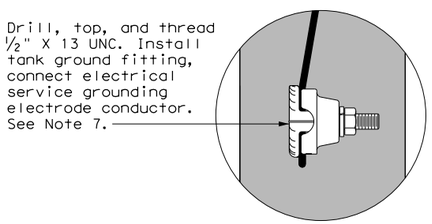
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



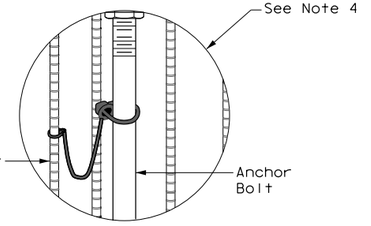
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

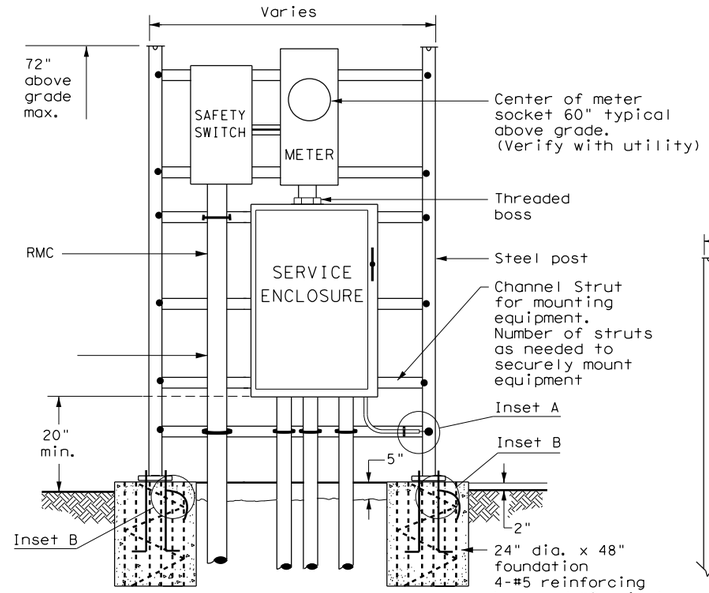


FRONT VIEW

INSET A

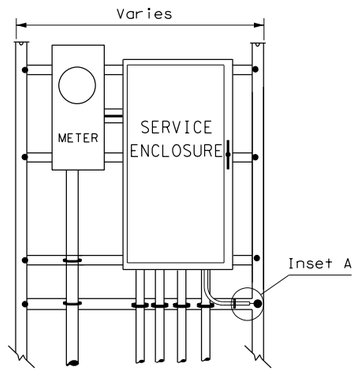


INSET B



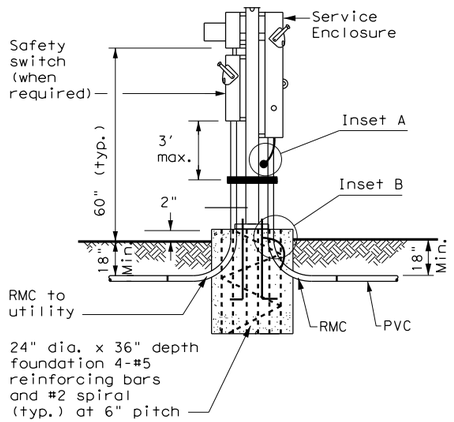
WITH SAFETY SWITCH

FRONT VIEW

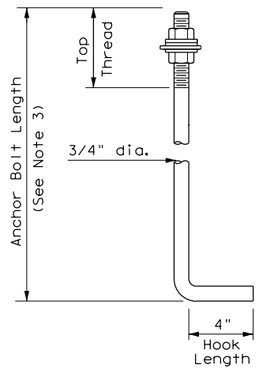


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

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REVISIONS	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		72

71G

TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. 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.
2. 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 electrial service.
3. 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.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 5/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1 1/2 in. to 1 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, 1/4 in. minimum diameter by 1 1/2 in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

(1) Class 5 pole, height as required

(2) Service drop from utility company (attached below weatherhead)

(3) Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)

(4) Safety switch (when required)

(5) Meter (when required)

(6) Service enclosure

(7) 6 AWG bare grounding electrode conductor in 1/2 in. PVC to ground rod - extend 1/2 in. PVC 6 in. underground.

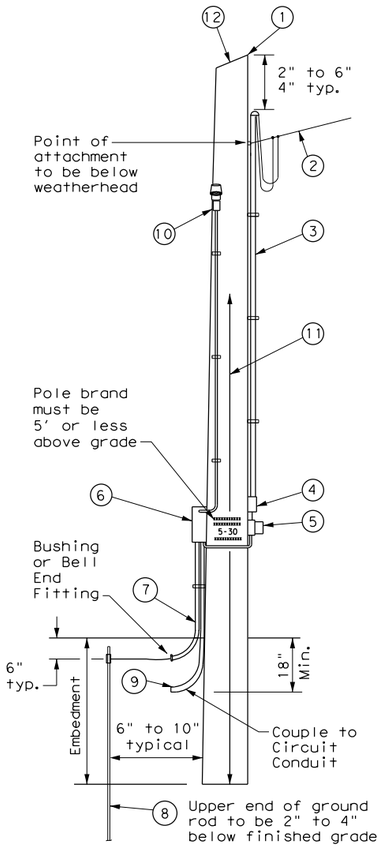
(8) 5/8 in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(9) RMC same size as branch circuit conduit.

(10) See pole-top mounted photocell detail on ED(5).

(11) 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.

(12) When required by utility, cut top of pole at an angle to enhance rain run off.

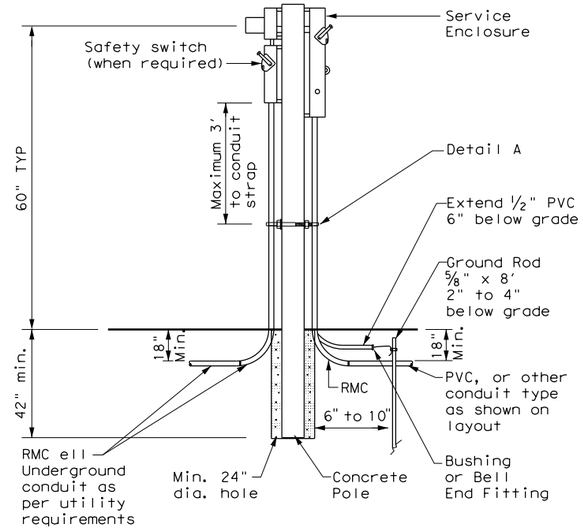


SERVICE SUPPORT TYPE TP (O)

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.

1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. 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.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. 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.
7. Furnish and install galvanized or stainless steel channel strut 1 1/2 in. or 1 5/8 in. wide by 1 in. up to 3 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.
8. 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.

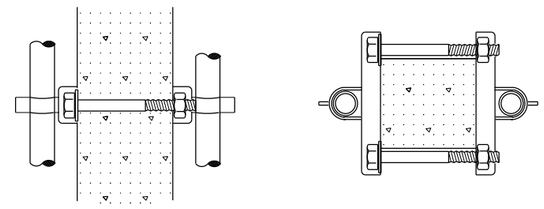


CONCRETE SERVICE SUPPORT

Underground (U)

CONCRETE SERVICE SUPPORT

Overhead (O)



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.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

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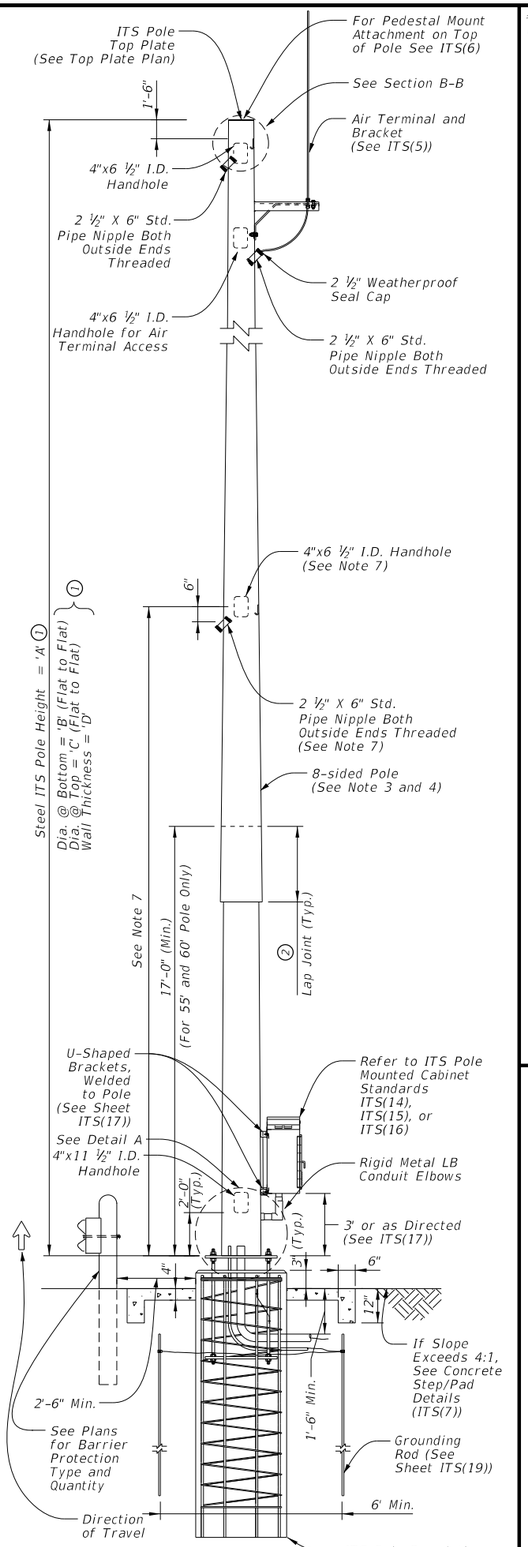
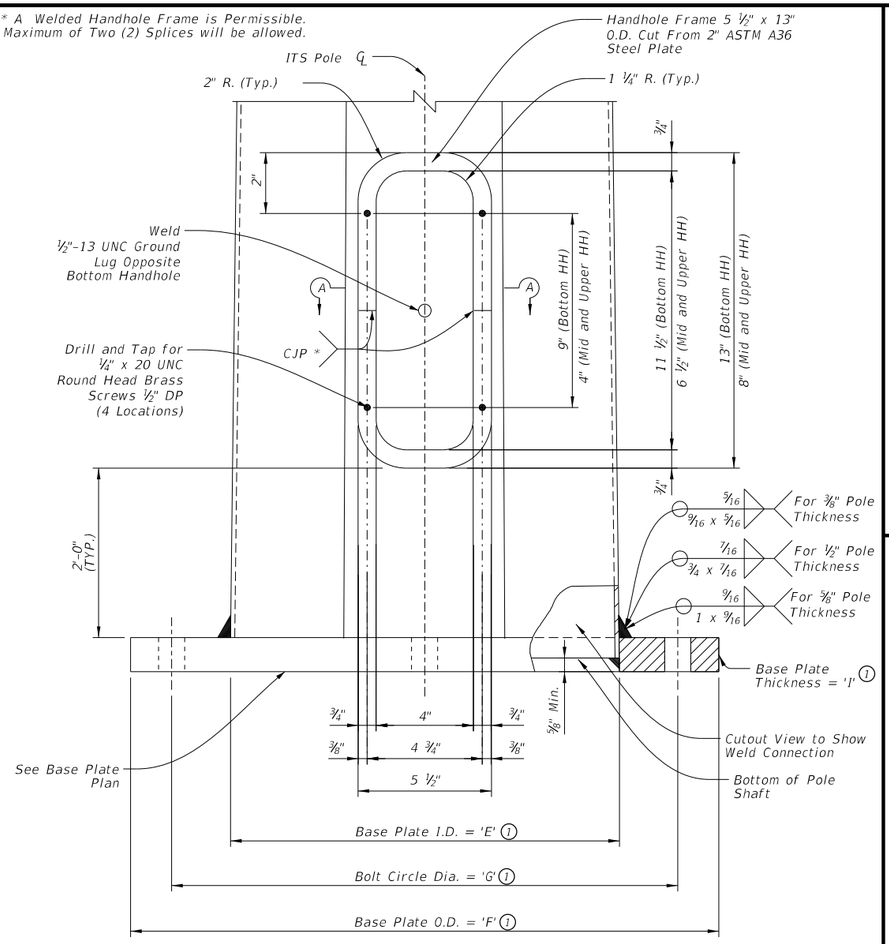
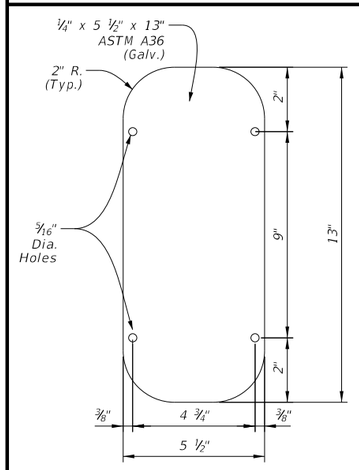


ITS Pole with Cabinet

* A Welded Handhole Frame is Permissible.
Maximum of Two (2) Splices will be allowed.

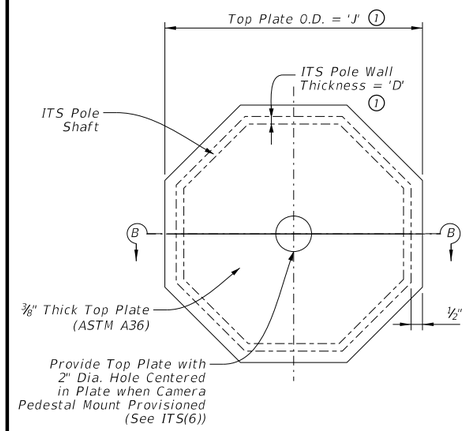


Detail A

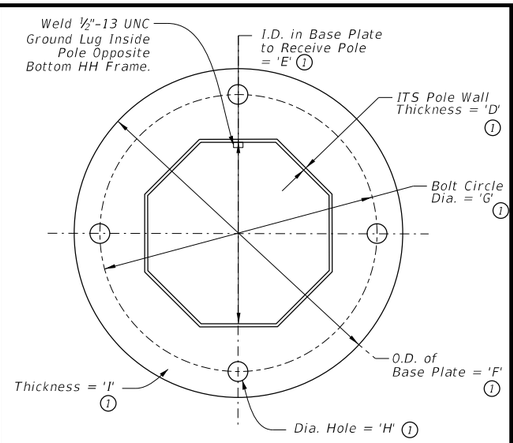


Handhole Cover Plate Detail

(Bottom Handhole)

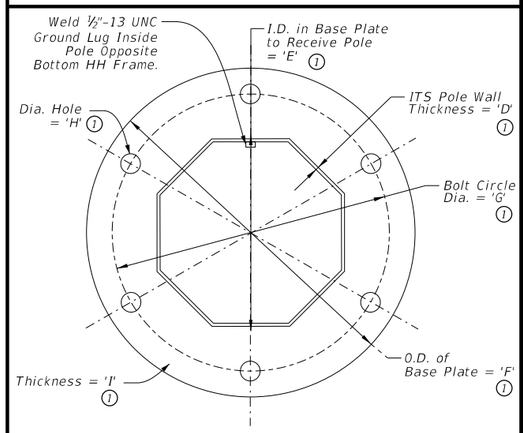


Top Plate Plan



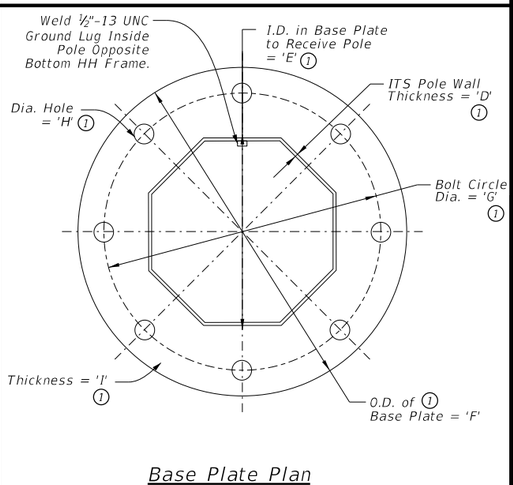
Base Plate Plan

4 Bolt Base Plate (ASTM A36)



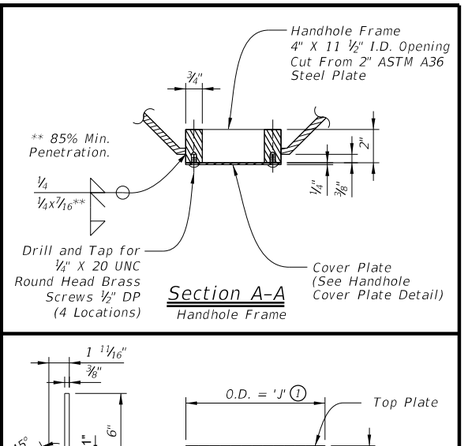
Base Plate Plan

6 Bolt Base Plate (ASTM A36)



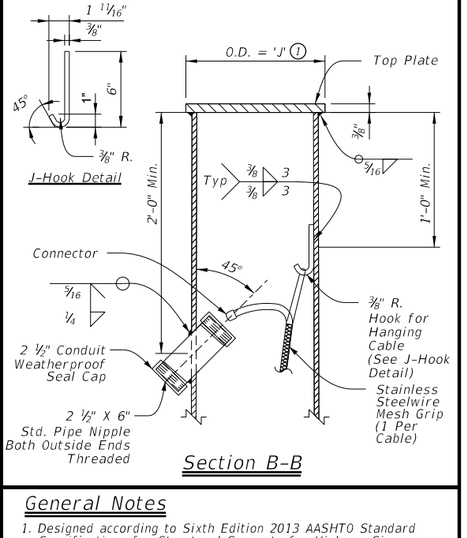
Base Plate Plan

8 Bolt Base Plate (ASTM A36)



Section A-A

Handhole Frame



Section B-B

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)

ITS(1)-15

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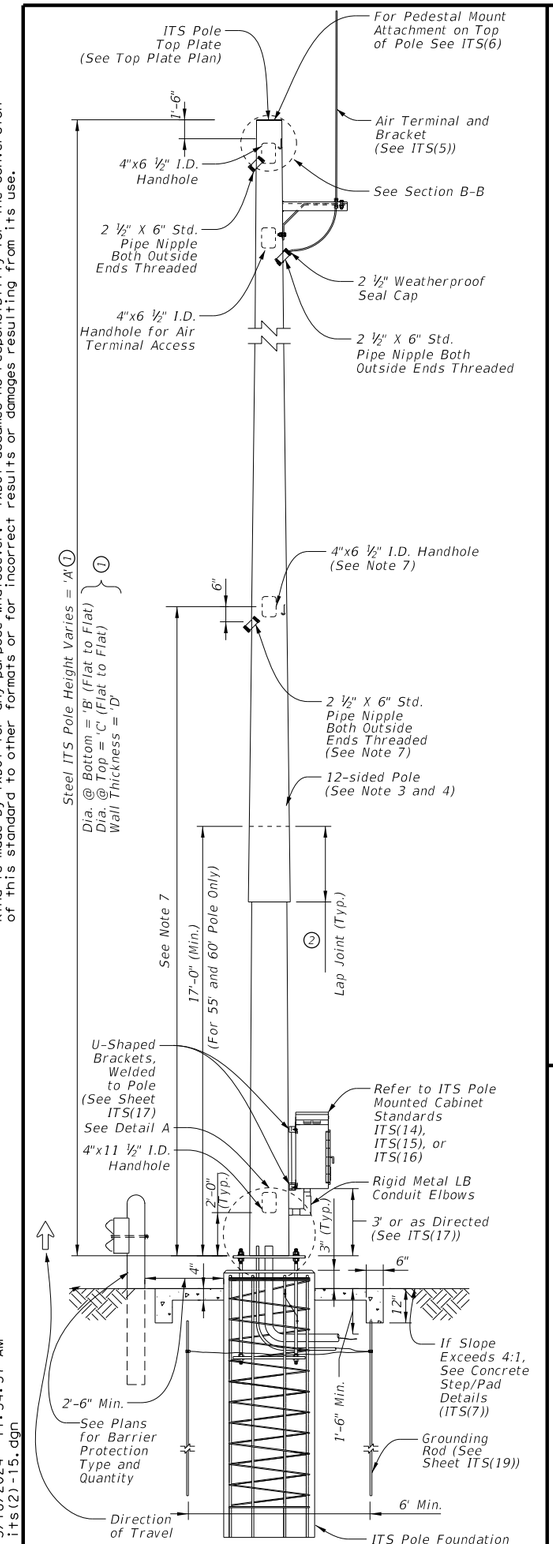
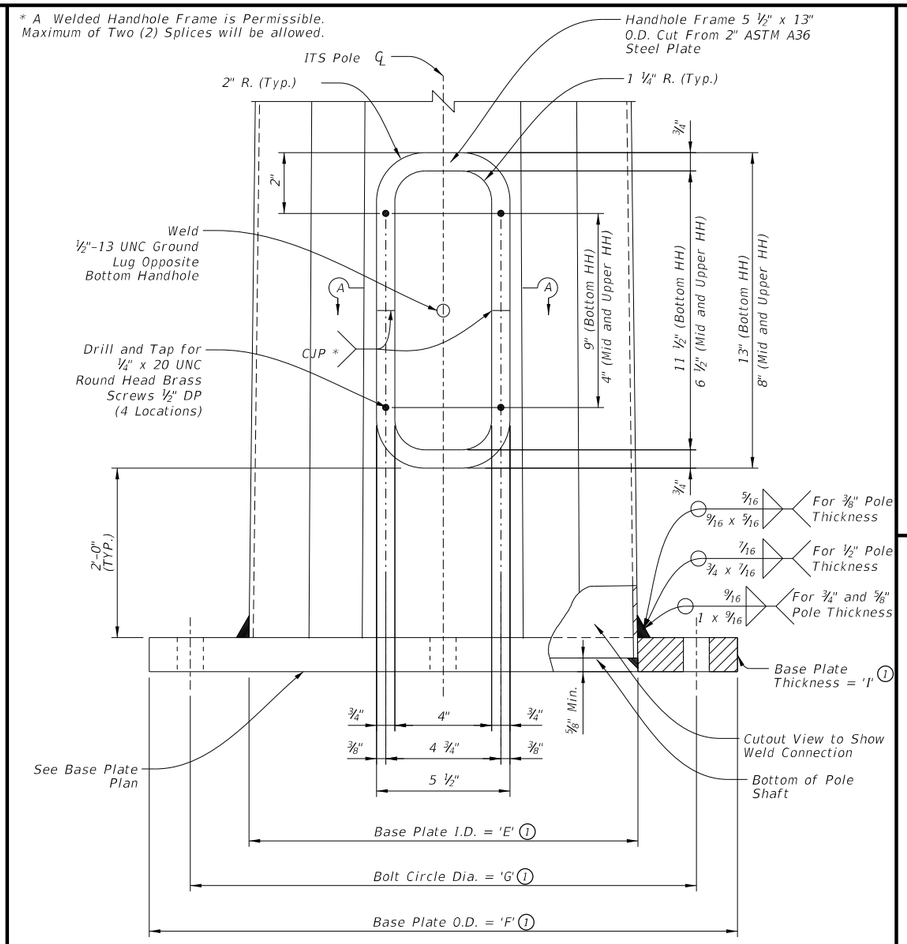
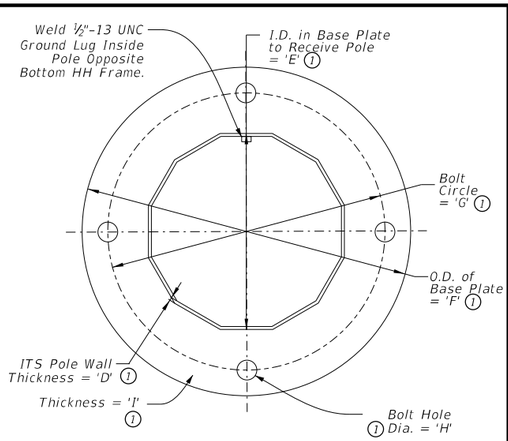


ITS Pole with Cabinet

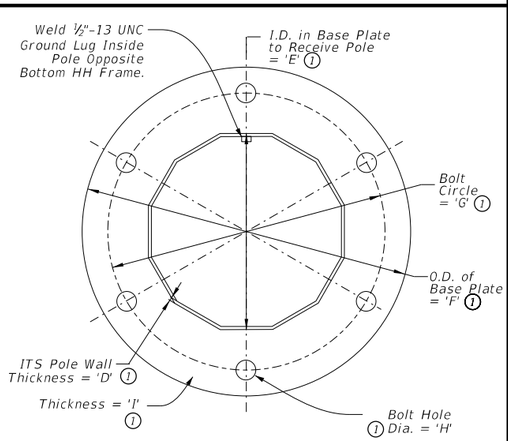


Detail A



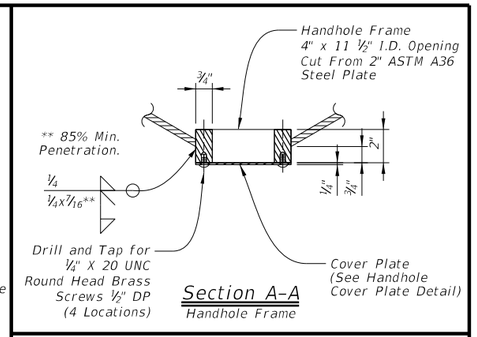
Base Plate Plan

4 Bolt Base Plate (ASTM A36)



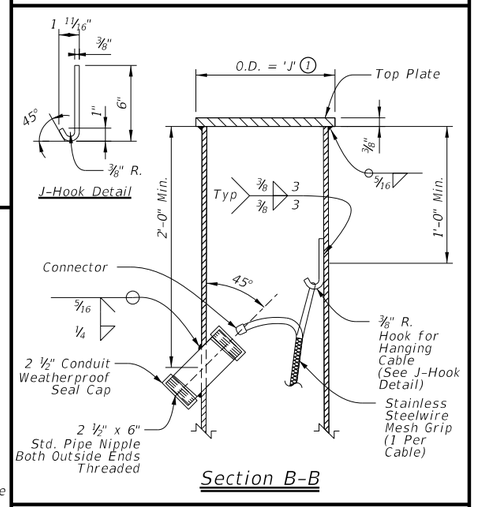
Base Plate Plan

6 Bolt Base Plate (ASTM A36)



Section A-A

Handhole Frame



Section B-B

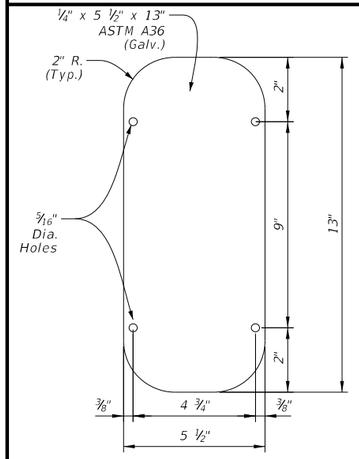
General Notes

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 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:

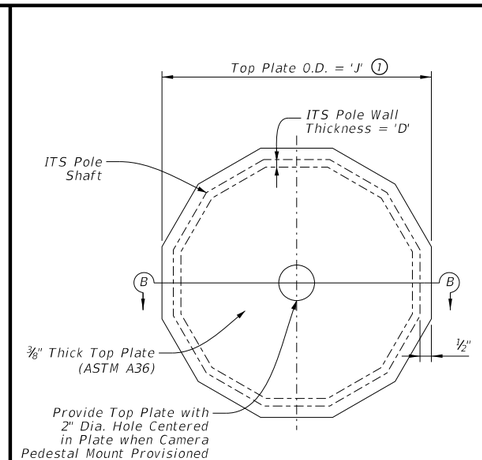
(1) See tables on Sheet ITS(4) for values of dimension variables.

(2) See lap joint note for 55' and 60' pole heights on ITS(4) at the bottom of each table.

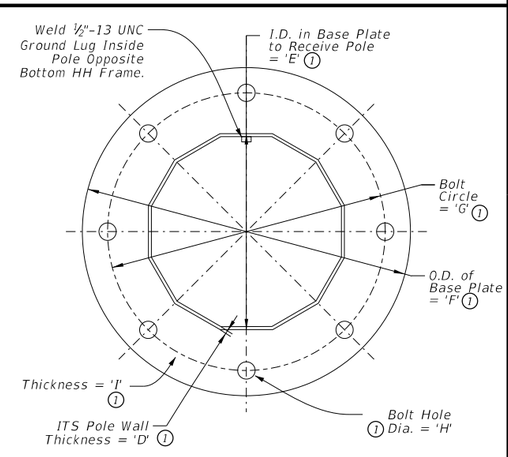


Handhole Cover Plate Detail

(Bottom Handhole)



Top Plate Plan



Base Plate Plan

8 Bolt Base Plate (ASTM A36)

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE DETAILS DODECAHEDRAL POLE (TWELVE SIDED POLE) (ALTERNATIVE) ITS(2)-15

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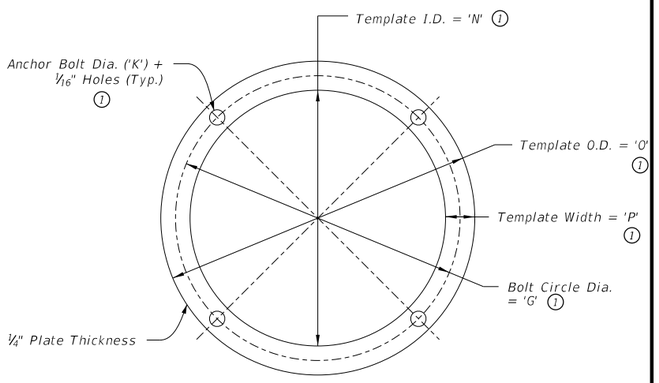
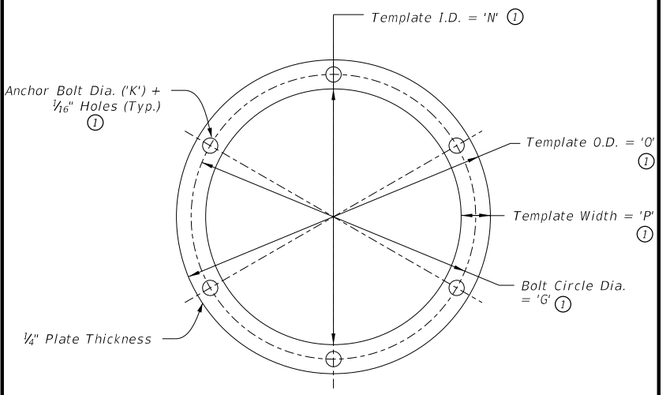
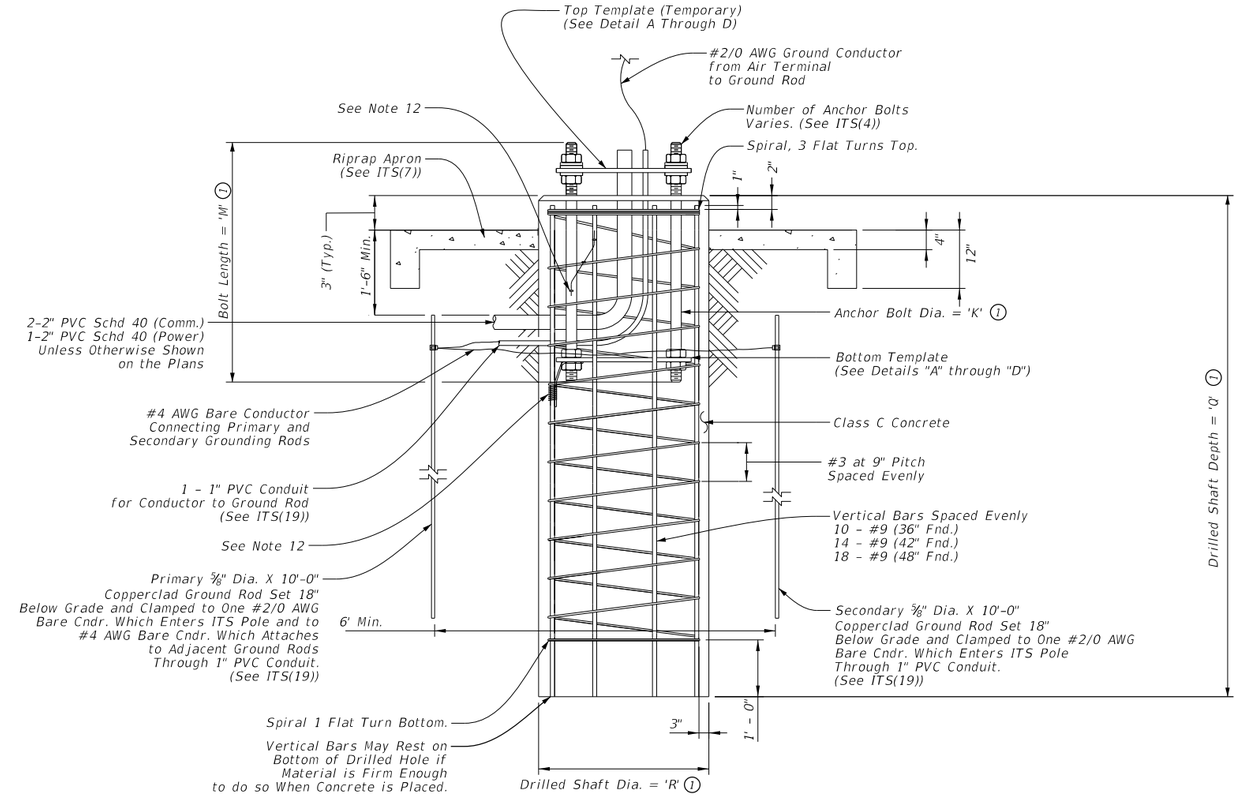


Top and Bottom Template (Four Bolt)
Detail A



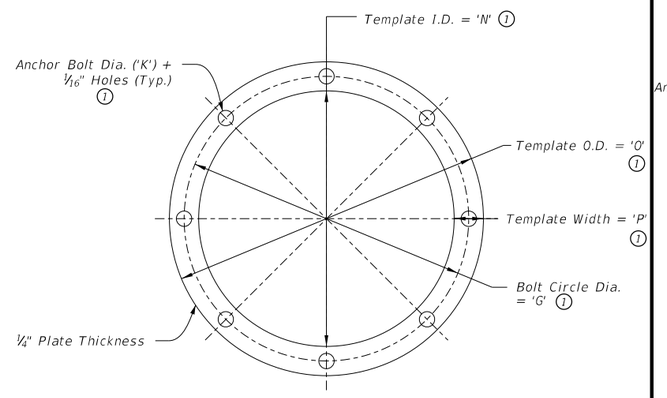
Top and Bottom Template (Six Bolt)
Detail B



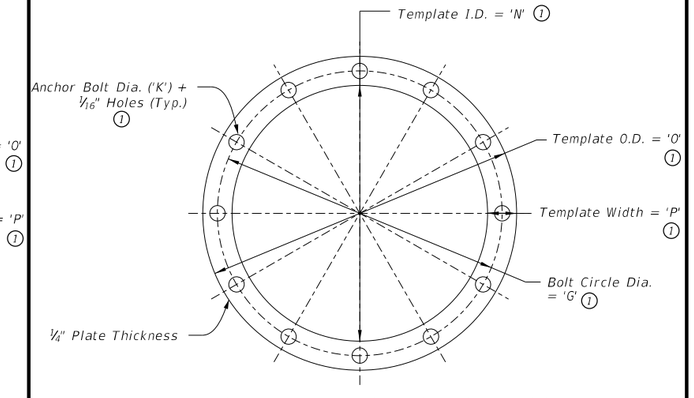
Foundation Details (Typical)
Elevation
Not to Scale

General Notes:

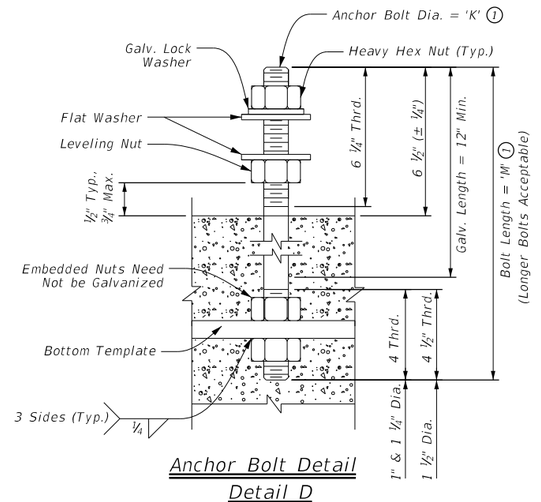
1. Drilled shaft concrete shall be Class "C" (f'_c = 3,600 PSI) in accordance with Item 416, "Drilled Shaft Foundations."
2. Reinforcing bars shall be Grade 60 (Fy = 60 KSI) and conform to ASTM A-615. All reinforcing shall conform to Item 440, "Reinforcing Steel."
3. Provide ASTM A-36 steel for templates. 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.



Top and Bottom Template (Eight Bolt)
Detail C



Top and Bottom Template (Twelve Bolt)
Detail D



Anchor Bolt Detail
Detail D

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

ITS(3)-16

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TABLE 1: ITS POLE – 90 MPH (W/ 2 SOLAR PANELS) ④

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ①⑩			BASE PLATE ①					TOP PLATE ②	ANCHOR BOLT ③						FOUNDATION ③			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	20	10	8	1/2	10-1/16	21	16	1-1/4	1-1/2	9	1	4	29	14	18	2	12	11	10	36
	30	13	9	1/2	13-1/16	24	19	1-9/16	1-1/2	10	1-1/4	4	35	16-1/2	21-1/2	2-1/2	15	13	10	36
	40	15	9	1/2	15-1/16	26	21	1-9/16	1-1/2	10	1-1/4	6	35	18-1/2	23-1/2	2-1/2	17	14	11	42
	45	16	10	1/2	16-1/16	27	22	1-9/16	1-1/2	11	1-1/4	6	35	19-1/2	24-1/2	2-1/2	18	16	12	42
	50	17	10	1/2	17-1/16	28	23	1-9/16	1-1/2	11	1-1/4	6	35	20-1/2	25-1/2	2-1/2	19	16	12	42
	55 ⑥⑦	19	11	5/8	19-1/16	30	25	1-13/16	2	12	1-1/2	6	40	22	28	3	21	18	13	42
	60 ⑥⑦	20	11	5/8	20-1/16	31	26	1-13/16	2	12	1-1/2	6	40	23	29	3	21	19	14	48

TABLE 2: ITS POLE – 110 MPH (W/ 2 SOLAR PANELS) ④

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ①⑩			BASE PLATE ①					TOP PLATE ②	ANCHOR BOLT ③						FOUNDATION ③			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	20	10	8	1/2	10-1/16	21	16	1-1/4	1-1/2	9	1	4	29	14	18	2	14	12	10	36
	30	13	9	1/2	13-1/16	24	19	1-9/16	1-3/4	10	1-1/4	6	35	16-1/2	21-1/2	2-1/2	18	15	11	36
	40	15	9	1/2	15-1/16	25	21	1-9/16	1-3/4	10	1-1/4	6	35	18-1/2	23-1/2	2-1/2	20	17	12	42
	45	16	10	1/2	17-1/16	27	22	1-9/16	1-3/4	11	1-1/4	8	35	19-1/2	24-1/2	2-1/2	21	18	13	42
	50	17	10	1/2	18-1/16	28	23	1-9/16	1-3/4	11	1-1/4	8	35	20-1/2	25-1/2	2-1/2	22	19	14	42
	55 ⑦	19	11	5/8	19-1/16	30	25	1-9/16	2	12	1-1/4	8	35	22-1/2	27-1/2	2-1/2	24	20	14	42
	60 ⑦	20	11	5/8	20-1/16	31	26	1-13/16	2	12	1-1/2	6	40	23	29	3	25	21	15	48

TABLE 3: ITS POLE – 130 MPH (W/ 1 SOLAR PANEL) ⑤

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ①⑩			BASE PLATE ①					TOP PLATE ②	ANCHOR BOLT ③						FOUNDATION ③			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	20	10	8	1/2	10-1/16	21	16	1-9/16	1-3/4	9	1-1/4	4	35	13-1/2	18-1/2	2-1/2	16	14	10	36
	30	13	9	1/2	15-1/16	24	19	1-9/16	1-3/4	10	1-1/4	6	35	16-1/2	21-1/2	2-1/2	18	16	11	36
	40	15	9	1/2	15-1/16	26	21	1-9/16	1-3/4	10	1-1/4	6	35	18-1/2	23-1/2	2-1/2	21	18	13	42
	45	16	10	1/2	16-1/16	27	22	1-9/16	1-3/4	11	1-1/4	8	35	19-1/2	24-1/2	2-1/2	23	19	14	42
	50	17	10	1/2	17-1/16	28	23	1-9/16	2	11	1-1/2	8	40	20	26	3	24	20	14	42
	55 ⑦	19	11	5/8	19-1/16	30	25	1-13/16	2	12	1-1/2	8	40	22	28	3	27	22	15	42
	60 ⑦	20	11	5/8	20-1/16	31	26	1-13/16	2	12	1-1/2	8	40	23	29	3	28	23	16	48

TABLE 4: ITS POLE WITH STIFFENERS – 90 MPH (W/ 4 SOLAR PANELS) ⑧

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ①			BASE PLATE ①					TOP PLATE ②	ANCHOR BOLT ③						FOUNDATION ③			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	30	13	9	3/8	13-1/16	28	22	1-1/4	1-3/4	10	1	8	29	20	24	2	17	15	11	42
	40	15	9	1/2	15-1/16	30	24	1-1/4	2	10	1	8	29	22	26	2	20	17	12	42
	45	16	10	1/2	16-1/16	31	25	1-9/16	2	11	1-1/4	8	35	22-1/2	27-1/2	2-1/2	21	18	13	42
	50	17	10	1/2	17-1/16	32	26	1-9/16	2	11	1-1/4	8	35	23-1/2	28-1/2	2-1/2	21	18	13	42
12 sided	55 ⑦	19	11	5/8	19-1/16	34	27	1-9/16	2	12	1-1/4	12	35	24-1/2	29-1/2	2-1/2	21	18	13	48
	60 ⑦	20	12	5/8	20-1/16	35	28	1-9/16	2	13	1-1/4	12	35	25-1/2	30-1/2	2-1/2	22	19	14	48

TABLE 5: ITS POLE WITH STIFFENERS – 110 MPH (W/ 4 SOLAR PANELS) ⑧

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ①			BASE PLATE ①					TOP PLATE ②	ANCHOR BOLT ③						FOUNDATION ③			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	30	13	9	1/2	13-1/16	28	22	1-9/16	2-1/4	10	1-1/4	8	35	19-1/2	24-1/2	2-1/2	20	17	12	42
	40	16	10	1/2	16-1/16	31	25	1-9/16	2-1/4	11	1-1/4	8	35	22-1/2	27-1/2	2-1/2	24	20	14	42
	45	17	11	1/2	17-1/16	32	26	1-9/16	2-1/4	12	1-1/4	8	35	23-1/2	28-1/2	2-1/2	25	21	15	42
	50	18	11	1/2	18-1/16	32	26	1-13/16	2-1/2	12	1-1/2	8	40	23	29	3	25	21	15	48
12 SIDED	55 ⑦	19	11	5/8	19-1/16	34	27	1-9/16	2-1/4	12	1-1/4	12	35	24-1/2	29-1/2	2-1/2	24	21	15	48
	60 ⑦	20	12	5/8	20-1/16	35	28	1-9/16	2-1/4	13	1-1/4	12	35	25-1/2	30-1/2	2-1/2	25	22	15	48

TABLE 6: ITS POLE WITH STIFFENERS – 130 MPH (W/ 3 SOLAR PANELS) ⑨

POLE TYPE ①	POLE HEIGHT (FT)	POLE SHAFT ①			BASE PLATE ①					TOP PLATE ②	ANCHOR BOLT ③						FOUNDATION ③			
		BOTTOM OUTSIDE DIA. (IN)	TOP OUTSIDE DIA. (IN)	WALL THICKNESS (IN)	INSIDE DIA. (IN)	OUTSIDE DIA. (IN)	BOLT CIRCLE DIA. (IN)	BOLT HOLE DIA. (IN)	THICKNESS (IN)	OUTSIDE DIA. (IN)	DIA. (IN)	NO. OF BOLTS	LENGTH OF BOLT MIN. (IN)	TEMPLATE INSIDE DIA. (IN)	TEMPLATE OUTSIDE DIA. (IN)	TEMPLATE WIDTH (IN)	DRILL SHAFT DEPTH – TEXAS CONE PENETROMETER (N – BLOWS/FT.) (SEE NOTE 5)			DRILLED SHAFT DIA. (IN)
																	N = 10	N = 15	N = 40	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'	'Q'			'R'
8 SIDED	30	13	9	1/2	13-1/16	28	22	1-9/16	2-1/2	10	1-1/4	8	35	19-1/2	24-1/2	2-1/2	23	19	14	42
	40	16	10	1/2	16-1/16	31	25	1-9/16	2-1/2	11	1-1/2	8	40	22	28	3	25	21	14	42
	45	17	11	1/2	17-1/16	32	26	1-13/16	2-1/2	12	1-1/2	8	40	23	29	3	26	22	16	48
	50	18	11	1/2	18-1/16	33	27	1-13/16	2-1/2	12	1-1/2	8	40	24	30	3	27	23	16	48
12 SIDED	55 ⑦	19	11	5/8	19-1/16	34	27	1-9/16	2-1/4	12	1-1/4	12	35	24-1/2	29-1/2	2-1/2	26	22	16	48
	60 ⑦	20	12	5/8	20-1/16	35	28	1-9/16	2-1/4	13	1-1/4	12	35	25 1/2	30 1/2	2-1/2	27	23	16	48

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 thereto.
2. Table 1 and Table 4 design wind speed equals 90 MPH (3-Second Wind Gusts) with a 1.14 gust factor. A wind importance factor of 1.00 is applied to adjust the wind speed to a 50 year recurrence interval at 33 FT above the ground for Exposure C category in accordance with TxDOT WV&IZ(LTS2013). Design values listed in the table allow the base of the pole to be elevated above the surrounding ground level no more than 20 FT.
3. Table 2 and Table 5 design wind speed equals 110 MPH (3-Second Wind Gusts) with a 1.14 gust factor. A wind importance factor of 1.00 is applied to adjust the wind speed to a 50 year recurrence interval at 33 FT above the ground for Exposure C category in accordance with TxDOT WV&IZ(LTS2013). Design values listed in the table allow the base of the pole to be elevated above the surrounding ground level no more than 20 FT.
4. Table 3 and Table 6 design wind speed equals 130 MPH (3-Second Wind Gusts) with a 1.14 gust factor. A wind importance factor of 1.00 is applied to adjust the wind speed to a 50 year recurrence interval at 33 FT above the ground for Exposure C category in accordance with TxDOT WV&IZ(LTS2013). Design values listed in the table allow the base of the pole to be elevated above the surrounding ground level no more than 20 FT.
5. Recommended embedment lengths are for information purposes only. Foundation embedment depth is based off Texas Cone Penetrometer Value N = 10 blows/ft. for soft soils and up to 40 blows/ft. for hard soils. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations" unless otherwise shown on the plans.
6. Deviation from the design criteria and values contained in the tables above constitute and alternative design and will require submission of shop drawings and calculations for approval, sealed by a Texas Professional Engineer.
7. 12-sided or round poles as a direct substitution for 8-sided and round poles as a direct substitution for 12-sided poles, meeting the design criteria and values contained in the tables above, require submission of shop drawings for approval.

Reference Notes

① See the following ITS Pole Standard sheets:
- 8-sided Pole – ITS(1)
- 12-sided Pole – ITS(2)

② Provision for 2" Dia. opening in top plate for poles requiring cameras mounted on top.
- See ITS Pole Mounting Details – ITS(6)

③ See ITS Pole Foundation Details – ITS(3)

④ Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- Two 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

⑤ Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- One 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

⑥ Pole heights at 55 Ft. and 60 Ft. located in the AMA, CHS, and LBB Districts, will require special design and design values shown shall not be used. Submit shop drawings for pole design and supporting calculations for 55 Ft. and 60 Ft. pole heights signed and sealed by a Texas Professional Engineer for approval.

⑦ Ensure minimum nominal splice length is 1.5 times the average pole diameter at the splice to the nearest inch. Ensure longitudinal seam welds that will be in contact at a slip joint splice are ground smooth for the length of splice plus a minimum of six inches. Ensure a 100% longitudinal seam weld for a length of 1.5 pole diameter plus a minimum of 6 inches in outer sections at splices and at base plate. Provide 85% penetration in longitudinal seam welds at other pole sections.

⑧ Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- Four 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

Refer to ITS(4A) for stiffening plate details at the pole to base plate connection.

⑨ Designed to support the following:
- Two Type 3 ITS pole mounted cabinets (280 LBS/EA and EPA = 14.50 sq. ft. per cabinet). See ITS(16).
- Three 250 W (50 LBS/EA and EPA = 30.70 sq. ft. per panel) solar panels (see ITS(24) "Solar Panel Matrix Table")
- Combined ITS equipment dead load of 170 LBS with an EPA = 6 sq. ft.

Refer to ITS(4A) for stiffening plate details at the pole to base plate connection.

⑩ When solar panels are not provisioned in the plans, ITS pole wall thickness may be reduced by ½".

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE DESIGN DETAILS DATA LOOKUP TABLE

ITS(4)-15

FILE: i+s(4)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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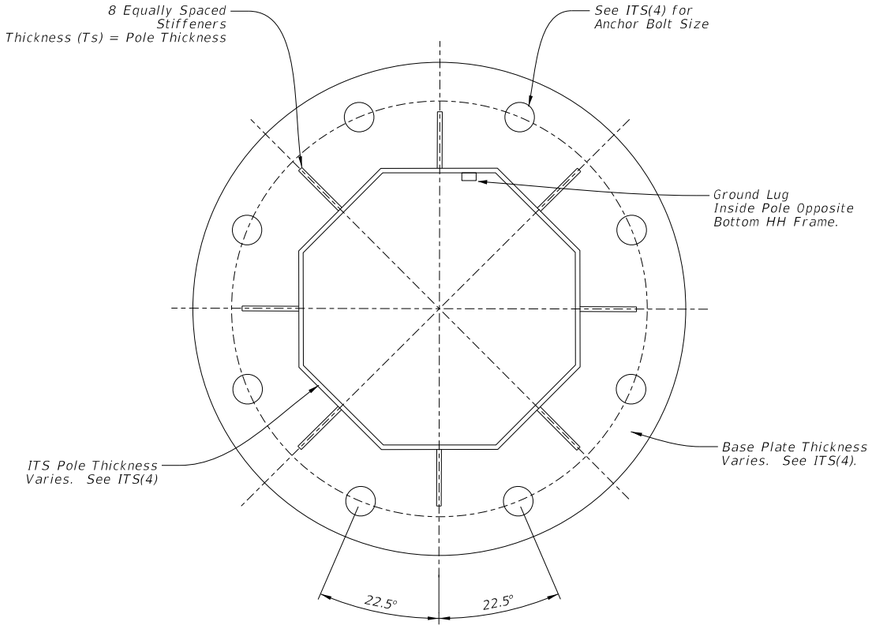
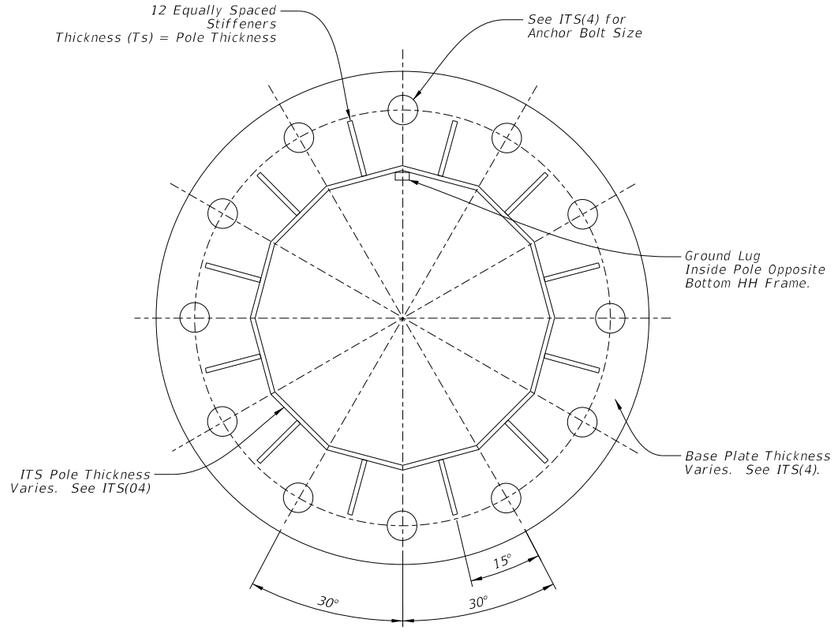


8-sided Pole Base Plate Detail



12-sided Pole Base Plate Detail

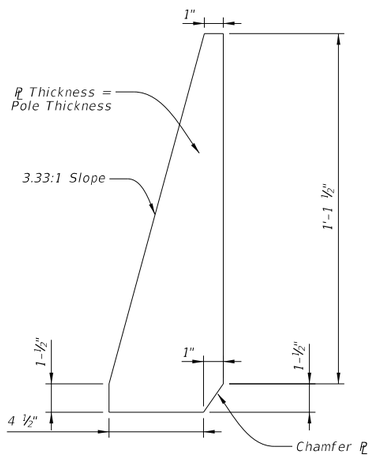
General Notes:

1. Steel stiffening plates shall conform to ASTM A36.
2. Make all welds conform to Item 441, "Steel Structures."
3. Galvanize in accordance with Item 445, "Galvanizing" unless otherwise noted.
4. Submit shop drawings detailing stiffening plate orientation along with ITS equipment intended for mounting for review and approval prior to fabrication.
5. HH = Handhole
6. T_s = Thickness

Reference Notes:

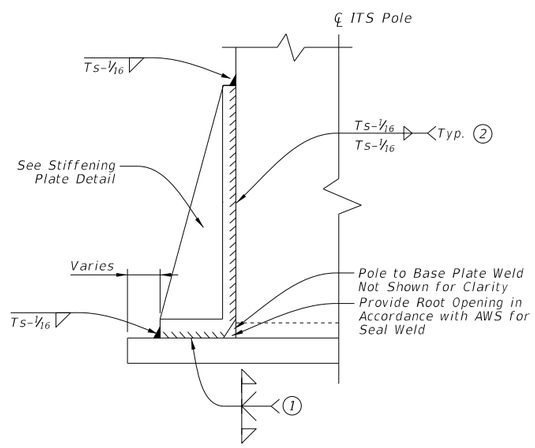
(1) Complete Joint Penetration Weld per AWS

(2) Wrap Fillet Weld Around Tip of Stiffener



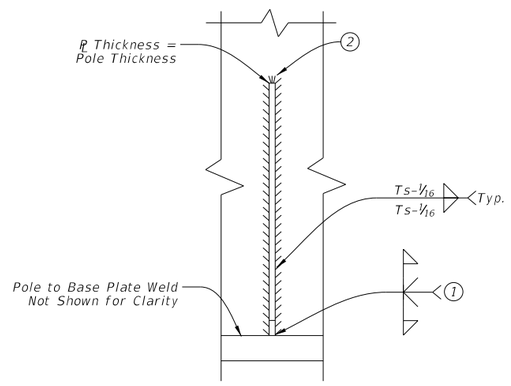
Stiffening Plate Detail

Not to Scale



Stiffening Detail - Elevation View

Not to Scale



Stiffening Detail - Front View

Not to Scale

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Traffic Operations Division Standard

ITS POLE STIFFENER PLATE DETAILS

ITS(4A)-15

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	ODA	ECTOR, ETC.		78

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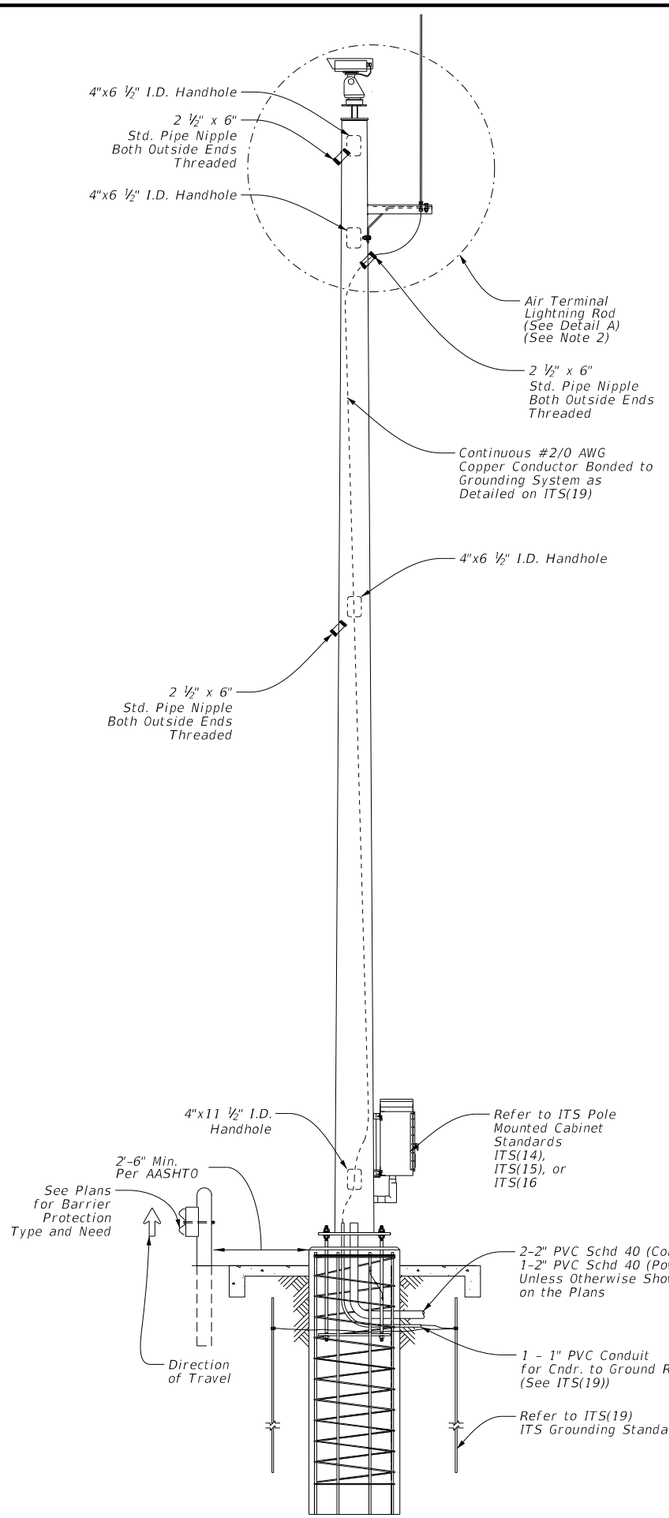
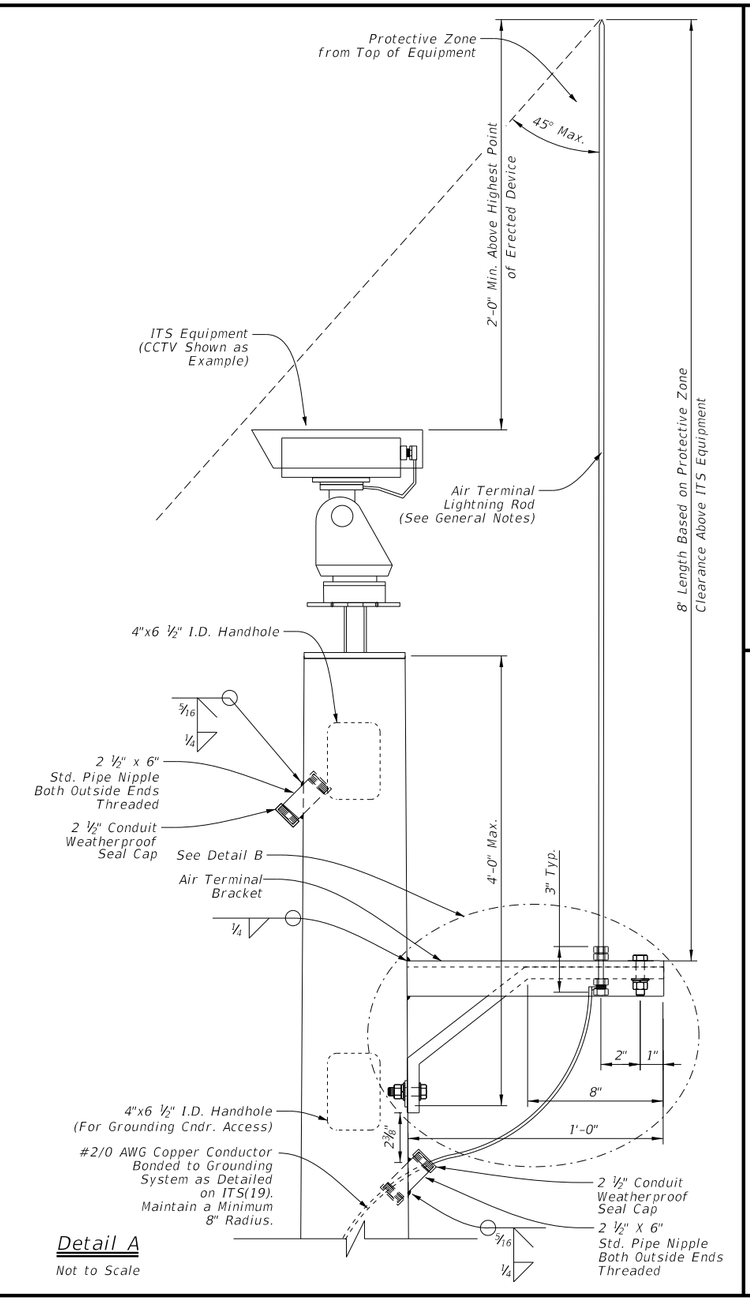


ITS Pole with Cabinet



Detail A

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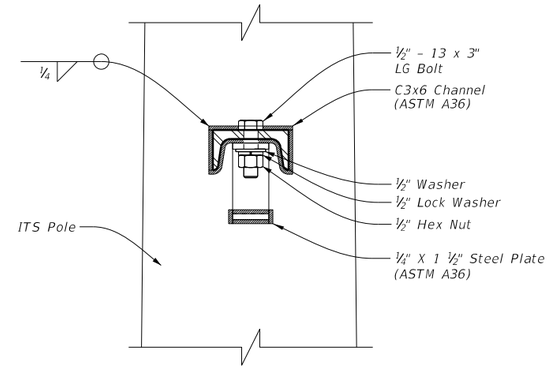

Section A-A

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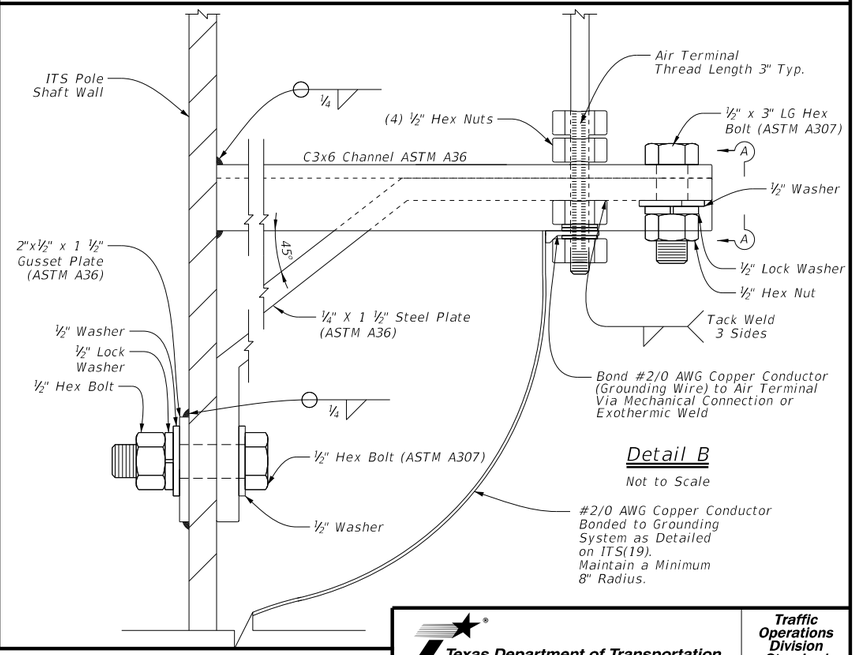

Detail B

Not to Scale

General Notes:

1. 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:
   A. Position - in center of least utilized field of view.
   B. Height - camera equipment to be within 45 degree protective zone of air terminal.
   C. Material - ½" ETP alloy 110 copper air terminal (Class II)
   D. Clearance - 24" minimum height above highest point of ITS equipment.
   E. Bonding - attach air terminal to bracket by exothermic weld or with approved clamping.
   F. Structure wind rating in accordance with TxDOT WV & IZ (LTS2013).
   G. Galvanize air terminal bracket in accordance with Item 445, "Galvanizing."
2. 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.
3. 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.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE AIR TERMINAL DETAILS

ITS(5)-15

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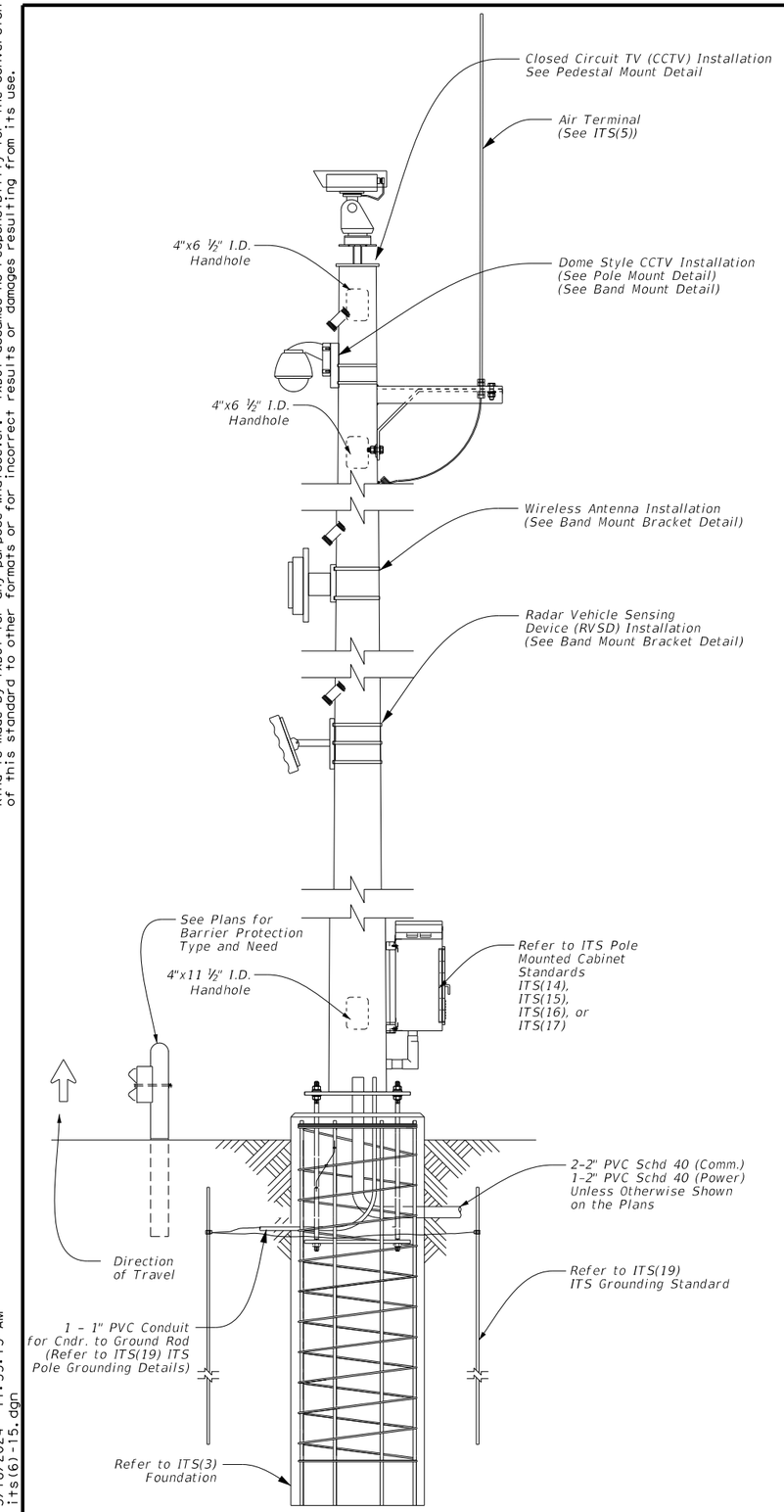
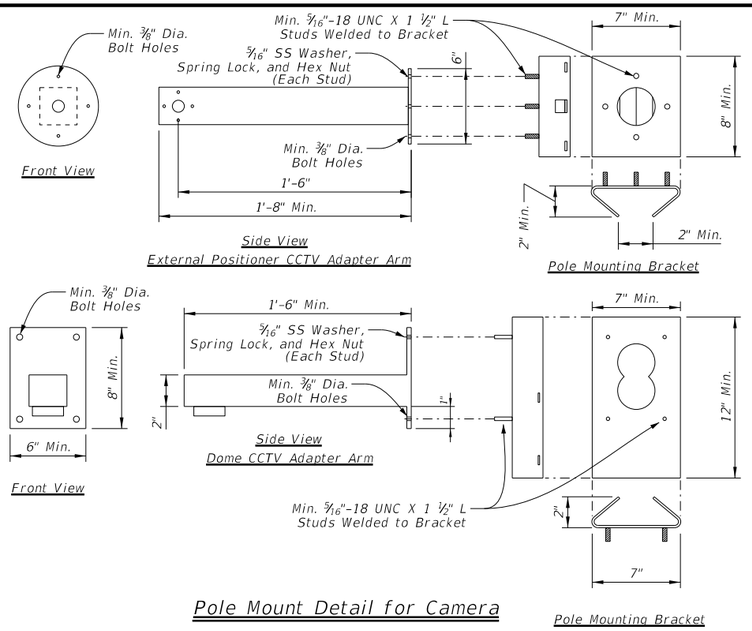
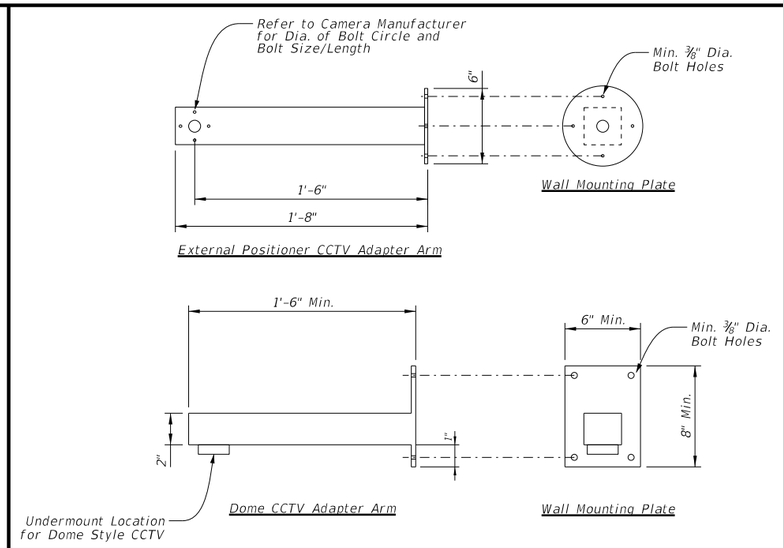


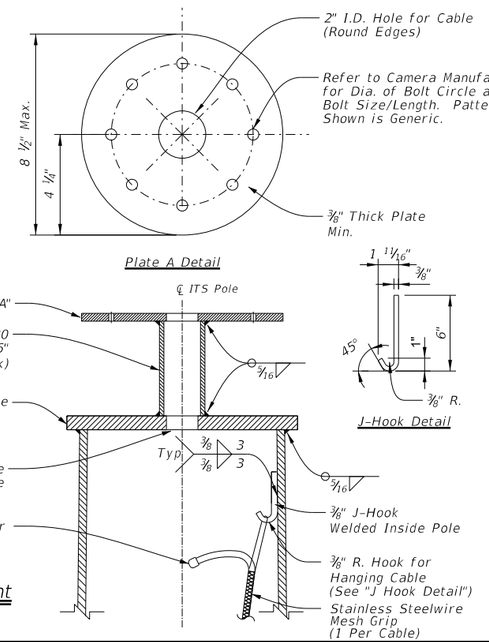
ITS Pole with Cabinet



Pole Mount Detail for Camera

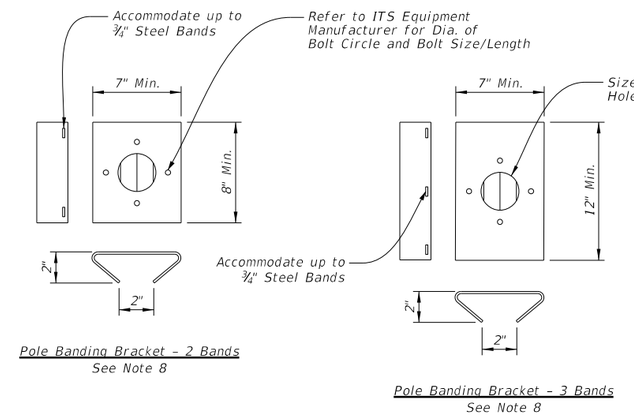


Wall Mount Detail



Pedestal Mount

Pole Top Detail



Band Mount Bracket Details

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 AWSD 1.1 (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.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE EQUIPMENT MOUNTING DETAILS

ITS(6)-15

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231

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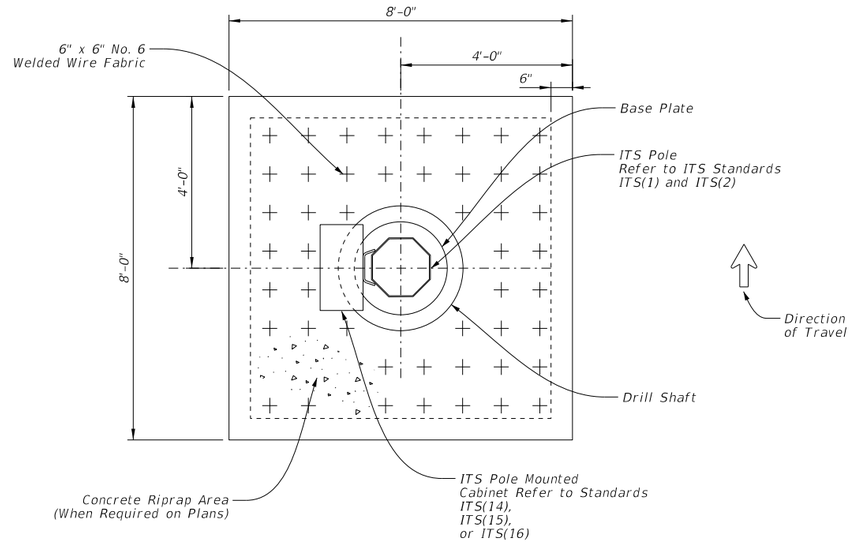
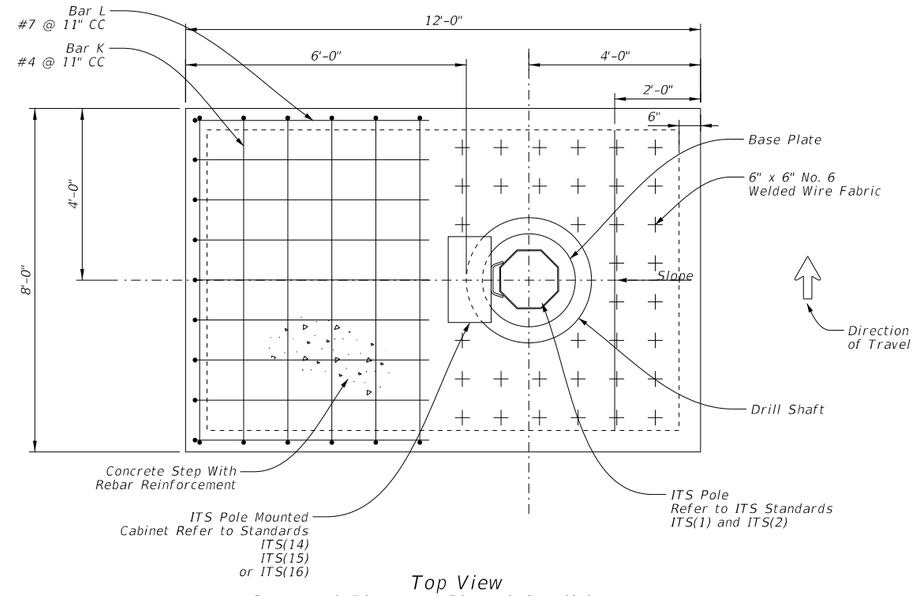
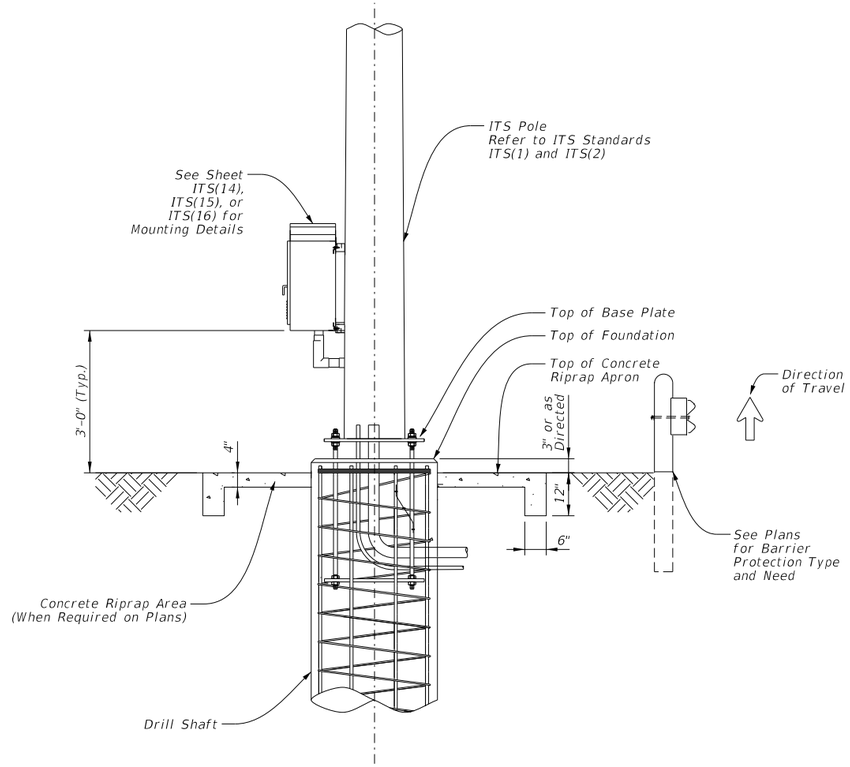


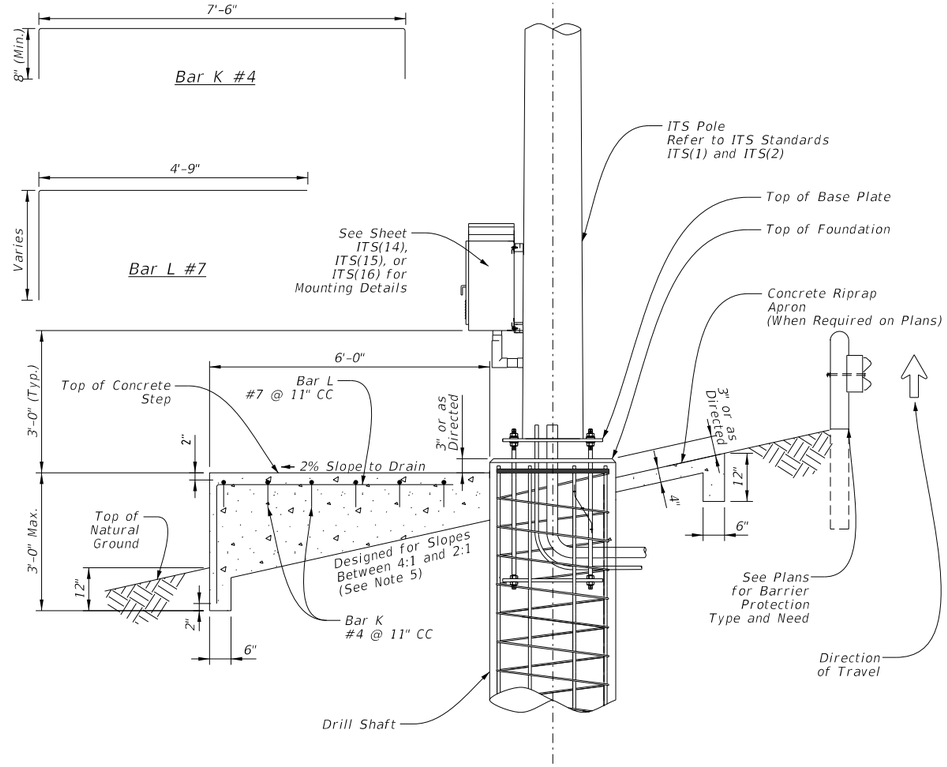
Top View
Riprap – Non-Sloped Conditions



Top View
Step and Riprap – Sloped Conditions



Elevation View
Riprap Apron Detail – Non-Sloped Conditions



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

General Notes:

1. 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."
2. 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.
3. 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.
4. Cabinet orientation may vary depending on field conditions or project constraints. Accommodate configuration of platform according to cabinet orientation.
5. 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.

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Traffic Operations Division Standard

ITS POLE RIPRAP DETAILS

ITS(7)-15

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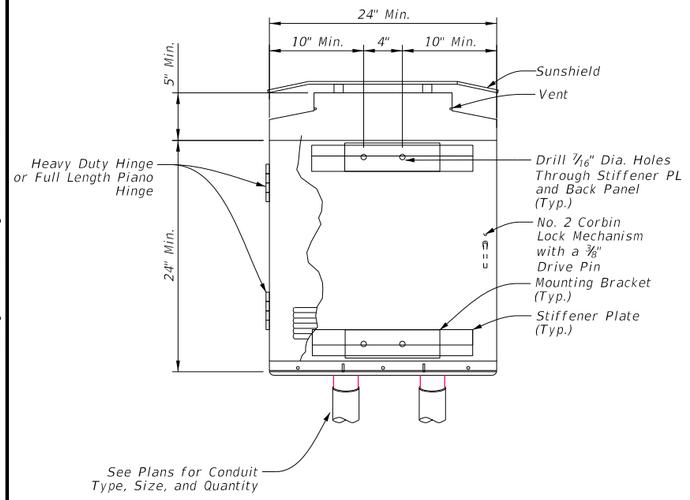
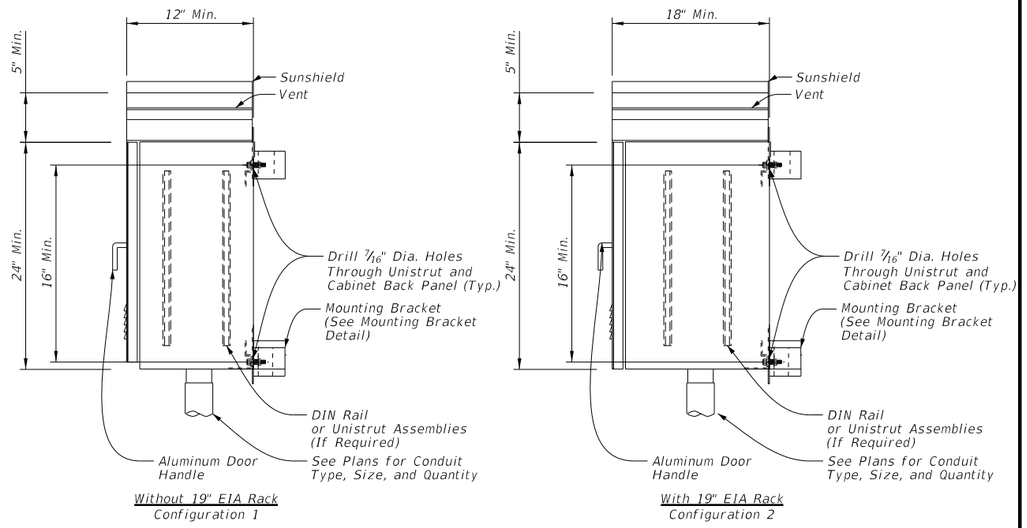


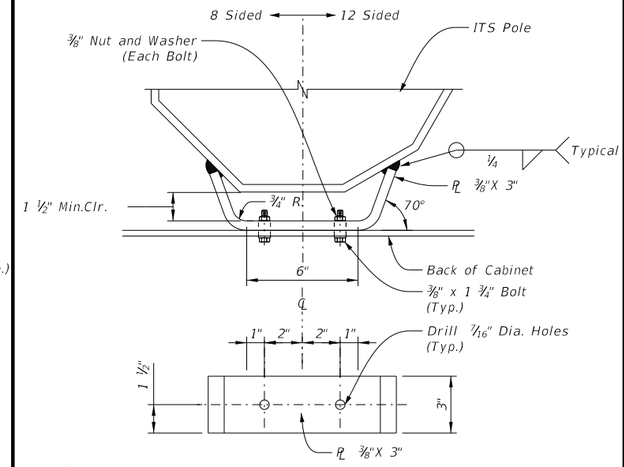
Pole Mounted Cabinet – Type 1 Front View

Not to Scale



Pole Mounted Cabinet – Type 1 Side View

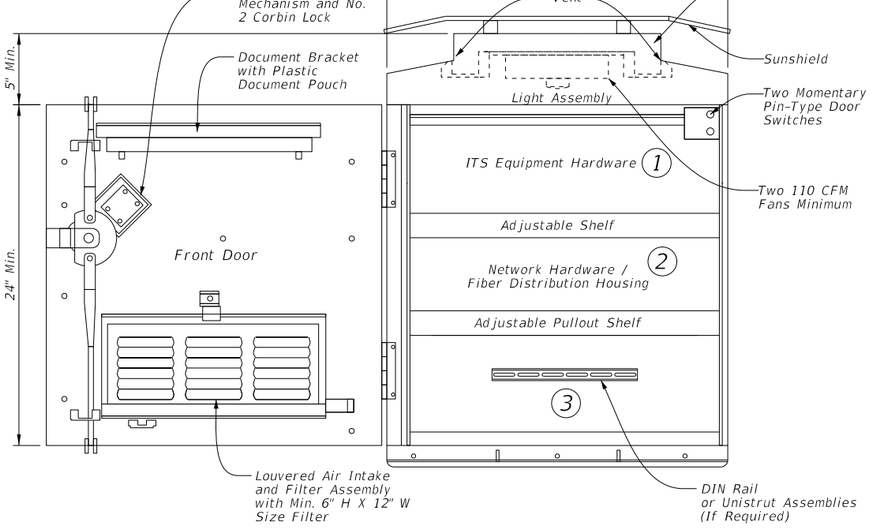
Not to Scale



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

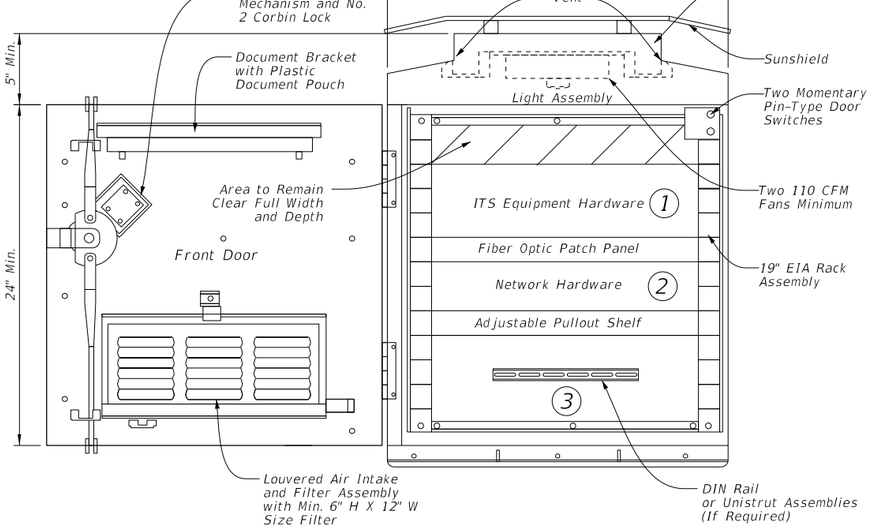
Mounting Bracket Detail

Not to Scale



Interior – Type 1 Without 19" EIA Rack – Front View

Not to Scale



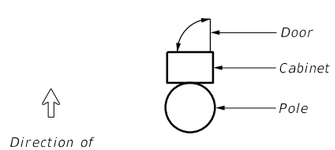
Interior – Type 1 With 19" EIA Rack – Front View

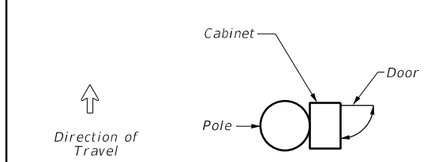
Not to Scale

Typical Equipment Layout Legend	
	Example Equipment
1	CCTV Interface Panel, Radar Vehicle Sensing Device (RVSD) Equipment, 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:

1. Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred Type 1 pole mounted cabinet setup. Hardware needed for each Type 1 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.
2. Mount cabinet as detailed on ITS(14) 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.
3. 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.
4. All dimensions are approximate and represent minimum cabinet dimensions.
5. Provide conduit entrances at the bottom of the cabinet.
6. 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 1 Cabinet on ITS Pole (Typical)

Not to Scale

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Traffic Operations Division Standard

ITS POLE MOUNTED CABINET TYPE 1 DETAILS

ITS(14)-15

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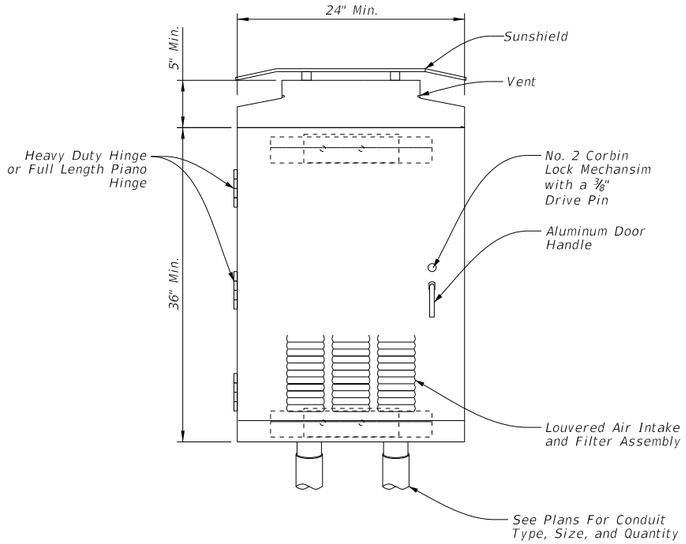
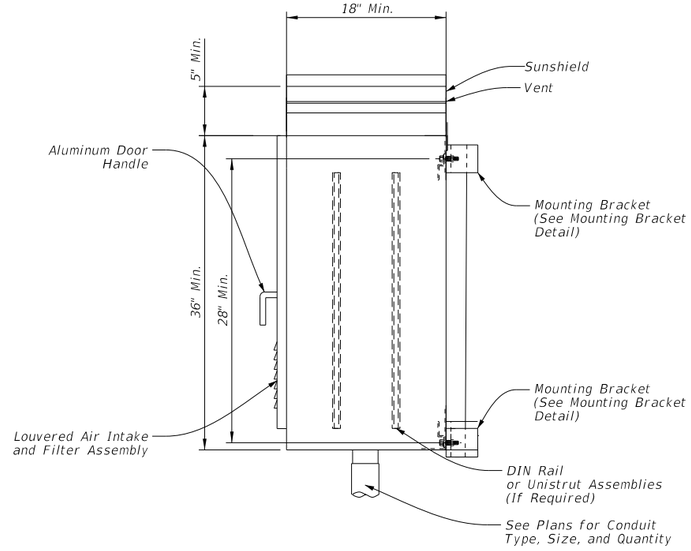


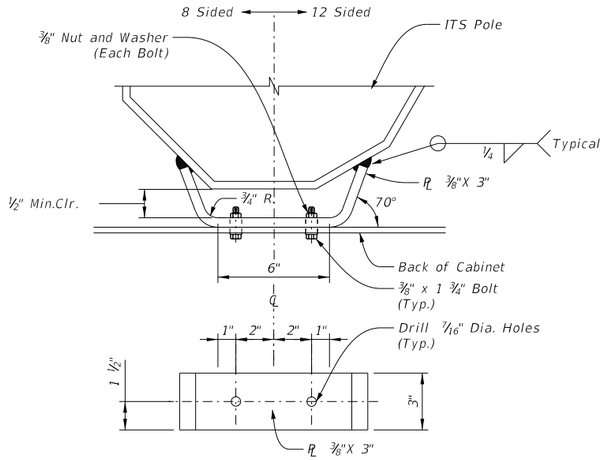
Pole Mounted Cabinet – Type 2 Front View

Not to Scale



Pole Mounted Cabinet – Type 2 Side View

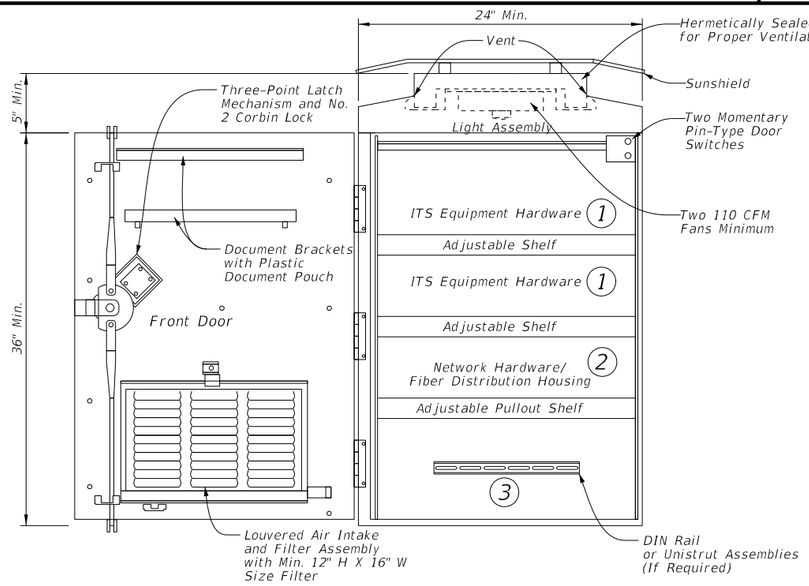
Not to Scale



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

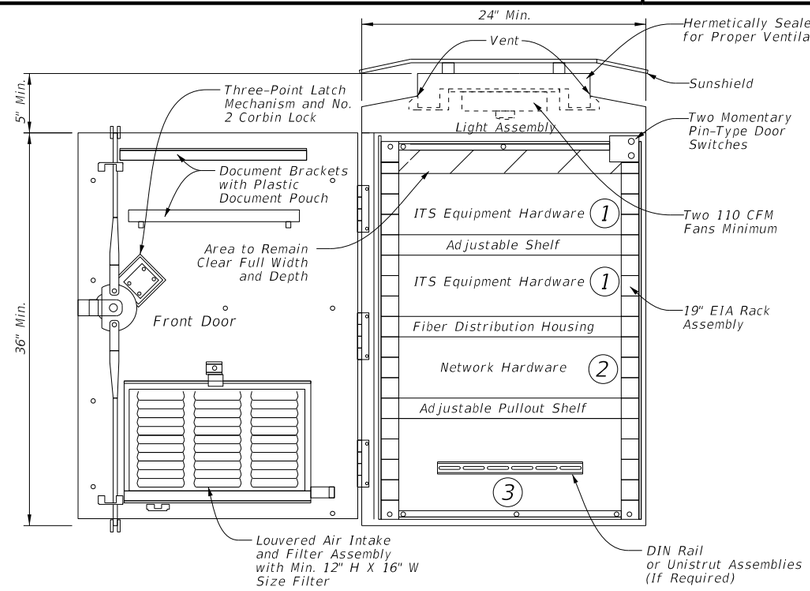
Mounting Bracket Detail

Not to Scale



Interior – Type 2 Without 19" EIA Rack – Front View

Not to Scale



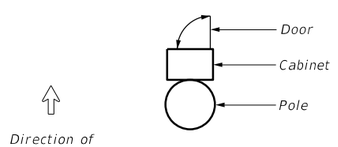
Interior – Type 2 With 19" EIA Rack – Front View

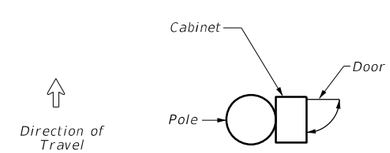
Not to Scale

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:

1. 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.
2. 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.
3. 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.
4. All dimensions are approximate and represent minimum cabinet dimensions.
5. Provide conduit entrances at the bottom of the cabinet.
6. 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

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Traffic Operations Division Standard

ITS POLE MOUNTED CABINET TYPE 2 DETAILS

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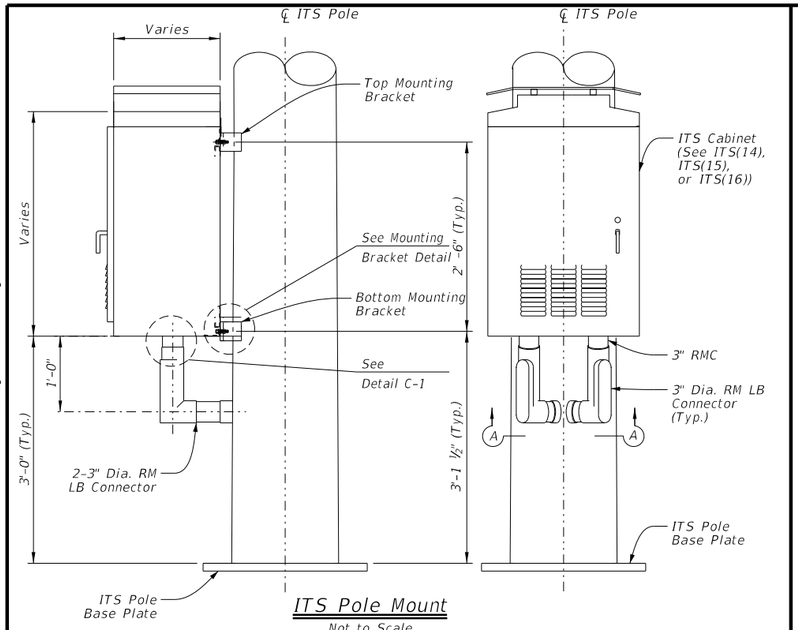
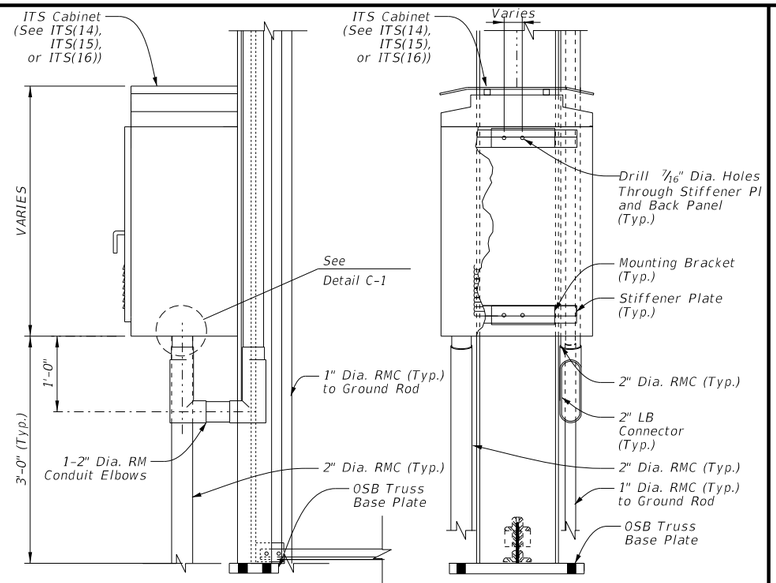
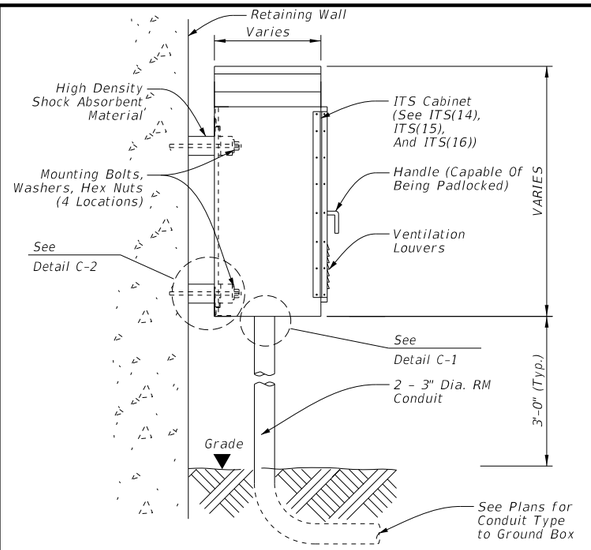


ITS Pole Mount
Not to Scale



OSB Truss Mount
Not to Scale



Retaining Wall Mount
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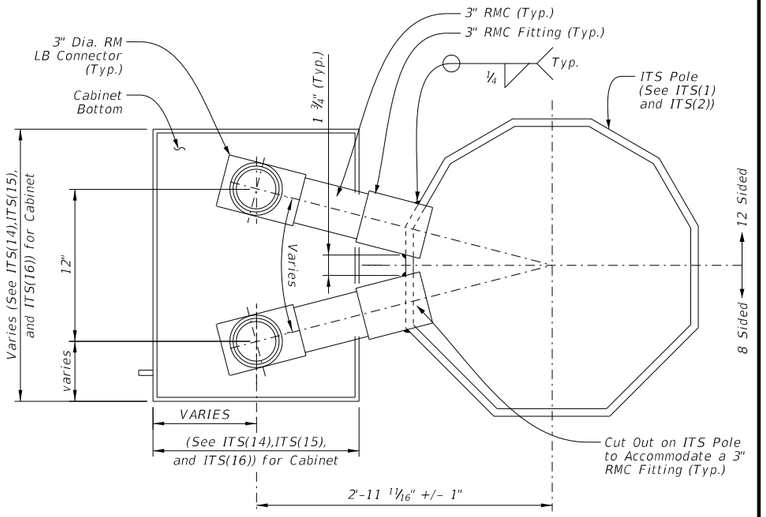

Section A-A
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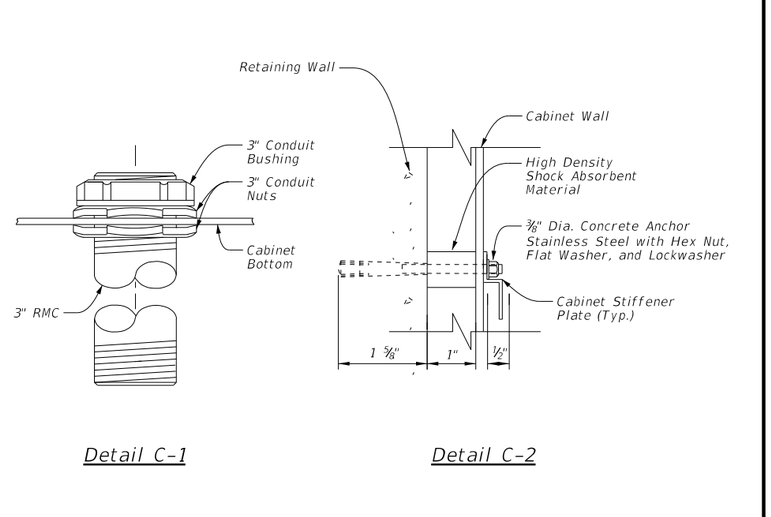
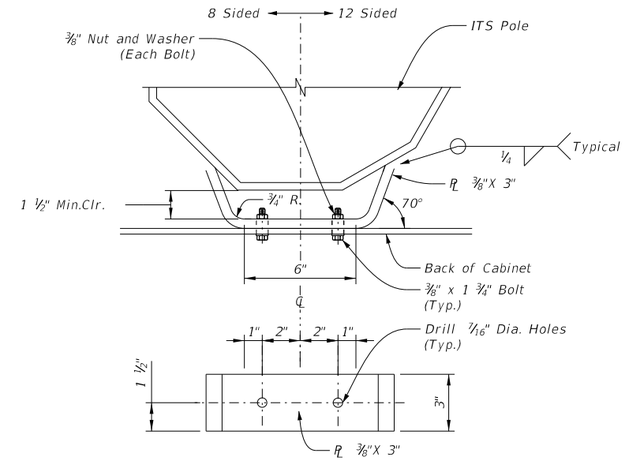


Detail C-1
Detail C-2
Not to Scale



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:

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.

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Traffic Operations Division Standard

ITS POLE MOUNTED CABINET MISC. MOUNTING DETAILS

ITS(17)-15

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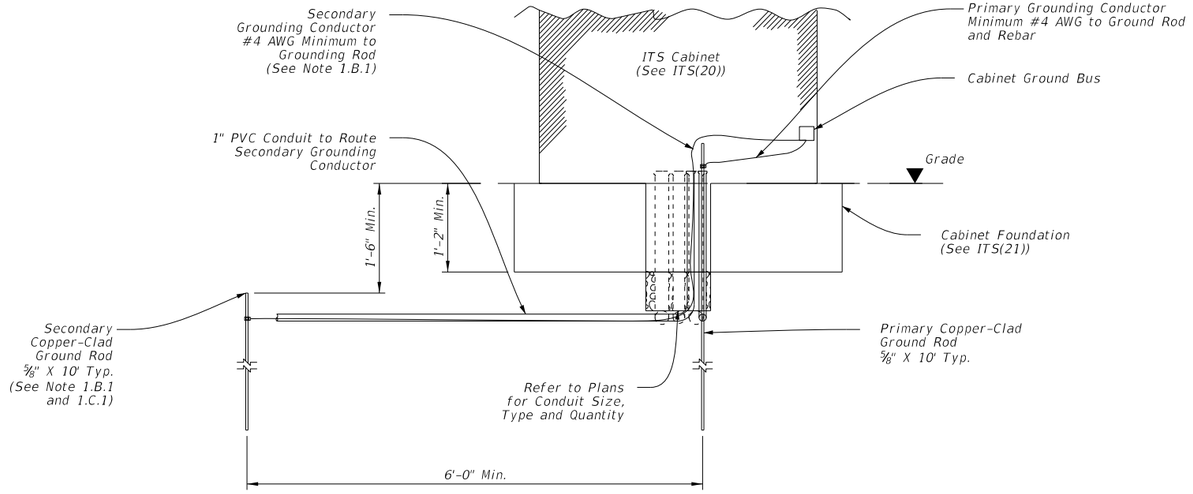
General Notes:

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.
        - b. 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: ⅝ in.
          2) Length: 10 Ft.

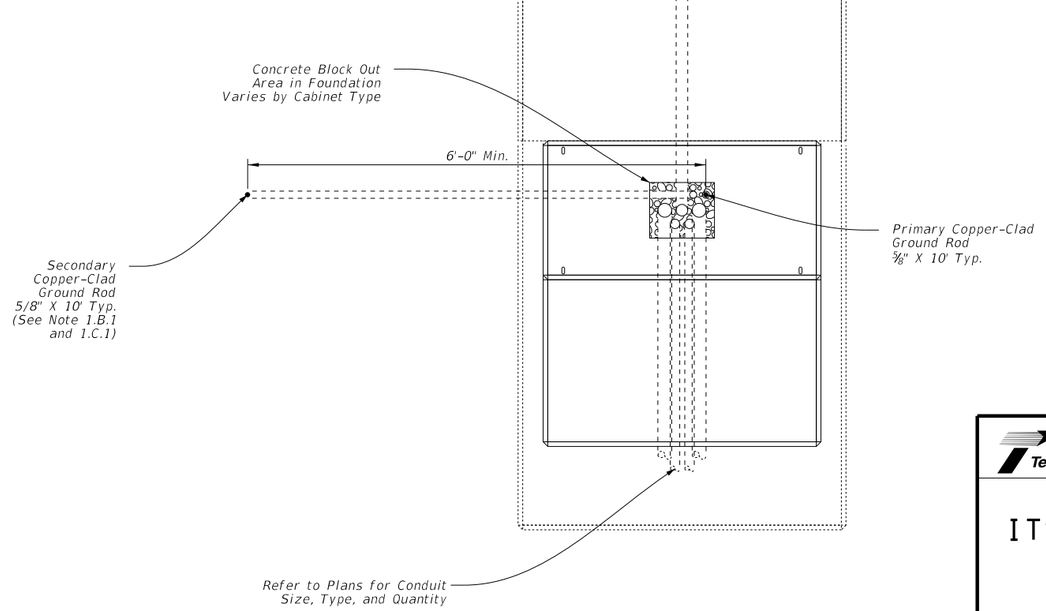
2. Installation:
   - A. Install grounding components and systems in accordance with the requirements specified in UL 467, IEEE 81, and IEEE 142.
   - B. System Grounding:
     1. Ground Rods:
        - a. Drive ground rods into the ground until the tops of the rods are approximately 18 in. below finished 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.



Ground Mounted Cabinet - Side View

(Slab & Base)
Not to Scale



Ground Mounted Cabinet - Top View

(Slab & Base)
Not to Scale

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Traffic Operations Division Standard

ITS CABINET GROUNDING DETAILS

ITS(18)-15

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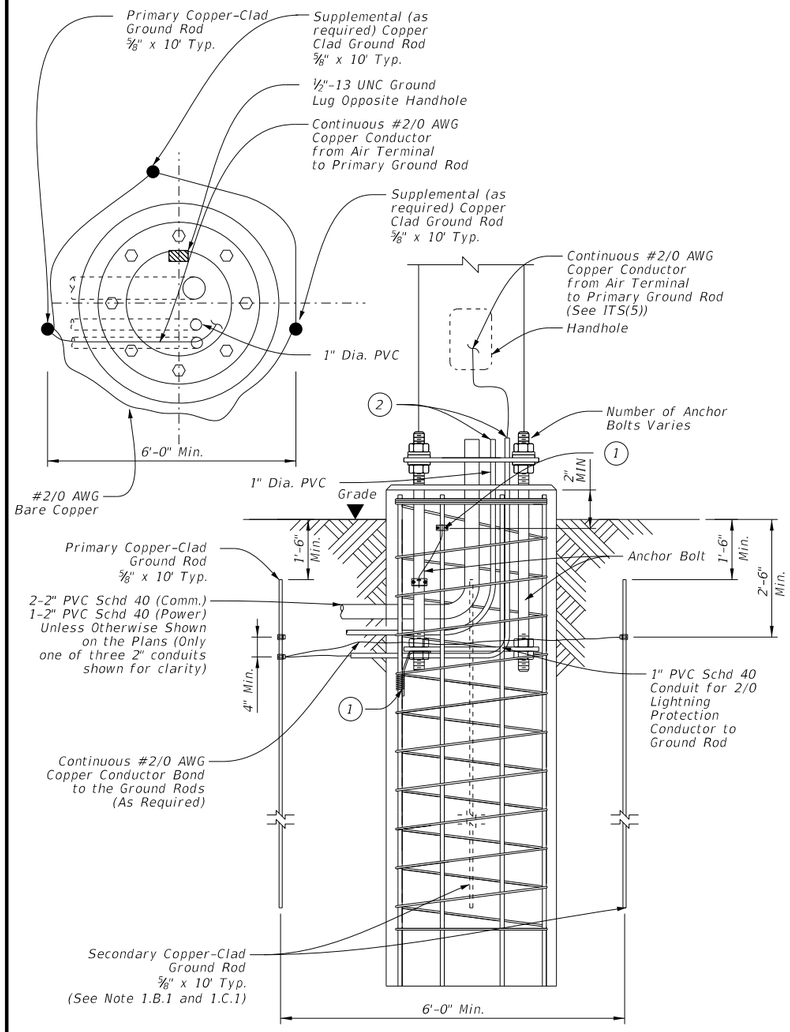
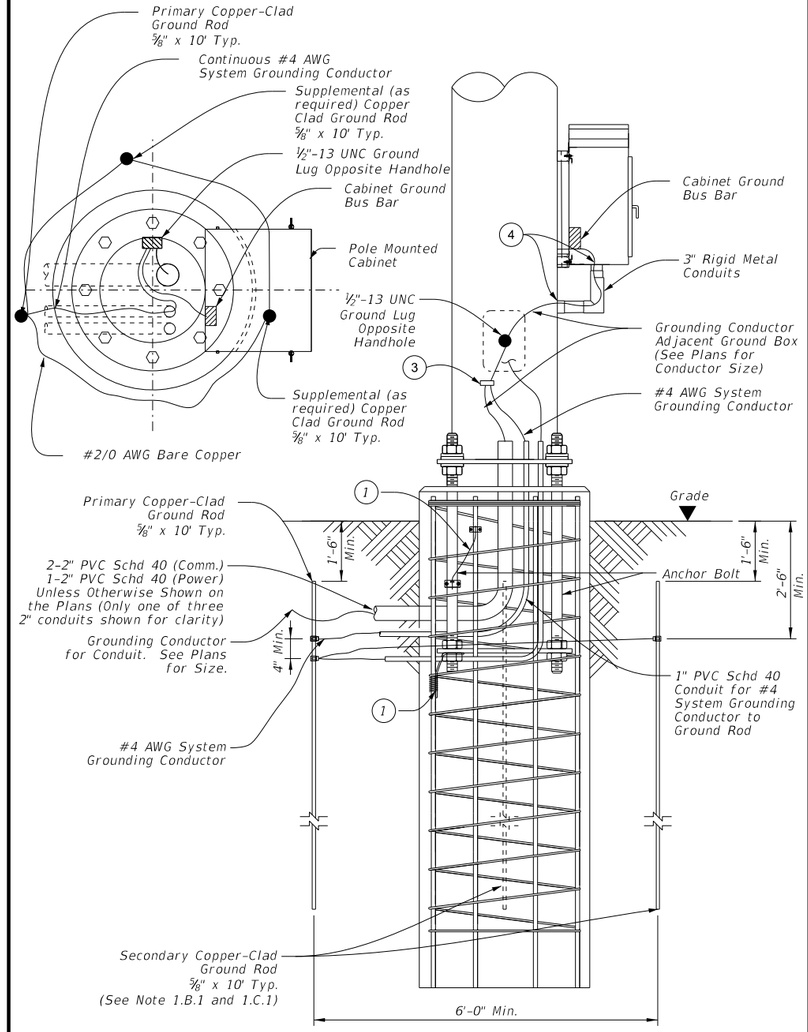
General Notes:

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 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.
     2. 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 througout the project.
     3. Ground Rods:
        - a. Provide copper-clad steel ground rods conforming to the requirements specified in DMS 11040.
          1) Diameter: ⅝ 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.

Texas Department of Transportation

Traffic Operations Division Standard

ITS POLE GROUNDING DETAILS

ITS(19)-17

FILE: its(19)-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
7-17	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		86

DATE: 3/18/2024 11:55:36 AM
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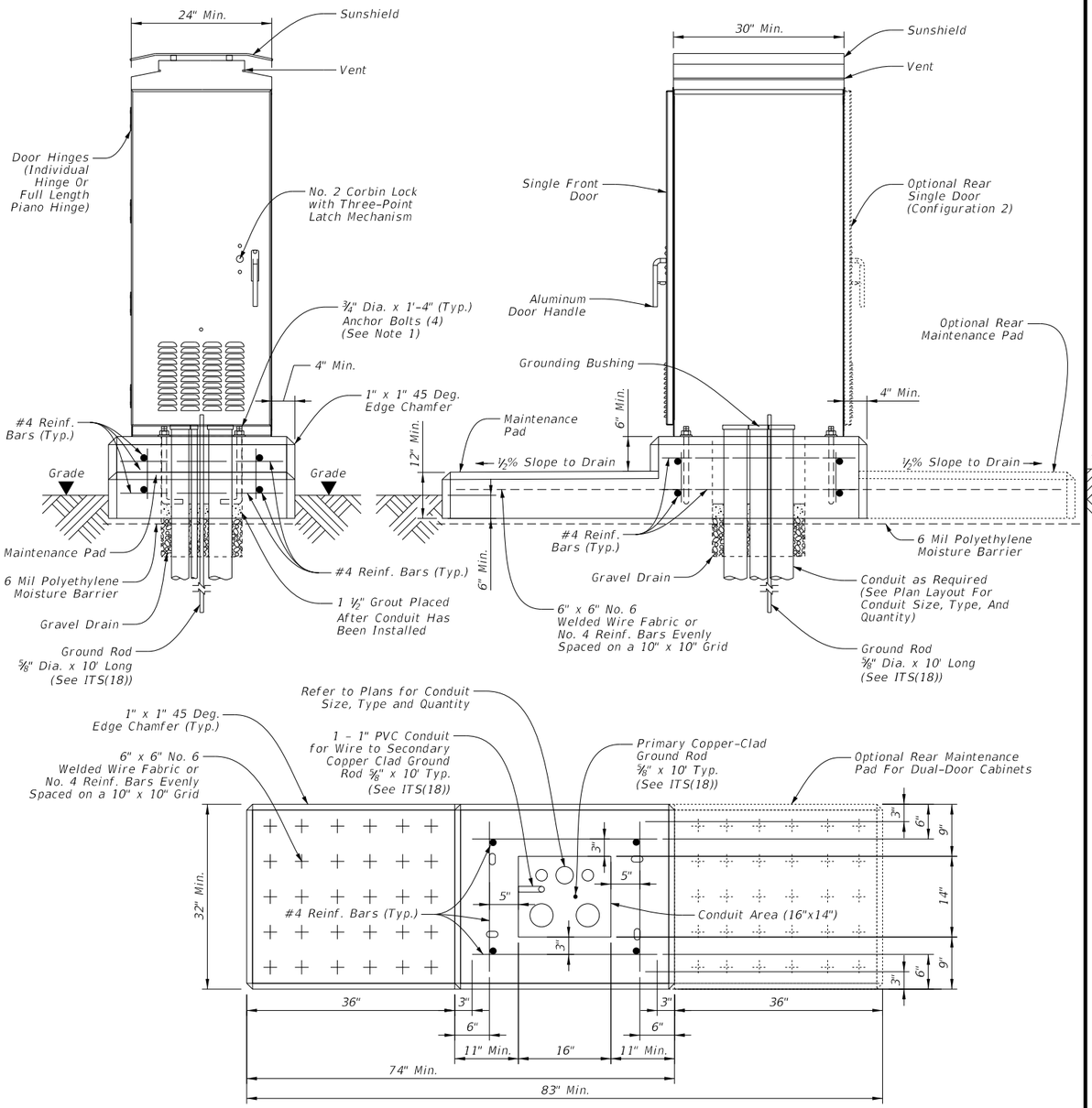
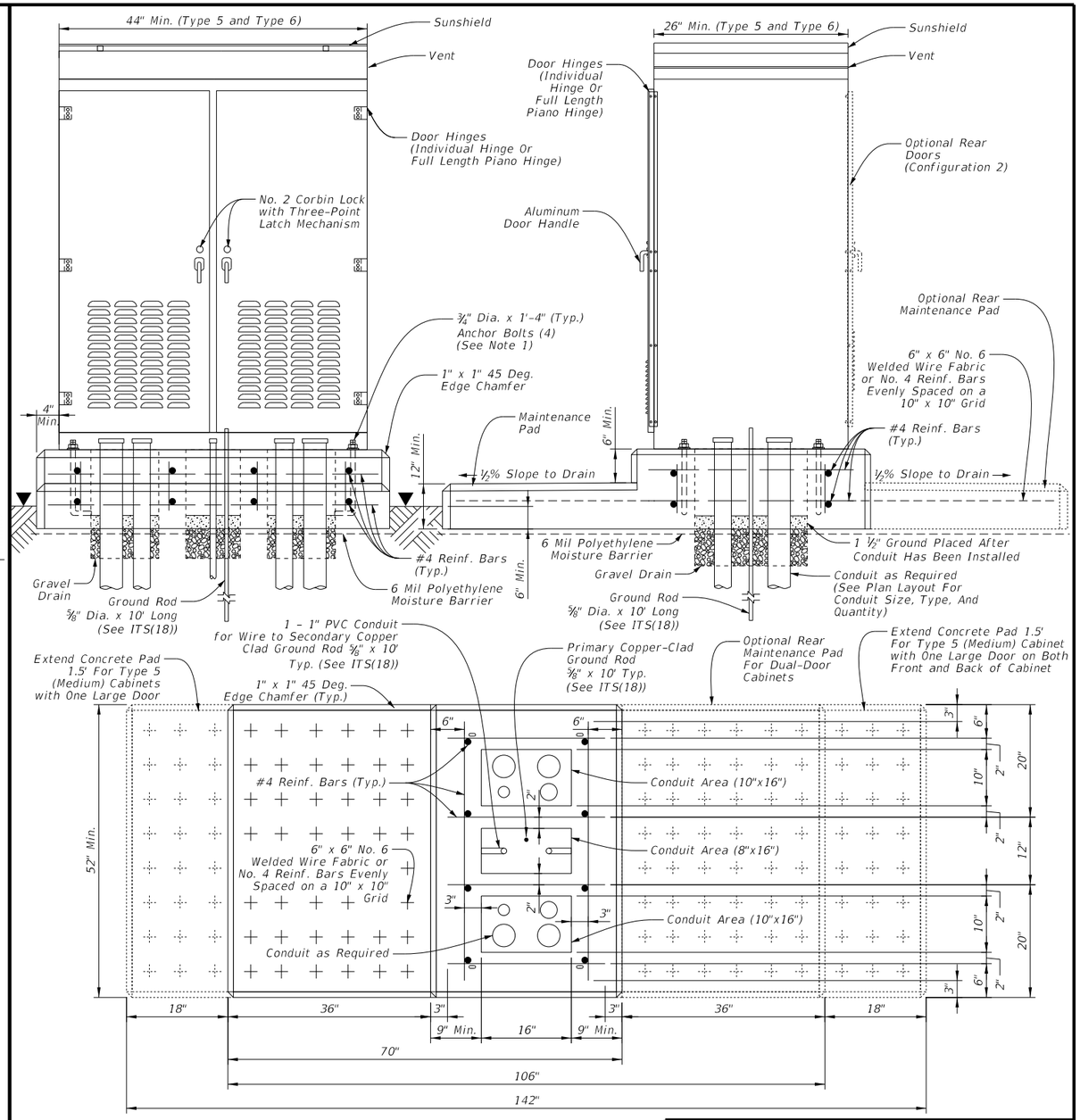


Type 4 (Small) Cabinet



Type 5 (Medium) & Type 6 (Large) Cabinet

General Notes:

1. Details of anchor bolt location to be furnished by the cabinet manufacturer. Size and length of anchor bolts shown in details may vary by manufacturer.
2. Modify concrete base dimensions to fit required cabinet type.
3. Ensure conduit area has gravel drain, 12" depth, course aggregate, grade No. 1.
4. All concrete to be Class "A" in accordance with Item 421.
5. Set the cabinet foundation level with the pavement surface, in unpaved area. The foundation shall be a minimum of 4" above surrounding grade, or as approved by the Engineer.
6. Furnish any additional concrete which may be necessary to stabilize foundation at unusual locations.
7. Foundation will be subsidiary to Special Specification "ITS Ground Mounted Cabinet.
8. Ground cabinet as required in cabinet specifications and as detailed on ITS(18) in accordance with the National Electric Code (NEC).
9. Treat cabinet foundation with moisture sealant.
10. Type 5 cabinet foundation will have a slightly larger foundation than Type 6. See foundation notes on details.
11. Drain pipe shall be screened for drainage portion below foundation in gravel.

Texas Department of Transportation

Traffic Operations Division Standard

ITS GROUND MOUNTED CABINET FOUNDATION DETAILS

ITS(21)-15

FILE: its(21)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		87

DATE: 3/18/2024 11:55:40 AM
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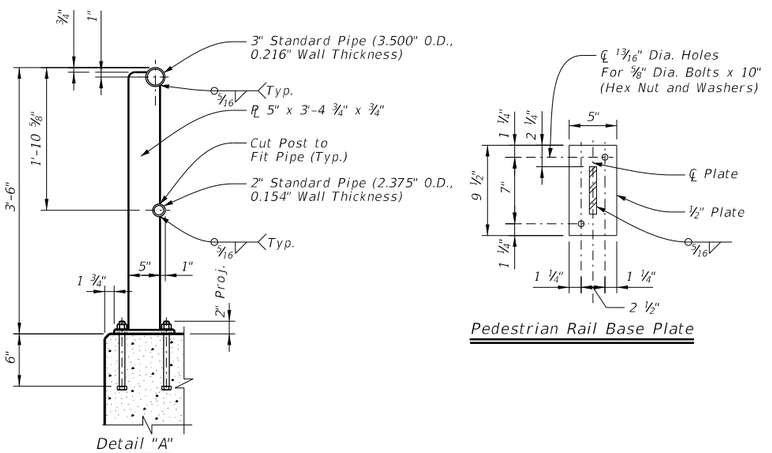
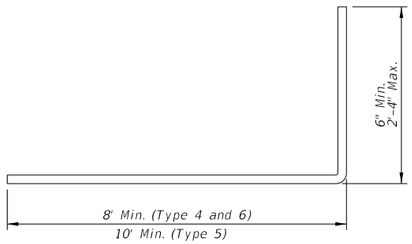
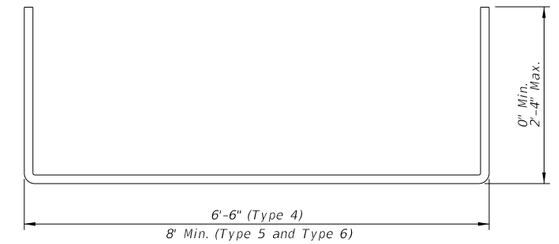


Detail "A"
Pedestrian Rail

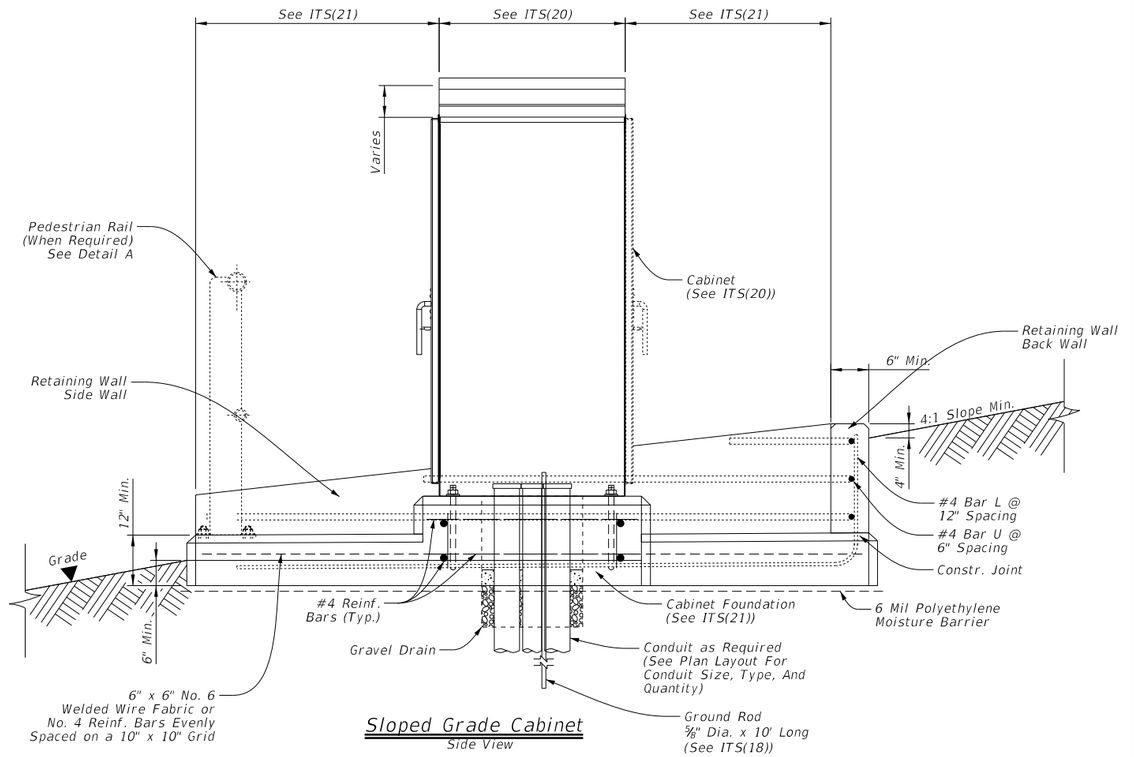
Pedestrian Rail Base Plate



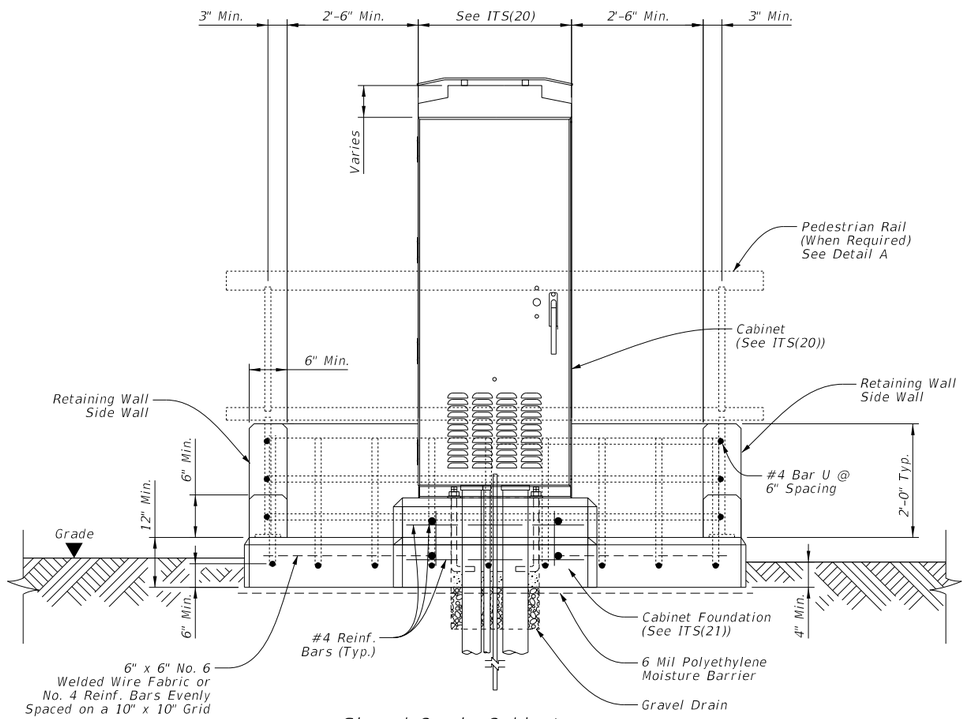
Reinforcement Bar L
#4 Bar @ 12" Spacing



Reinforcement Bar U
#4 Bar @ 6" Spacing



Sloped Grade Cabinet
Side View



Sloped Grade Cabinet
Front View

General Notes:

1. Details of anchor bolt location to be furnished by the cabinet manufacturer. See ITS(21) for size and type of anchor bolts. May vary by manufacturer.
2. Modify concrete base dimensions to fit required cabinet type.
3. Ensure conduit area has gravel drain, 12" depth, course aggregate, Grade No. 1.
4. All concrete to be Class "A" in accordance with Item 421.
5. Set the cabinet foundation level with the pavement surface, in unpaved area. The foundation shall be a minimum of 6" above surrounding grade, or as approved by the Engineer.
6. Furnish any additional concrete which may be necessary to stabilize foundation at unusual locations.
7. Foundation will be considered subsidiary to Special Specification "ITS Ground Mounted Cabinet."
8. Ground cabinet as required in cabinet specifications and as per National Electric Code (NEC).
9. Treat cabinet foundation with moisture sealant.
10. Type 5 cabinet foundation will have a slightly larger foundation than Type 6. See foundation notes on details.
11. Drain pipe shall be screened for drainage portion below foundation in gravel.
12. Pipe for pipe rail must conform to ASTM A53 GR B, or A500 GR B. Posts and plates must be ASTM A36. All steel components to be galvanized unless otherwise shown in plans.
13. Pedestrian rail anchor bolts must be 5/8" diameter ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt. Threaded rods may be 0.557" minimum diameter with rolled threads. Nuts must conform to A563 requirements.
14. Exposed edges of pipe rail and pipe rail posts must be rounded or chamfered to approximately 1/16" by grinding. Provide an end cap at either end of pipe railing.
15. Welded wire mesh not required in maintenance pad area when retaining wall rebar is integrated into maintenance pad.

Texas Department of Transportation

Traffic Operations Division Standard

ITS GROUND MOUNTED CABINET FOUNDATION ON SLOPE DETAILS

ITS(22)-15

FILE: its(22)-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0906	00	271	VARIOUS
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC.		88

DATE: 3/18/2024 11:55:43 AM
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DATE: 3/18/2024
FILE: 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. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000

2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.

3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.

4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☒ No Permit Required

☐ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

3.

4.

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

Best Management Practices:

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

III. CULTURAL RESOURCES

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

☒ No Action Required ☐ Required Action

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	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR	
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY	
REVISIONS 12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	0906	00	271	VARIOUS	
	DIST	COUNTY		SHEET NO.	
	ODA	ECTOR, ETC.		89	

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

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

For projects with less than one acre of soil disturbing activity and that have Environmental, Permits, Issues, and Commitments (EPICs) dependent on stormwater controls and water quality measures TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office, Area Office, or electronically.

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

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
0906-00-271

1.2 PROJECT LIMITS:
From: IH-10 - 2.2 MI W OF PECOS COUNTY LINE

To: IH-10 - 4.2 MI W OF FM 1776

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 30.955490° ,(Long) -103.448960°

END: (Lat) 30.910770° ,(Long) -103.125853°

1.4 TOTAL PROJECT AREA (Acres): 0.15

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.15

1.6 NATURE OF CONSTRUCTION ACTIVITY:
TRUCK PARKING AVAILABILITY SYSTEM CONSISTING OF INSTALLATION OF ITS EQUIPMENT

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Reakor association, nearly level	Pecos EB Safety Rest Area - 75% Reakor, 25% Minor Components, well drained, medium rate of runoff, and slight erosion potential
Reakor association, nearly level	Pecos WB Safety Rest Area - 75% Reakor, 25% Minor Components, well drained, medium rate of runoff, and slight erosion potential
Reakor association, nearly level	EB DPAS #1 - 100% Reakor, well drained, medium rate of runoff, and slight erosion potential
Upton gravelly loam, 0 to 1 percent slopes	WB DPAS #2 - 100% Upton gravelly loam, well drained, low rate of runoff, and slight erosion potential

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

☐ PSLs determined during preconstruction meeting
☐ PSLs determined during construction
☒ No PSLs planned for construction

Type	Sheet #s

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

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

☒ Mobilization
☒ Install sediment and erosion controls
☐ Blade existing topsoil into windrows, prep ROW, clear and grub
☐ Remove existing pavement
☐ Grading operations, excavation, and embankment
☐ Excavate and prepare subgrade for proposed pavement widening
☐ Remove existing culverts, safety end treatments (SETs)
☐ Remove existing metal beam guard fence (MBGF), bridge rail
☐ Install proposed pavement per plans
☐ Install culverts, culvert extensions, SETs
☒ Install mow strip, MBGF, bridge rail
☐ Place flex base
☐ Rework slopes, grade ditches
☐ Blade windrowed material back across slopes
☐ Revegetation of unpaved areas
☒ Achieve site stabilization and remove sediment and erosion control measures
☒ Other: BORE AND TRENCH ACTIVITIES FOR PROPOSED CONDUIT INSTALLATION.
☒ Other: INSTALLATION OF ITS POLES AND DPAS.
☐ 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
☐ Discharges from concrete washout activities, runoff from concrete cutting activities, and other concrete related activities
☐ 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	

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

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☐ Other: _____
☐ Other: _____
☐ Other: _____

STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER
3/19/2024

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

July 2023 Sheet 1 of 2
Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			90
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	ECTOR, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0906	00	271	VARIOUS

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

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

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

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

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

2.2 SEDIMENT CONTROL BMPs:

T / P

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

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

2.3 PERMANENT CONTROLS:

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

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
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
- ☐ Daily street sweeping
- ☐ 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		

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 DEWATERING:

Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment and other pollutants.

2.9 INSPECTIONS:

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

2.10 MAINTENANCE:

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

STATE OF TEXAS
SAI GEETHA KOGANTI
125265
LICENSED
PROFESSIONAL ENGINEER
3/18/2024

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

July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			91
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	ECTOR, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0906	00	271	VARIOUS