

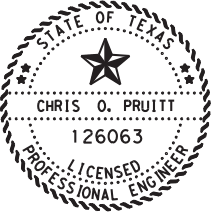
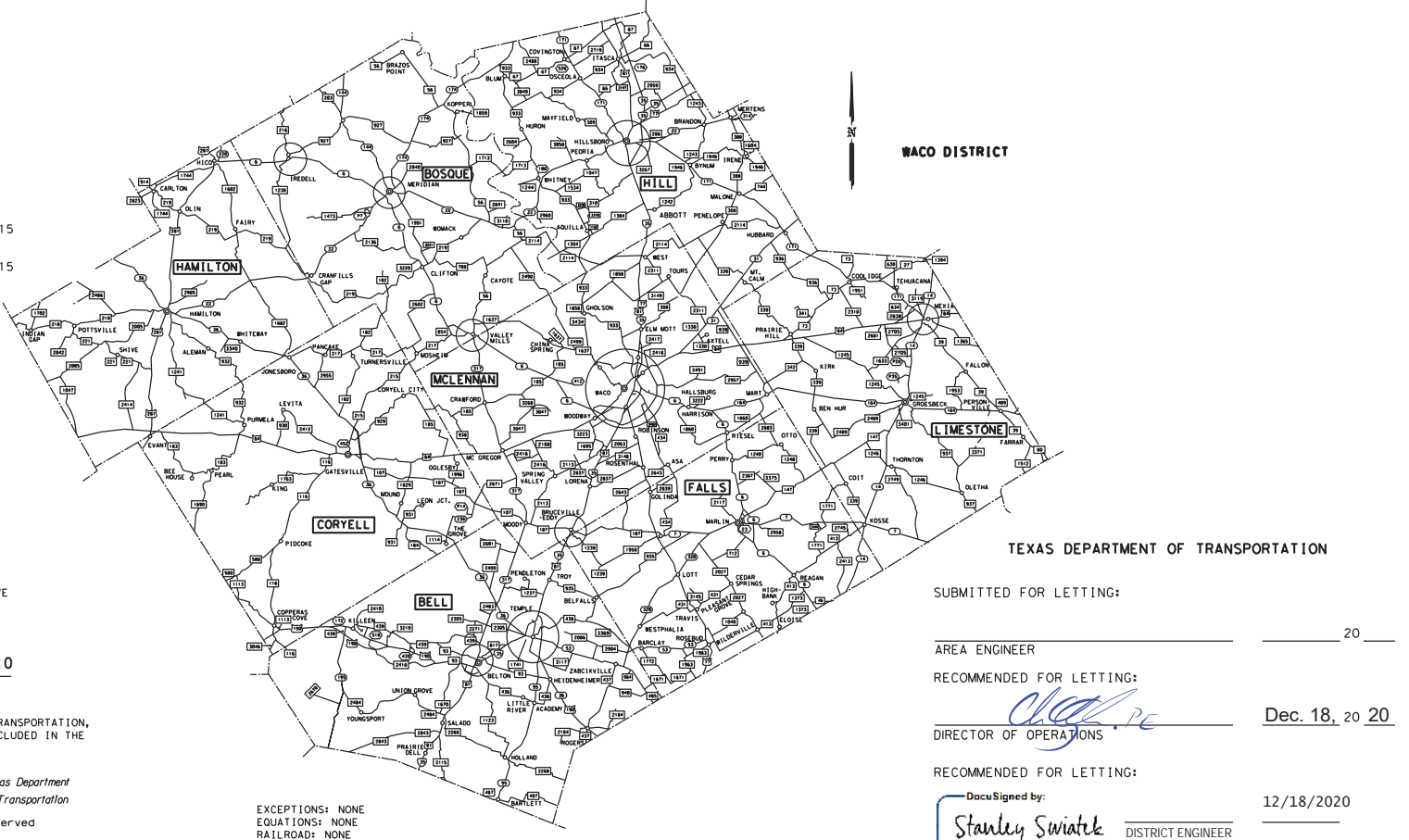
INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2-2D	GENERAL NOTES
3-3C	ESTIMATE & QUANTITY
4	CONSOLIDATED SUMMARY
5-16	BC(1)-14 THROUGH BC(12)-14
17-18	WZ(BTS-1)-13 THRU WZ(BTS-2)-13
19-23	TCP(1-1)-18 THROUGH TCP(1-5)-18
24	TCP(5-1)-18
25-29	ED(1)-14 THROUGH ED(5)-14
30-32	ED(6)-14 THROUGH ED(8)-14
33-34	SP-80(1)-12 & SP-80(2)-12
35	SMA-80(1)-12
36	SMA-80(2)-12
37	MA-C-12
38	MA-D-12
39	TS-FD-12
40	LUM-A-12
41	CFA-12
42	TS-CF-04
43	MA-DPD-20
44	TS-BP-20
45	ITS(1)-15
46	ITS(3)-16
47-50	ITS(4)-15 THRU ITS(6)-15
51	ITS(7)-15
52-56	ITS(14)-15 THRU ITS(18)-15
57	ITS(19)-17
58-63	ITS(20)-15 THRU ITS(25)-15
64	ITS(36)-16
65-74	TA-BMP(WACO DISTRICT)

DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
HIGHWAY ROUTINE MAINTENANCE CONTRACT
TYPE OF WORK:
DISTRICT WIDE MAINTENANCE OF SIGNAL SYSTEMS

PROJECT NO. : RMC 637532001
HIGHWAY : U.S. 190, ETC.
LIMITS OF WORK : VARIOUS LOCATIONS IN BELL, BOSQUE, CORYELL, FALLS,
HAMILTON, HILL, LIMESTONE AND MCLENNAN COUNTIES



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

Chris O. Pruitt, P.E. 12/17/2020
DATE

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIAL SPECIFICATION ITEMS INCLUDED IN THE CONTRACT SHALL GOVERN ON THIS PROJECT.



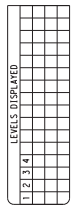
EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROADS: NONE

TEXAS DEPARTMENT OF TRANSPORTATION
SUBMITTED FOR LETTING: _____ 20

AREA ENGINEER _____
RECOMMENDED FOR LETTING:
DIRECTOR OF OPERATIONS *[Signature]* Dec. 18, 20 20

RECOMMENDED FOR LETTING:
DocuSigned by: Stanley Swiatek 12/18/2020
DISTRICT ENGINEER

MAINTENANCE PROJECT NO. RMC 637532001			SHEET NO. 1
STATE TEXAS	STATE DISTRICT WACO	COUNTY BELL, ETC.	
CONT. 6375	SECT. 32	JOB 001	HIGHWAY NO. US 190, ETC.



COUNTY: BELL, ETC.

SHEET 2

HIGHWAY: US 190, ETC.

CSJ: 6375-32-001

GENERAL NOTES

Contractor questions will be accepted through email, phone and in person by the following individual(s):

Bill Compton - WacoPreBid@txdot.gov, 254-867-2770, 100 S. Loop Dr., Waco, TX
Carmen Chau - Wacoprebid@txdot.gov, 254-867-2794, 100 S. Loop Dr., Waco, TX

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following address:

<https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting Responses/>

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

GENERAL

Contract for the non-site specific repair, replacement and new installation of signal systems and ITS poles in the Waco District according to the Standard Specifications or as modified in the general specifications listed below. The Waco District includes the following counties: Bell, Bosque, Coryell, Falls, Hamilton, Hill, Limestone, and McLennan.

Specific project locations and plan details will be shown by work order at later dates.

Work will be performed under multiple work orders. Begin work within seven (7) calendar days after the authorization date to begin work as shown on the work order. Each work order may include multiple locations as directed by the Engineer.

OFFICE OF RECORD

For this contract, the office of record will be the Texas Department of Transportation office listed below.

<u>Project Manager</u>	<u>Telephone Number</u>	<u>Office Location</u>
Chris Pruitt, P.E. Transportation Supervisor E-mail: Chris.Pruitt@txdot.gov	(254) 867-2802	100 South Loop Drive Waco, TX 76704-2858

Work will be performed according to the Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2014).

The Contractor will have a standard specification book on the project at all times.

The estimated quantities in the project proposal are estimates only and to be used in the determination of the low bidder.

The actual quantities to be installed for each bid item may vary.

Unless directed by the Engineer, a pre-construction meeting will not be required when each work order is issued. For each work order, the State will provide a written authorization that includes the location and other pertinent items regarding the work.

METHODS OF OPERATION

For this project, perform all work Monday through Friday, a minimum of eight (8) hours per day (weather permitting), until the work is completed.

In addition to other safety requirements, all trucks used for hauling material and/or equipment to or from this project will be equipped with an adequate audible backup warning device that are in good operating condition.

MATERIALS

For both VIVDS and Radar detection systems, contractor shall submit and receive TxDOT approval of the equipment prior to installation.

Contractor shall furnish all materials as required except for: Traffic signal cabinets, PTZ camera, cellular modem, Ethernet switch, and power supply.

CLEAN-UP

Clean up and remove from all work areas all loose material resulting from contract operations each day before work is suspended for that day.

The Contractor is responsible for leaving the project site clean and neat in appearance upon completion and before final acceptance.

ITEM 4: SCOPE OF WORK

This contract is for the installation and maintenance of traffic signals and ITS poles within the Waco District.

The work items will be identified within each work order.

COUNTY: BELL, ETC.

SHEET 2B

HIGHWAY: US 190, ETC.

CSJ: 6375-32-001

The Engineer reserves the right to make changes in the work, including addition, reduction, or elimination of quantities and alterations need to complete the Contract. Quantities shown in the plans are estimated quantities only, actual quantities may vary.

ITEM 5: CONTROL OF THE WORK

Prior to beginning work in the area of existing utilities, the contractor will consult with the utility companies for exact locations to prevent any damage or interference with present facilities. This action will in no way be interpreted as relieving the contractor of his responsibilities, under the terms of the contract and as set out in the plans and specifications. The contractor will repair any damage caused by his operations, at his own expense and will restore facilities to service in a timely manner.

Prior to any excavation, contractor will contact Waco District Signal Shop crew to locate any loop detectors or other buried traffic facilities. The contractor will coordinate with the Signal Shop any required relocations or adjustments.

Submit all fabrication and shop drawings to the Area Engineer for review and approval, unless otherwise directed.

ITEM 6: CONTROL OF MATERIALS

References to manufacturer's trade name or catalog numbers are for the purpose of identification only and the contractor will be permitted to furnish like materials of other manufacturers provided they are of equal quality and comply with specifications for this project.

ITEM 7: LEGAL RELATIONS AND RESPONSIBILITIES

No significant traffic generator events identified.

If utilizing private property for waste disposal sites, field office sites, equipment storage sites or for any other purpose involved with this project, provide to the Engineer written proof of the property owner's approval of the use of this property. This proof may be in the form of a letter or agreement signed by the property owner or other documents acceptable to the Engineer.

Personal vehicles of the contractor's employees will not be parked within the right of way at any time including any section closed to public traffic, unless the vehicle is being utilized for construction procedures. However, the contractor's employees may park on the right of way at the sites where the contractor has his office, equipment and materials storage yard.

The contractor is alerted to the possible presence of swallows under the existing bridges or culverts. Because the migratory bird treaty act prohibits harm to swallows, their eggs or their nestlings, the contractor will not begin potentially disturbing activities on or near the bridge until the birds have abandoned any occupied nests (approximately September 1). Active nests may not be removed regardless of the date.

Prior to the swallows returning to the nests (approximately March 1), abandoned nests will be removed from the bridge. The contractor will prevent the establishment of new nests on any portion of the structure. Methods for preventing the establishment of new nests must be approved by the project Engineer. Examples of acceptable nest prevention methods are bird-deterrent netting and bird-repelling sprays and/or gels to be applied to the structure. This work will not be paid for directly, but will be subsidiary to the various bid items.

ITEM 8: PROSECUTION AND PROGRESS

This project will be a Calendar Day project.

For Daytime Operations, do not begin work on the roadway until thirty (30) minutes after sunrise and all equipment and personnel must be off the road and lanes opened to traffic by thirty (30) minutes before sunset when utilizing temporary lane closures.

No lane closures will be allowed at any hour during the week between Christmas Eve and New Year's Day.

In the event utility lines needing unforeseen adjustments are encountered during construction operations, alter operations and continue to prosecute the contract in such a manner that will allow utility adjustments to be made by others.

For all subcontracts, physically attach all provisions listed in the "Contractor's Assurance" to the subcontract agreement. Provide a copy of subcontracts, with attachments, for all DBE Subcontractors. Submit the subcontracts to the Engineer when submitting the subcontract approval request.

ITEM 500: MOBILIZATION

Each work order will include multiple locations, but only one mobilization (call out) will be paid per work order.

ITEM 502: BARRICADES, SIGNS AND TRAFFIC HANDLING

The Contractor Responsible Person(s) (CRP) will be certified by TEEX, ATSSA, the National Safety Council or other approved organization. Certifications will be submitted to the Engineer at the pre-construction meeting.

The Contractor Responsible Person(s) (CRP) for Work Zone Traffic Controls will inspect and ensure any deficiencies are corrected each and every day throughout the duration of this contract. Any misaligned or damaged traffic control devices will be repaired as soon as practical after deficiency is discovered.

In addition to providing a Contractor's Responsible Person and a phone number for emergency contact, have an employee(s) available to respond on the project for emergencies and for taking corrective measures within thirty (30) minutes.

COUNTY: BELL, ETC.

SHEET 2C

HIGHWAY: US 190, ETC.

CSJ: 6375-32-001

Place advisory speed plates (CW13-1) in accordance with the TMUTCD and as directed. Signs (CW13-1) will not be used with any signs other than a warning sign, nor will it be used alone. Sign mounting height will be seven (7) feet minimum to the bottom of the speed plate.

Unless otherwise shown on plans, where there is excavation adjacent to the pavement edge, provide adequate warning signs, vertical panels, drums and reflectors at the pavement edge.

If operations require a sidewalk closure, use traffic control devices controlling pedestrian flows as necessary to route pedestrians around the closed sidewalk.

Equip all construction equipment involved in roadway work with a permanently mounted warning light with amber lens as approved.

ITEM 618: CONDUIT

The locations of conduit as shown are for diagrammatic purposes only and may be varied to meet local conditions, subject to approval.

When backfilling bore pits, ensure that the conduit does not become damaged during installation or due to any settling of the backfill material. Compact select backfill in three equal lifts to the bottom of the conduit or if sand is used, place to a point two (2) inches above the conduit. Backfill density will be equal to the existing soil. Be careful to prevent any material from entering the conduit.

Backfill all open trenches before the end of the workday and do not leave any trench open overnight.

Remove all abandoned conductor and conduit to one (1) foot below ground level. This work will not be paid for directly, but will be subsidiary to the pertinent items.

ITEM 620: ELECTRICAL CONDUCTORS

Place the communications and/or coaxial cables in a separate conduit from the 120 or 240-volt electrical conductors.

Any damage to any wire or any cable is cause for immediate rejection of the entire cable being tested. Remove and replace the entire cable at the Contractor's expense.

Electrical certification for this project will be as per Item 7 of the current Texas Standard Specifications and any applicable Special Provision to Item 7.

ITEM 624: GROUND BOXES

Ground box locations shown on the plans are approximate locations. Actual locations are as directed.

ITEM 628: ELECTRICAL SERVICES

Contact the Electric Utility Company to make all necessary arrangements to provide electrical service shown on the plans and the Electrical Details, except that TxDOT will make application to the Electric Utility Company for service (See note below).

NOTE:

Before fabricating the electrical service, contact the Waco District Traffic Signal Service Supervisor at (254) 867-2807, to make application (billing arrangements) for service with the Electric Utility Company.

Furnish and install a lock on all electrical services. The lock is to be a Master-Lock number 2195.

The proposed electrical service location will be approved by TxDOT prior to installation.

ITEM 682: VEHICLE AND PEDESTRAIN SIGNAL HEADS

Provide and install LIGHT EMITTING DIODE (LED) traffic signal lamp units in all vehicle and pedestrian signal head sections.

Provide new signal head housings with black aluminum housings and back plates. Cover all signal heads installed, but not in operation, in an approved manner from the time of installation until the signal is placed in operation. This will not be paid for directly, but will be subsidiary to Item 682, "Vehicle and Pedestrian Signal Heads".

Provide and install standard detachable tunnel visors on all signal heads. Provide and install all necessary mounting hardware to insure proper mounting of all signal heads. The mounting hardware and attachments will be new (no reuse of old existing attachment hardware) and the same color as the signal head housings. Use signal heads made of aluminum with 12 inch LED indications and aluminum back plates.

Install signal heads mounted on mast arms, as described on the Traffic Signal Support Structures Details, or as approved. Mount signal heads mounted on end of arm with a 90 degree mast arm elbow fitting as shown on the Structure Assembly on the Traffic Signal Support Structures Details.

Use standard 1 1/2-inch diameter steel pipe side pole mount for pedestrian signal heads.

Ensure that each signal head has a minimum vertical clearance of 18.5 feet and a maximum vertical clearance of 19 feet between the bottom edge of the signal head and the surface of the roadway.

Provide aluminum pedestrian signal heads. Pedestrian indications will be LED signal sections with symbolized messages as shown on the plans and in accordance with the 2012 TEXAS MANUAL ON

COUNTY: BELL, ETC.

SHEET 2D

HIGHWAY: US 190, ETC.

CSJ: 6375-32-001

UNIFORM TRAFFIC CONTROL DEVICES, Revision 1. Symbols will be a minimum of 9 inches in height.

Ensure pedestrian signal heads are mounted with the bottom of the housing not less than seven (7) feet or more than nine (9) feet above the sidewalk.

ITEM 686: TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL)

686-6292 INS TRF SIG PL AM (MAST) (INSTALL) – removal of the existing mast arm, detection, and replacement of all existing signal equipment (if applicable) will be considered subsidiary to this Item. Any new equipment that is required (signs, detection, signal heads, etc.) will be paid for under the applicable Item.

Payment for traffic signal pole foundations is per Item 416, “Drill Shaft Foundations”. Furnish and use a circular steel anchor bolt templates as shown on the Traffic Signal Pole Foundation Details for all signal pole foundations on this project.

Attach dampening devices as shown on the plans to mast arms twenty-eight (28) feet in length and longer. Make attachment using ASTRO-SIGN-BRAC type mounts option “C” on the Traffic Signal Support Structures Details. Dampening will not be paid for directly, but will be considered subsidiary to Item 686, “Traffic Signal Pole Assemblies (Steel).”

No exposed signal cable on the mast arm assemblies will be allowed. Install the signal cable so it will exit the mast arm directly behind each signal head as directed. This will require drilling holes in the mast at the exact location for each signal head. Drip loops are not allowed.

ITEM 688: PEDESTRIAN DETECTORS AND VEHICLE LOOP DETECTORS

Pedestrian push buttons are required to be a minimum of two (2) inches in the smallest dimension and be mounted a minimum height of thirty-eight (38) to a maximum of forty-two (42) inches above the sidewalk or landing. The Engineer will approve the location of each pedestrian push button.

Install pedestrian push button signs (R10-4B) directly above the push buttons.

Installation of pedestrian push buttons signs, electrical connections and all mounting hardware will not be paid for directly, but considered subsidiary to Item 688, “Pedestrian Detectors and Vehicle Loop Detectors.”

ITEM 6185: TRUCK MOUNTED ATTENUATORS

The total number of truck mounted attenuators (TMA) required when utilizing the traffic control standards are shown in the tables below.

TCP 1 Series	Scenario		Required TMA	
(1-1)-18 / (1-2)-18			1	
(1-3)-18	A	B	1	2
(1-4)-18 / (1-5)-18 / (1-6)-18			1	



CONTROLLING PROJECT ID 6375-32-001

DISTRICT Waco
HIGHWAY US0190

COUNTY Bell

QUANTITY SHEET

CONTROL SECTION JOB				6375-32-001		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00139389			
COUNTY				Bell			
HIGHWAY				US0190			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	104-6015	REMOVING CONC (SIDEWALKS)	SY	15.000		15.000	
	416-6030	DRILL SHAFT (TRF SIG POLE) (24 IN)	LF	24.000		24.000	
	416-6031	DRILL SHAFT (TRF SIG POLE) (30 IN)	LF	24.000		24.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	26.000		26.000	
	416-6033	DRILL SHAFT (TRF SIG POLE) (42 IN)	LF	24.000		24.000	
	416-6034	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF	24.000		24.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	10.000		10.000	
	500-6033	MOBILIZATION (CALLOUT)	EA	12.000		12.000	
	531-6002	CONC SIDEWALKS (5")	SY	15.000		15.000	
	618-6019	CONDT (PVC) (SCH 40) (1 1/4")	LF	200.000		200.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF	250.000		250.000	
	618-6029	CONDT (PVC) (SCH 40) (3")	LF	300.000		300.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	200.000		200.000	
	618-6070	CONDT (RM) (2")	LF	100.000		100.000	
	618-6074	CONDT (RM) (3")	LF	75.000		75.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF	500.000		500.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	1,000.000		1,000.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	250.000		250.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	500.000		500.000	
	621-6005	TRAY CABLE (4 CONDR) (12 AWG)	LF	250.000		250.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	2.000		2.000	
	624-6008	GROUND BOX TY C (162911)W/APRON	EA	3.000		3.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	10.000		10.000	
	625-6003	ZINC-COAT STL WIRE STRAND (3/8")	LF	500.000		500.000	
	628-6002	REMOVE ELECTRICAL SERVICES	EA	2.000		2.000	
	628-6144	ELC SRV TY D 120/240 060(NS)SS(E)PS(U)	EA	2.000		2.000	
	628-6145	ELC SRV TY D 120/240 060(NS)SS(E)SP(O)	EA	2.000		2.000	
	636-6003	ALUMINUM SIGNS (TY O)	SF	50.000		50.000	
	636-6007	REPLACE EXISTING ALUMINUM SIGNS(TY A)	SF	50.000		50.000	
	636-6009	REPLACE EXISTING ALUMINUM SIGNS(TY O)	SF	50.000		50.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	15.000		15.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	15.000		15.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	15.000		15.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	15.000		15.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	15.000		15.000	
	682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	10.000		10.000	
	682-6017	PED SIG SEC (LED)(2 INDICATIONS)	EA	3.000		3.000	



DISTRICT	COUNTY	CCSJ	SHEET
Waco	Bell	6375-32-001	3



CONTROLLING PROJECT ID 6375-32-001

DISTRICT Waco
HIGHWAY US0190

COUNTY Bell

QUANTITY SHEET

CONTROL SECTION JOB				6375-32-001		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00139389			
COUNTY				Bell			
HIGHWAY				US0190			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	682-6018	PED SIG SEC (LED)(COUNTDOWN)	EA	3.000		3.000	
	682-6019	PED SIG SEC (LED)(CNTDWN)(MODUL ONLY)	EA	2.000		2.000	
	682-6021	BACK PLATE (12") (1 SEC)	EA	10.000		10.000	
	682-6051	BACKPLATE W/REFL BRDR(3 SEC)ALUM	EA	5.000		5.000	
	682-6052	BACKPLATE W/REFL BRDR(4 SEC)ALUM	EA	5.000		5.000	
	682-6053	BACKPLATE W/REFL BRDR(5 SEC)ALUM	EA	5.000		5.000	
	682-6057	RETROFIT REFL BRDR SHEETING (3 SEC)	EA	30.000		30.000	
	682-6058	RETROFIT REFL BRDR SHEETING (4 SEC)	EA	20.000		20.000	
	682-6059	RETROFIT REFL BRDR SHEETING (5 SEC)	EA	5.000		5.000	
	684-6008	TRF SIG CBL (TY A)(12 AWG)(3 CONDR)	LF	100.000		100.000	
	684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	200.000		200.000	
	684-6021	TRF SIG CBL (TY A)(12 AWG)(16 CONDR)	LF	400.000		400.000	
	684-6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF	200.000		200.000	
	686-6020	INS TRF SIG PL AM (5)STR(TY D)LUM	EA	4.000		4.000	
	686-6051	INS TRF SIG PL AM(S)1 ARM(48")LUM	EA	1.000		1.000	
	686-6292	INS TRF SIG PL AM (MAST)(INSTALL ONLY)	EA	2.000		2.000	
	687-6001	PED POLE ASSEMBLY	EA	2.000		2.000	
	688-6001	PED DETECT PUSH BUTTON (APS)	EA	2.000		2.000	
	688-6003	PED DETECTOR CONTROLLER UNIT	EA	2.000		2.000	
	690-6033	REMOVAL OF TRAFFIC SIGNAL POLE FND	LF	10.000		10.000	
	690-6040	INSTALL OF CONTROL CABINET(GRND MNT)	EA	2.000		2.000	
	690-6046	INSTALL OF FLASHER CABINET	EA	1.000		1.000	
	690-6051	REMOVAL OF SIGNAL POLE ASSM	EA	1.000		1.000	
	690-6068	REPLACE OF LUMINAIRE MAST ARMS	EA	2.000		2.000	
	690-6086	REMOVE VID IMAGE VEH DET SYS (VIVDS)	EA	3.000		3.000	
	6027-6003	CONDUIT (PREPARE)	LF	600.000		600.000	
	6058-6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	3.000		3.000	
	6064-6037	ITS POLE (50 FT)(90 MPH)	EA	1.000		1.000	
	6064-6046	ITS POLE (55 FT)(90 MPH)	EA	1.000		1.000	
	6064-6055	ITS POLE (60 FT)(90 MPH)	EA	1.000		1.000	
	6064-6072	ITS POLE MNT CAB (TY 1)(CONF 1)	EA	1.000		1.000	
	6064-6076	ITS POLE MNT CAB (TY 1)(CONF 2)	EA	1.000		1.000	
	6185-6002	TMA (STATIONARY)	DAY	150.000		150.000	
	6292-6003	RVDS(PRESENCE AND ADVANCE DET)	EA	5.000		5.000	
	6306-6001	VIVDS PROSR SYS	EA	2.000		2.000	
	6306-6002	VIVDS CAM ASSY FXD LNS	EA	2.000		2.000	
	6306-6003	VIVDS CAM ASSY VAR LNS	EA	3.000		3.000	



DISTRICT	COUNTY	CCSJ	SHEET
Waco	Bell	6375-32-001	3B



CONTROLLING PROJECT ID 6375-32-001

DISTRICT Waco
HIGHWAY US0190

COUNTY Bell

QUANTITY SHEET

CONTROL SECTION JOB				6375-32-001		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00139389			
COUNTY				Bell			
HIGHWAY				US0190			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	6306-6005	VIVDS CNTRL SOFTWARE	EA	2.000		2.000	
	6306-6007	VIVDS CABLING	LF	100.000		100.000	
	08	LAW ENFORCEMENT	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE (NON-PART)	LS	1.000		1.000	

\$TIMES

\$DAYS

\$FILES

NODE

BID CODE	500-6033	104-6015	416-6034	416-6033	416-6032	416-6030	416-6031	432-6001	531-6002	618-6019	618-6074	618-6070	618-6029
DESCRIPTION	MOBILIZATION (CALLOUT)	REMOVING CONC (SIDEWALKS)	DRILL SHAFT (TRF SIG POLE)	DRILL SHAFT (TRF SIG POLE)	DRILL SHAFT (TRF SIG POLE)	DRILL SHAFT (TRF SIG POLE)	DRILL SHAFT (TRF SIG POLE)	RIPRAP (CONC)(4 IN)	CONC SIDEWALKS (5')	CONDT (PVC) (SCH 40) (1 1/4")	CONDT (RM) (3")	CONDT (RM) (2")	CONDT (PVC) (SCH 40) (3")
UNIT	Each	Square Yards	Linear Feet	Linear Feet	Linear Feet	Linear Feet	Linear Feet	Cubic Yard	Square Yards	Linear Feet	Linear Feet	Linear Feet	Linear Feet
	12	15	24	24	26	24	24	10	15	200	75	100	300
BID CODE	618-6054	618-6023	620-6009	620-6010	620-6007	620-6008	621-6005	624-6008	624-6002	624-6010	625-6003	628-6144	628-6145
DESCRIPTION	CONDT (PVC) (SCH 80) (3")	CONDT (PVC) (SCH 40) (2")	ELEC CONDR (NO. 6) BARE	ELEC CONDR (NO. 6) INSULATED	ELEC CONDR (NO. 8) BARE	ELEC CONDR (NO. 8) INSULATED	TRAY CABLE (4 CONDR) (12 AWG)	GROUND BOX TY C (162911)W/APRON	GROUND BOX TY A (122311)W/APRON	GROUND BOX TY D (162922)W/APRON	ZINC-COAT STL WIRE STRAND	ELC SRV TY D 120/240	ELC SRV TY D 120/240
UNIT	Linear Feet	Linear Feet	Linear Feet	Linear Feet	Linear Feet	Linear Feet	Linear Feet	Each	Each	Each	Linear Feet	Each	Each
	200	250	250	500	500	1,000	250	3	2	10	500	2	2
BID CODE	628-6002	636-6009	636-6007	636-6003	682-6051	682-6006	682-6052	682-6057	682-6001	682-6002	682-6017	682-6003	682-6021
DESCRIPTION	REMOVE ELECTRICAL SERVICES	REPLACE EXISTING ALUMINUM	REPLACE EXISTING ALUMINUM	ALUMINUM SIGNS (TY 0)	BACKPLATE W/REFL BRDR(3 SEC)ALUM	VEH SIG SEC (12")LED(RED ARW)	BACKPLATE W/REFL BRDR(4 SEC)ALUM	RETROFIT REFL BRDR SHEETING (3 SEC)	VEH SIG SEC (12")LED(GRN)	VEH SIG SEC (12")LED(GRN ARW)	PED SIG SEC (LED)(2 INDICATIONS)	VEH SIG SEC (12")LED(YEL)	BACK PLATE (12") (1 SEC)
UNIT	Each	Square Feet	Square Feet	Square Feet	Each	Each	Each	Each	Each	Each	Each	Each	Each
	2	50	50	50	5	10	5	30	15	15	3	15	10
BID CODE	682-6019	682-6018	682-6058	682-6004	682-6053	682-6005	682-6059	684-6008	684-6012	684-6031	684-6021	686-6292	686-6051
DESCRIPTION	PED SIG SEC (LED)(CNTDWN)(MODUL ONLY)	PED SIG SEC (LED)(COUNTDOWN)	RETROFIT REFL BRDR SHEETING (4 SEC)	VEH SIG SEC (12")LED(YEL ARW)	BACKPLATE W/REFL BRDR(5 SEC)ALUM	VEH SIG SEC (12")LED(RED)	RETROFIT REFL BRDR SHEETING (5 SEC)	TRF SIG CBL (TY A)(12 AWG)(3 CONDR)	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	TRF SIG CBL (TY A)(12 AWG)(16 CONDR)	INS TRF SIG PL (MST)(INSTALL	INS TRF SIG PL (MST)(INSTALL
UNIT	Each	Each	Each	Each	Each	Each	Each	Linear Feet	Linear Feet	Linear Feet	Linear Feet	Each	Each
	2	3	20	15	5	15	5	100	200	200	400	2	1
BID CODE	686-6020	687-6001	688-6001	688-6003	690-6046	690-6040	690-6068	690-6051	690-6033	690-6086	6027-6003	6058-6001	6064-6072
DESCRIPTION	INS TRF SIG PL AM (S)STR TY D)LUM	PED POLE ASSEMBLY	PED DETECT PUSH BUTTON (APS)	PED DETECTOR CONTROLLER UNIT	INSTALL OF FLASHER CABINET	INSTALL OF CONTROL CABINET(GRND	REPLACE OF LUMINAIRE MAST ARMS	REMOVAL OF SIGNAL POLE ASSM	REMOVAL OF TRAFFIC SIGNAL POLE FND	REMOVE VID IMAGE VEH DET SYS (VIVDS)	CONDUIT (PREPARE)	BBU SYSTEM (EXTERNAL BATT CABINET)	ITS POLE MNT CAB (TY 1)(CONF
UNIT	Each	Each	Each	Each	Each	Each	Each	Each	Linear Feet	Each	Linear Feet	Each	Each
	4	2	2	2	1	2	2	1	10	3	600	3	1
BID CODE	6064-6055	6064-6076	6064-6046	6064-6037	6185-6002	6292-6003	6306-6001	6306-6005	6306-6007	6306-6002	6306-6003		
DESCRIPTION	ITS POLE (60 FT)(90 MPH)	ITS POLE MNT CAB (TY 1)(CONF	ITS POLE (55 FT)(90 MPH)	ITS POLE (50 FT)(90 MPH)	TMA (STATIONARY)	RVDS(PRESENCE AND ADVANCE DET	VIVDS PROSR SYS	VIVDS CNTRL SOFTWARE	VIVDS CABLING	VIVDS CAM ASSY FXD LNS	VIVDS CAM ASSY VAR LNS		
UNIT	Each	Each	Each	Each	Day	Each	Each	Each	Linear Feet	Each	Each		
	1	1	1	1	150	5	2	2	100	2	3		



CONSOLIDATED SUMMARY

SHEET 1 OF 1

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	6375	32	001	US 190, ETC
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	BELL, ETC.		4

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by the Texas Department of Transportation for the use of this standard for purposes other than those intended. The use of this standard for other purposes is at the user's risk.

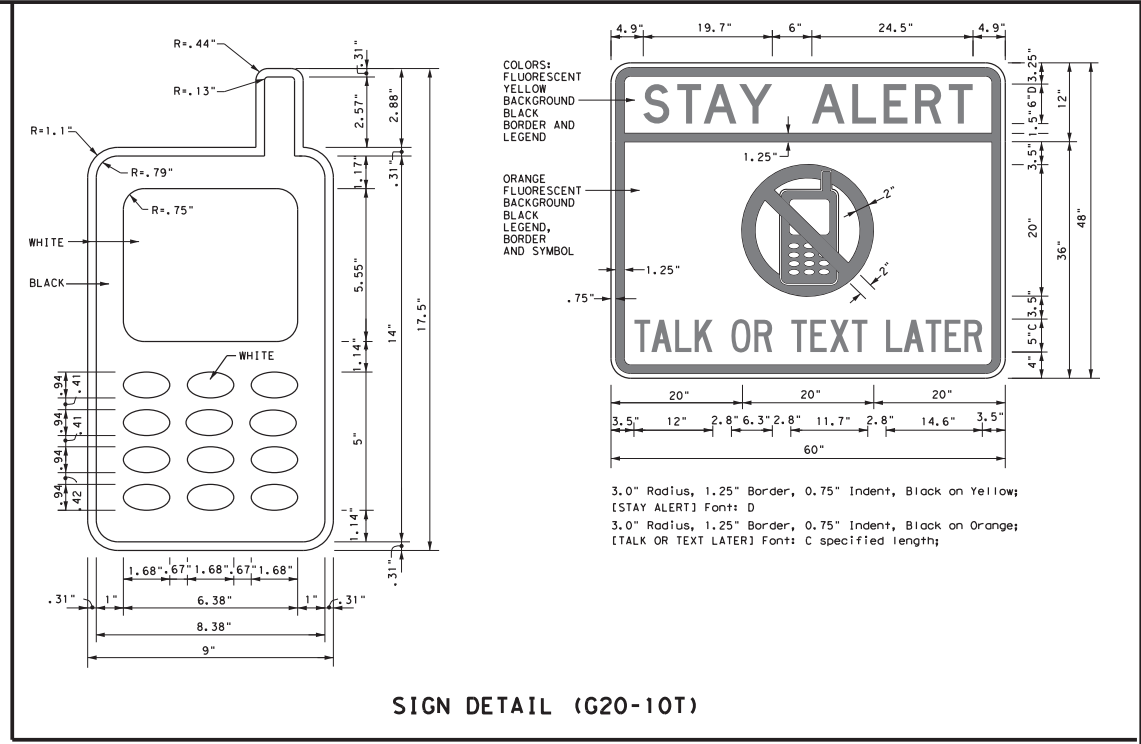
DATE: 12/16/2020 4:45:24 PM
 FILE: T:\MACTRAFF\VMC\SIGNAL_2021\STANDARD\BC-14.dgn

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

- The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may delete, sign and seal Contractor proposed changes.
- The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
- Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.
- When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
- The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
- All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
- The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
- As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.
- Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.
- The Engineer has the final decision on the location of all traffic control devices.
- Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY APPAREL NOTES:

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



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

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

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

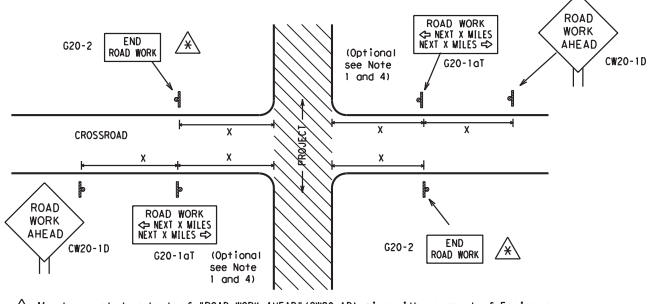
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

SHEET 1 OF 12

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS
BC(1) - 14

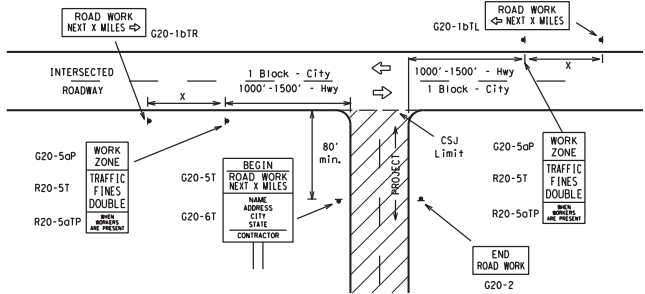
FILE: bc-14.dgn	DN: TxDOT	CR: TxDOT	DN: TxDOT	CR: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
4-03 REVISIONS	6375	32	001	US 190, ETC
5-10				
8-14				
9-07	DIST	COUNTY		SHEET NO.
7-13	WACO	BELL, ETC		5

TYPICAL LOCATION OF CROSSROAD SIGNS



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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING¹⁵⁻⁶

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

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

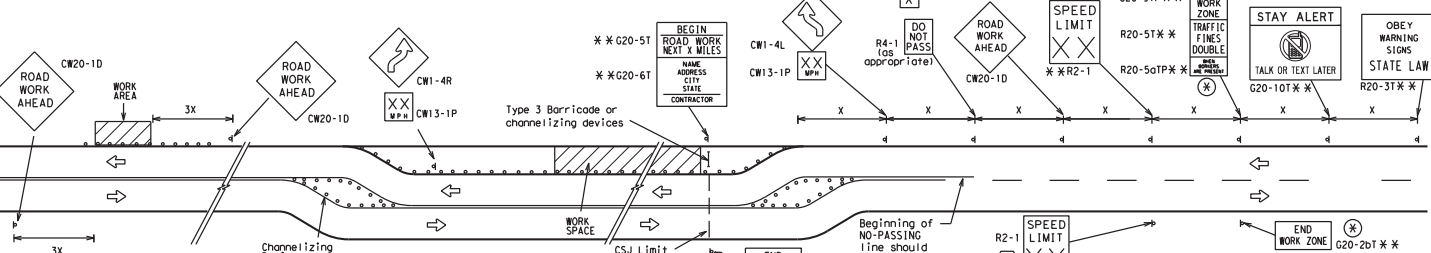
Δ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

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

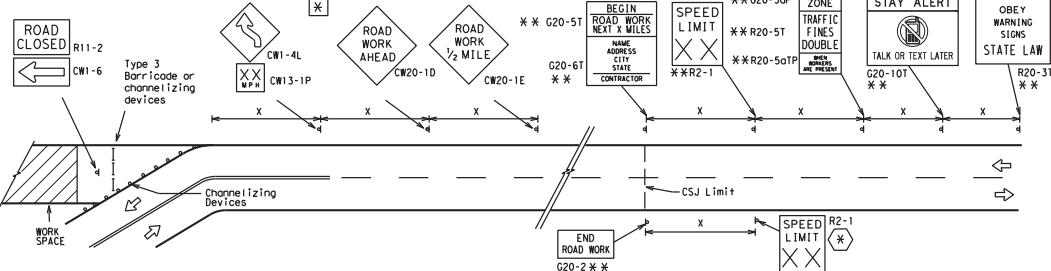
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by the State of Texas or the Department of Transportation. The use of this standard is intended to provide a minimum standard for the use of this standard. The use of this standard does not constitute an endorsement of any product or service. The use of this standard does not constitute a warranty of any kind. The use of this standard does not constitute a liability for any damages resulting from its use.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

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



NOTES

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
 - Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.
 - Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
 - Contractor will install a regulatory speed limit sign at the end of the work zone.

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

SHEET 2 OF 12

Texas Department of Transportation
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2) - 14

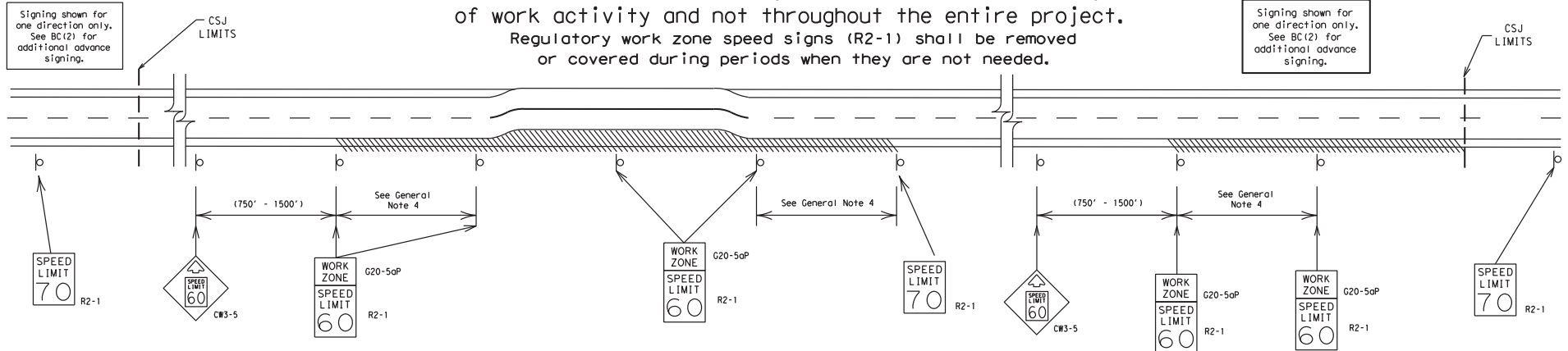
FILE: bc-14.dgn	DNV: TxDOT	CHK: TxDOT	DRW: TxDOT	CHK: TxDOT
© TxDOT November 2002	CONT: 6375	SECT: 32	JOB: 001	US: 190, ETC
REVISIONS	DIST: 9-07	COUNTY: 8-14	DATE: 7-13	SHEET NO. 6
	WACO	BELL, ETC		

DATE: 12/16/2020 4:45:25 PM
FILE: T:\MACTRAFF\JMC\SIGNAL_2021\stn\sig\bc-14.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 travelled way.

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

GENERAL NOTES

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

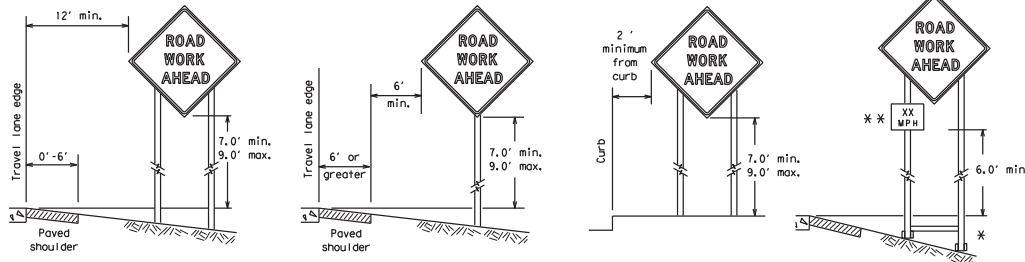
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for inexact results or damages resulting from its use.

DATE: 12/16/2020 4:45:25 PM
FILE: T:\NACTRAFF\IMC\SIGNAL_2021\Standard-ds\bc-14.dgn

SHEET 3 OF 12

		Traffic Operations Division Standard	
<h3>BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT</h3>			
<h2>BC (3) - 14</h2>			
FILE: dc-14.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT
© TxDOT November 2002	CONT SECT	JOB	HIGHWAY
REVISIONS	6375 32	001	US 190, ETC
9-07 8-14	DIST	COUNTY	SHEET NO.
7-13	WACO	BELL, ETC	7

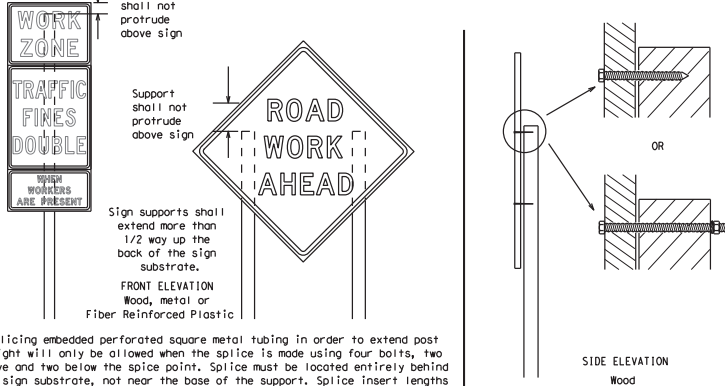
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

ATTACHMENT FOR SIGN SUPPORTS



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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

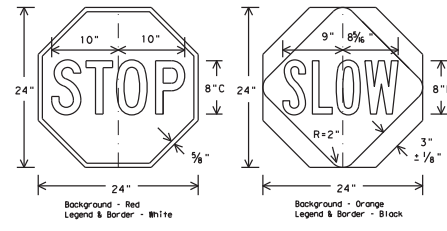
- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not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

FLAGS ON SIGNS

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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



BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 14

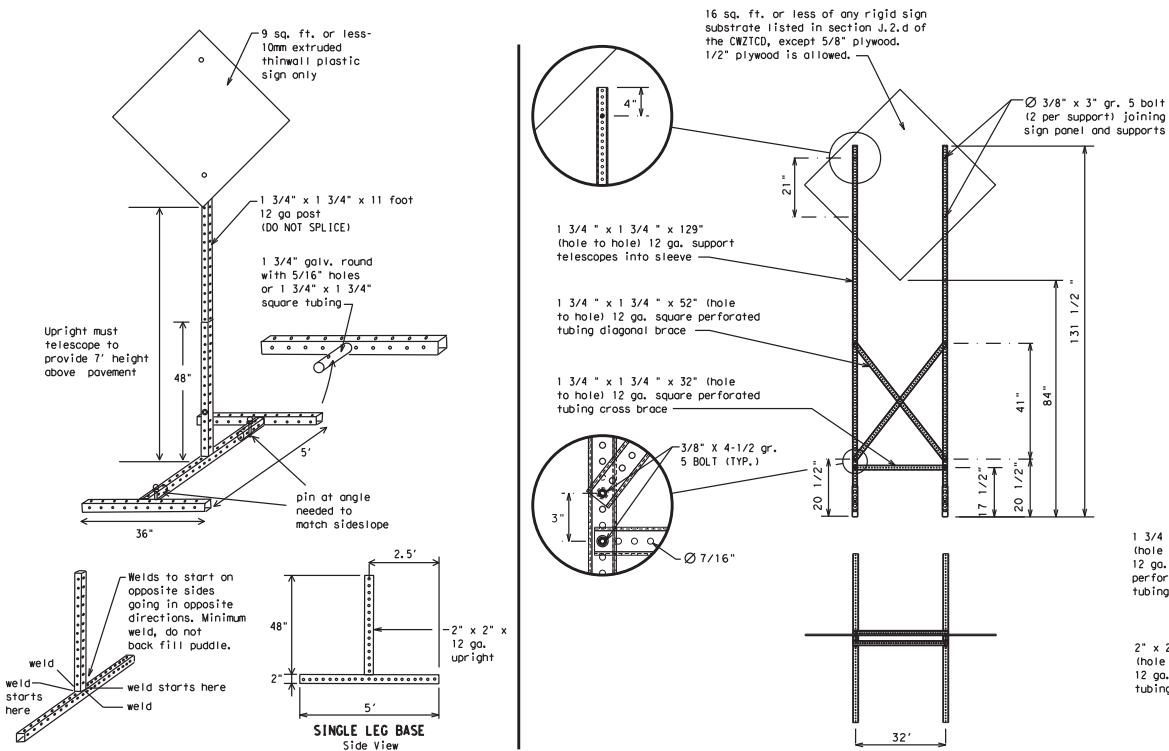
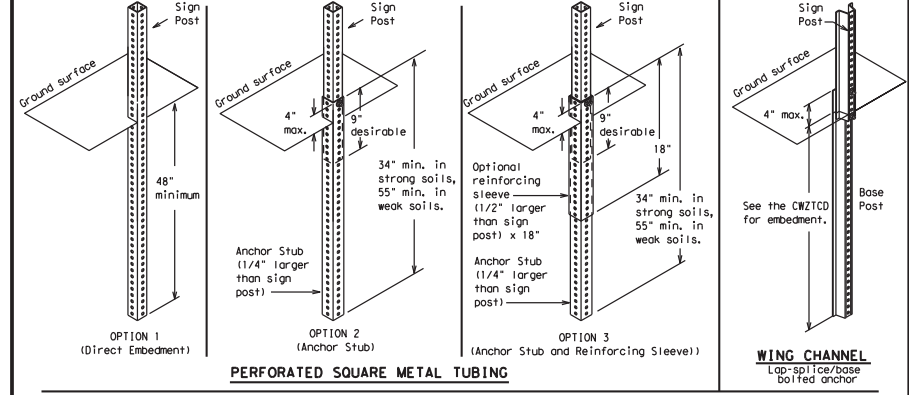
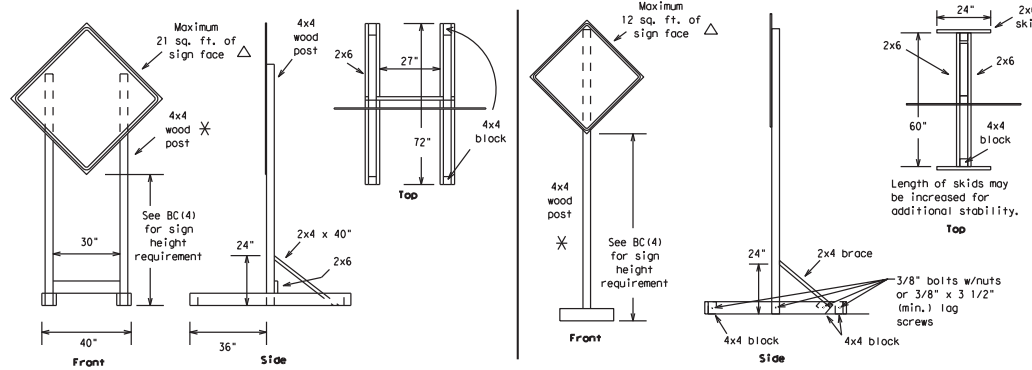
FILE:	DC-14.dgn	DN:	TxDOT	CR:	TxDOT	DR:	TxDOT	EX:	TxDOT
REVISED:	NOVEMBER 2002	CONT:	6375	SECT:	32	JOB:	001	US:	190, ETC
DATE:	9-07	DIST:	8-14	COUNTY:		SHEET NO.:			
TIME:	7-13	WACO:		BELL, ETC:		SHEET NO.:			8

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for the use of this standard or for incorrect results or damages resulting from its use.

DATE: 12/16/2020 4:45:26 PM
FILE: T:\MACTRAFF\JMC\SIGNAL_2021\Standard\sb\bc-14.dgn

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by the Texas Department of Transportation for the accuracy, completeness, or conversion of this standard to other formats or for incorrect results or damages resulting therefrom. Its use.

DATE: 12/16/2020 4:45:27 PM
 FILE: T:\MACTRAFF\IMC\SIGNAL\2021\Standard.dwg\bc-14.dwg



WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS

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

1 1/2" Dia. (typ)
 4"
 6"
 18"
 4"
 Direction of Traffic

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

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

GENERAL NOTES

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

□ See BC(4) for definition of "Work Duration."
 ✕ Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.
 Δ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12

Texas Department of Transportation
 Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT
BC(5) - 14

FILE:	bc-14.dwg	DN:	TxDOT	CR:	TxDOT	DR:	TxDOT	CR:	TxDOT
© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
9-07	8-14	6375	32	001	US 190, ETC				
7-13		DIST	COUNTY	SHEET NO.					
		WACO	BELL, ETC	9					

99

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

ROADWORK XXX FT	ROAD REPAIRS XXXX FT
FLAGGER XXXX FT	LANE NARROWS XXXX FT
RIGHT LN CLOSED 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 LANES 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	XXXXXXXX TO XXXXXXX	US XXX TO FM XXXX
------------	--------------------------	--------------	---------------------	-------------------

Warning List

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

** Advance Notice List

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

** See Application Guidelines Note 6.

DISCLAIMER: The use of this standard is governed by the Texas Engineering Practice Act. No warranty of any kind is made by the Texas Department of Transportation for the accuracy or completeness of this standard or for incorrect results or damages resulting from its use.

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

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

APPLICATION GUIDELINES

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

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

FULL MATRIX PCMS SIGNS

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

SHEET 6 OF 12



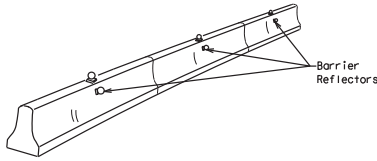
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC (6) - 14

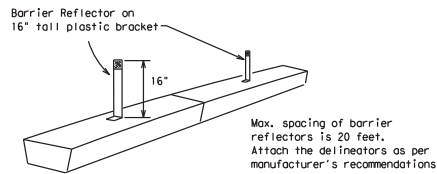
FILE#	DC-14.dgn	DATE	TxDOT	DATE	TxDOT	DATE	TxDOT	DATE	TxDOT
REV#	November 2002	DATE	6375	DATE	32	DATE	001	DATE	US 190, ETC
REVISIONS		DIST	7-13	COUNTY	WACO	SHEET NO.	BELL, ETC		10

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

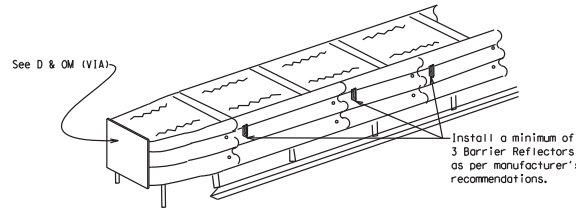


CONCRETE TRAFFIC BARRIER (CTB)

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



LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

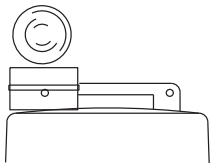
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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 B₁ or C₁ Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
- When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

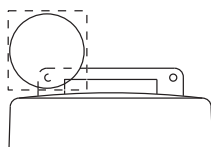
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing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

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

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



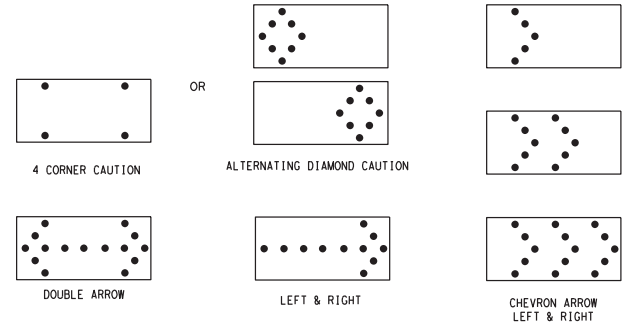
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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

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

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



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

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

ATTENTION
Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

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



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

BC(7) - 14

FILE#	bc-14.dgn	DATE	TxDOT	DATE	TxDOT	DATE	TxDOT
REV#	1	NOVEMBER 2002	6375	32	001	US 190, ETC	
DATE	9-07	8-14	DIST		COUNTY		SHEET NO.
DATE	7-13		WACO		BELL, ETC		11

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

DATE: 12/16/2020 4:45:28 PM
FILE: T:\MACTRAFF\JMC\SIGNAL_2021\Standard\ds\bc-14.dgn

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

DATE: 12/16/2020 4:45:28 PM
 FILE: \\T:\ACT\TRAFF\WMS\SIGNAL_2021\N:\stg\ar\ds\bc-14.dgn

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

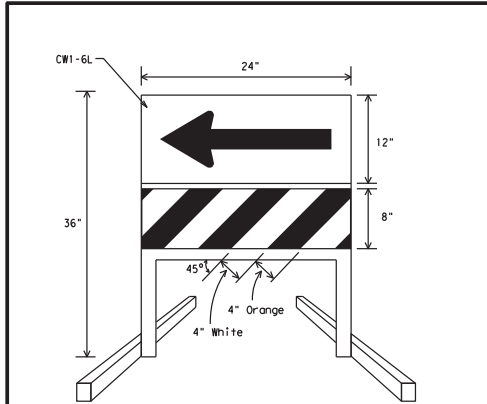
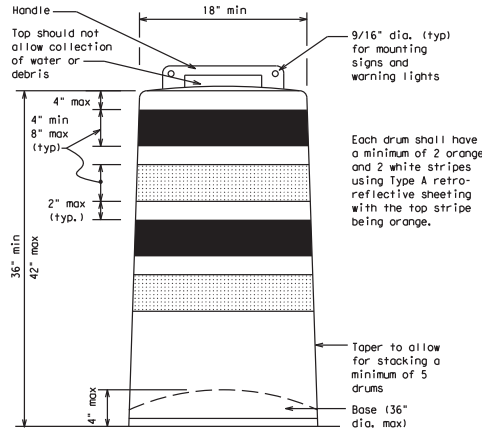
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

RETROREFLECTIVE SHEETING

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

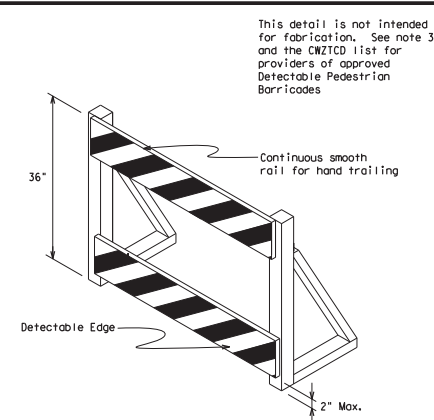
BALLAST

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



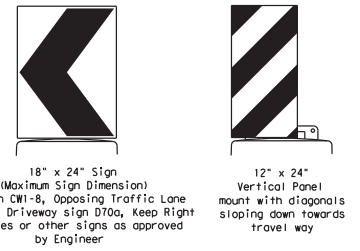
DIRECTION INDICATOR BARRICADE

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



DETECTABLE PEDESTRIAN BARRICADES

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



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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

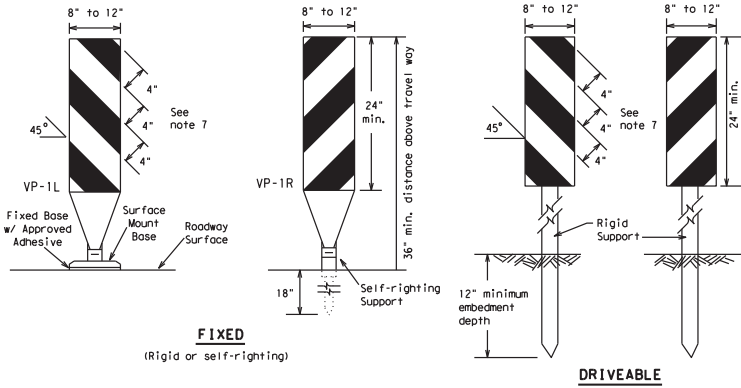


BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 14

FILE: bc-14.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	EX: TxDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
6375	32	001	US 190, ETC	
4-03 7-13	DIST	COUNTY	SHEET NO.	
9-07 8-14	WACO	BELL, ETC	12	

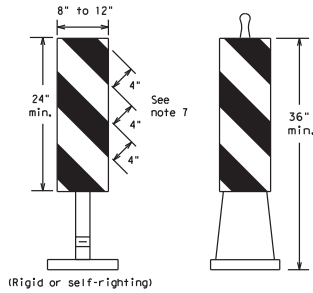
DISCLAIMER: This standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for use of this standard or for incorrect results or damages resulting from its use.



FIXED
(Rigid or self-righting)

DRIVEABLE

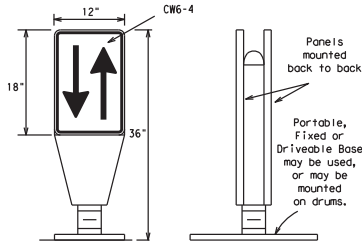
- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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



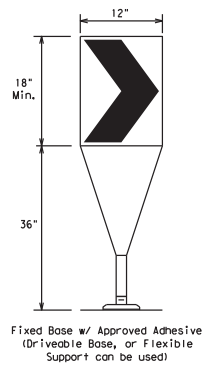
PORTABLE

VERTICAL PANELS (VPs)

- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with 42" cones or VPS.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPS placed between the OTLD's should not exceed 100 foot spacing.
- The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B₁ or Type C₁ conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.



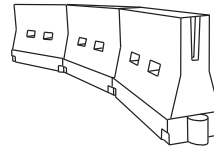
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
- Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B₁ or Type C₁ conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
- For Long Term Stationary use on tapers or transitions on freeways and divided highways self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

GENERAL NOTES

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS 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



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) - 14

FILE:	dc-14.dgn	DW:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
REVISED:	November 2002	CONF:	SECT:	JOB:	HIGHWAY				
9-07	8-14	6375	32	001	US 190, ETC				
7-13		DIST:	COUNTY:	SHEET NO.:					
		WACO	BELL, ETC	13					

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by the State of Texas for the use of this standard or for incorrect results or damages resulting from its use.

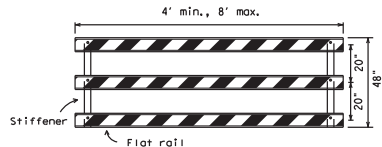
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTD) 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 fire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.

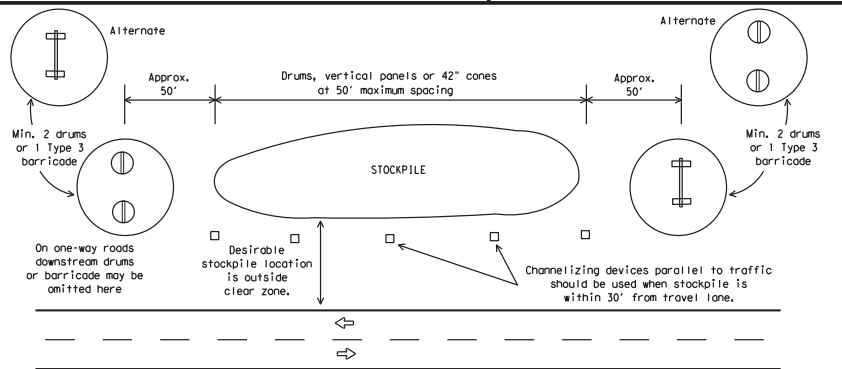


TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



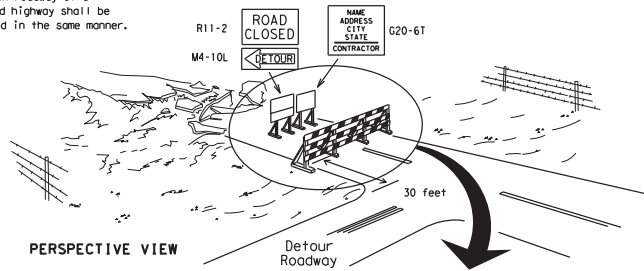
Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



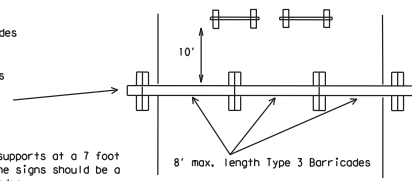
TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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.

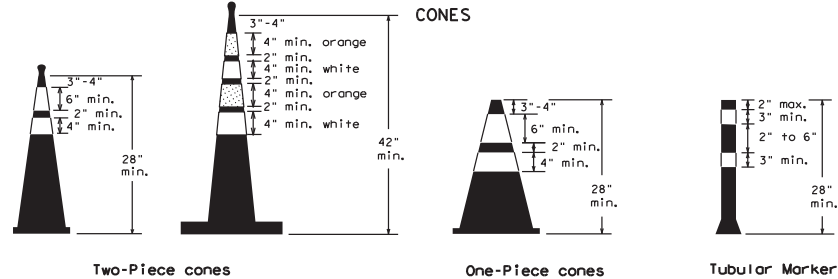


PLAN VIEW

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.

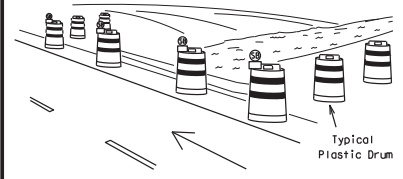
TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION

CONES



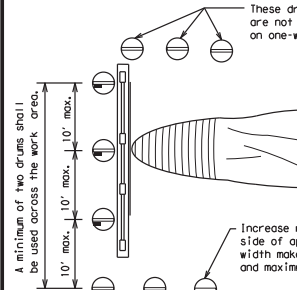
28" Cones shall have a minimum weight of 9 1/2 lbs.
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(14). 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.



PERSPECTIVE VIEW

These drums are not required on one-way roadway



PLAN VIEW

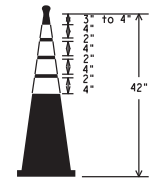
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

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

LEGEND

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

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



EDGE LINE CHANNELIZER

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

SHEET 10 OF 12

Texas Department of Transportation
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) - 14

FILE: dc-14.dgn	DN: TXDOT	CR: TXDOT	DR: TXDOT	EX: TXDOT
REV: November 2002	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
REVISIONS: 9-07 8-14	DIST: 7-13	COUNTY: WACO	COUNTY: BELL, ETC	SHEET NO.: 14

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by the author of this standard or other formats or for incorrect results or damages resulting from its use.

DATE: 12/16/2020 4:45:31 PM
 FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Standard\ds\bc-14.dgn

WORK ZONE PAVEMENT MARKINGS

GENERAL

- The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(S1PM).
- When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

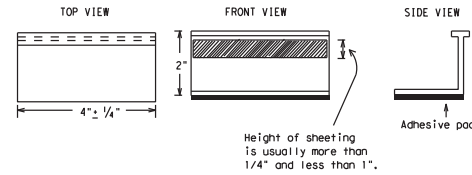
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
 - Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
 - Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
- Small design variances may be noted between tab manufacturers.
- See Standard Sheet WZ(S1PM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

SHEET 11 OF 12



Traffic
 Operations
 Division
 Standard

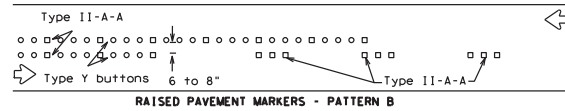
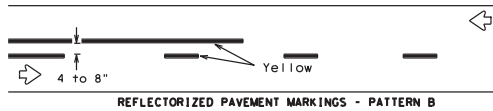
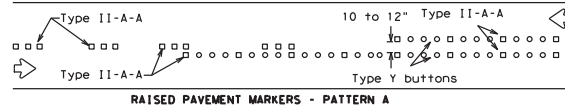
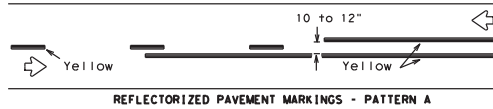
BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

FILE: bc-14.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	EX: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
2-98	9-07	6375	32	001
1-02	7-13	DIST	COUNTY	SHEET NO.
11-02	8-14	WACO	BELL, ETC	15

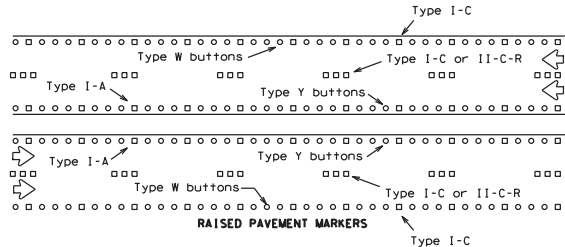
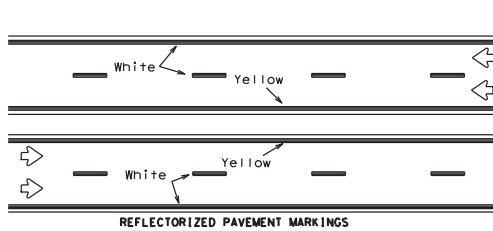
105

PAVEMENT MARKING PATTERNS



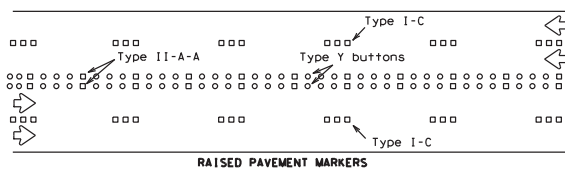
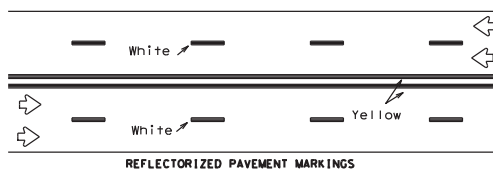
Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectORIZED pavement markings.

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



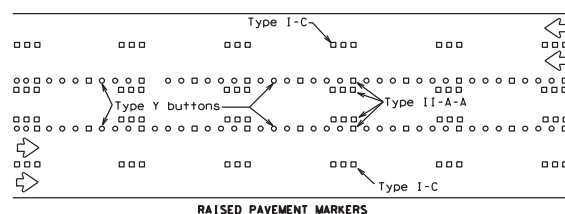
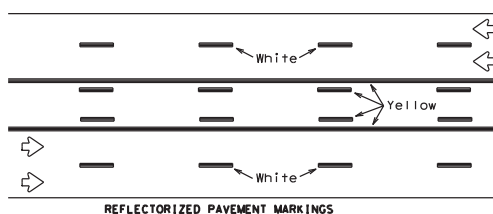
Prefabricated markings may be substituted for reflectORIZED pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



Prefabricated markings may be substituted for reflectORIZED pavement markings.

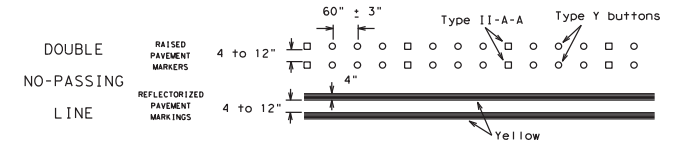
LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



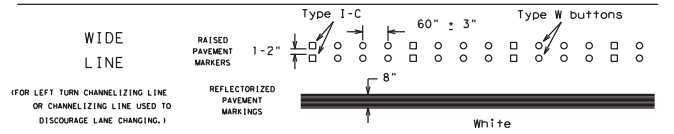
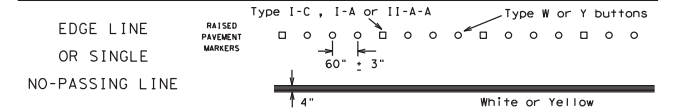
Prefabricated markings may be substituted for reflectORIZED pavement markings.

TWO-WAY LEFT TURN LANE

STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

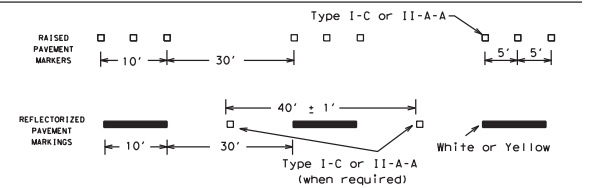


SOLID LINES

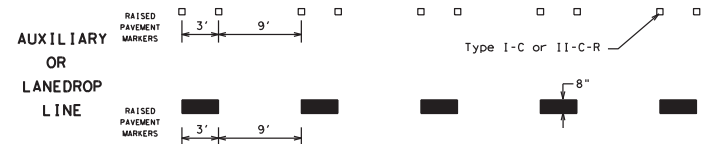


(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

CENTER LINE OR LANE LINE

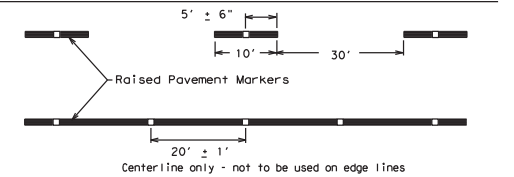


BROKEN LINES



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

SHEET 12 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

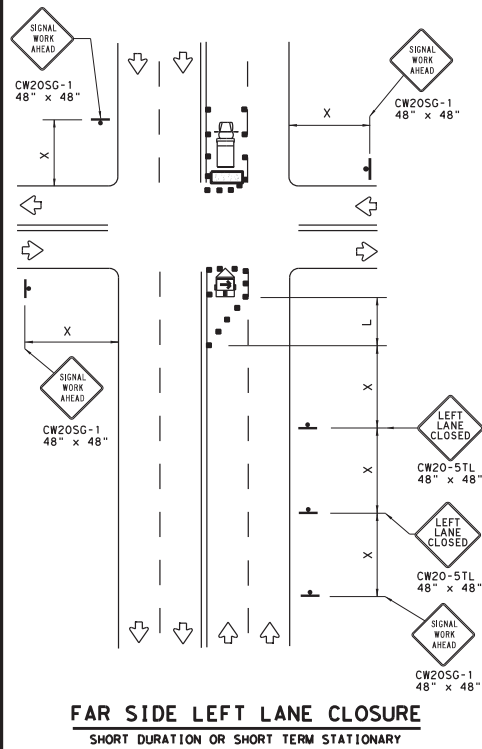
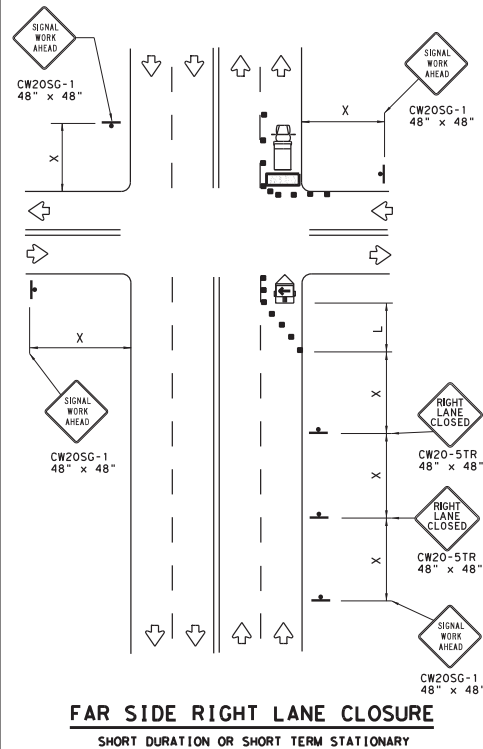
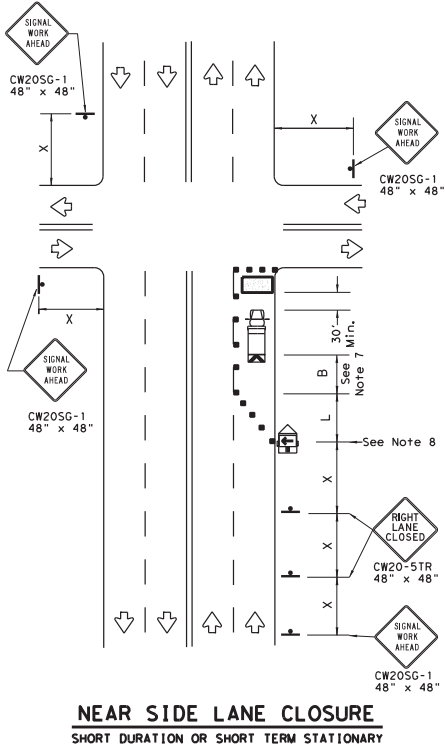
Raised pavement markers used as standard pavement markers shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

FILE: dc-14.dgn	DN: TXDOT	CR: TXDOT	DR: TXDOT	EX: TXDOT
© TXDOT February 1998	CONT	SECT	JOB	HIGHWAY
1-97 9-07 REVISIONS	6375	32	001	US 190, ETC
2-98 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	WACO	BELL, ETC		16

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by the Texas Department of Transportation for the accuracy or completeness of this standard or for any consequences resulting from its use.

DATE: 12/16/2020 4:45:31 PM
FILE: T:\MACTRAFF\JMC\SIGNAL_2021\Standard-05\bc-14.dgn

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

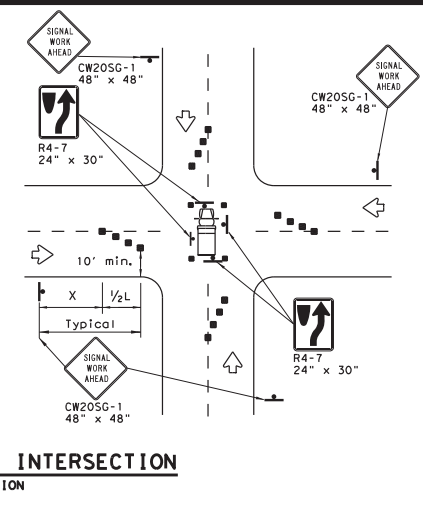
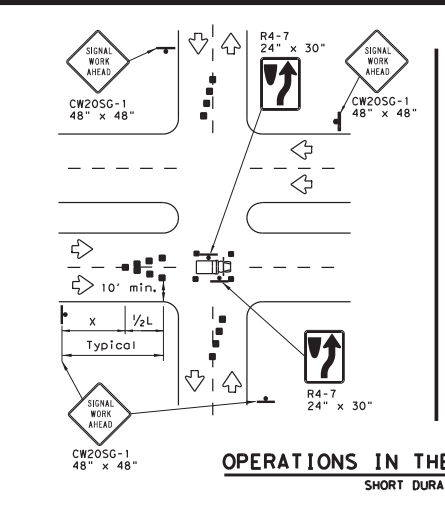


LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

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

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.



GENERAL NOTES

- The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
- Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
- Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
- Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
- High level warning devices (flag trees) may be used at corners of the vehicle.
- When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1) and R1-3P) signs may be implemented when approved by the engineer.
- For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
- The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
- Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.



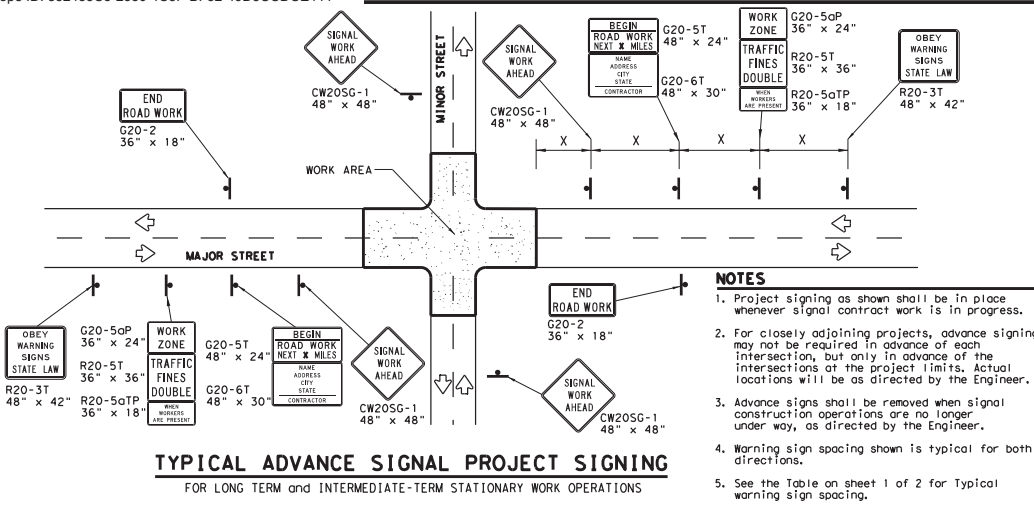
TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
4-98 3-03	WACO	BELL, ETC	17	

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

DATE: 12/16/2020 4:45:40 PM
 FILE: \\TXACTRAFF\WMS\SIGNAL_2021\Standard\BTS\WZBTS-13.dgn



- NOTES**
- Project signing as shown shall be in place whenever signal contract work is in progress.
 - For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections of the project limits. Actual locations will be as directed by the Engineer.
 - Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
 - Warning sign spacing shown is typical for both directions.
 - See the Table on sheet 1 of 2 for Typical warning sign spacing.

TYPICAL ADVANCE SIGNAL PROJECT SIGNING
FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

GENERAL NOTES FOR WORK ZONE SIGNS

- Signs shall be installed and maintained in a straight and plumb condition.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- Nails shall NOT be used to attach signs to any support.
- All signs shall be installed in accordance with the plans or as directed by the Engineer.
- The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
- The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
- Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
- 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".
- Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

- Work zone durations are defined in Part 6, Section 60.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

- Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
- Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
- Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

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

REFLECTIVE SHEETING

- All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

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

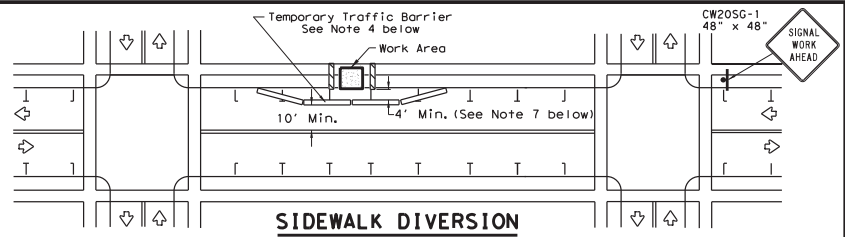
LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

DEPARTMENTAL MATERIAL SPECIFICATIONS

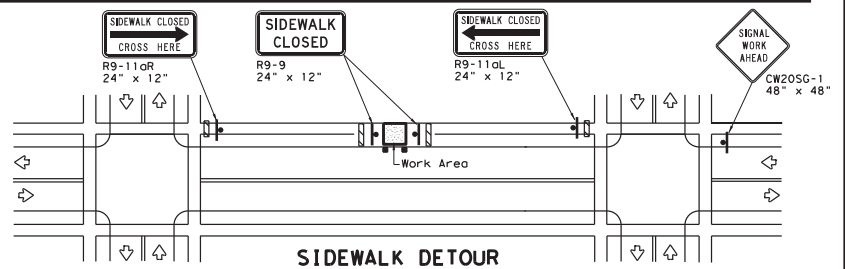
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B _{FL} OR TYPE C _{FL} SHEETING
WHITE	BACKGROUND	TYPE A SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

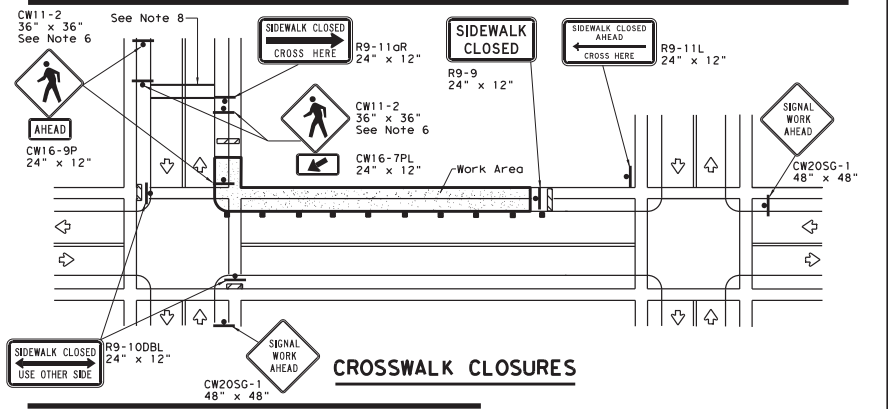
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

- Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
- "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
- R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates. They may be mounted on top of a plastic drum at or near the location shown.
- For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of front ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
- Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
- Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
- The width of existing sidewalk shall be maintained if practical.
- Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
- When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.



TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

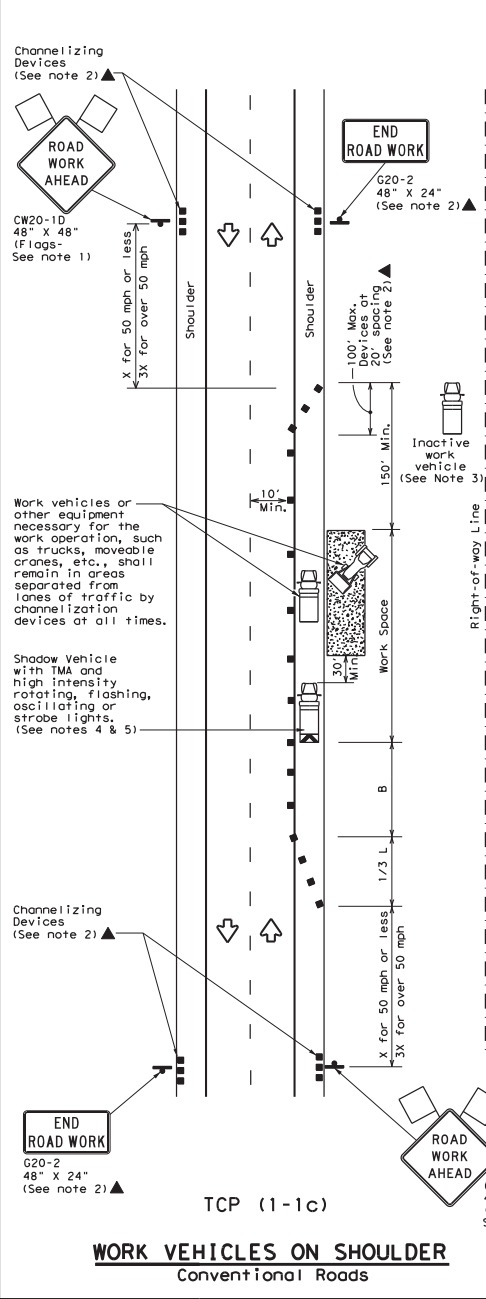
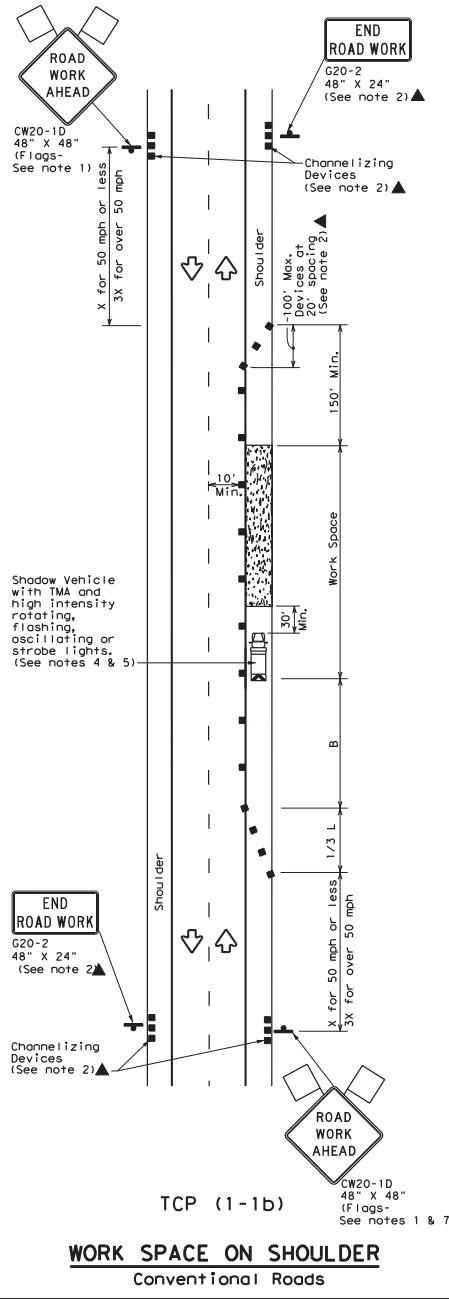
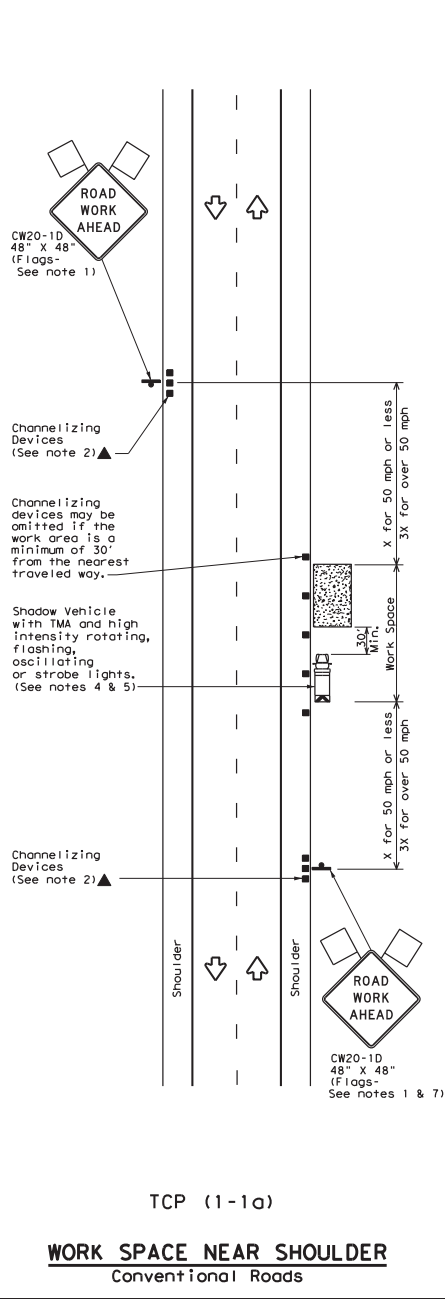
WZ(BTS-2) - 13

FILE: wZBts-13.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	EX: TxDOT
© TxDOT April 1992	CONF SECT	JOB	HIGHWAY	
REVISIONS	6375	32	001	US 190, ETC
2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
4-98 3-03	WACO	BELL, ETC	18	

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

20211118.dgn

DATE: 12/16/2020 4:45:43 PM
 FILE: T:\MACTRAFF\IMC\NSIGNAL_2021\Standard\ds\TCPI-1-18.dgn



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

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

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

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

- GENERAL NOTES**
- Flags attached to signs where shown are REQUIRED.
 - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
 - Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
 - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
 - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
 - See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
 - CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.



**TRAFFIC CONTROL PLAN
 CONVENTIONAL ROAD
 SHOULDER WORK**

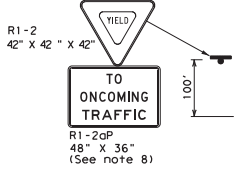
TCP (1-1) - 18

FILE: tcp1-1-18.dgn	DN: TxDOT	CR: TxDOT	DN: TxDOT	CR: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
2-94 4-98 REVISIONS	6375	32	001	US 190, ETC
8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	WACO	BELL, ETC		19

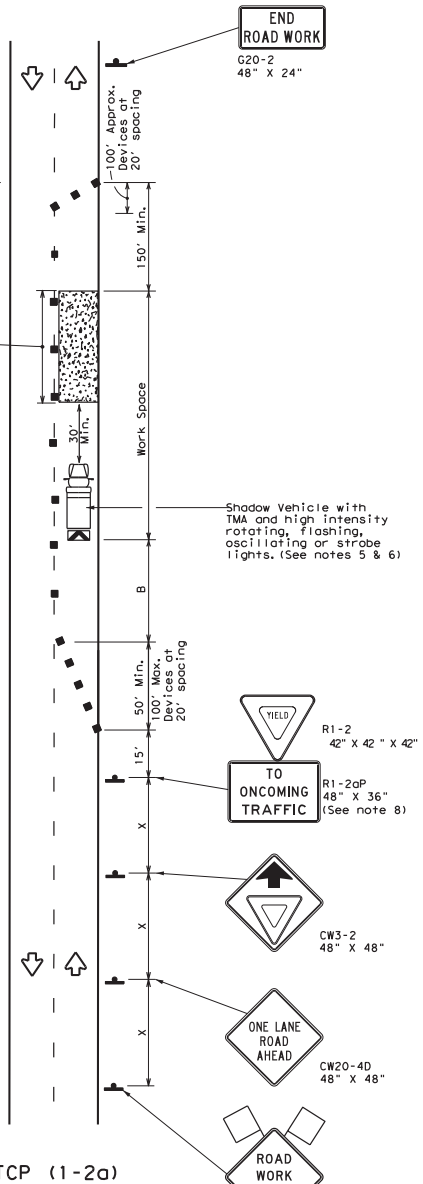
DISCONTINUED
 The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its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

DATE: 12/16/2020 4:45:46 PM
 FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Standard.dgn

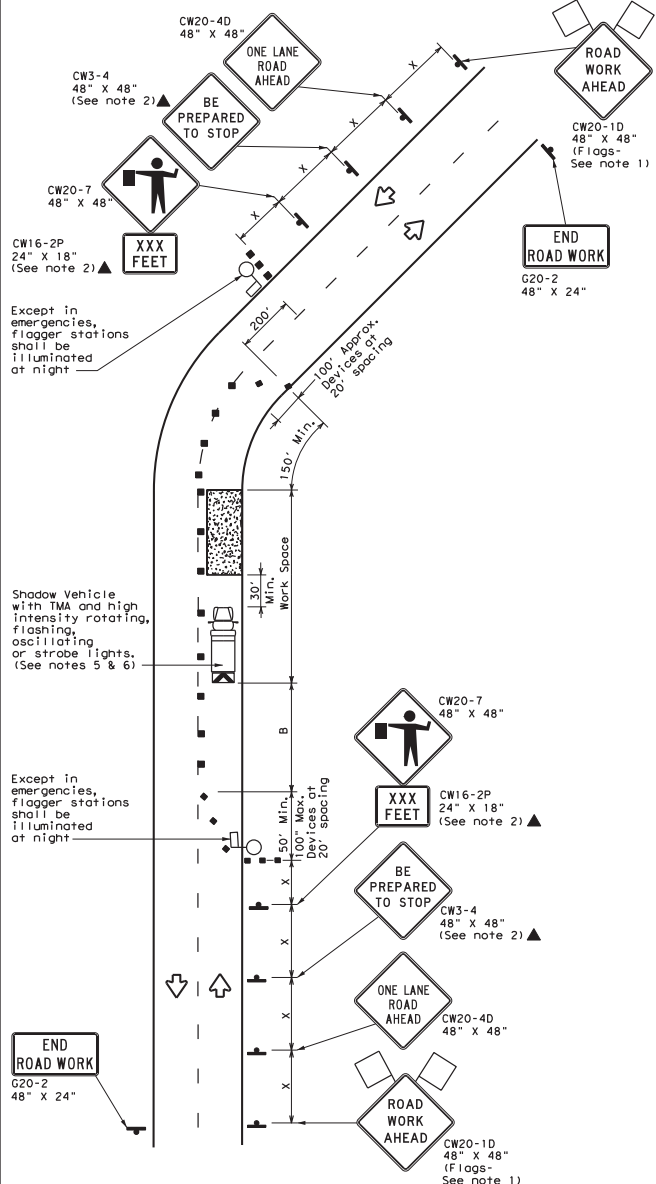
Warning Sign Sequence in Opposite Direction Same as Below



Channelizing devices separate work space from traveled way



TCP (1-2a)
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
 (Less than 2000 ADT - See note 7)



TCP (1-2b)
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		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X"	Suggested Longitudinal Buffer Space "B"	Stopping Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	L = 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	LONG TERM STATIONARY
	✓	✓	

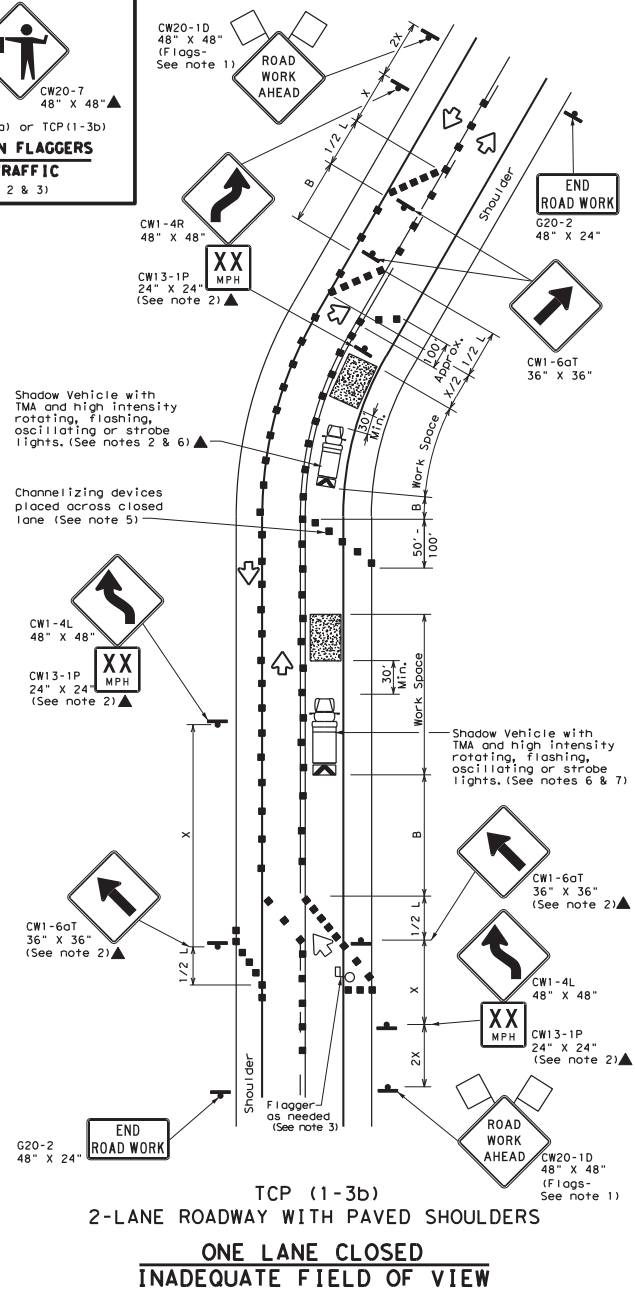
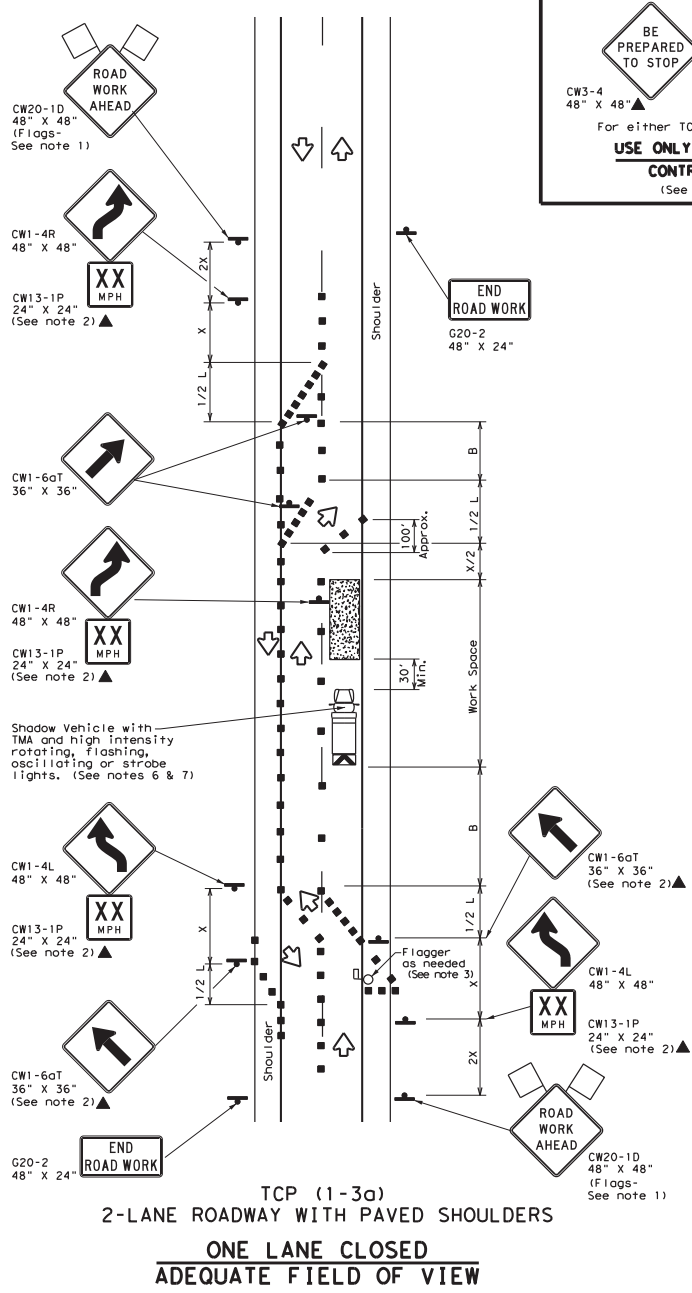
GENERAL NOTES

- Flags attached to signs where shown are REQUIRED.
 - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
 - The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
 - Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
 - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
 - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
- TCP (1-2a)**
- R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
 - R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.
- TCP (1-2b)**
- Flaggers should use two-way radios or other methods of communication to control traffic.
 - Length of work space should be based on the ability of flaggers to communicate.
 - If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
 - Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
 - Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

		Traffic Operations Division Standard	
TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL			
TCP (1-2)-18			
FILE: tcp1-2-18.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT
© TxDOT December 1985	CONT SECT	6375 32	JOB
4-90 4-98 REVISIONS		001	US 190, ETC
2-94 2-12	DIST		COUNTY
1-97 2-18	WACO		BELL, ETC
			SHEET NO. 20

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

DATE: 12/16/2020 4:45:48 PM
 FILE: T:\MACTRAFF\UMCSIGNAL_2021\Standard.dwg\cp1-3-18.dgn



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

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

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

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

- GENERAL NOTES**
- Flags attached to signs where shown are REQUIRED.
 - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
 - Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
 - DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
 - When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
 - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
 - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
 - Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

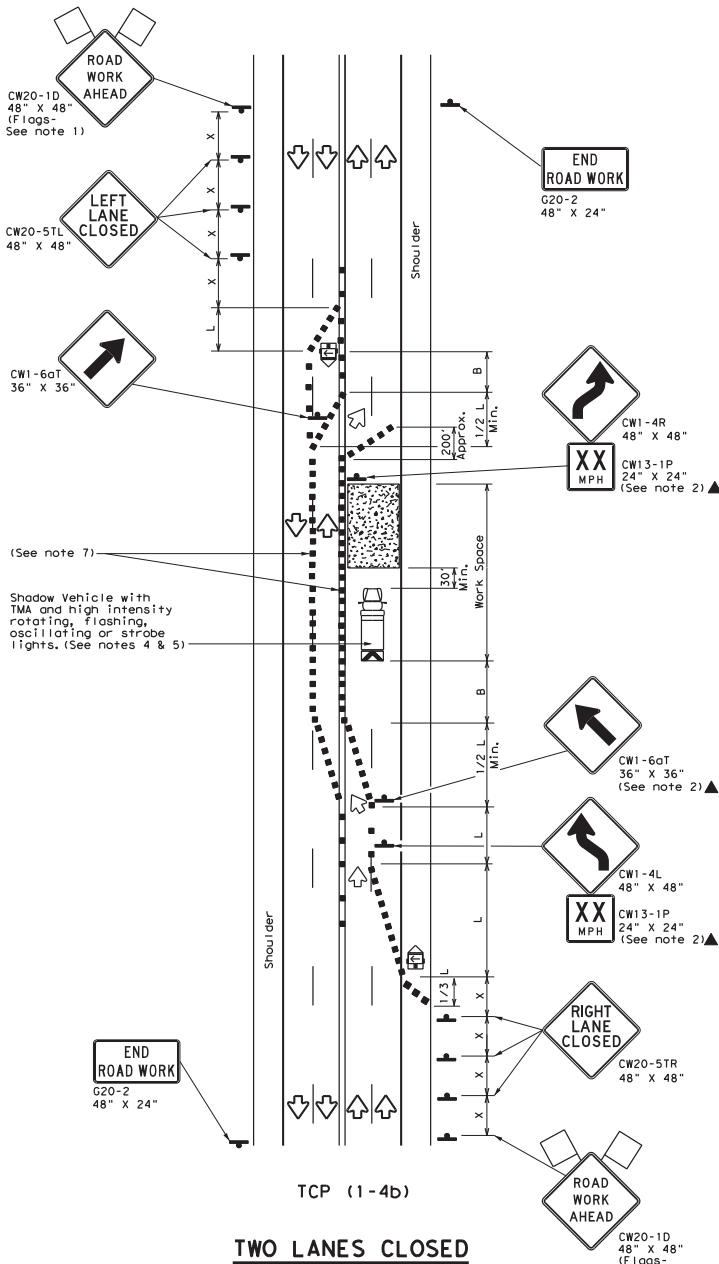
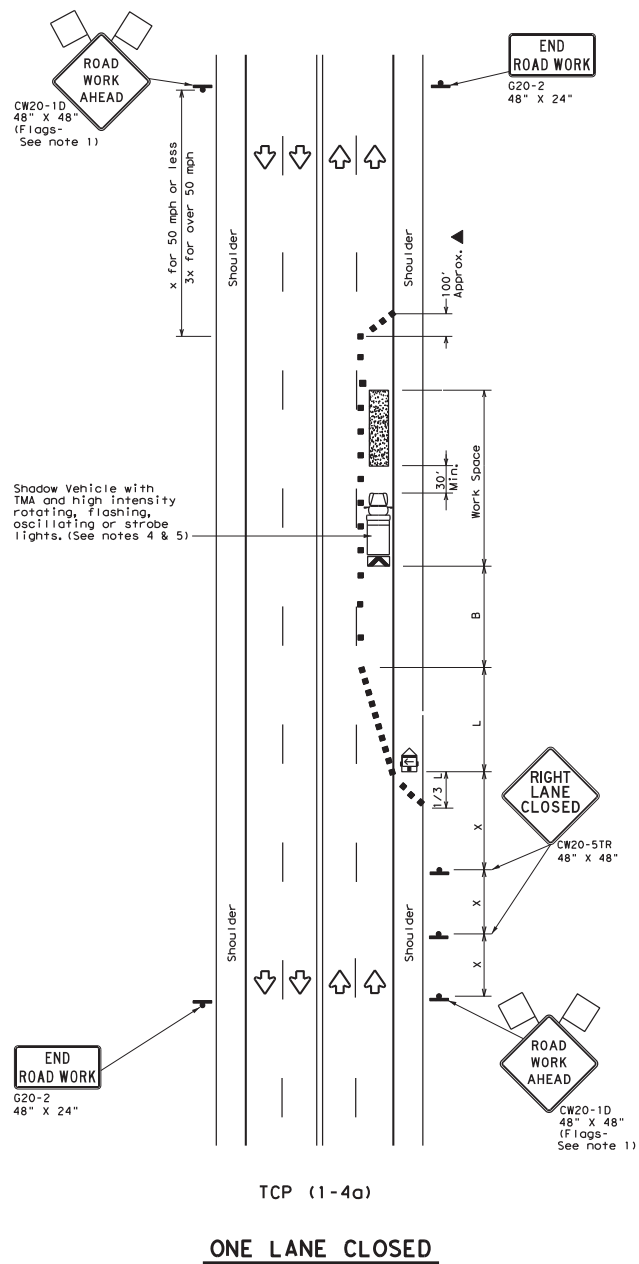
Texas Department of Transportation
 Traffic Operations Division

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON
TWO LANE ROADS
TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
2-94 4-98	6375	32	001	US 190, ETC
8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	WACO	BELL, ETC		21

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

DATE: 12/16/2020 4:45:51 PM
 FILE: T:\MACTRAFF\JMC\SIGNAL_2021\Signal.dgn\TCPI-4-18.dgn



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

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

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

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

- GENERAL NOTES**
- Flags attached to signs where shown are REQUIRED.
 - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
 - The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
 - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
 - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
- TCP (1-4a)**
- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.
- TCP (1-4b)**
- Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LANE CLOSURES ON MULTILANE
CONVENTIONAL ROADS

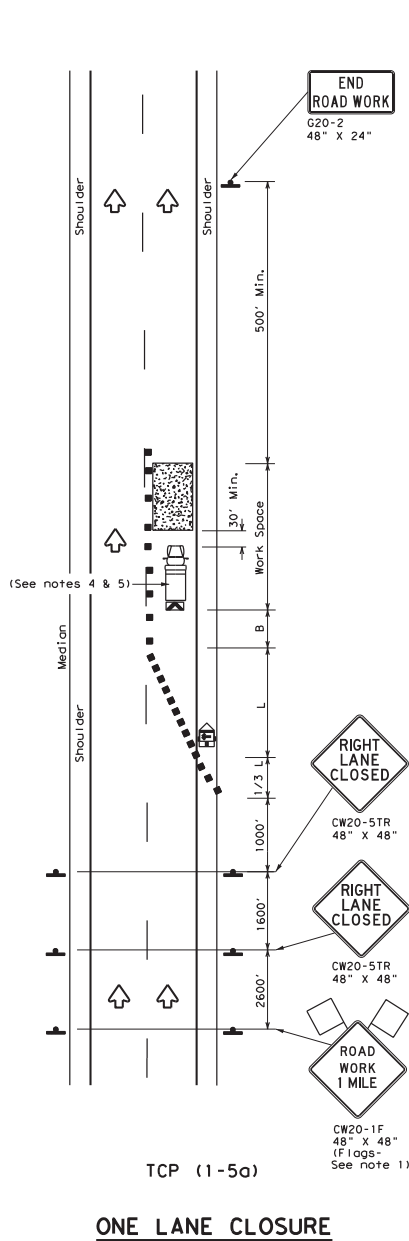
TCP (1-4) - 18

FILE: tcp1-4-18.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT SECT	JOB	HIGHWAY	
2-94	4-98	6375 32	001	US 190, ETC
8-95	2-12	DIST	COUNTY	
1-97	2-18	WACO	BELL, ETC	
				SHEET NO. 22

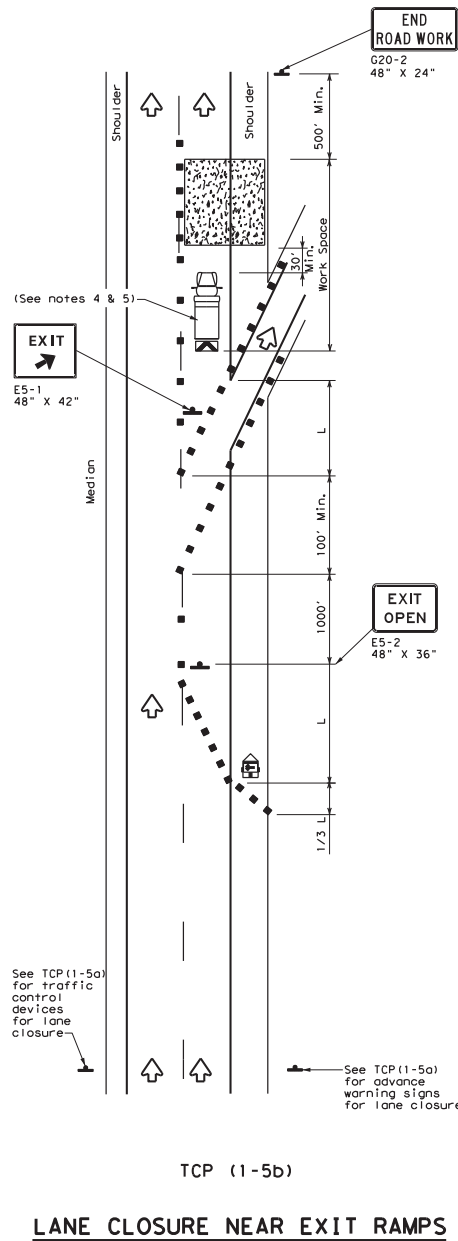
[T32]

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

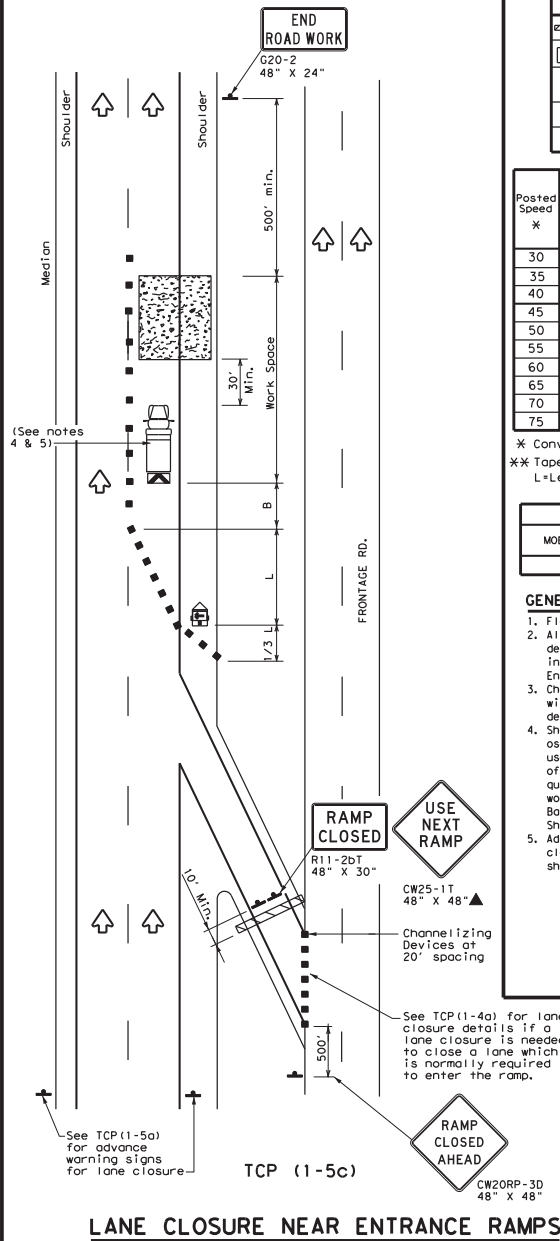
DATE: 12/16/2020 4:45:53 PM
 FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Standard.dwg\TCPI-5-18.dgn



ONE LANE CLOSURE



LANE CLOSURE NEAR EXIT RAMP



LANE CLOSURE NEAR ENTRANCE RAMP

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

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

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

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

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

Traffic Operations Division Standard

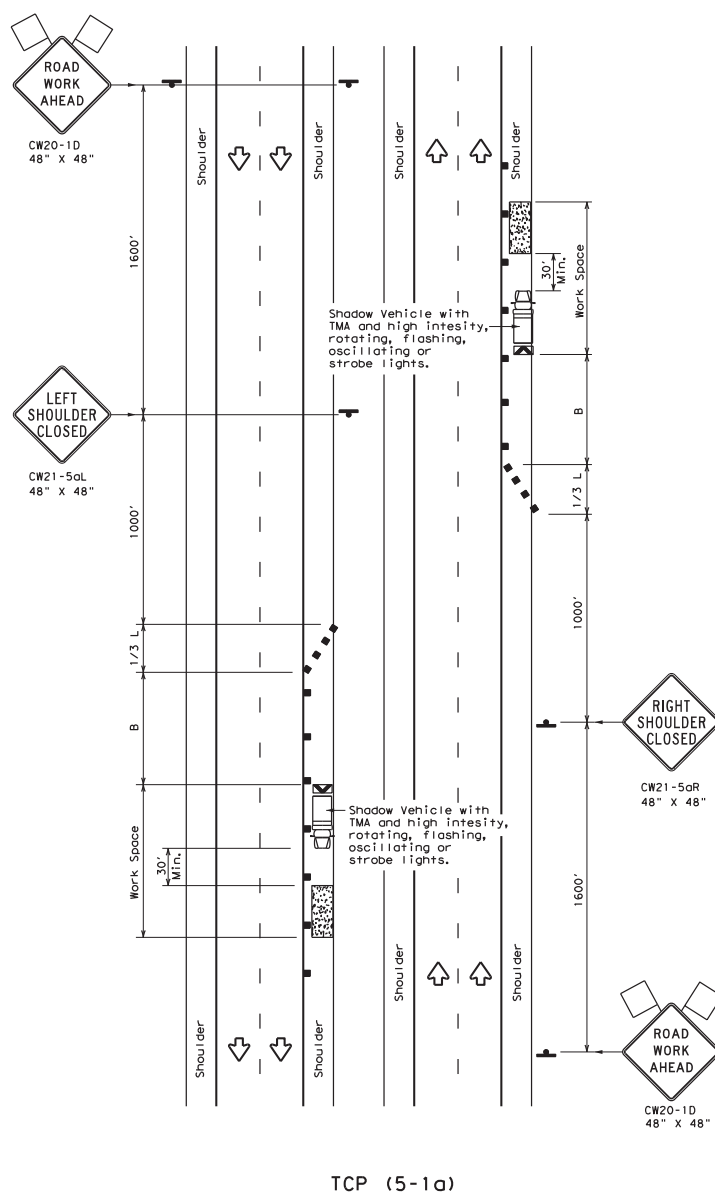
TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP (1-5) - 18

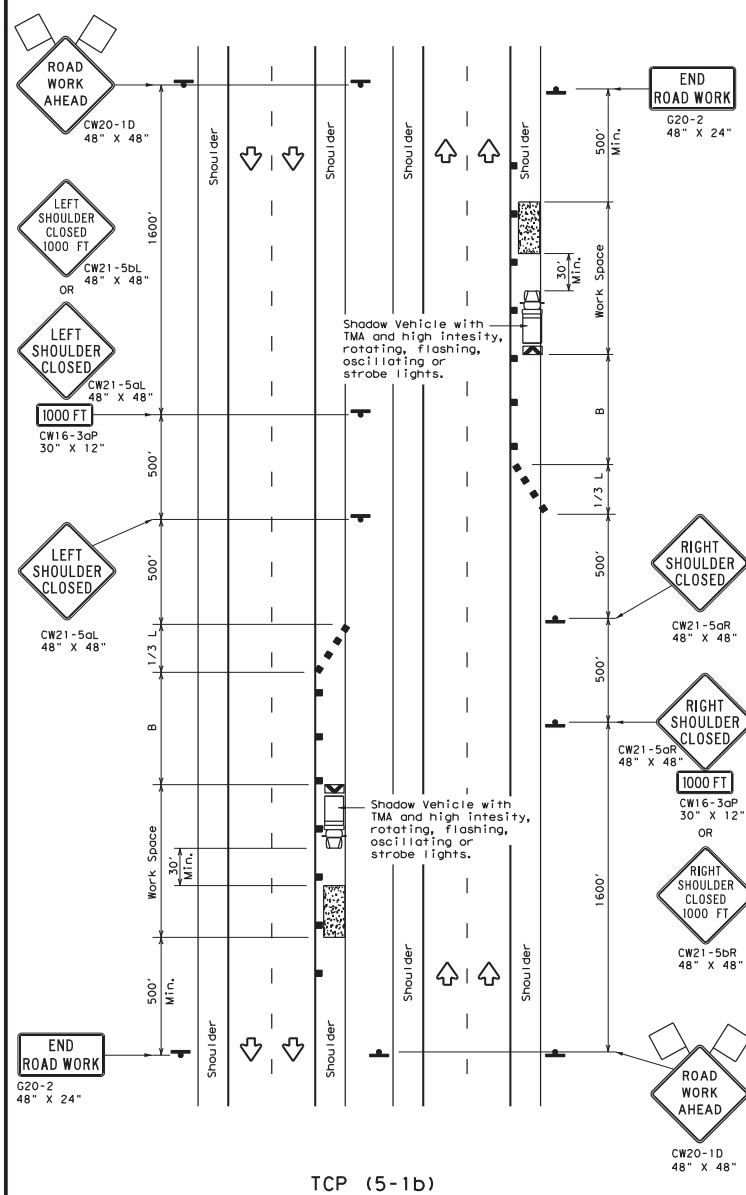
FILE:	tcp1-5-18.dgn	DATE:	TxDOT	DATE:	TxDOT	DATE:	TxDOT
REVISIONS	6375	SECTION	32	JOB	001	US	190, ETC
DIST	WACO	COUNTY	BELL, ETC	SHEET NO.	23		

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

DATE: 12/16/2020 4:45:55 PM
 FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Standard-ds\TCP5-1-18.dgn



TCP (5-1a)
WORK AREA ON SHOULDER



TCP (5-1b)
WORK AREA ON SHOULDER

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

Posted Speed * *	Formula	Minimum Desirable Taper Lengths			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
30	L = WS 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	L = WS	600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75	L = WS	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**
- A Shadow Vehicle with a TMA should be used anytime it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the performance or quality of the work. Type 3 barricades or drums may be substituted when workers on foot are no longer present when approved by the Engineer.
 - 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: TxDOT	CR: TxDOT	DR: TxDOT	EX: TxDOT
© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
2-18	DIST	COUNTY	SHEET NO.	
	WACO	BELL, ETC	24	

190

GENERAL NOTES FOR ALL ELECTRICAL WORK

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

CONDUIT

A. MATERIALS

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

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

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


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

B. CONSTRUCTION METHODS

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

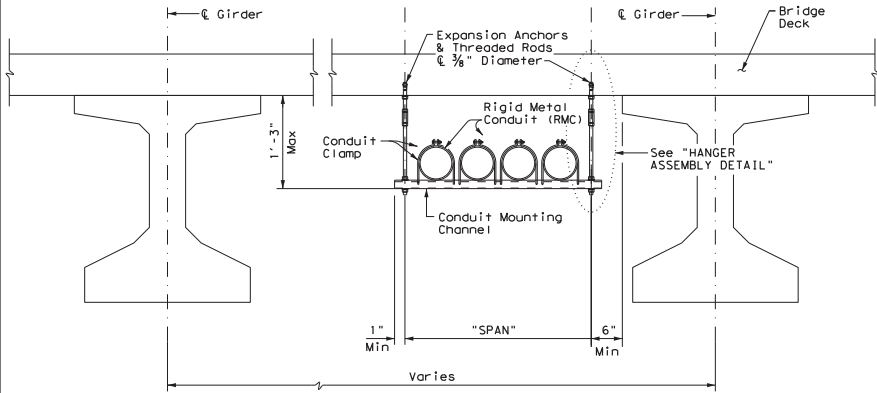
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for inaccuracies resulting from its use.

DATE: 12/16/2020 4:45:57 PM
FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Standard\ds\ed1-14.dgn

				Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS CONDUITS & NOTES</h2>					
<h3>ED(1) - 14</h3>					
FILE:	ed1-14.dgn	DATE:	October 2014	CONTRACT NO.:	6375 32
REVISIONS:		SECTION:	001	JOB:	US 190, ETC
		COUNTY:		DISTRICT:	WACO
		CITY:	BELL, ETC	SHEET NO.:	25

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

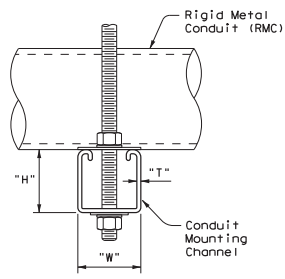
DATE: 12/16/2020 4:46:00 PM
 FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Standard-ds\ed2-14.dgn



CONDUIT HANGING DETAIL

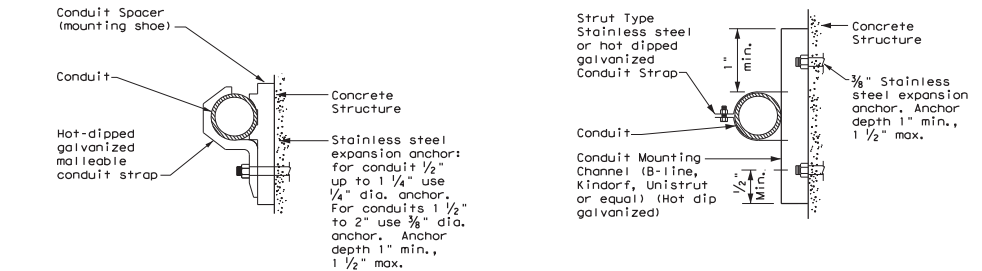
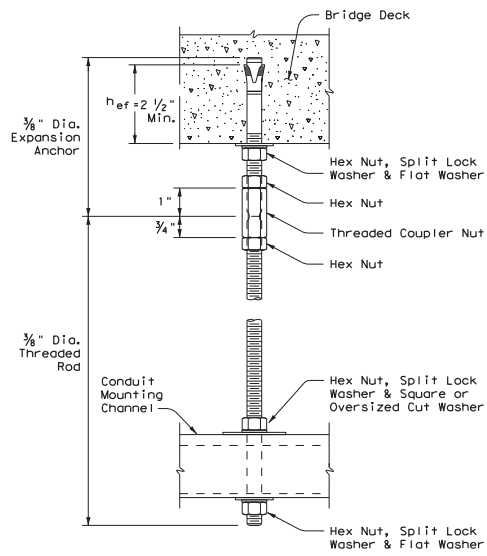
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/8"	12 Ga.

Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.



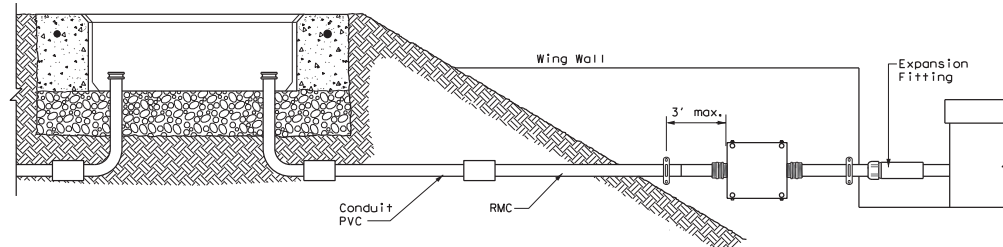
HANGER ASSEMBLY DETAIL

ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT



CONDUIT MOUNTING OPTIONS

Attachment to concrete surfaces
See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.
2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.
3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.
4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.
5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{eff}), as shown. Increase (h_{eff}) as needed to ensure sufficient thread length for proper torquing and tightening of anchors.
6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{eff}). No lateral loads shall be introduced after conduit installation.

		Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS CONDUIT SUPPORTS</h2>			
<h3>ED(2) - 14</h3>			
FILE: ed2-14.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT
REVISIONS	CONT: 6375	SECT: 32	JOB: 001
	BIST: WACO	COUNTY: BELL, ETC	SHEET NO.: 26

ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

- 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, 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.
- 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.
- 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.
- 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

- 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.
- 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.
- 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.
- Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
- 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.
- Support conductors in illumination poles with a J-hook at the top of the pole.
- 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.
- Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
- Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
- 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.
- 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.

- 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

- Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
- 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.
- Use listed wire nuts with factory applied sealant for temporary wiring where approved.
- 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.
- Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

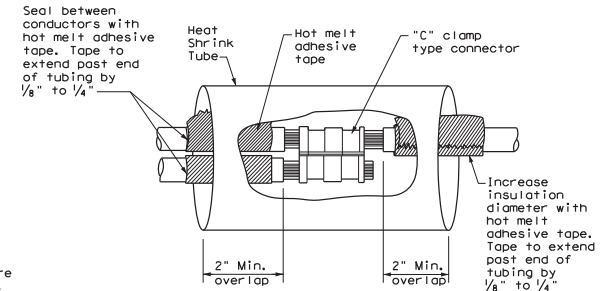
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

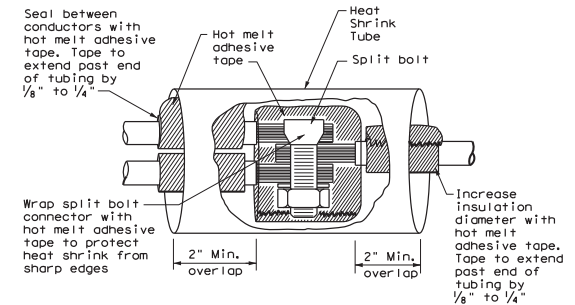
- Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in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

B. CONSTRUCTION METHODS

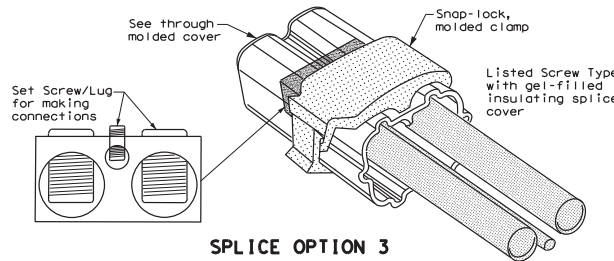
- Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
- Do not place ground rods in the same drilled hole as a timber pole.
- Install ground rods so the imprinted part number is at the upper end of the rod.
- Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
- 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.
- 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.
- 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**

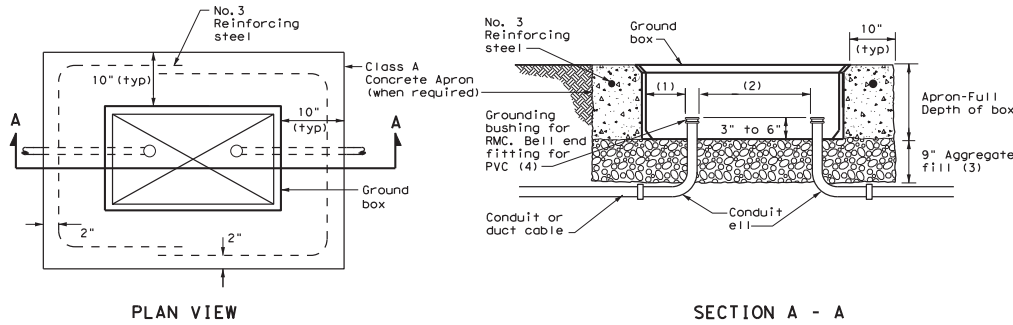
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for inaccurate results or damages resulting from its use.

DATE: 12/16/2020 4:46:01 PM
FILE: \\NACTRAFF\UMC\SIGNAL_2021\Standard-ds\ed3-14.dgn

		Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS CONDUCTORS</h2> <h3>ED(3)-14</h3>			
FILE: ed3-14.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT
REVISIONS	CONTRACT NO. 6375	SECTION 32	JOB NO. 001
	DISTRICT WACO	COUNTY BELL, ETC	SHEET NO. 27
			71C

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

DATE: 12/16/2020 4:46:05 PM
 FILE: T:\WACTRAFF\JMC\SIGNAL_2021\Standard\ds\ed4-14.dgn

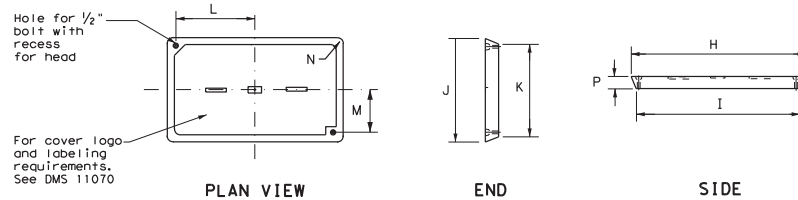


APRON FOR GROUND BOX

- (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 1/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



GROUND BOX COVER

GROUND BOXES

A. MATERIALS

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

B. CONSTRUCTION METHODS

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

				Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS</h2> <h3>GROUND BOXES</h3> <h4>ED(4) - 14</h4>					
FILE:	ed4-14.dgn	DATE:	TxDOT	CHK:	TxDOT
REVISED:	October 2014	CONT:	6375	SECT:	32
		JOB:	001	US:	190, ETC
		COUNTY:	WACO	BELL, ETC	SHEET NO.
				28	

ELECTRICAL SERVICES NOTES

- Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.
- Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services," DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)," and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.
- Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.
- Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.
- The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.
- Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.
- When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
- Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color tape on each tape. Mark with at least 6 inches of conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.
- All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.
- Provide rigid metal conduit (RMC) for all conduits on service, except for the 1/2" in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.
- Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.
- Ensure all mounting hardware and installation details of services conform to utility company specifications.
- For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.
- When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.
- Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

- Provide threaded hub for all conduit entries into the top of enclosure.
- Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.
- Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.
- Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

- Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.
- When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

- Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

*** ELECTRICAL SERVICE DATA**

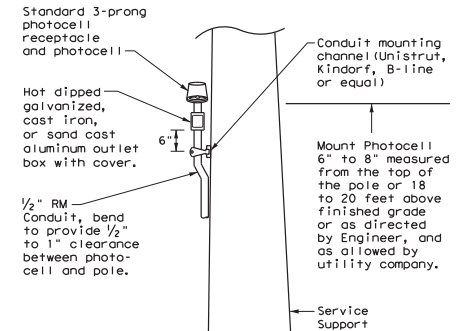
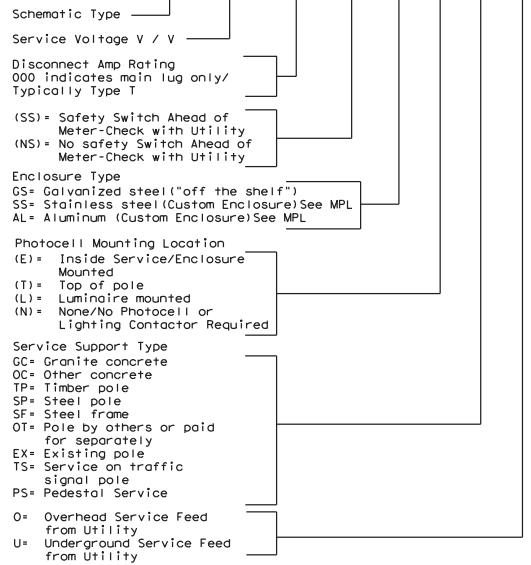
Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panel/bd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 1/4"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 1/4"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

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

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National Electrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

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



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

FILES: eds-14.dgn	DATE: TxDOT October 2014	CON: 6375	SECT: 32	JOB: 001	US: 190, ETC
REVISIONS		DIST	COUNTY	SHEET NO.	
		WACO	BELL, ETC	29	

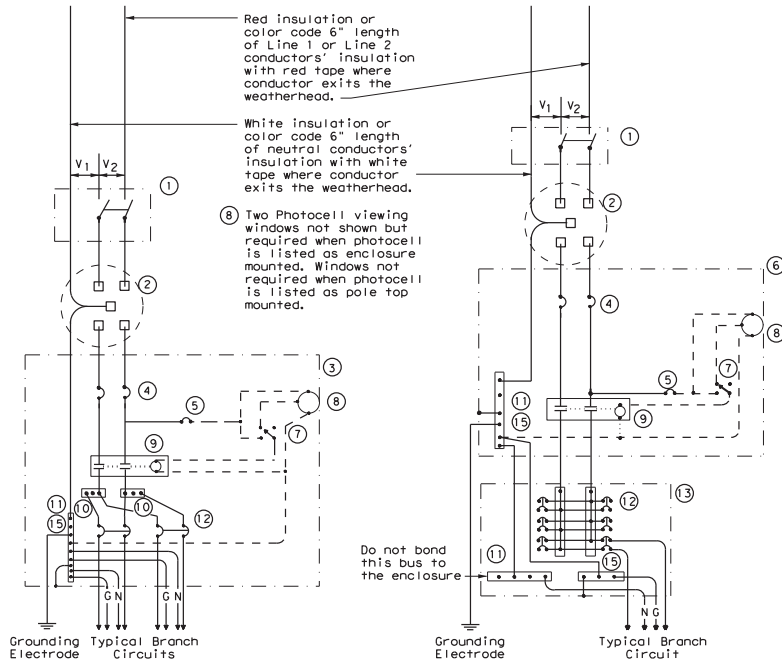
71E

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

DATE: 12/16/2020 4:46:07 PM
FILE: \\T:\ACTR\REF\IMC\SIGNAL_2021\N:\stg\ngar-gb\eds-14.dgn

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

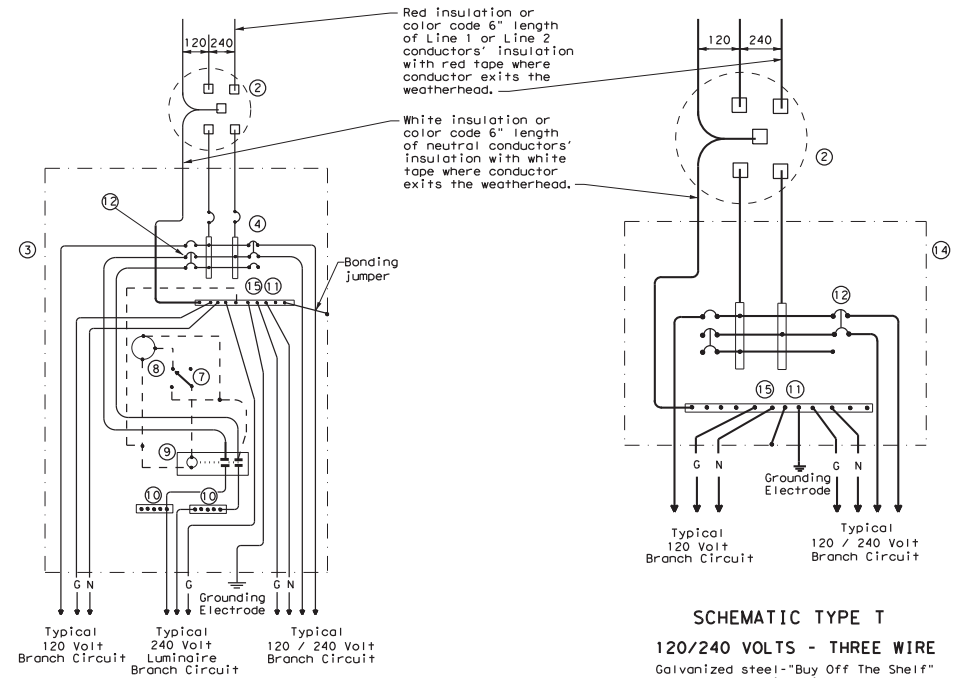
DATE: 12/16/2020 4:46:08 PM
 FILE: T:\MACTRAFF\JMC\SIGNAL_2021\Standard-ds\ed6-14.dgn



**SCHEMATIC TYPE A
THREE WIRE**

**SCHEMATIC TYPE C
THREE WIRE**

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



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

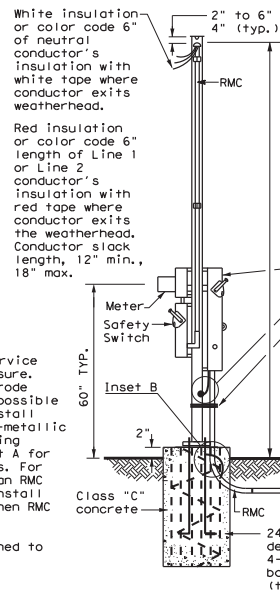
**SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE**
 Galvanized steel—"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required—verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

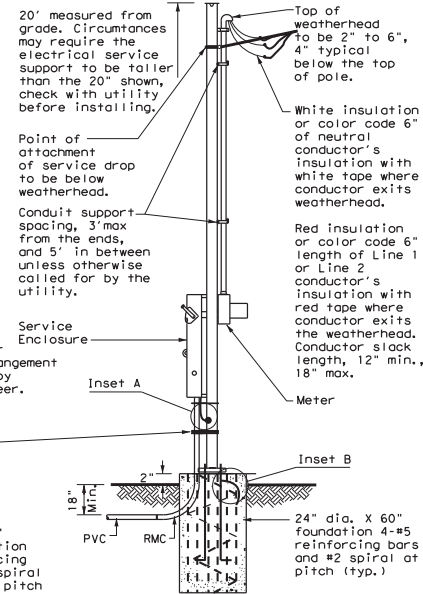
		Traffic Operations Division Standard	
ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES			
ED(6) - 14			
FILE: ed6-14.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT
© TxDOT October 2014	CONT SECT	JOB	HIGHWAY
REVISIONS	6375 32	001	US 190, ETC
BIST	COUNTY	SHEET NO.	
WACO	BELL, ETC	30	

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

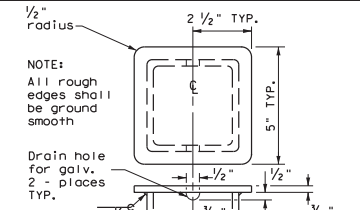
1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS) 11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 1/2 in. or 1 3/8 in. wide by 1 in. up to 3 3/4 in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stock channel. File smooth and paint field end 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 3/4 in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Ensure anchor bolts have 3 in of thread, with 3 1/4 in. to 3 1/2 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 ellis 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 1/2 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 1/4" - 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.



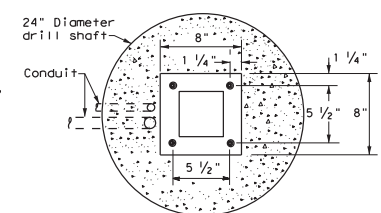
WITH SAFETY SWITCH
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



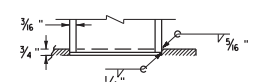
WITHOUT SAFETY SWITCH



POLE TOP PLATE

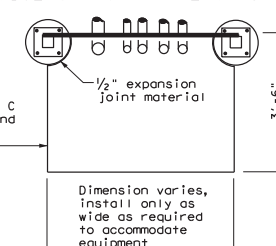


BASE PLATE DETAIL



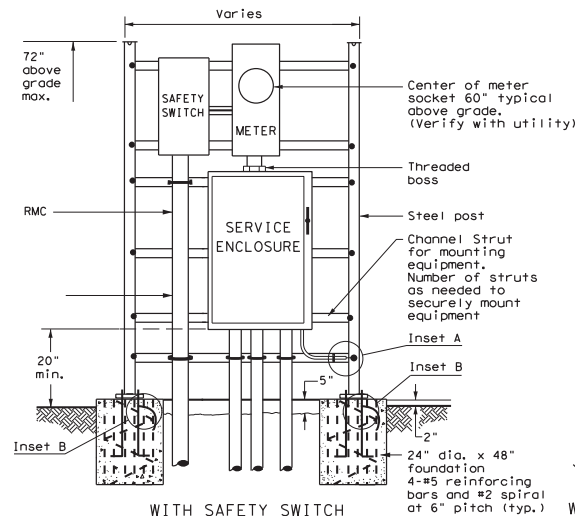
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



TOP VIEW

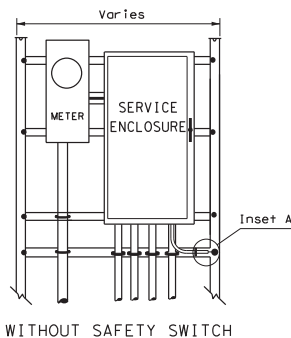
SERVICE SUPPORT TYPE SF (O) & SF (U)



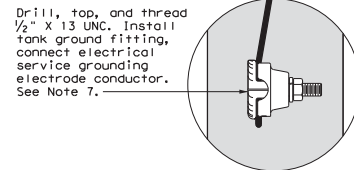
WITH SAFETY SWITCH

FRONT VIEW

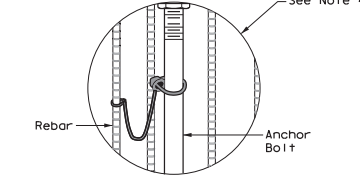
SERVICE SUPPORT TYPE SF (U) - UNDERGROUND SERVICE



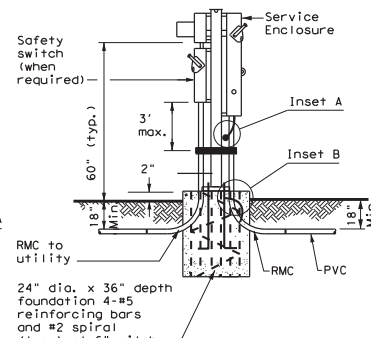
WITHOUT SAFETY SWITCH



FRONT VIEW
INSET A

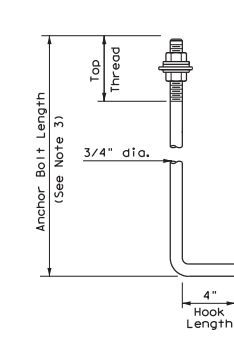


INSET B



WITH SAFETY SWITCH

SERVICE SUPPORT TYPE SP (U) - UNDERGROUND SERVICE



HOOKED ANCHOR DETAIL

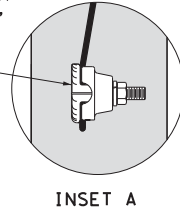
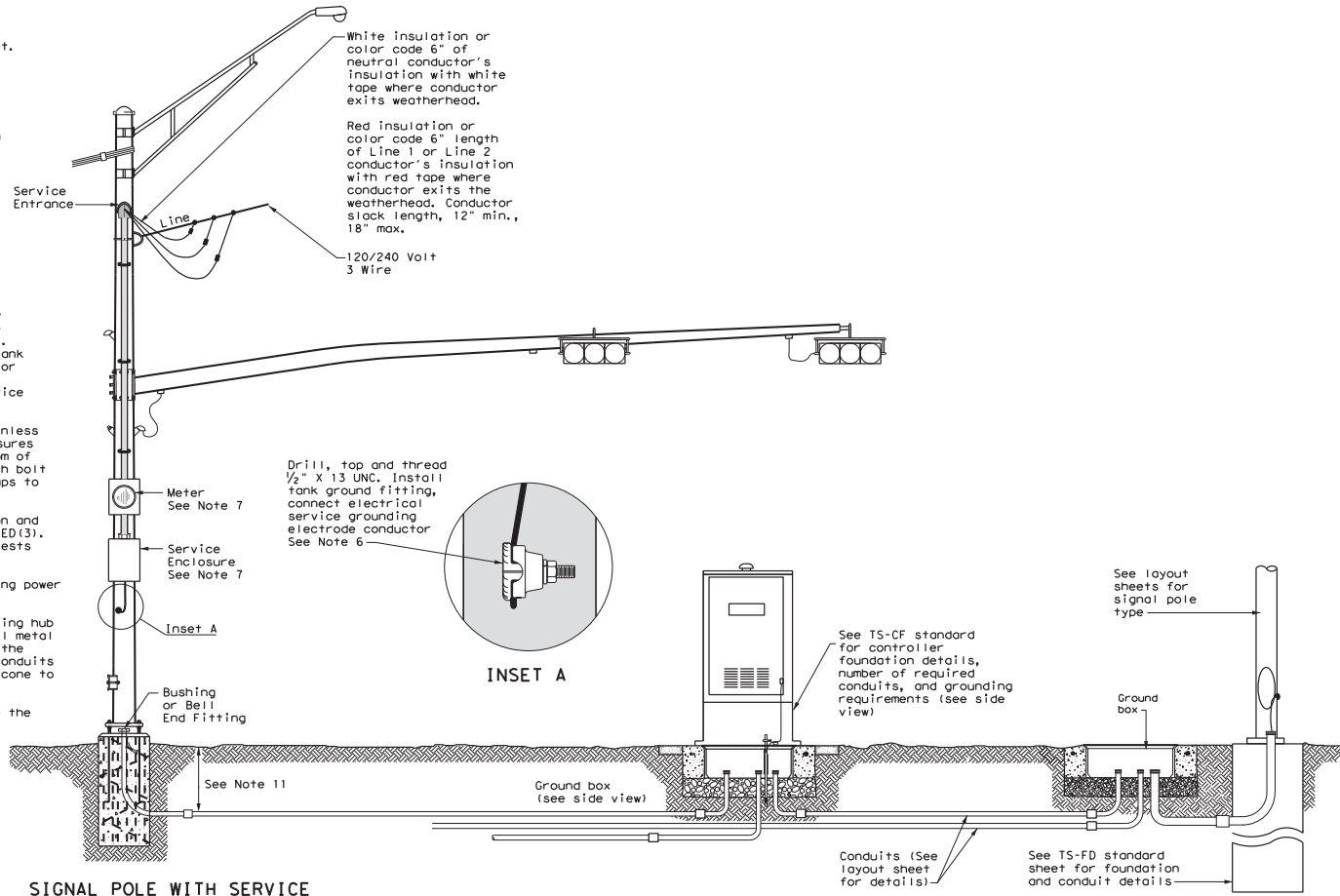
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for inaccuracies or damages resulting from its use.

DATE: 12/16/2020 4:46:12 PM
FILE: T:\MACTRAFF\RMCS\IGNAL_2021\Standard-ds\ed7-14.dgn

		Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS</h2> <h3>SERVICE SUPPORT TYPES SF & SP</h3> <h4>ED(7)-14</h4>			
FILE: ed7-14.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT
REVISIONS	CONT	SECT	JOB
6375	32	001	US 190, ETC
DIST	COUNTY	SHEET NO.	
WACO	BELL, ETC	31	

TRAFFIC SIGNAL NOTES

1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for 1/2 in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of 3/4 in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Band the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".

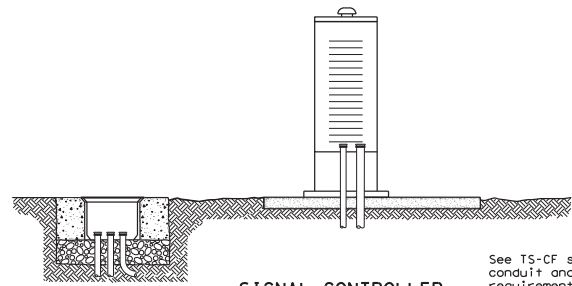


SIGNAL POLE WITH SERVICE

Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

SIGNAL CONTROLLER FRONT VIEW

SIGNAL POLE



SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.

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

DATE: 12/16/2020 4:46:15 PM
FILE: T:\MACTRAFF\UMC\SIGNAL_2021\Standard-05_Ved8-14.dgn



**ELECTRICAL DETAILS
TYPICAL TRAFFIC SIGNAL
SYSTEM DETAILS
ED(8) - 14**

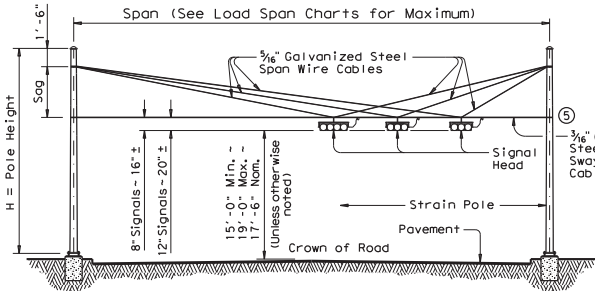
FILE: ed8-14.dgn	DN: TXDOT	CR: TXDOT	DR: TXDOT	CK: TXDOT
© TXDOT October 2014	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
REVISIONS	BIST	COUNTY	SHEET NO.	
	WACO	BELL, ETC	32	

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

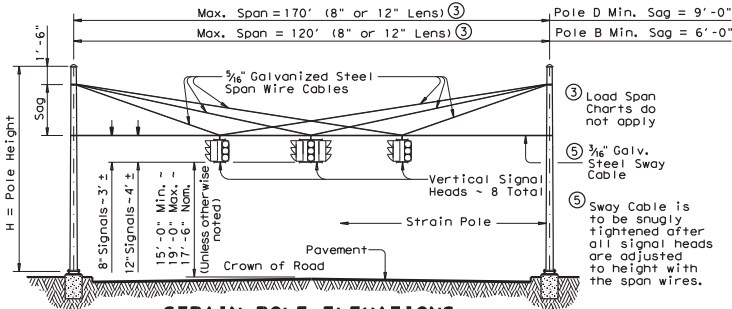
DATE: 12/16/2020 4:46:19 PM
 FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Standard-85.sp80(1).and (2)-12.dgn

STRAIN POLE DESCRIPTION	Pole Type	Founda-tion Type	Maximum Permissible Span Wire Load (lbs.)
26' Pole	A	36-A	5200
30' Pole	B	36-A	4600
30' Pole with Lum.	B	36-A	4400
30' Pole with 20' Mast Arm	C	36-B	5600
30' Pole with 24' Mast Arm	C	36-B	5500
30' Pole with 28' Mast Arm	C	36-B	5300
30' Pole with 32' Mast Arm	C	36-B	5100
30' Pole with 36' Mast Arm	C	36-B	4900
30' Pole with 20' Mast Arm & Lum.	C	36-B	5300
30' Pole with 24' Mast Arm & Lum.	C	36-B	5200
30' Pole with 28' Mast Arm & Lum.	C	36-B	5000
30' Pole with 32' Mast Arm & Lum.	C	36-B	4800
30' Pole with 36' Mast Arm & Lum.	C	36-B	4500
34' Pole	D	36-B	5600
34' Pole with Lum.	D	36-B	5400

② Numbers on Load Span Charts indicate the number of signal heads on the span. The total span wire design load is based on one 5-section head and one or more additional 3-section head(s). Design wind pressures on cables are assumed as 1.0 lb/ft. Weight of span wire cables (one per signal head) is assumed as 0.65 lb/ft which includes an allowance for conductor cables and miscellaneous hardware. The effect of the sway cable on load distribution is ignored as it is assumed to break at design wind conditions. When a pole supports 2 spans, the span wire design loads for both spans should be added vectorially to determine the design load for that pole.

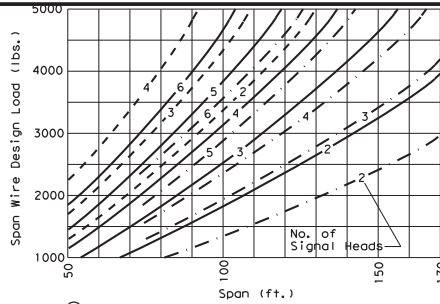


STRAIN POLE ELEVATIONS HORIZONTAL SIGNALS

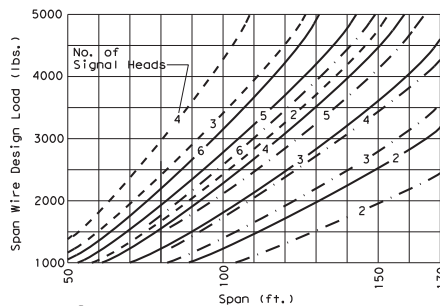


STRAIN POLE ELEVATIONS VERTICAL SIGNALS

(Mast arms are not used with vertical signals)



② SIGNALS WITH 12-INCH LENS



② SIGNALS WITH 8-INCH LENS

Signal Head Type	Wt. Per Head	Wind Area
5-Section, 12" Lens	125 lbs	9.6 sq. ft.
5-Section, 8" Lens	70 lbs	4.8 sq. ft.
3-Section, 12" Lens	75 lbs	5.64 sq. ft.
3-Section, 8" Lens	45 lbs	3.0 sq. ft.

♦ Effective projected design wind area (actual area times drag coefficient)
 - - - - - Sag = 4'-6" (26' or 30' Pole)
 - Sag = 8'-0" (30' or 34' Pole)
 - - - - - Sag = 11'-6" (34' Pole)

Pole Type	ROUND POLES				POLYGONAL POLES			
	D _B in.	D _T in.	(4)thk in.	H ft.	D _B in.	D _T in.	(4)thk in.	H ft.
A	12.5	8.9	.239	26	13.0	9.0	.239	26
B	13.5	9.3	.239	30	14.0	9.0	.239	30
C	15.5	11.3	.239	30	16.0	11.0	.239	30
D	15.5	10.7	.239	34	16.0	11.0	.239	34

D_B = Pole Base O.D. D_T = Pole Top O.D. H = Pole Height

④ Thickness shown are minimum, thicker materials may be used.

SHIPPING PARTS LIST

Poles (Without Traffic Signal Arm)						
Pole Type	Strain poles with Luminaire			Strain poles without Luminaire		
	Description	Designation	Quantity	Description	Designation	Quantity
A	Ship each pole with the following hardware attached: handhole at base, pole cap, 2 clamp-on simplex and 1 pipe plug.			Ship each pole with the following hardware attached: handhole at base, pole cap and 1 pipe plug.		
B	30' Strain Pole	SPL 30 B-80		30' Strain Pole	SP 30 B-80	
D	34' Strain Pole	SPL 34 D-80		34' Strain Pole	SP 34 D-80	

Poles (With Traffic Signal Arm)						
Pole Type	Strain poles with Luminaire			Strain poles without Luminaire		
	Description	Designation	Quantity	Description	Designation	Quantity
C	Ship each pole with the following hardware attached: handhole at base, pole cap, clamp-on simplex and 3 pipe plugs.			Ship each pole with the following hardware attached: handhole at base, pole cap and 3 pipe plugs.		
	30' SPw/TS Arm	SPL 30 C-80		30' SPw/TS Arm	SP 30 C-80	

Traffic Signal Arms (For Type C poles)						
Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	Description	Quantity	Description	Quantity	Description	Quantity
20	Ship each Type I Arm with the following hardware attached: 2 CGB Connectors, 1 clamp with bolts and washers		Ship each Type II Arm with the following hardware attached: 1 Bracket Assembly, 3 CGB Connectors and 1 clamp with bolts and washers		Ship each Type III Arm with the following hardware attached: 2 Bracket Assemblies, 4 CGB Connectors and 1 clamp with bolts and washers	
24	20I-80		24 II -80		32 III -80	
28	28I-80		28 II -80		36 III -80	
32			32 II -80			
36			36 II -80			

Anchor Bolt Assemblies (1 per pole)

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

Luminaire Arms

Nominal Arm Length	Quantity
8' Arm	

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

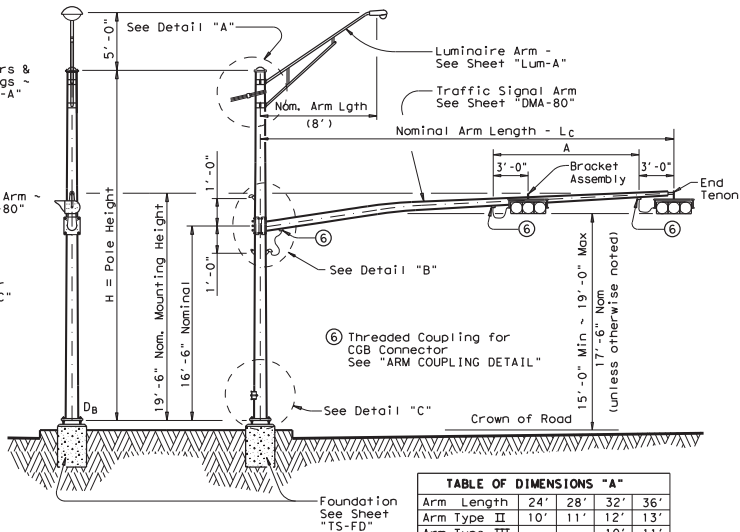
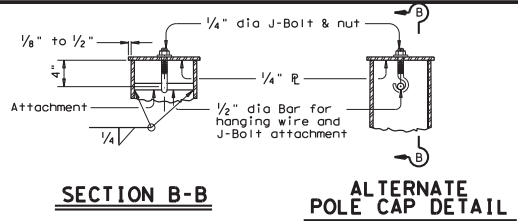
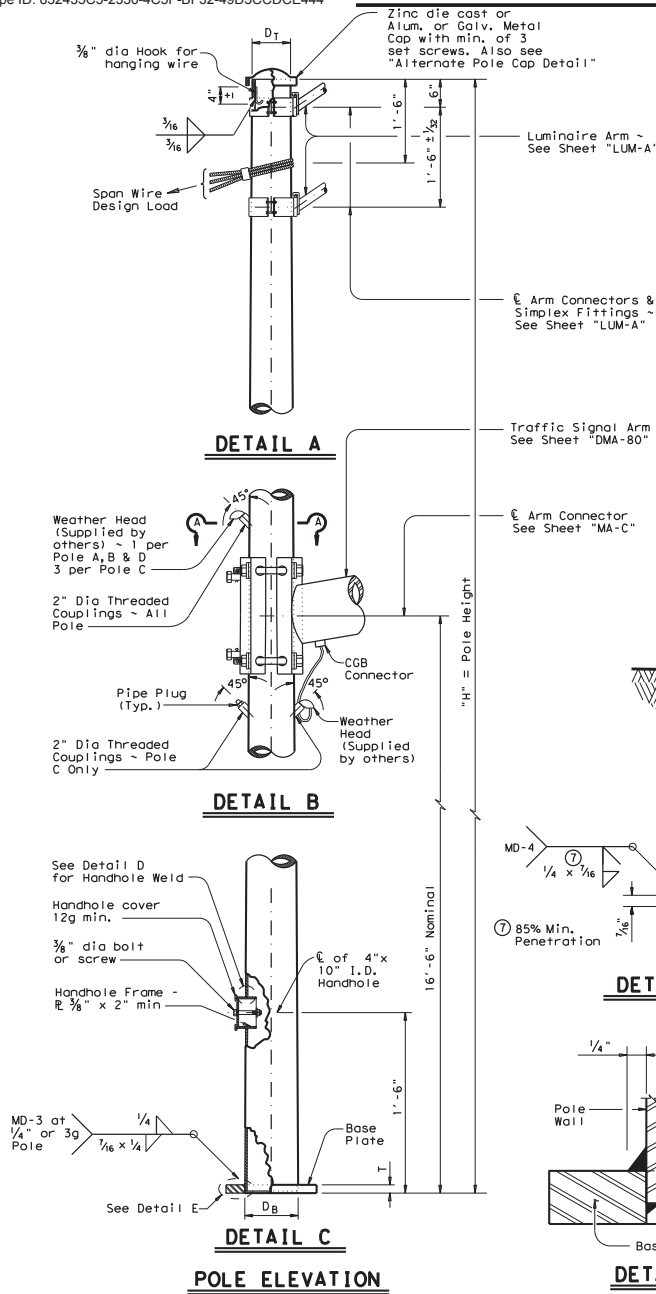
① See Sheet "DMA-80"

Texas Department of Transportation
 Traffic Operations Division
TRAFFIC SIGNAL SUPPORT STRUCTURES STRAIN POLE ASSEMBLIES
 (80 MPH WIND ZONE)
SP-80(1)-12

REVISIONS		DATE	BY	CHKD	APP'D
6-86	1-12	6375	32	001	US 190, ETC
WACO		BELL, ETC		33	

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

DATE: 12/16/2020 4:46:20 PM
 FILE: T:\NACTRAFF\UMC\SIGNAL_2021\Standard-88.sp80(1) and (2)-12.dgn



MATERIALS	
Round Shafts or Polygonal Shafts ^③	ASTM A595 Gr. A, A588, A1008 HSLAS Gr. 50 Class 2, A1011 HSLAS Gr. 50 Class 2, A572 Gr. 50 or A1011 SS Gr. 50 ^⑩
Plates ^④	ASTM A36, A588, or A572 Gr. 50
Connection Bolts	ASTM A325 except where noted
Pin Bolts	ASTM A325
Pipe ^⑤	ASTM A53 Gr. B, A501, A1008 HSLAS-F Gr. 50, A1011 HSLAS-F Gr. 50
Steel Cable	ASTM A475, 7 Wire Utilities Grade
Misc. Hardware	Galvanized steel or stainless steel or as noted

^③ ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

^⑩ ASTM A1011 SS Gr. 50 shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES

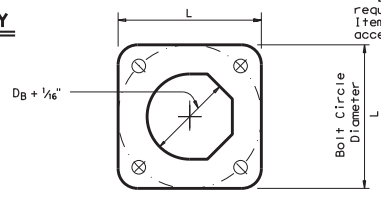
Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. The maximum permissible span wire design loads tabulated are calculated at a stress load of 1.4 times the basic allowable stress. A simultaneous wind on the pole, mast arm, and luminaire is also included.

See standard sheet "DMA-80" for details of clamp-on traffic signal arms, sheet "MA-C" for traffic signal arm connection details, sheet "LUM-A" for luminaire arm and connection details, and sheet "TS-FD" for anchor bolt and foundation details.

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

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

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



Foundation Type	Anchor Bolt Diameter	Bolt Hole Diameter	Bolt Circle Diameter	Base R. Dim. L x T
36-A	1 3/4"	2"	19"	19" x 1 3/4"
36-B	2"	2 1/4"	21"	21" x 2"

Texas Department of Transportation
 Traffic Operations Division
TRAFFIC SIGNAL SUPPORT STRUCTURES STRAIN POLE ASSEMBLIES
 (80 MPH WIND ZONE)
SP-80(2)-12

REVISIONS		CONTRACT	SECTION	JOB	HIGHWAY
6-96	1-12	6375	32	001	US 190, ETC
		DIST	COUNTY		SHEET NO.
		WACO	BELL, ETC		34

© TxDOT March 1996

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

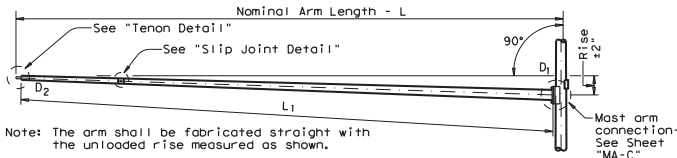
DATE: 12/16/2020 4:46:23 PM
 FILE: T:\WACTRAFF\IMC\SIGNAL_2021\Standard-80(SMA-80(1)) and (2)-12.dgn

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

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

D_B = Pole Base O.D.
 D₁₉ = Pole Top O.D. with no Luminaire and no ILSN
 D₂₄ = Pole Top O.D. with ILSN w/out Luminaire
 D₃₀ = Pole Top O.D. with Luminaire
 D₁ = Arm Base O.D.
 D₂ = Arm End O.D.
 L₁ = Shaft Length
 L = Nominal Arm Length

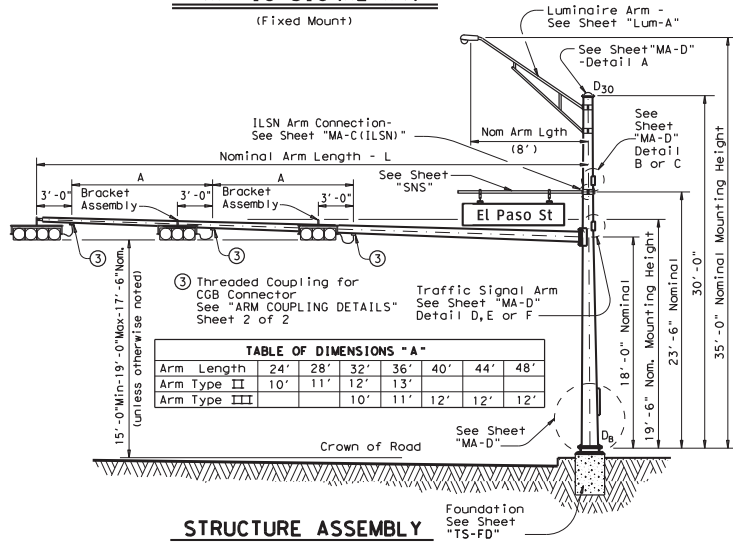
- ① Thickness shown are minimums, thicker materials may be used.
- ② D₂ may be increased by up to 1" for polygonal arms.



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

TRAFFIC SIGNAL ARM

(Fixed Mount)



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

Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type II	10'	11'	12'	13'			
Arm Type III		10'	11'	12'	12'	12'	12'

SHIPPING PARTS LIST

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

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-80		20S-80		20-80	
24	24L-80		24S-80		24-80	
28	28L-80		28S-80		28-80	
32	32L-80		32S-80		32-80	
36	36L-80		36S-80		36-80	
40	40L-80		40S-80		40-80	
44	44L-80		44S-80		44-80	
48	48L-80		48S-80		48-80	

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

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80			
32			32II-80		32III-80	
36			36II-80		36III-80	
40					40III-80	
44					44III-80	
48					48III-80	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	

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

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

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

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

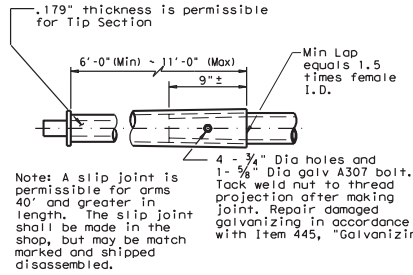
Templates may be removed for shipment.

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

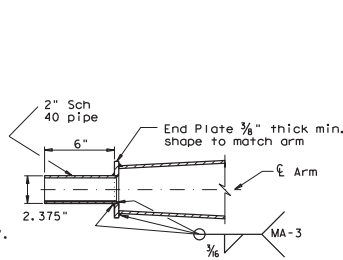
© TxDOT August 1995		DN:	CK:	DM:	CK:
REVISIONS					
5-96	11-99	6375	32	001	US 190, ETC
				COUNTY	SHEET NO.
				WACO	BELL, ETC
					35

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

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



SLIP JOINT DETAIL



TENON DETAIL

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

BRACKET ASSEMBLY

VIBRATION WARNING

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

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

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

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

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

GENERAL NOTES:

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

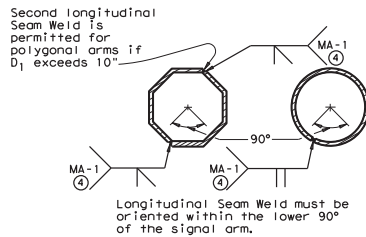
Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective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

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

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

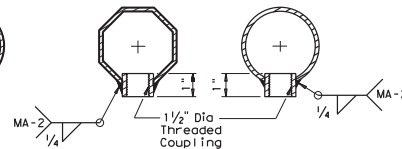
Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

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




ARM WELD DETAIL

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



ARM COUPLING DETAILS


Texas Department of Transportation
 Traffic Operations Division
TRAFFIC SIGNAL
SUPPORT STRUCTURES
SINGLE MAST ARM ASSEMBLY
(80 MPH WIND ZONE)
SMA-80(2)-12

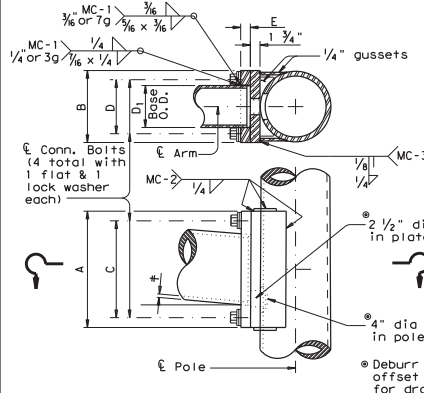
© TxDOT August 1995		DN:	CK:	DM:	CK:
REVISIONS					
5-96	1-12	CONT	SECT	JOB	HIGHWAY
		6375	32	001	US 190, ETC
		DIST	COUNTY	SHEET NO.	
		WACO	BELL, ETC	36	

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

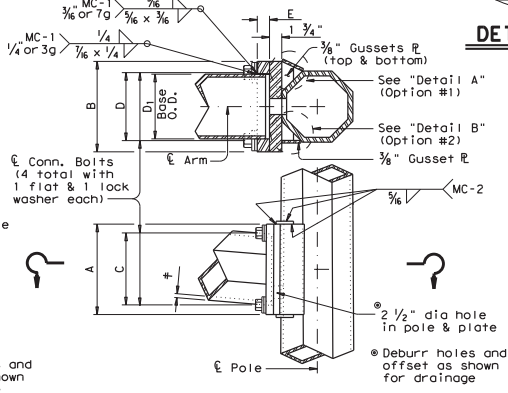
DATE: 12/16/2020 4:46:27 PM
 FILE: T:\MACTRAFF\JMCSIGNAL_2021\Standard-05-mac-12.dgn

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

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



FIXED MOUNT DETAIL 1

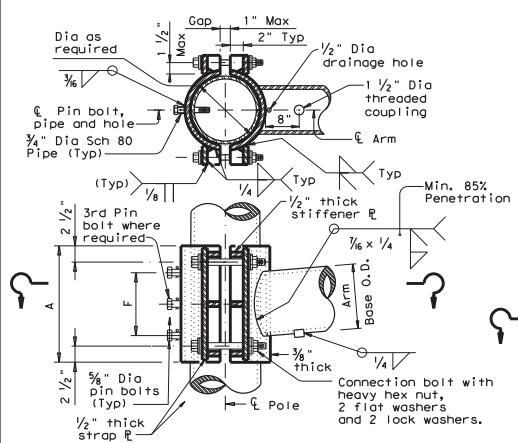


FIXED MOUNT DETAIL 2

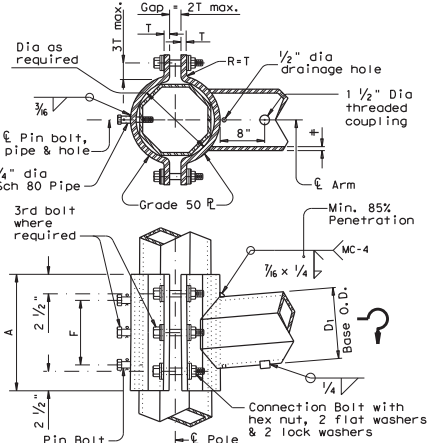
ARM SIZE		A	F	CONN. BOLTS	PIN BOLTS
D ₁	#	in.	in.	No. Dia	No. Dia
6.5	.179	12	6	4 1/2	2 3/8
7.5	.179	14	8	4 1/2	2 3/8
8.0	.179	14	8	4 1/2	2 3/8
9.0	.179	16	10	4 1/2	2 3/8
9.5	.179	18	12	4 1/2	3 3/8
9.5	.239	18	12	4 1/2	3 3/8
10.0	.239	18	12	4 1/2	3 3/8

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

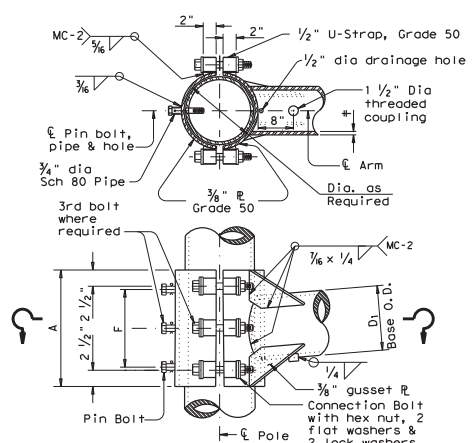
ARM SIZE		A	F	CONN. BOLTS	PIN BOLTS
D ₁	#	in.	in.	No. Dia	No. Dia
6.5	.179	12	6	4 1/2	2 3/8
7.5	.179	14	8	4 1/2	2 3/8
8.0	.179	14	8	4 1/2	2 3/8
9.0	.179	16	10	4 1/2	2 3/8
9.5	.179	18	12	6 1/2	3 3/8
9.5	.239	18	12	6 1/2	3 3/8
10.0	.239	18	12	6 1/2	3 3/8



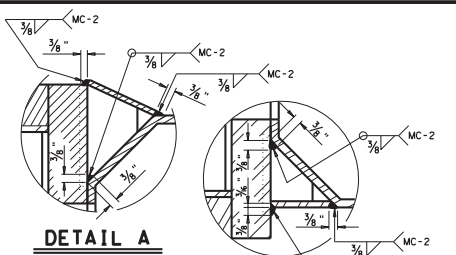
CLAMP-ON DETAIL 1



CLAMP-ON DETAIL 2

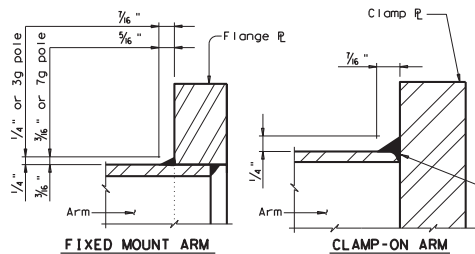


CLAMP-ON DETAIL 3



DETAIL A

DETAIL B



ARM BASE WELD DETAILS

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

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

GENERAL NOTES:

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

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

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

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

NOTE:

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

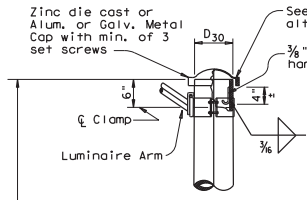
Texas Department of Transportation
 Traffic Operations Division
STANDARD ASSEMBLY
FOR TRAFFIC SIGNAL
SUPPORT STRUCTURES
MAST ARM CONNECTIONS
MA-C-12

© TxDOT August 1995		DN:	CK:	DM:	CK:
REVISIONS					
REV	DATE	BY	CHKD	APP'D	REASON
1-96					
1-99					
12					
CONT SECT		JOB		HIGHWAY	
6375 32		001		US 190, ETC	
DIST		COUNTY		SHEET NO.	
WACO		BELL, ETC		37	

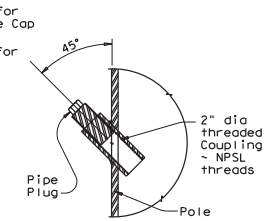
126A

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

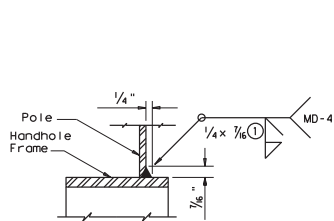
DATE: 12/16/2020 4:46:30 PM
 FILE: T:\NACTRAFF\IMC\SIGNAL_2021\Standard-ds.mxd-12.dgn



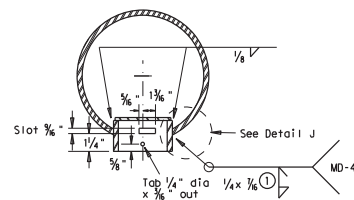
DETAIL A
(for pole with luminaire)



POLE COUPLING DETAIL

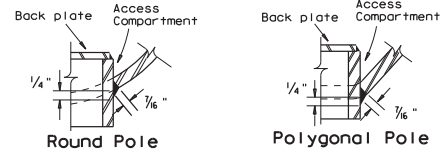


DETAIL G

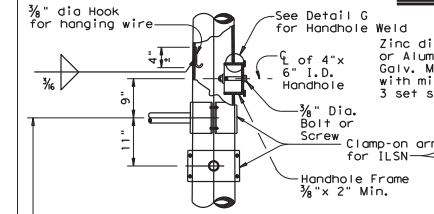


SECTION X-X

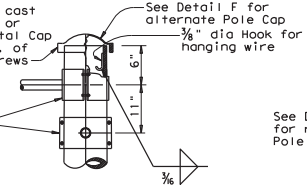
Opening for access compartment shall be no more than 1/8 inch wider than the access compartment itself.



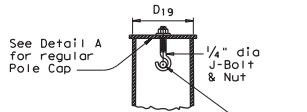
DETAIL J



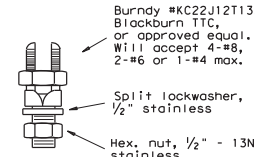
DETAIL B
(If ILSN applied)



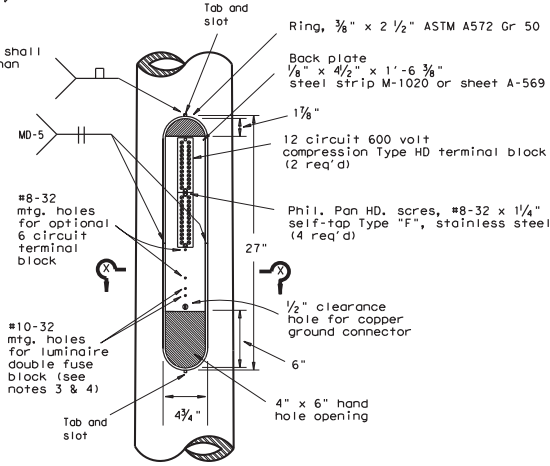
DETAIL C



SECTION Y-Y



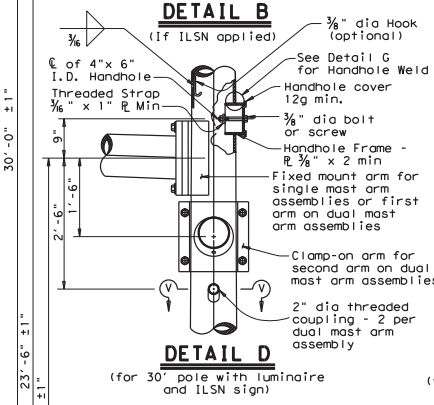
COPPER GROUND CONNECTOR



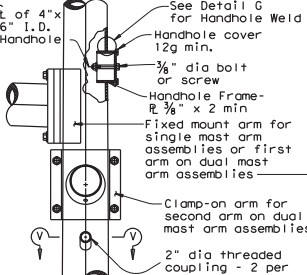
ACCESS COMPARTMENT

NOTES:

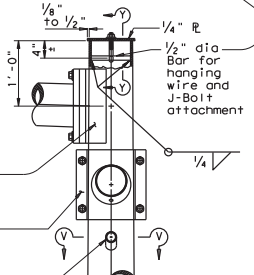
- The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20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



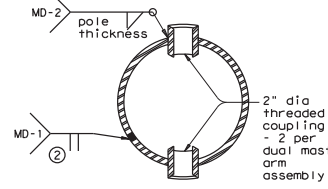
DETAIL D
(for 30" pole with luminaire and ILSN sign)



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

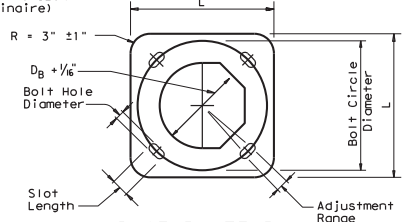


DETAIL F
(for 19" pole with no ILSN sign and no luminaire)



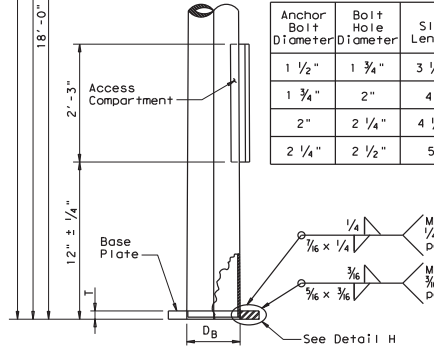
SECTION V-V

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

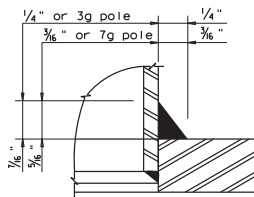


BASE PLATE PLAN

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



POLE ELEVATION



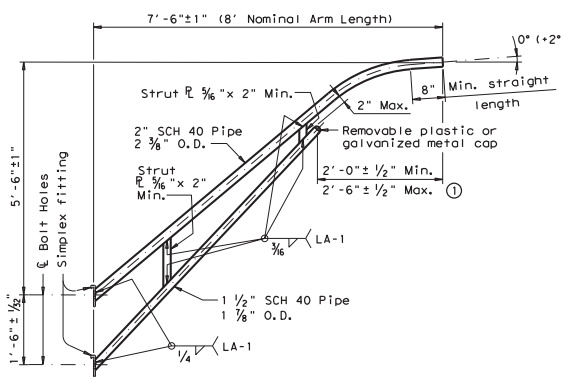
DETAIL H

TRAFFIC SIGNAL SUPPORT STRUCTURES
MAST ARM POLE DETAILS
MA-D-12

© TxDOT August 1995		DN: MS	CK: JSY	DN: FDN	CK: CAL
REVISIONS		CONT	SECT	JOB	HIGHWAY
8-99		6375	32	001	US 190, ETC
1-12		DIST	COUNTY	SHEET NO.	
		WACO	BELL, ETC	38	

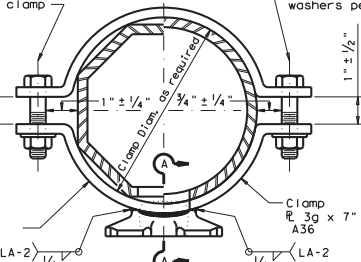
The use of this standard is governed by the "Texas Engineering Practices Act". No warranty, of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 12/16/2020 4:46:36 PM
 FILE: T:\NACTRAFF\JMC\STGNAL_2021\Standard\DS\Lum-a-12.dgn

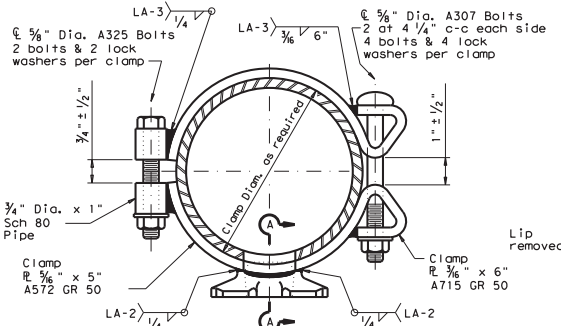


8-FOOT LUMINAIRE ARM

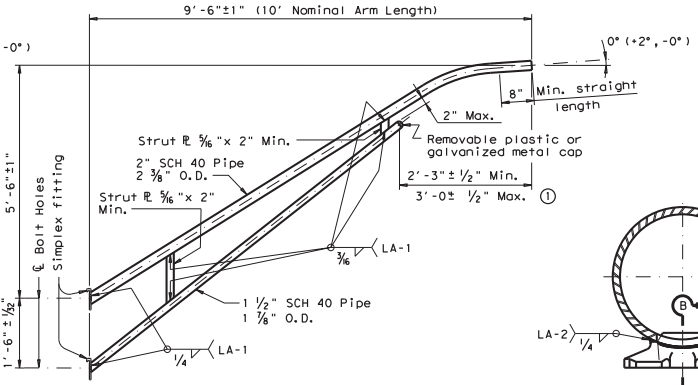
1/2" Dia. A307 Bolts
 2 at 4" c-c each side
 4 bolts & 4 lock washers per clamp
 1" ± 1/2"



CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

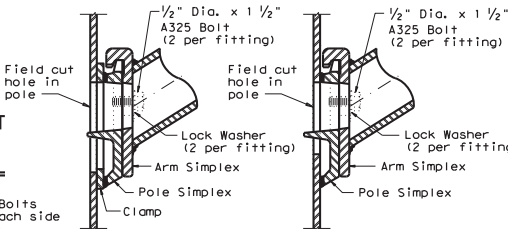


CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)



10-FOOT LUMINAIRE ARM

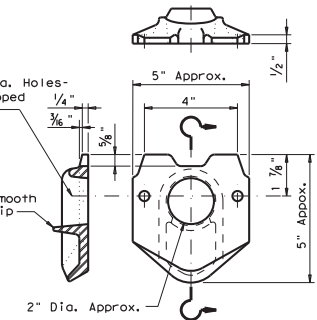
1/2" Dia. A307 Bolts
 2 at 5" c-c each side
 4 bolts & 4 lock washers per clamp
 1" ± 1/2"



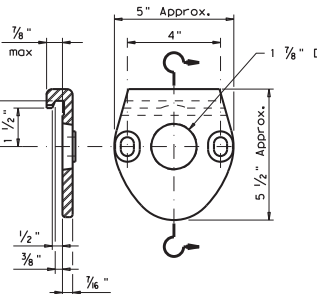
UPPER SIMPLEX FITTING

LOWER SIMPLEX FITTING

SECTION A-A



POLE SIMPLEX DETAIL



ARM SIMPLEX DETAIL

DIRECT ATTACHMENT DETAIL

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr. 65-35 or A148 Gr. 80-50, A576 Gr. 1021 (3), or A36 (Arm only)
Arm Pipes	ASTM A53 Gr. B, A501, A1008 HSLAS-F Gr. 50 (4), or A1011 HSLAS-F Gr. 50 (4)
Arm Strut Plates (2)	ASTM A36, A572 Gr. 50 (4), or A588
Misc.	ASTM designations as noted

- ① Dimensional limits are given to show acceptable variation in design. All of a fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.
- ② Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- ③ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.
- ④ ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:
 Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminares, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".
 Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

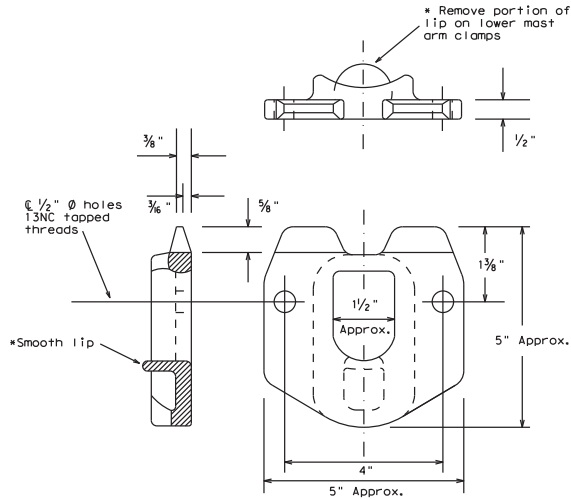
If clamp assemblies are ordered without poles, the fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.

Texas Department of Transportation
 Traffic Operations Division
STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES
ARM DETAILS
LUM-A-12

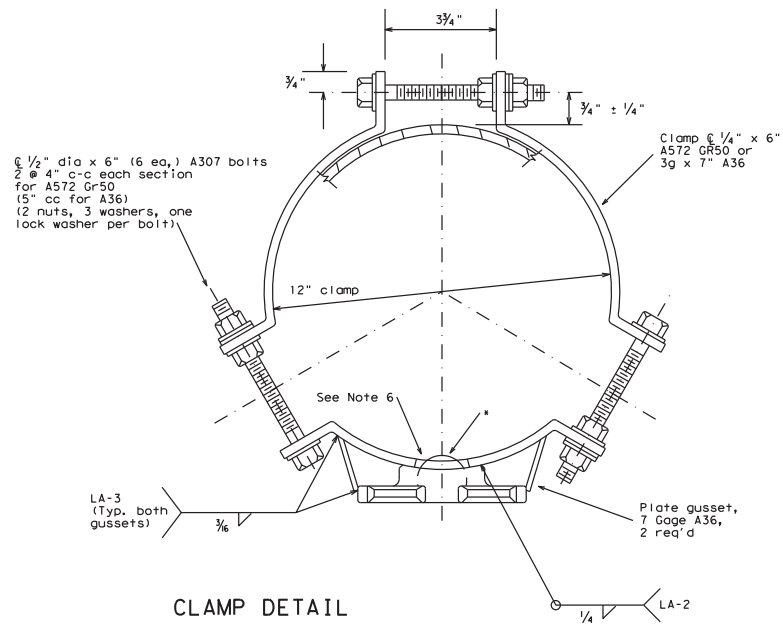
© TxDOT August 1995		DN:	CK:	DM:	CK:
5-96	REVISIONS	CONT	SECT	JOB	HIGHWAY
1-99		6375	32	001	US 190, ETC
1-12		DIST	COUNTY	SHEET NO.	
		WACO	BELL, ETC		40

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

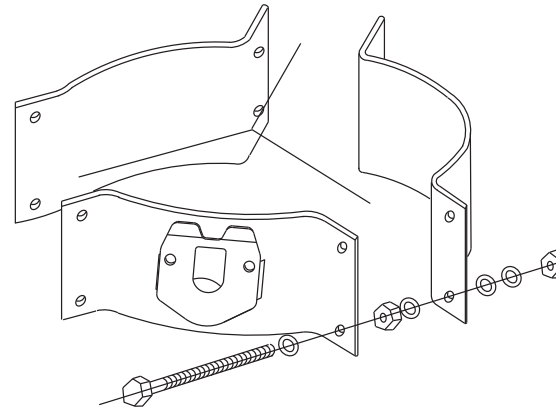
DATE: 12/16/2020 4:46:37 PM
 FILE: T:\WACTRAFF\JMC\SIGNAL_2021\Standard-ds\CFa-12.dgn



POLE SIMPLEX DETAILS



CLAMP DETAIL



PROJECTION

For 8.9 - 12 inch diameter Signal Poles
(Two req'd for each mast arm)

OTHER MATERIALS:

1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.
2. Welded tabs and backplates shall be ASTM A-36 steel or better.
3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.
3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, 1/2 in. X 1 1/2 in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft., 12 ft. maximum arm length.
5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.
6. Approximately 2 in. diameter hole in upper mast arm clamp.

Texas Department of Transportation
Traffic Operations Division

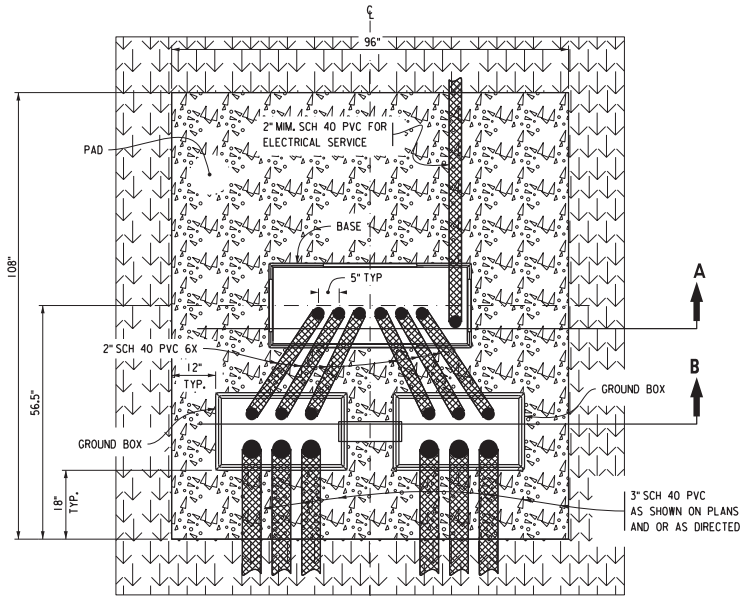
**CLAMP ON
FITTING ASSEMBLY FOR
LUMINAIRE MAST ARM**

CFA-12

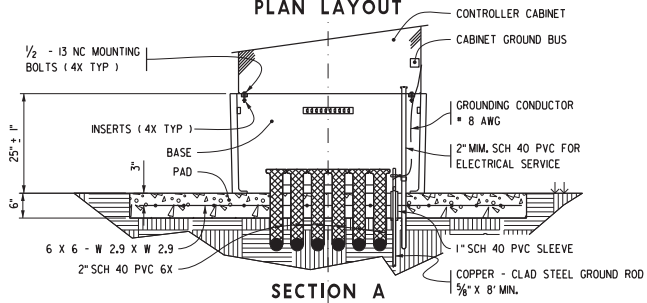
© TxDOT		DN:	CK:	DN:	CK:
REVISIONS					
NO.	DATE	BY	REASON	NO.	DATE
11-99					
1-12					
6375	32		001	US 190, ETC	
				COUNTY	SHEET NO.
				BELL, ETC	41

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

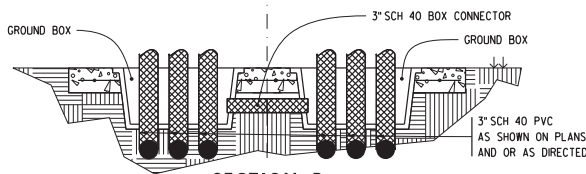
DISCLAIMER: DATE: 12/16/2020 4:46:43 PM FILE: T:\NACTRAFF\JMC\STIGNAL_2021\Standard\TS-CF_DETAIL.dgn



PLAN LAYOUT



SECTION A



SECTION B

TRAFFIC SIGNAL CONTROLLER BASE:

1. PROVIDE A TRAFFIC SIGNAL CONTROLLER BASE (CABINET BASE) MANUFACTURED OF POLYMER CONCRETE MATERIAL CONSISTING OF CALICAREOUS AND SILICEOUS STONE, GLASS FIBERS AND THERMOSET POLYESTER RESIN. THE POLYMER CONCRETE CABINET BASE MUST BE REINFORCED ON THE INSIDE OF THE CABINET BASE WITH FIBERGLASS MATTING. PROVIDE ONE OF THE FOLLOWING BASES: ARMORCAST PART # A600848X24, QUAZITE MODEL # PG3048Z709, OR OTHER AS APPROVED BY TxDOT TRAFFIC OPERATION DIVISION.
2. THE POLYMER CONCRETE MATERIAL MUST HAVE A MINIMUM COMPRESSIVE STRENGTH OF 10,300 POUNDS PER SQUARE INCH (PSI), MINIMUM FLEXURAL STRENGTH OF 3600 PSI, AND MINIMUM SHEAR STRENGTH OF 3600 PSI.
3. THE POLYMER CONCRETE CABINET BASE MUST CONFORM TO THE DIMENSIONS SHOWN AND MUST ACCOMMODATE A STANDARD TxDOT BASEMOUNT CABINET.
4. SUPPLY THE CABINET BASE WITH 1/2" - 13 UNC STAINLESS STEEL INSERTS FOR ATTACHMENT OF THE CABINET TO THE BASE. INSERTS MUST WITHSTAND A MINIMUM TORQUE OF 50 FT-LB AND A MINIMUM STRAIGHT PULL OUT STRENGTH OF 750 LBS.
5. PROVIDE THE CABINET BASE WITH 4 CABLE RACKS MOUNTED ONE ON EACH SIDE OF THE BASE 2" TO 7" FROM THE TOP EDGE OF THE BASE. UNLESS APPROVED OTHERWISE, CABLE RACKS MUST BE 1-1/2" X 9/16" X 3/16" INCH STEEL CHANNEL WITH EIGHT T-SLOTS SPACED AT 1-1/2 INCHES. THE CABLE RACKS MUST EASILY ACCOMMODATE THE INSERTION OF TIE WRAPS TO ATTACHFIELD WIRING TO THE RACKS TO SERVE AS STRAIN RELIEF. SECURE CABLE RACKS TO THE BASE USING 1/2" - 13 UNC STAINLESS STEEL SCREWS AND INSERTS.
6. THE CABINET BASE, WHEN SECURED TO THE CONCRETE SLAB WITH CONTROLLER CABINET ATTACHED, MUST WITHSTAND A MINIMUM WIND LOAD OF 125 MPH OR A 850 LB FORCE APPLIED AT 49° ABOVE THE BOTTOM OF THE BASE WITHOUT CAUSING THE BASE OR CABINET TO COME OUT OF THEIR ANCHORED POSITION OR CAUSE ANY PERMANENT DEFORMATION. THE MANUFACTURER MUST SUPPLY CERTIFICATION BY AN INDEPENDENT TESTING LABORATORY OR SEALED BY A TEXAS LICENSED PROFESSIONAL ENGINEER. PROVIDE THE CABINET BASE WITH HARDWARE FOR ATTACHMENT TO A CONCRETE SLAB.
7. THE TRAFFIC SIGNAL BASE MUST BE PERMANENTLY MARKED EITHER BY IMPRESS OR BY PERMANENT INK WITH THE MANUFACTURER'S MODEL NUMBER AND NAME OR LOGO.
8. SEAL THE BASE TO THE CONCRETE WITH A SILICONE CAULK BEAD AND FASTENED TO THE SLAB PER MANUFACTURER'S INSTRUCTIONS.

CONCRETE SLAB:

9. TRAFFIC SIGNAL CONTROLLER PAD MUST BE A PORTLAND CEMENT CONCRETE SLAB POURED IN PLACE, MUST CONFORM TO THE DIMENSIONS SHOWN, AND MUST BE LEVEL.
10. BOND A #8 AWG COPPER GROUND WIRE AND AN 8 FT GROUND ROD BONDED TO THE REINFORCING MESH BY A SUITABLE UL LISTED CLAMP AND TERMINATED TO THE CABINET GROUNDING BUS FOR THE PURPOSE OF PROVIDING A LOCAL GROUND FOR THE ELECTRICAL GROUNDING CONDUCTOR. THE ELECTRICAL GROUNDING CONDUCTOR SPECIFIED IN ITEM 680-3.A.4 IS REQUIRED AND MUST BE TERMINATED TO THE CABINET GROUND BUS.
11. INSTALL A PVC SLEEVE TO PREVENT THE GROUND ROD FROM DIRECT EMBEDMENT IN THE SLAB.
12. PROVIDE WELDED WIRE MESH 6X6-W2.9 X W2.9 FOR REINFORCEMENT. PROVIDE JOINTS AND SPLICES IN THE MESH WITH A MINIMUM 6-INCH OVERLAP. CENTER THE MESH BETWEEN TOP AND BOTTOM AND PROVIDE A MINIMUM 3 INCH COVER ON THE EDGES.
13. PROVIDE CLASS B CONCRETE MINIMUM FOR THE SLAB IN ACCORDANCE WITH ITEM 421. CONSTRUCT THE SLAB IN ACCORDANCE WITH ITEM 531.

CONDUITS:

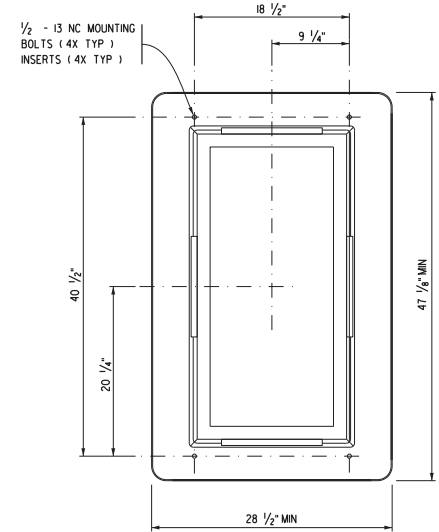
14. STUB UP AND RUN 3-INCH CONDUITS THROUGH THE SLAB TO THE VARIOUS TRAFFIC SIGNAL POLES AND GROUND BOXES AS SHOWN ON THE LAYOUTS. INSTALL THE NUMBER OF CONDUITS AS SHOWN ON LAYOUTS PLUS TWO ADDITIONAL 3 INCH CONDUITS FOR FUTURE USE. TERMINATE THE CONDUITS WITH A BUSHING BETWEEN 2 AND 4-INCHES ABOVE THE SLAB.
15. EXTEND CONDUITS FOR FUTURE USE INTO PROPOSED GROUND BOXES. CAP AND SEAL SO THAT THE SEAL CAN BE REMOVED WITHOUT DAMAGING THE COUPLING.
16. STUB UP TWO SEPARATE CONDUITS THROUGH THE SLAB FROM THE ELECTRICAL SERVICES. RUN THE CONDUIT FOR THE ELECTRICAL FEED DIRECTLY TO THE ELECTRICAL SERVICE ENCLOSURE.
17. TERMINATE ELECTRIC ABOVE THE SLAB WITH A COUPLING. AFTER THE BASE IS INSTALLED, EXTEND THE CONDUITS ABOVE THE TOP OF THE BASE AND SECURE TO THE BASE USING A STEEL ONE HOLE STRAP OR SIMILAR SUITABLE SUBSTITUTE.

CONTROLLER CABINET:

18. ANCHOR THE CONTROLLER CABINET TO THE BASE USING FOUR STAINLESS STEEL 1/2-13 NC BOLTS.
19. THE SILICONE CAULK BEAD SPECIFIED IN ITEM 680.3.B MUST BE RTV 133.

PAYMENT:

20. BID TS-CF AS SUBSIDIARY TO ITEM 680 6002 FOR CSJ'S 0049-01-094, 0056-03-065, AND 2506-01-040 OTHERWISE BID AS 690 6040 AS SHOWN IN PLANS
21. GROUND BOXES WILL BE PAID UNDER ITEM 624 AS SHOWN ELSEWHERE IN PLANS.



Chris D. Pruitt, P.E.

12/17/2020

Texas Department of Transportation
 © 2018

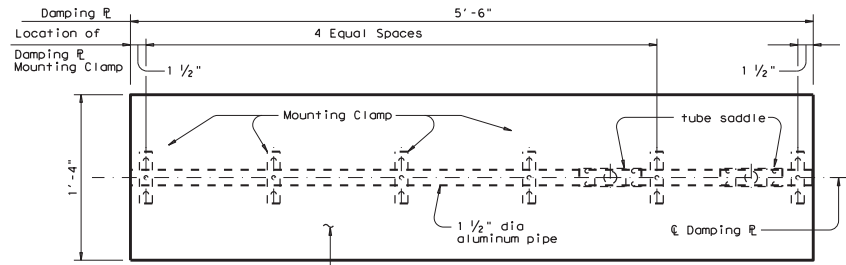
TS-CF DETAIL

TRAFFIC SIGNAL CONTROLLER
CABINET BASE AND PAD

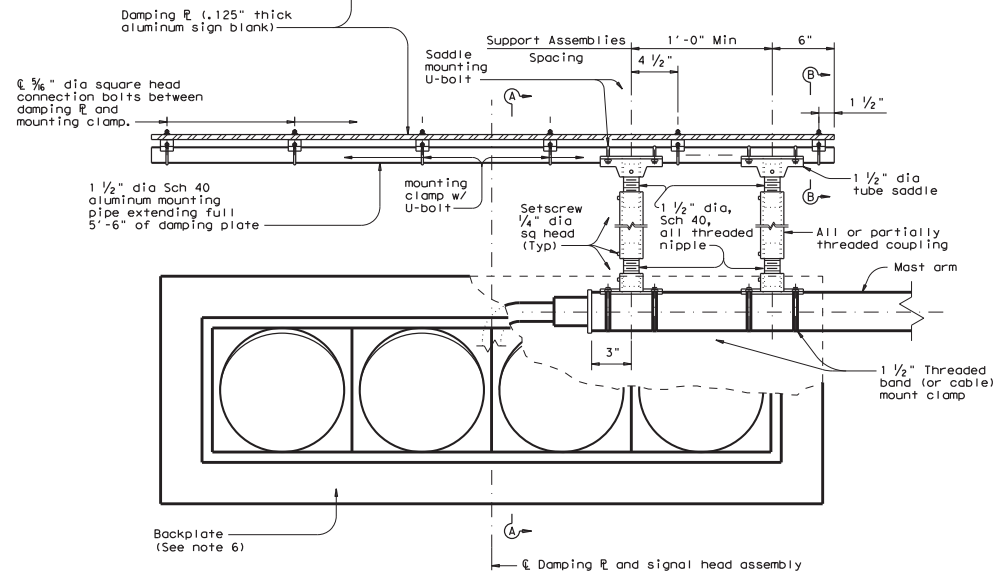
© TxDOT October 2000		DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
12-04	REVISIONS	CONT SECT	JOB	HIGHWAY	
		6375 32	001	US 190, ETC	
		DIST	COUNTY	SHEET NO.	
		WACO	BELL, ETC	42	

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

DATE: 12/16/2020 4:46:47 PM
 FILE: T:\MACTRAFF\IMC\SEGAL_2021\Standard-ds\ma-dpd-20.dgn



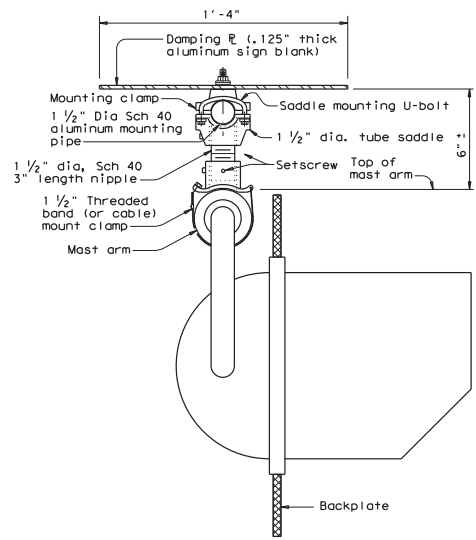
PLAN



ELEVATION

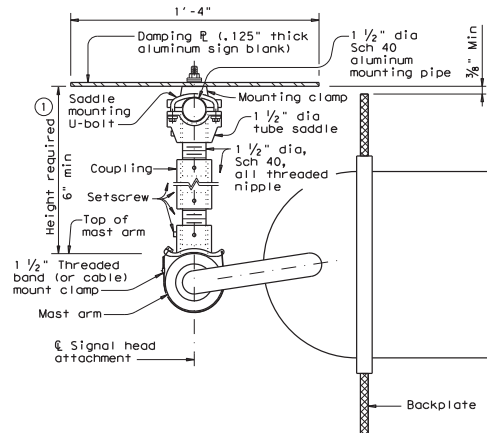
DAMPING PLATE MOUNTING DETAILS

(Showing alternate placement of signal head)



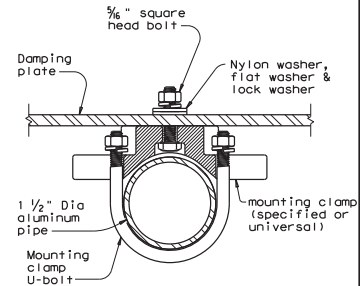
SECTION A-A

(Showing standard placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)



SECTION A-A

(Showing alternate placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)



SECTION B-B

(Showing damping plate attachment)

GENERAL NOTES:

- In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.
- Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and U-bolt assemblies will conform to Standard sheet SMD (GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.
- Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.
- Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "galvanizing".
- Contractor will verify applicable field dimensions before the installation.
- Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B₁ or C₁ retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

① Recommended supporting assemblies to achieve required height for horizontal section heads

Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 3/4"	3"	-	-
7"-8 1/2"	4"	-	-
9"-10 1/2"	6"	-	-
11"-15 1/2"	-	4"	5"
16"-24"	-	6"	10"

Texas Department of Transportation

Traffic Safety Division Standard

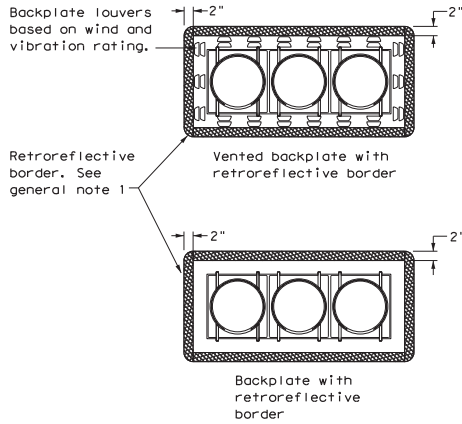
MAST ARM DAMPING PLATE DETAILS

MA-DPD-20

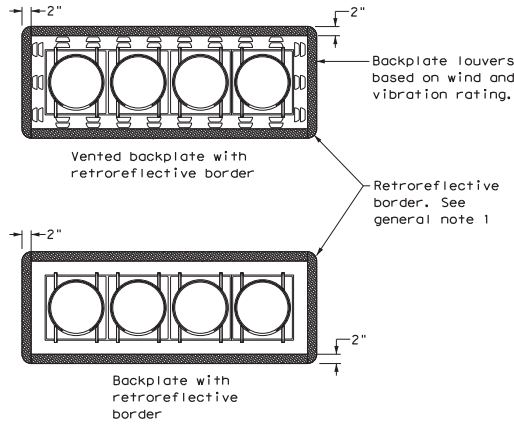
FILE: ma-dpd-20.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT	CHK: TxDOT
© TxDOT January 2012	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
6-20 REVISIONS	DIST: WACO	COUNTY: BELL, ETC	SHEET NO. 43	

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

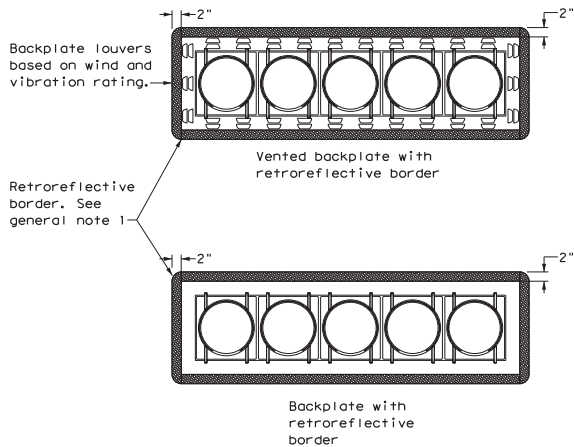
DATE: 12/16/2020 4:46:51 PM
 FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Standard-ds\ts-bp-20.dgn



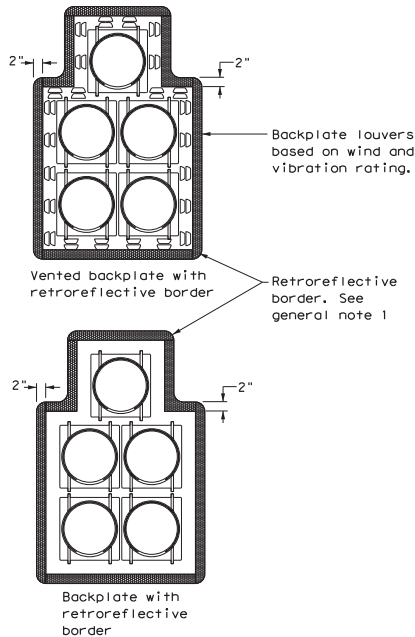
THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



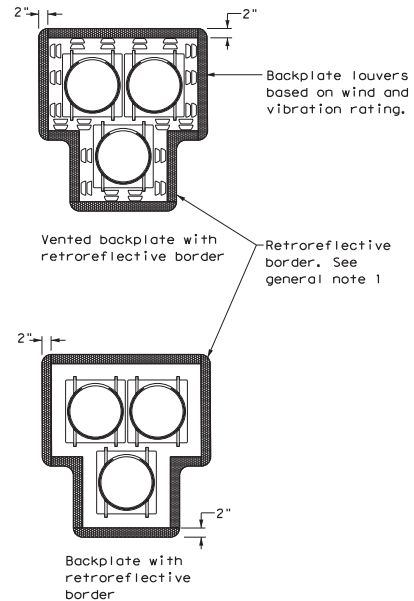
FOUR-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

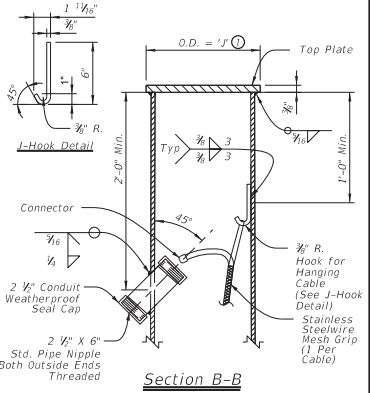
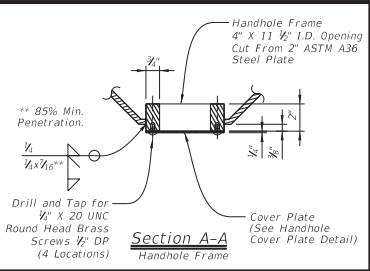
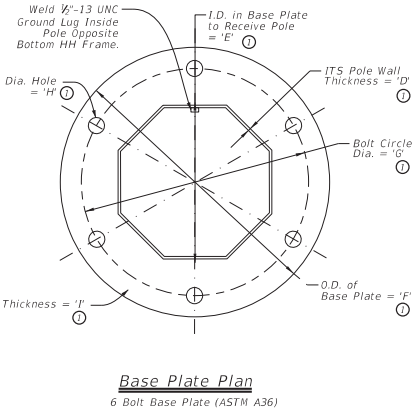
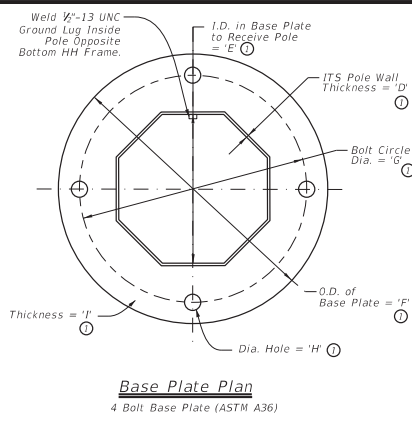
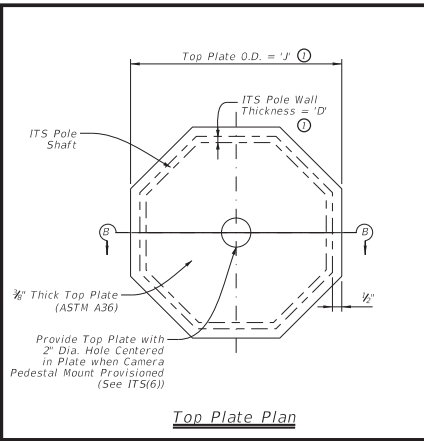
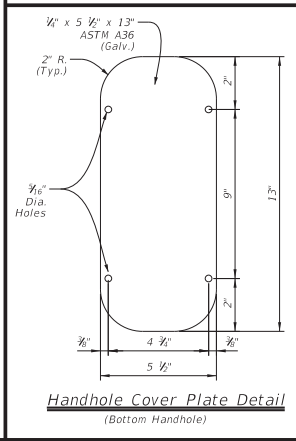
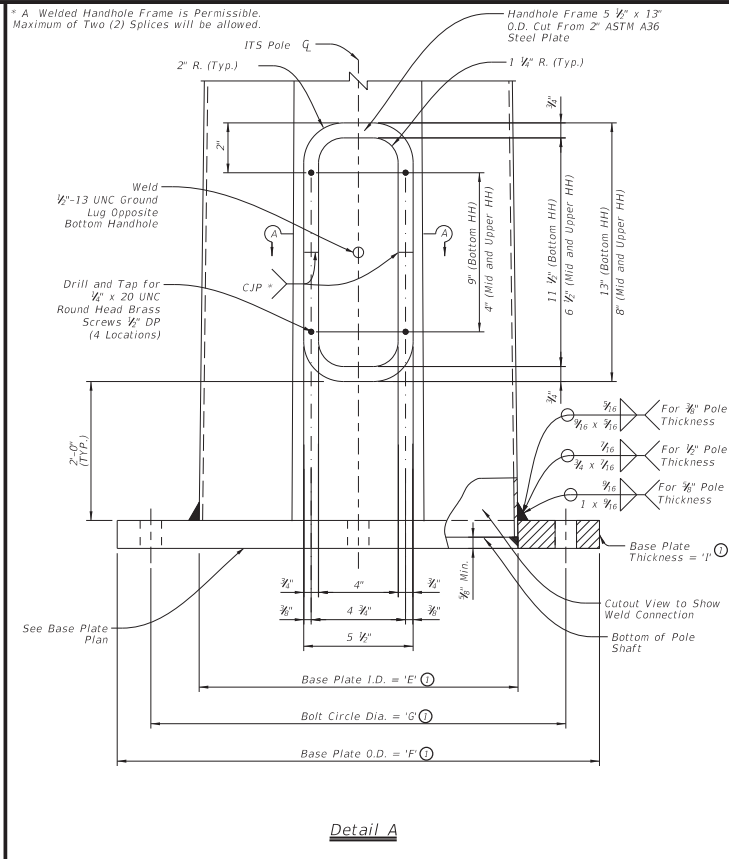
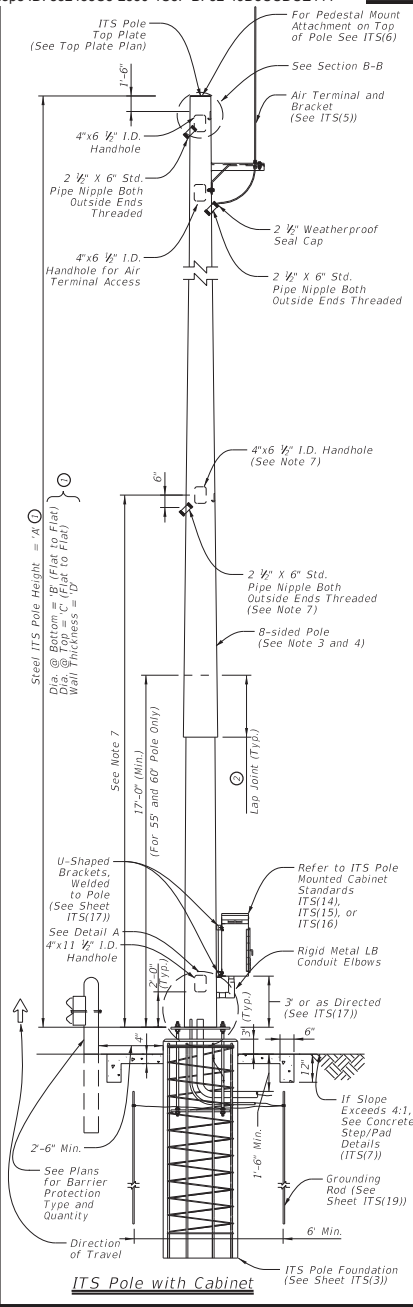
GENERAL NOTES:

- Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{PL} or C_{PL} retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
- Signal head and backplate compatibility must be verified by the contractor prior to installation.
- When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
- When a vented backplate is used, the retroreflective border must not be placed over the louvers.
- This standard sheet applies to all signal heads with backplates, including but not limited to:
 - Pole mounted
 - Overhead mounted
 - Span wire mounted
 - Mast arm mounted
 - Vertical signal heads
 - Horizontal signal heads
 - Clustered signal heads
 - Pedestrian hybrid beacons

		Traffic Safety Division Standard	
TRAFFIC SIGNAL HEAD WITH BACKPLATE TS-BP-20			
FILE: ts-bp-20.dgn	DATE: TxDOT	CHK: TxDOT	DES: TxDOT
© TxDOT June 2020	CONT: 6375	SECT: 32	JOB: 001
REVISIONS		US: 190, ETC	HIGHWAY
B1ST: WACO	COUNTY: BELL, ETC	SHEET NO. 44	

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

DATE: 12/16/2020 4:46:54 PM
 FILE: T:\MACTRAFF\UNCSIGNAL_2021\Standard\ITS(1)-15.dgn



- General Notes**
- Designed according to Sixth Edition 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications.
 - Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
 - 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.
 - 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.
 - Locate handholes opposite of the direction of travel.
 - Appropriate number of anchor bolts for base plate determined by height of pole. See 'L' on sheet ITS(4).
 - 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:**
- See tables on Sheet ITS(4) for values of dimension variables.
 - See lap joint note for 55' and 60' pole heights on ITS(4) at the bottom of each table.



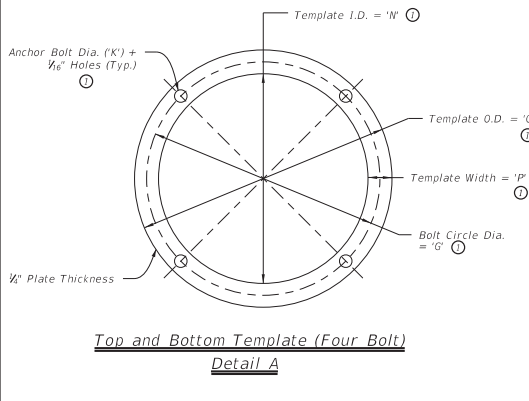
ITS POLE DETAILS OCTAGONAL POLE (EIGHT SIDED POLE)

ITS(1)-15

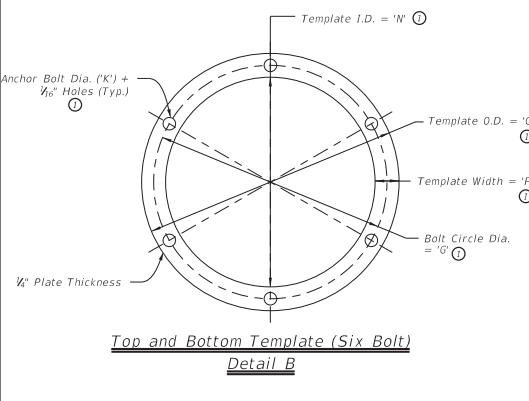
FILE: its(1)-15.dgn	DN: TxDOT	CK: TxDOT	DR: TxDOT	CHK: TxDOT
© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
	DIST	COUNTY		SHEET NO.
	WACO	BELL, ETC		45

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

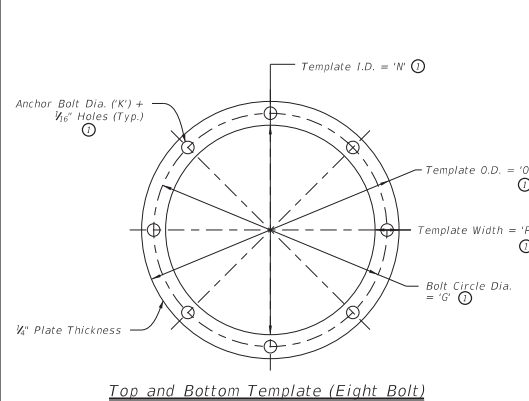
DATE: 12/16/2020 4:46:58 PM
 FILE: T:\WACTRAFF\IMC\SIGNAL_2021\Standard\rs\its(3)-16.dgn



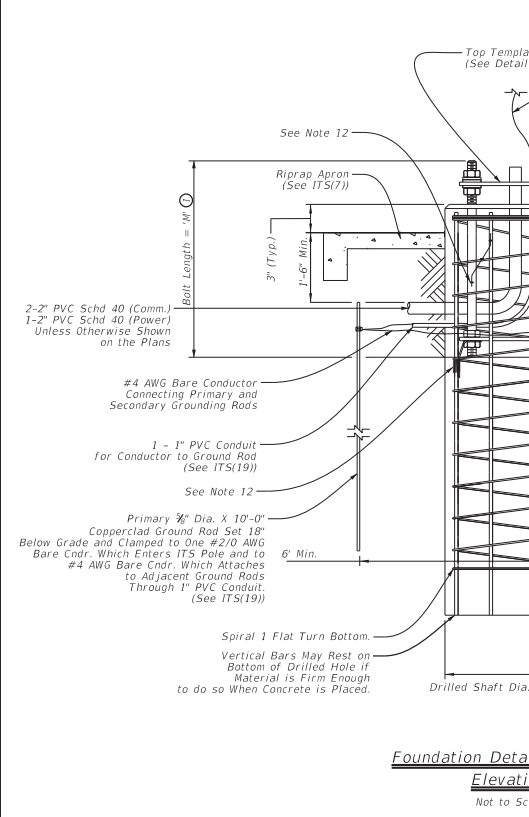
Top and Bottom Template (Four Bolt)
Detail A



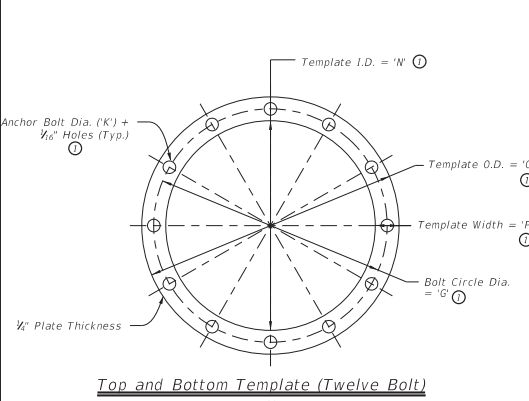
Top and Bottom Template (Six Bolt)
Detail B



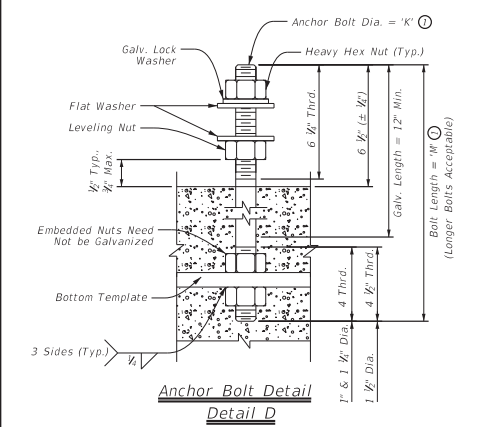
Top and Bottom Template (Eight Bolt)
Detail C



Foundation Details (Typical)
Elevation
Not to Scale



Top and Bottom Template (Twelve Bolt)
Detail D



Anchor Bolt Detail
Detail D

- General Notes:**
1. Drilled shaft concrete shall be Class "C" ($f'_c = 3600$ PSI) in accordance with Item 416, "Drilled Shaft Foundations."
 2. Reinforcing bars shall be Grade 60 ($F_y = 60$ 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 six inches for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing."
 7. All vertical reinforcement shall be carried to the bottom of the drilled shaft.
 8. Place three flat turns of the spiral bar at the top and one flat turn at the bottom of the drilled shaft.
 9. Drilled shaft shall be measured by the linear foot and paid under Item 416, "Drill Shaft Foundations."
 10. If rock is encountered, the drilled shaft to extend a minimum of two diameters into solid rock.
 11. Location for conduit entering foundation may vary. Orient conduit entering foundation to coincide with location of ground boxes and primary ground rod.
 12. Bond anchor bolts to rebar with #2/0 AWG jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Mechanical connectors shall be UL Listed for concrete encasement.

- Reference Notes:**
- ① See tables on Sheet ITS(4) for values of dimension variables.



**ITS POLE
FOUNDATION DETAILS**
ITS (3) - 16

FILE: itl 31-16.dgn	DN: TxDOT	CK: TxDOT	DR: TxDOT	CK: TxDOT
© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
6375	32	001	US 190, ETC	
Apr 11 2016	REVISIONS	COUNTY	SHEET NO.	
	WACO	BELL, ETC	46	

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

DATE: 12/16/2020 4:47:01 PM
FILE: \\TXACTRAFF\CMCS\IGNAL_2021\TSG\08118(4)-15.dgn

TABLE 1: ITS POLE - 90 MPH (W/ 2 SOLAR PANELS)
Table with columns for Pole Type, Pole Height (FT), Pole Shaft (Bottom, Top, Wall, Thick), Base Plate (Inside, Outside, Bolt Circle, Bolt Hole, Thick), Top Plate (Outside, Dia), Anchor Bolt (No. of Bolts, Length, Template Inside, Template Outside, Template Width), Foundation (Drill Shaft Depth - Texas Cone Penetrometer, Drilled Shaft Dia), and Remarks (R).

TABLE 2: ITS POLE - 110 MPH (W/ 2 SOLAR PANELS)
Table with columns for Pole Type, Pole Height (FT), Pole Shaft (Bottom, Top, Wall, Thick), Base Plate (Inside, Outside, Bolt Circle, Bolt Hole, Thick), Top Plate (Outside, Dia), Anchor Bolt (No. of Bolts, Length, Template Inside, Template Outside, Template Width), Foundation (Drill Shaft Depth - Texas Cone Penetrometer, Drilled Shaft Dia), and Remarks (R).

TABLE 3: ITS POLE - 130 MPH (W/ 1 SOLAR PANEL)
Table with columns for Pole Type, Pole Height (FT), Pole Shaft (Bottom, Top, Wall, Thick), Base Plate (Inside, Outside, Bolt Circle, Bolt Hole, Thick), Top Plate (Outside, Dia), Anchor Bolt (No. of Bolts, Length, Template Inside, Template Outside, Template Width), Foundation (Drill Shaft Depth - Texas Cone Penetrometer, Drilled Shaft Dia), and Remarks (R).

General Notes:

- 1. Designed according to Sixth Edition 2013 AASHTO Standard Specifications for Structural Specifications for Highway Signs, Luminares, 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 WW&I2(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 WW&I2(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 WW&I2(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 an 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.

TABLE 4: ITS POLE WITH STIFFENERS - 90 MPH (W/ 4 SOLAR PANELS)
Table with columns for Pole Type, Pole Height (FT), Pole Shaft (Bottom, Top, Wall, Thick), Base Plate (Inside, Outside, Bolt Circle, Bolt Hole, Thick), Top Plate (Outside, Dia), Anchor Bolt (No. of Bolts, Length, Template Inside, Template Outside, Template Width), Foundation (Drill Shaft Depth - Texas Cone Penetrometer, Drilled Shaft Dia), and Remarks (R).

TABLE 5: ITS POLE WITH STIFFENERS - 110 MPH (W/ 4 SOLAR PANELS)
Table with columns for Pole Type, Pole Height (FT), Pole Shaft (Bottom, Top, Wall, Thick), Base Plate (Inside, Outside, Bolt Circle, Bolt Hole, Thick), Top Plate (Outside, Dia), Anchor Bolt (No. of Bolts, Length, Template Inside, Template Outside, Template Width), Foundation (Drill Shaft Depth - Texas Cone Penetrometer, Drilled Shaft Dia), and Remarks (R).

TABLE 6: ITS POLE WITH STIFFENERS - 130 MPH (W/ 3 SOLAR PANELS)
Table with columns for Pole Type, Pole Height (FT), Pole Shaft (Bottom, Top, Wall, Thick), Base Plate (Inside, Outside, Bolt Circle, Bolt Hole, Thick), Top Plate (Outside, Dia), Anchor Bolt (No. of Bolts, Length, Template Inside, Template Outside, Template Width), Foundation (Drill Shaft Depth - Texas Cone Penetrometer, Drilled Shaft Dia), and Remarks (R).

- 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.

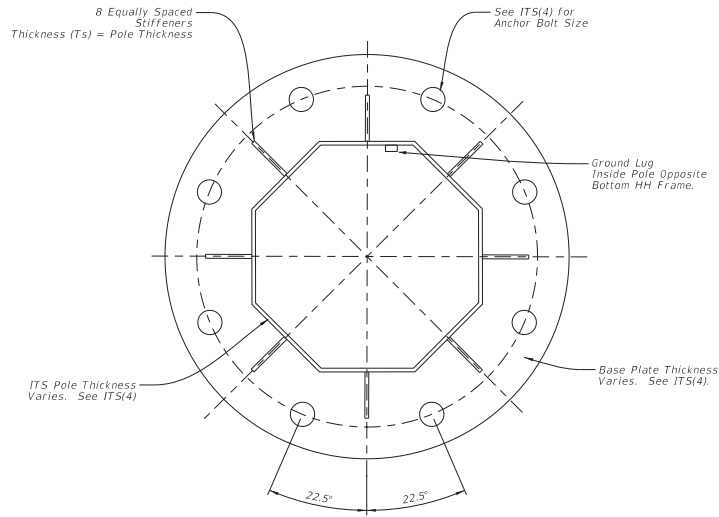
When solar panels are not provisioned in the plans, ITS pole wall thickness may be reduced by 1/8".

- 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.

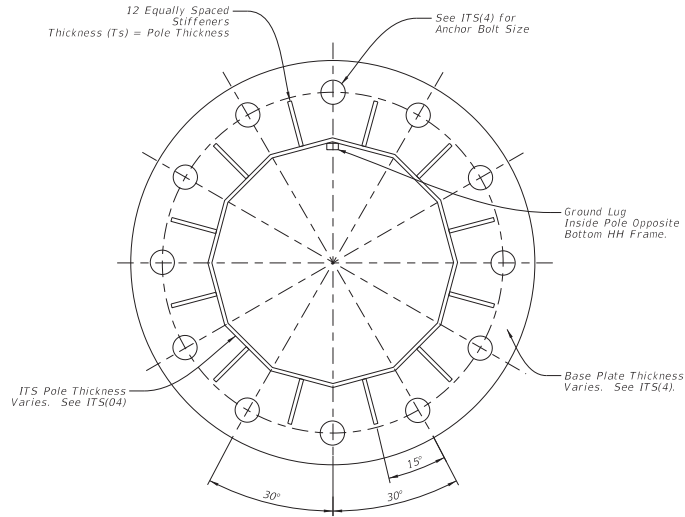
Texas Department of Transportation Traffic Operations Division Standard
ITS POLE DESIGN DETAILS DATA LOOKUP TABLE
ITS(4)-15
FILE: its(4)-15.dgn
REV: 03/2015
COUNT: 6375
SECTION: 32
JOB: 001
HIGHWAY: US 190, ETC
DIST: WACO
COUNTY: BELL, ETC
SHEET NO: 47

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

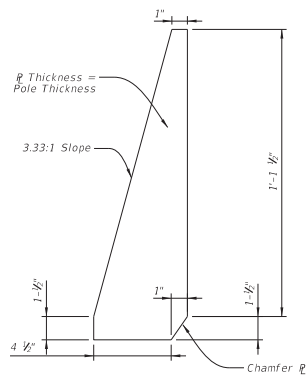
DATE: 12/16/2020 4:47:04 PM
 FILE: T:\WACTRAFF\UNCSIGNAL_2021\Standard\sts(4a)-15.dgn



8-sided Pole Base Plate Detail

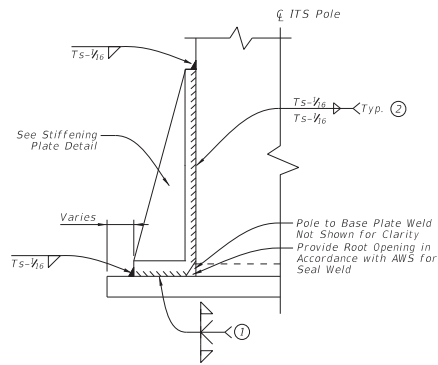


12-sided Pole Base Plate Detail



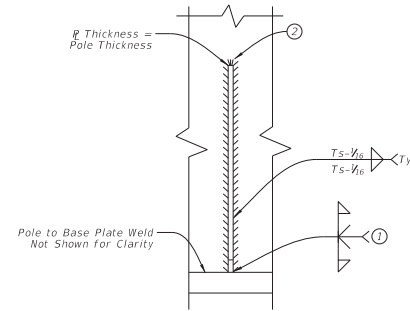
Stiffening Plate Detail

Not to Scale



Stiffening Detail - Elevation View

Not to Scale



Stiffening Detail - Front View

Not to Scale

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



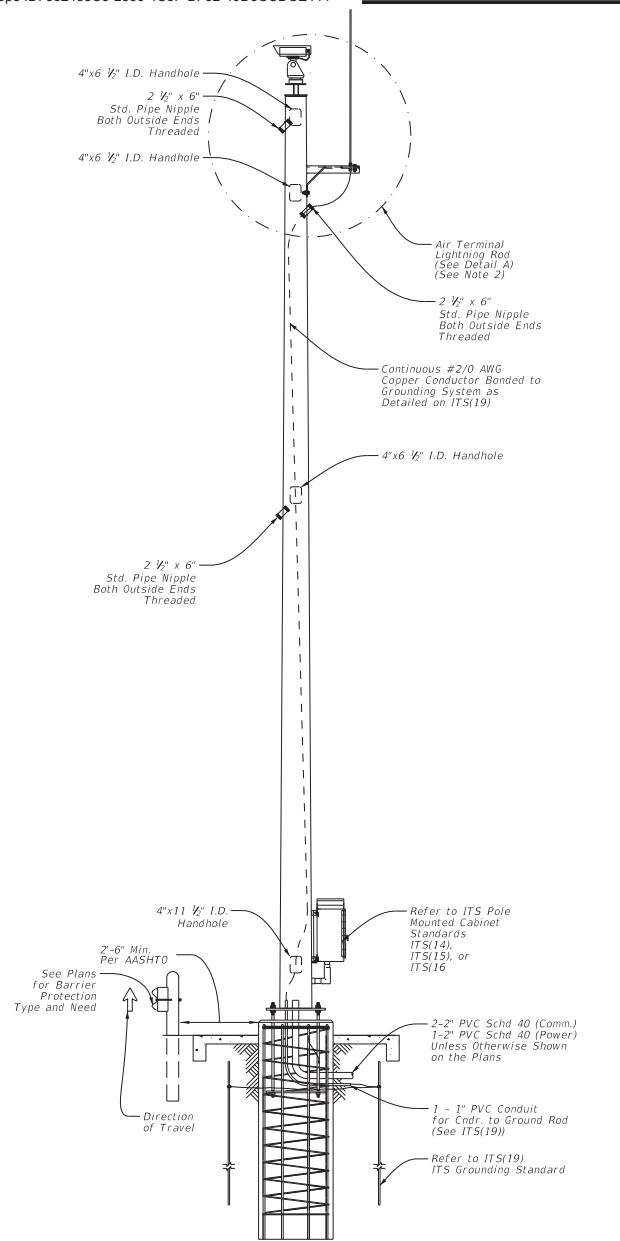
ITS POLE STIFFENER PLATE DETAILS

ITS(4A) - 15

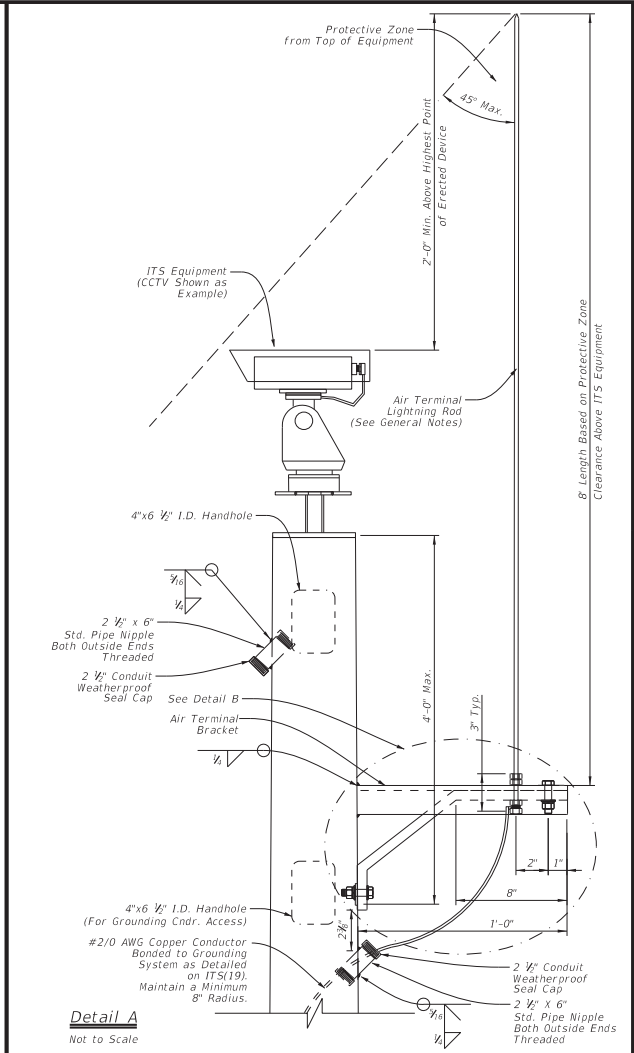
FILE: sts(4A)-15.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT	CHK: TxDOT
© TxDOT June 2015	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
REVISIONS	BIST	COUNTY	WACO	BELL, ETC
				SHEET NO. 48

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

DATE: 12/16/2020 4:47:07 PM
 FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Signal\drb\ITS(5)-15.dgn



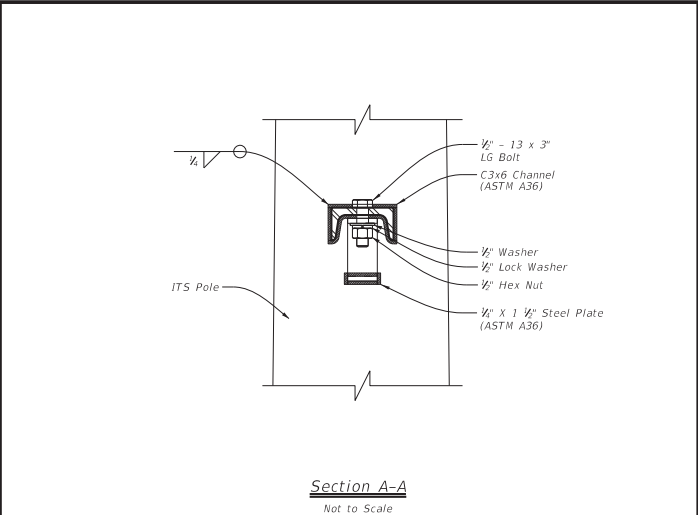
ITS Pole with Cabinet



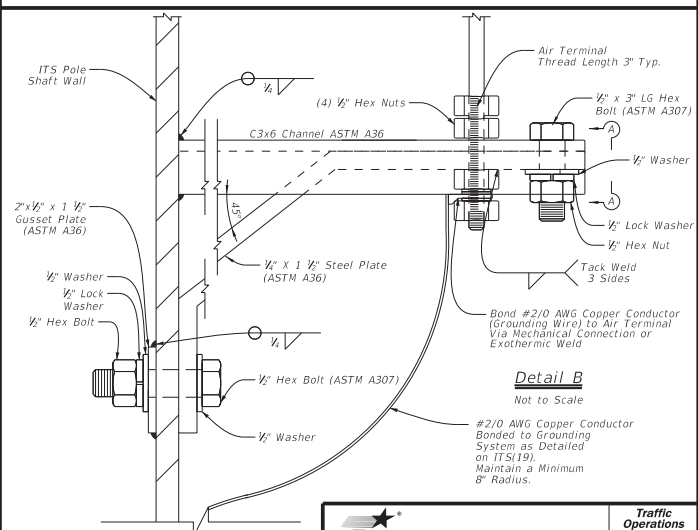
Detail A
Not to Scale

General Notes:

- Provide lightning protection using air terminals on structures utilizing the rolling sphere method. Provide lightning protection system consisting of air terminals, down conductor, and grounding system installed in accordance with NFPA 780 and tested in accordance with IEEE 142. Meet the following requirements:
 - 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 - 1/2" 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 WW & IZ (ITS2003).
 - G. Galvanize air terminal bracket in accordance with Item 445, "Galvanizing."
- Alternative orientation for air terminal and pole mounted cabinet due to project specific needs to be indicated on the plans and detailed in shop drawing submittal for approval.



Section A-A
Not to Scale



Detail B
Not to Scale

Traffic Operations Division Standard

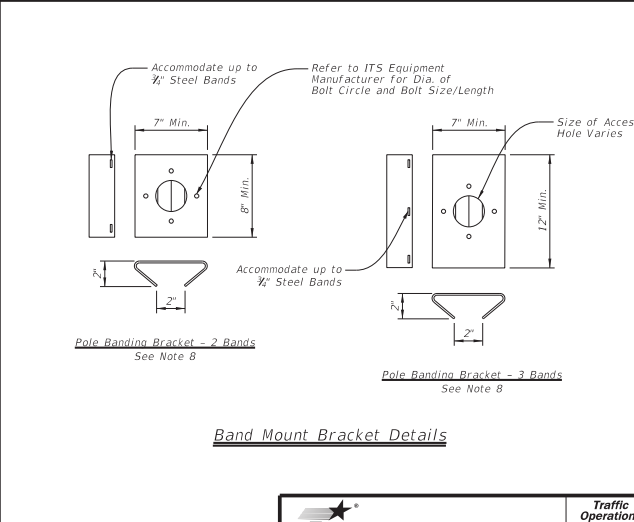
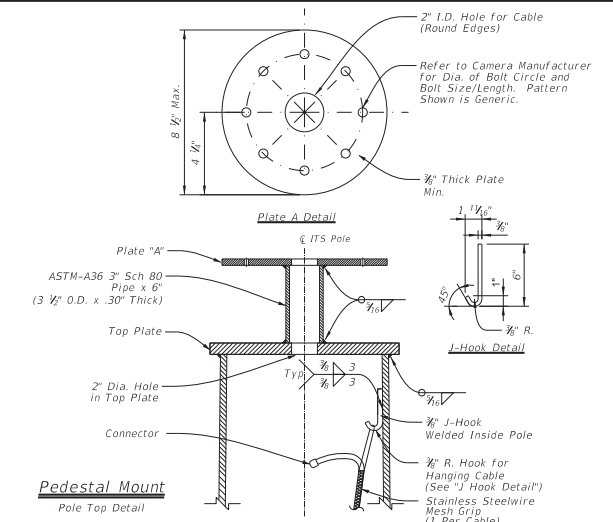
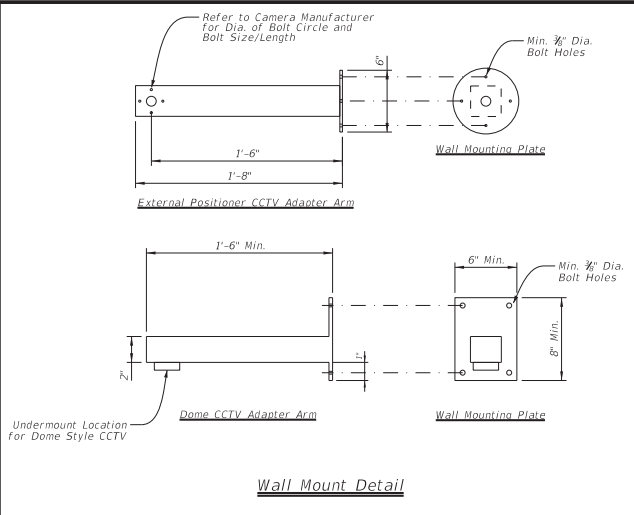
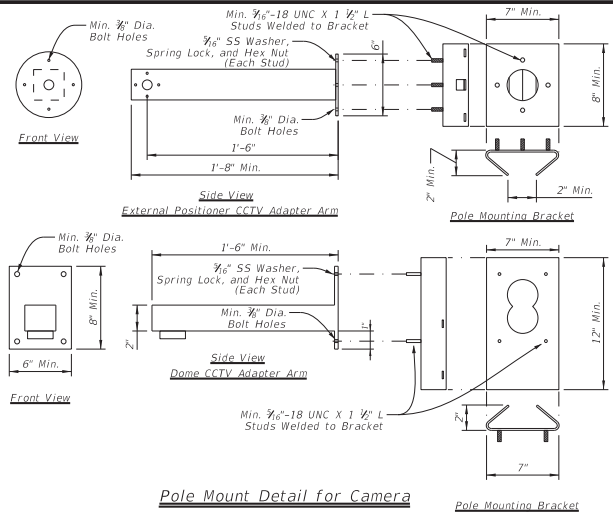
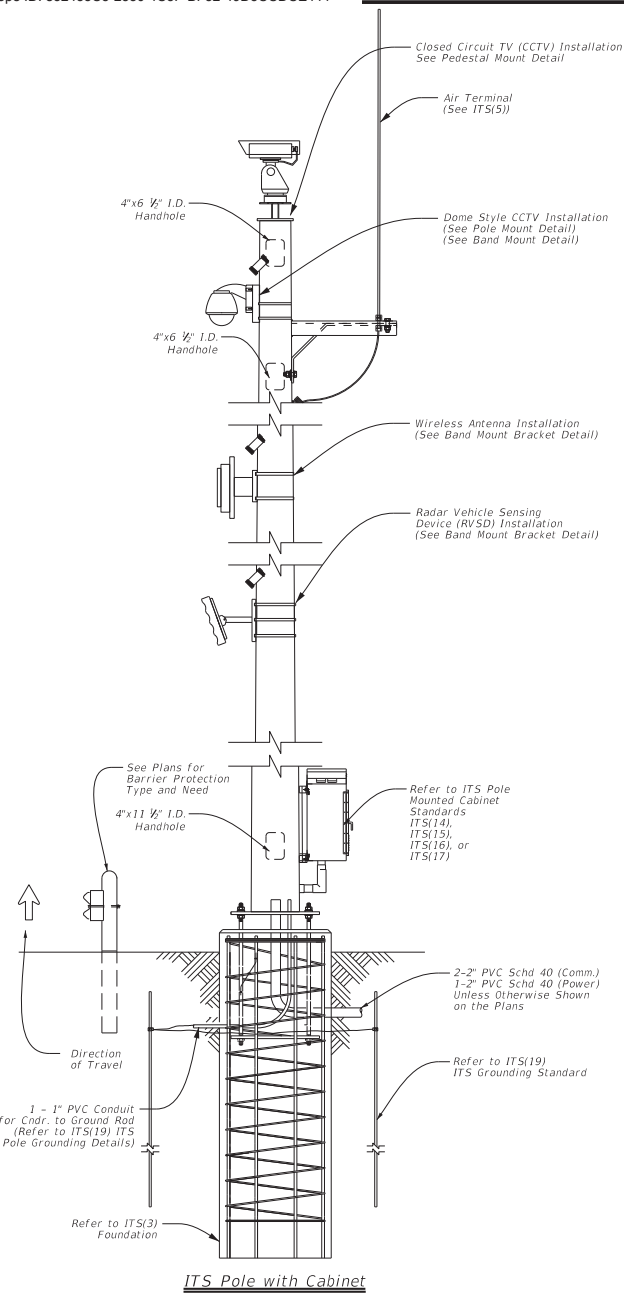
ITS POLE AIR TERMINAL DETAILS

ITS(5)-15

FILE: its(5)-15.dgn	DATE: June 2015	BY: TxDOT	CHK: TxDOT	DATE: June 2015	CHK: TxDOT
CONT: 6375	SECT: 32	JOB: 001	US: 190	ETC: ETC	
DIST: WACO		COUNTY: BELL, ETC	SHEET NO. 49		

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

DATE: 12/16/2020 4:47:10 PM
 FILE: T:\NACTRAFF\UMCSIGNAL_2021\Standard\ITS(6)-15.dgn

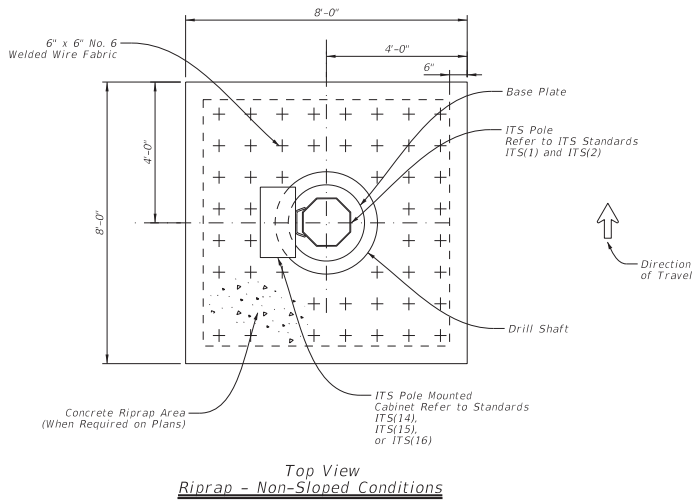


- General Notes:**
1. Designed according to Sixth Edition AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications.
 2. Hang all cabling inside ITS pole structure with stainless steel wire mesh grips.
 3. Bolt positioning in the pedestal top plate (Plate "A") for the pan/tilt base must be determined in the field per camera manufacturer's recommendations. This will allow positioning of the camera to maximize coverage area. The Engineer will determine the camera's blind zone at each location.
 4. Provide pedestal top plate and Plate "A" that conform to ASTM A36.
 5. Make all welds conform to Item 441 and AWS D 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.

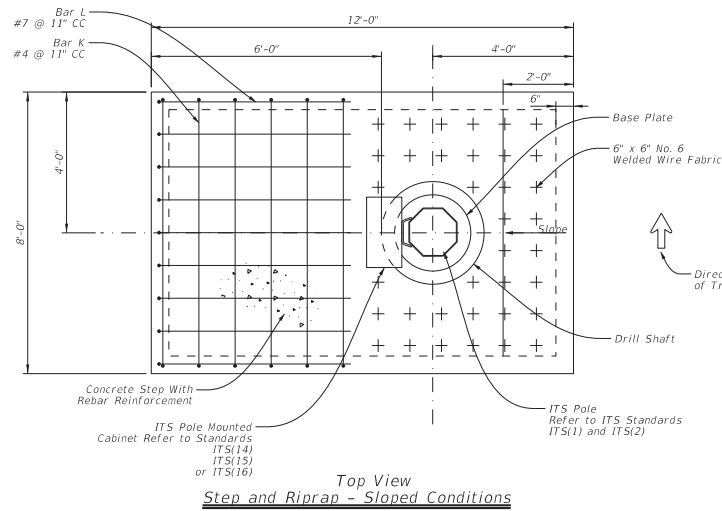
				Traffic Operations Division Standard	
ITS POLE EQUIPMENT MOUNTING DETAILS ITS(6) - 15					
FILE: its(6)-15.dgn	DRN: TxDOT	CHK: TxDOT	DES: TxDOT	CHK: TxDOT	
© TxDOT June 2015	CONT: 6375	SECT: 32	JOB: 001	US: 190	ETC
REVISIONS		DIST: COUNTY		SHEET NO.	
		WACO		BELL, ETC	
				50	

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

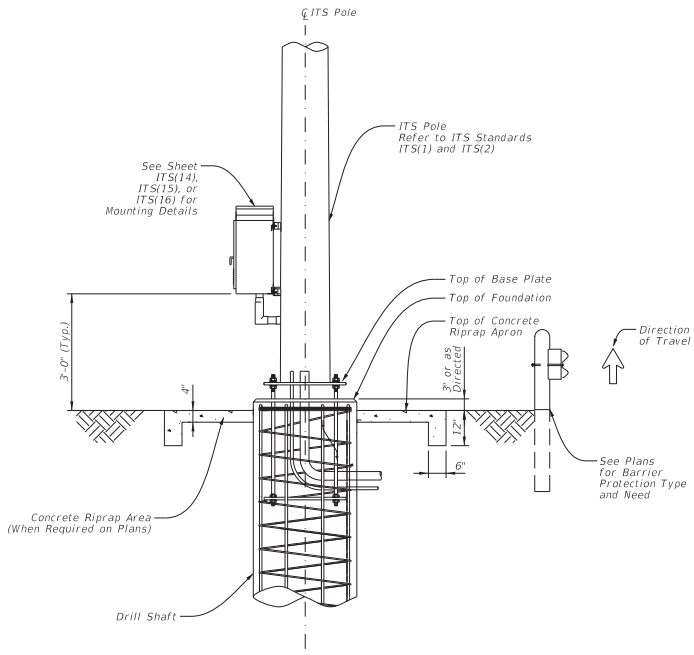
DATE: 12/16/2020 4:47:12 PM
 FILE: T:\WACTRAFF\IMC\SIGNAL_2021\Standard-ds\ITS(7)-15.dgn



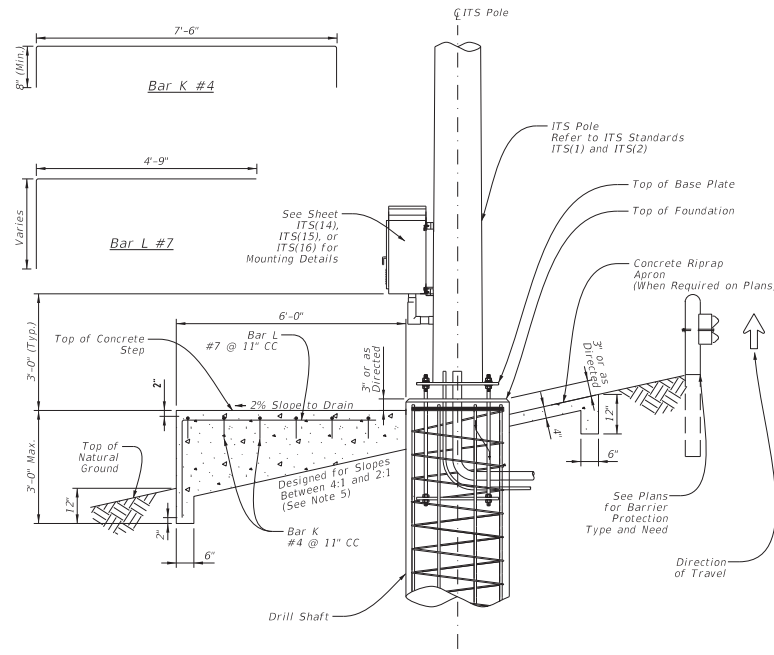
**Top View
Riprap - Non-Sloped Conditions**



**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:

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



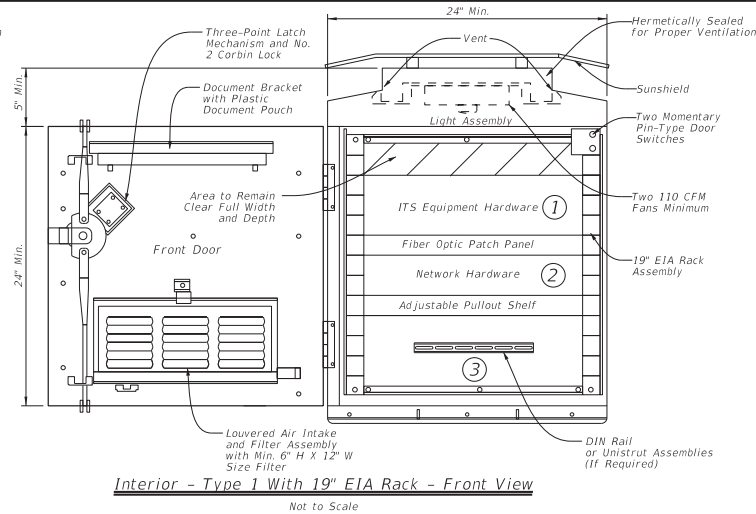
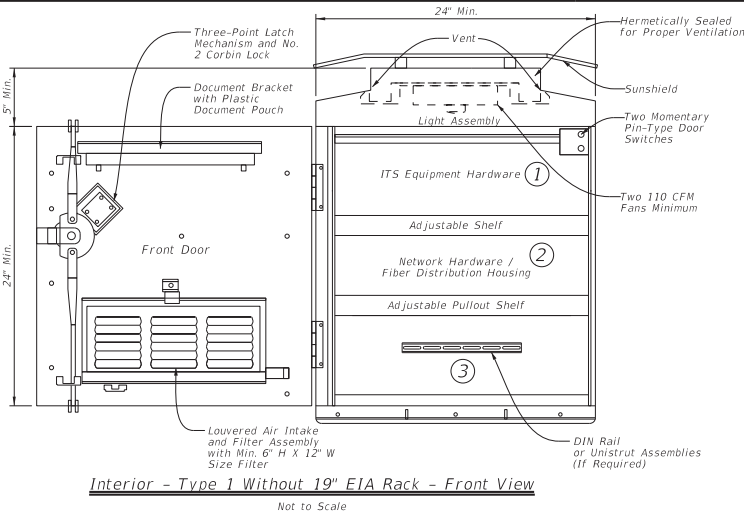
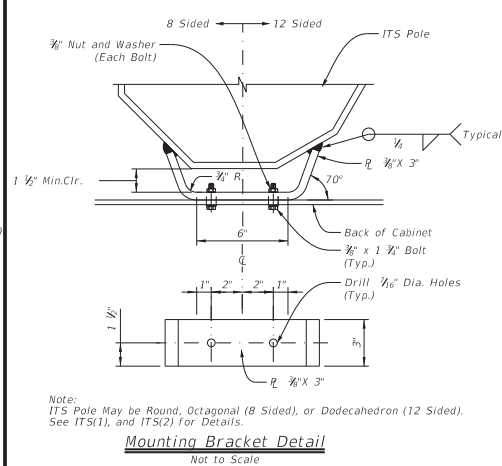
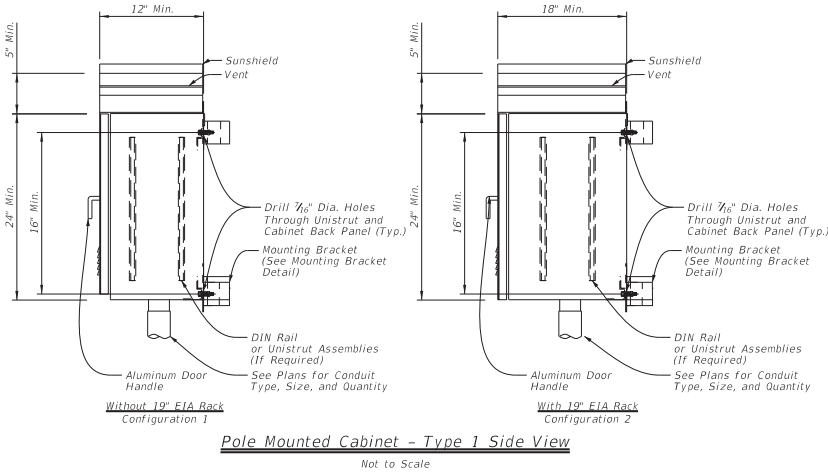
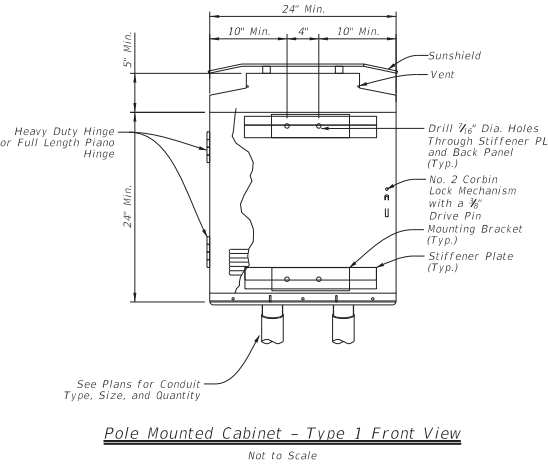
**ITS POLE
RIPRAP DETAILS**

ITS(7)-15

FILE: its(7)-15.dgn	DATE: TxDOT	DATE: TxDOT	DATE: TxDOT	DATE: TxDOT
6375	32	001	US 190, ETC	
REVISIONS		COUNTY	SHEET NO.	
WACO		BELL, ETC	51	

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

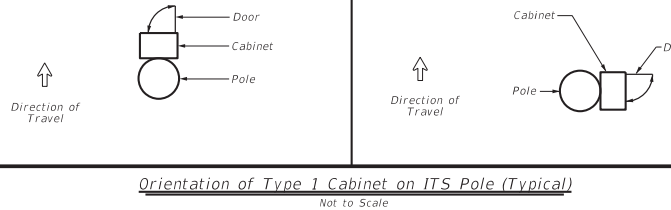
DATE: 12/16/2020 4:47:16 PM
 FILE: T:\NACTRAFF\IMC\SIGNAL_2021\Signdgr-ds\ITS(14)-15.dgn



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:

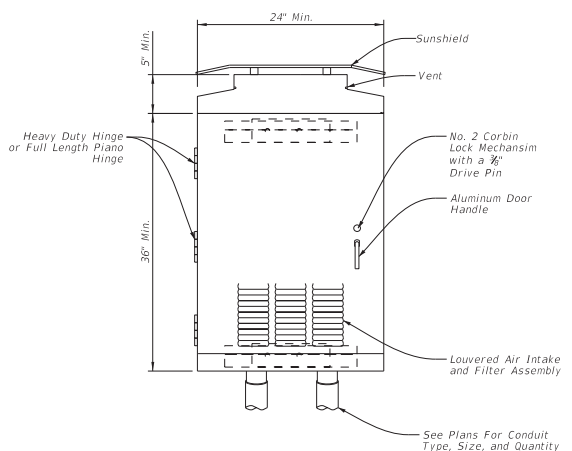
- Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred Type 1 pole mounted cabinet setup. Hardware needed for each Type 1 cabinet varies and not all cabinet equipment may be shown. The contractor will be responsible for configuring cabinets 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.
- 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.
- For ITS pole sites located on slopes greater than 4H:1V, mount the cabinet to the backside of the ITS pole as detailed on ITS(7). Mounting height to accommodate maintenance pad for easy access.
- All dimensions are approximate and represent minimum cabinet dimensions.
- Provide conduit entrances at the bottom of the cabinet.
- Paid under Special Specification "ITS Pole with Cabinet" (Configuration 1) without 19" EIA rack.
Paid under Special Specification "ITS Pole with Cabinet" (Configuration 2) with 19" EIA rack.



				Traffic Operations Division Standard	
ITS POLE MOUNTED CABINET TYPE 1 DETAILS ITS(14)-15					
FILE: ITS(14)-15.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT
© TxDOT June 2015	CONT: 6375	SECT: 32	JOB: 001	US: 190, ETC	HIGHWAY
REVISIONS			BIST: COUNTY	SHEET NO.	
			WACO	BELL, ETC	52

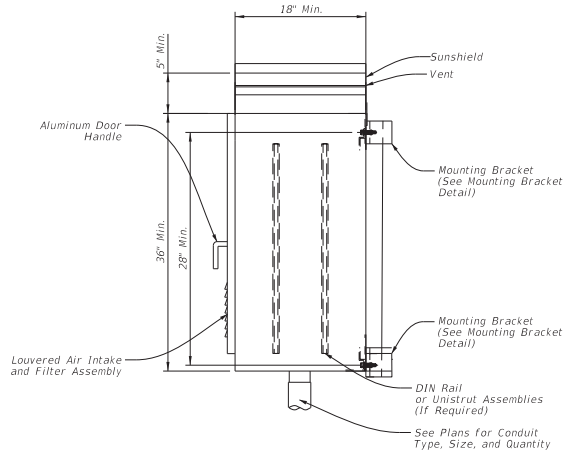
DISCLOSURE: This standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 12/16/2020 4:47:18 PM
 FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Signal\ds\Its(15)-15.dgn



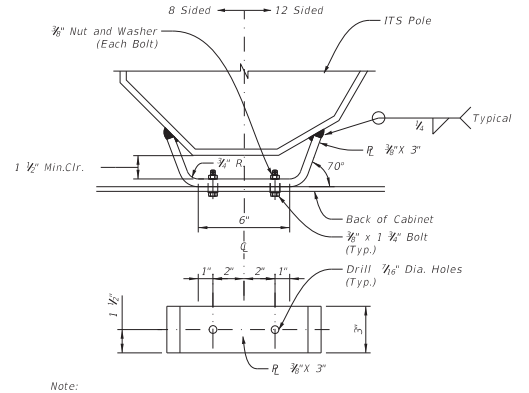
Pole Mounted Cabinet - Type 2 Front View

Not to Scale



Pole Mounted Cabinet - Type 2 Side View

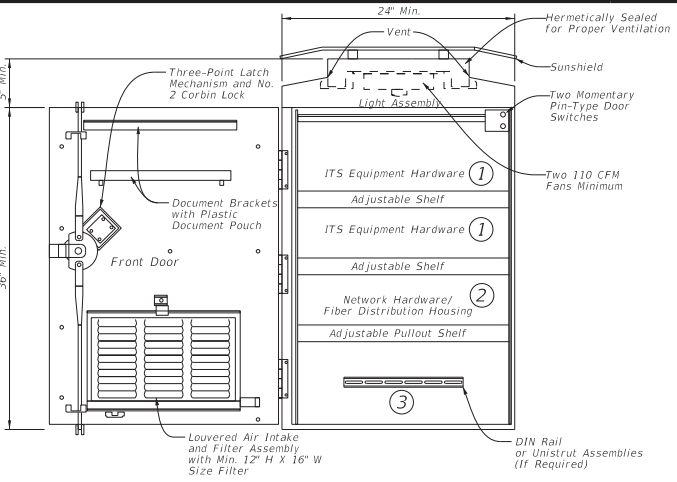
Not to Scale



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

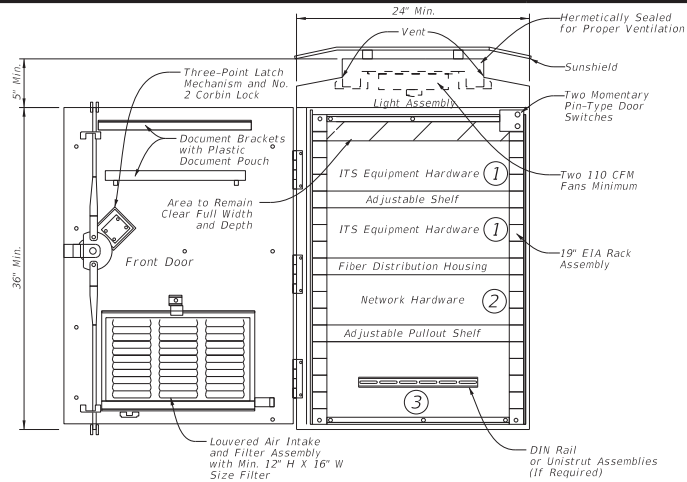
Mounting Bracket Detail

Not to Scale



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

Not to Scale



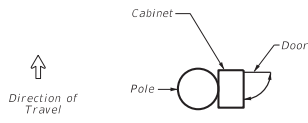
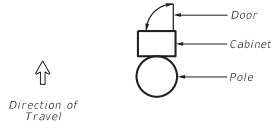
Interior - Type 2 With 19" EIA Rack - Front View

Not to Scale

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

General Notes:

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



Orientation of Type 2 Cabinet on ITS Pole (Typical)

Not to Scale

Texas Department of Transportation
Traffic Operations Division Standard

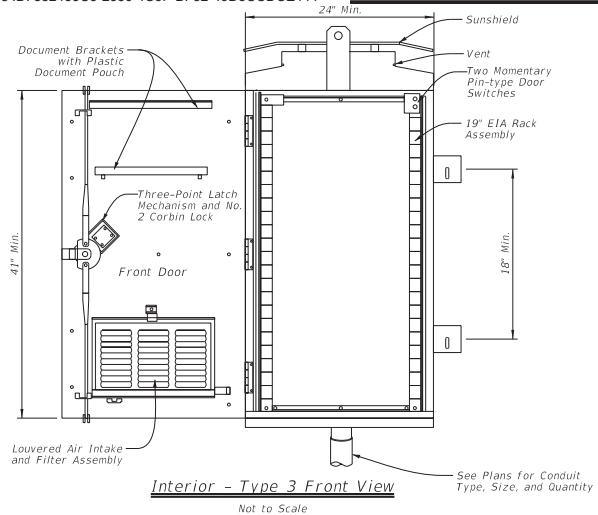
ITS POLE MOUNTED CABINET TYPE 2 DETAILS

ITS(15)-15

FILE: Its(15)-15.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	CK: TxDOT
© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
	DIST	COUNTY	SHEET NO.	
	WACO	BELL, ETC	53	

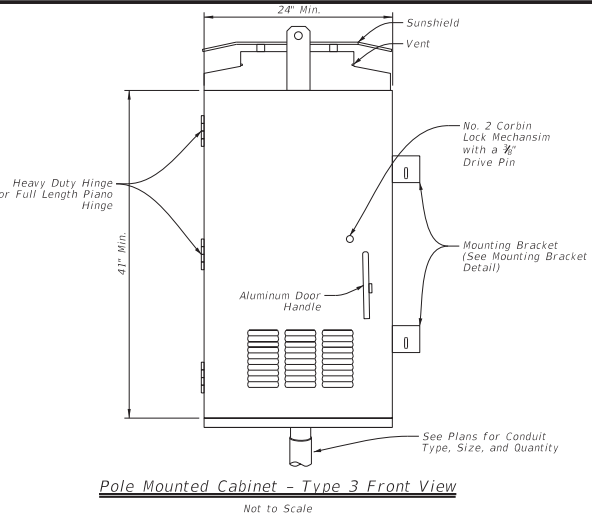
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for inaccuracies or damages resulting from its use.

DATE: 12/16/2020 4:47:22 PM
FILE: T:\MACTRAFF\JMCS\IGNAL_2021\Signal\gdr\ITS(16)-15.dgn



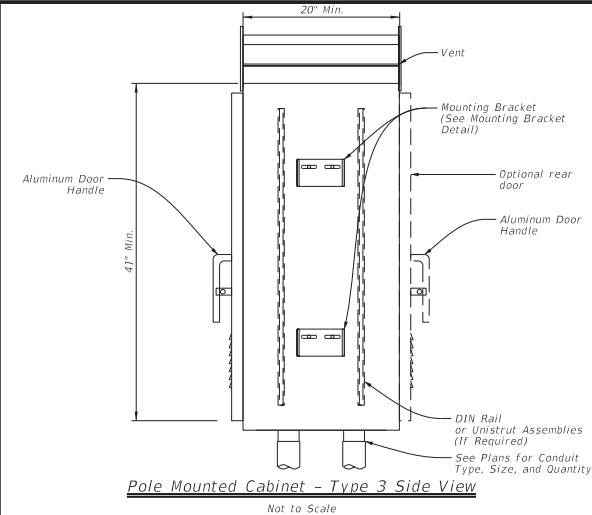
Interior - Type 3 Front View

Not to Scale



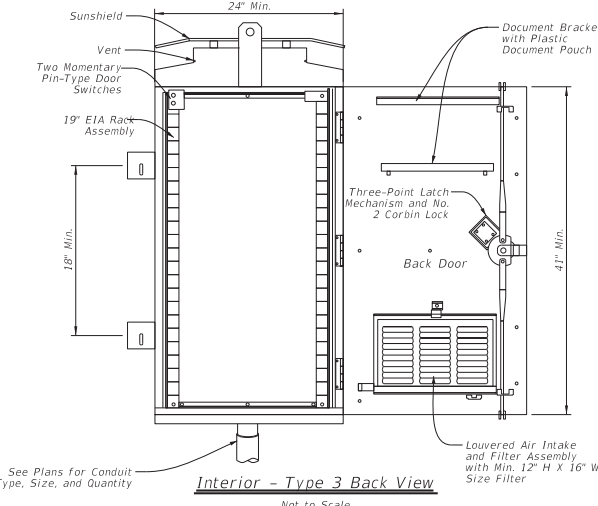
Pole Mounted Cabinet - Type 3 Front View

Not to Scale



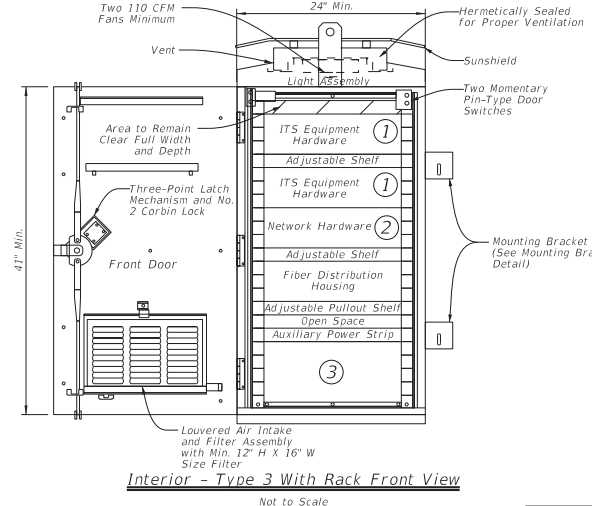
Pole Mounted Cabinet - Type 3 Side View

Not to Scale



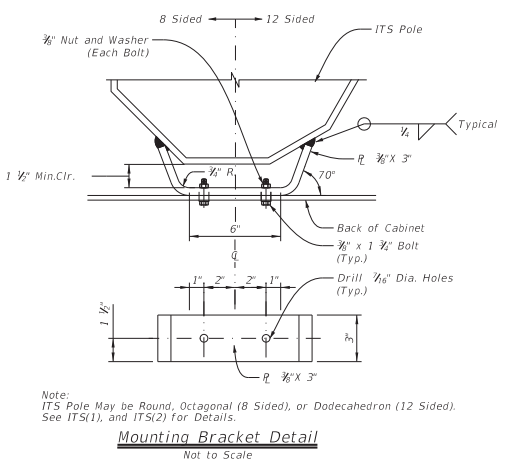
Interior - Type 3 Back View

Not to Scale



Interior - Type 3 With Rack Front View

Not to Scale

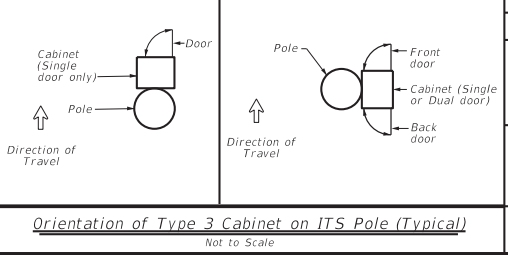


Mounting Bracket Detail

Not to Scale

General Notes:

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



Orientation of Type 3 Cabinet on ITS Pole (Typical)

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

Texas Department of Transportation
Traffic Operations Division Standard

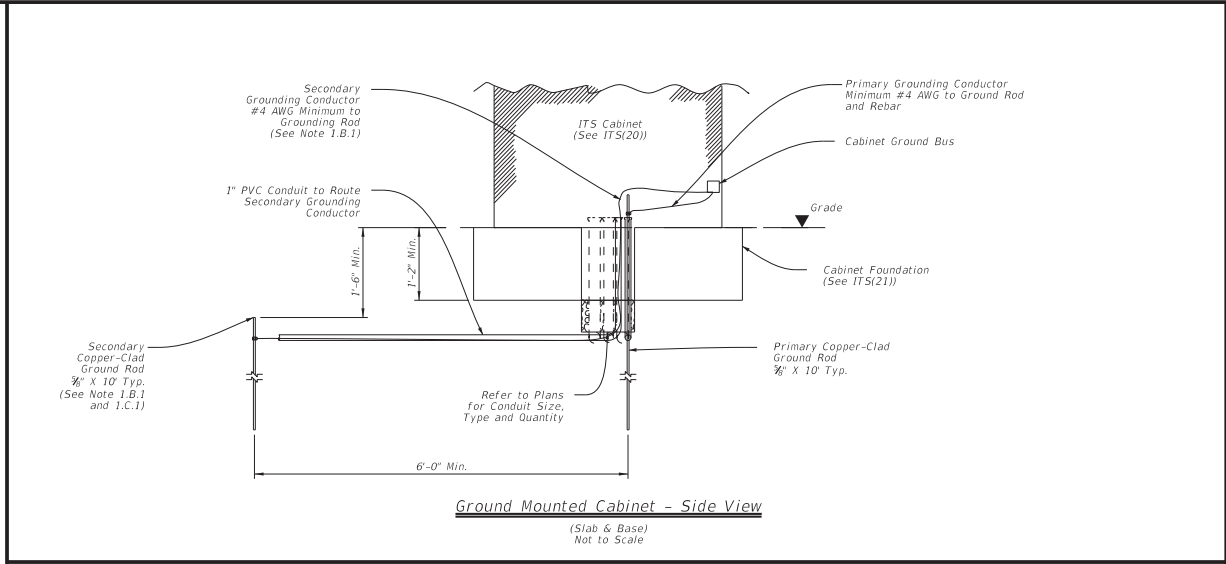
ITS POLE MOUNTED CABINET TYPE 3 DETAILS

ITS(16)-15

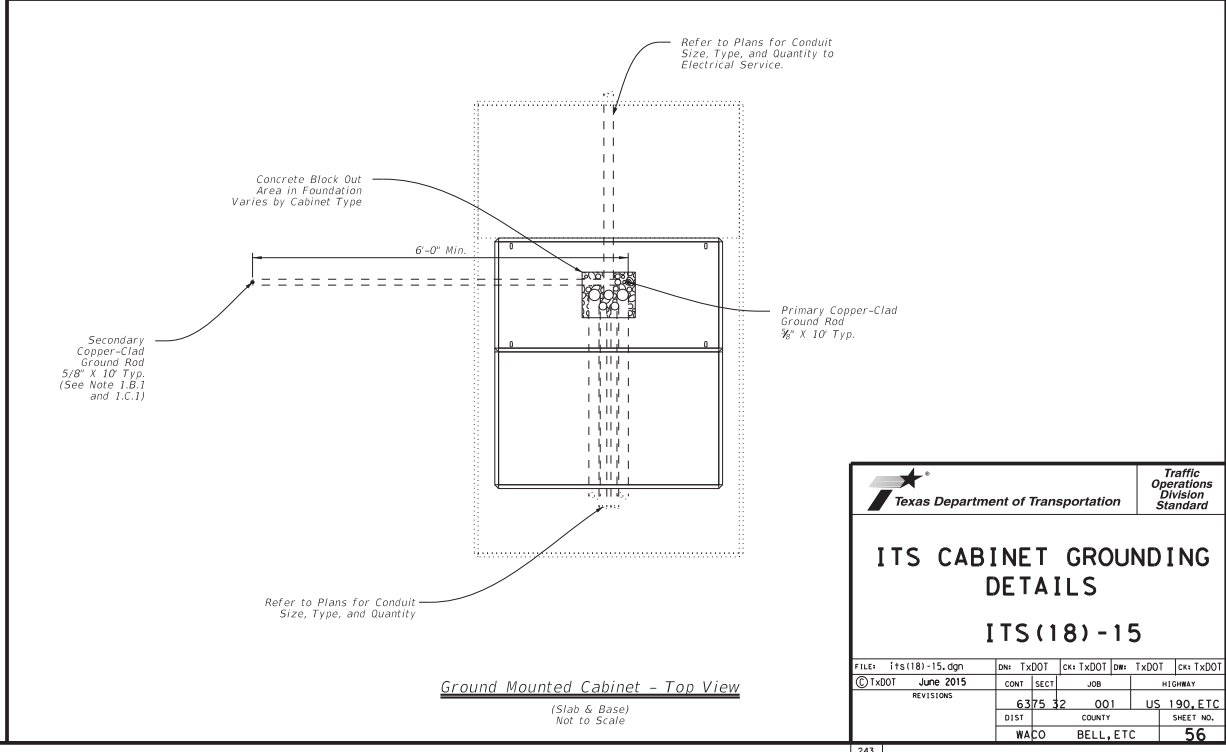
FILE: its(16)-15.dgn	DR: TxDOT	CHK: TxDOT	DATE: TxDOT	CHK: TxDOT
© TxDOT June 2015	CONT: 32	SECT: 001	JOB: US 190, ETC	HIGHWAY: BELL, ETC
REVISIONS		BIST: COUNTY	SHEET NO. 54	
WACO		BELL, ETC		

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: 3/8 in.
 - 2) Length: 10 Ft.
 2. **Installation:**
 - A. Install grounding components and systems in accordance with the requirements specified in UL 467, IEEE 81, and IEEE 142.
 - B. **System Grounding:**
 1. **Ground Rods:**
 - a. Drive ground rods into the ground until the tops of the rods are approximately 18 in. below finished grade.
 - b. If multiple ground rods are needed to meet the minimum resistance of 5 Ohms, space ground rods as evenly as possible, at least 6 feet apart, and so conductors will be connected below grade.
 2. **Conductors:**
 - a. Provide minimum No. 4 AWG ground wire for system and equipment grounding.
 - b. Using suitable fasteners, securely attach exposed ground wires to structural supports at not more than 2 ft. intervals, where applicable.
 - c. Bends in ground wires greater than 45 degrees are unacceptable.
 3. **Cable Connections:**
 - a. Use approved exothermic-welded connections for conductor splices and connections between conductors and other components.
 3. **Testing:**
 - A. **Resistance Test:**
 1. **Test Procedure:**
 - a. The ground-resistance measurements of each ground Rod shall be taken.
 - 1) The resistance to ground shall be measured in accordance with the fall-of-potential method specified in IEEE 81 and IEEE 142.
 - 2) Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.
 - b. Test reports shall be prepared that indicate the location of the ground rod, the grounding system, and the resistance and soil conditions at the time the test was performed.
 2. **Acceptance Criteria:**
 - a. The grounding system must have a resistance not greater than 5 Ohms.
 - b. Do not energize any part of the electrical distribution system prior to the resistance testing of that system's ground rods and grounding system, and submission of the test results for approval.
 3. **Inspections:**
 - a. Prepare and submit as-built record drawings of the grounding system as installed and test reports for approval.



Ground Mounted Cabinet - Side View
(Slab & Base)
Not to Scale



Ground Mounted Cabinet - Top View
(Slab & Base)
Not to Scale

DISCONTINUED: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.
 DATE: 12/16/2020 4:47:27 PM
 FILE: T:\NACTRA\F\UMC\SIGNAL_2021\Standard\ITS(18)-15.dgn

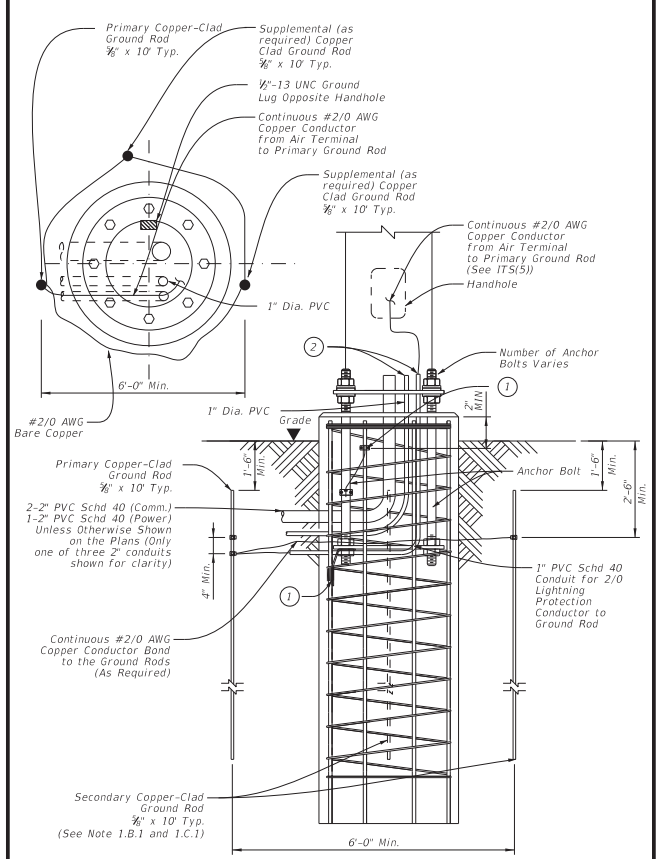
		Traffic Operations Division Standard		
<h2>ITS CABINET GROUNDING DETAILS</h2> <h3>ITS(18)-15</h3>				
FILE: ITS(18)-15.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
© TxDOT	REVISIONS	DATE	BY	DESCRIPTION
	6375	32	001	US 190, ETC
	DIST	COUNTY	SHEET NO.	
	WACO	BELL, ETC	56	

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

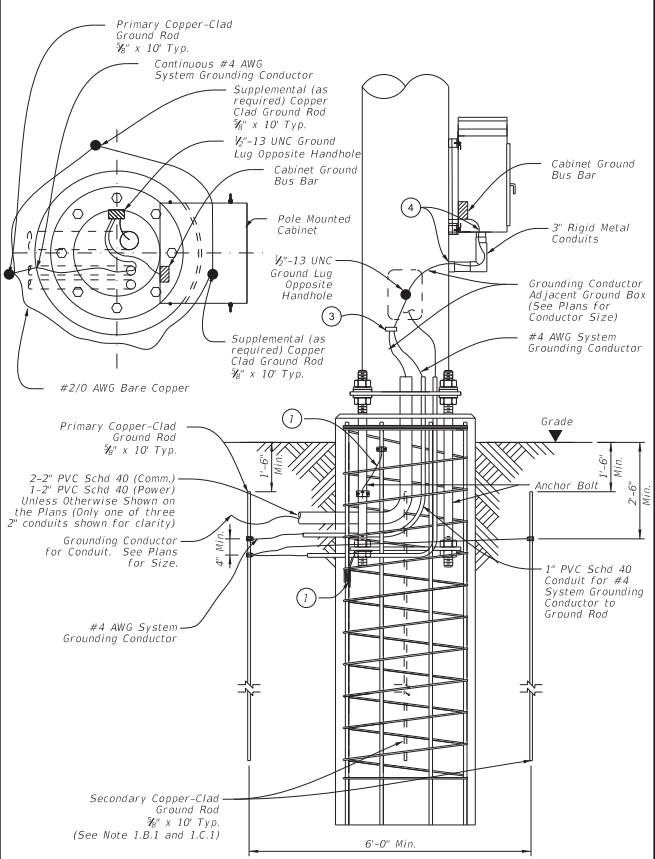
DATE: 12/16/2020 4:47:30 PM
 FILE: T:\WACTRAFF\IMC\SIGNAL_2021\Standard-ds\Its(19)-17.dgn

General Notes:

1. Grounding System:
 - A. Description:
 1. Provide ground system consisting of copper wires, ground rods, and concrete-encased grounding electrodes (ifers), of the configuration shown to minimize potential gradient irregularities, drain leakage, and fault currents to earth.
 - B. Performance:
 1. Provide a grounding system, consisting of a minimum one ground rod, having a resistance not greater than 5 Ohms to ground. Provide up to 2 additional supplemental ground rods if necessary to achieve a resistance not greater than 5 Ohms to ground. If a total of 3 ground rods is needed then install as part of a ground ring.
 2. If a ground ring is required, provide a minimum conductor length of 20 ft. placed at a minimum depth of 30 in..
 - C. Design Criteria:
 1. The grounding system of the ITS pole may be bonded below grade to the grounding systems of other nearby equipment to meet the specified grounding resistance. A minimum of one ground rod for the ITS pole is still required.
 2. Separately measure the grounding resistance of each system before bonding together below grade.
 3. Only provide UL-approved materials listed for grounding systems.
 4. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.
 5. Submit product data for the materials and products used to perform the work of this section.
 - D. Materials:
 1. Conductors:
 - a. Bare Ground Conductor:
 - 1) Provide prequalified copper conductors appearing on the Material Producers List, according to Item 618.
 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 throughout the project.
 3. Ground Rods:
 - a. Provide copper-clad steel ground rods conforming to the requirements specified in DMS 11040.
 - 1) Diameter: 1/2 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, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.
 - 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

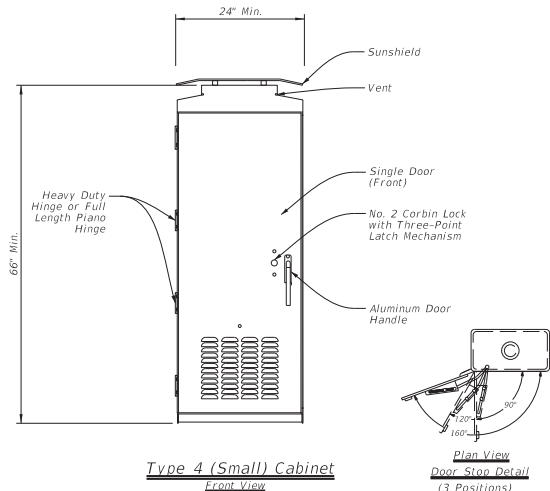
Reference Notes:

- 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	
<h2 style="margin: 0;">ITS POLE GROUNDING DETAILS</h2>					
<h3 style="margin: 0;">ITS(19)-17</h3>					
FILE: Its(19)-17.dgn	DATE: June 2015	CONTRACT: 6375	SECTION: 32	JOB: 001	HIGHWAY: US 190, ETC
T-17 REVISIONS		COUNTY		SHEET NO.	
		WACO		BELL, ETC	
244					

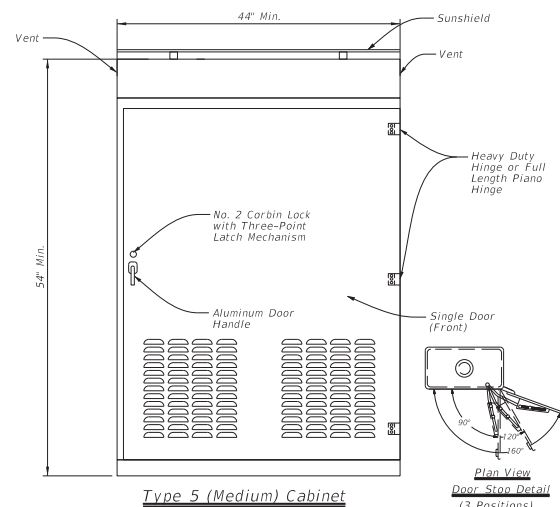
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 12/16/2020 4:47:33 PM
 FILE: T:\WACTRAFF\UMCSIGNAL_2021\Standard\ds\its(20)-15.dgn



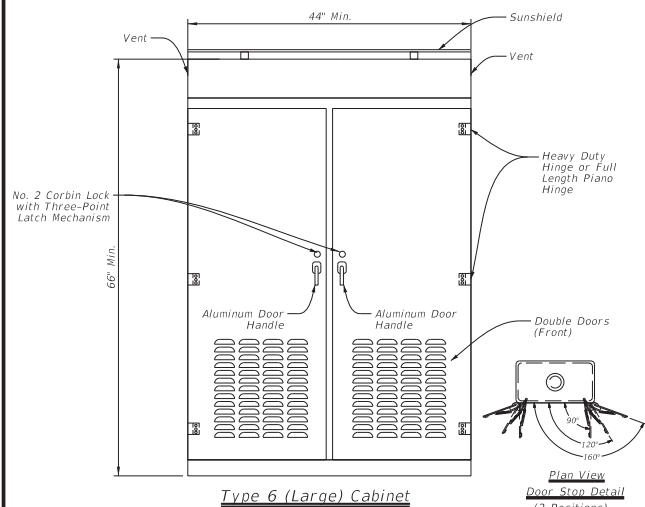
Type 4 (Small) Cabinet
Front View

Door Stop Detail
(4 Positions)



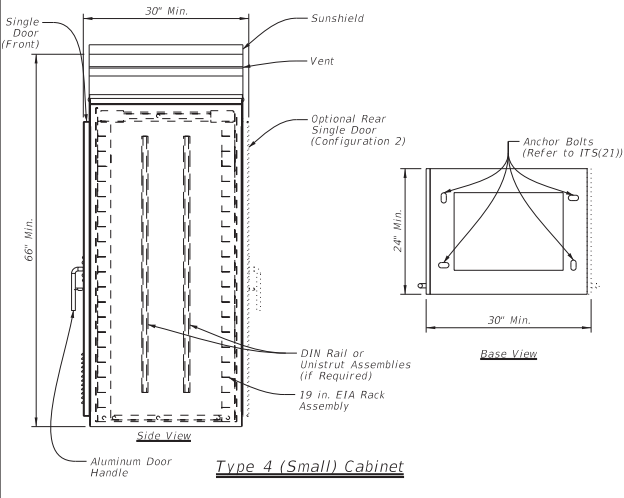
Type 5 (Medium) Cabinet
Front View

Door Stop Detail
(3 Positions)



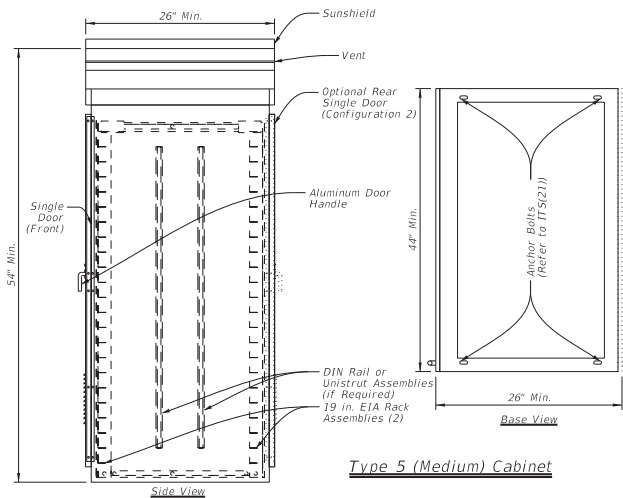
Type 6 (Large) Cabinet
Front View

Door Stop Detail
(3 Positions)



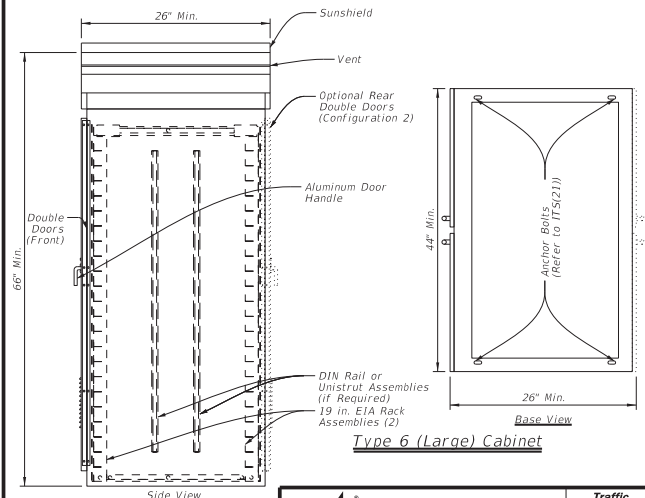
Type 4 (Small) Cabinet
Side View

Base View



Type 5 (Medium) Cabinet
Side View

Base View



Type 6 (Large) Cabinet
Side View

Base View

General Notes:

- Cabinet hardware equipment and door configuration shown is diagrammatic in nature and intended to represent a preferred ground mounted cabinet setup. Door orientation may vary and will be noted in the plans. 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.
- All dimensions are approximate and represent minimum dimensions.
- Provide conduit entrances at the bottom of the cabinet.
- Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 1) with single door.
Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 2) for rear door option.
- Sunshield to be mounted to cabinet using nuts, bolts, and spacers.
Water proof sealant to be used at cabinet surface/bolt contact points.

Texas Department of Transportation
Traffic Operations Division Standard

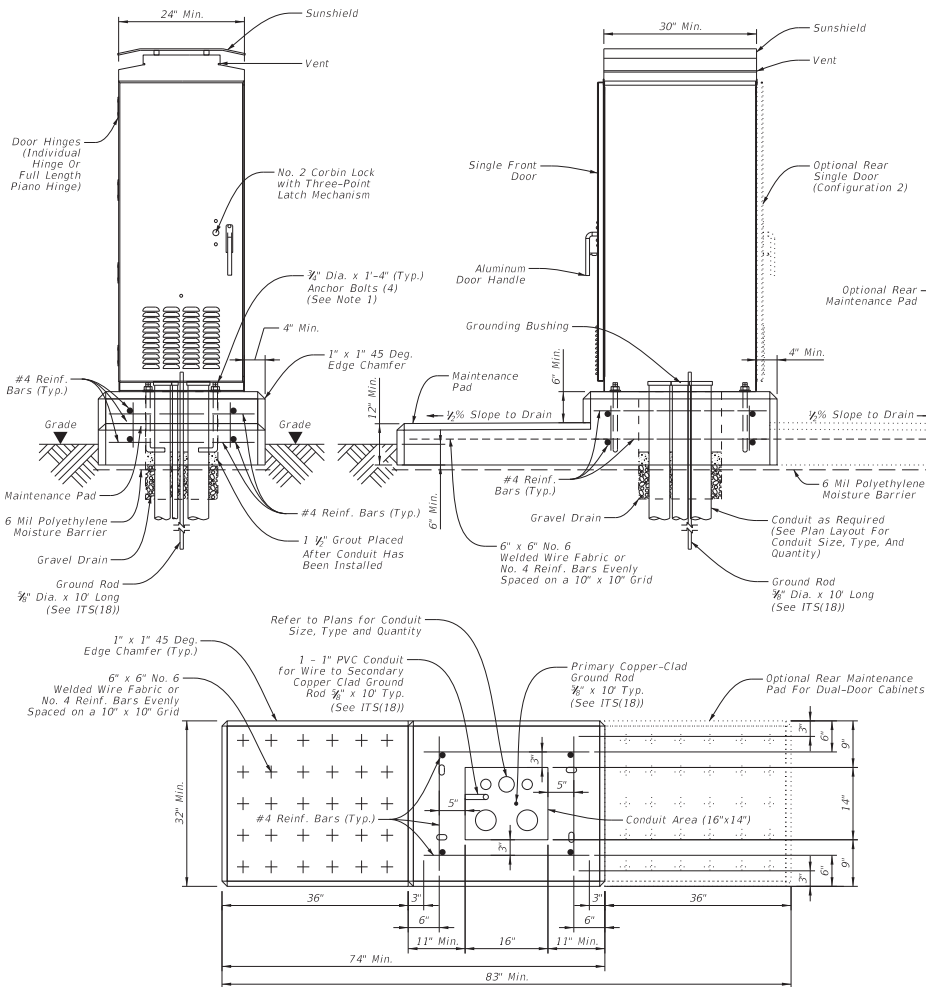
ITS GROUND MOUNTED CABINET ELEVATION DETAILS

ITS(20)-15

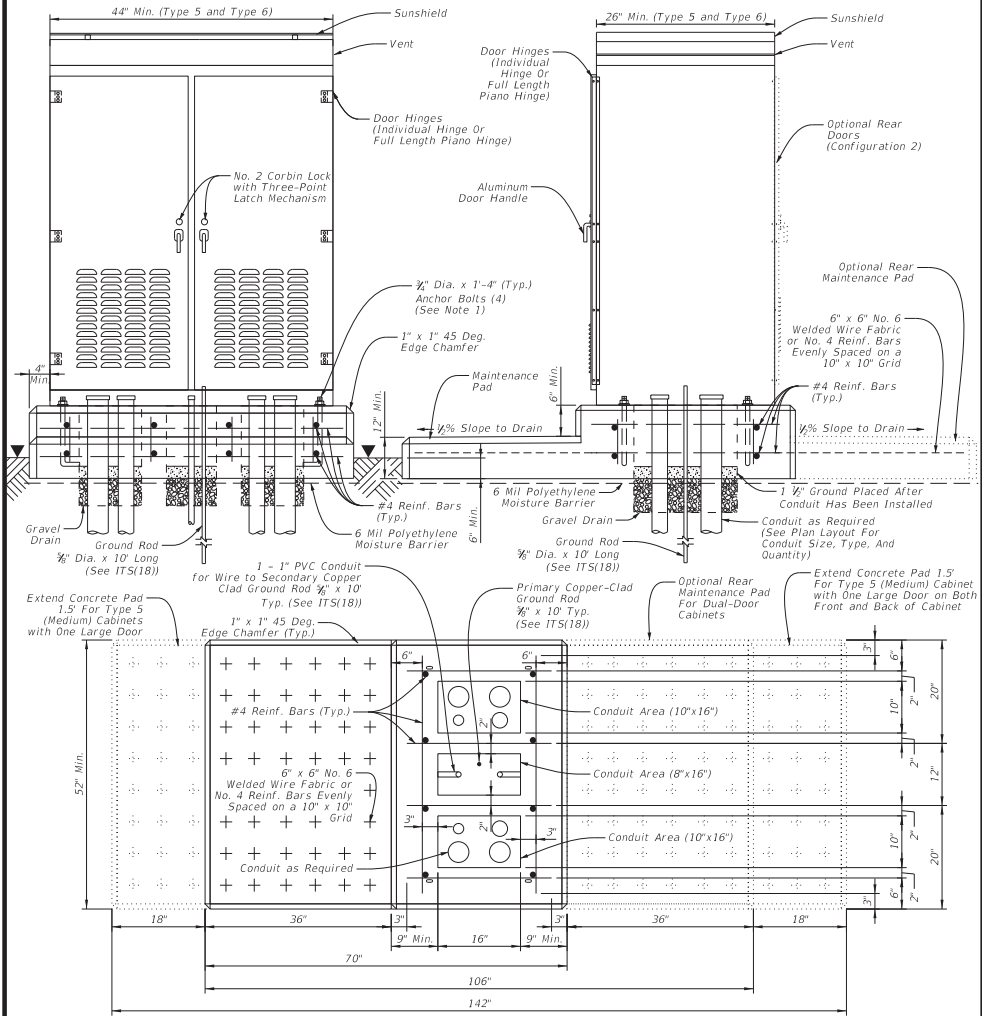
FILE: its(20)-15.dgn	DN: TxDOT	CK: TxDOT	DR: TxDOT	CR: TxDOT
© TxDOT June 2015	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
REVISIONS	BIST	COUNTY	SHEET NO.	
	WACO	BELL, ETC	58	

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

DATE: 12/16/2020 4:47:36 PM
 FILE: T:\WACTRAFF\JMC\SIGNAL_2021\Standard\ITS(21)-15.dgn



Type 4 (Small) Cabinet



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

General Notes:

- 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.
- Modify concrete base dimensions to fit required cabinet type.
- Ensure conduit area has gravel drain, 12" depth, coarse aggregate, grade No. 1.
- All concrete to be Class "A" in accordance with Item 421.
- 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.
- Furnish any additional concrete which may be necessary to stabilize foundation at unusual locations.
- Foundation will be subsidiary to Special Specification "ITS Ground Mounted Cabinet."
- Ground cabinet as required in cabinet specifications and as detailed on ITS(18) in accordance with the National Electric Code (NEC).
- Treat cabinet foundation with moisture sealant.
- Type 5 cabinet foundation will have a slightly larger foundation than Type 6. See foundation notes on details.
- Drain pipe shall be screened for drainage portion below foundation in gravel.

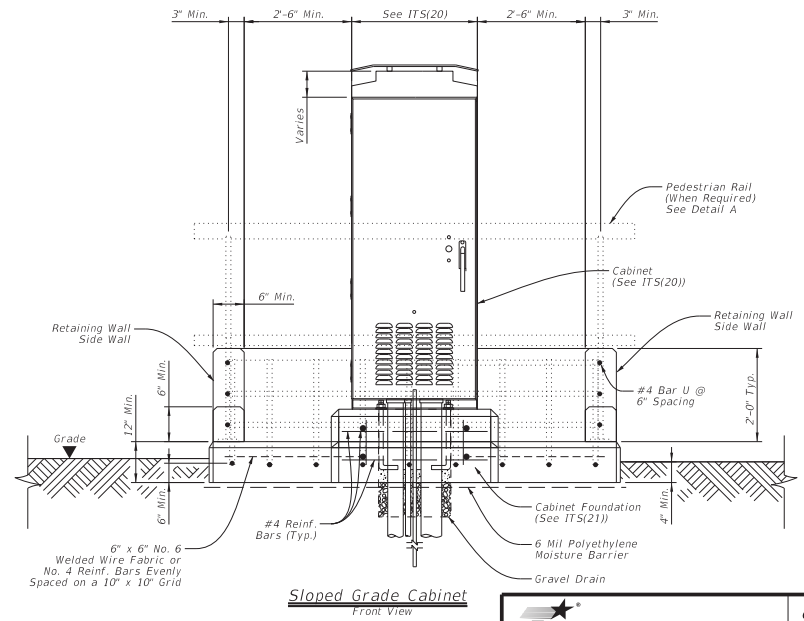
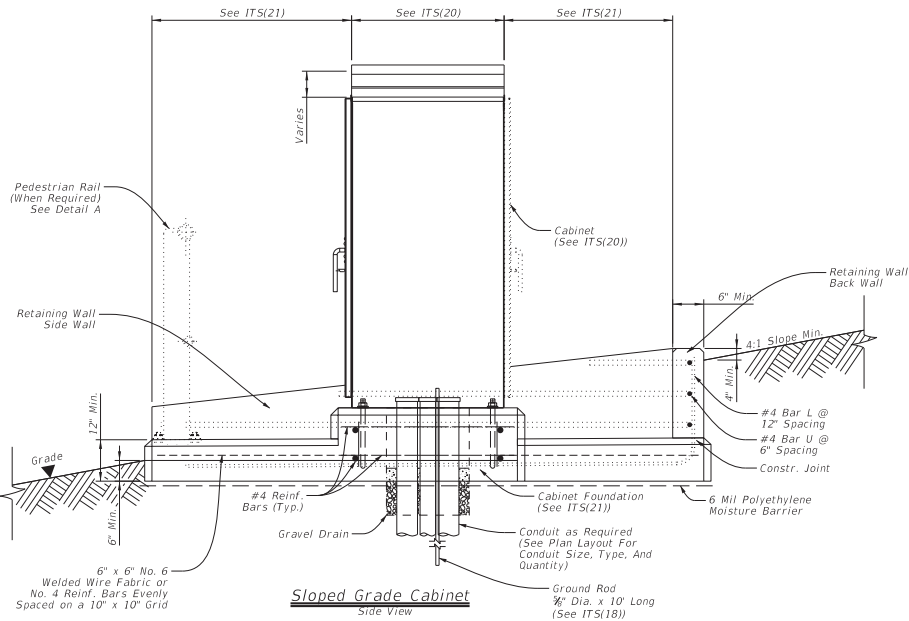
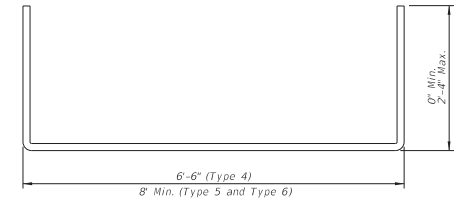
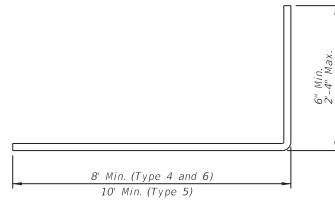
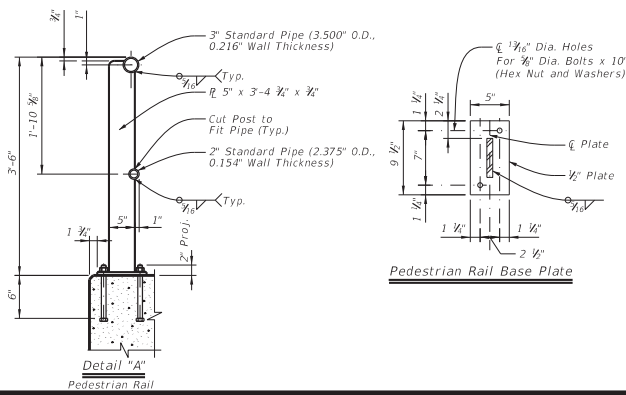
Texas Department of Transportation
Traffic Operations Division Standard

ITS GROUND MOUNTED CABINET FOUNDATION DETAILS

ITS(21)-15

FILE: Its(21)-15.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	CK: TxDOT
© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
DIST	COUNTY		SHEET NO.	
WACO	BELL, ETC		59	

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



General Notes:

- 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.
- Modify concrete base dimensions to fit required cabinet type.
- Ensure conduit area has gravel drain, 12" depth, coarse aggregate, Grade No. 1.
- All concrete to be Class "A" in accordance with Item 421.
- 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.
- Furnish any additional concrete which may be necessary to stabilize foundation at unusual locations.
- Foundation will be considered subsidiary to Special Specification "ITS Ground Mounted Cabinet."
- Ground cabinet as required in cabinet specifications and as per National Electric Code (NEC).
- Treat cabinet foundation with moisture sealant.
- Type 5 cabinet foundation will have a slightly larger foundation than Type 6. See foundation notes on details.
- Drain pipe shall be screened for drainage portion below foundation in gravel.
- 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.
- Pedestrian rail anchor bolts must be 3/8" 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.
- 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.
- Welded wire mesh not required in maintenance pad area when retaining wall rebar is integrated into maintenance pad.

ITS GROUND MOUNTED CABINET FOUNDATION ON SLOPE DETAILS

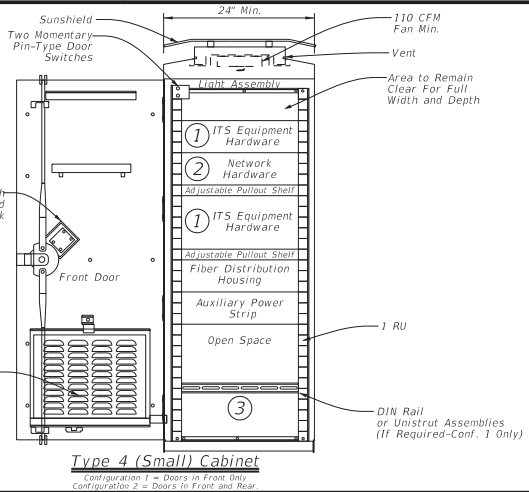
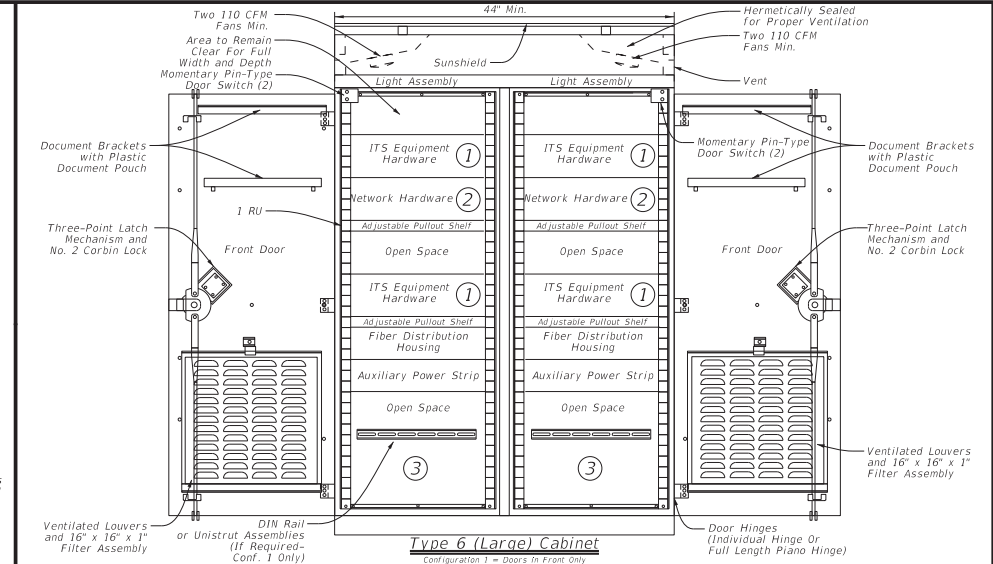
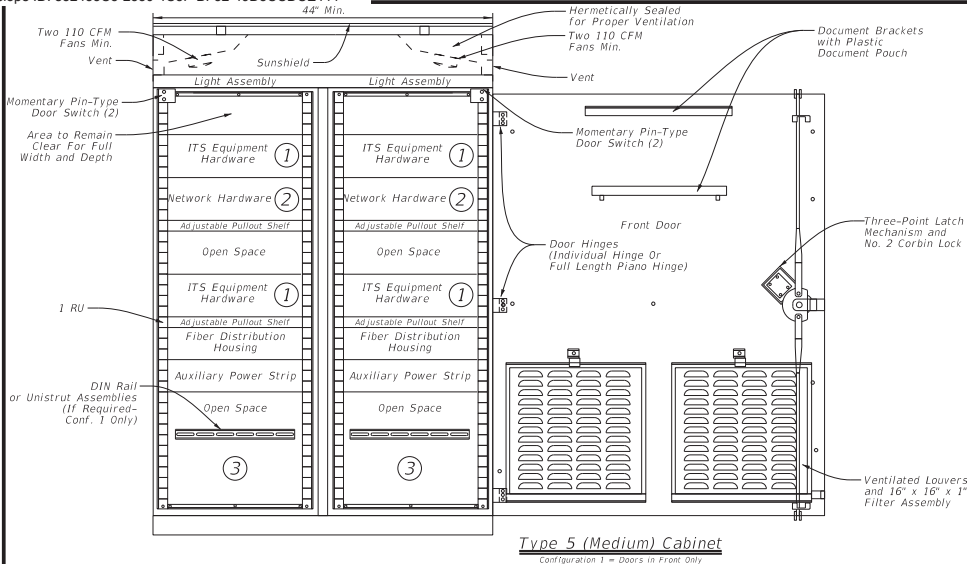
ITS(22)-15

FILE: Its(22)-15.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT	CHK: TxDOT
© TxDOT June 2015	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
REVISIONS		DIST: COUNTY		SHEET NO.
		WACO		BELL, ETC
				60

DATE: 12/16/2020 4:47:40 PM
 FILE: T:\MACTRAFF\JMC\SIGNAL_2021\Signal\ds\Its(22)-15.dgn

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

DATE: 12/16/2020 4:47:43 PM
FILE: T:\MACTRAFF\IMC\SIGNAL_2021\Standard.dwg\Its(23)-15.dgn



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, Highway Advisory Radio (HAR), Ramp Meter or Inductive Loop Card Rack, Automatic Vehicle Identification (AVI) 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, Solar Power System (If Required)

General Notes:

- Layout of hardware equipment and configuration shown is diagrammatic in nature and intended to represent a preferred ground mounted cabinet setup. Hardware needed for each 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.
- All dimensions are approximate and represent minimum dimensions.
- Provide conduit entrances at the bottom of the cabinet.
- Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 1) with single door.
Paid under Special Specification "ITS Ground Mounted Cabinet" (Configuration 2) for rear door option.
- RU = rack unit.
- Contractor to remove the cabinet removable center support, which ensures cabinet rigidity during shipping, during installation.

Texas Department of Transportation

Traffic Operations Division Standard

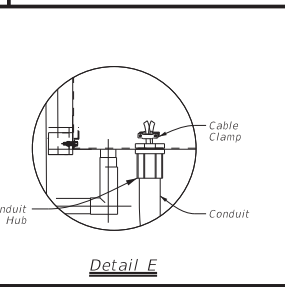
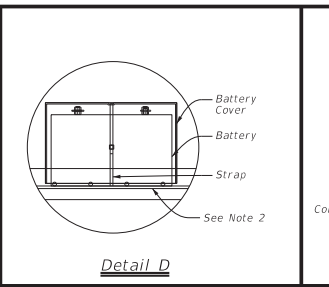
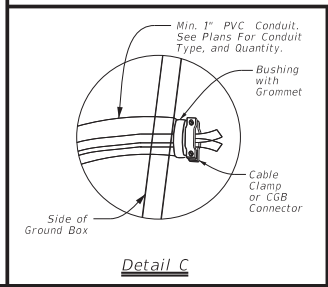
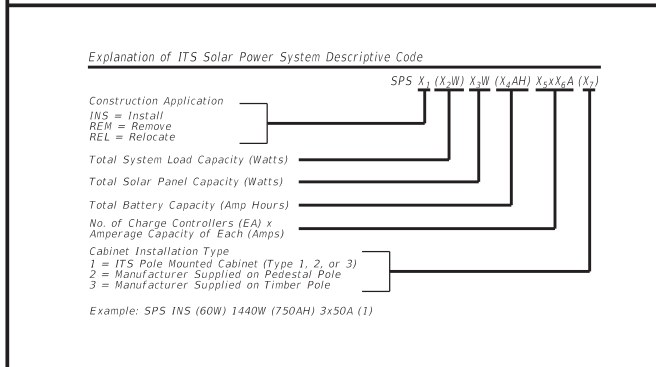
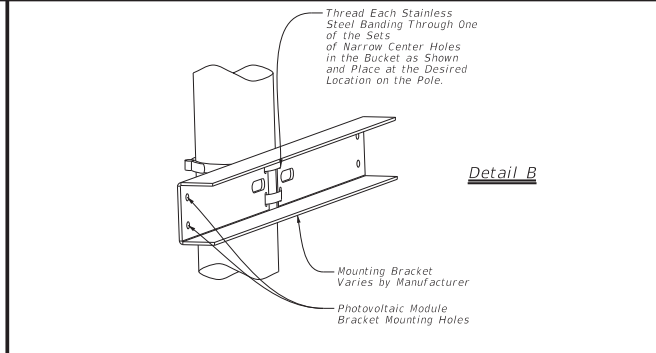
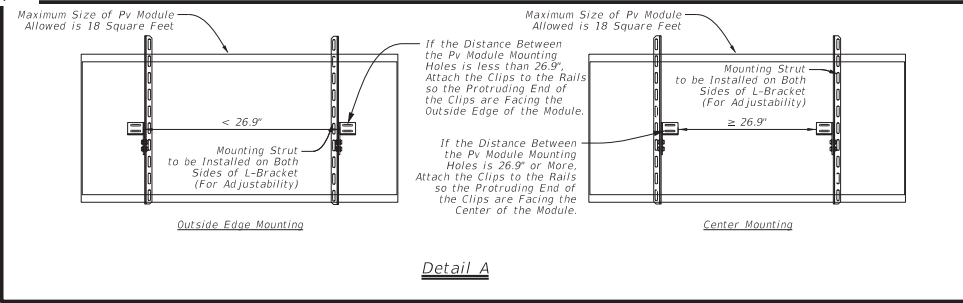
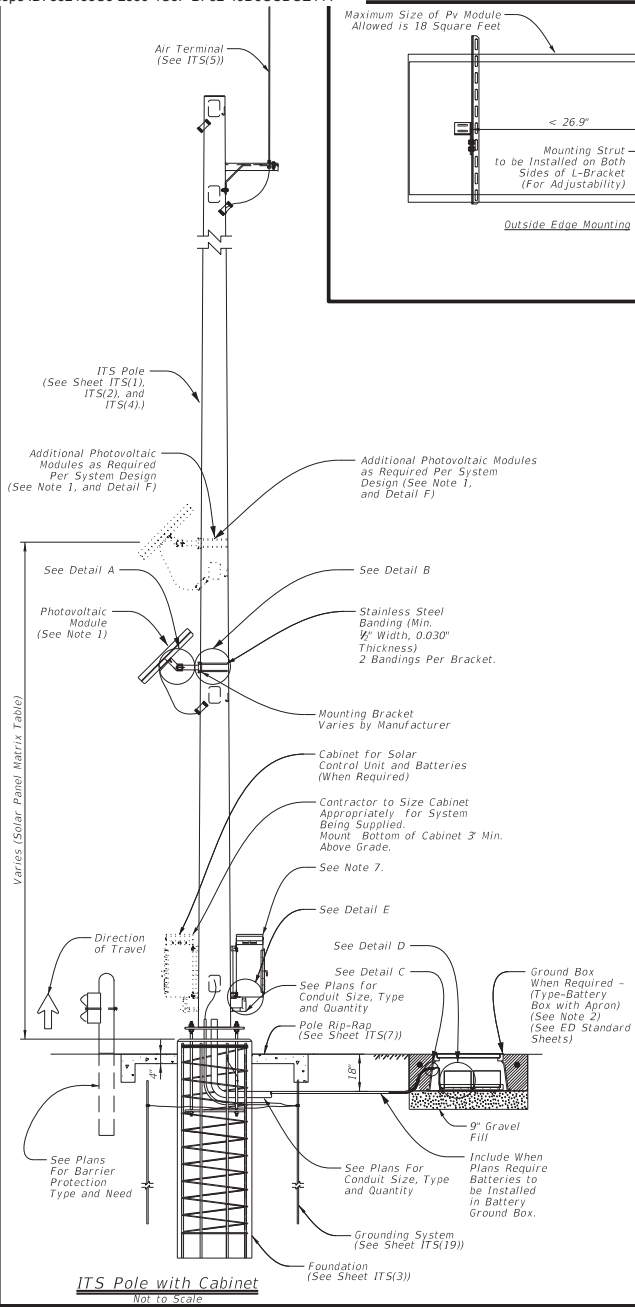
ITS GROUND MOUNTED CABINET INTERIOR DETAILS

ITS(23) - 15

FILE: Its(23)-15.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT	CHK: TxDOT
© TxDOT June 2015	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
REVISIONS		COUNTY		SHEET NO.
		WACO		BELL, ETC
				61

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

DATE: 12/16/2020 4:47:46 PM
 FILE: T:\WACTRAFF\IMC\SIGNAL_2021\Standard-ds\Its(24)-15.dgn

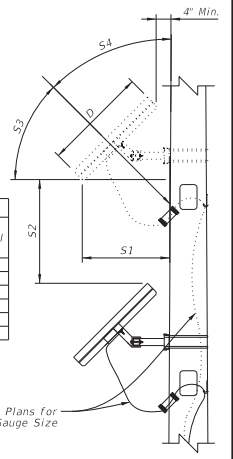


Dimension	Distance/Angle
S1	= $D \times (\sin(S3)) + 4$ (in.)
S2	= $D \times (\sin(S3)) \times (\tan(S3))$ (in.)
S3	= 90 deg. - S4 (zenith angle)
S4	Variable

S1 = Panel offset
 S2 = Optimum vertical clearance between panels (in.)
 S3 = Tilt angle (degrees), also sun elevation from horizon
 S4 = Sun zenith angle (degrees) oriented for maximum exposure per National Renewable Energy Laboratory (NREL)
 D = Depth of panel (in.)

Wind Zone (MPH)	Pole Height (FT)	Stiffeners	Max. No. of Solar Panels	Max. Height of Upper Solar Panel (FT)
90 or 110	20	Not Included	1	15
90 or 110	30-60	Not Included	2	20
90 or 110	30	Included	3	25
90 or 110	40-60	Included	4	30
130	20-60	Not Included	1	15
130	30-60	Included	3	25

* - ITS pole height less than 20 ft. have not been designed to support solar panels



General Notes:

- Orient photovoltaic module (Pv) for optimum exposure to sunlight (face to the south) per National Renewable Energy Laboratory (NREL) guidelines. Prior to installation, check the location to ensure there is no overhead obstruction that would block the Photovoltaic Module from receiving full sunlight. Unless specified elsewhere, mount a minimum of 14" above grade.
- When required for batteries to be installed in a battery ground box, place the batteries on a 3/8" thick plastic sheet and connect batteries together. Place a plastic cover (battery bell jar) over the top of each battery and secure the battery bell jar to the battery with a strap. The batteries, bell jars, straps and 3/8" thick plastic sheet will be subsidiary to special specification "ITS Solar Power System."
- When required for batteries to be installed in a pole mounted cabinet, wire batteries according to manufacturer's recommendations. Provide the number of batteries as required by the manufacturer. Stack the batteries in the cabinet on shelves with 1" vertical separation.
- See Electrical Details (ED) standard sheets for additional requirements regarding the installation of ground boxes/battery boxes, and conduit.
- Use materials specifically designed for attaching cabinets, photovoltaic modules, etc., to poles.
- See special specification "ITS Solar Power System" for further requirements.
- When provisioned in the plans, solar controller and batteries are permitted to be installed along with ITS equipment inside ITS pole mounted cabinet for new installations. For existing conditions, solar controller and batteries are permitted if spare capacity exists. Engineer to verify existing cabinet type and spare capacity before sizing solar power system.
- Pv = Photovoltaic
- See sheets ITS(1), ITS(2), and ITS(4) "ITS Pole Details" for further information regarding the ITS pole assembly.
- Use hardware specifically designed for attaching equipment (i.e., cabinet, photovoltaic module, etc.) to pole as recommended by equipment manufacturer. Provide mounting details for approval.

Texas Department of Transportation

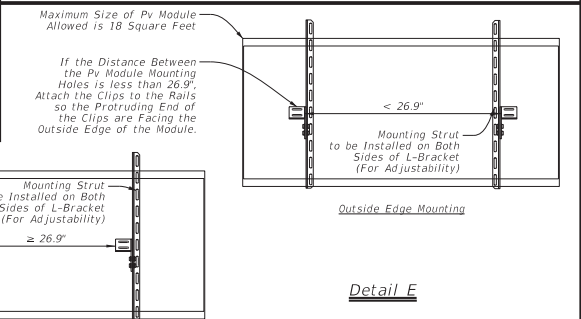
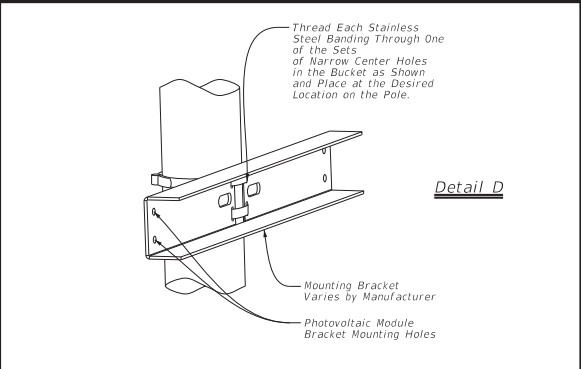
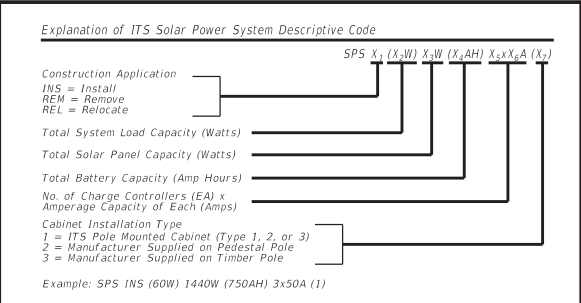
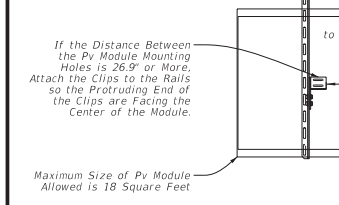
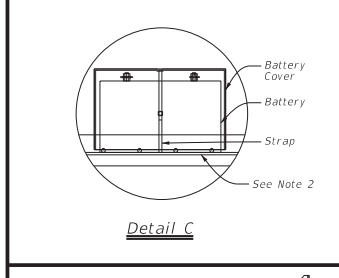
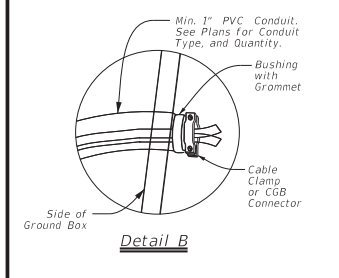
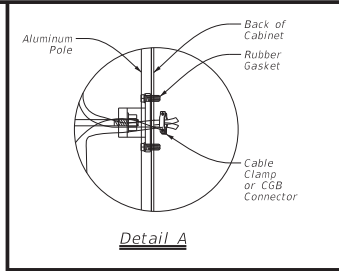
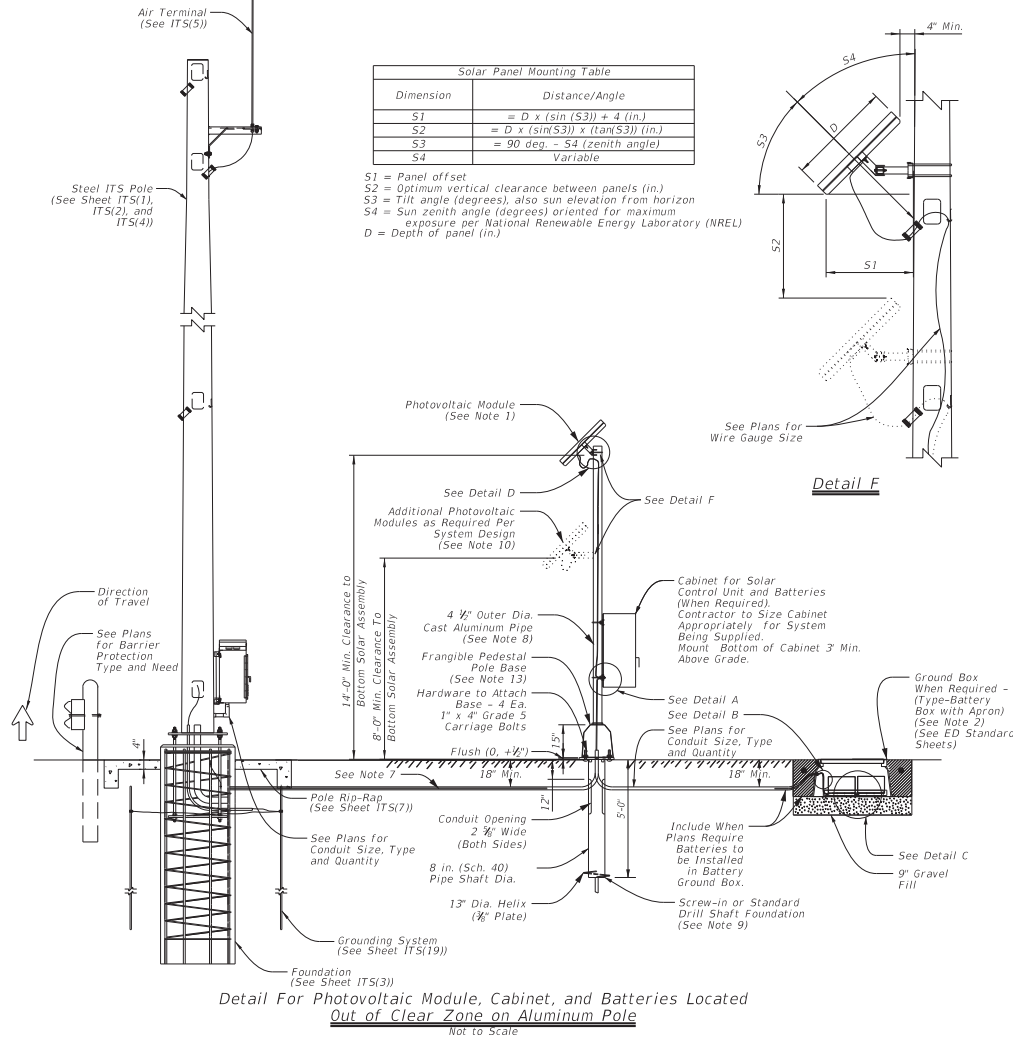
ITS SOLAR POWER SYSTEM POLE MOUNTING DETAILS

ITS(24)-15

FILE: Its(24)-15.dgn	DATE: TxDOT	DATE: C&TxDOT	DATE: TxDOT	DATE: C&TxDOT
© TxDOT June 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
	DIST	COUNTY		SHEET NO.
	WACO	BELL, ETC		62

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

DATE: 12/16/2020 4:47:51 PM
 FILE: T:\MACTRAFF\IMCS\IGNAL_2021\Standard\ITS(25)-15.dgn



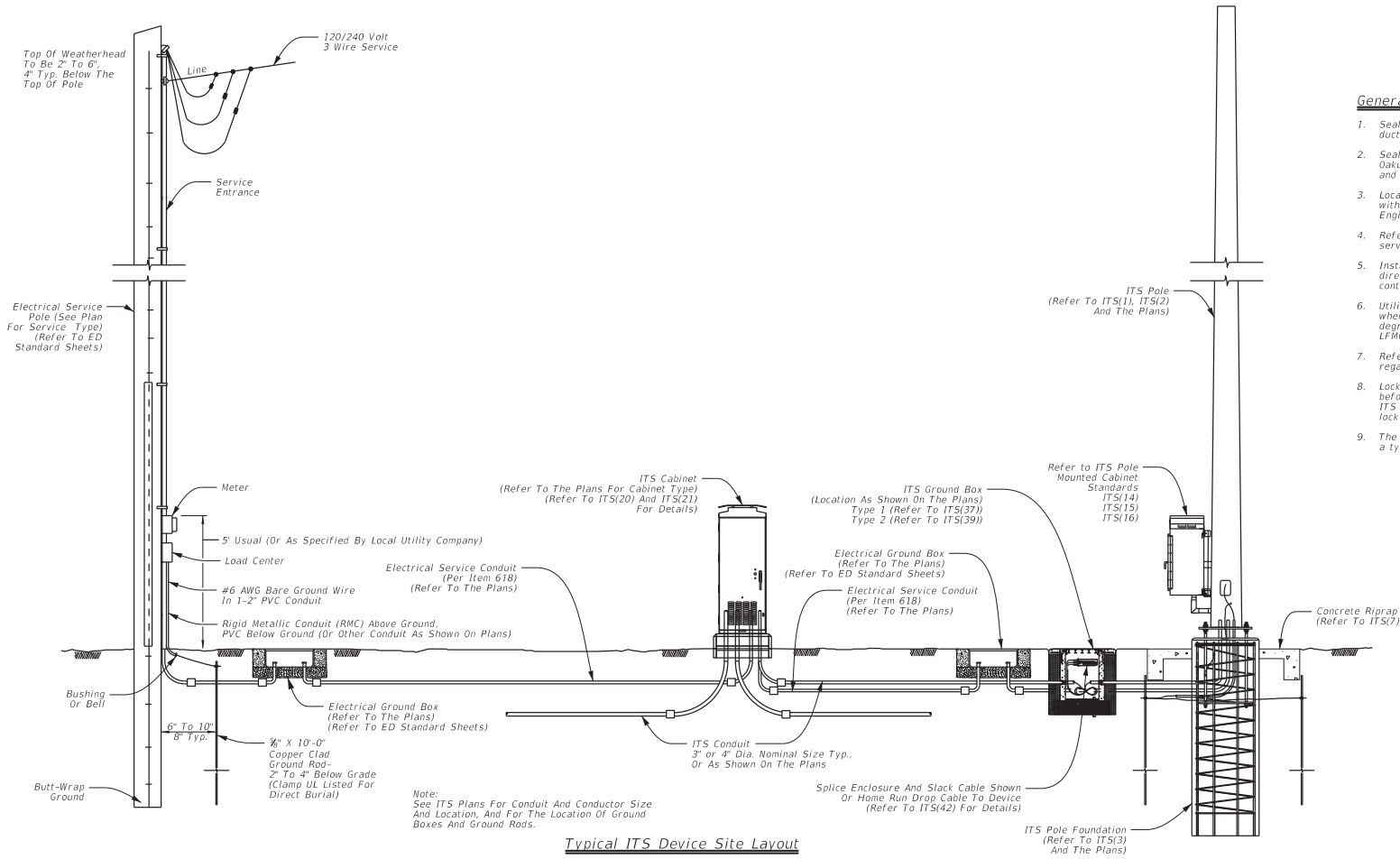
General Notes:

- Orient photovoltaic module for optimum exposure to sunlight (face to the south) per National Renewable Energy Laboratory (NREL) guidelines. Prior to installation, check the location to ensure there is no overhead obstruction that would block the Photovoltaic Module from receiving full sunlight. Unless specified elsewhere, mount a minimum of 1' above grade.
- When required for batteries to be installed in a battery ground box, place the batteries on a 1/2" thick plastic sheet and connect batteries together. Place a plastic cover (battery bell jar) over the top of each battery and secure the battery bell jar to the battery with a strap. The batteries, bell jars, straps and 3/16" thick plastic sheet will be subsidiary to special specification "ITS Solar Power System".
- When required for batteries to be installed in a pole mounted cabinet, wire batteries according to manufacturer's recommendations. Provide the number of batteries as required by the manufacturer. Stack the batteries in the cabinet on shelves with 1" vertical separation.
- See Electrical Details (ED) standard sheets for additional requirements regarding the installation of ground boxes/battery boxes, and conduit.
- Use materials specifically designed for attaching cabinets, photovoltaic modules, etc., to poles.
- See special specification "ITS Solar Power System" for further requirements.
- See plans for electrical conductor circuit size from solar cabinet to ITS pole mounted cabinet. Circuit to be designed based off of ITS equipment design load and allowable 5% voltage drop over distance from the solar assembly to ITS cabinet.
- Provide pedestal pole assembly in accordance with Item 687. Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 aluminum pipe, ASTM B429 or B221 (alloy 6061-T6 only). Aluminum conduit will not provide the necessary strength and will not be allowed.
- Use either a screw-in type anchor foundation or a drilled shaft foundation as identified in the plans. When plans require a drilled shaft foundation, construct in accordance with Item #16 and standard sheet TS-FD. Install the screw-in type anchor foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-in shaft foundation will be subsidiary to special specification "ITS Solar Power System".
- If more than 2 photovoltaic modules are needed, a second pedestal pole assembly may be required.
- See sheets ITS(1)-15, ITS(2), and ITS(4) "ITS Pole Details" for further information regarding the steel ITS pole assembly.
- Pv = Photovoltaic
- Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base color assembly to add strength and prevent loosening at connection.
- Use hardware specifically designed for attaching equipment (i.e., cabinet, photovoltaic module, etc.) to pole as recommended by equipment manufacturer. Provide mounting details for approval by equipment manufacturer.

Texas Department of Transportation
ITS SOLAR POWER SYSTEM ALUMINUM POLE MOUNTING DETAILS
ITS(25)-15
 Traffic Operations Division Standard
 FILE: ITS(25)-15.dgn
 DATE: 06/20/2015
 COUNTY: WACO
 SHEET NO.: 63

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

DATE: 12/16/2020 4:47:54 PM
 FILE: T:\NACTRAFF\IMC\SIGNAL\2021\Standard\ITS(36)-16.dgn



General Notes:

1. Seal all ITS communications conduits with waterproof duct plugs and seals.
2. Seal ends of all conduit entries into ITS cabinets with Oakum or other as approved by the District representative and pack with duct sealant.
3. Locate ground boxes for electrical and ITS communications within 5'-0" of cabinet enclosure, or as directed by the Engineer.
4. Refer to ED standard sheets for additional notes regarding electrical service.
5. Install service pole ground rod at alternate location when directed by the engineer. Maintain a minimum of 8'-0" in contact with the earth.
6. Utilize liquidtight flexible metal conduit (LFMC), as required when meter and service enclosure are mounted 90 to 180 degrees to each other. Refer to ED standard sheets for details on LFMC use.
7. Refer to ITS(21), ITS(37) and ITS(39) for details regarding conduit depth and entry into ITS ground boxes.
8. Lock all enclosures and bolt all ground box covers before power is applied to the circuit. Refer to the ITS cabinet references indicated on this sheet for cabinet lock requirements.
9. The detail shown is diagrammatic and is intended to represent a typical layout from electrical service to ITS devices.

Typical ITS Device Site Layout


		Traffic Operations Division Standard	
<h2>TYPICAL ITS DEVICE SITE LAYOUT</h2> <h3>ITS(36)-16</h3>			
FILE: Its(36)-16.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT
© TxDOT FEBRUARY 2016	CONT: 6375	SECT: 32	JOB: 001
REVISIONS		US: 190, ETC	HIGHWAY
BIST	COUNTY	SHEET NO.	
WACO	BELL, ETC	64	

Sheet Details
Not To Scale

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

1. Prior to TxDOT allowing the Contractor to start construction, the Contractor will provide the required storm water and 404 permit documentation and support activities, including but not limited to the following:
 - Provide a list of all chemicals, construction and waste products that will be generated, stored or brought upon TxDOT ROW. The list includes expected construction debris, sanitary wastes, construction chemicals and petroleum products used or generated by the Contractor and sub-contractors. Along with the list, the Contractor will supply a spill prevention plan and clean up procedures that will include each of these chemical products or generated waste.
 - Provide in the construction schedule the necessary line items that will comply with the schedule and planning requirements of the storm water permit.
 - Post the TxDOT storm water permit and any Contractor permits, per permit requirements.
 - Provide copies of storm water permits for Contractor PSL(s). As new PSL(s) may be obtained for the project, provide copies of new or amended permits to TxDOT. The Contractor will not disturb soil without the proper permits.
 - Provide scale drawings of off ROW PSL's within one mile of the project, for field offices, borrow sources, plant sites or other uses.
 - Provide permit information on any Contractor batch plants or concrete crushing plants to be located at a Contractor PSL(s) within one mile of the project limits or boundaries. Copies of the air and water permits are to be provided to TxDOT before materials will be used on the project. No asphalt or concrete batch plants or concrete crushing plants will be located on TxDOT ROW.
 - Provide a letter indicating a Contractor Responsible Person for environmental compliance (CRP) for the project, and maintain a CRP throughout the project duration.
 - Provide all environmental documentation including certification of compliance and EMS training documents/certificates prior to starting work. The Contractor is to provide daily BMP inspection reports that document all field BMPs needing repair or replacement. The Contractor is to clearly document specific BMPs needing repair and location each work day. The Contractor is encouraged to be proactive in fixing BMPs without TxDOT direction.
 - Provide documentation required for Waters of the US, Note #3 and submittals for Item 496 bridge removal. Bridge removal methods submitted will follow all Waters of the US note requirements. The Contractor is not to start construction within the Ordinary High Water Marks of any stream until receiving approval for stream channel construction methods from TxDOT.
 - Provide a written procedure for managing all chemicals and construction items placed in vertical containment structures. Also, provide methods to be used for the treatment, disposal, collection or release of storm water.
 - Provide an estimated date by letter, for the submittal of marked up bridge drawings, indicating cut locations for any structural steel requiring cutting or torching of steel, coated with lead containing paints.
2. Place and maintain trash cans and portable sanitary facilities at locations where there is active construction. Worker generated trash and construction debris will be kept from being transported by storm water and will be collected daily from the ground and routinely hauled from the work area.
3. Contractor will provide TxDOT copies of all correspondence with MS4s, TCEQ, EPA, DSHS and Corps of Engineers regarding activities on this project.
4. Contractor to conduct storm water inspections and develop SWPPP documents to support Contractor permits obtained for the project including PSL(s).
5. Contractor will maintain written documentation of locations of all portable sanitary facilities. The Contractor is required to document the location and disposition of all spills and cleanups from portable sanitary facilities.
6. Contractor will not store chemicals on TxDOT ROW, unless chemicals are stored following all environmental and safety regulations. Fuels for construction equipment will not be stored on TxDOT ROW.
7. The Contractor will store fuels and bulk chemicals on Contractor PSL(s) using a secondary containment method, such as double lined tanks and/or free standing containment reservoirs made of plastic or steel designed to hold bulk chemicals or drums.
8. The Contractor will not remove sediment controls without the prior approval of TxDOT, except for a sediment control that may back up water and cause safety or traffic problems.

SCALE = NTS SHEET 1 OF 10



Texas Department of Transportation
Waco District Standard

**TYPICAL APPLICATIONS
FOR
BEST MANAGEMENT
PRACTICES**


TA-BMP

FILES: BMPLAYOUTS.dgn	DN: TxDOT	CR: TxDOT	DN: TxDOT	CR: TxDOT
© TxDOT 2009	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
DEC 2013	DIST	COUNTY	SHEET NO.	
FEB 2015	WACO	BELL, ETC	65	

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

9. Any sediment controls removed by the Contractor must be re-installed before the next rainfall event or by the end of day, as approved in advance.
10. Vegetative buffer strips may be used in place of temporary sediment controls such as silt fences and rock filter dams. The amount of disturbed soil area will be limited to 1/3 of an acre or less for a minimum of 50 feet of grassed ditch and 2/3 of an acre of disturbed soil for a minimum of 100 feet of grassed ditch.
11. Construction equipment found to be leaking oil, fuel or coolant will be immediately stopped, the leaking fluid collected and the equipment fixed. Equipment continuing to leak will be removed from the project at no cost to TxDOT. Leaking fluids from equipment will be collected and removed from the project or PSL.
12. Earth berms or mounds typically used to stockpile topsoil and used in place of boundary silt fence will be seeded upon being constructed. Long term use of earth berms or mounds will not be continued without establishing grass on the control.
13. The Contractor will inform TxDOT of new areas where soil will be disturbed to facilitate planning for new sediment controls. Areas of vegetated soil will not be disturbed by the Contractor, unless adequate sediment controls can be installed before the next rainfall event. The Contractor will assist TxDOT in keeping an accurate set of working SWPPP drawings that show the locations of all temporary sediment and erosion controls.
14. The Contractor will maintain an adequate amount of temporary sediment controls on hand at the field office or project staging area for critical SWPPP maintenance, including silt fence (minimum of 200 feet) and rock / fabric for rock filter dams (minimum for 100 feet of Type III dams).
The requirement for BMP rock quantities on hand is waived for small projects for on and off system bridge installations. The Contractor having a BMP Subcontractor does not eliminate the requirement for the Contractor to have the required silt fence and rock on hand, typically stored at the Contractor PSL.
15. Failure of a sub-contractor to complete storm water work on time will require the Contractor to start storm water sediment control work immediately and complete the work with high priority, or be subject to stop work on the entire project.
16. Earth materials on roads as a result of soil tracking will not be allowed to be transported off ROW in storm water. Soil or rock material found on roadways deposited from Contractor equipment will be removed daily.
17. Unless approved, completed concrete curb inlets will not be blocked by sediment controls. The contractor will frequently sweep the completed or partially completed roadway to keep sediment out of drainage pipes.
18. The Contractor will be responsible for proper dust control and will route construction traffic in a manner that minimizes dust generation.
19. Water for dust control will contain no pollutants, but may be non-potable from upland stock ponds. No quantity of water to be used for construction purposes may be taken from a 404 stream, prior to the proper authorizations or permits being obtained by the Contractor.
20. Contractor is to direct workers and sub-contractors to use portable sanitary facilities provided by the Contractor and not to trespass off ROW.
21. Contractor will provide written verification to TxDOT that earth borrow pits and disposal sources meet environmental and regulatory requirements, prior to use. Excavations will meet all OSHA requirements and the current safety guidelines established for TxDOT Quarries and Pits.
22. Boundary silt fences that are terminated down slope, with one end being at the lowest elevation, will be installed with an L - hook to contain sediment. Boundary silt fences that are installed on flat ground will have L-hooks on both ends.
23. Rock filter dams across ditches will be constructed where the rock filter dam ends are embedded within the ditch side slopes and ditch bottom. The top center elevation of the rock filter dam will be at least 6 inches lower than the elevations on the rock filter dam ends.
24. Silt fence will be constructed in a U or V pattern across ditch lines and up the ditch side slope to keep storm water from flowing around the ends of the silt fence. Small silt fences that do not adequately span the ditch and allows storm water around the ends will not be used. Where there is adequate space, large U pattern silt fences are preferred to facilitate sediment collection and sediment removal with equipment.
25. Sediment controls (RFDs or silt fences) will be located along road ditches as marked on the SWPPP drawings. Modifications to the sediment control spacing will be adjusted during the project based on sediment control effectiveness. The installation and maintenance of sediment controls at or near outfalls, where storm water leaves TxDOT ROW, takes persistent over ditch line sediment controls.

SCALE = NTS SHEET 2 OF 10



**TYPICAL APPLICATIONS
FOR
BEST MANAGEMENT
PRACTICES**

TA-BMP

FILES: BMP.LAYOUTS.dgn	DN: TxDOT	CR: TxDOT	DN: TxDOT	CR: TxDOT
© TxDOT 2009	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
DEC 2013	DIST	COUNTY	SHEET NO.	
FEB 2015	WACO	BELL, ETC	66	

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

26. Storm water draining sheet flow over disturbed soil sloped towards the ROW property line, will be intercepted by a boundary silt fence typically installed with L-shaped ends.
27. For ditch grading and shoulder up work, the Contractor is limited during good weather to remove up to one mile (limited to five acres of disturbed soil) of ditch line sediment controls; on one side of the roadway. Outfall controls cannot be removed during this activity. Ditch line controls must be replaced upon completion of work and before the next rain event.
28. Sediment controls damaged by the Contractor, as defined by permit, must be fixed or replaced immediately upon discovery.
29. Notches in silt fences are not typically allowed. Specific silt fences that back up water onto lanes of traffic may be notched if approved.
30. For silt fence maintenance, the Contractor will leave approximately 4 inches of deposited sediment up stream of silt fences and not over excavate around silt fences or rock filter dams.
31. The Contractor will inform TxDOT of new construction areas and where soil is planned to be disturbed. Sediment controls will be installed at outfalls prior to the Contractor beginning soil disturbing activities up slope from the outfall.
32. Water from concrete saw cutting, concrete grinding and concrete coring activities; or fine materials from concrete chipping and salvage will not be allowed to enter storm drains or enter streams.
33. Storm water containing suspended sediment and turbidity needing to be removed from excavations or low areas will be pumped or gravity drained through vegetated buffer strips (50 foot minimum) or placed in ditches with temporary sediment controls, prior to the water being discharged into a stream.
34. Uncontaminated water from natural groundwater seepage, springs, foundations and drains that does not contain suspended sediment or any pollutants may be discharged without storm water controls.
35. Lime or cement if spilled in ditches or outside the defined limits of application is considered a pollutant and will be excavated and removed the same day, to avoid contaminating streams.
36. If located along the project ROW, RAP stockpiles will be located where there is a minimum 100 feet of vegetative buffer strip before storm water will reach a stream. RAP will not be used as a construction material within the Ordinary High Water Marks of a stream channel of a 404 designated stream.
37. If allowed on the project, concrete truck wash out areas will have adequate volume to allow 12 inch freeboard for rain and will be lined with 6 mils of plastic. No concrete will be stored higher than the 12 inch freeboard. Cleaning of truck chutes and equipment does not constitute concrete truck wash out and this activity may be completed at the concrete placement location. Wash out areas will not be located closer than 50 ft from down slope inlets or stream channels.
38. For outfalls near stock ponds closer than 50 foot from disturbed soil at the ROW line, redundant sediment controls will be provided, typically a combination of rock filter dam and a silt fence constructed in line of the flow.
39. Earth stockpiles will utilize silt fence sediment controls, positioned on the low end of the stockpile drainage area with L-hooks or silt fence installed around the entire stockpile.
40. Sediment controls including rock filter dams and silt fences will not be installed across any 404 streams. Sediment controls at 404 streams will be positioned to limit sediment entering the stream from the banks and around structures/culverts, and will allow free flow of storm water to pass through the ROW without being dammed by any sediment controls. Remove loose materials from stream channels prior to each rain event.
41. Sediment controls for non-404 streams may be constructed across the drainage channel in unlimited locations. It is appropriate to use sediment control details typically used for 404 streams for non-404 streams when flow velocities are high. Remove loose material from stream channels prior to each rain event.
42. Incomplete drainage pipe installation across the roadway does not remove the requirement for having sediment controls around the ends of the pipe. To stay within permit requirements, sediment controls should be installed over and around the terminated end and along each side of the banks as soon as construction on the pipe has been completed. Remove loose material from stream channels prior to each rain event.
43. Safety end / headwall construction temporarily will require the removal of part of the sediment control placed over and around the pipe end. Retain in place as much functioning sediment control as possible. Replace the silt fence over and around the top of the pipe, immediately upon concrete placement and form removal. Do not remove culvert sediment controls that cannot be replaced before the next rain event. Sediment control at the ends of culverts must be in place and available for any rain event until the disturbed soil areas are re-vegetated.

SCALE = NTS SHEET 3 OF 10



TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

FILES: BEMPLAYOUTS.dgn	DN: TxDOT	CR: TxDOT	DN: TxDOT	CR: TxDOT
© TxDOT 2009	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
DEC 2013	DIST	COUNTY		SHEET NO.
FEB 2015	WACO	BELL, ETC		67

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

44. Between the Ordinary High Water Marks of a 404 stream channel, the Contractor will disturb only the minimum amount of stream channel that is necessary to complete the work.
45. Rock riprap for erosion control does not replace the requirements to maintain sediment control until vegetation is re-established. Replace sediment controls immediately after installing erosion rock.
46. At the direction of TxDOT, sediment deposited into existing and new culverts will be removed subsidiary to Item 506. Sediment to be removed is either pre-existing material before construction starts or sediment generated as a part of this project.
47. Provide treated 2X4 cross bracing for rectangular inlet silt fence, subsidiary to Item 506.
48. Loose or granular earth materials will not be used to repair silt fence undercuts. Silt fence undercut repairs will be conducted with well compacted soils or the silt fence will be reset in a nearby location.
49. Silt fence steel T posts of approximately 1.25 pounds per foot are allowed at a spacing of 8 feet or less. Silt fence steel T posts between approximately 1.25 pounds per foot and 0.85 pounds per foot are allowed for T post spacing of 5 feet or less.
50. Silt fence to be used to slow the flow of storm water down slopes will be positioned approximately horizontal (on the contour) with L hooks on the ends and limited to approximately 200 feet in length. Multiple sections and levels of silt fence may be required in addition to temporary / permanent erosion control flumes.
51. Soil retention blankets will be installed rolled down the slope with the small dimension side embedded at the top of slope, unless recommended otherwise by the manufacturer. Excess grass, rocks, trash, debris or clods will be removed before seeding and installing soil retention blankets. All installations will be by the manufacturer recommendations. Contractor equipment, including tractor mowers will be kept off areas with soil retention blankets until the grass is established.

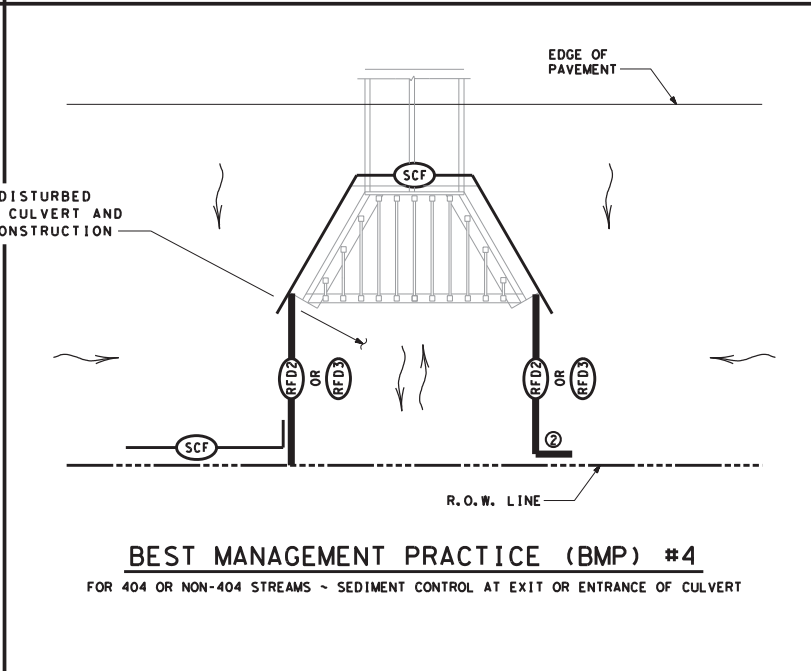
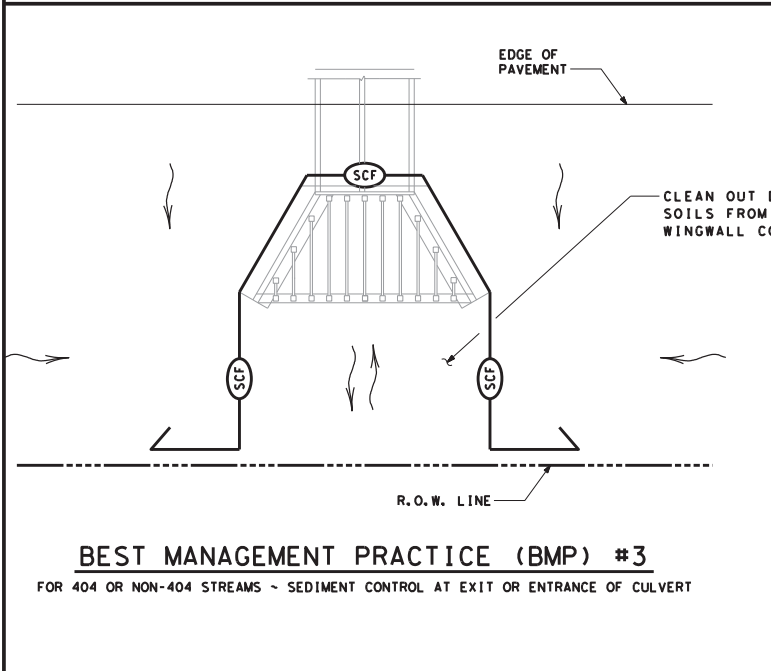
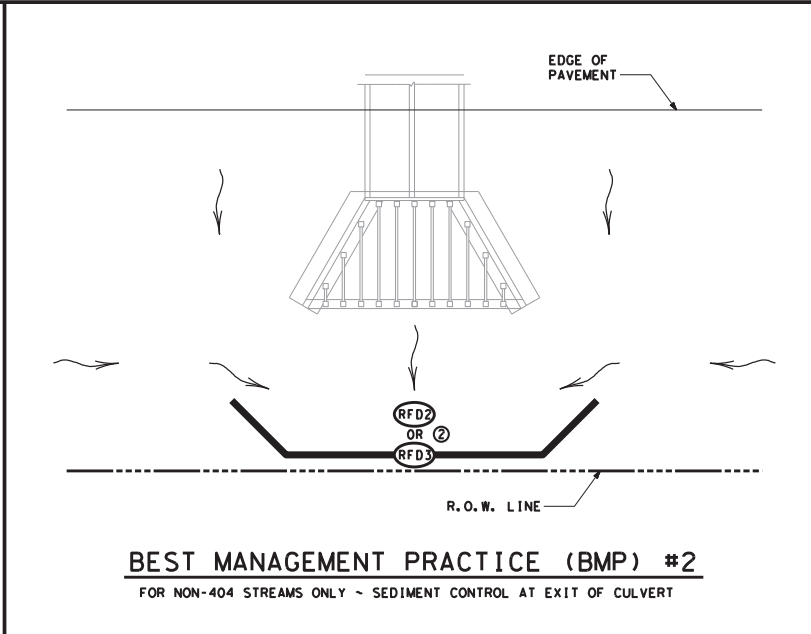
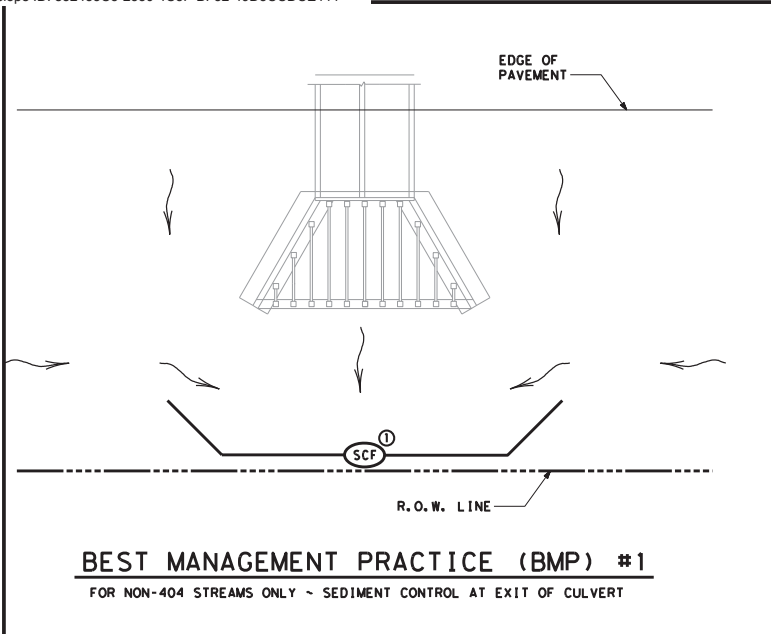
SCALE = NTS SHEET 4 OF 10



TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA - BMP

FILES: BMPLAYOUTS.dgn	DWG: TxDOT	CHK: TxDOT	DWF: TxDOT	CHK: TxDOT	DWF: TxDOT
© TxDOT 2009	CONT: 6375	SECT: 32	JOB: 001	US: 190, ETC	HIGHWAY
REVISIONS DEC 2013 FEB 2015	DIST: WACO	COUNTY: BELL, ETC	SHEET NO.: 68		



	SEDIMENT CONTROL FENCE
	ROCK FILTER DAM (TY 2)
	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

- NOTES:**
- ① EXTEND SILT FENCE SO STORM WATER DOES NOT GO AROUND THE ENDS. USE L-HOOKS ON ENDS AS REQUIRED.
 - ② EXTEND ROCK FILTER DAM SO STORM WATER DOES NOT GO AROUND THE ENDS.

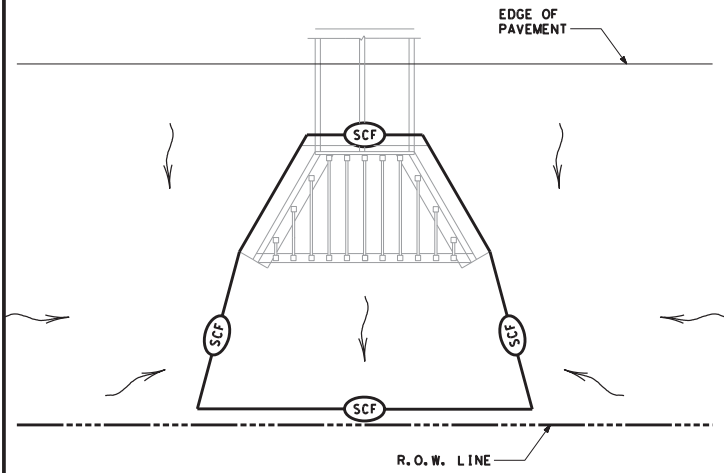
SCALE = NTS SHEET 5 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

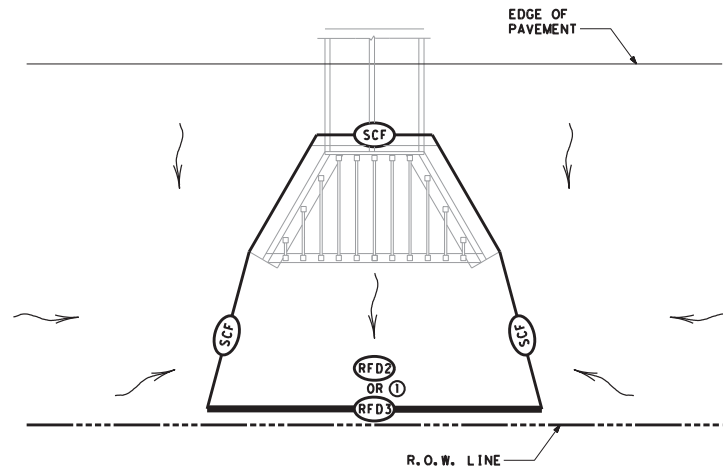
TA-BMP

FILES: BMPLAYOUTS.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT	CHK: TxDOT
© TxDOT 2009	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
REVISIONS: DEC 2013, FEB 2015	DIST: WACO	COUNTY: BELL, ETC	SHEET NO.: 69	



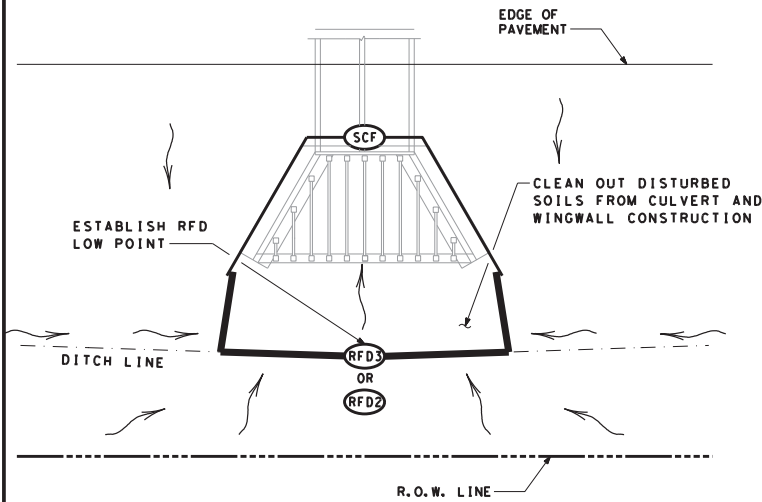
BEST MANAGEMENT PRACTICE (BMP) #5

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



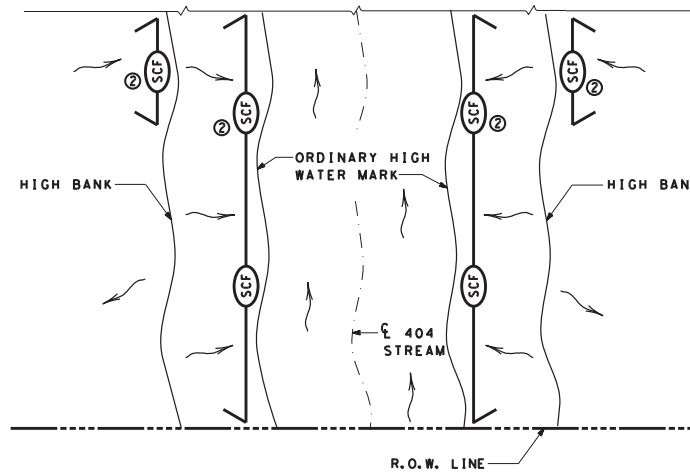
BEST MANAGEMENT PRACTICE (BMP) #6

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #7

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #8

FOR 404 STREAMS ~ SEDIMENT CONTROL DURING PROJECT CLEARING AND GRUBBING

	SEDIMENT CONTROL FENCE
	ROCK FILTER DAM (TY 2)
	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

- NOTES:
- PROVIDE OVERLAP OF SILT FENCE WITH ROCK FILTER DAM.
 - USE SILT FENCE L-HOOKS ON ENDS TO BLOCK STORM WATER SEDIMENT

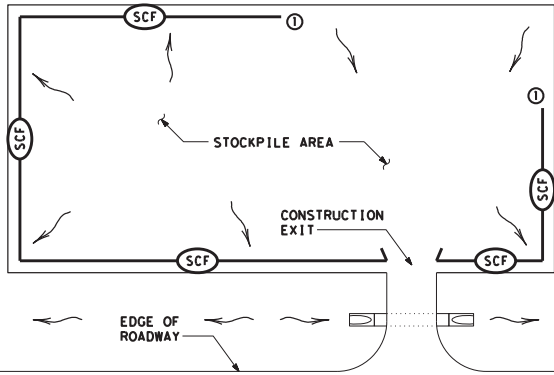
SCALE = NTS SHEET 6 OF 10



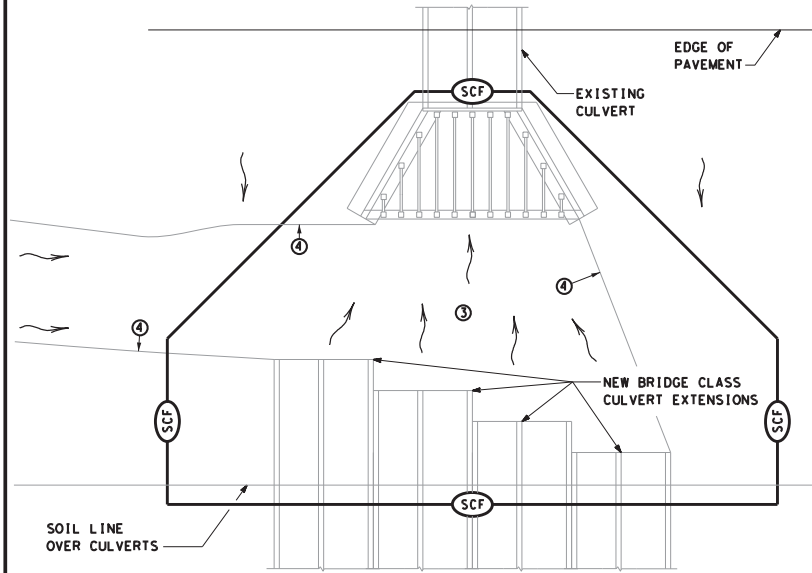
TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

FILES: BMPPLAYOUTS.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
© TxDOT 2009	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
DEC 2013	DIST	COUNTY	SHEET NO.	
FEB 2015	WACO	BELL, ETC	70	



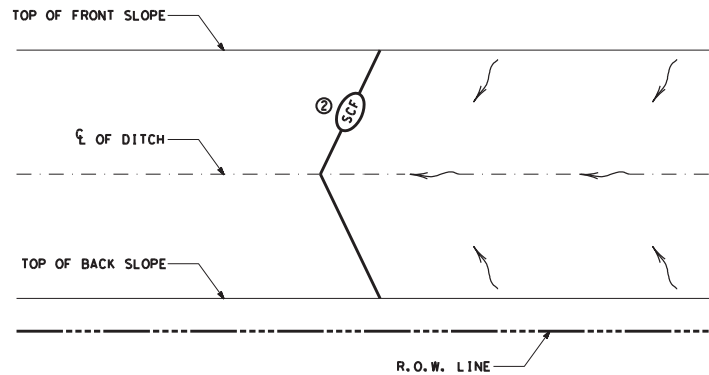
BEST MANAGEMENT PRACTICE (BMP) #9
STOCKPILE SEDIMENT CONTROL



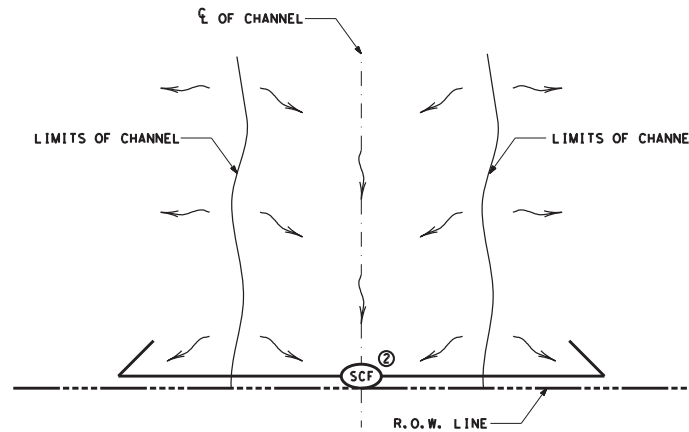
BEST MANAGEMENT PRACTICE (BMP) #10
FOR 404 OR NON-404 STREAMS ONLY ~
SEDIMENT CONTROL AT PHASED CONSTRUCTION OF BRIDGE CLASS CULVERTS

	SEDIMENT CONTROL FENCE
	ROCK FILTER DAM (TY 2)
	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

- NOTES:
- START SEDIMENT CONTROL AT LOCATION SO ALL STORM WATER WITH SEDIMENT IS COLLECTED
 - ROCK FILTER DAMS OR EARTH/GRASSED EMBANKMENTS CAN BE SUBSTITUTED AS DIRECTED.
 - PROVIDE A SMOOTH TRANSITION FROM THE INVERT ELEVATIONS BETWEEN CULVERTS. REMOVE LOOSE SOIL FROM EXCAVATED AREA BETWEEN CULVERTS.
 - PROVIDE AND INSTALL PNEUMATICALLY PLACED CONCRETE ON THE DITCH BOTTOM AND SIDE SLOPES BETWEEN TEMPORARY TERMINATIONS BETWEEN OLD AND NEW CULVERTS. PNEUMATICALLY PLACED CONCRETE WILL BE PLACED TO THE HEIGHT OF THE LARGEST CULVERT ON THE DITCH SIDE SLOPES; AND TO A LIMIT 10 FEET OUTSIDE THE LOCATION OF BMPS ALONG THE DITCH BOTTOM. CEMENT STABILIZED SAND MAY BE SUBSTITUTED FOR PNEUMATICALLY PLACED CONCRETE, IN AREAS WHERE INSTALLATION WORKS AND AT THE OPTION OF TXDOT.



BEST MANAGEMENT PRACTICE (BMP) #11
BOUNDARY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED UP SLOPE



BEST MANAGEMENT PRACTICE (BMP) #12
BOUNDARY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED DOWN SLOPE

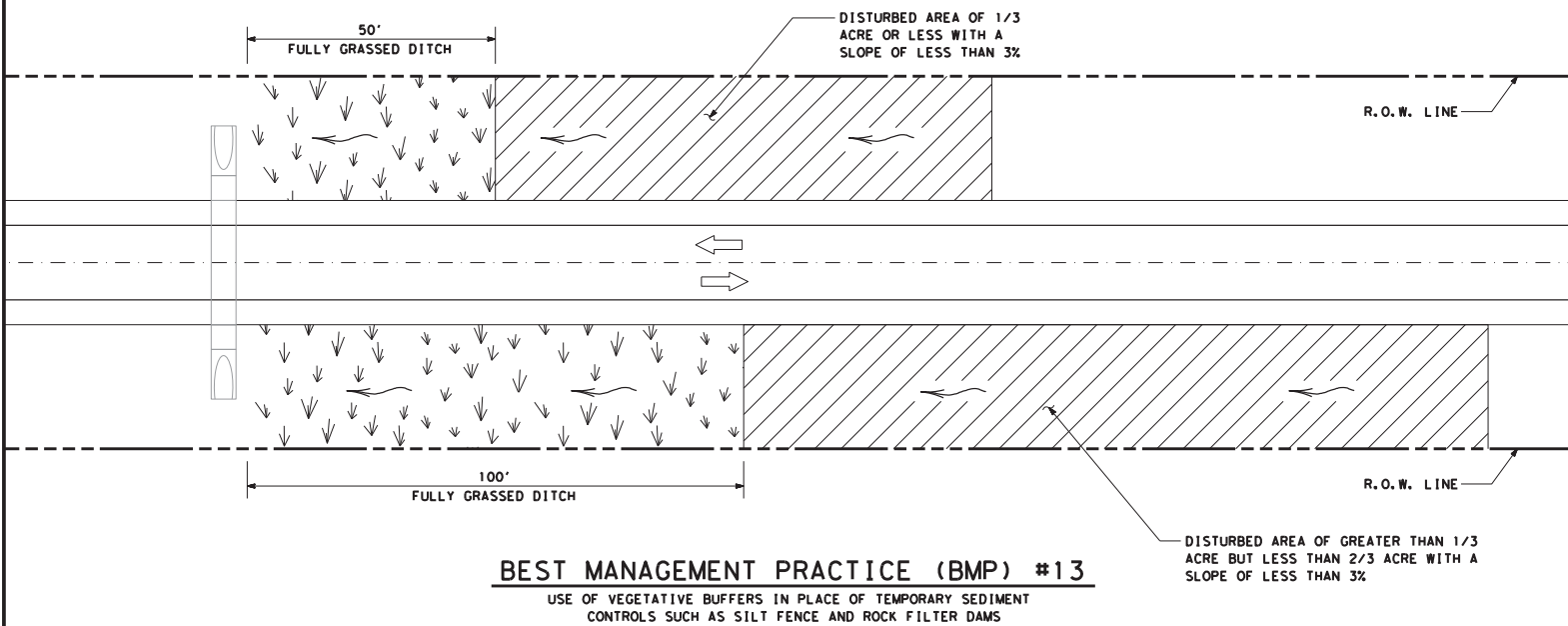
SCALE = NTS SHEET 7 OF 10



TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

FILES: BMLAYOUTS.dgn	DN: TXDOT	CR: TXDOT	DN: TXDOT	CR: TXDOT
© TXDOT 2009	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	32	001	US 190, ETC
DEC 2013	DIST	COUNTY	SHEET NO.	
FEB 2015	WACO	BELL, ETC	71	

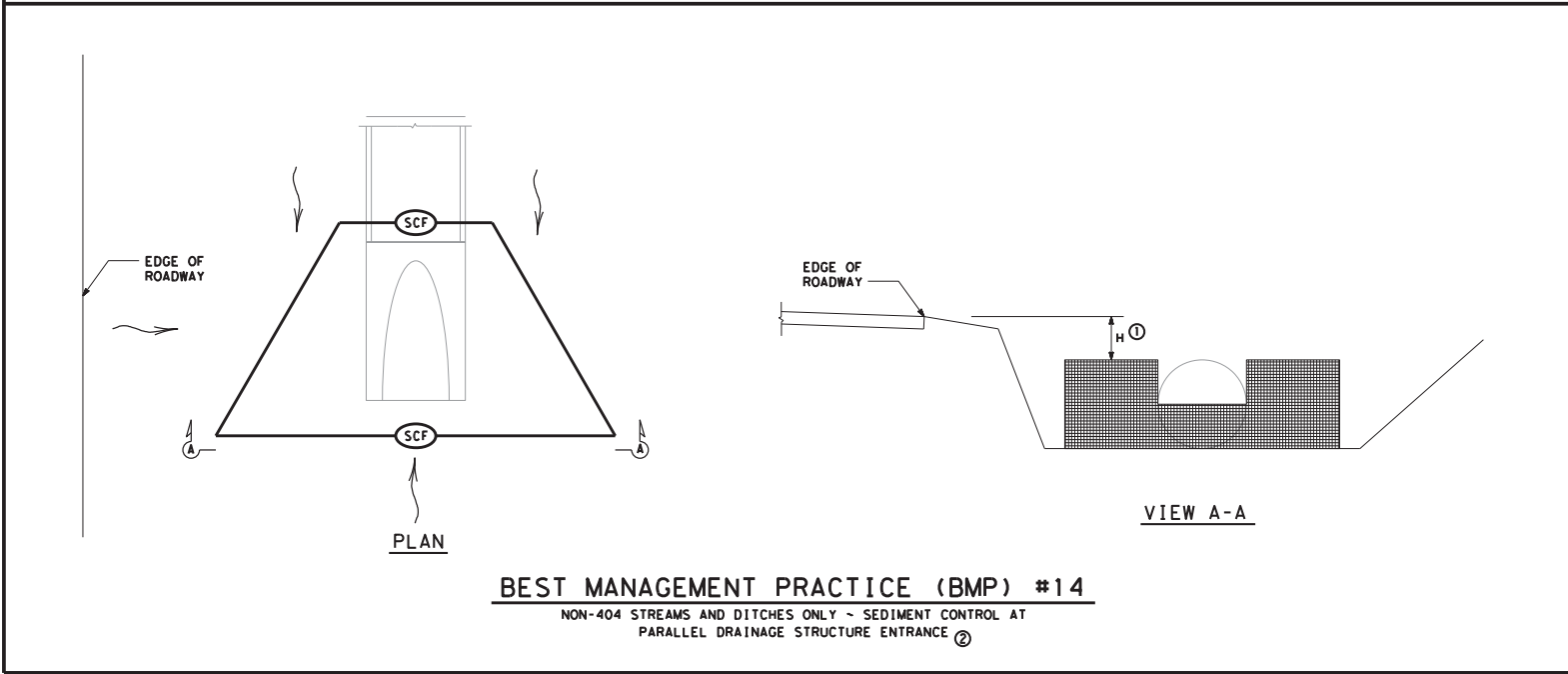


BEST MANAGEMENT PRACTICE (BMP) #13

USE OF VEGETATIVE BUFFERS IN PLACE OF TEMPORARY SEDIMENT CONTROLS SUCH AS SILT FENCE AND ROCK FILTER DAMS

	FULLY GRASSED DITCH
	DISTURBED AREA
	DIRECTION OF FLOW
	SEDIMENT CONTROL FENCE

- ① FOR H DIMENSIONS LESS THAN 1.5' SILT FENCE MAY NEED TO BE NOTCHED AS SHOWN IN VIEW A-A. ADD EXTRA POSTS AT NOTCH.
- ② BMP #14 MAY BE USED AT CROSS DRAINAGE STRUCTURES AS DIRECTED.



BEST MANAGEMENT PRACTICE (BMP) #14

NON-404 STREAMS AND DITCHES ONLY - SEDIMENT CONTROL AT PARALLEL DRAINAGE STRUCTURE ENTRANCE ②

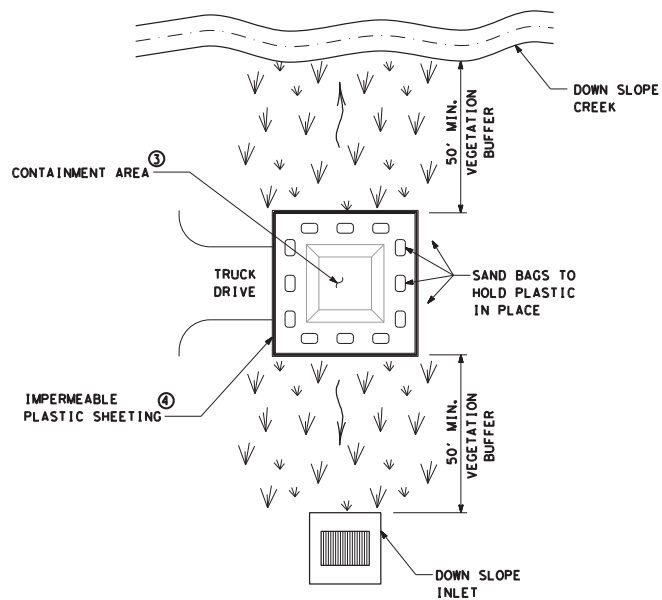
SCALE = NTS SHEET 8 OF 10



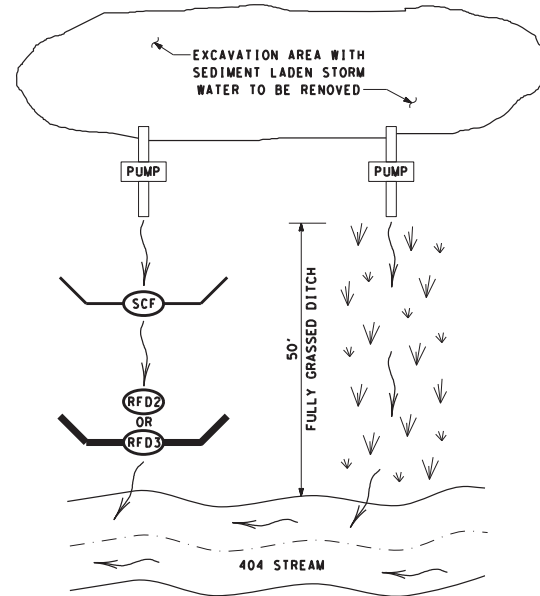
TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

FILES: BMPLAYOUTS.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT	CHK: TxDOT
© TxDOT 2009	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
REVISIONS: DEC 2013	DIST: WACO	COUNTY: BELL, ETC	SHEET NO. 72	



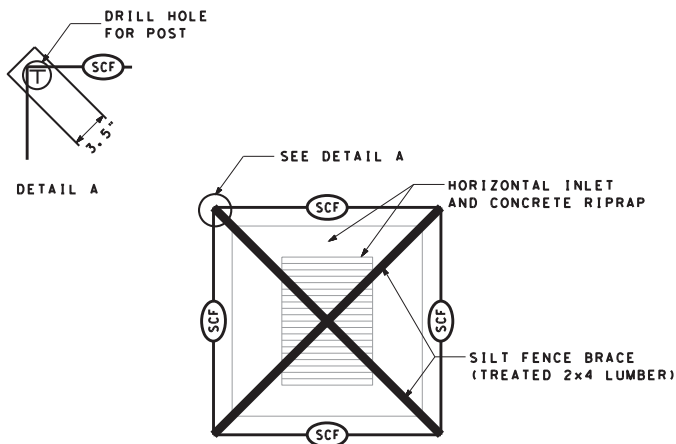
BEST MANAGEMENT PRACTICE (BMP) #15
CONCRETE TRUCK WASHOUT AREA



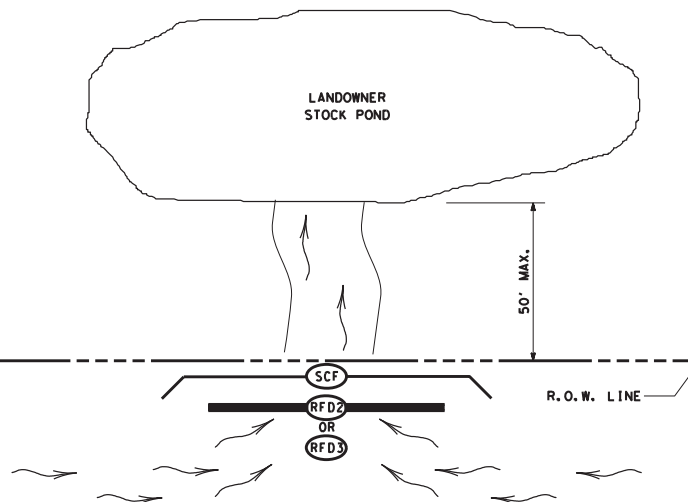
BEST MANAGEMENT PRACTICE (BMP) #16
PUMPED STORM WATER SEDIMENT CONTROLS ①

	FULLY GRASSED DITCH
	DIRECTION OF FLOW
	SEDIMENT CONTROL FENCE
	ROCK FILTER DAM (TY 2)
	ROCK FILTER DAM (TY 3)

- ① PUMPED STORM WATER FROM AN EXCAVATION AREA SHOULD BE DISCHARGED IN A 50' VEGETATIVE BARRIER OR THROUGH TWO TEMPORARY SEDIMENT CONTROLS BEFORE ENTERING A 404 STREAM.
- ② FOR LANDOWNER STOCKPONS WITHIN 50' OF THE RIGHT OF WAY LINE, PROVIDE REDUNDANT SEDIMENT CONTROLS AT THE CONVEYANCE OF THE POND. MINIMUM OF TWO SEDIMENT CONTROLS.
- ③ WHEN CONTAINMENT AREA REACHES 1' FREEBOARD, DISCONTINUE WASHOUT PLACEMENT AND REMOVE MATERIAL UPON SOLIDIFICATION.
- ④ EACH TIME SOLIDIFIED MATERIAL IS REMOVED REPLACE PLASTIC SHEETING.



BEST MANAGEMENT PRACTICE (BMP) #17
HORIZONTAL INLET SEDIMENT CONTROL



BEST MANAGEMENT PRACTICE (BMP) #18
LANDOWNER STOCKPOND SEDIMENT CONTROL ②

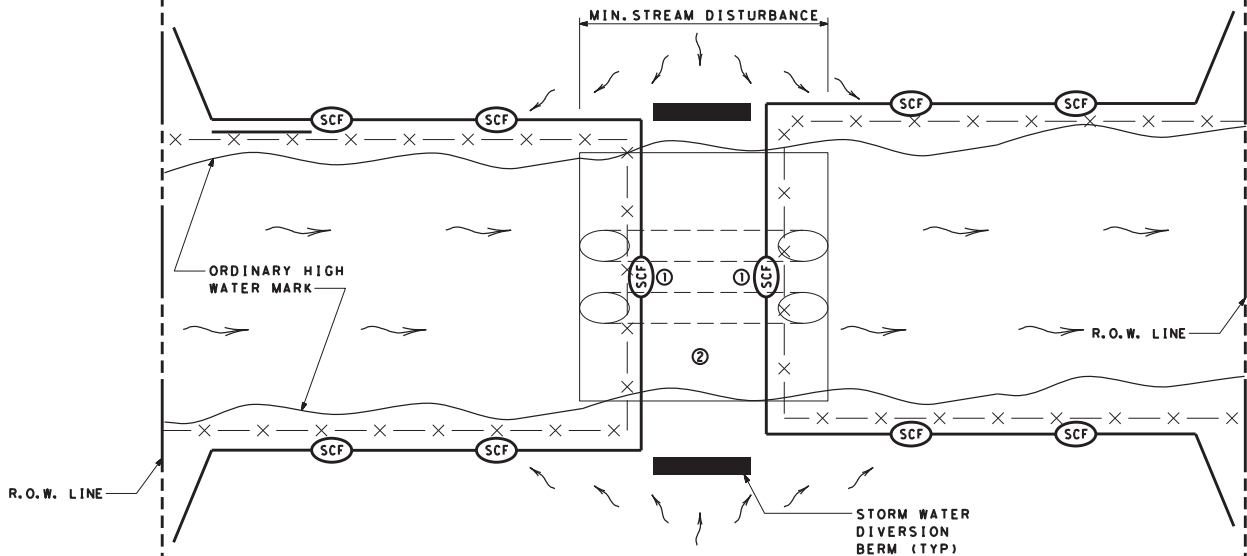
SCALE = NTS SHEET 9 OF 10



TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

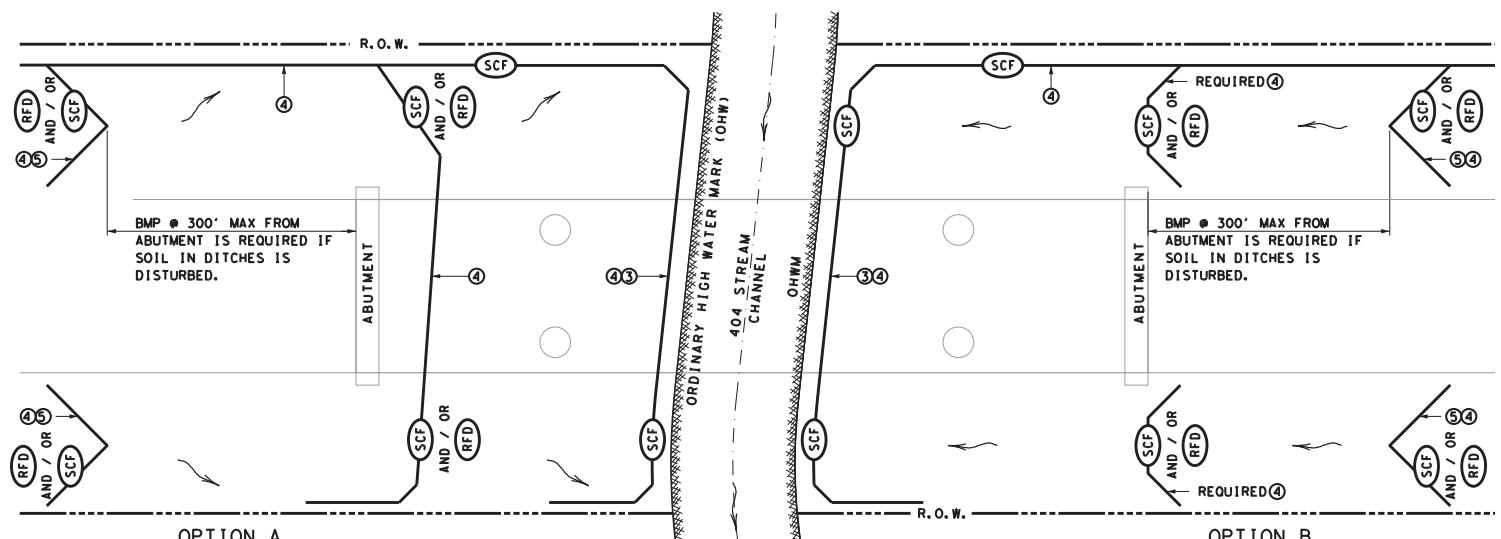
FILES: BMLAYOUTS.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT	CHK: TxDOT
© TxDOT 2009	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
REVISIONS	DIST: WACO	COUNTY: BELL, ETC	SHEET NO. 73	



BEST MANAGEMENT PRACTICE (BMP) #19
TYPICAL 404 STREAM CROSSING (SEDIMENT CONTROL AT CROSSING)

	DIRECTION OF FLOW
	SEDIMENT CONTROL FENCE
	ROCK FILTER DAM
	SECURITY FENCING

- ① HAY BALES MAY BE SUBSTITUTED FOR SILT FENCE OVER THE STREAM CROSSING.
- ② CROSSING WILL BE AS PER REQUIREMENTS OF THE WATERS OF THE US GENERAL NOTES.
- ③ INSTALL SILT FENCE SLIGHTLY UP FROM OHW MARK FROM R.O.W. TO R.O.W.
- ④ USE SILT FENCE L-HOOKS ON LEVEL OR DOWN SLOPING ENDS TO BLOCK STORM WATER SEDIMENT
- ⑤ INSTALL LARGE V OR U SHAPED BMP'S FROM ABUTMENT AS SHOWN. IF THERE IS STEEP DITCH CONDITIONS DECREASE SPACING AND CONSIDER RFD'S. ADD ADDITIONAL BMP'S IF GRADE IS STEEP OR IF FLOW IS HIGH.



BEST MANAGEMENT PRACTICE (BMP) #20
FOR 404 STREAMS ~ BMP'S AT BRIDGES

SCALE = NTS SHEET 10 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

FILES: BMLAYOUTS.dgn	DATE: TxDOT	CHK: TxDOT	DATE: TxDOT	CHK: TxDOT
© TxDOT 2009	CONT: 6375	SECT: 32	JOB: 001	HIGHWAY: US 190, ETC
REVISIONS: DEC 2013	DIST: WACO	COUNTY: BELL, ETC	SHEET NO. 74	