FEDERAL-AID PROJECT NUMBER			
F 2022(959)			
CONT	SECT	JOB	HIGHWAY
0907	24	054	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		1

INDEX OF SHEETS

SEE SHEET NO. 2

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT F 2022(959)

BRYANT BOULEVARD (US 87)
TOM GREEN COUNTY

NET LENGTH OF PROJECT = 1,100 FT. = 0.208 MI.

LIMITS: US 87 AT AVE L AND AVE N IN SAN ANGELO

FOR THE CONSTRUCTION OF
TRAFFIC SIGNAL IMPROVEMENTS CONSISTING OF
UPGRADING TRAFFIC SIGNALS AND PEDESTRIAN
CROSSINGS ON US 87 AT AVENUE L AND AVENUE N IN
SAN ANGELO

FINAL PLANS

Letting Date: ______
Name of Contractor: ______
Date Work Began: ______
Date Work Completed: ______
Date Work Accepted: ______
Final Contract Cost: ______

Project was built according to the Plans & Specifications.
These final plans reflect the work done and the quantities
shown thereon and on the Final Estimate are Final Quantities.

Area Engineer   Date

Summary of Change Orders:

CSJ: 0907-24-054
BRYANT BLVD (US 87) AT AVENUE L
BRYANT BLVD (US 87) AT AVENUE N

REGISTERED ACCESSIBILITY SPECIALIST (RAS)
INSPECTION REQUIRED. TDLR NO: TABS2022020642

PLANS PREPARED BY:

Kimley»Horn
TBPE FIRM F-928

13455 NOEL ROAD
TWO GALLERIA OFFICE TOWER, SUITE 700
DALLAS, TEXAS 75240
PH (972) 770-1300
CONTACT; HIRON FERNANDO, P.E.

5/31/2022
STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
PROFESSIONAL ENGINEER

2022
Texas Department of Transportation

SUBMITTED FOR LETTING: 6/3/2022
DocuSigned by:
Nicholas Greenly
DDF89C6522AF49E...
District Design Engineer

RECOMMENDED FOR LETTING: 6/3/2022
DocuSigned by:
[signature] P.E.
826185212F51427...
District Director of TP&D

APPROVED FOR LETTING: 6/3/2022
DocuSigned by:
[signature]
BC10B17FA709437...
District Engineer

EXCEPTIONS
NONE
EQUATIONS
NONE
RAILROAD CROSSINGS
DOT 018763R

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY 1, 2012).

DATE:5/31/2022 6:02:49 PM
FILE:K:\DAL_TPTO\1project\064586903 - San Angelo RO3 Signal Design\CADD\0907-24-054_10_Cover.dgn

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

Signature of Registrant , P.E. & Date 5/25/2022

5/25/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
PROFESSIONAL ENGINEER

Kimley»Horn F-928

13455 Noel Road
Two Galleria Office Tower, Suite 700
Dallas, Texas 75240

Tel. No. (972) 770-1300
Fax No. (972) 239-3820

THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

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ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	SJT	TOM GREEN	2
HMF	CONTROL	SECTION	JOB	
CHECK	0907	24	054	
HMF				

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_11_Index.dgn
40.0079 ft / in.
BY: Abby.Axelson

GENERAL NOTES

The following Standard Sheets have been modified: None

Locate the project bulletin board at an approved location within the project limits such as at a field office, staging area, or stockpile, and make accessible to the public at all times. Do not remove the bulletin board from the project until approved. If a construction site notice is required for the project, post a copy at each geographically separated work location.

In those instances where fixed features require, vary the governing slopes indicated in these plans from within the limits to the extent determined.

If Contractor elects to establish a pit within 200 ft. of a public road, construct a barrier or other device in accordance with Natural Resources Code, Chapter 133, and Section 133.041.

Do not use salt water with solids in excess of 10,000 parts per million, as determined by evaporation.

Contractor questions on this project are to be addressed by the following individual:

Chukwuma Osemeke, P.E.; email SJT_PreliminaryReview@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individual.

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%20Responses/

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

Item 5, "Control of the Work"

State Highway right of way markers destroyed by the Contractor shall be replaced by a Texas Registered Professional Land Surveyor (RPLS) at no cost to the State. Provide written documentation from the RPLS attesting to the replacement of the right of way markers.

Make suitable advance notification to affected non-participating municipalities regarding Class B underground facilities, call the Department's San Angelo District Traffic Office at telephone number (325) 947-9208 to have the Department's existing traffic signal and illumination utilities located, and call the Department's San Angelo District Maintenance

County: Tom Green **Sheet:** 3

Highway: US 87 **Control:** 0907-24-054

Office at telephone number (325) 947-9322 to have the Department's existing irrigation utilities located.

Responsibility for construction surveying shall conform to Section 5.9.3., "Method C."

Submit shop drawings electronically for the fabrication of structural items and other items specifically listed in the plans to SJT_ShopPlanReview@txdot.gov. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" at http://www.txdot.gov/business/resources/specifications/shop-drawings.html.

Item 6, "Control of Materials"

When allowed, store materials and equipment in approved areas within the right of way.

Access the work area from the right of way.

Item 7, "Legal Relations and Responsibilities"

No significant traffic generator events have been identified.

Item 8, "Prosecution and Progress"

Submit the sequence of work and estimated progress schedule on paper or as a Portable Document Format (PDF) electronic file compatible with Adobe Systems Incorporated "Acrobat Reader XI".

A delayed start provision is included in the contract to allow time to procure construction materials including traffic signal components and roadway illumination components.

Nighttime work is allowed. Provide adequate lighting to allow satisfactory inspection.

Restricted work hours are from 7:30 A.M to 8:30 A.M.

Restricted work hours are from 5:00 P.M. to 6:00 P.M.

Item 9, "Measurement and Payment"

The progress payment period shall end two working days before the last working day of the month. Deliver invoices to be paid as material on hand on or before the end of the progress payment period.

Item 104, "Removing Concrete"

The following are notes for the removal of existing pavement, curb or sidewalk and construction of new pavement, curb or sidewalk adjacent to historic buildings and historic masonry retaining walls at locations as shown in the plans or otherwise directed:

1. To minimize potential damage to historic structures, saw cut existing sidewalk 8 to 12 in. away from the structure.

2. Construct new sidewalk next to the saw cut edge with installation of expansion joint in between. If existing sidewalk is to be removed entirely, the remaining 8 to 12 in. next to the historic structure will be removed by hand. Place expansion joint between historic structure and new sidewalk.

3. Prevent damage to historic structures during the entire construction project, especially during removal of existing pavement, curb, or sidewalk. During the saw cut and hand removal process, shall ensure protection of historic structure foundation, materials, elevations, and entryways with decorative flooring.

4. Repair or replace in kind, at Contractor's expense, any historic materials damaged in the course of executing the work. Locate replacement source for Environmental Affairs Division of proposed repairs, to facilitate consultation with Texas Historical Commission.

Item 110, "Excavation"

Pre-split rock cuts designated on the plans. The maximum spacing between the drilled holes for blasting shall be 3 ft. Pre-split rock cuts to proposed ditch grade before primary blasting operations.

Item 360, "Concrete Pavement"

A metal-tine texture finish is not required.

Item 421, "Hydraulic Cement Concrete"

Provide sulfate-resistant concrete (containing Type II cement) for all concrete identified as structural concrete in Table 8, except for the following: bridge railing, approach slabs, concrete traffic barrier, prestressed concrete panels, Class H concrete, and Class S concrete.

Entrained air is required in all slip formed concrete, but is not required for other structural concrete. Adjust the dosage of air entraining agent for low air content as directed by the Engineer. If entrained air is provided where not required, only the upper limits of the applicable Special Provision will be enforced.

Provide only the following items listed in 421.3.3, "Testing Equipment": test molds and wheelbarrow.

Item 432, "Riprap"

Furnish and install 1/2-in. thick joint filler board conforming to DMS-6310, "Joint Sealants and Fillers" between concrete riprap and adjacent existing concrete, and where directed.

County: Tom Green **Sheet:** 3A

Highway: US 87 **Control:** 0907-24-054

Item 502, "Barricades, Signs and Traffic Handling"

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

Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls"

The project is exempt from the Texas Pollutant Discharge Elimination System (TPDES) General Permit (TXR150000). Exempt projects are those that disturb less than one acre or routine maintenance activities that maintain the original line and grade, hydraulic capacity, or original purposes of the site.

Item 618, "Conduit"

Place milled rumble strips prior to placement of final pavement markings.

Where PVC, duct cable, and HDPE conduit 1 in. diameter and larger is allowed and installed as per Department standards, optionally provide PVC elbows in place of the galvanized rigid metal elbows required by the Electrical Details standard sheets. Provide PVC elbows of the same schedule rating as the conduits to which they connect. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system that uses PVC elbows.

Secure permission from the proper authority before cutting into or removing any walks or curbs.

Install conduit under existing pavement by an approved boring method unless otherwise directed. Do not construct boring pits within 2 ft. of the edge of the pavement unless otherwise directed. When conduits are bored, the vertical and horizontal tolerances shall not exceed 18 in. as measured from the intended target point.

Do not use a pneumatically driven device for punching holes beneath the pavement, commonly known as a "missile."

Install a pull rope in conduit runs in excess of 60 ft.

Furnish and install duct seal at ends of conduits.

Furnish and install access fittings in bridges for conduit.

Optionally substitute HDPE conduit meeting the requirements of Item 622, "Duct Cable" for bores requiring PVC Schedule 40 and Schedule 80 conduit when approved. HDPE shall be the same size as the PVC conduit shown on the plans. No additional compensation will be paid when HDPE is substituted for this purpose.

Install a continuous bare or green insulated copper wire number 8 AWG or larger in every conduit throughout the electrical system in accordance with the electrical detail sheets and the NEC.

Item 620, "Electrical Conductors"

Grounding conductors that share the same conduit, junction box, ground box or structure shall be bonded together at every accessible point in accordance with the NEC.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse-holders as noted on the Department's Material/Producer List for Roadway Illumination and Electrical Supplies.

Item 628, "Electrical Services"

Costs for utility-owned power line extensions, connection charges, meter charges, and other charges will be paid for by the City of San Angelo. The City of San Angelo will reimburse the contractor only the amount billed by the utility. No additional amount for supervision of the utility's work will be paid.

Item 636, "Signs"

Before removal from the project site, spray-paint (with an oil-based paint), an "X" across the face of non-salvageable signs as directed.

Item 658, "Delineator and Object Marker Assemblies"

Remove existing object markers and delineators. Removal is not a pay item.

Item 666, "Retroreflectorized Pavement Markings"

Place glass beads for pavement markings in accordance with the following table:

Marking Types	Glass Bead (Double Drop) Types	Glass Bead Rates	
		Surface Treatment	Asphalt Concrete Pavement, Microsurfacing, Concrete Pavement
TY I markings	Type II	12 LB per 100 SF	6 LB per 100 SF
	Type III	12 LB per 100 SF	6 LB per 100 SF
TY II markings	Type II	12 LB per GAL	6 LB per GAL
	Type III	12 LB per GAL	6 LB per GAL

Apply TY II marking material at a rate of 25 gallons per mile.

County: Tom Green **Sheet:** 3B

Highway: US 87 **Control:** 0907-24-054

The striper speed shall not exceed 5 MPH during application. Convert to gravity-flow beaders (if not in use) to obtain optimum bead application, when directed.

Clean striper tanks before use if there is a build-up of dry paint, as directed. Flush lines and guns before use.

Reference existing markings before performing work that disturbs the markings, so that the markings can be re-established.

Provide a double-drop of Type II and Type III glass beads.

Item 668, "Prefabricated Pavement Markings"

When applying Type C specialty markings (symbols, words, etc.) over existing thermoplastic markings, first apply heat to the surface of the existing markings and roughen the surface with a shovel. Remove existing Type A, B, or C prefabricated markings prior to placing the new Type C markings.

Item 677, "Eliminating Existing Pavement Markings and Markers"

Use the following method: Mechanical

Item 678, "Pavement Surface Preparation for Markings"

Some stop bars on existing pavement are covered in material from adjacent unpaved roads. Provide cleaning tools. Locations of these stop bars are referenced in the plans.

Item 680, "Highway Traffic Signals"

Signal and sign mounts shall be as manufactured by the following, or approved equal:

Pelco Products 320 West 18th Street Edmond, Oklahoma 73013 405-340-3434 www.pelcoinc.com	Traffic Parts Inc. P.O. Box 837 Spring, Texas 77383 800-345-6329 www.trafficparts.com

Cover new signal heads with an approved opaque material until placed in operation.

Install mast-arm-mounted signal heads in the horizontal position unless otherwise indicated.

Provide IMSA Level I personnel on the job or on-call 24 hours per day to provide traffic signal maintenance after installation of the traffic signals, during the specified test periods. Furnish the name, address and telephone number of the person responsible for traffic signal maintenance. Respond to reported trouble calls within a reasonable travel time from a San Angelo address, not to exceed thirty minutes. Make appropriate repairs within 24 hours. Furnish and install a logbook in the controller cabinet and shall keep a record of each trouble call reported. Notify the Engineer of each trouble call. The error

log in the conflict monitor shall not be cleared during the test period without the prior approval of the Engineer.

Demonstrate that the field wiring is properly installed and then install the controller assembly on the completed foundation. Connect the field wiring to the controller assembly, set up, and turn on the controller. After it has been determined that the field wiring (including any detector loops) is satisfactory, the specified test period will begin.

Remove and deliver any existing traffic signal items determined to be salvageable to the San Angelo District Traffic Signal Shop located at 4502 Knickerbocker Road in San Angelo.

Remove existing ground boxes that are not indicated to remain, as shown in the plans or as directed.

Controller cabinets shall be base-mounted.

Item 682, "Vehicle and Pedestrian Signal Heads"

Signal heads, lenses and visors shall be manufactured of polycarbonate. Signal heads shall be yellow or other color as approved. Mounting brackets and pipes shall not be manufactured of polycarbonate.

Signal heads mounted on poles and mast arm shall be level and plumb.

Enclose electrical wiring and traffic signal cable in an approved traffic signal devices and mounting hardware.

Item 684, "Traffic Signal Cables"

Leave a minimum of 1 foot of each signal cable in each signal pole base and controller enclosure.

Terminate the multiconductor signal cable shown on the plans on the terminal strip in the hand hole. Do not splice the conductors at the hand hole.

Identify each cable as shown on the plans with permanent marking labels using a double-tie strap label at each ground box, pole base and controller.

Item 686, "Traffic Signal Pole Assemblies (Steel)"

Set anchor bolts for signal poles so that two are in tension and two are in compression.

Traffic signal pole heights and mast arm lengths are shown on the plans for bidding purposes only. Before fabrication, make field measurements to determine the actual pole height necessary to ensure a vertical clearance between 17'-6" and 19'-0" from the roadway surface to the bottom of the lowest point on the signal head assembly or mast arm, and to determine the mast arm lengths required to mount the traffic signal heads over the travel lanes. The mast arm shall be straight and level in the span area where the signal heads are attached. These field measurements and elevations shall be

determined from the actual field locations of the pole foundations, considering above- and below-ground utilities and the existing roadway elevations and widths.

Item 687, "Pedestal Pole Assemblies"

Inside each breakaway base, provide breakaway fuse-holders conforming to Material/Producer List, "Item 620 – Electrical Conductors" for ungrounded cables, neutral breakaway connectors for neutral cable, and pedestrian button cables.

Item 688, "Pedestrian Detectors and Vehicle Loop Detectors"

Identify each detector cable as shown on the plans with permanent marking labels using a double-tie strap label at each ground box, pole base and controller.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0907-24-054 **DISTRICT** San Angelo **COUNTY** Tom Green
HIGHWAY Various

							TOTAL EST.	TOTAL FINAL
			CONTROL SECTION JOB		**0907-24-054**			
			PROJECT ID		**A00185696**			
			COUNTY		**Tom Green**			
			HIGHWAY		**Various**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL		
	104-6001	REMOVING CONC (PAV)		SY	16.000		16.000	
	104-6011	REMOVING CONC (MEDIANS)		SY	97.000		97.000	
	104-6013	REMOVING CONC (FOUNDATIONS)		SY	3.000		3.000	
	104-6022	REMOVING CONC (CURB AND GUTTER)		LF	104.000		104.000	
	104-6036	REMOVING CONC (SIDEWALK OR RAMP)		SY	4.000		4.000	
	110-6001	EXCAVATION (ROADWAY)		CY	18.000		18.000	
	360-6044	CONC PVMT (CONT REINF)(FAST TRK)(12")		SY	48.000		48.000	
	416-6031	DRILL SHAFT (TRF SIG POLE) (30 IN)		LF	33.000		33.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)		LF	13.000		13.000	
	416-6034	DRILL SHAFT (TRF SIG POLE) (48 IN)		LF	88.000		88.000	
	432-6003	RIPRAP (CONC)(6 IN)		CY	12.000		12.000	
	479-6005	ADJUSTING MANHOLES (WATER VALVE BOX)		EA	1.000		1.000	
	500-6001	MOBILIZATION		LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO	4.000		4.000	
	506-6042	BIODEG EROSN CONT LOGS (INSTL) (18")		LF	160.000		160.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)		LF	160.000		160.000	
	529-6002	CONC CURB (TY II)		LF	46.000		46.000	
	529-6008	CONC CURB & GUTTER (TY II)		LF	219.000		219.000	
	531-6003	CONC SIDEWALKS (6")		SY	57.000		57.000	
	531-6004	CURB RAMPS (TY 1)		EA	2.000		2.000	
	531-6005	CURB RAMPS (TY 2)		EA	1.000		1.000	
	531-6008	CURB RAMPS (TY 5)		EA	1.000		1.000	
	531-6010	CURB RAMPS (TY 7)		EA	8.000		8.000	
	531-6016	CURB RAMPS (TY 21)		EA	2.000		2.000	
	531-6017	CURB RAMPS (TY 22)		EA	1.000		1.000	
	536-6006	CONC MEDIAN(MONO NOSE)		SY	41.000		41.000	
	618-6046	CONDT (PVC) (SCH 80) (2")		LF	205.000		205.000	
	618-6053	CONDT (PVC) (SCH 80) (3")		LF	225.000		225.000	
	618-6058	CONDT (PVC) (SCH 80) (4")		LF	100.000		100.000	
	618-6059	CONDT (PVC) (SCH 80) (4") (BORE)		LF	860.000		860.000	
	620-6004	ELEC CONDR (NO.12) INSULATED		LF	720.000		720.000	
	620-6007	ELEC CONDR (NO.8) BARE		LF	1,420.000		1,420.000	
	620-6008	ELEC CONDR (NO.8) INSULATED		LF	2,730.000		2,730.000	
	621-6002	TRAY CABLE (3 CONDR) (12 AWG)		LF	75.000		75.000	
	624-6008	GROUND BOX TY C (162911)W/APRON		EA	15.000		15.000	
	624-6028	REMOVE GROUND BOX		EA	10.000		10.000	
	628-6188	ELC SRV TY D 120/240 070(NS)SS(E)SP(O)		EA	2.000		2.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0907-24-054 **DISTRICT** San Angelo **COUNTY** Tom Green
HIGHWAY Various

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0907-24-054**			
		PROJECT ID		**A00185696**			
		COUNTY		**Tom Green**			
		HIGHWAY		**Various**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	666-6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	1,020.000		1,020.000	
	666-6047	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	LF	1,464.000		1,464.000	
	666-6224	PAVEMENT SEALER 4"	LF	2,495.000		2,495.000	
	666-6226	PAVEMENT SEALER 8"	LF	1,020.000		1,020.000	
	666-6230	PAVEMENT SEALER 24"	LF	1,464.000		1,464.000	
	666-6231	PAVEMENT SEALER (ARROW)	EA	8.000		8.000	
	666-6232	PAVEMENT SEALER (WORD)	EA	8.000		8.000	
	666-6243	PAVEMENT SEALER (YLD TRI)	EA	10.000		10.000	
	666-6299	RE PM W/RET REQ TY I (W)4"(BRK)(090MIL)	LF	970.000		970.000	
	666-6302	RE PM W/RET REQ TY I (W)4"(SLD)(090MIL)	LF	325.000		325.000	
	666-6314	RE PM W/RET REQ TY I (Y)4"(SLD)(090MIL)	LF	1,200.000		1,200.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)	EA	8.000		8.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	8.000		8.000	
	668-6089	PREFAB PAV MRK TY C (W) (RR XING)	EA	4.000		4.000	
	668-6091	PREFAB PAV MRK TY C (W) (18")(YLD TRI)	EA	10.000		10.000	
	672-6007	REFL PAV MRKR TY I-C	EA	91.000		91.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	74.000		74.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	2,435.000		2,435.000	
	677-6003	ELIM EXT PAV MRK & MRKS (8")	LF	700.000		700.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	854.000		854.000	
	677-6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	6.000		6.000	
	677-6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	6.000		6.000	
	678-6001	PAV SURF PREP FOR MRK (4")	LF	2,495.000		2,495.000	
	678-6004	PAV SURF PREP FOR MRK (8")	LF	1,020.000		1,020.000	
	678-6008	PAV SURF PREP FOR MRK (24")	LF	1,464.000		1,464.000	
	678-6009	PAV SURF PREP FOR MRK (ARROW)	EA	8.000		8.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)	EA	8.000		8.000	
	678-6020	PAV SURF PREP FOR MRK (RR XING)	EA	4.000		4.000	
	678-6022	PAV SURF PREP FOR MRK (18")(YLD TRI)	EA	10.000		10.000	
	678-6033	PAV SURF PREP FOR MRK (RPM)	EA	118.000		118.000	
	680-6003	INSTALL HWY TRF SIG (SYSTEM)	EA	2.000		2.000	
	680-6004	REMOVING TRAFFIC SIGNALS	EA	2.000		2.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	27.000		27.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	8.000		8.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	27.000		27.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	8.000		8.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	27.000		27.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0907-24-054 **DISTRICT** San Angelo **COUNTY** Tom Green
HIGHWAY Various

		CONTROL SECTION JOB		**0907-24-054**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00185696**			
		COUNTY		**Tom Green**			
		HIGHWAY		**Various**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	4.000		4.000	
	682-6018	PED SIG SEC (LED)(COUNTDOWN)	EA	20.000		20.000	
	682-6051	BACKPLATE W/REFL BRDR(3 SEC)ALUM	EA	23.000		23.000	
	682-6052	BACKPLATE W/REFL BRDR(4 SEC)ALUM	EA	8.000		8.000	
	684-6029	TRF SIG CBL (TY A)(14 AWG)(3 CONDR)	LF	90.000		90.000	
	684-6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF	1,165.000		1,165.000	
	684-6033	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	LF	530.000		530.000	
	684-6036	TRF SIG CBL (TY A)(14 AWG)(10 CONDR)	LF	1,855.000		1,855.000	
	684-6046	TRF SIG CBL (TY A)(14 AWG)(20 CONDR)	LF	1,205.000		1,205.000	
	684-6079	TRF SIG CBL (TY C)(12 AWG)(2 CONDR)	LF	2,780.000		2,780.000	
	686-6031	INS TRF SIG PL AM(S)1 ARM(28')LUM	EA	2.000		2.000	
	686-6035	INS TRF SIG PL AM(S)1 ARM(32')LUM	EA	1.000		1.000	
	686-6051	INS TRF SIG PL AM(S)1 ARM(48')LUM	EA	1.000		1.000	
	686-6063	INS TRF SIG PL AM(S)1 ARM(60')LUM	EA	2.000		2.000	
	686-6067	INS TRF SIG PL AM(S)1 ARM(65')LUM	EA	2.000		2.000	
	687-6001	PED POLE ASSEMBLY	EA	12.000		12.000	
	688-6001	PED DETECT PUSH BUTTON (APS)	EA	18.000		18.000	
	688-6003	PED DETECTOR CONTROLLER UNIT	EA	2.000		2.000	
	5084-6001	FIXED BOLLARD	EA	6.000		6.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	20.000		20.000	
	6058-6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	2.000		2.000	
	6062-6042	RELOCATE ITS RADIO	EA	1.000		1.000	
	6066-6001	LED BLANK-OUT SIGN ASSEMBLY	EA	1.000		1.000	
	6089-6002	CAT 5 ETHERNET CABLE	LF	70.000		70.000	
	6185-6002	TMA (STATIONARY)	DAY	12.000		12.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	16.000		16.000	
	18	ELECTRICAL: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		RAILROAD FLAGGING: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

SUMMARY OF QUANTITIES				0907-24-054		PROJECT TOTAL
ITEM NO.	CODE	DESCRIPTION	UNIT	BRYANT BLVD AT AVENUE L	BRYANT BLVD AT AVENUE N	
104	6001	REMOVING CONC (PAV)	SY		16	16
104	6011	REMOVING CONC (MEDIANS)	SY	61	36	97
104	6013	REMOVING CONC (FOUNDATIONS)	SY	2	1	3
104	6022	REMOVING CONC (CURB AND GUTTER)	LF	59	45	104
104	6036	REMOVING CONC (SIDEWALK OR RAMP)	SY	4		4
110	6001	EXCAVATION (ROADWAY)	CY		18	18
360	6044	CONC PVMT (CONT REINF)(FAST TRK)(12")	SY	32	16	48
416	6031	DRILL SHAFT (TRF SIG POLE) (30 IN)	LF	22	11	33
416	6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF		13	13
416	6034	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF	44	44	88
432	6003	RIPRAP (CONC)(6 IN)	CY	6	6	12
479	6005	ADJUSTING MANHOLES (WATER VALVE BOX)	EA		1	1
500	6001	MOBILIZATION	LS	0.5	0.5	1
502	6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	2	2	4**
506	6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF	80	80	160
506	6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	80	80	160
529	6002	CONC CURB (TY II)	LF	46		46
529	6008	CONC CURB & GUTTER (TY II)	LF	79	140	219
531	6003	CONC SIDEWALKS (6")	SY	30	27	57
531	6004	CURB RAMPS (TY 1)	EA	2		2
531	6005	CURB RAMPS (TY 2)	EA		1	1
531	6008	CURB RAMPS (TY 5)	EA	1		1
531	6010	CURB RAMPS (TY 7)	EA	4	4	8
531	6016	CURB RAMPS (TY 21)	EA	1	1	2
531	6017	CURB RAMPS (TY 22)	EA		1	1
536	6006	CONC MEDIAN(MONO NOSE)	SY	20	21	41
618	6046	CONDT (PVC) (SCH 80) (2")	LF	125	80	205
618	6053	CONDT (PVC) (SCH 80) (3")	LF	120	105	225
618	6058	CONDT (PVC) (SCH 80) (4")	LF	60	40	100
618	6059	CONDT (PVC) (SCH 80) (4") (BORE)	LF	440	420	860
620	6004	ELEC CONDR (NO.12) INSULATED	LF	320	400	720
620	6007	ELEC CONDR (NO.8) BARE	LF	750	670	1420
620	6008	ELEC CONDR (NO.8) INSULATED	LF	1600	1130	2730
621	6002	TRAY CABLE (3 CONDR) (12 AWG)	LF	75		75
624	6008	GROUND BOX TY C (162911)W/APRON	EA	8	7	15
624	6028	REMOVE GROUND BOX	EA	6	4	10
628	6188	ELC SRV TY D 120/240 070(NS)SS(E)SP(O)	EA	1	1	2
666	6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	800	220	1020
666	6047	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	LF	760	704	1464
666	6224	PAVEMENT SEALER 4"	LF	770	1725	2495
666	6226	PAVEMENT SEALER 8"	LF	800	220	1020
666	6230	PAVEMENT SEALER 24"	LF	760	704	1464
666	6231	PAVEMENT SEALER (ARROW)	EA	5	3	8
666	6232	PAVEMENT SEALER (WORD)	EA	5	3	8
666	6243	PAVEMENT SEALER (YLD TRI)	EA		10	10
666	6299	RE PM W/RET REQ TY I (W)4"(BRK)(090MIL)	LF	370	600	970
666	6302	RE PM W/RET REQ TY I (W)4"(SLD)(090MIL)	LF		325	325
666	6314	RE PM W/RET REQ TY I (Y)4"(SLD)(090MIL)	LF	400	800	1200
668	6077	PREFAB PAV MRK TY C (W) (ARROW)	EA	5	3	8
668	6085	PREFAB PAV MRK TY C (W) (WORD)	EA	5	3	8
668	6089	PREFAB PAV MRK TY C (W) (RR XING)	EA	4		4
668	6091	PREFAB PAV MRK TY C (W) (18")(YLD TRI)	EA		10	10
672	6007	REFL PAV MRKR TY I-C	EA	47	44	91
672	6009	REFL PAV MRKR TY II-A-A	EA	40	34	74
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	770	1665	2435
677	6003	ELIM EXT PAV MRK & MRKS (8")	LF	480	220	700
677	6007	ELIM EXT PAV MRK & MRKS (24")	LF	150	704	854
677	6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	3	3	6
677	6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	3	3	6
678	6001	PAV SURF PREP FOR MRK (4")	LF	770	1725	2495
678	6004	PAV SURF PREP FOR MRK (8")	LF	800	220	1020
678	6008	PAV SURF PREP FOR MRK (24")	LF	760	704	1464
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	5	3	8
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	5	3	8
678	6020	PAV SURF PREP FOR MRK (RR XING)	EA	4		4
678	6022	PAV SURF PREP FOR MRK (18")(YLD TRI)	EA		10	10
678	6033	PAV SURF PREP FOR MRK (RPM)	EA	40	78	118
680	6003	INSTALL HWY TRF SIG (SYSTEM)	EA	1	1	2
*	*	GRIDSMART DETECTOR AND EQUIPMENT	EA	1	1	2
*	*	GRIDSMART CAT5E CABLE	LF	70	70	140
*	*	GRIDSMART PROCESSOR UNIT	EA	1	1	2
*	*	OPTICOM DUAL SENSOR	EA	2		2
*	*	OPTICOM SINGLE SENSOR	EA		2	2
*	*	OPTICOM OPTICAL SIGNAL PROCESSOR SYSTEM	EA	1	1	2
*	*	OPTICOM CABLE	LF	285	380	665
*	*	TRAFFIC SIGNAL CABINET	EA	1	1	2
*	*	TRAFFIC SIGNAL CONTROLLER	EA	1	1	2
*	*	MAST ARM MITIGATOR	EA	2	2	4
*	*	SIGNAL MOUNTED SIGNS	EA	11	11	22

* SUBSIDIARY TO ITEM 680

** TOTAL MONTHS OF BARRICADES QUANTITIED FOR BOTH INTERSECTIONS TO BE CONSTRUCTED SIMULTANEOUSLY

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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

SUMMARY OF QUANTITIES

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	5
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

PLOTTED: 7/8/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTC Signal Design\CADD\COSA-RTC_12_Quantity Summary (1 of 2).dgn
40.0014 ft / in.
BY: Abby.Axelson

SUMMARY OF QUANTITIES				0907-24-054		PROJECT TOTAL
ITEM NO.	CODE	DESCRIPTION	UNIT	BRYANT BLVD AT AVENUE L	BRYANT BLVD AT AVENUE N	
680	6004	REMOVING TRAFFIC SIGNALS	EA	1	1	2
682	6001	VEH SIG SEC (12")LED(GRN)	EA	14	13	27
682	6002	VEH SIG SEC (12")LED(GRN ARW)	EA	4	4	8
682	6003	VEH SIG SEC (12")LED(YEL)	EA	14	13	27
682	6004	VEH SIG SEC (12")LED(YEL ARW)	EA	4	4	8
682	6005	VEH SIG SEC (12")LED(RED)	EA	14	13	27
682	6006	VEH SIG SEC (12")LED(RED ARW)	EA	2	2	4
682	6018	PED SIG SEC (LED)(COUNTDOWN)	EA	10	10	20
682	6051	BACKPLATE W/REFL BRDR(3 SEC)ALUM	EA	12	11	23
682	6052	BACKPLATE W/REFL BRDR(4 SEC)ALUM	EA	4	4	8
684	6029	TRF SIG CBL (TY A)(14 AWG)(3 CONDR)	LF	90		90
684	6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF	575	590	1165
684	6033	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	LF	250	280	530
684	6036	TRF SIG CBL (TY A)(14 AWG)(10 CONDR)	LF	1030	825	1855
684	6046	TRF SIG CBL (TY A)(14 AWG)(20 CONDR)	LF	655	550	1205
684	6079	TRF SIG CBL (TY C)(12 AWG)(2 CONDR)	LF	1430	1350	2780
686	6031	INS TRF SIG PL AM(S)1 ARM(28')LUM	EA	1	1	2
686	6035	INS TRF SIG PL AM(S)1 ARM(32')LUM	EA	1		1
686	6051	INS TRF SIG PL AM(S)1 ARM(48')LUM	EA		1	1
686	6063	INS TRF SIG PL AM(S)1 ARM(60')LUM	EA	1	1	2
686	6067	INS TRF SIG PL AM(S)1 ARM(65')LUM	EA	1	1	2
687	6001	PED POLE ASSEMBLY	EA	6	6	12
688	6001	PED DETECT PUSH BUTTON (APS)	EA	9	9	18
688	6003	PED DETECTOR CONTROLLER UNIT	EA	1	1	2
5084	6001	FIXED BOLLARD	EA	6		6
6001	6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	10	10	20
6058	6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1	1	2
6062	6042	RELOCATE ITS RADIO	EA	1		1
6066	6001	LED BLANK-OUT SIGN ASSEMBLY	EA	1		1
6089	6002	CAT 5 ETHERNET CABLE	LF	70		70
6185	6002	TMA (STATIONARY)	DAY	6	6	12
6185	6005	TMA (MOBILE OPERATION)	DAY	8	8	16

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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

SUMMARY OF QUANTITIES

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK HMF	TEXAS	SJT	TOM GREEN	6
CHECK HMF	CONTROL	SECTION	JOB	
	0907	24	054	

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_13_Quantity Summary (2 of 2).dgn
40.0000 ft / in.
BY: Abby.Axelson

TRAFFIC CONTROL PLAN NOTES

1. FOR TRAFFIC SIGNAL WORK AT BRYANT BLVD (US 87) (AVENUE L AND AVENUE N) USE WZ-BTS-13, TCP(1-3)-13, TCP(2-1)-18, TCP(2-2)-18, TCP(2-4)-18, AND TCP(2-5)-18 FOR LANE CLOSURES.

2. PLAN FOR LONG TERM LANE CLOSURES FOR CONCRETE PLACEMENT ON CURB RAMPS, CURB AND GUTTER, MEDIANS, AND RIP RAP ITEMS.

3. USE TCP(3-3)-14 AND TCP(3-4)-13 FOR PAVEMENT MARKING REMOVAL AND INSTALLATION. FOR MOBILE OPERATIONS (WORK THAT MOVES CONTINUOUSLY OR INTERMEDIATELY - STOPPING FOR UP TO 15 MINUTES) USE SHORT DURATION/ SHORT TERM STATIONARY TCP FOR WORK THAT OCCUPIES A LOCATION FOR MORE THAN 15 MINUTES.

4. ADVANCED SIGNS SHOWN IN TRAFFIC CONTROL PLAN PROJECT LIMIT SIGNS FOR ISOLATED AREAS (SAN ANGELO DISTRICT) STANDARD ARE REQUIRED FOR ALL APPROACHES FOR EACH PHASE OF THE TRAFFIC CONTROL PLAN.

CONSTRUCTION SEQUENCE

1. OBTAIN UTILITY INFORMATION FROM 811, TXDOT, AND CITY OF SAN ANGELO.

2. INSTALL PROJECT SIGNS.

3. INSTALL AND PREPARE NEW TRAFFIC SIGNAL EQUIPMENT FOR OPERATION.

4. COVER OR TURN DOWN SIGNAL HEADS. CONTRACTOR TO CONFIRM EXISTING SIGNAL HEADS ARE VISIBLE TO DRIVERS. MAINTAIN COVERS OVER PROPOSED PEDESTRIAN HEADS.

5. CONSTRUCT PROPOSED PEDESTRIAN RAMPS AND SIDEWALK FACILITIES ACCORDING TO LAYOUTS.

6. PLACE TYPE I PAVEMENT MARKINGS AND RPMS ACCORDING TO LAYOUTS.

7. WHEN APPROVED, PLACE NEW TRAFFIC SIGNAL EQUIPMENT INTO OPERATION AND REMOVE PEDESTRIAN HEAD COVERS. REMOVE ALL EXISTING SIGNALS AND INFRASTRUCTURE.

8. PERFORM FINAL CLEAN-UP.

9. REMOVE PROJECT SIGNS.

5/25/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
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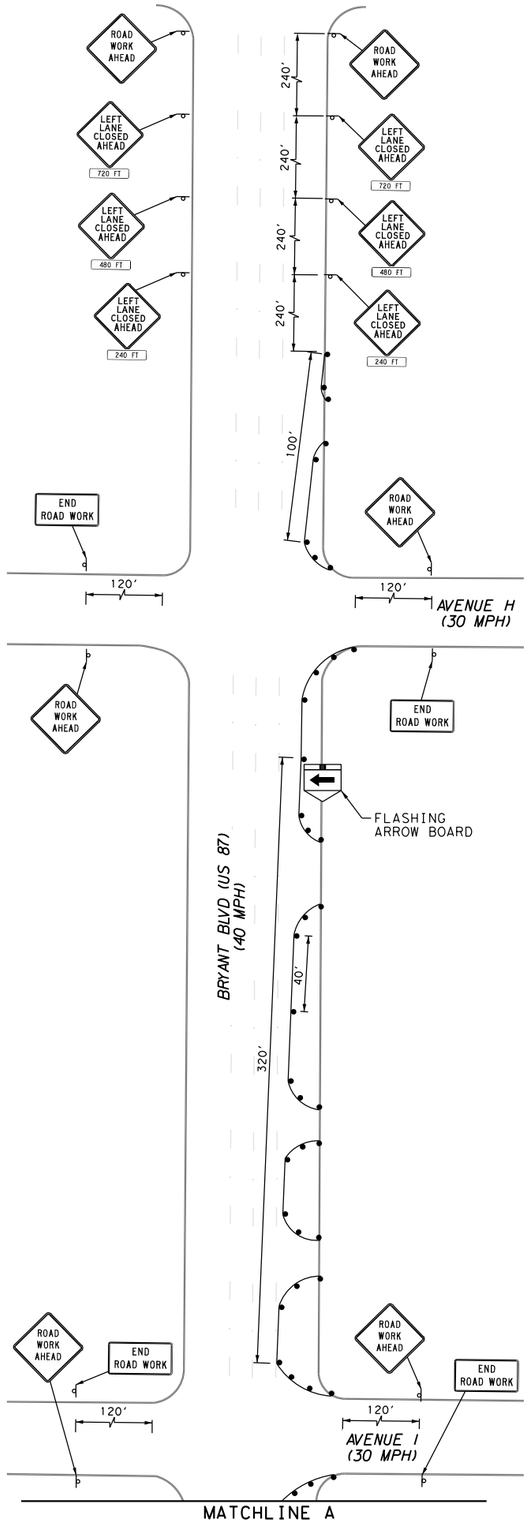
THE CITY OF SAN ANGELO TEXAS

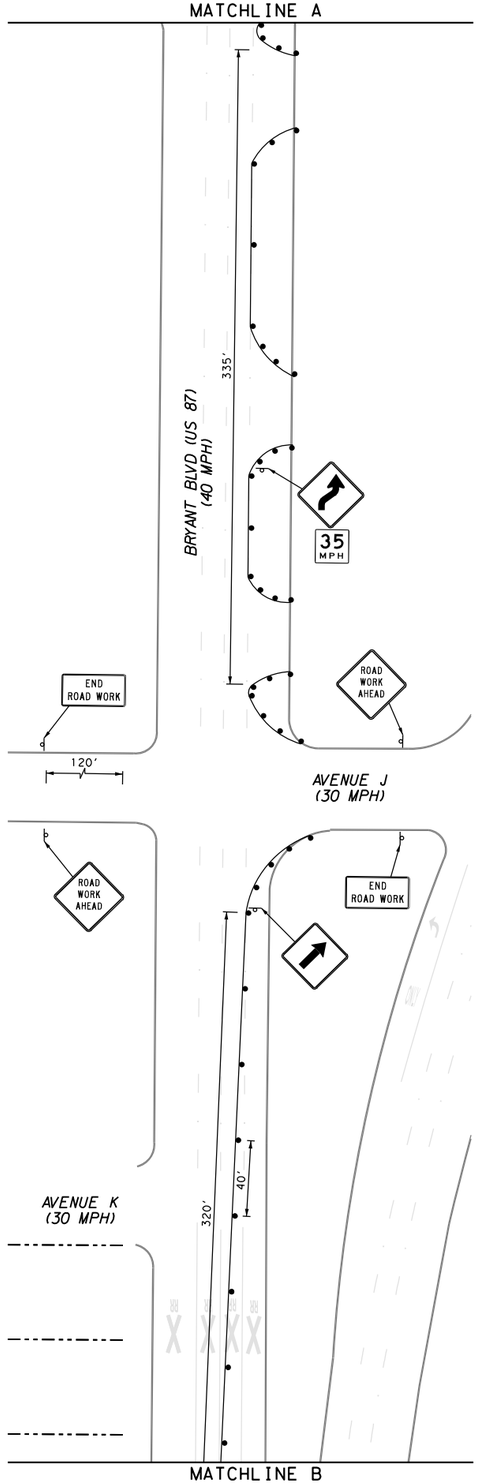
TRAFFIC SAFETY IMPROVEMENTS

TRAFFIC CONTROL & CONSTRUCTION SEQUENCE NOTES

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK HMF	TEXAS	SJT	TOM GREEN	7
CHECK HMF	CONTROL 0907	SECTION 24	JOB 054	

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\1project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_15_TCP Notes.dgn
40.0079 ft / in.
BY: Abby.Axelson





TRAFFIC CONTROL PLAN GENERAL NOTES:

1. ALL TRAFFIC CONTROL SHALL CONFORM TO THE LATEST VERSION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD), PART VI AND TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT) BARRICADE & CONSTRUCTION STANDARDS. FIELD MODIFICATIONS MAY BE MADE TO ADDRESS LOCAL CONDITIONS WITH THE APPROVAL OF THE ENGINEER.
2. DESIGN SPEEDS, MINIMUM SIGN SPACING, CHANNELIZATION DEVICE SPACING, AND TAPER LENGTHS ARE AS SHOWN ON EACH OF THE TCP PHASES.
3. CONTRACTOR IS RESPONSIBLE FOR INSTALLATION, MAINTENANCE, AND REMOVAL OF TRAFFIC CONTROL DEVICES. TRAFFIC CONTROL DEVICES SHOULD BE INSPECTED DAILY AND REPAIRED OR REPLACED AS NECESSARY. AFTER REMOVAL, CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF MODIFICATIONS TO ROADWAY AND SIDEWALK SURFACES, ROADWAY MARKINGS, AND SIGNAGE DUE TO TRAFFIC CONTROL DEVICES OR CONSTRUCTION ACTIVITY.
4. CHANNELIZATION DRUMS ARE THE MINIMUM LEVEL OF CHANNELIZATION DEVICE WHICH SHALL BE USED ON THE OUTSIDE EDGES OF THE TRAVEL LANES. NARROW CHANNELIZATION DEVICES ON THE CENTERLINE SEPARATING OPPOSING LANES OF TRAFFIC SHALL BE VERTICAL PANELS, TABULAR MARKERS, OR NAVIGATOR/NAVICADE DELINEATORS OR EQUIVALENT 12"-WIDE DEVICES. OPPOSITE TRAFFIC LANE DIVIDER (OTLD) DEVICES WITH CW6-4 "TWO WAY TRAFFIC" SIGNS SHALL BE USED AT INTERVALS AS SHOWN.
5. IF THE TCP IS ACTIVE DURING THE HOURS OF DARKNESS, ALL CHANNELIZATION DEVICES SHALL HAVE A TYPE "C" STEADY-BURN WARNING LIGHT OR EQUIVALENT REFLECTOR, AND ALL WARNING SIGNS SHALL HAVE A TYPE "A" LOW-INTENSITY FLASHING WARNING LIGHT, AS REQUIRED IN ACCORDANCE WITH THE CURRENT EDITION OF TMUTCD.
6. PEDESTRIAN PATHWAYS SHALL BE PROVIDED ACROSS OR AROUND THE WORK AREA IN ACCORDANCE WITH THE TMUTCD. CONTRACTOR SHALL PROVIDE SIDEWALK CLOSURE, CROSSWALK CLOSURE, AND/OR WALKWAY BYPASS WHEREVER PEDESTRIAN MOVEMENTS ARE AFFECTED BY CONSTRUCTION ACTIVITIES. ALL SIDEWALKS AND CROSSWALKS SHALL BE ACCESSIBLE WHEN CONTRACTOR IS NOT WORKING UNLESS OTHERWISE APPROVED BY THE CITY TRAFFIC ENGINEER.
7. WHEN THE TCP IS NOT IN EFFECT, ALL CHANNELIZING DEVICES SHALL BE REMOVED FROM THE TRAVEL LANES AND ALL SIGNS SHALL BE COVERED OR TURNED AWAY FROM THE DIRECTION OF TRAFFIC. WHERE A SAW CUT OR PAVEMENT REMOVAL RESULTS IN MORE THAN A 2" DROP-OFF ADJACENT TO AN ACTIVE TRAVEL LANE, THE EDGE SHALL BE MARKED WITH VERTICAL PANELS OR CHANNELIZATION DELINEATOR AT 25' SPACING, AND WARNING SIGN CW 8-9a "SHOULDER DROP-OFF" SHALL BE POSTED 240' IN ADVANCE OF THE DROP-OFF CONDITION.
8. CONTRACTOR SHALL ONLY WORK DURING THE TIMES APPROVED BY THE TXDOT SJT DISTRICT AND CITY OF SAN ANGELO POLICY. LANE CLOSURES ARE ONLY ALLOWED MONDAY - FRIDAY, 9:00 AM - 3:00 PM. ANY VARIANCE MUST BE APPROVED BY THE THE TXDOT SJT DISTRICT.
9. CONTRACTOR SHALL COORDINATE WITH PROPERTY OWNERS AROUND THE WORK AREA IN ADVANCE BEFORE ROAD CLOSURE OR PARKING LOT CLOSURE.
10. CONTRACTOR SHALL MAINTAIN DRIVEWAY AND ALLEYWAY ACCESS AT ALL TIMES. CONTRACTOR SHALL COORDINATE WITH PROPERTY OWNERS IN THE WORK ZONE ABOUT THE UTILITY WORK DATE AND TIME. IF A DRIVEWAY OR ALLEYWAY IS NEEDED DUE TO AN EMERGENCY, CONTRACTOR SHALL RESTORE THE TRAVEL WAY WITH STEEL PLATES OR PROVIDE ACCESS WITH TEMPORARY ROADWAY MATERIALS.

0 20 40 80
ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 80'

LEGEND

- WORK ZONE
- SIGN
- FLASHING ARROW BOARD
- CHANNELIZING DEVICES
- TRAFFIC FLOW
- TYPE III BARRICADE
- HEAVY WORK VEHICLE
- TRUCK MOUNTED ATTENUATOR (TMA)

5/26/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

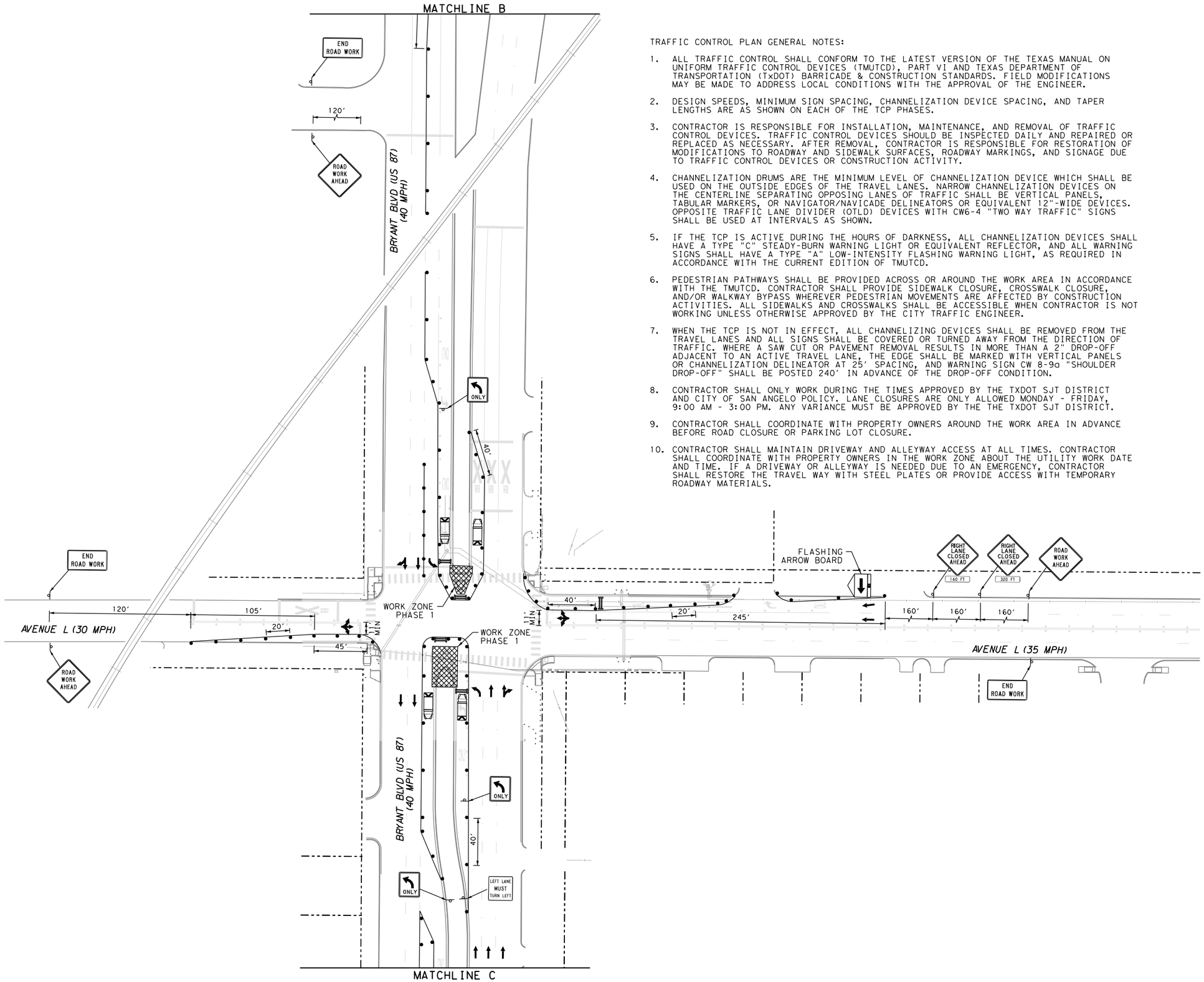
TRAFFIC CONTROL PLAN PHASE 1

NORTH OF BRYANT BOULEVARD (US 87) AT AVENUE L

SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	8
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

PLOTTED: 5/26/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_16_TCP Phase 1 (1 of 3).dgn
80.0000 ft / in.
BY: Abby.Axelson



TRAFFIC CONTROL PLAN GENERAL NOTES:

1. ALL TRAFFIC CONTROL SHALL CONFORM TO THE LATEST VERSION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD), PART VI AND TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT) BARRICADE & CONSTRUCTION STANDARDS. FIELD MODIFICATIONS MAY BE MADE TO ADDRESS LOCAL CONDITIONS WITH THE APPROVAL OF THE ENGINEER.
2. DESIGN SPEEDS, MINIMUM SIGN SPACING, CHANNELIZATION DEVICE SPACING, AND TAPER LENGTHS ARE AS SHOWN ON EACH OF THE TCP PHASES.
3. CONTRACTOR IS RESPONSIBLE FOR INSTALLATION, MAINTENANCE, AND REMOVAL OF TRAFFIC CONTROL DEVICES. TRAFFIC CONTROL DEVICES SHOULD BE INSPECTED DAILY AND REPAIRED OR REPLACED AS NECESSARY. AFTER REMOVAL, CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF MODIFICATIONS TO ROADWAY AND SIDEWALK SURFACES, ROADWAY MARKINGS, AND SIGNAGE DUE TO TRAFFIC CONTROL DEVICES OR CONSTRUCTION ACTIVITY.
4. CHANNELIZATION DRUMS ARE THE MINIMUM LEVEL OF CHANNELIZATION DEVICE WHICH SHALL BE USED ON THE OUTSIDE EDGES OF THE TRAVEL LANES. NARROW CHANNELIZATION DEVICES ON THE CENTERLINE SEPARATING OPPOSING LANES OF TRAFFIC SHALL BE VERTICAL PANELS, TABULAR MARKERS, OR NAVIGATOR/NAVICADE DELINEATORS OR EQUIVALENT 12"-WIDE DEVICES. OPPOSITE TRAFFIC LANE DIVIDER (OTLD) DEVICES WITH CW6-4 "TWO WAY TRAFFIC" SIGNS SHALL BE USED AT INTERVALS AS SHOWN.
5. IF THE TCP IS ACTIVE DURING THE HOURS OF DARKNESS, ALL CHANNELIZATION DEVICES SHALL HAVE A TYPE "C" STEADY-BURN WARNING LIGHT OR EQUIVALENT REFLECTOR, AND ALL WARNING SIGNS SHALL HAVE A TYPE "A" LOW-INTENSITY FLASHING WARNING LIGHT, AS REQUIRED IN ACCORDANCE WITH THE CURRENT EDITION OF TMUTCD.
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0 20 40 80
ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 80'

LEGEND

- WORK ZONE
- SIGN
- FLASHING ARROW BOARD
- CHANNELIZING DEVICES
- TRAFFIC FLOW
- TYPE III BARRICADE
- HEAVY WORK VEHICLE
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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

TRAFFIC CONTROL PLAN PHASE 1

BRYANT BOULEVARD (US 87) AT AVENUE L

SHEET 2 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	
CHECK	CONTROL	SECTION	JOB	9
HMF	0907	24	054	
CHECK				
HMF				

PLOTTED: 5/26/2022
FILENAME: K:\DAL_TPTO\project\06458903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_16_TCP Phase 1 (2 of 3).dgn
80.0000 ft / in.
BY: Abby.Axelson

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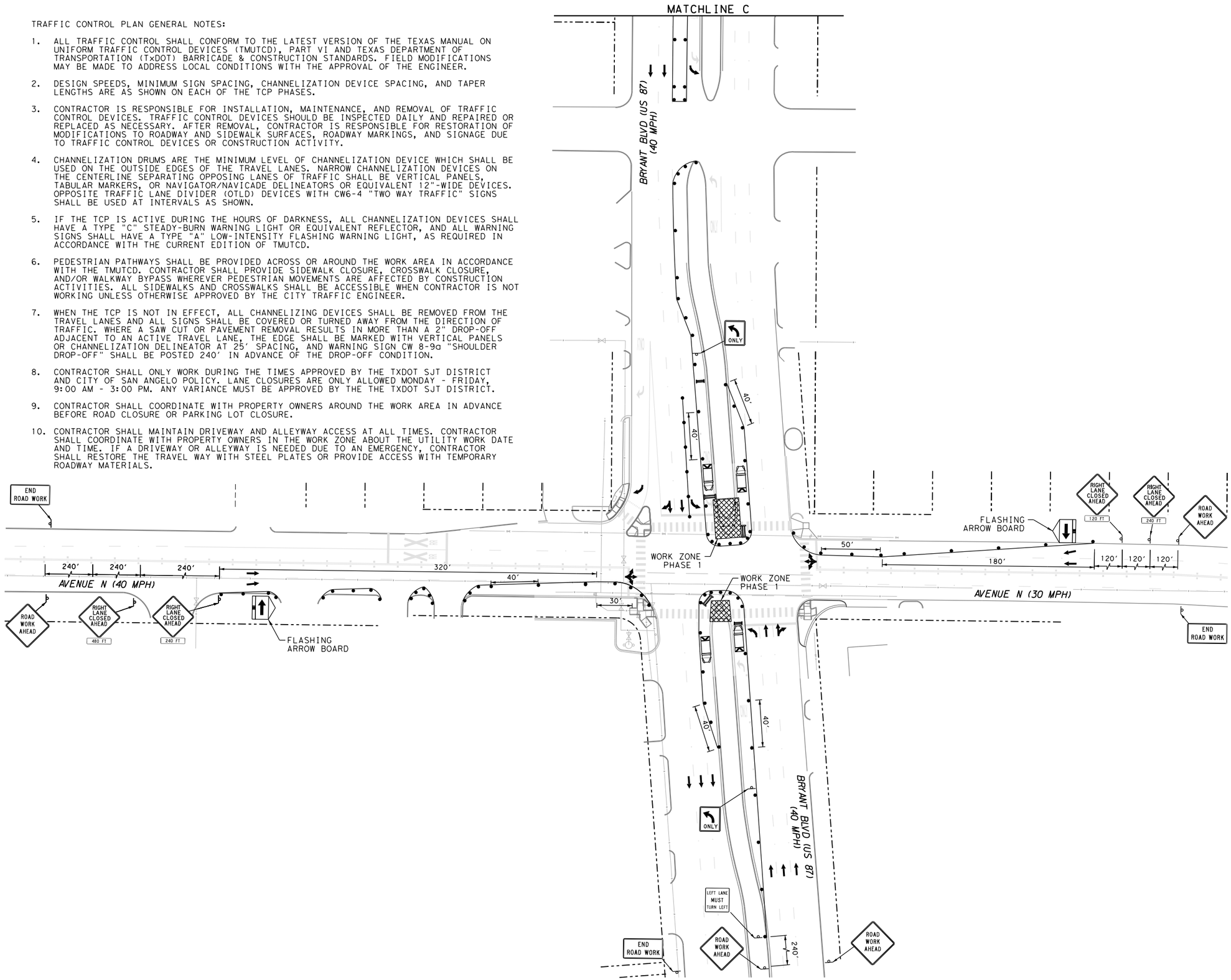

0 20 40 80

ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 80'

LEGEND

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5/26/2022

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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

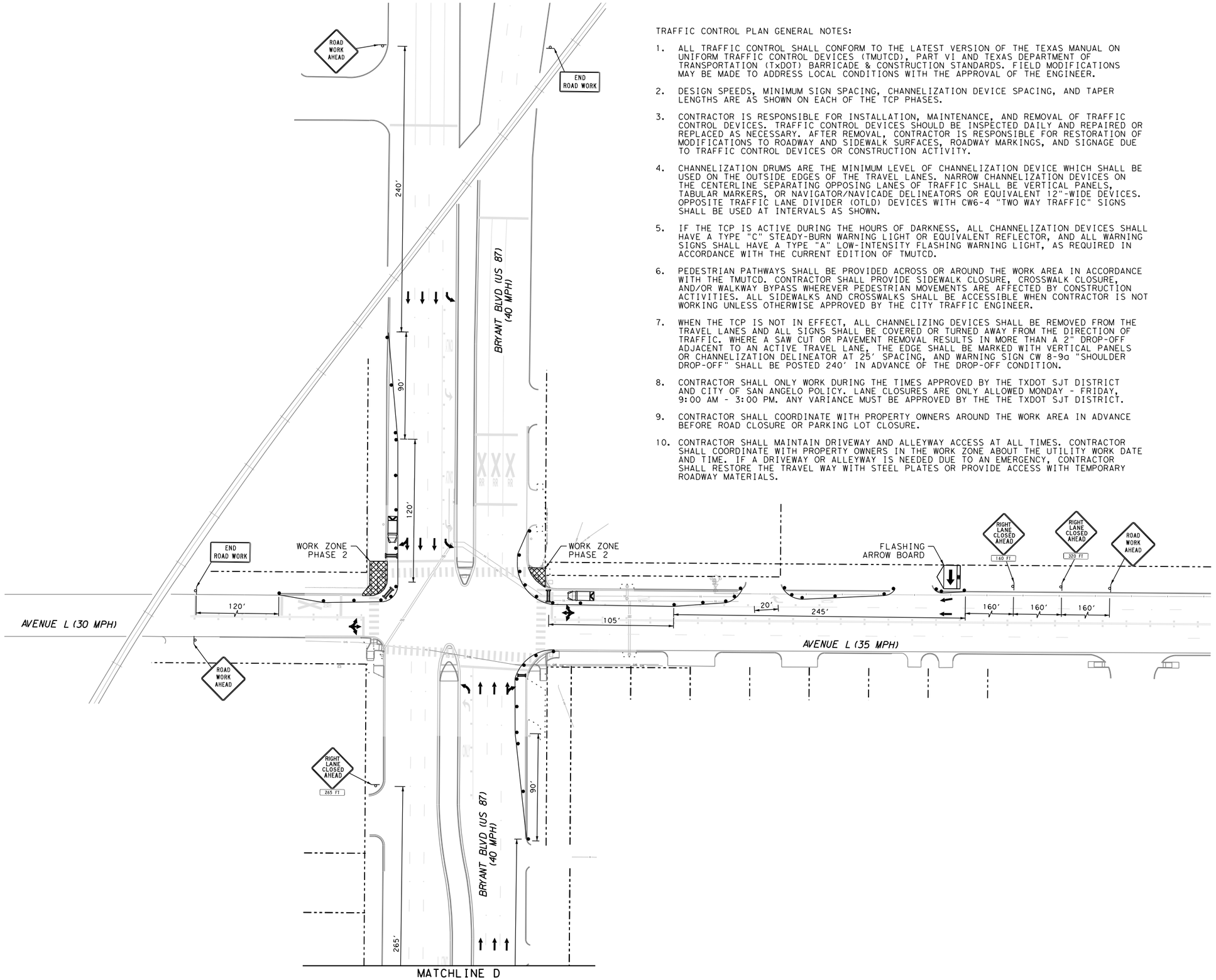
TRAFFIC CONTROL PLAN PHASE 1

BRYANT BOULEVARD (US 87) AT AVENUE N

SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS				
ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	SJT	TOM GREEN	
HMF	CONTROL	SECTION	JOB	10
CHECK	0907	24	054	
HMF				

PLOTTED: 5/26/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_16_TCP Phase 1 (3 of 3).dgn
80.0000 ft / in.
BY: Abby.Axelson



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0 20 40 80
ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 80'

LEGEND

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- SIGN
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5/26/2022

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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

TRAFFIC CONTROL PLAN PHASE 2

BRYANT BOULEVARD (US 87) AT AVENUE L

SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK HMF	TEXAS	SJT	TOM GREEN	11
CHECK HMF	CONTROL	SECTION	JOB	
	0907	24	054	

PLOTTED: 5/26/2022
FILENAME: K:\DAL_TPTO\Iproject\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_17_TCP Phase 2 (1 of 2).dgn
80.0000 ft / in.
BY: Abby.Axelson

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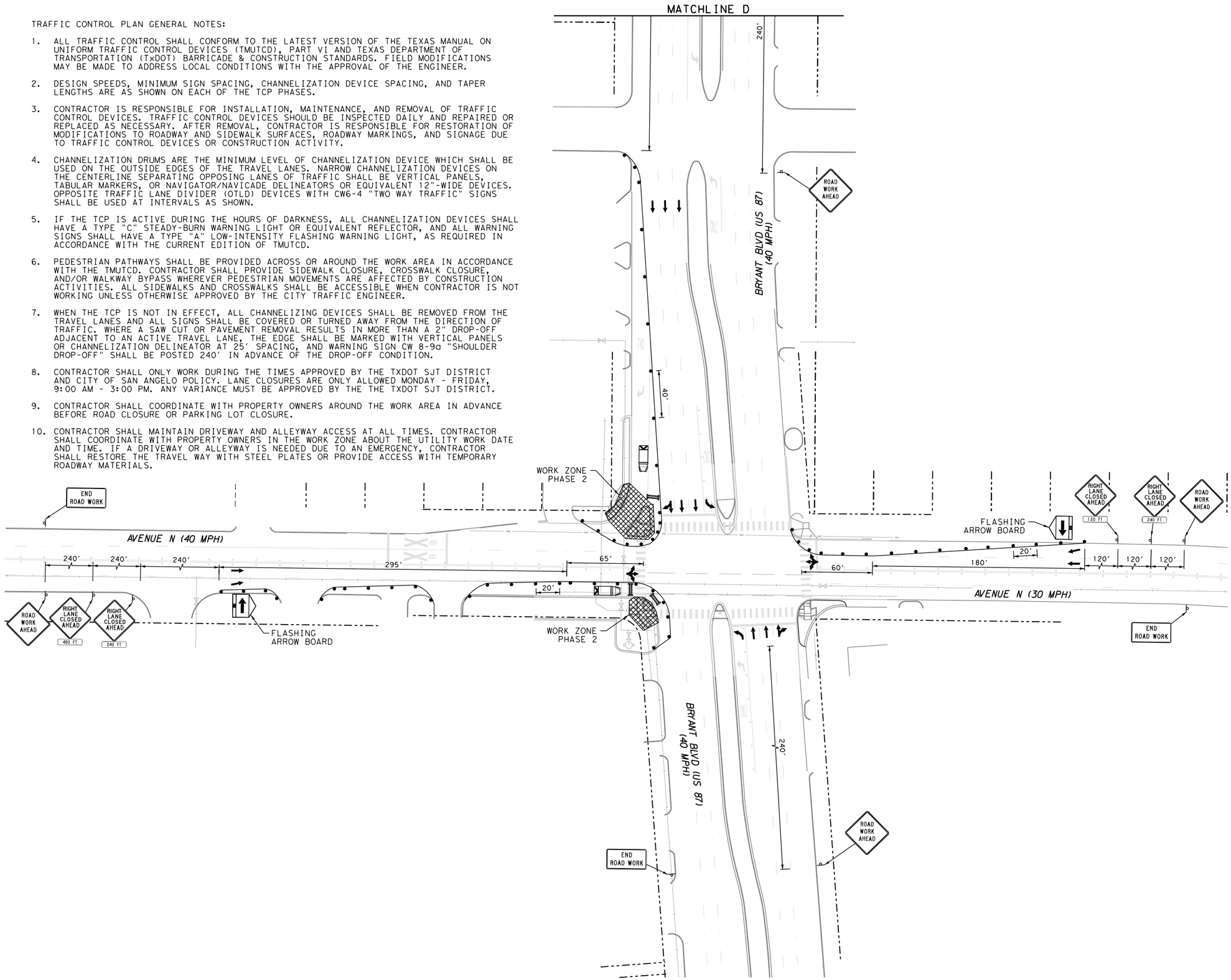

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ORIGINALLY PLOTTED SCALE: SCALE: 1" = 80'

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TRAFFIC CONTROL PLAN PHASE 2

BRYANT BOULEVARD (US 87) AT AVENUE N

SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
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GRAPHICS				
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HMF	CONTROL	SECTION	JOB	12
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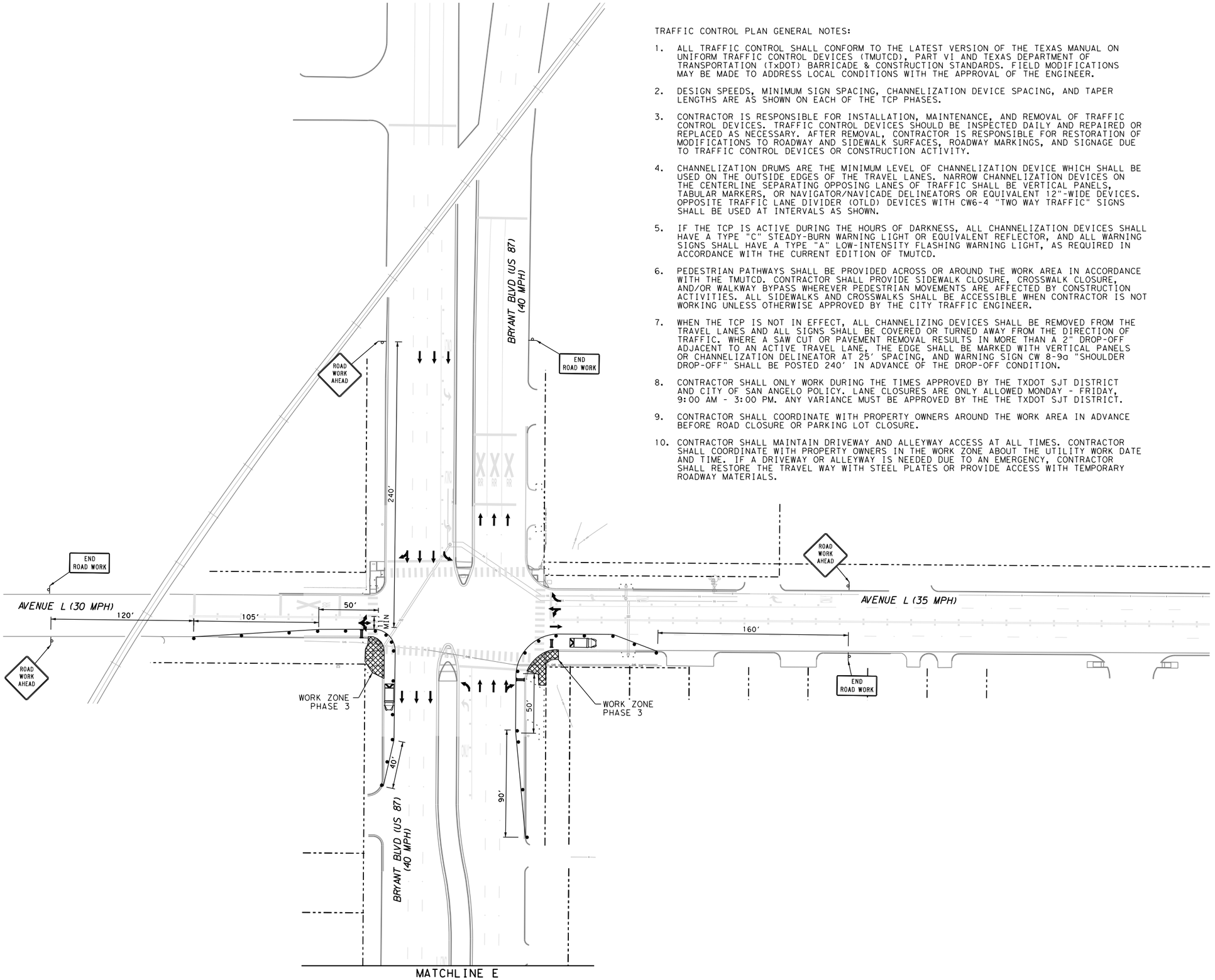

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5. IF THE TCP IS ACTIVE DURING THE HOURS OF DARKNESS, ALL CHANNELIZATION DEVICES SHALL HAVE A TYPE "C" STEADY-BURN WARNING LIGHT OR EQUIVALENT REFLECTOR, AND ALL WARNING SIGNS SHALL HAVE A TYPE "A" LOW-INTENSITY FLASHING WARNING LIGHT, AS REQUIRED IN ACCORDANCE WITH THE CURRENT EDITION OF TMUTCD.
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7. WHEN THE TCP IS NOT IN EFFECT, ALL CHANNELIZING DEVICES SHALL BE REMOVED FROM THE TRAVEL LANES AND ALL SIGNS SHALL BE COVERED OR TURNED AWAY FROM THE DIRECTION OF TRAFFIC. WHERE A SAW CUT OR PAVEMENT REMOVAL RESULTS IN MORE THAN A 2" DROP-OFF ADJACENT TO AN ACTIVE TRAVEL LANE, THE EDGE SHALL BE MARKED WITH VERTICAL PANELS OR CHANNELIZATION DELINEATOR AT 25' SPACING, AND WARNING SIGN CW 8-9a "SHOULDER DROP-OFF" SHALL BE POSTED 240' IN ADVANCE OF THE DROP-OFF CONDITION.
8. CONTRACTOR SHALL ONLY WORK DURING THE TIMES APPROVED BY THE TXDOT SJT DISTRICT AND CITY OF SAN ANGELO POLICY. LANE CLOSURES ARE ONLY ALLOWED MONDAY - FRIDAY, 9:00 AM - 3:00 PM. ANY VARIANCE MUST BE APPROVED BY THE THE TXDOT SJT DISTRICT.
9. CONTRACTOR SHALL COORDINATE WITH PROPERTY OWNERS AROUND THE WORK AREA IN ADVANCE BEFORE ROAD CLOSURE OR PARKING LOT CLOSURE.
10. CONTRACTOR SHALL MAINTAIN DRIVEWAY AND ALLEYWAY ACCESS AT ALL TIMES. CONTRACTOR SHALL COORDINATE WITH PROPERTY OWNERS IN THE WORK ZONE ABOUT THE UTILITY WORK DATE AND TIME. IF A DRIVEWAY OR ALLEYWAY IS NEEDED DUE TO AN EMERGENCY, CONTRACTOR SHALL RESTORE THE TRAVEL WAY WITH STEEL PLATES OR PROVIDE ACCESS WITH TEMPORARY ROADWAY MATERIALS.

0 20 40 80
ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 80'

LEGEND

- WORK ZONE
- SIGN
- FLASHING ARROW BOARD
- CHANNELIZING DEVICES
- TRAFFIC FLOW
- TYPE III BARRICADE
- HEAVY WORK VEHICLE
- TRUCK MOUNTED ATTENUATOR (TMA)

5/26/2022

STATE OF TEXAS
HIRON M. FERNANDO
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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

TRAFFIC CONTROL PLAN PHASE 3

BRYANT BOULEVARD (US 87) AT AVENUE L

SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK HMF	TEXAS	SJT	TOM GREEN	13
CHECK HMF	CONTROL	SECTION	JOB	
	0907	24	054	

PLOTTED: 5/26/2022
FILENAME: K:\DAL_TPTO\Iproject\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_18_TCP Phase 3 (1 of 2).dgn
80.0000 ft / in.
BY: Abby.Axelson

TRAFFIC CONTROL PLAN GENERAL NOTES:

1. ALL TRAFFIC CONTROL SHALL CONFORM TO THE LATEST VERSION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD), PART VI AND TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT) BARRICADE & CONSTRUCTION STANDARDS. FIELD MODIFICATIONS MAY BE MADE TO ADDRESS LOCAL CONDITIONS WITH THE APPROVAL OF THE ENGINEER.

2. DESIGN SPEEDS, MINIMUM SIGN SPACING, CHANNELIZATION DEVICE SPACING, AND TAPER LENGTHS ARE AS SHOWN ON EACH OF THE TCP PHASES.

3. CONTRACTOR IS RESPONSIBLE FOR INSTALLATION, MAINTENANCE, AND REMOVAL OF TRAFFIC CONTROL DEVICES. TRAFFIC CONTROL DEVICES SHOULD BE INSPECTED DAILY AND REPAIRED OR REPLACED AS NECESSARY. AFTER REMOVAL, CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF MODIFICATIONS TO ROADWAY AND SIDEWALK SURFACES, ROADWAY MARKINGS, AND SIGNAGE DUE TO TRAFFIC CONTROL DEVICES OR CONSTRUCTION ACTIVITY.

4. CHANNELIZATION DRUMS ARE THE MINIMUM LEVEL OF CHANNELIZATION DEVICE WHICH SHALL BE USED ON THE OUTSIDE EDGES OF THE TRAVEL LANES. NARROW CHANNELIZATION DEVICES ON THE CENTERLINE SEPARATING OPPOSING LANES OF TRAFFIC SHALL BE VERTICAL PANELS, TABULAR MARKERS, OR NAVIGATOR/NAVICADE DELINEATORS OR EQUIVALENT 12"-WIDE DEVICES. OPPOSITE TRAFFIC LANE DIVIDER (OTLD) DEVICES WITH CW6-4 "TWO WAY TRAFFIC" SIGNS SHALL BE USED AT INTERVALS AS SHOWN.

5. IF THE TCP IS ACTIVE DURING THE HOURS OF DARKNESS, ALL CHANNELIZATION DEVICES SHALL HAVE A TYPE "C" STEADY-BURN WARNING LIGHT OR EQUIVALENT REFLECTOR, AND ALL WARNING SIGNS SHALL HAVE A TYPE "A" LOW-INTENSITY FLASHING WARNING LIGHT, AS REQUIRED IN ACCORDANCE WITH THE CURRENT EDITION OF TMUTCD.

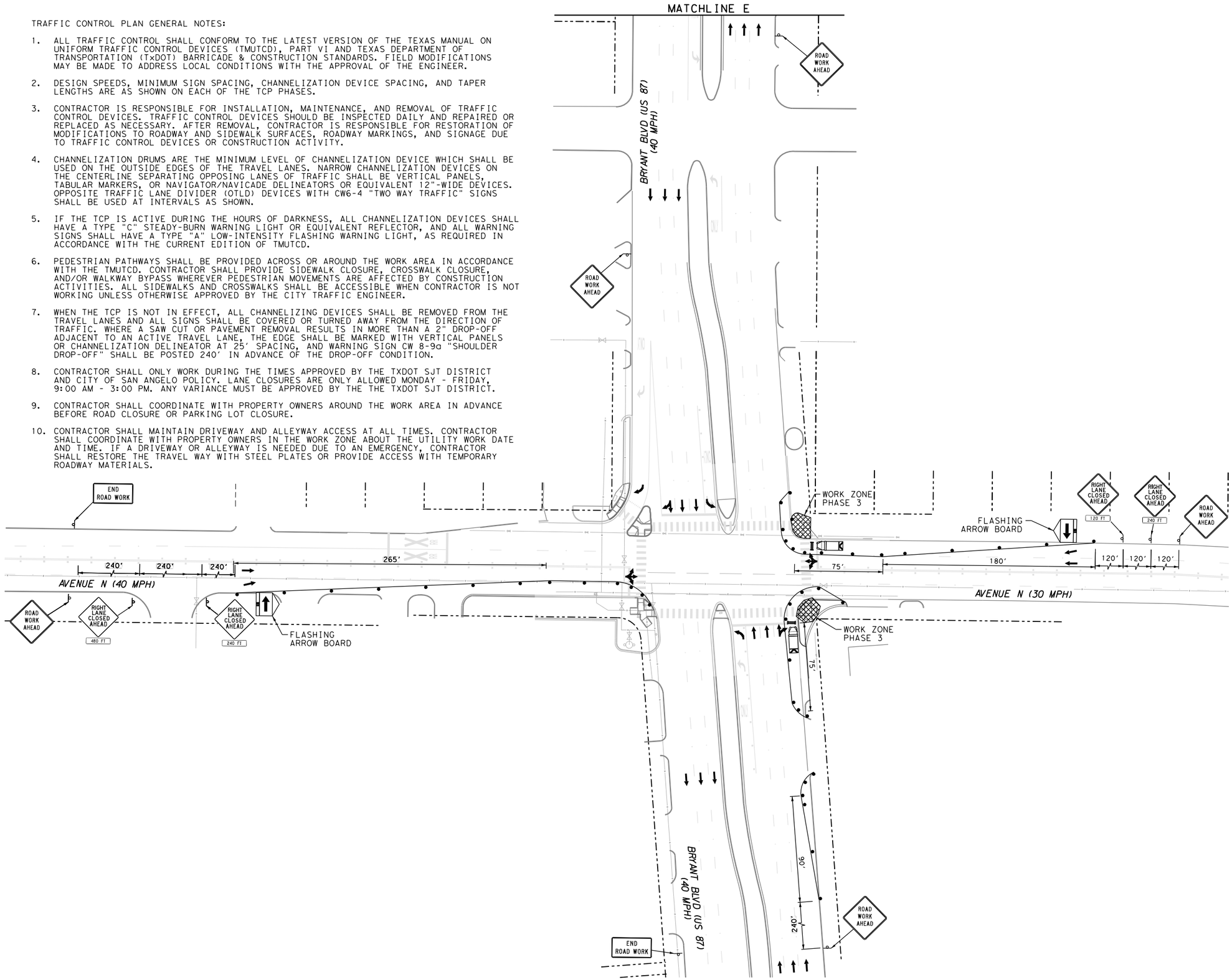
6. PEDESTRIAN PATHWAYS SHALL BE PROVIDED ACROSS OR AROUND THE WORK AREA IN ACCORDANCE WITH THE TMUTCD. CONTRACTOR SHALL PROVIDE SIDEWALK CLOSURE, CROSSWALK CLOSURE, AND/OR WALKWAY BYPASS WHEREVER PEDESTRIAN MOVEMENTS ARE AFFECTED BY CONSTRUCTION ACTIVITIES. ALL SIDEWALKS AND CROSSWALKS SHALL BE ACCESSIBLE WHEN CONTRACTOR IS NOT WORKING UNLESS OTHERWISE APPROVED BY THE CITY TRAFFIC ENGINEER.

7. WHEN THE TCP IS NOT IN EFFECT, ALL CHANNELIZING DEVICES SHALL BE REMOVED FROM THE TRAVEL LANES AND ALL SIGNS SHALL BE COVERED OR TURNED AWAY FROM THE DIRECTION OF TRAFFIC. WHERE A SAW CUT OR PAVEMENT REMOVAL RESULTS IN MORE THAN A 2" DROP-OFF ADJACENT TO AN ACTIVE TRAVEL LANE, THE EDGE SHALL BE MARKED WITH VERTICAL PANELS OR CHANNELIZATION DELINEATOR AT 25' SPACING, AND WARNING SIGN CW 8-9a "SHOULDER DROP-OFF" SHALL BE POSTED 240' IN ADVANCE OF THE DROP-OFF CONDITION.

8. CONTRACTOR SHALL ONLY WORK DURING THE TIMES APPROVED BY THE TXDOT SJT DISTRICT AND CITY OF SAN ANGELO POLICY. LANE CLOSURES ARE ONLY ALLOWED MONDAY - FRIDAY, 9:00 AM - 3:00 PM. ANY VARIANCE MUST BE APPROVED BY THE THE TXDOT SJT DISTRICT.

9. CONTRACTOR SHALL COORDINATE WITH PROPERTY OWNERS AROUND THE WORK AREA IN ADVANCE BEFORE ROAD CLOSURE OR PARKING LOT CLOSURE.

10. CONTRACTOR SHALL MAINTAIN DRIVEWAY AND ALLEYWAY ACCESS AT ALL TIMES. CONTRACTOR SHALL COORDINATE WITH PROPERTY OWNERS IN THE WORK ZONE ABOUT THE UTILITY WORK DATE AND TIME. IF A DRIVEWAY OR ALLEYWAY IS NEEDED DUE TO AN EMERGENCY, CONTRACTOR SHALL RESTORE THE TRAVEL WAY WITH STEEL PLATES OR PROVIDE ACCESS WITH TEMPORARY ROADWAY MATERIALS.



0 20 40 80

ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 80'

LEGEND

- WORK ZONE
- SIGN
- FLASHING ARROW BOARD
- CHANNELIZING DEVICES
- TRAFFIC FLOW
- TYPE III BARRICADE
- HEAVY WORK VEHICLE
- TRUCK MOUNTED ATTENUATOR (TMA)

5/26/2022

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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

TRAFFIC CONTROL PLAN PHASE 3

BRYANT BOULEVARD (US 87) AT AVENUE N

SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	14
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

PLOTTED: 5/26/2022
FILENAME: K:\DAL_TPTO\project\06458903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_18_TCP Phase 3 (2 of 2).dgn
80.0000 ft / in.
BY: Abby.Axelson

GENERAL NOTES

1. When a contractor force account “Safety Contingency” has been established for the project, it is for work zone enhancements that were unforeseen in the project planning and design stage, but would improve the effectiveness of the traffic control plan. These enhancements will be mutually agreed upon by the Engineer and the Contractor’s Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if doing so does not slow implementation of work zone enhancements.
2. Shadow, lead, trail, and ramp control vehicles shown on the plans are required.
3. Use high level warning flags on advance warning signs during daytime operations.
4. Provide flaggers at such times and locations as directed to ensure the safe passage of traffic through construction areas. When flaggers are used to control traffic, furnish and install signs CW20-7 “FLAGGER SYMBOL”, CW20-7aD "FLAGGER AHEAD", and CW3-4 "BE PREPARED TO STOP”. Flaggers shall use 24 in. STOP/SLOW paddles.
5. Temporarily relocate existing mailbox assemblies on portable mailbox stands as shown on the plans, or as directed. Use materials conforming to the Compliant Work Zone Traffic Control Device List (CWZTCDL).
6. Prior to each work day, make provisions to exclude vehicles from parking within work areas.
7. Temporarily relocate existing permanent sign assemblies to temporary supports as shown on the plans, or as directed.
8. Omit advance warning signs and furnish and install reduced size signs CW20-1 “ROAD WORK AHEAD” mounted back to back with reduced size signs G20-2 “END ROAD WORK” signs at intersecting city streets and county roads.
9. Furnish and install signs CW20-1D “ROAD WORK AHEAD”, G20-1aT “ROAD WORK ←NEXT X MILES, NEXT X MILES→”, and G20-2 “END ROAD WORK” at intersecting state highways.
10. Sign and buffer spacing may be altered to fit field conditions, as directed.
11. In addition to providing a Contractor’s Responsible Person and a phone number for emergency contact, have employee(s) available to respond on the project for emergencies and for taking corrective measures within 30 minutes.
12. Cones may be used as the typical channelizing device for freeway surfacing projects.
13. 28 in. tall 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 in. tall two-piece cones.
14. All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
15. The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
16. Warning signs for long term stationary work should be mounted at 7 ft. to the bottom of the sign.
17. For long term stationary work at night, floodlights should be used to illuminate the work area and equipment crossings. Floodlights shall not produce a disabling glare condition for road users or workers.
18. All motor vehicle equipment having an obstructed view to the rear shall have a reverse signal alarm audible above the surrounding noise level.
19. Traffic control devices denoted with the triangle symbol on the plans may be omitted.
20. When sheet WZ(RS) is included in the plans, furnish and install temporary rumble strips for daytime lane closures. Do not use temporary rumble strips on freeways or expressways.
21. When sheet WZ(BRK) is included in the plans, furnish and install signs CW21-1T "GIVE US A BRAKE".
22. Flags attached to signs shown in the plans are required.
23. Signs END ROAD WORK (G20-2) may be omitted when conflicting with G20-2 signs already in place on the project.
24. The Engineer will determine advisory speeds to be shown on plaques CW13-1P.
25. Temporary work zone devices (including portable barriers) manufactured after December 31, 2019 must have been successfully tested to the 2016 edition of Manual for Assessing Safety Hardware (MASH). Such devices manufactured on or before this date, and successfully tested to either National Cooperative Highway Research Program (NCHRP) Report 350 or the 2009 edition of MASH, may continue to be used.

TRUCK MOUNTED ATTENUATOR REQUIREMENTS

Provide the number of vehicles with truck mounted attenuators listed in the table below. The Contractor shall determine if multiple operations will occur at the same time, to determine the total number of truck mounted attenuators needed for the project.

WZ(BTS-1)	1	TCP(2-3)	0	TCP(6-1)	0
TCP(1-1)	0	TCP(2-4)	1	TCP(6-2)	0
TCP(1-2)	0	TCP(2-5)	1	TCP(6-3)	0
TCP(1-3)	0	TCP(2-6)	0	TCP(6-4)	0
TCP(1-4)	0	TCP(3-1)	0	TCP(6-5)	0
TCP(1-5)	0	TCP(3-2)	0	TCP(6-6)	0
TCP(1-6)	0	TCP(3-3)	2	TCP(6-7)	0
TCP(2-1)	1	TCP(3-4)	1	TCP(6-8)	0
TCP(2-2)	1	TCP(5-1)	0	TCP(6-9)	0
TRAFFIC CONTROL PLAN PILOT VEHICLE OPERATION					0
TRAFFIC CONTROL PLAN TWO LANE CLOSURES ON FOUR LANE UNDIVIDED HIGHWAYS					0
TRAFFIC CONTROL PLAN LANE CLOSURES WITH BARRIER					0
TRAFFIC CONTROL PLAN SHOULDER CLOSURES WITH BARRIER					0
TRAFFIC CONTROL PLAN WORK SPACE NEAR SHOULDER					0
TRAFFIC CONTROL PLAN CROSSOVER CLOSURE					0
TRAFFIC CONTROL PLAN TURNAROUND CLOSURE					0
TRAFFIC CONTROL PLAN LANE CLOSURES WITH TRAFFIC SIGNAL AND BARRIER					0
TRAFFIC CONTROL PLAN LANE CLOSURES WITH TRAFFIC SIGNAL					0
TRAFFIC CONTROL PLAN FREEWAY CLOSURE					0

PORTABLE CHANGEABLE MESSAGE SIGN REQUIREMENTS

Provide the portable changeable message signs listed in the table below. The Contractor shall determine if multiple operations will occur at the same time, to determine the total number of portable changeable message signs needed for the project.

TCP(6-1)	0	TCP(6-4)	0	TCP(6-8)	0
TCP(6-2)	0	TCP(6-6)	0	TCP(6-9)	0
TCP(6-3)	0	TCP(6-7)	0		
TRAFFIC CONTROL PLAN LANE CLOSURES WITH BARRIER					0
TRAFFIC CONTROL PLAN SHOULDER CLOSURES WITH BARRIER					0
TRAFFIC CONTROL PLAN LANE CLOSURES WITH TRAFFIC SIGNAL AND BARRIER					0
TRAFFIC CONTROL PLAN LANE CLOSURES WITH TRAFFIC SIGNAL					0
TRAFFIC CONTROL PLAN FREEWAY CLOSURE					0

TYPICAL USAGE

MOBILE
Work that moves continuously or intermittently (stopping for up to approximately 15 minutes).

SHORT DURATION
Work that occupies a location up to 1 hour.

SHORT TERM STATIONARY
Daytime work that occupies a location for more than 1 hour in a single daylight period.

INTERMEDIATE TERM STATIONARY
Work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.

LONG TERM STATIONARY
Work that occupies a location more than 3 days.

5/25/2022
STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
PROFESSIONAL ENGINEER

THE AFFIXED SEAL ABOVE APPLIES ONLY TO INFORMATION FILLED BY ABOVE STATED ENGINEER.

Texas Department of Transportation | San Angelo District

TRAFFIC CONTROL PLAN GENERAL REQUIREMENTS

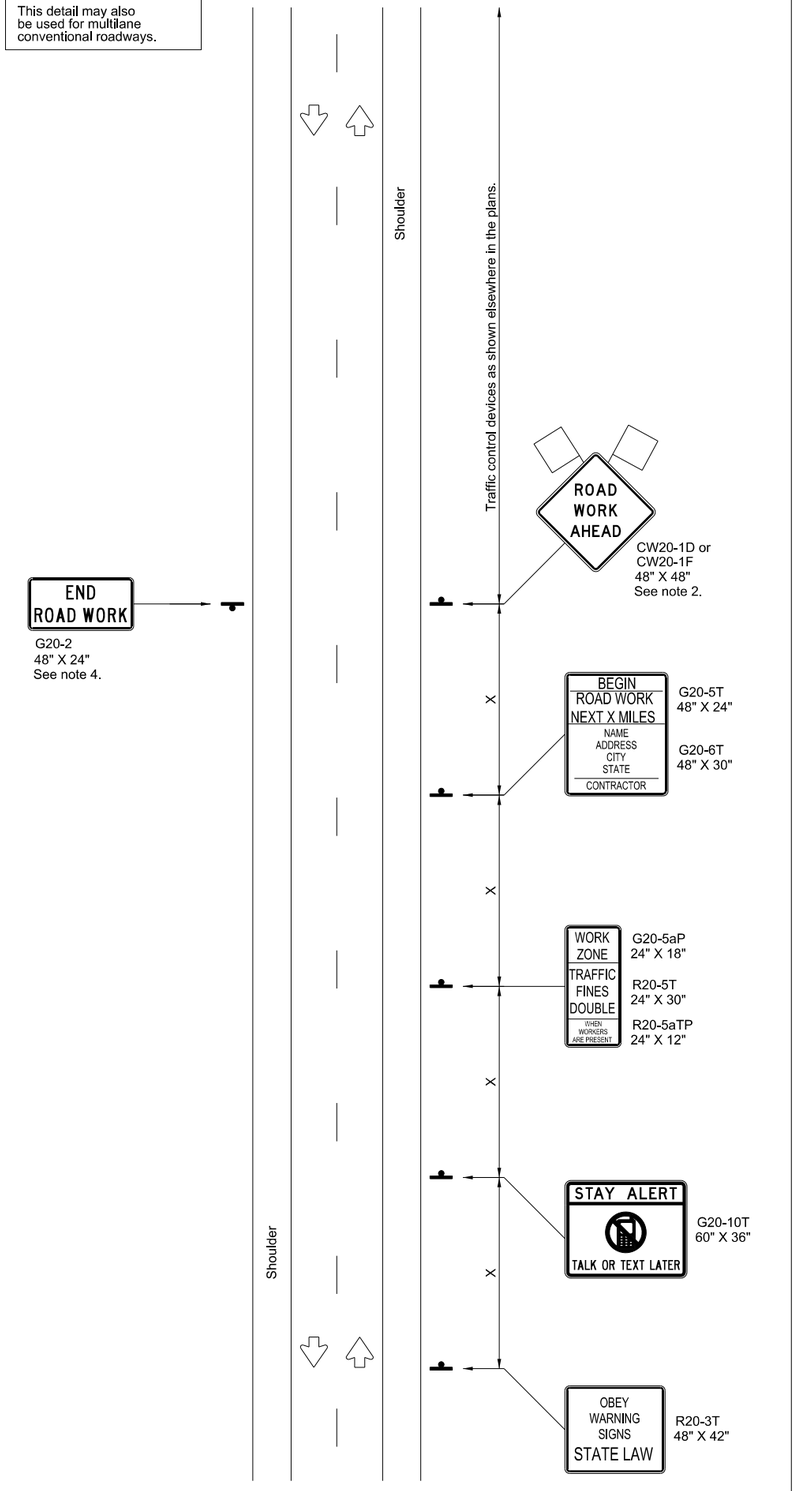
SHEET 1 OF 1 NOT TO SCALE

SHEET ISSUED OR LAST REVISED
11-19

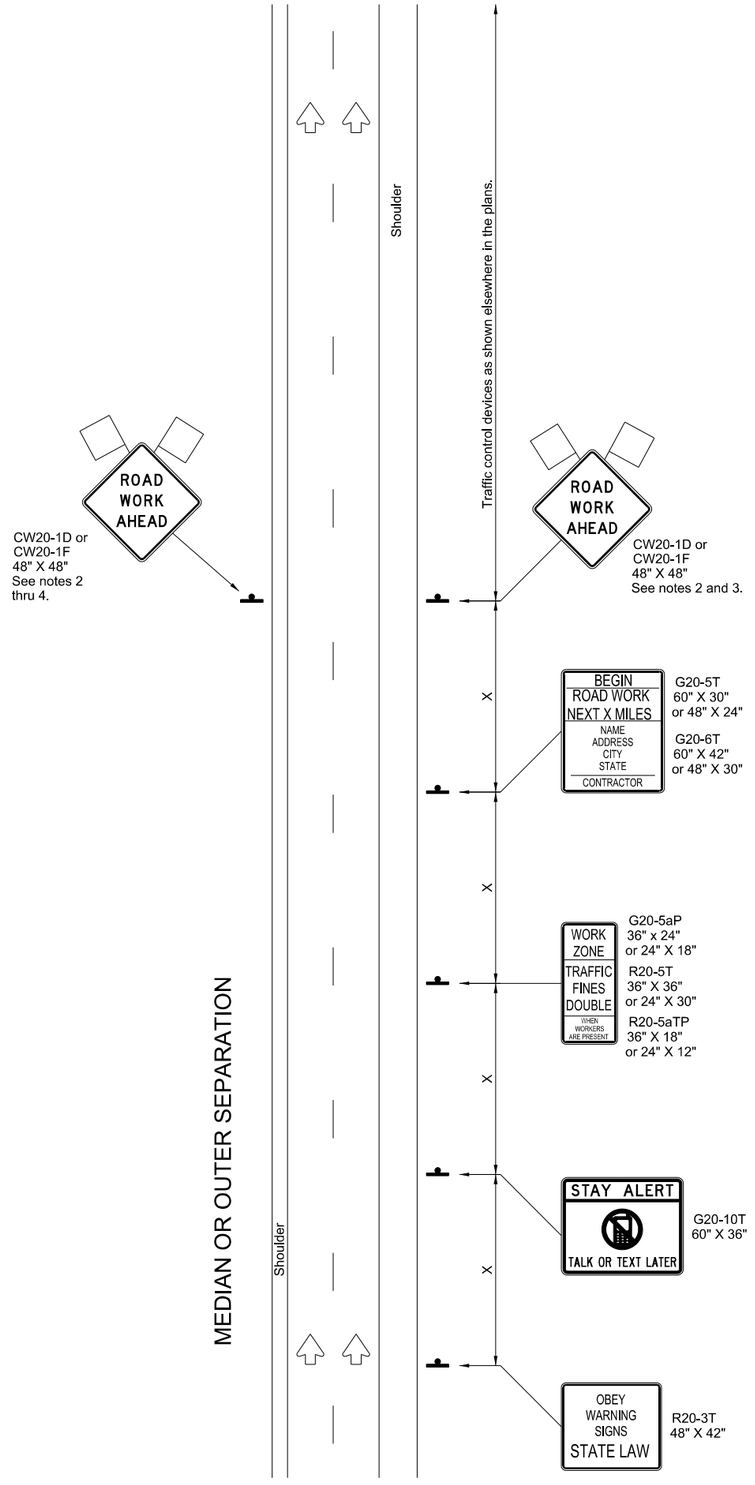
CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		15

DATE: 5/25/2022 8:20:07 PM
FILE: K:\DAL_TPTO\1project\0645869903 - San Angelo RTZ Signal Design\CADD\SJT-TRAFFIC CONTROL PLAN GENERAL REQUIREMENTS.DGN

This detail may also be used for multilane conventional roadways.



TYPICAL CONVENTIONAL ROADWAY
OR TYPICAL TWO-WAY FRONTAGE ROAD



TYPICAL DIVIDED HIGHWAY OR FREEWAY
OR TYPICAL ONE-WAY FRONTAGE ROAD

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger
	Raised Pavement Markers Ty II-AA	P	Pilot Vehicle
	Temporary or Portable Traffic Signal		Automated Flagger Assistance Device (AFAD)

Posted Speed	Formula	Minimum Desirable Taper Lengths ✻✻ 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'
80		800'	880'	960'	80'	160'	1000'	615'	910'

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

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

GENERAL NOTES

1. This traffic control plan is for use at isolated work areas not associated with CSJ limits.
2. Display sign message "ROAD WORK 1 MILE" if sign type CW20-1F is required as shown in the plans.
3. Omit flags attached to signs on freeways.
4. Omit sign if indicated elsewhere in the plans.
5. Where two sign sizes are shown, use the larger sizes for divided highways or freeways and use the smaller sizes for conventional roadways.

5/25/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED PROFESSIONAL ENGINEER

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Texas Department of Transportation

San Angelo District

TRAFFIC CONTROL PLAN PROJECT LIMIT SIGNS FOR ISOLATED WORK AREAS

SHEET 1 OF 1 NOT TO SCALE

SHEET ISSUED OR LAST REVISED 11-19

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		16

DATE: 5/25/2022 8:20:09 PM
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DATE:
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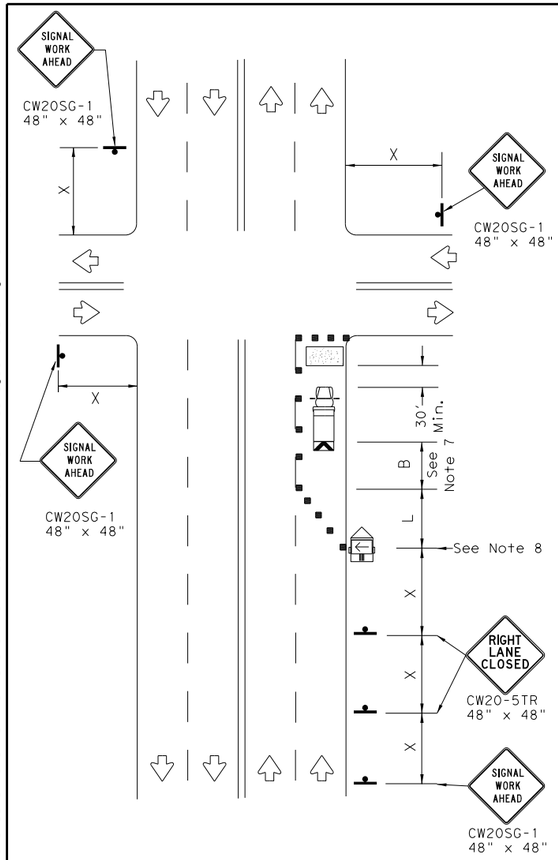
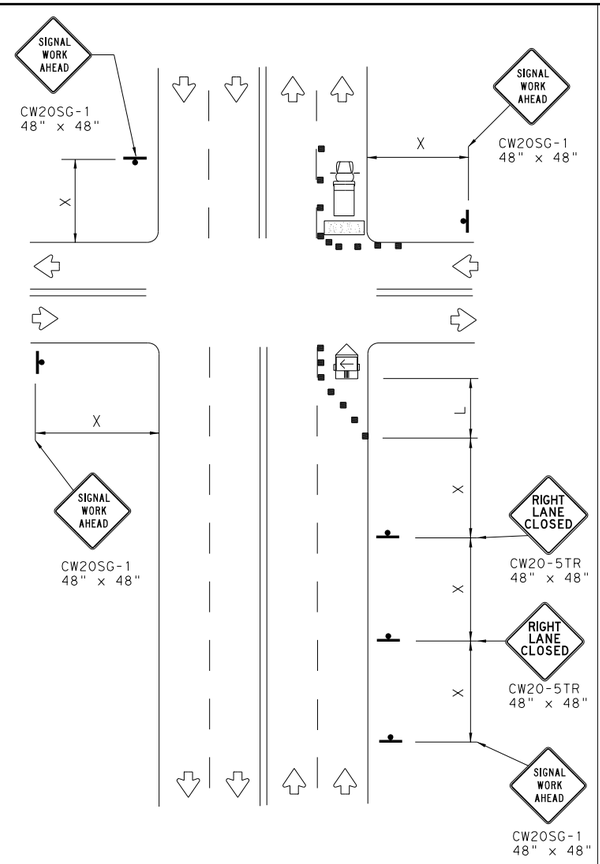


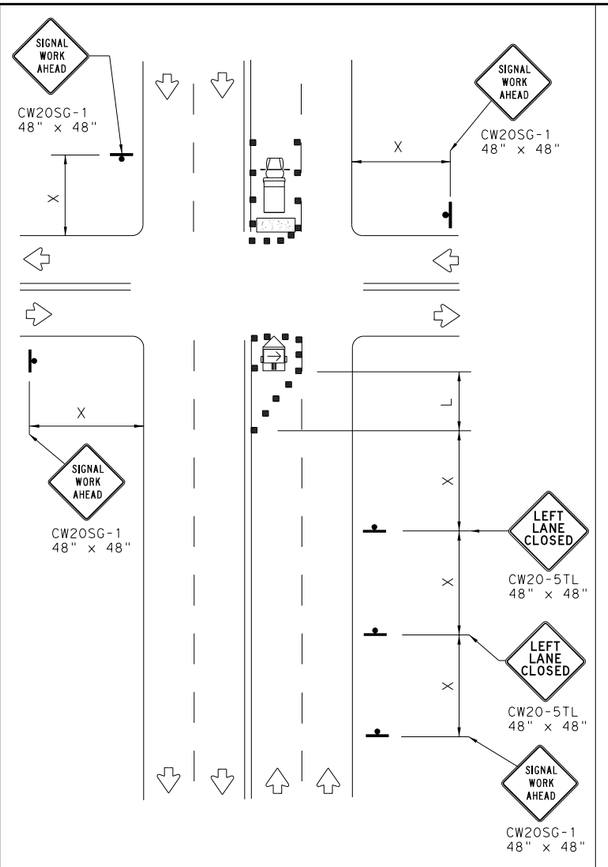
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



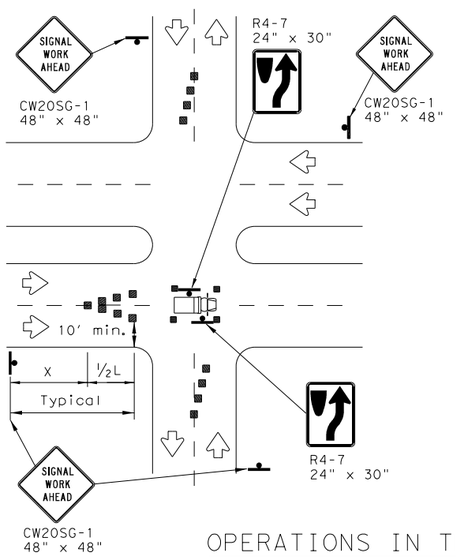
FAR SIDE RIGHT LANE CLOSURE

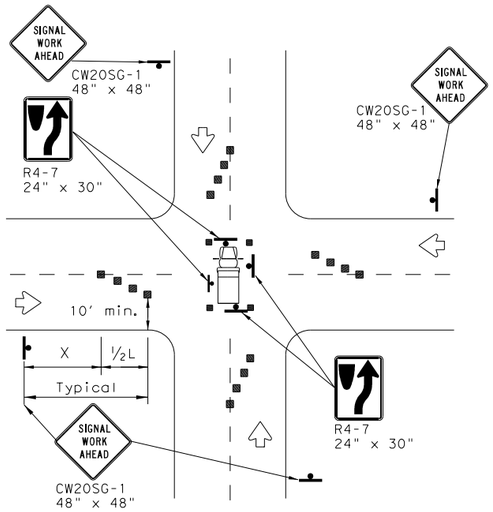
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY





OPERATIONS IN THE INTERSECTION

SHORT DURATION

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. 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.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. 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.
7. 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.
8. 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.
9. 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.

Texas Department of Transportation

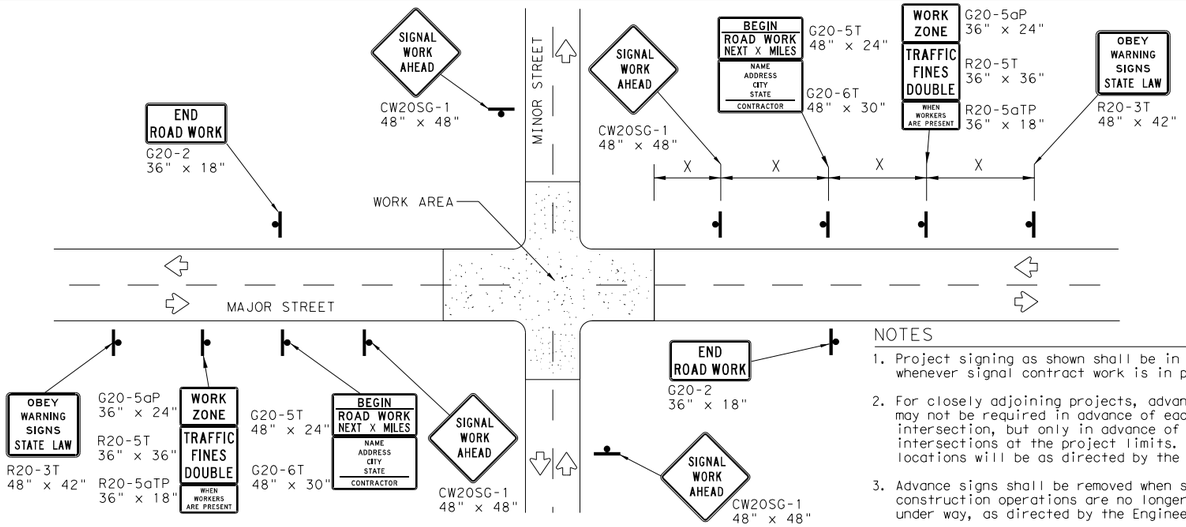
Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	SJT	TOM GREEN		17

DATE:
FILE:



TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

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

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. 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.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. 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".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. 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

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. 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 alluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes backfilled upon completion of the work.

REFLECTIVE SHEETING

1. 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

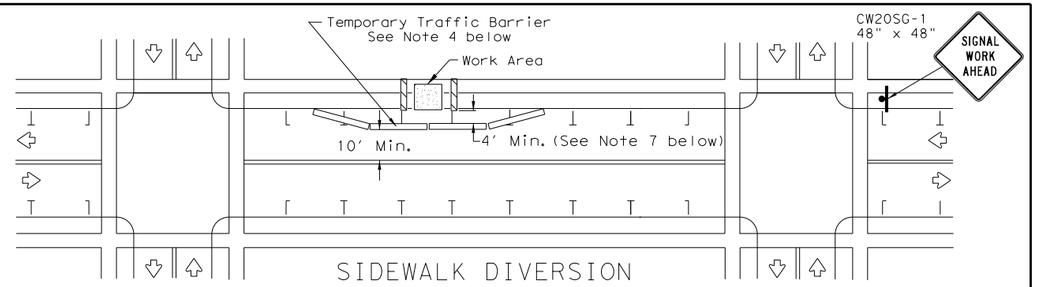
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

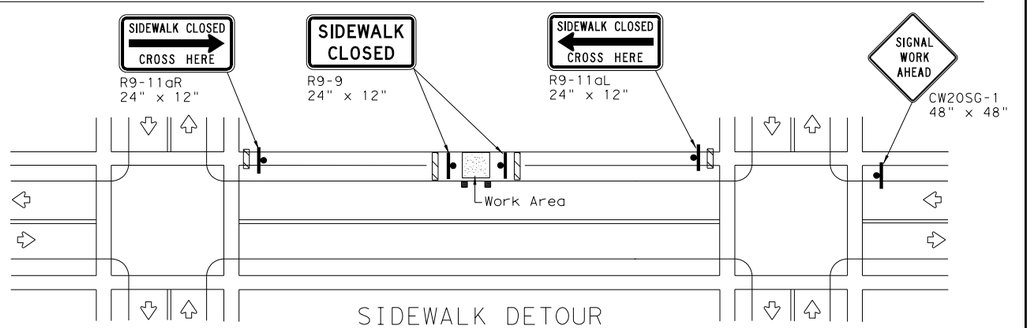
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

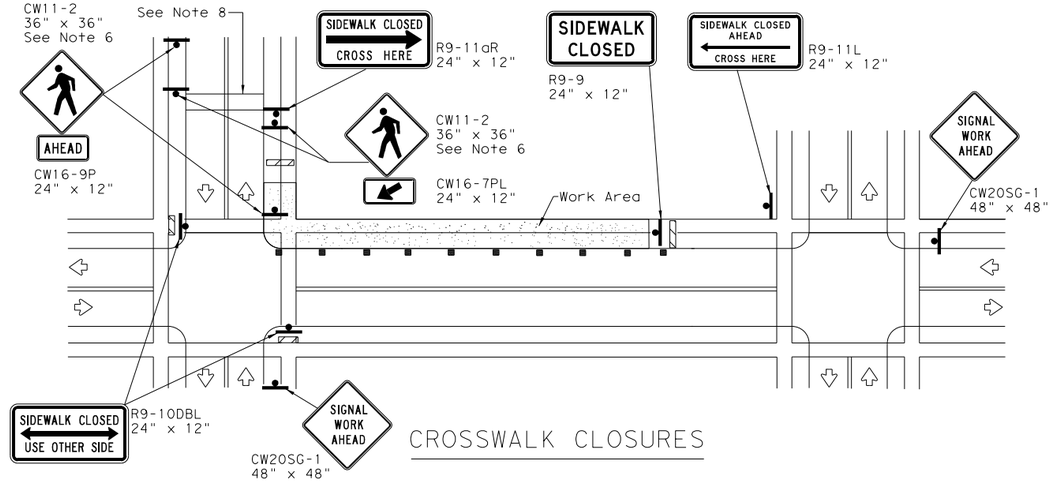
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. 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.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. 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.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. 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.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

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© TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		0907	24	54	US 87
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4-98 3-03		SJT	TOM GREEN		18

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

DATE: DATE TIME
FILE: DOCUMENT NAME

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
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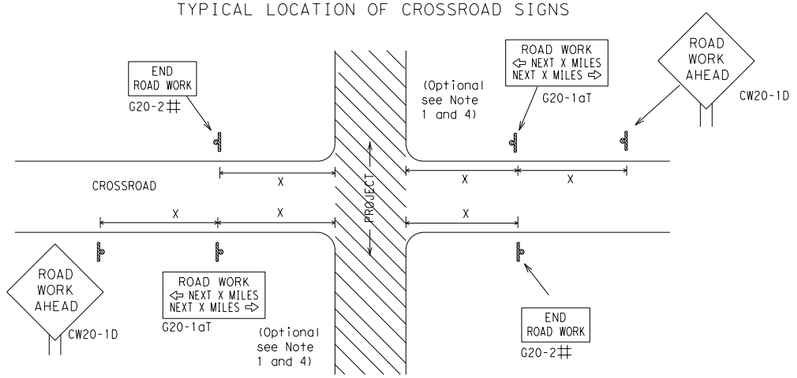
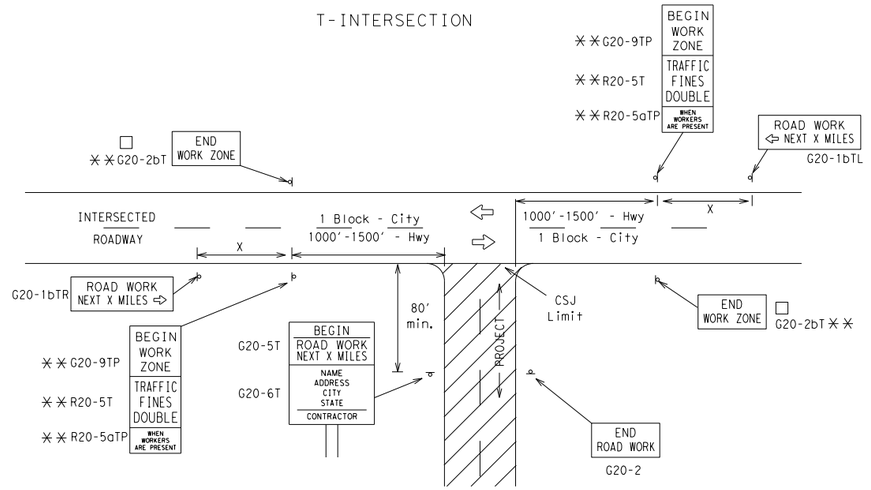
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

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

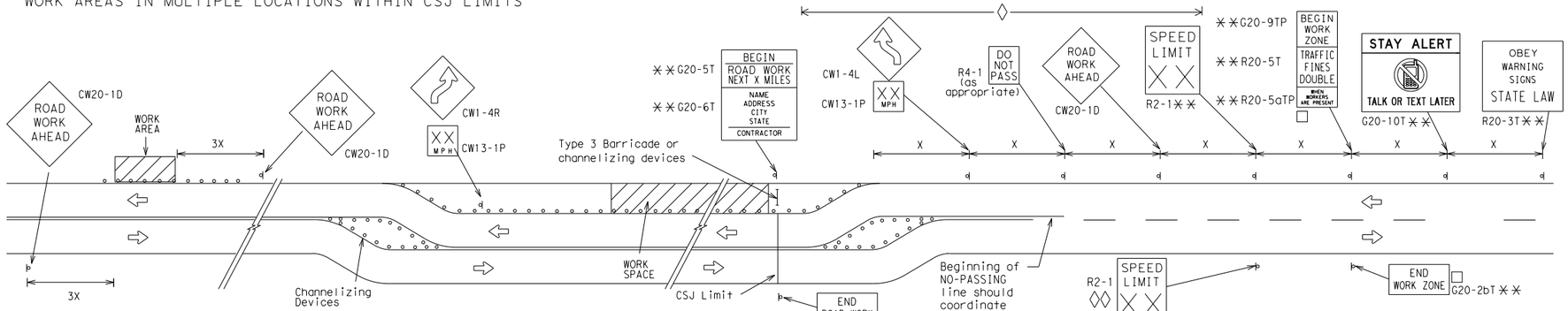
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

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

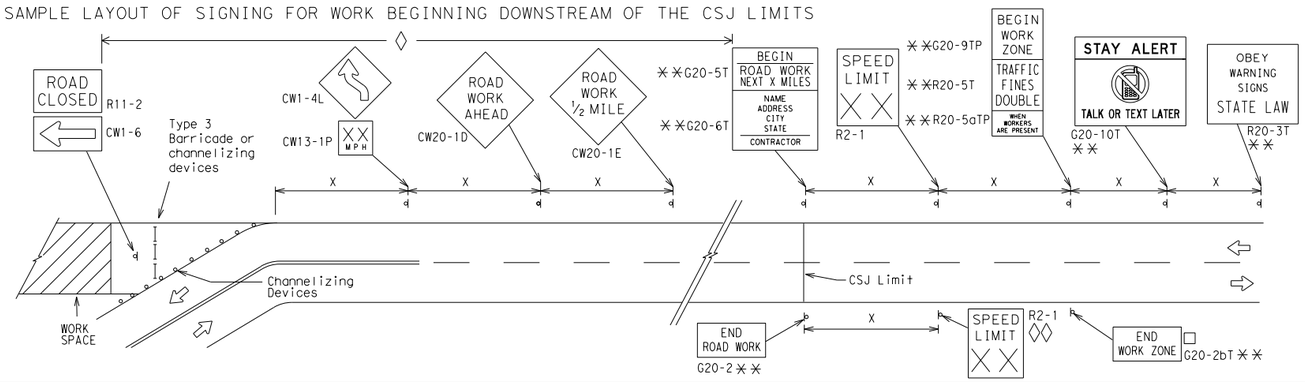
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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

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



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

□ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

✳✳ CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

◊ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

◊◊ Contractor will install a regulatory speed limit sign at the end of the work zone.

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0907	24	54	US 87
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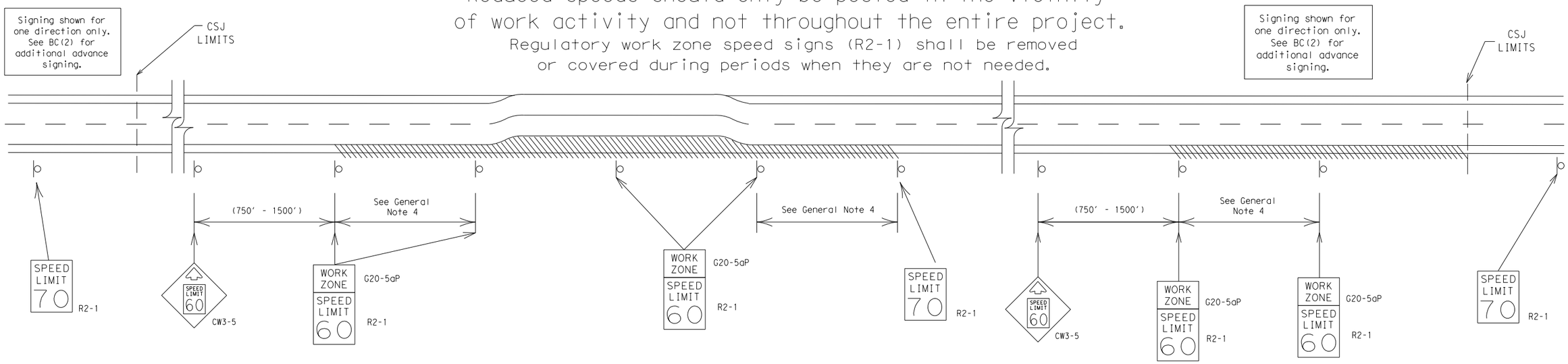
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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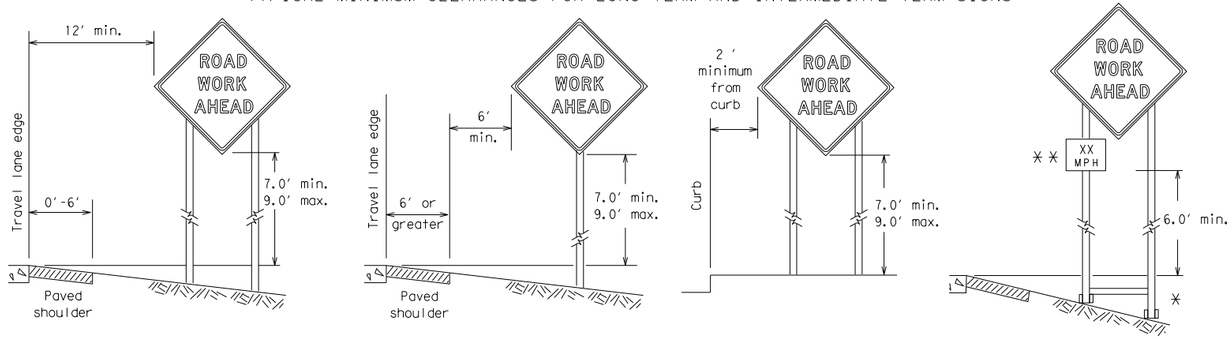
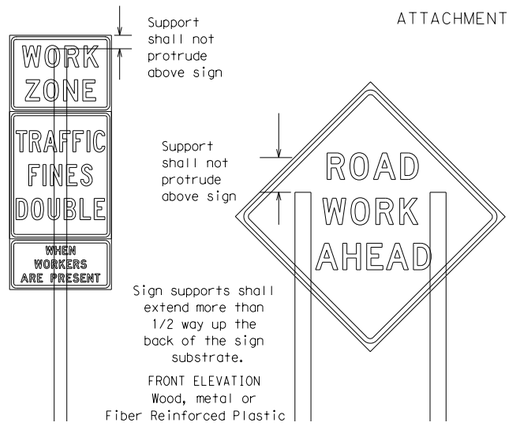
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

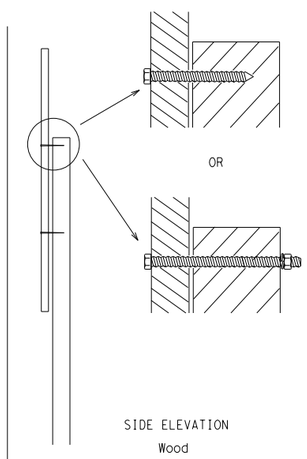


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





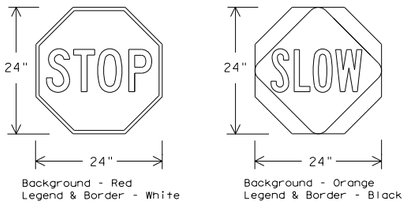
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

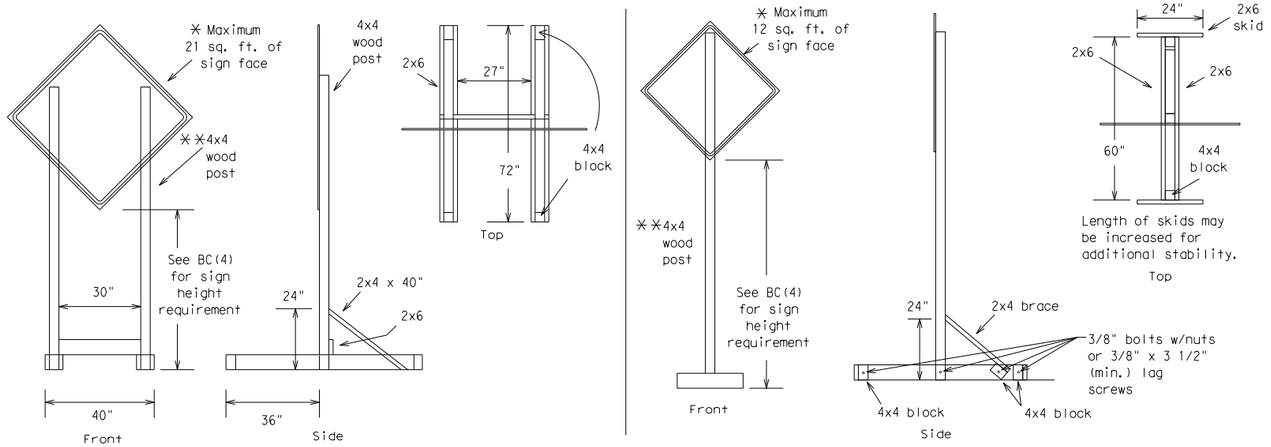
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

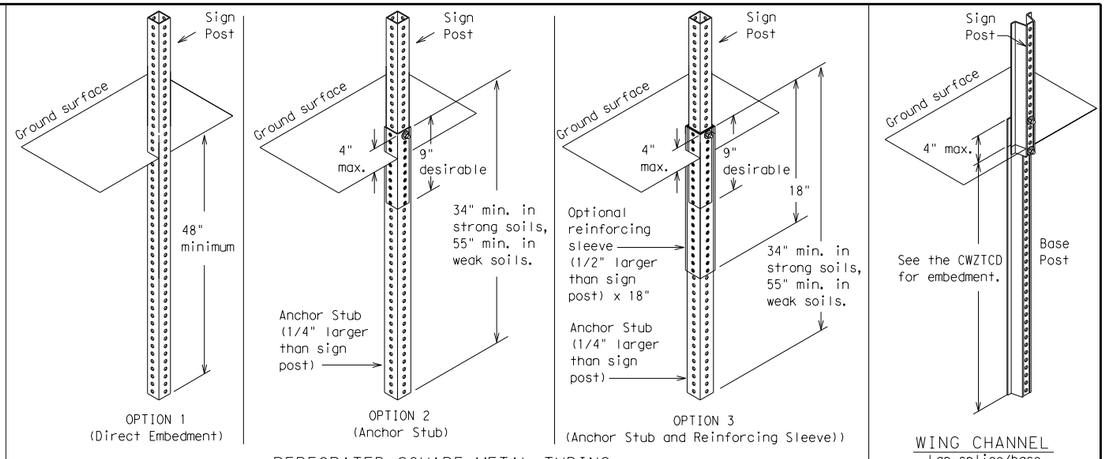
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SJT	TOM GREEN		22

DATE: DATE TIME
FILE: DOCUMENT NAME



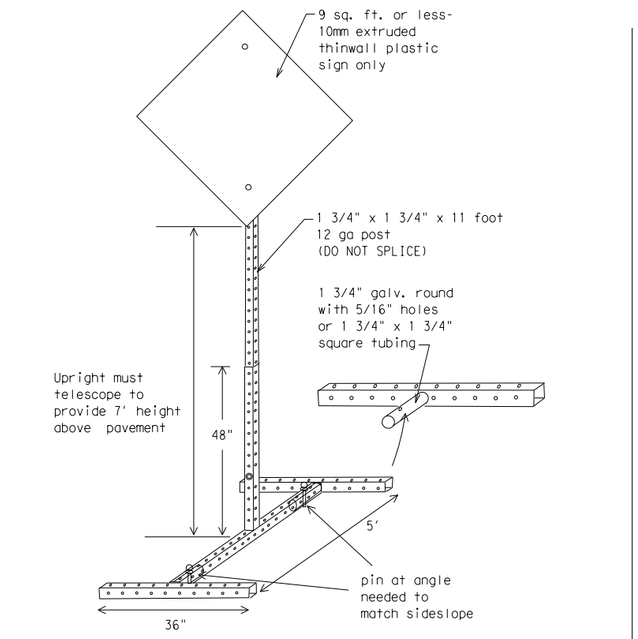
SKID MOUNTED WOOD SIGN SUPPORTS

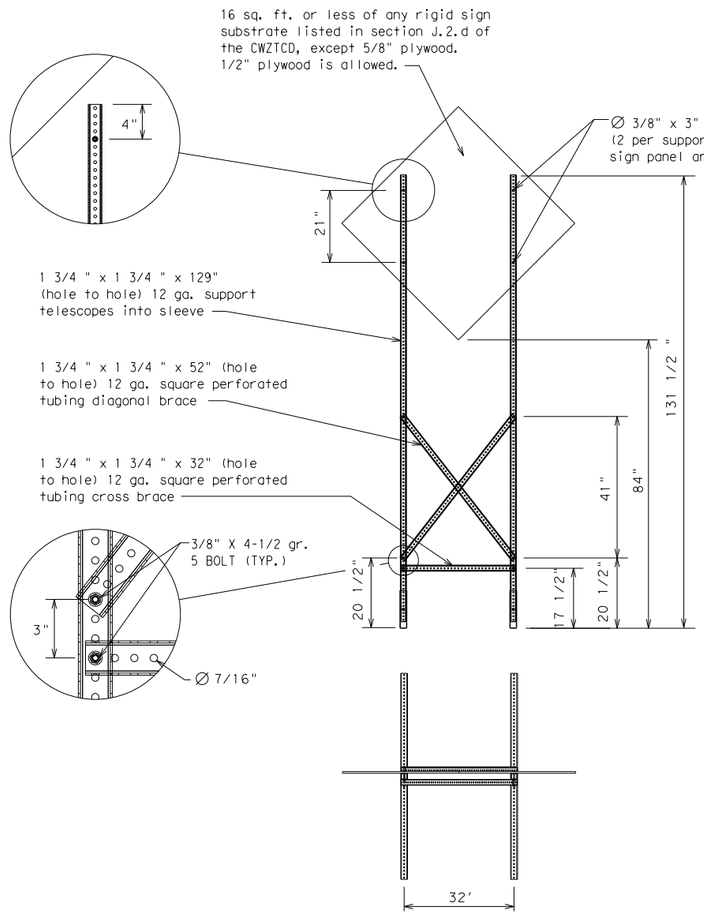
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

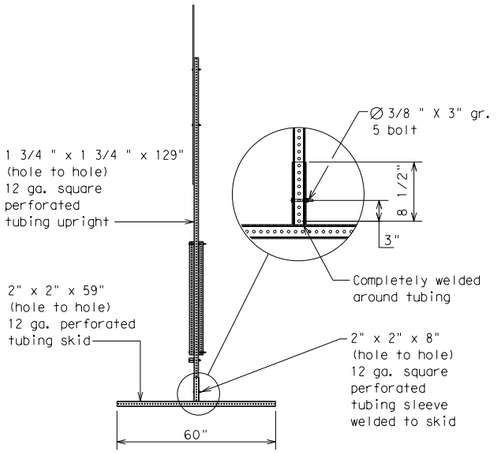


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SJT	TOM GREEN		23

DATE: DATE TIME
FILE: DOCUMENT NAME

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

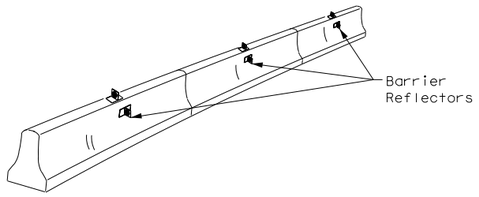
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

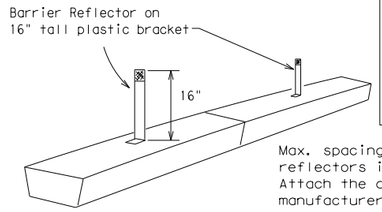
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SJT	TOM GREEN		24

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



CONCRETE TRAFFIC BARRIER (CTB)

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

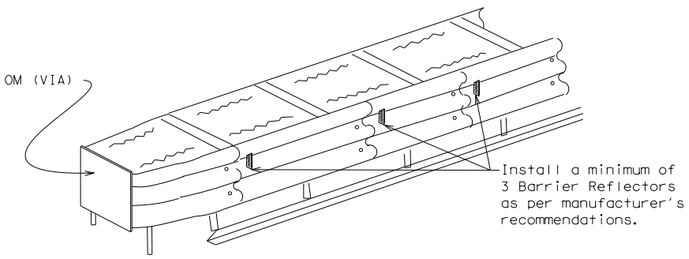


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

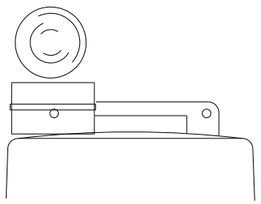


DELINEATION OF END TREATMENTS

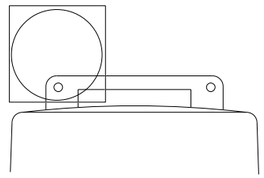
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

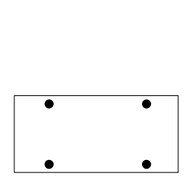
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

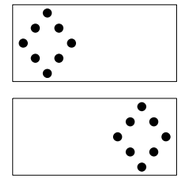
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

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

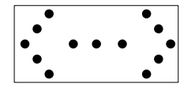


4 CORNER CAUTION

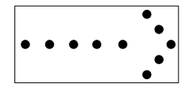
OR



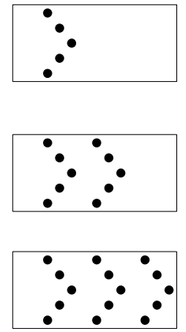
ALTERNATING DIAMOND CAUTION



DOUBLE ARROW



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



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

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

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

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

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SJT	TOM GREEN		25

101

DATE: DATE TIME
FILE: DOCUMENT NAME

DATE: DATE TIME
FILE: DOCUMENT NAME

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

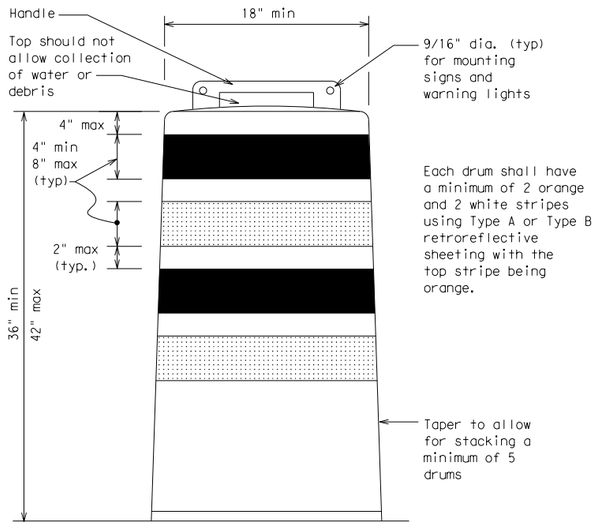
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

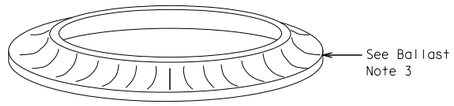
RETROREFLECTIVE SHEETING

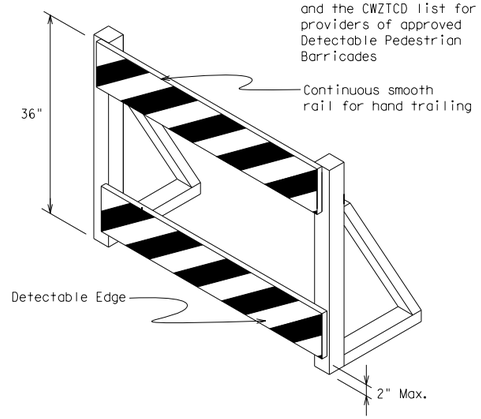
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

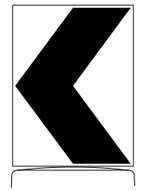




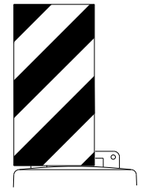


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

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Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	SJT	TOM GREEN		26
7-13				

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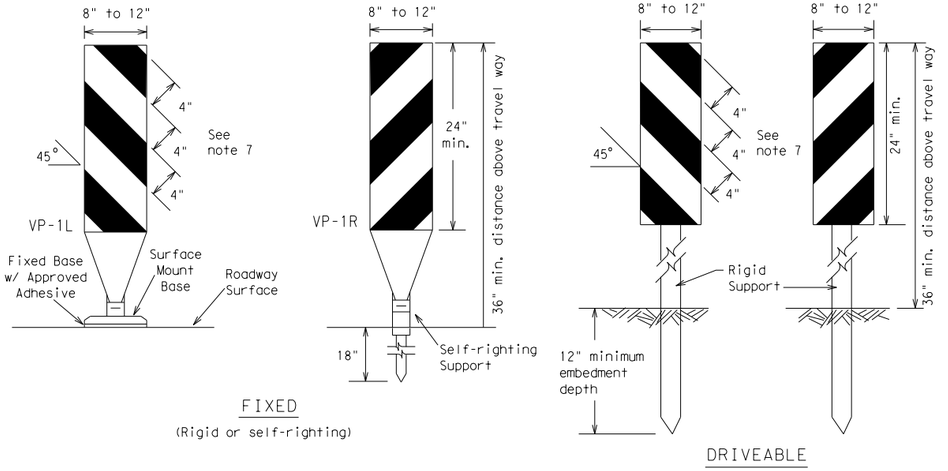


FIXED

(Rigid or self-righting)

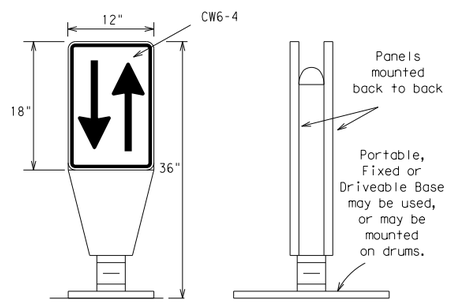
DRIVEABLE

(Rigid or self-righting)

PORTABLE

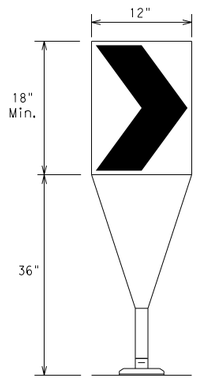
VERTICAL PANELS (VPs)

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



OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

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



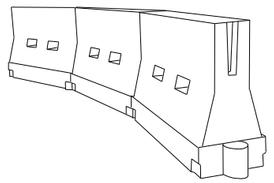
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

CHEVRONS

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

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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	$L=\frac{WS^2}{60}$	150′	165′	180′	30′	60′
35		205′	225′	245′	35′	70′
40		265′	295′	320′	40′	80′
45	L = WS	450′	495′	540′	45′	90′
50		500′	550′	600′	50′	100′
55		550′	605′	660′	55′	110′
60		600′	660′	720′	60′	120′
65		650′	715′	780′	65′	130′
70		700′	770′	840′	70′	140′
75		750′	825′	900′	75′	150′
80		800′	880′	960′	80′	160′

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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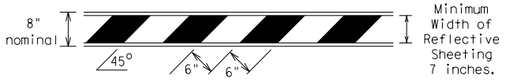
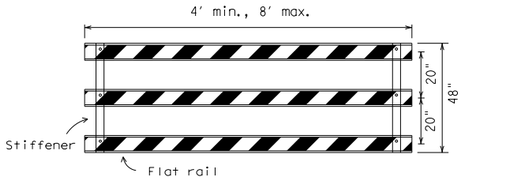
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



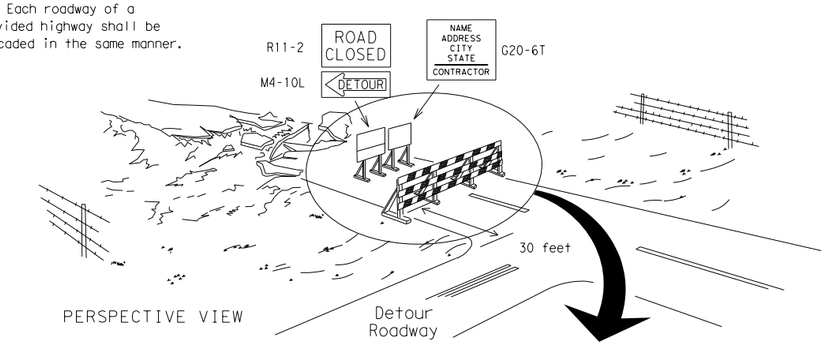
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

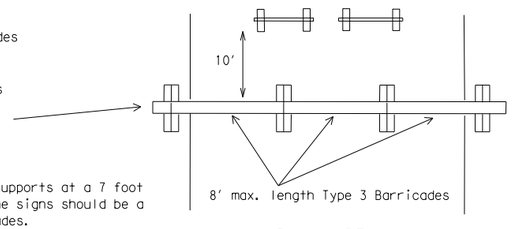
TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

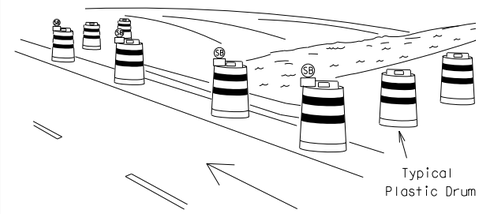
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

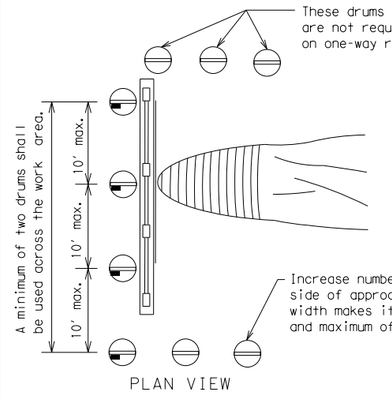
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

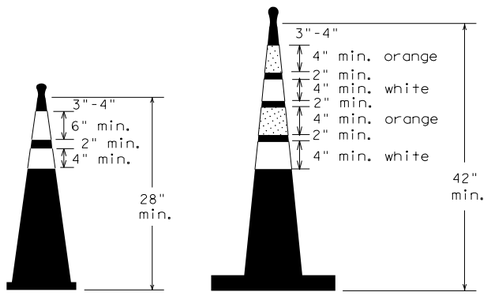
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



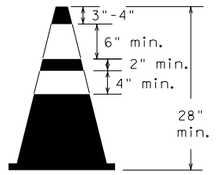
PLAN VIEW

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

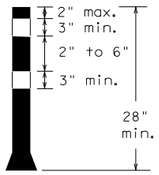
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

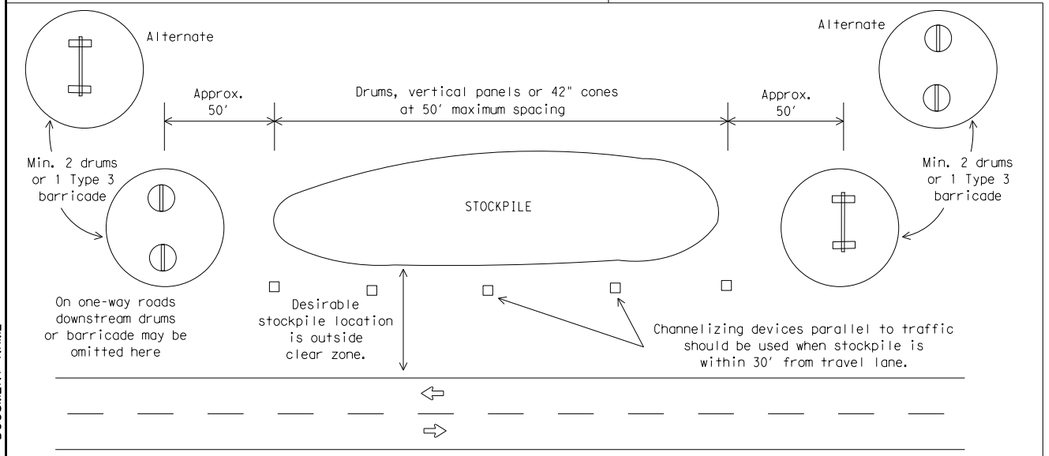


Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

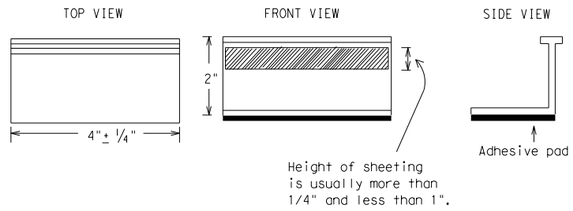
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

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BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

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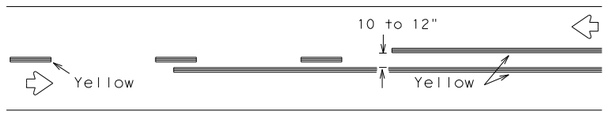
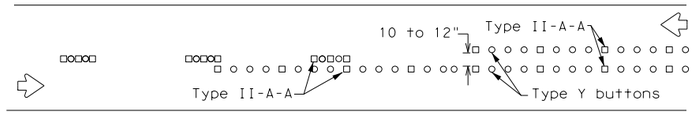
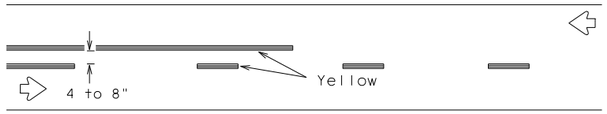
PAVEMENT MARKING PATTERNS



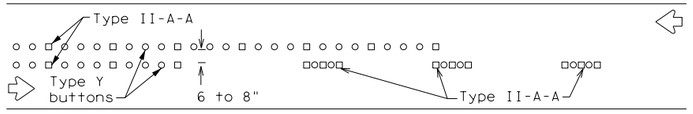
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



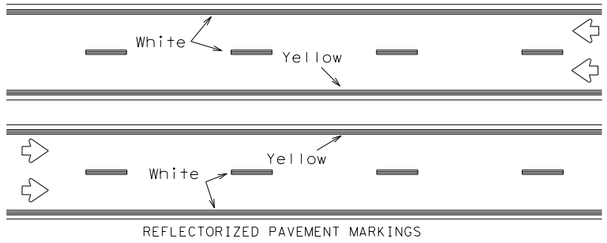
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



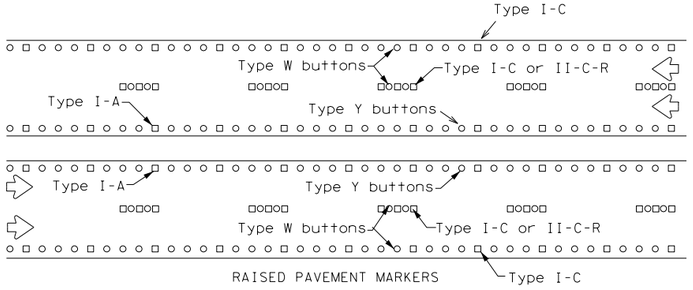
RAISED PAVEMENT MARKERS - PATTERN B

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

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



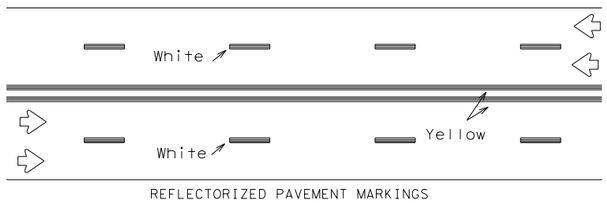
REFLECTORIZED PAVEMENT MARKINGS



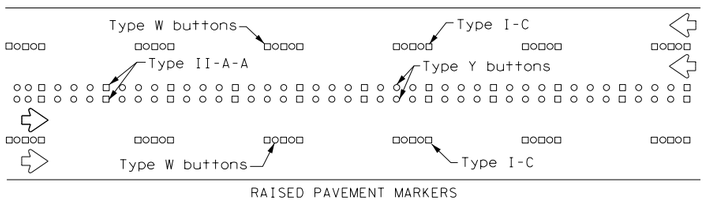
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



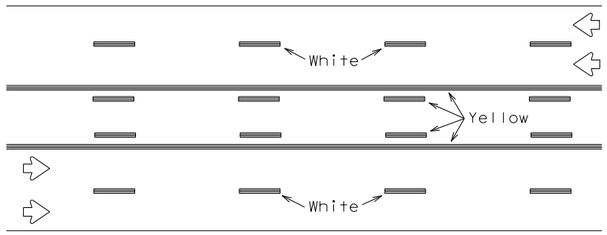
REFLECTORIZED PAVEMENT MARKINGS



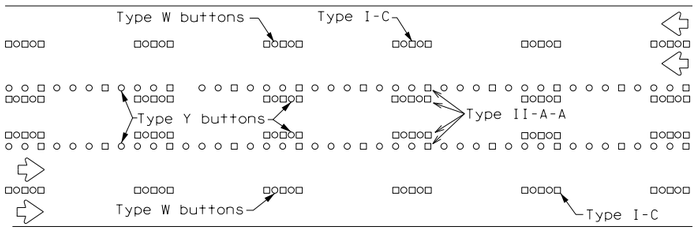
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

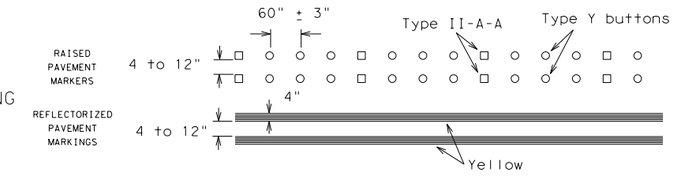
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

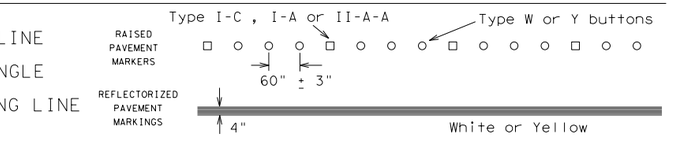
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

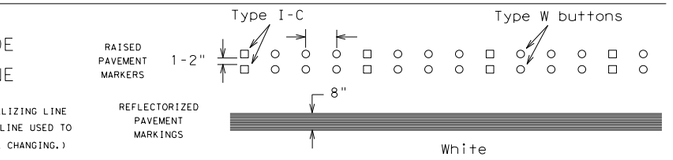


EDGE LINE OR SINGLE NO-PASSING LINE



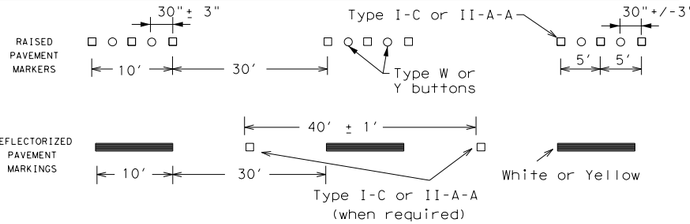
WIDE LINE

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

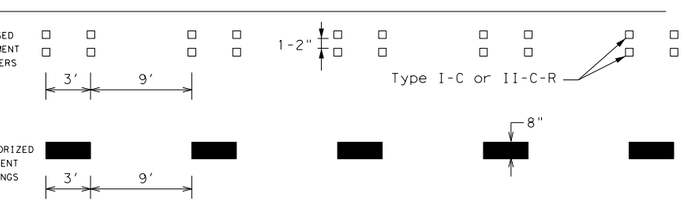


BROKEN LINES

CENTER LINE OR LANE LINE

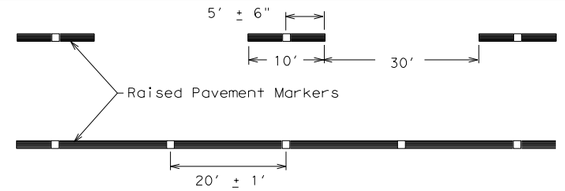


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

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BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

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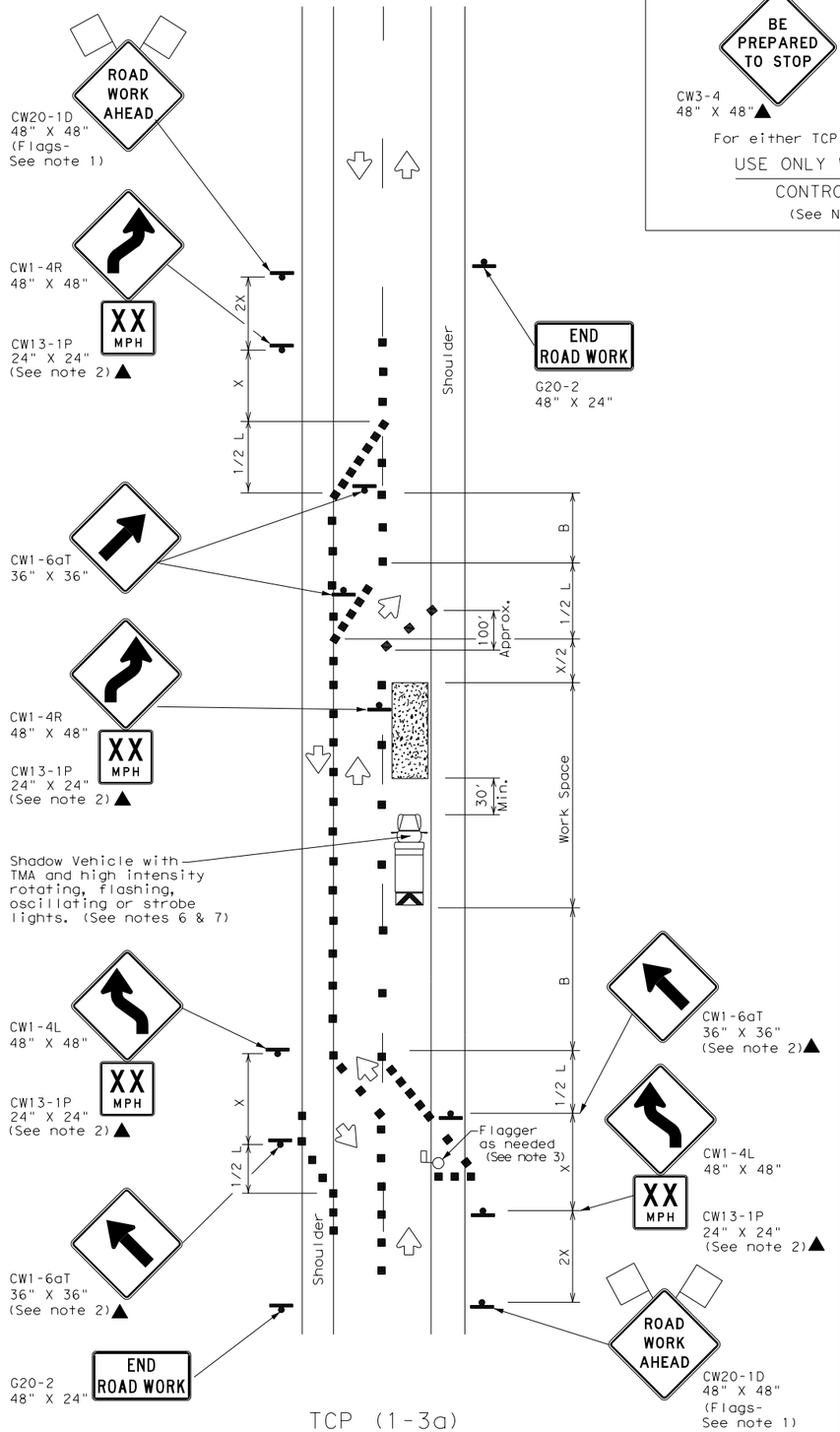
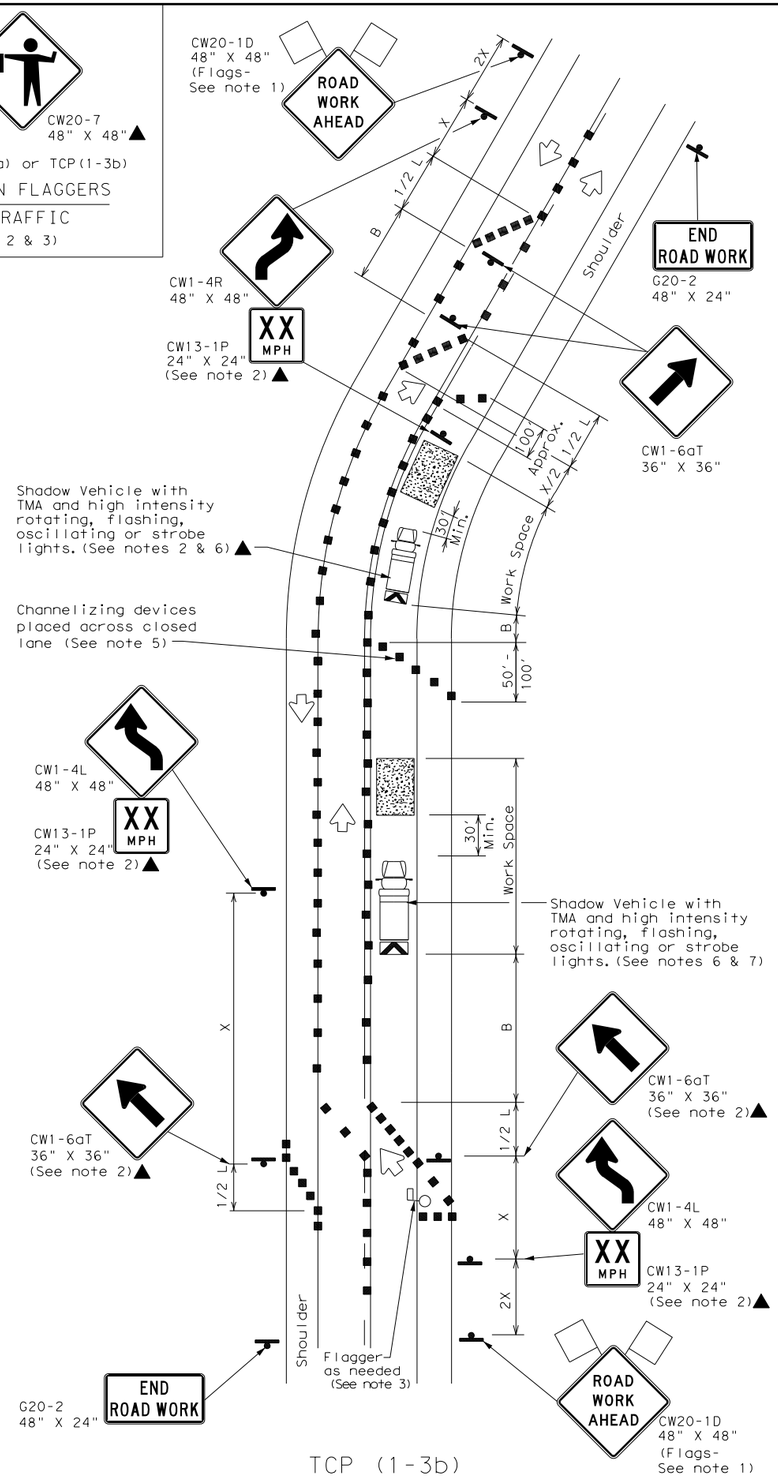


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

For either TCP(1-3a) or TCP(1-3b)

USE ONLY WHEN FLAGGERS CONTROL TRAFFIC
(See Notes 2 & 3)

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. 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.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. 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.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
8. 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 Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	SJT	TOM GREEN		31
1-97 2-18				

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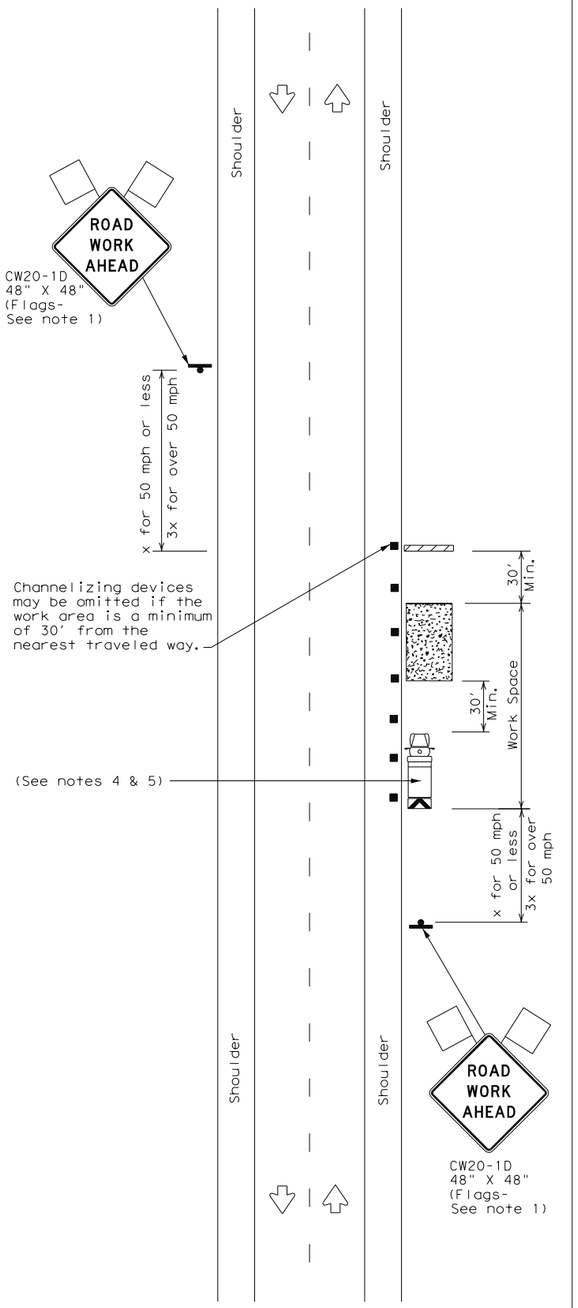
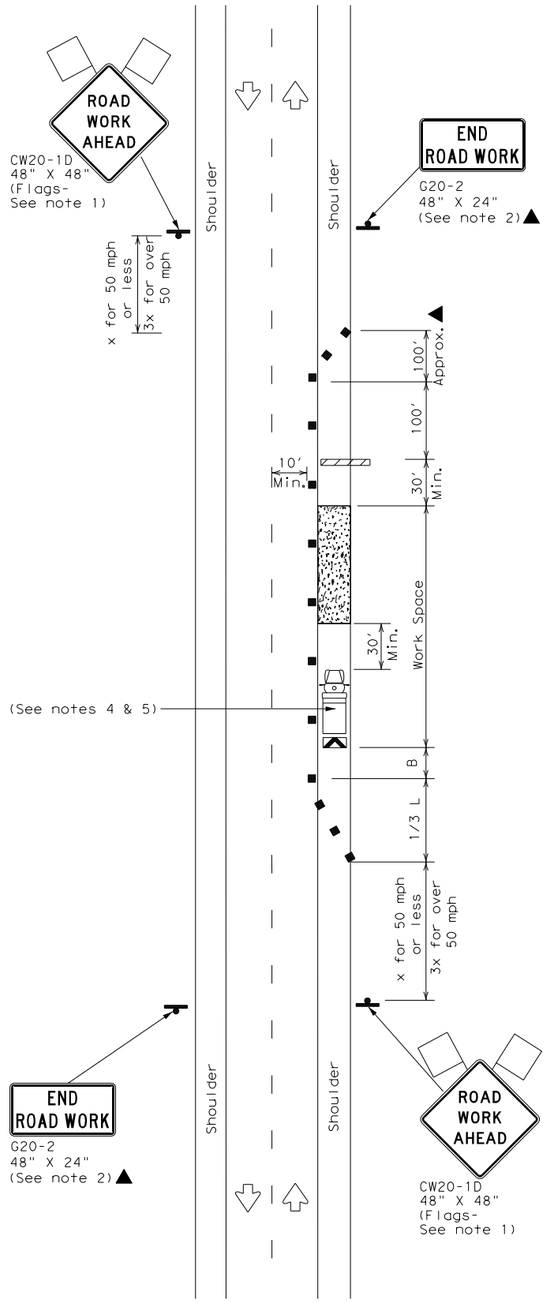
DATE: DATE TIME
FILE: DOCUMENT NAME



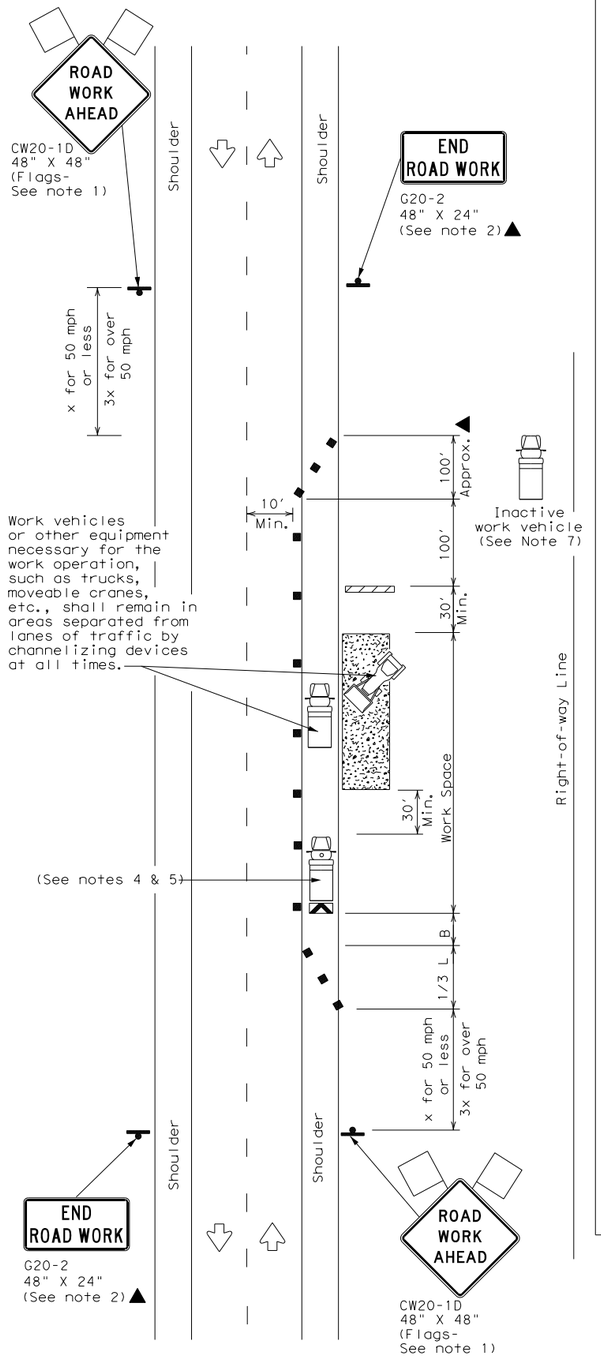
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	SJT	TOM GREEN		32
1-97 2-18				

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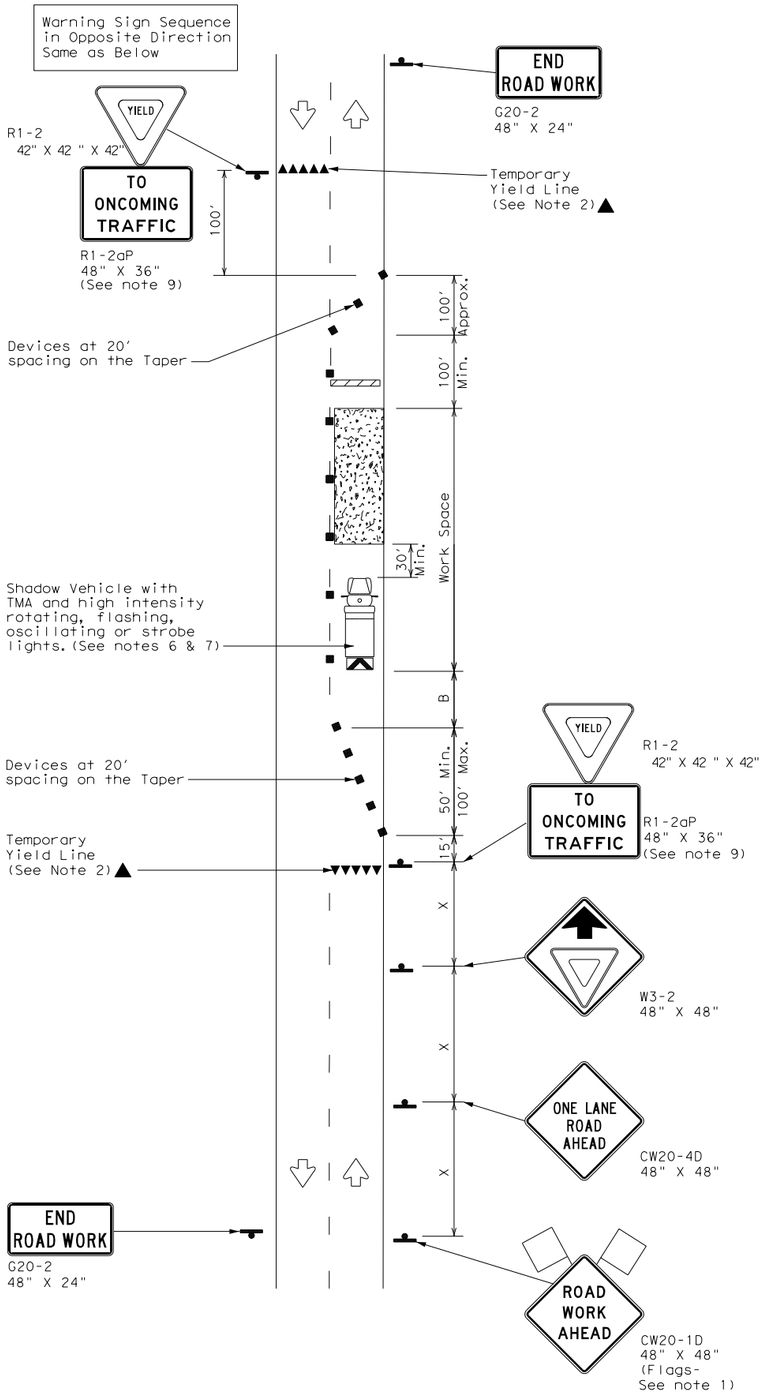
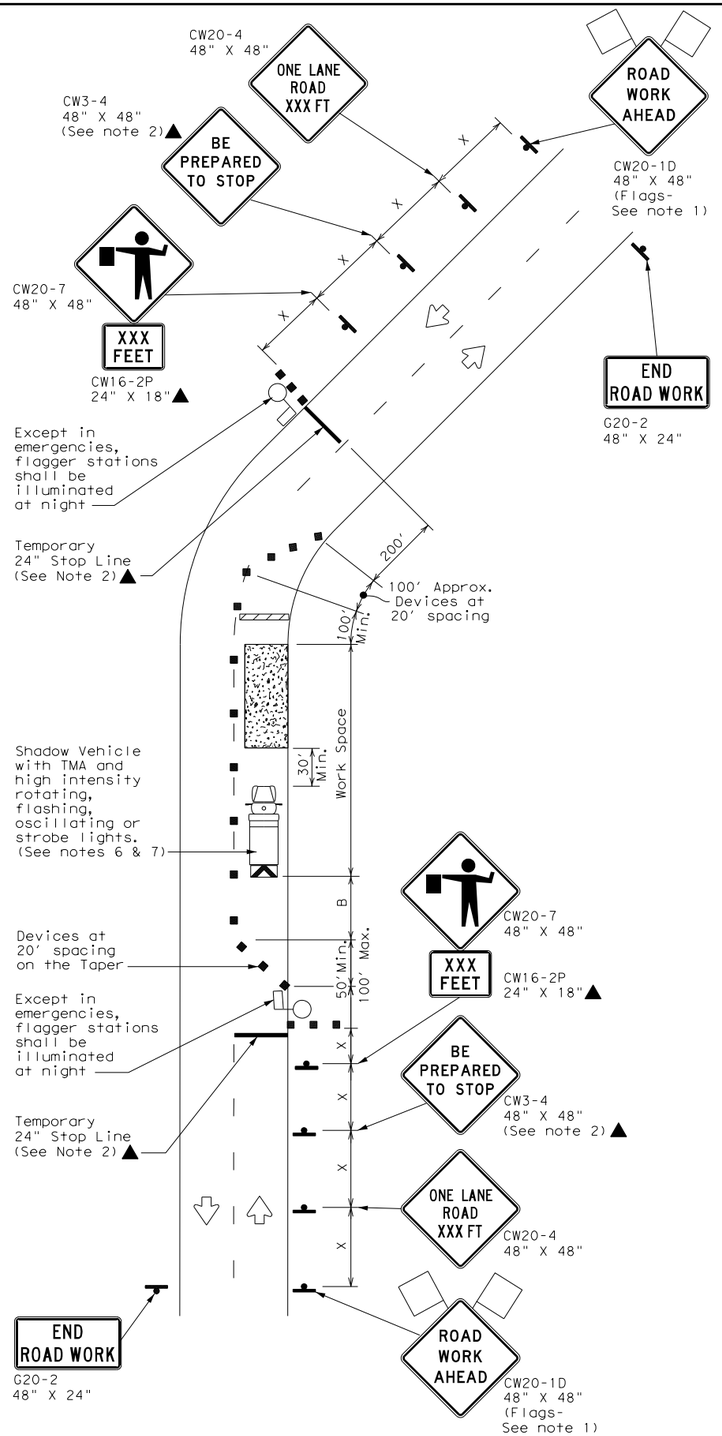
DATE: DATE TIME
FILE: DOCUMENT NAME



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



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		33

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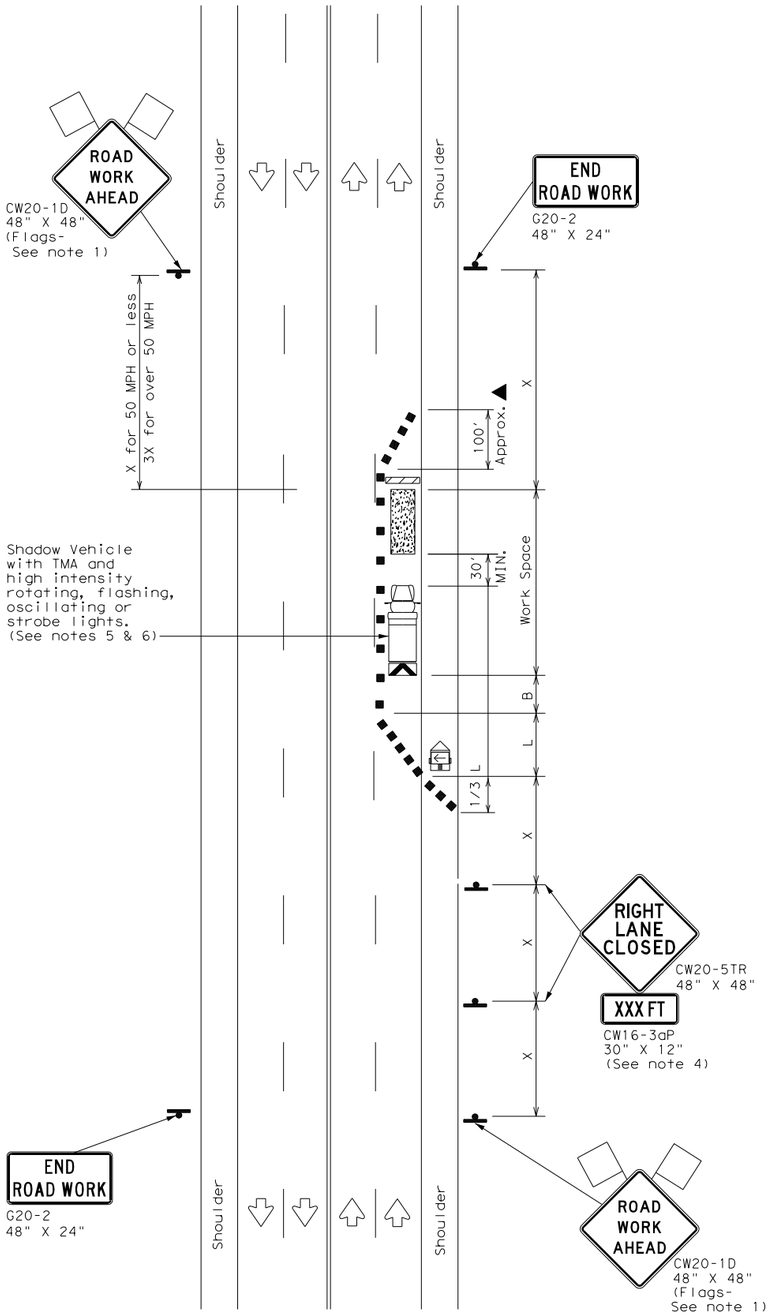
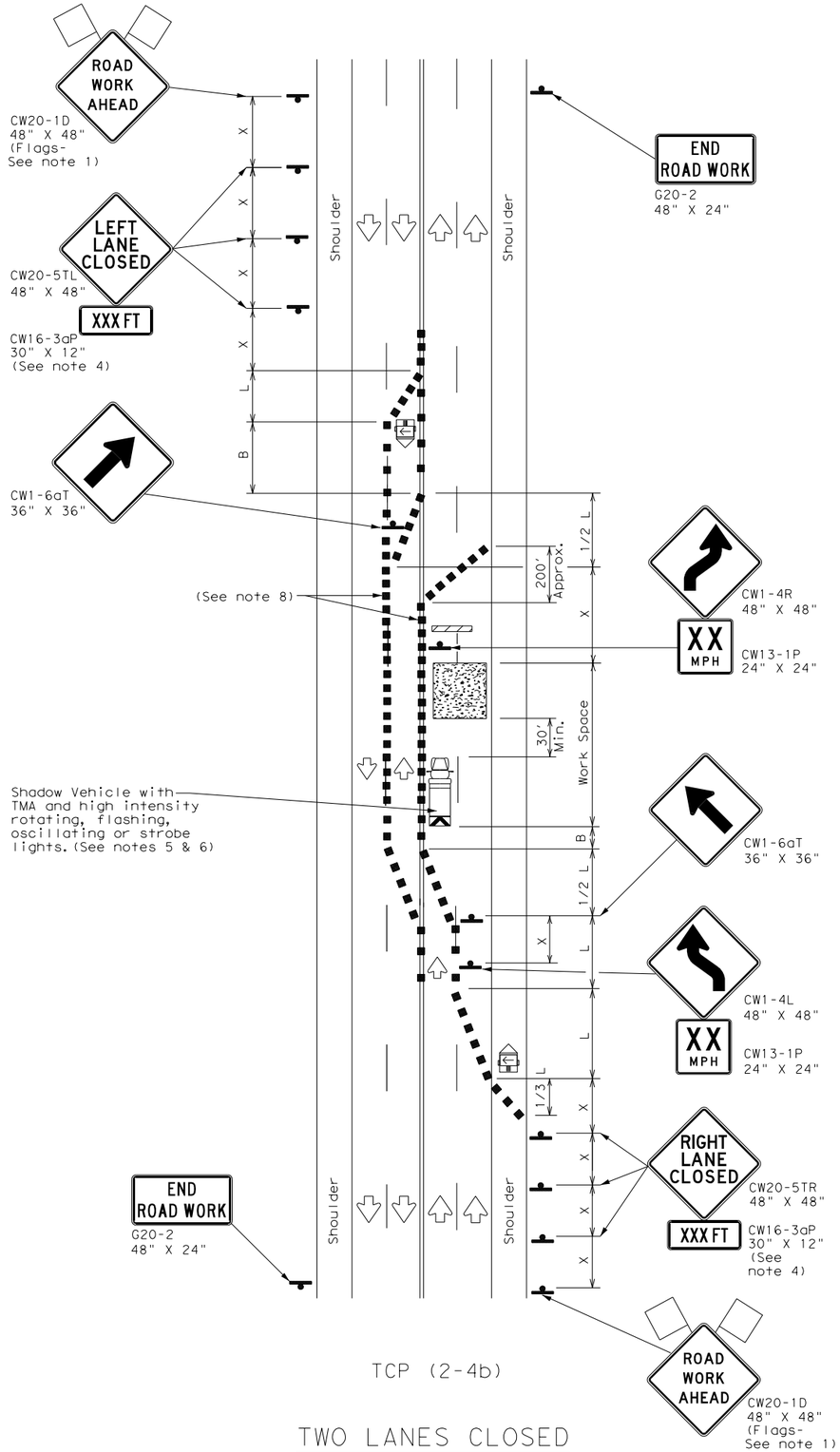
DATE: DATE TIME
FILE: DOCUMENT NAME



TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
4. For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
5. 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.
6. 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.

TCP (2-4a)

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

TCP (2-4b)

8. For shorter durations 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 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

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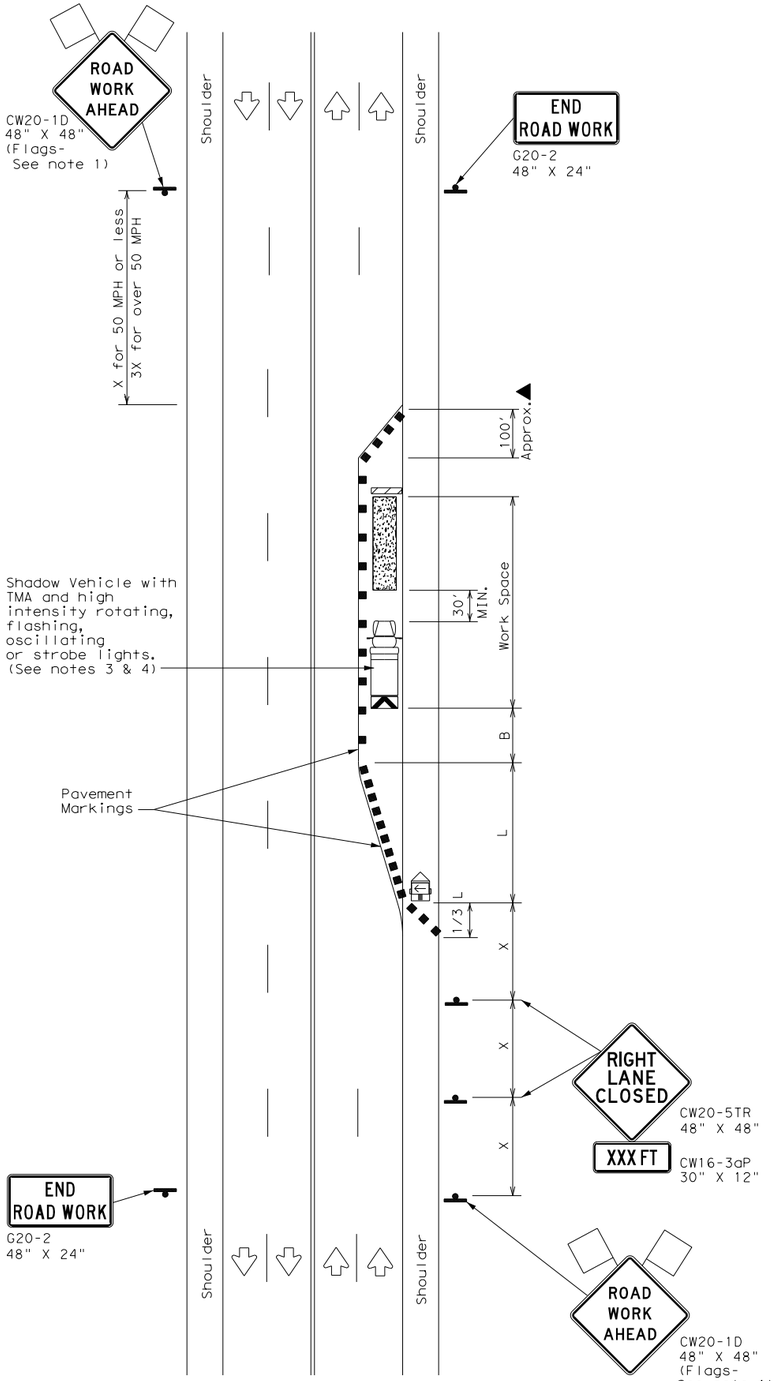
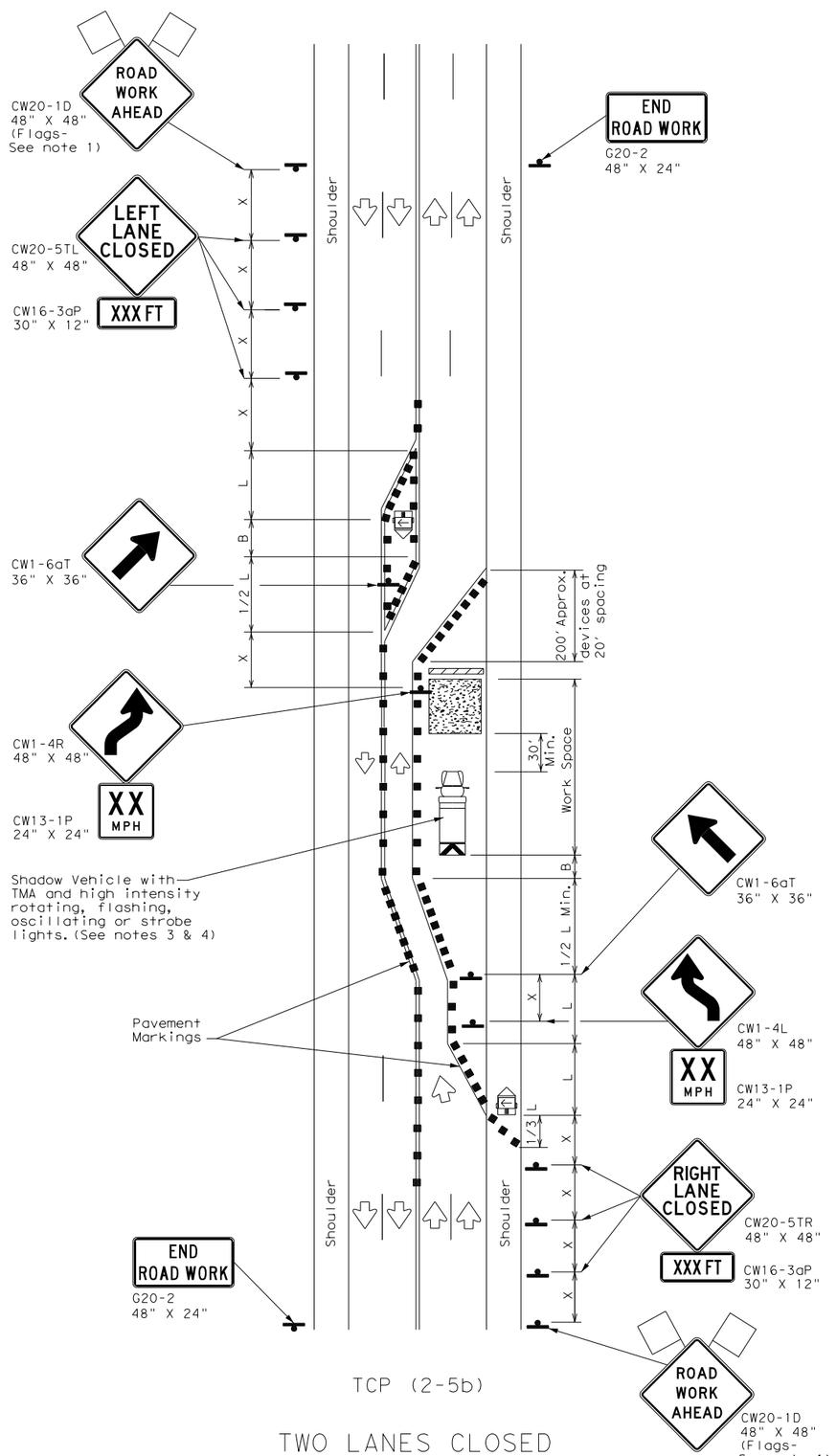
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0907	24	54	US 87
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	SJT	TOM GREEN		34



TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. 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 eposure 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 substitutued for the Shadow Vehicle and TMA.
4. 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.
5. The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

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

TCP (2-5b)

7. Conflicting pavement markings shall be removed for long-term projects.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

FILE: tcp2-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 2-12	0907	24	54	US 87
1-97 3-03	DIST	COUNTY		SHEET NO.
4-98 2-18	SJT	TOM GREEN		35

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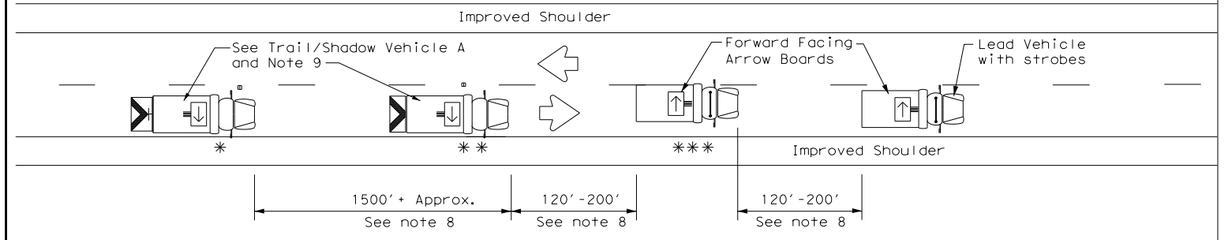
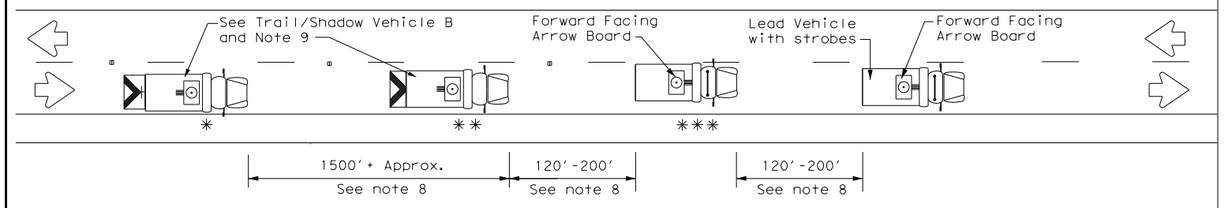


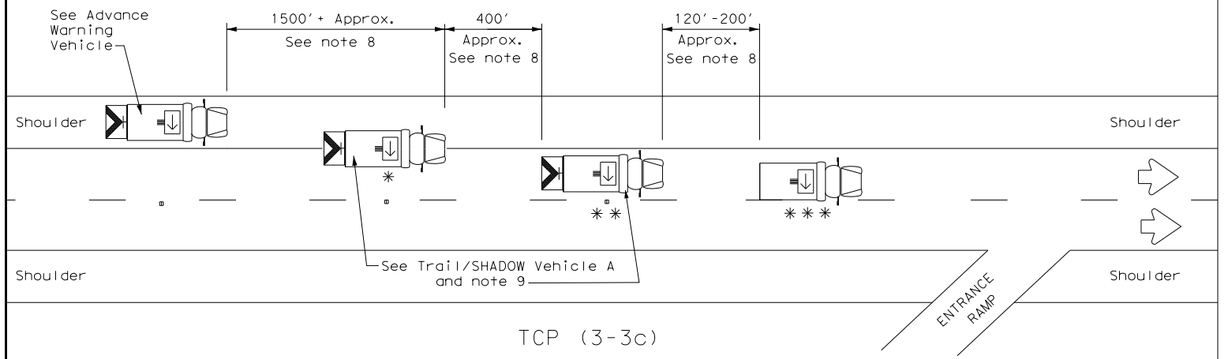
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS (WORK ON TRAVEL LANE)



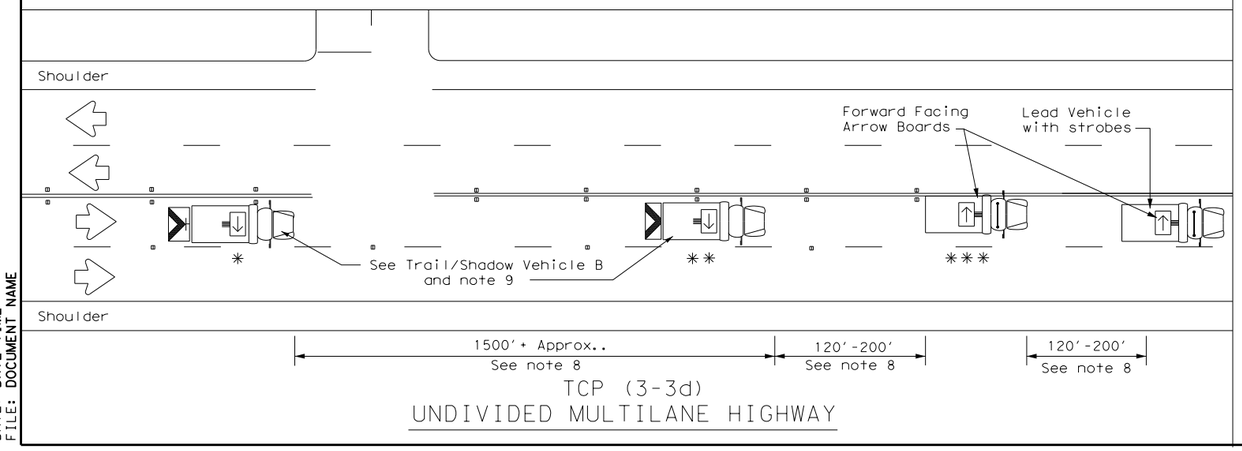
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS (WORK ON TRAVEL LANE)



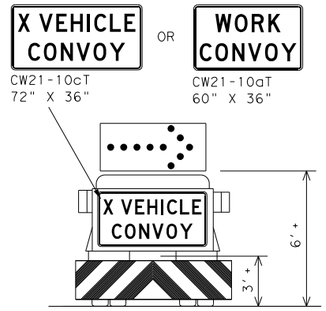
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



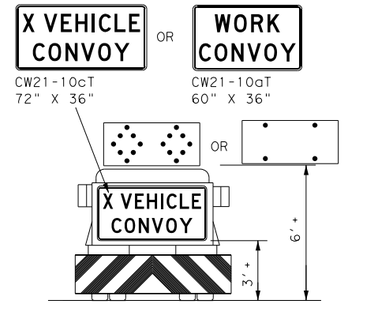
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



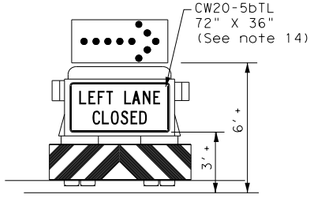
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

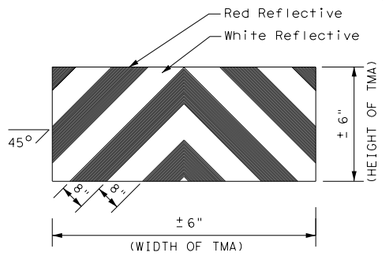


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

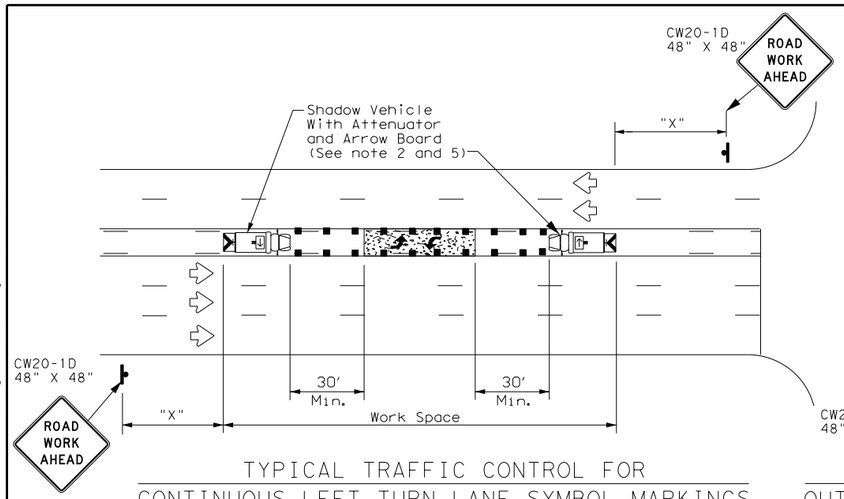
TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

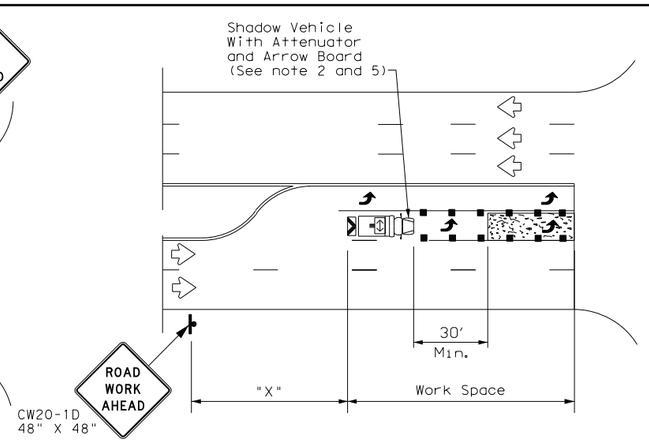
FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	SJT	TOM GREEN		36
1-97 7-14				

177

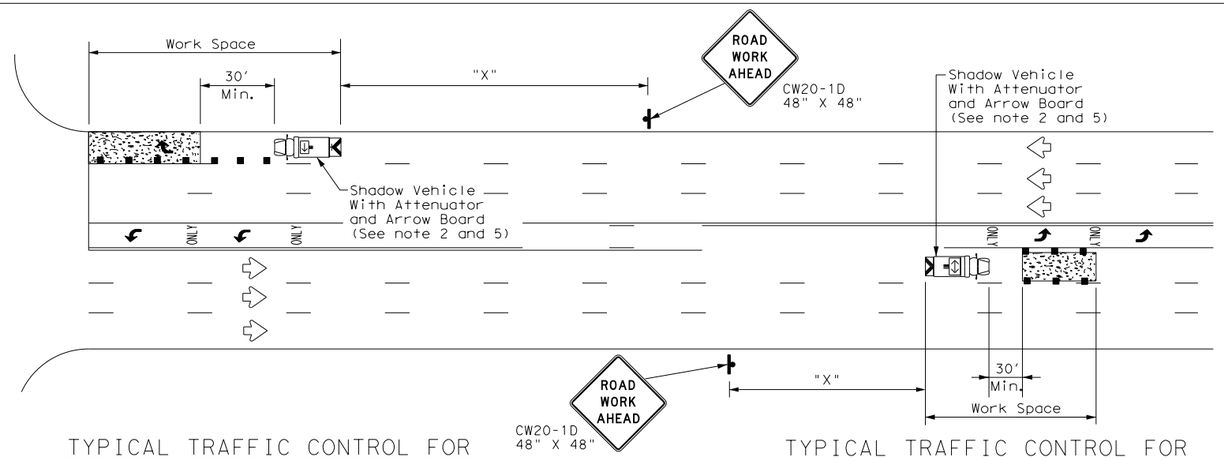
DATE: DATE TIME
FILE: DOCUMENT NAME



TYPICAL TRAFFIC CONTROL FOR
CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS

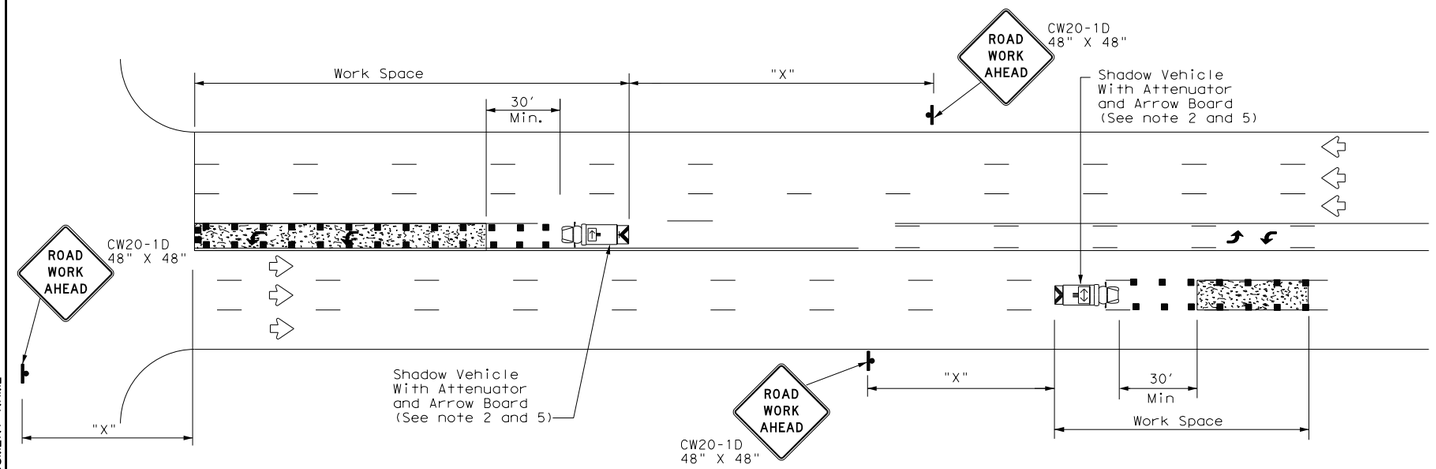


TYPICAL TRAFFIC CONTROL FOR
OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS



TYPICAL TRAFFIC CONTROL FOR
OUTSIDE LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
INSIDE LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR
LEFT TURN LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
CENTER LANE MARKINGS

LEGEND			
✳	Trail Vehicle	ARROW BOARD DISPLAY	
✳✳	Shadow Vehicle		
✳✳✳	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow	■ ■ ■	Channelizing Devices

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

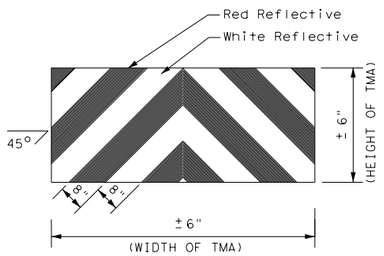
✳ Conventional Roads Only

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

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

GENERAL NOTES

1. This traffic control plan is for use on conventional roads posted at 45 mph or less and is intended for mobile operations that move continuously or intermittently (stopping up to approximately 15 minutes) such as short-line striping and in-lane rumble strips. When activities are anticipated to take longer amounts of time or traffic conditions warrant, a short duration or short-term stationary traffic control plan should be used.
2. A Truck Mounted Attenuator shall be used on Shadow Vehicle. Striping on the back panel of all truck mounted attenuators shall be 8" red and white reflective sheeting placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of departmental material specification DMS-8300, Type A.
3. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
4. The use of yellow rotating beacons or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the drivers side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
5. Flashing arrow board shall be used on Shadow Vehicle. Flashing arrow board shall be Type B or Type C as per BC Standards. The arrow board operation shall be controlled from inside the truck.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

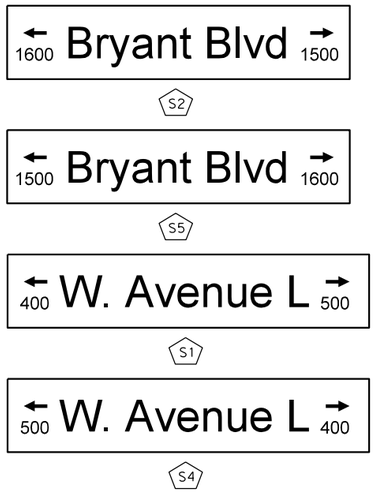
TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS

TCP(3-4)-13

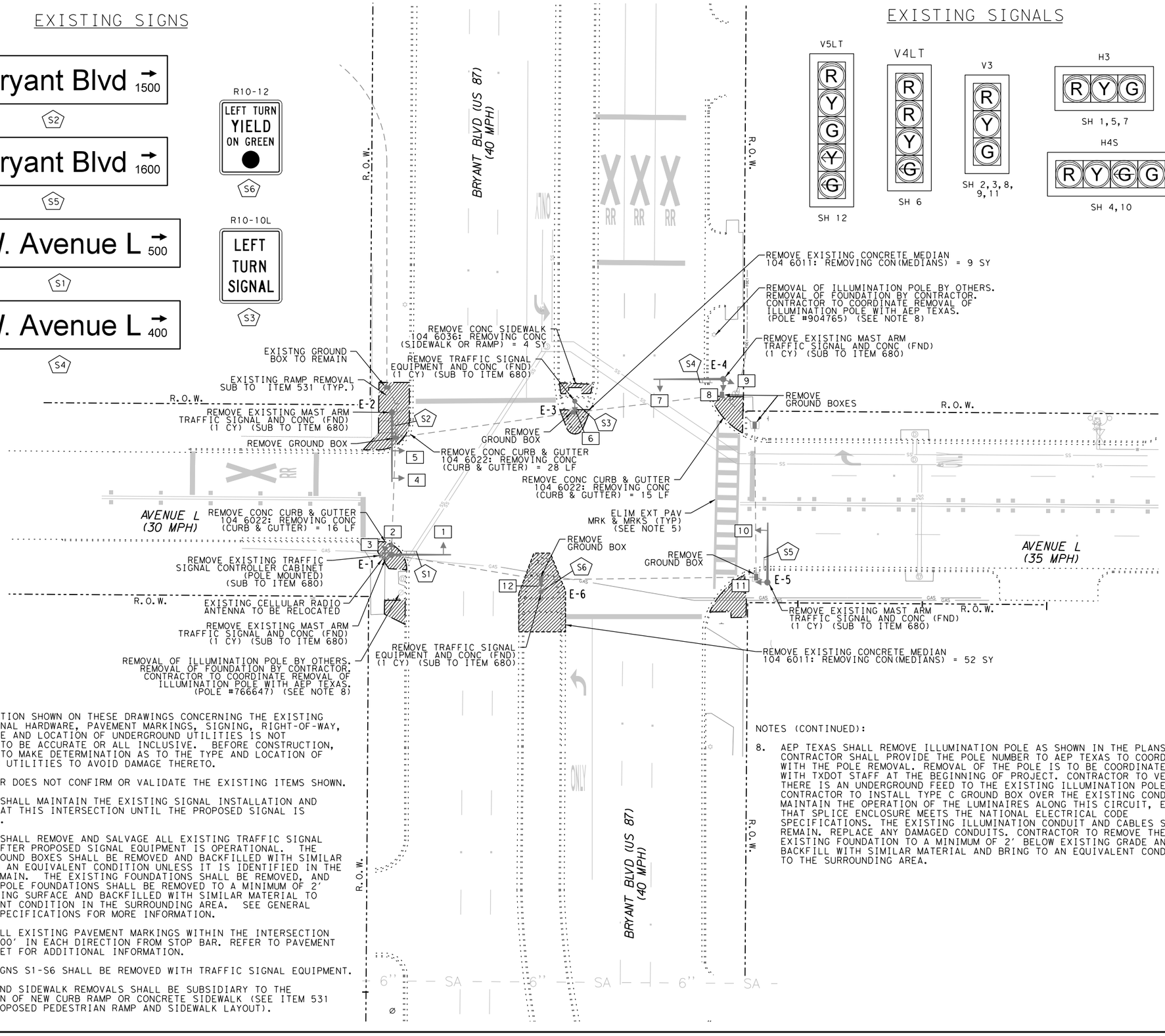
FILE: tcp3-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT July, 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		37

DATE: DATE TIME
FILE: DOCUMENT NAME

EXISTING SIGNS



EXISTING SIGNALS



0 10 20 40
ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 40'

LEGEND

- EXISTING TYPICAL MAST ARM COMBINATION SIGNAL \ WITH PEDESTRIAN SIGNAL, PUSH BUTTON, LED LUMINAIRE, AND SIGNAGE
- EXISTING TRAFFIC SIGNAL CONTROLLER CABINET
- EXISTING GROUND BOX
- EXISTING CONDUIT
- EXISTING ELECTRICAL SERVICE
- 1 — SIGNAL HEAD NUMBER
- S1 — SIGN LABEL
- E-# — EXISTING TRAFFIC SIGNAL POLE NUMBER
- REMOVAL

NOTES:

1. THE INFORMATION SHOWN ON THESE DRAWINGS CONCERNING THE EXISTING TRAFFIC SIGNAL HARDWARE, PAVEMENT MARKINGS, SIGNING, RIGHT-OF-WAY, AND THE TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. BEFORE CONSTRUCTION, CONTRACTOR TO MAKE DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES TO AVOID DAMAGE THERETO.
2. THE ENGINEER DOES NOT CONFIRM OR VALIDATE THE EXISTING ITEMS SHOWN.
3. CONTRACTOR SHALL MAINTAIN THE EXISTING SIGNAL INSTALLATION AND OPERATIONS AT THIS INTERSECTION UNTIL THE PROPOSED SIGNAL IS OPERATIONAL.
4. CONTRACTOR SHALL REMOVE AND SALVAGE ALL EXISTING TRAFFIC SIGNAL EQUIPMENT AFTER PROPOSED SIGNAL EQUIPMENT IS OPERATIONAL. THE EXISTING GROUND BOXES SHALL BE REMOVED AND BACKFILLED WITH SIMILAR MATERIAL TO AN EQUIVALENT CONDITION UNLESS IT IS IDENTIFIED IN THE PLANS TO REMAIN. THE EXISTING FOUNDATIONS SHALL BE REMOVED, AND THE SIGNAL POLE FOUNDATIONS SHALL BE REMOVED TO A MINIMUM OF 2' BELOW EXISTING SURFACE AND BACKFILLED WITH SIMILAR MATERIAL TO AN EQUIVALENT CONDITION IN THE SURROUNDING AREA. SEE GENERAL NOTES AND SPECIFICATIONS FOR MORE INFORMATION.
5. ELIMINATE ALL EXISTING PAVEMENT MARKINGS WITHIN THE INTERSECTION AND ALONG 200' IN EACH DIRECTION FROM STOP BAR. REFER TO PAVEMENT MARKING SHEET FOR ADDITIONAL INFORMATION.
6. EXISTING SIGNS S1-S6 SHALL BE REMOVED WITH TRAFFIC SIGNAL EQUIPMENT.
7. CURB RAMP AND SIDEWALK REMOVALS SHALL BE SUBSIDIARY TO THE INSTALLATION OF NEW CURB RAMP OR CONCRETE SIDEWALK (SEE ITEM 531 QTYS AND PROPOSED PEDESTRIAN RAMP AND SIDEWALK LAYOUT).

NOTES (CONTINUED):

8. AEP TEXAS SHALL REMOVE ILLUMINATION POLE AS SHOWN IN THE PLANS. CONTRACTOR SHALL PROVIDE THE POLE NUMBER TO AEP TEXAS TO COORDINATE WITH THE POLE REMOVAL. REMOVAL OF THE POLE IS TO BE COORDINATED WITH TXDOT STAFF AT THE BEGINNING OF PROJECT. CONTRACTOR TO VERIFY IF THERE IS AN UNDERGROUND FEED TO THE EXISTING ILLUMINATION POLE. IF SO, CONTRACTOR TO INSTALL TYPE C GROUND BOX OVER THE EXISTING CONDUITS AND MAINTAIN THE OPERATION OF THE LUMINAIRES ALONG THIS CIRCUIT, ENSURING THAT SPLICE ENCLOSURE MEETS THE NATIONAL ELECTRICAL CODE SPECIFICATIONS. THE EXISTING ILLUMINATION CONDUIT AND CABLES SHALL REMAIN. REPLACE ANY DAMAGED CONDUITS. CONTRACTOR TO REMOVE THE EXISTING FOUNDATION TO A MINIMUM OF 2' BELOW EXISTING GRADE AND BACKFILL WITH SIMILAR MATERIAL AND BRING TO AN EQUIVALENT CONDITION TO THE SURROUNDING AREA.

5/25/2022

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Dallas, Texas 75240
Tel. No. (972) 770-1300
Fax No. (972) 239-3820

THE CITY OF SAN ANGELO TEXAS

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TRAFFIC SAFETY IMPROVEMENTS

EXISTING CONDITIONS AND REMOVALS

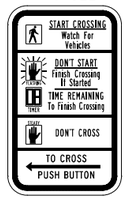
BRYANT BOULEVARD (US 87) AT AVENUE L

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	38
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\1project\06458903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_21_Bryant at Avenue L_Existing.dgn
40.0000 ft / in.
BY: Abby.Axelson

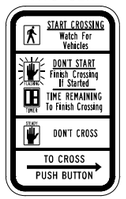
PROPOSED SIGNS

R10-3EL



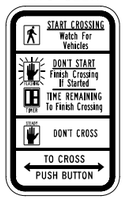
S5 S10 S15 S20

R10-3ER



S6 S9 S16 S19

R10-3ELR



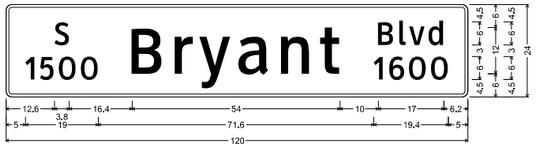
S11

R10-17T

S1 S12

R3-1a

S4

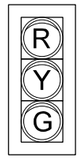


D-3:
1.5" Radius, 0.8" Border, White on Green;
"S", ClearviewHwy-3-W; "1500", ClearviewHwy-3-W; "Bryant", ClearviewHwy-3-W;
"Blvd", ClearviewHwy-3-W; "1600", ClearviewHwy-3-W;

S18

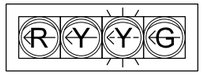
PROPOSED SIGNALS

V3



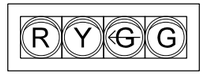
SH 5, 10, 19, 24

H4FLT



SH 1, 15

H4S

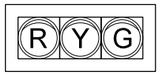


SH 8, 22

LED COUNTDOWN PEDESTRIAN SIGNAL

SH 6, 7, 11, 12, 13, 14, 20, 21, 25, 26

H3



SH 2, 3, 4, 9, 16, 17, 18, 23

PROPOSED SIGNS

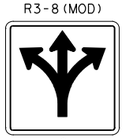
R3-8 MR

S7

R3-5L

S2 S13

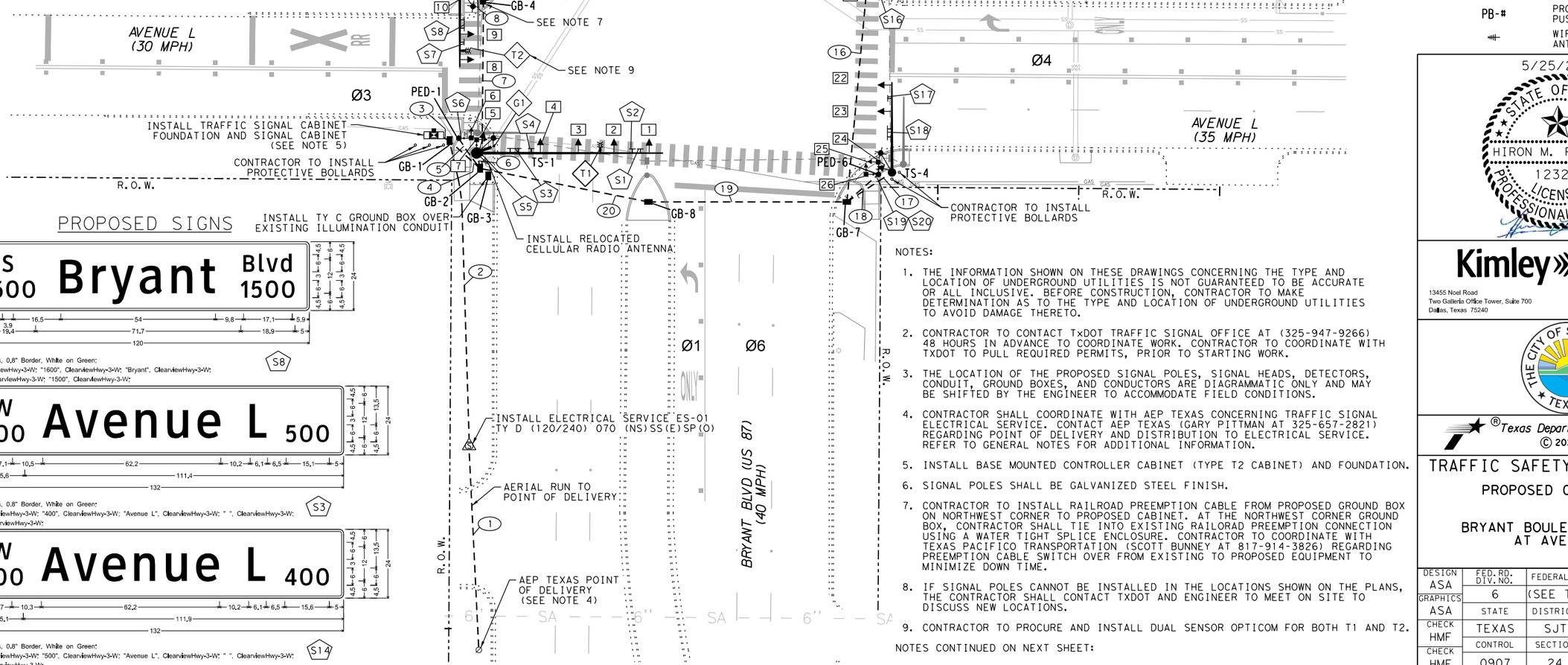
R3-8 (MOD)



S17

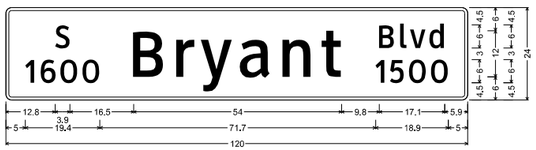
D-3:
1.5" Radius, 0.8" Border, White on Green;
"S", ClearviewHwy-3-W; "1500", ClearviewHwy-3-W; "Bryant", ClearviewHwy-3-W;
"Blvd", ClearviewHwy-3-W; "1600", ClearviewHwy-3-W;

S18



PROPOSED SIGNS

INSTALL TY C GROUND BOX OVER EXISTING ILLUMINATION CONDUIT



D-3:
1,5" Radius, 0,8" Border, White on Green;
"S", ClearviewHwy-3-W; "1600", ClearviewHwy-3-W; "Bryant", ClearviewHwy-3-W;
"Blvd", ClearviewHwy-3-W; "1500", ClearviewHwy-3-W;

S8

D-3:
1.5" Radius, 0.8" Border, White on Green:
"W", ClearviewHwy-3-W; "400", ClearviewHwy-3-W; "Avenue L", ClearviewHwy-3-W; " ", ClearviewHwy-3-W;
"500", ClearviewHwy-3-W;

S3

D-3:
1,5" Radius, 0,8" Border, White on Green:
"W", ClearviewHwy-3-W; "500", ClearviewHwy-3-W; "Avenue L", ClearviewHwy-3-W; " ", ClearviewHwy-3-W;
"400", ClearviewHwy-3-W;

S14

LEGEND

- TYPICAL PROPOSED MAST ARM COMBINATION SIGNAL\ WITH PEDESTRIAN SIGNAL, PUSH BUTTON, LED LUMINAIRE (250W E.Q.), AND SIGNAGE
- TRAFFIC SIGNAL CONTROLLER CABINET AND CONCRETE PAD
- EXISTING GROUND BOX
- PROPOSED TYPE C GROUND BOX W/ APRON
- PROPOSED CONDUIT
- (1) CONDUIT RUN NUMBER
- [1] SIGNAL HEAD NUMBER
- (S1) SIGN LABEL
- G1 PROPOSED GRIDSMART DETECTOR
- T1 PROPOSED OPTICOM
- S PROPOSED ELECTRICAL SERVICE
- TS-# PROPOSED TRAFFIC SIGNAL POLE NUMBER
- PED-# PROPOSED PEDESTRIAN SIGNAL POLE NUMBER
- PB-# PROPOSED PEDESTRIAN PUSH BUTTON NUMBER
- WIRELESS COMMUNICATION ANTENNA

0 10 20 40
ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 40'

NOTES:

1. THE INFORMATION SHOWN ON THESE DRAWINGS CONCERNING THE TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. BEFORE CONSTRUCTION, CONTRACTOR TO MAKE DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES TO AVOID DAMAGE THERETO.
2. CONTRACTOR TO CONTACT TxDOT TRAFFIC SIGNAL OFFICE AT (325-947-9266) 48 HOURS IN ADVANCE TO COORDINATE WORK. CONTRACTOR TO COORDINATE WITH TXDOT TO PULL REQUIRED PERMITS, PRIOR TO STARTING WORK.
3. THE LOCATION OF THE PROPOSED SIGNAL POLES, SIGNAL HEADS, DETECTORS, CONDUIT, GROUND BOXES, AND CONDUCTORS ARE DIAGRAMMATIC ONLY AND MAY BE SHIFTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
4. CONTRACTOR SHALL COORDINATE WITH AEP TEXAS CONCERNING TRAFFIC SIGNAL ELECTRICAL SERVICE. CONTACT AEP TEXAS (GARY PITTMAN AT 325-657-2821) REGARDING POINT OF DELIVERY AND DISTRIBUTION TO ELECTRICAL SERVICE. REFER TO GENERAL NOTES FOR ADDITIONAL INFORMATION.
5. INSTALL BASE MOUNTED CONTROLLER CABINET (TYPE T2 CABINET) AND FOUNDATION.
6. SIGNAL POLES SHALL BE GALVANIZED STEEL FINISH.
7. CONTRACTOR TO INSTALL RAILROAD PREEMPTION CABLE FROM PROPOSED GROUND BOX ON NORTHWEST CORNER TO PROPOSED CABINET. AT THE NORTHWEST CORNER GROUND BOX, CONTRACTOR SHALL TIE INTO EXISTING RAILORAD PREEMPTION CONNECTION USING A WATER TIGHT SPLICE ENCLOSURE. CONTRACTOR TO COORDINATE WITH TEXAS PACIFICO TRANSPORTATION (SCOTT BUNNEY AT 817-914-3826) REGARDING PREEMPTION CABLE SWITCH OVER FROM EXISTING TO PROPOSED EQUIPMENT TO MINIMIZE DOWN TIME.
8. IF SIGNAL POLES CANNOT BE INSTALLED IN THE LOCATIONS SHOWN ON THE PLANS, THE CONTRACTOR SHALL CONTACT TXDOT AND ENGINEER TO MEET ON SITE TO DISCUSS NEW LOCATIONS.
9. CONTRACTOR TO PROCURE AND INSTALL DUAL SENSOR OPTICOM FOR BOTH T1 AND T2.

NOTES CONTINUED ON NEXT SHEET:

5/25/2022

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Dallas, Texas 75240
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THE CITY OF SAN ANGELO TEXAS

Texas Department of Transportation

TRAFFIC SAFETY IMPROVEMENTS

PROPOSED CONDITIONS

BRYANT BOULEVARD (US 87) AT AVENUE L

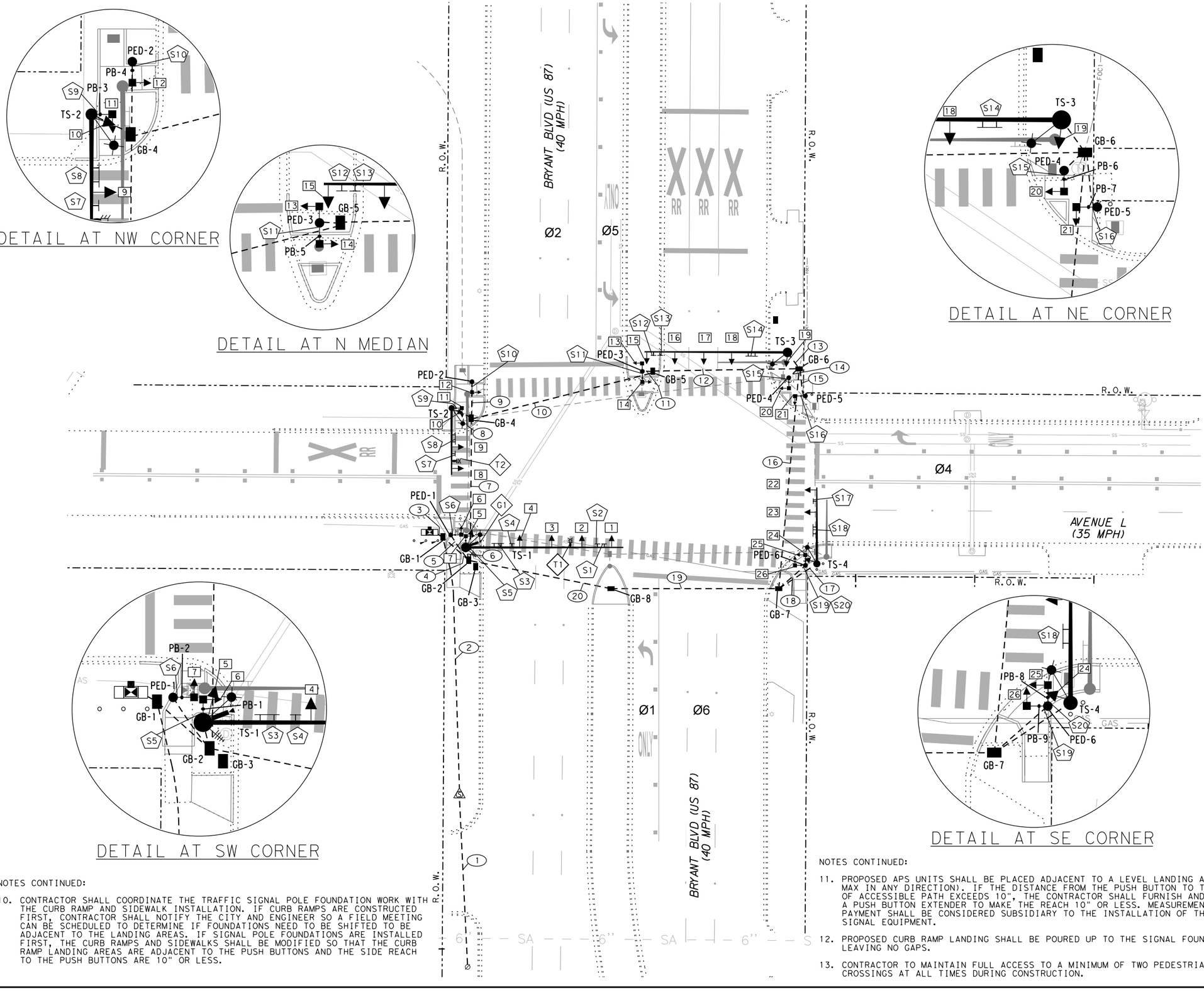
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	39
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_22_Bryant at Avenue L_Proposed.dgn
40.0000 ft / in.
BY: Abby.Axelson

DETAIL AT NW CORNER

DETAIL AT N MEDIAN

DETAIL AT NE CORNER



DETAIL AT SW CORNER

DETAIL AT SE CORNER

NOTES CONTINUED:

10. CONTRACTOR SHALL COORDINATE THE TRAFFIC SIGNAL POLE FOUNDATION WORK WITH THE CURB RAMP AND SIDEWALK INSTALLATION. IF CURB RAMPS ARE CONSTRUCTED FIRST, CONTRACTOR SHALL NOTIFY THE CITY AND ENGINEER SO A FIELD MEETING CAN BE SCHEDULED TO DETERMINE IF FOUNDATIONS NEED TO BE SHIFTED TO BE ADJACENT TO THE LANDING AREAS. IF SIGNAL POLE FOUNDATIONS ARE INSTALLED FIRST, THE CURB RAMPS AND SIDEWALKS SHALL BE MODIFIED SO THAT THE CURB RAMP LANDING AREAS ARE ADJACENT TO THE PUSH BUTTONS AND THE SIDE REACH TO THE PUSH BUTTONS ARE 10" OR LESS.

NOTES CONTINUED:

11. PROPOSED APS UNITS SHALL BE PLACED ADJACENT TO A LEVEL LANDING AREA (2% MAX IN ANY DIRECTION). IF THE DISTANCE FROM THE PUSH BUTTON TO THE EDGE OF ACCESSIBLE PATH EXCEEDS 10", THE CONTRACTOR SHALL FURNISH AND INSTALL A PUSH BUTTON EXTENDER TO MAKE THE REACH 10" OR LESS. MEASUREMENT AND PAYMENT SHALL BE CONSIDERED SUBSIDIARY TO THE INSTALLATION OF THE TRAFFIC SIGNAL EQUIPMENT.

12. PROPOSED CURB RAMP LANDING SHALL BE POURED UP TO THE SIGNAL FOUNDATION, LEAVING NO GAPS.

13. CONTRACTOR TO MAINTAIN FULL ACCESS TO A MINIMUM OF TWO PEDESTRIAN CROSSINGS AT ALL TIMES DURING CONSTRUCTION.

0 10 20 40
ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 40'

LEGEND

- TYPICAL PROPOSED MAST ARM COMBINATION SIGNAL\ WITH PEDESTRIAN SIGNAL, PUSH BUTTON, LED LUMINAIRE (250W E.Q.), AND SIGNAGE
- TRAFFIC SIGNAL CONTROLLER CABINET AND CONCRETE PAD
- EXISTING GROUND BOX
- PROPOSED TYPE C GROUND BOX W/ APRON
- PROPOSED CONDUIT
- (1) CONDUIT RUN NUMBER
- [1] SIGNAL HEAD NUMBER
- S1 SIGN LABEL
- G1 PROPOSED GRIDSMART DETECTOR
- T1 PROPOSED OPTICOM
- PROPOSED ELECTRICAL SERVICE
- TS-# PROPOSED TRAFFIC SIGNAL POLE NUMBER
- PED-# PROPOSED PEDESTRIAN SIGNAL POLE NUMBER
- PB-# PROPOSED PEDESTRIAN PUSH BUTTON NUMBER
- WIRELESS COMMUNICATION ANTENNA

5/26/2022

STATE OF TEXAS
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THE CITY OF SAN ANGELO TEXAS

Texas Department of Transportation

TRAFFIC SAFETY IMPROVEMENTS

PROPOSED CONDITIONS (CORNER DETAILS)

BRYANT BOULEVARD (US 87) AT AVENUE L

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS				
ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	SJT	TOM GREEN	40
HMF	CONTROL	SECTION	JOB	
CHECK	0907	24	054	
HMF				

PLOTTED: 5/26/2022
FILENAME: K:\DAL_TPTO\lproject\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_22A_Bryant at Avenue L_Proposed Blowups.dgn
40.0000 ft / in.
BY: Abby.Axelson

CONDUIT AND CABLE CHART
WIRE SIZE AND TYPE

RUN NO	CONDUIT STATUS	ITEM 618 CONDUIT (SCH 80)										CABLE STATUS	ITEM 620 ELECTRICAL CONDUCTORS								ITEM 621 TRAY CABLE		ITEM 684 TRAFFIC SIGNAL CABLES												CAT5E CABLE				OPTICOM CABLE		TOTAL LENGTH OF RUN	RUN NO
		2" PVC SCH 80 (RISER)		2" PVC (TRENCHED)		3" PVC (TRENCHED)		4" PVC (TRENCHED)		4" PVC (BORED)			NO. 8 XHHW WIRE (POWER)		NO. 8 XHHW WIRE (LUMINAIRES)		NO. 8 BARE WIRE		NO. 12 XHHW WIRE		3 CNDR NO. 12 (BLANK OUT SIGN)		TY C 2 CNDR NO. 12		TY A 3 CNDR NO. 12 (PREEMPTION CABLE)		TY A 5 CNDR NO. 14		TY A 7 CNDR NO. 14		TY A 10 CNDR NO. 14		TY A 20 CNDR NO. 14		GRIDSMART CABLE		ANTENNA CABLE					
		Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len		Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len		
1	I	TO BE INSTALLED BY OTHERS																																				70	1
2	I	1	10	1	110							I	2	220	4	440	1	110																				110	2
3	I			1	5							I	2	10			1	5																				5	3
	I							1	5			I					1	5					9	45	1	5					6	30								
	I							1	5			I					1	5			1	5											4	20	1	5	1	5	2	5		
4	I							2	50			I			4	100	1	25			1	25	9	225	1	25					6	150	4	100	1	25	1	25	2	50	25	4
5	I					1	15					I					1	15					1	15							1	15							15	5
6	I					1	10					I			4	40	1	10			1	10	1	10									1	10	1	10	1	10	1	10	10	6
7	I									1	60	I			2	120	1	60					5	300	1	60					4	240	1	60					1	60	60	7
8	I					1	10					I			2	20	1	10					1	10									1	10					1	10	10	8
9	I					1	15					I					1	15					1	15							1	15							15	9
10	I									1	80	I					1	80					3	240							3	240							80	10
11	I					1	5					I					1	5					1	5							1	5							5	11
12	I									1	65	I					1	65					2	130							2	130							65	12
13	I					1	10					I			2	20	1	10															1	10					10	13
14	I					1	10					I					1	10					1	10							1	10							10	14
15	I					1	10					I					1	10					1	10							1	10							10	15
16	I									1	95	I			2	190	1	95															1	95					95	16
17	I					1	20					I			4	120	1	30															1	30					20	17
18	I					1	15					I					1	25					2	50							1	25							15	18
19	I									1	75	I			2	170	1	85					2	170							1	85	2	170					75	19
20	I									1	65	I			2	150	1	75					2	150							1	75	2	150					65	20
SUBTOTAL			10		115		120		60		440			230		1370		750		0		40		1385		90		0		0		1030		655		40		40		135		
TS-1	P											I								160		35		5				195		85					30		30		85	VARIES	TS-1
PED-1	P											I												5				10												VARIES	PED-1
TS-2	P											I								80				5				60		35								65	VARIES	TS-2
PED-2	P											I												5				10												VARIES	PED-2
PED-3	P											I												5				20												VARIES	PED-3
TS-3	P											I								80								185		80										VARIES	TS-3
PED-4	P											I												5				10												VARIES	PED-4
PED-5	P											I												5				10												VARIES	PED-5
TS-4	P											I								160								55		50										VARIES	TS-4
PED-6	P											I												10				20												VARIES	PED-6
SUBTOTAL			0		0		0		0		0			0		0		0		320		75		45		0		575		250		0		0		30		30		150		
TOTAL			10		115		120		60		440			230		1370		750		320		75		1430		90		575		250		1030		655		70		70		285		

CONDUIT STATUS: I=INSTALL; E=EXISTING; P=WIRE TO BE INSTALLED INSIDE STEEL POLE; A=ABANDON; REM=REMOVE AND SALVAGE

P-# - REFERS TO WIRING WITHIN THE SIGNAL POLE AND MAST ARM.

* - AEP TEXAS WILL INSTALL THE ELECTRICAL CONDUCTORS AND AERIAL RUN FROM THE POINT OF DELIVERY TO THE ELECTRICAL SERVICE POLE.

SIGNAL HEAD AND POLE PLACEMENT (FT)

POLE NUMBER	STATUS	A (FT)	B (FT)	C (FT)	D (FT)	E (FT)	F (FT)	G (FT)	H (FT)	I (FT)	NO. OF HEADS (EA)*	SUB TO 680 GRIDSMART DET. (EA)	LUM	DRILLED SHAFT LENGTH (FT) 24" DIA SUB TO ITEM 687	30" DIA TYPE A ITEM 416	48" DIA TYPE A ITEM 416	FDN. TYPE WIND ZONE 80 MPH
TS-1	I	6	23	13	13	12	65**	19	30	13	4	1	Y	-	-	22	48-A
PED-1	I	7	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	24-A
TS-2	I	10	16	9	-	-	28	19	30	13	2	-	Y	-	11	-	30-A
PED-2	I	5	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	24-A
PED-3	I	6	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	24-A
TS-3	I	8	23	12	12	12	60**	19	30	13	4	-	Y	-	-	22	48-A
PED-4	I	7	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	24-A
PED-5	I	8	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	24-A
TS-4	I	8	21	9	-	-	32	19	30	13	2	-	Y	-	11	-	30-A
PED-6	I	7	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	24-A
										TOTAL:		1		36	22	44	

SIGNAL POLE STATUS: I=INSTALL; E=EXISTING; REM=REMOVE; F=INSTALL IN FUTURE PHASE

*- DOES NOT INCLUDE VERTICAL SIDEMOUNT SIGNAL HEADS OR PEDESTRIAN SIGNAL HEADS

**- INSTALL MAST ARM MITIGATOR ON TS-1 AND TS-3

ELECTRICAL SERVICE DATA

ELEC. SERVICE ID	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUCTORS NO. / SIZE	SAFETY SWITCH AMPS	MAIN CKT. BRK. POLE / AMPS	TWO-POLE CONTACTOR AMPS	PANELBD / LOADCENTER AMP RATING (MIN)	BRANCH CIRCUIT ID	BRANCH CKT. BRK. POLE / AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
ES-01	TY D (120/240) 070 (NS) SS (E) SP (O)	3 / #6	N/A	2P / 70	30	100	T.S. LIGHTING	1P / 50 2P / 20	23 4	<7.1

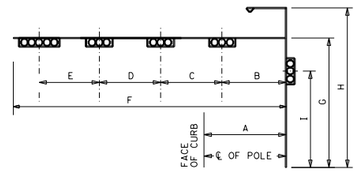
THE FOLLOWING CHART SUMMARIZES THE TRAFFIC SIGNAL EQUIPMENT. ALL EQUIPMENT TO BE PROCURED AND INSTALLED BY THE CONTRACTOR.

SUMMARY OF TRAFFIC SIGNAL EQUIPMENT

ITEM	TxDOT ITEM NUMBER	DESCRIPTION
CABINET	SUB TO 680	TS2-TY2 BASE MOUNTED CONTROLLER CABINET AND FOUNDATION
CONTROLLER	SUB TO 680	ECONOLITE COBALT CONTROLLER
MMU	SUB TO 680	EDI MMU-16 LEip SMART MONITOR
COMMUNICATIONS	6062	CEULLULAR RADIO ANTENNA (RELOCATED)
COMMUNICATIONS CABLE	6089	CAT 5E CABLE FOR CELLULAR ROUTER
DETECTION	SUB TO 680	GRIDSMART DETECTION W/ PERFOMANCE MODULE
DETECTION CABLE	6089	CAT 5E CABLE FOR GRIDSMART DETECTOR
SIGNAGE	SUB TO 680	ALL SIGNS AND MOUNTING HARDWARE
OPTICOM SYSTEM	SUB TO 680	OPTICOM SYSTEM
APS PUSH BUTTONS	688	POLARA iNS iNAVIGATOR PUSH BUTTONS
BATTERY BACK-UP UNIT (BBU)	6058	ALPHA FXMHP 2000 BATTERY BACK-UP UNIT (BBU)
MAST ARM DAMPENER	SUB TO 680	VALMONT MITIGATOR (DST-1)

Notes:

1. Any additional items not explicitly stated shall be procured and installed by the contractor.
2. Contractor to submit shop drawings to City of San Angelo Traffic Operations Department to review and approve prior to equipment procurement.



5/25/2022

STATE OF TEXAS
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THE CITY OF SAN ANGELO TEXAS

Texas Department of Transportation

TRAFFIC SAFETY IMPROVEMENTS
PROPOSED QUANTITIES

BRYANT BOULEVARD (US 87)
AT AVENUE L

SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	41
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\Project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_23_Bryant at Avenue L_Quantities (1 of 3).dgn
40.0000 ft / in.
BY: Abby.Axelson

CABLE TERMINATION CHART

CNDR. NO.	CONDUCTOR COLOR	CABLE 1 20 CNDR. FROM TS-1 TO CNTRL.	CABLE 2 10 CNDR. FROM PED-1 TO CNTRL.	CABLE 3 20 CNDR. FROM TS-2 TO CNTRL.	CABLE 4 10 CNDR. FROM PED-2 TO CNTRL.	CABLE 5 10 CNDR. FROM PED-3 TO CNTRL.	CABLE 6 20 CNDR. FROM TS-3 TO CNTRL.	CABLE 7 10 CNDR. FROM PED-4 TO CNTRL.	CABLE 8 10 CNDR. FROM PED-5 TO CNTRL.	CABLE 9 20 CNDR. FROM TS-4 TO CNTRL.	CABLE 10 10 CNDR. FROM PED-6 TO CNTRL.
1	BLACK	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
2	WHITE	SH COM	SH COM	SH COM	SH COM	SH COM	SH COM	SH COM	SH COM	SH COM	SH COM
3	RED	SH 2,3,4,5 - Ø2 R	SPARE	SH 8,9,10 - Ø4 R	SPARE	SPARE	SH 16,17,18,19 - Ø6 R	SPARE	SPARE	SH 22,23,24 - Ø3 R	SPARE
4	GREEN	SH 2,3,4,5 - Ø2 G	SPARE	SH 8,9,10 - Ø4 G & G LT ARW	SPARE	SPARE	SH 16,17,18,19 - Ø6 G	SPARE	SPARE	SH 22,23,24 - Ø3 G & G LT ARW	SPARE
5	ORANGE	SH 2,3,4,5 - Ø2 Y	SPARE	SH 8,9,10 - Ø4 Y	SPARE	SPARE	SH 16,17,18,19 - Ø6 Y	SPARE	SPARE	SH 22,23,24 - Ø3 Y	SPARE
6	BLUE	SH 7 - Ø3 DW	SH 6 - Ø2 DW	SPARE	SH 12 - Ø4 DW	SH 13 - Ø4 DW	SPARE	SH 20 - Ø4 DW	SH 21 - Ø6 DW	SPARE	SH 25 - Ø3 DW
7	WHITE/BLACK	SH 7 - Ø3 W	SH 6 - Ø2 W	SPARE	SH 12 - Ø4 W	SH 13 - Ø4 W	SPARE	SH 20 - Ø4 W	SH 21 - Ø6 W	SPARE	SH 25 - Ø3 W
8	RED/BLACK	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
9	GREEN/BLACK	SPARE	SPARE	SH 11 - Ø2 DW	SPARE	SH 14 - Ø4 DW	SPARE	SPARE	SPARE	SPARE	SH 26 - Ø6 DW
10	ORANGE/BLACK	SPARE	SPARE	SH 11 - Ø2 W	SPARE	SH 14 - Ø4 W	SPARE	SPARE	SPARE	SPARE	SH 26 - Ø6 W
11	BLUE/BLACK	SPARE		SPARE			SPARE			SPARE	
12	BLACK/WHITE	SPARE		SPARE			SPARE			SPARE	
13	RED/WHITE	SH 1 - OLC R (LT ARW)		SPARE			SH 15 - OLA R (LT ARW)			SPARE	
14	GREEN/WHITE	SH 1 - Ø5 G (LT ARW)		SPARE			SH 15 - Ø1 G (LT ARW)			SPARE	
15	BLUE/WHITE	SH 1 - OLC Y (LT ARW)		SPARE			SH 15 - OLA Y (LT ARW)			SPARE	
16	BLACK/RED	SPARE		SPARE			SPARE			SPARE	
17	WHITE/RED	SPARE		SPARE			SPARE			SPARE	
18	ORANGE/RED	SPARE		SPARE			SPARE			SPARE	
19	BLUE/RED	SH 1 - OLC FY (LT ARW)		SPARE			SH 15 - OLA FY (LT ARW)			SPARE	
20	RED/GREEN	SPARE		SPARE			SPARE			SPARE	

*NOTE: HOME RUN 2 CONDR. TO ALL POLES WITH PED HEADS FOR PED CALL

SIGNS SUMMARY

SIGN *	SIGN TYPE	SIGN LEGEND	STATUS	SUPPORT	SIGN DIMENSION (in x in)
S1	R10-17T	LEFT TURN YIELD ON FLASHING YELLOW ARROW	I	TS-1	36" x 30"
S2	R3-5L	LEFT-TURN ONLY	I	TS-1	36" x 30"
S3	STREET NAME	W. AVENUE L	I	TS-1	24" x 132"
S4	R3-1a	NO RIGHT TURN (BLANK OUT SIGN)	I	TS-1	36" x 36"
S5	R10-3EL	PED PUSH BUTTON	I	TS-1	9" x 15"
S6	R10-3ER	PED PUSH BUTTON	I	PED-1	9" x 15"
S7	R3-8 MR	LANE ASSIGNMENT	I	TS-2	36" x 36"
S8	STREET NAME	BRYANT BLVD	I	TS-2	24" x 120"
S9	R10-3ER	PED PUSH BUTTON	I	TS-2	9" x 15"
S10	R10-3EL	PED PUSH BUTTON	I	PED-2	9" x 15"
S11	R10-3ELR	PED PUSH BUTTON	I	PED-3	9" x 15"
S12	R10-17T	LEFT TURN YIELD ON FLASHING YELLOW ARROW	I	TS-3	36" x 30"
S13	R3-5L	LEFT-TURN ONLY	I	TS-3	36" x 30"
S14	STREET NAME	W. AVENUE L	I	TS-3	24" x 132"
S15	R10-3EL	PED PUSH BUTTON	I	PED-4	9" x 15"
S16	R10-3ER	PED PUSH BUTTON	I	PED-5	9" x 15"
S17	R3-8(MOD)	LANE ASSIGNMENT	I	TS-4	36" x 36"
S18	STREET NAME	BRYANT BLVD	I	TS-4	24" x 120"
S19	R10-3ER	PED PUSH BUTTON	I	PED-6	9" x 15"
S20	R10-3EL	PED PUSH BUTTON	I	PED-6	9" x 15"

STATUS: I=INSTALL; E=EXISTING; REM=EXISTING TO BE REMOVED; REL=EXISTING TO BE RELOCATED

*- ALL SIGNS TO BE FURNISH AND INSTALL BY THE CONTRACTOR (SUB TO ITEM 680).

GROUND BOX SUMMARY

ITEM NO.	DESCRIPTION	UNIT	QTY.
0624	GROUND BOX TY C (162911)W/APRON	EA	8

5/25/2022

STATE OF TEXAS
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THE CITY OF SAN ANGELO TEXAS

Texas Department of Transportation

TRAFFIC SAFETY IMPROVEMENTS

PROPOSED QUANTITIES

BRYANT BOULEVARD (US 87)
AT AVENUE L

SHEET 2 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS				
ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	SJT	TOM GREEN	
HMF	CONTROL	SECTION	JOB	42
CHECK	0907	24	054	
HMF				

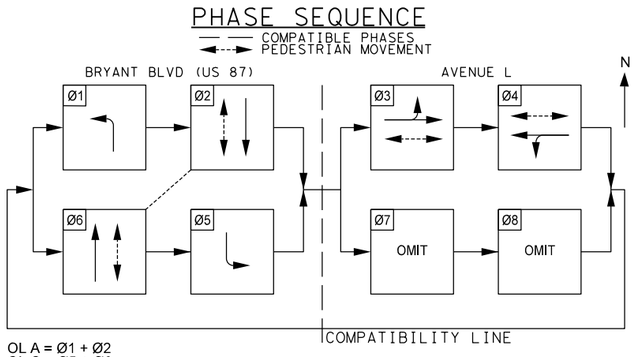
PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\project\06458903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_24_Bryant at Avenue L_Quantities (2 of 3).dgn
40.0000 ft / in.
BY: Abby.Axelson

APS MESSAGE CHART			
POLE LOCATION	PEDESTRIAN MOVEMENT	FUNCTIONS	SPEECH MESSAGE/SOUND DETAILS
TS-1	Phase 3	BUTTON PUSH ON DW	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE L
		EXTENDED BUTTON PUSH	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE L
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	BRYANT BOULEVARD, WALK SIGN IS ON TO CROSS BRYANT BOULEVARD
PED-1	Phase 2	BUTTON PUSH ON DW	WAIT TO CROSS AVENUE L AT BRYANT BOULEVARD
		EXTENDED BUTTON PUSH	WAIT TO CROSS AVENUE L AT BRYANT BOULEVARD
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	AVENUE L, WALK SIGN IS ON TO CROSS AVENUE L
TS-2	Phase 2	BUTTON PUSH ON DW	WAIT
		EXTENDED BUTTON PUSH	WAIT TO CROSS AVENUE L AT BRYANT BOULEVARD
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	RAPID TICK
PED-2	Phase 4	BUTTON PUSH ON DW	WAIT
		EXTENDED BUTTON PUSH	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE L
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	RAPID TICK
PED-3	Phase 4	BUTTON PUSH ON DW	WAIT
		EXTENDED BUTTON PUSH	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE L
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	RAPID TICK
PED-4	Phase 4	BUTTON PUSH ON DW	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE L
		EXTENDED BUTTON PUSH	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE L
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	BRYANT BOULEVARD, WALK SIGN IS ON TO CROSS BRYANT BOULEVARD
PED-5	Phase 6	BUTTON PUSH ON DW	WAIT TO CROSS AVENUE L AT BRYANT BOULEVARD
		EXTENDED BUTTON PUSH	WAIT TO CROSS AVENUE L AT BRYANT BOULEVARD
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	AVENUE L, WALK SIGN IS ON TO CROSS AVENUE L
PED-6	Phase 6	BUTTON PUSH ON DW	WAIT TO CROSS AVENUE L AT BRYANT BOULEVARD
		EXTENDED BUTTON PUSH	WAIT TO CROSS AVENUE L AT BRYANT BOULEVARD
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	AVENUE L, WALK SIGN IS ON TO CROSS AVENUE L
PED-6	Phase 3	BUTTON PUSH ON DW	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE L
		EXTENDED BUTTON PUSH	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE L
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	BRYANT BOULEVARD, WALK SIGN IS ON TO CROSS BRYANT BOULEVARD

SIGNAL HEADS (ITEM 682)											
SIGNAL HEAD NUMBER	12" LED SIGNAL INDICATION										PED SIG SEC (LED) (COUNTDOWN)
	SIGNAL HEAD TYPE	STATUS	BACK PLATE		LED SIGNAL LAMPS						
			3 SEC	4 SEC	<-G-	G	<-Y-	Y	<-R-	R	
			EA	EA	EA	EA	EA	EA	EA	EA	EA
1	H4FLT	I		1	1		2		1		
2	H3	I	1			1		1		1	
3	H3	I	1			1		1		1	
4	H3	I	1			1		1		1	
5	V3	I	1			1		1		1	
6	PED	I									1
7	PED	I									1
8	H4S	I		1	1	1		1		1	
9	H3	I	1			1		1		1	
10	V3	I	1			1		1		1	
11	PED	I									1
12	PED	I									1
13	PED	I									1
14	PED	I									1
15	H4FLT	I		1	1		2		1		
16	H3	I	1			1		1		1	
17	H3	I	1			1		1		1	
18	H3	I	1			1		1		1	
19	V3	I	1			1		1		1	
20	PED	I									1
21	PED	I									1
22	H4S	I		1	1	1		1		1	
23	H3	I	1			1		1		1	
24	V3	I	1			1		1		1	
25	PED	I									1
26	PED	I									1
	TOTAL (NEW)		12	4	4	14	4	14	2	14	10

STATUS: I=INSTALL; E=EXISTING; REM=EXISTING TO BE REMOVED; REL=RELOCATE

PHASE SEQUENCE



OL A = Ø1 + Ø2
OL C = Ø5 + Ø6

NOTES:
- S4 BLANK OUT SIGN TO BE ACTIVATED WITH RAILROAD PREEMPTION.
- Ø1 AND Ø5 SHALL NOT RUN CONCURRENTLY AND SHALL USE LEAD/LAG SEQUENCING.

5/25/2022

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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

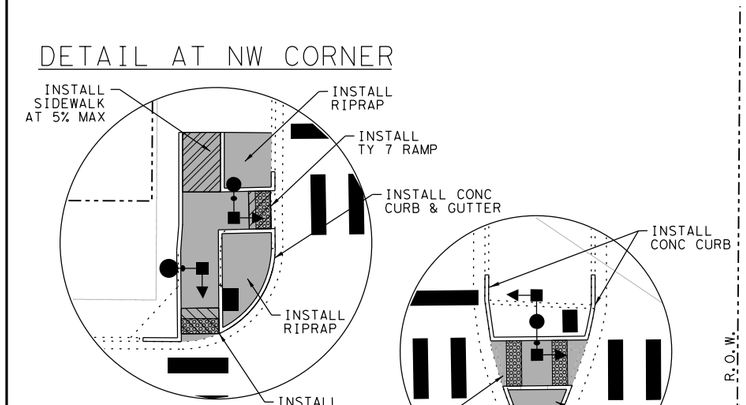
PROPOSED QUANTITIES

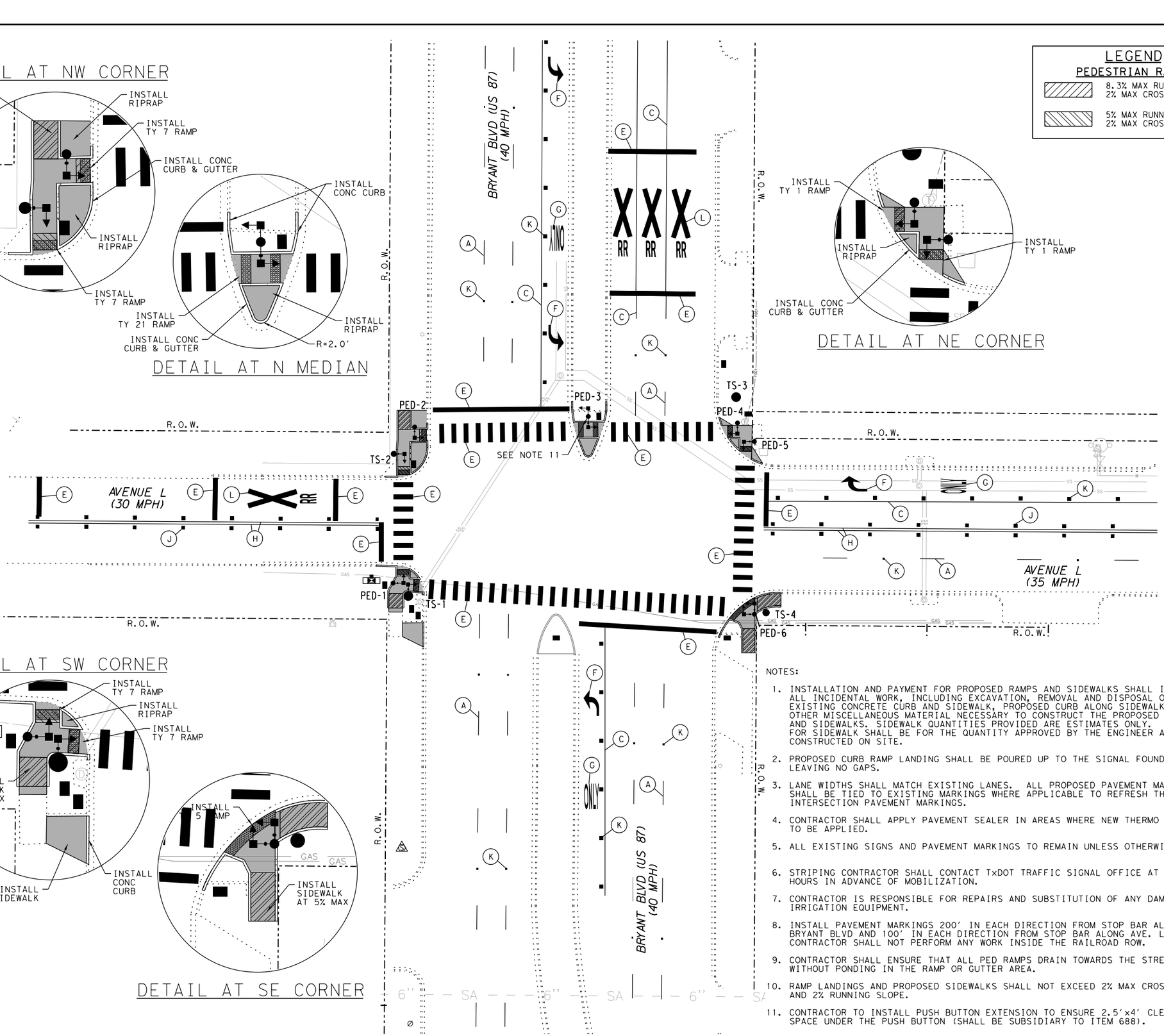
BRYANT BOULEVARD (US 87) AT AVENUE L

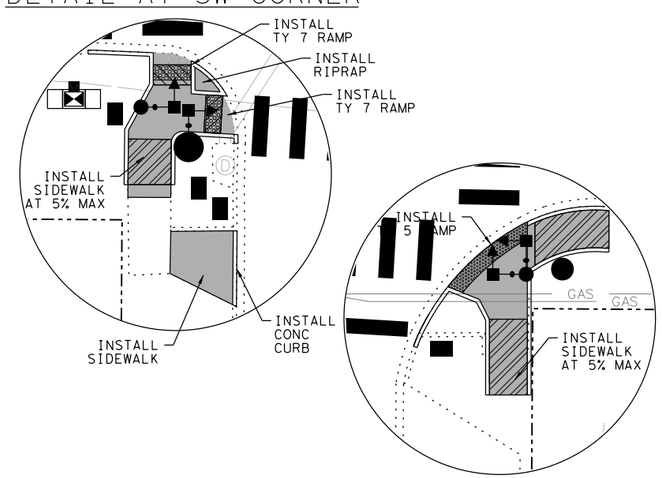
SHEET 3 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	43
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_25_Bryant at Avenue L_Quantities (3 of 3).dgn
40.0000 ft / in.
BY: Abby.Axelson







NOTES:

1. INSTALLATION AND PAYMENT FOR PROPOSED RAMPS AND SIDEWALKS SHALL INCLUDE ALL INCIDENTAL WORK, INCLUDING EXCAVATION, REMOVAL AND DISPOSAL OF EXISTING CONCRETE CURB AND SIDEWALK, PROPOSED CURB ALONG SIDEWALKS, AND OTHER MISCELLANEOUS MATERIAL NECESSARY TO CONSTRUCT THE PROPOSED RAMPS AND SIDEWALKS. SIDEWALK QUANTITIES PROVIDED ARE ESTIMATES ONLY. PAYMENT FOR SIDEWALK SHALL BE FOR THE QUANTITY APPROVED BY THE ENGINEER AND CONSTRUCTED ON SITE.
2. PROPOSED CURB RAMP LANDING SHALL BE POURED UP TO THE SIGNAL FOUNDATION, LEAVING NO GAPS.
3. LANE WIDTHS SHALL MATCH EXISTING LANES. ALL PROPOSED PAVEMENT MARKINGS SHALL BE TIED TO EXISTING MARKINGS WHERE APPLICABLE TO REFRESH THE INTERSECTION PAVEMENT MARKINGS.
4. CONTRACTOR SHALL APPLY PAVEMENT SEALER IN AREAS WHERE NEW THERMO IS TO BE APPLIED.
5. ALL EXISTING SIGNS AND PAVEMENT MARKINGS TO REMAIN UNLESS OTHERWISE NOTED.
6. STRIPING CONTRACTOR SHALL CONTACT TxDOT TRAFFIC SIGNAL OFFICE AT LEAST 24 HOURS IN ADVANCE OF MOBILIZATION.
7. CONTRACTOR IS RESPONSIBLE FOR REPAIRS AND SUBSTITUTION OF ANY DAMAGED IRRIGATION EQUIPMENT.
8. INSTALL PAVEMENT MARKINGS 200' IN EACH DIRECTION FROM STOP BAR ALONG BRYANT BLVD AND 100' IN EACH DIRECTION FROM STOP BAR ALONG AVE. L. CONTRACTOR SHALL NOT PERFORM ANY WORK INSIDE THE RAILROAD ROW.
9. CONTRACTOR SHALL ENSURE THAT ALL PED RAMPS DRAIN TOWARDS THE STREET WITHOUT PONDING IN THE RAMP OR GUTTER AREA.
10. RAMP LANDINGS AND PROPOSED SIDEWALKS SHALL NOT EXCEED 2% MAX CROSS SLOPE AND 2% RUNNING SLOPE.
11. CONTRACTOR TO INSTALL PUSH BUTTON EXTENSION TO ENSURE 2.5'x4' CLEAR FLOOR SPACE UNDER THE PUSH BUTTON (SHALL BE SUBSIDIARY TO ITEM 688).

0 5 10 20 — PEDESTRIAN RAMP DETAILS : SCALE: 1" = 20'

0 10 20 40 — ORIGINALLY PLOTTED SCALE: SCALE: 1" = 40"

LEGEND
PEDESTRIAN RAMPS

- 8.3% MAX RUNNING SLOPE, 2% MAX CROSS SLOPE
- 5% MAX RUNNING SLOPE, 2% MAX CROSS SLOPE

LEGEND
PAVEMENT MARKING

A	RE PM W/RET REQ TY I (W)4"(BRK)(090MIL)
B	RE PM W/RET REQ TY I (W)4"(SLD)(090MIL)
C	REFL PAV MRK TY I (W)8"(SLD)(090MIL)
D	REFL PAV MRK TY I (W)12"(SLD)(090MIL)
E	REFL PAV MRK TY I (W)24"(SLD)(090MIL)
F	PREFAB PAV MRK TY C (W)(ARROW)
G	PREFAB PAV MRK TY C (W)(WORD)
H	RE PM W/RET REQ TY I (Y)4"(SLD)(090MIL)
I	REFL PAV MRK TY I (Y)24"(SLD)(090MIL)
J	REFL PAV MRK TY II A-A
K	REFL PAV MRK TY I-C
L	PREFAB PAV MRK TY C (W)(RR XING)
M	REFL PAV MRK TY I (W)18"(YLD TRI)(≤40mph)
N	RE PM W/RET REQ TY I (W)6"(SLD)(090MIL)

6/2/2022

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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

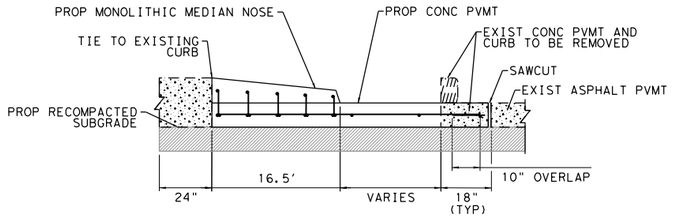
PROPOSED PAVEMENT MARKINGS AND PEDESTRIAN RAMPS

BRYANT BOULEVARD (US 87) AT AVENUE L

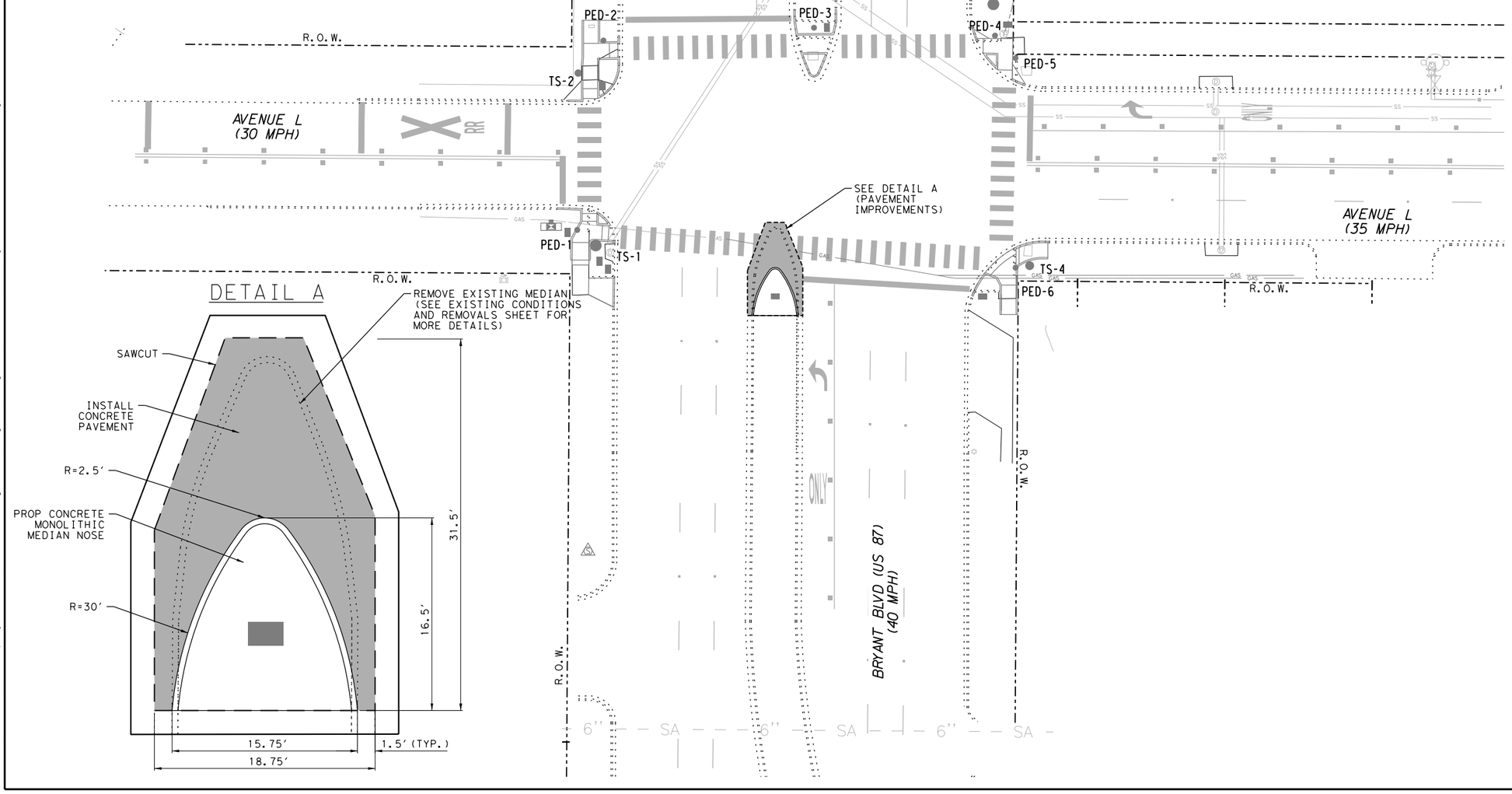
SHEET 1 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS				
ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	SJT	TOM GREEN	44
HMF	CONTROL	SECTION	JOB	
CHECK	0907	24	054	
HMF				

PLOTTED: 6/2/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_26_Bryant at Avenue L_Striping.dgn
40.0000 ft / in.
BY: hiron.fernando



TYPICAL CROSS SECTION FOR MONOLITHIC MEDIAN NOSE IMPROVEMENT
(NOT TO SCALE)



0 2.5 5 10 — MEDIAN DETIAL SCALE: 1" = 10'

0 10 20 40 — ORIGINALLY PLOTTED SCALE: SCALE: 1" = 40'

LEGEND

CONCRETE PAVEMENT

NOTES:

1. REFER TO EXISTING CONDITIONS AND REMOVALS SHEET FOR ADDITIONAL INFORMATION.
2. REFER TO PROPOSED CONDITION SHEET FOR ADDITIONAL INFORMATION.

5/25/2022

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THE CITY OF SAN ANGELO TEXAS

Texas Department of Transportation

TRAFFIC SAFETY IMPROVEMENTS

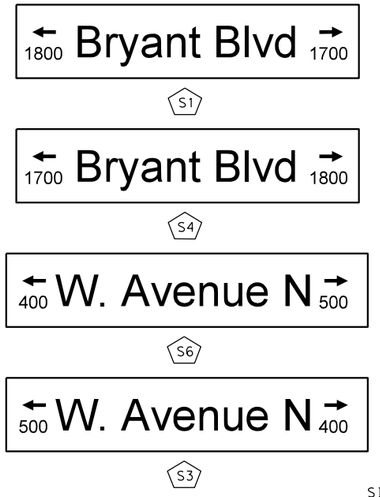
PROPOSED MEDIAN DETAILS

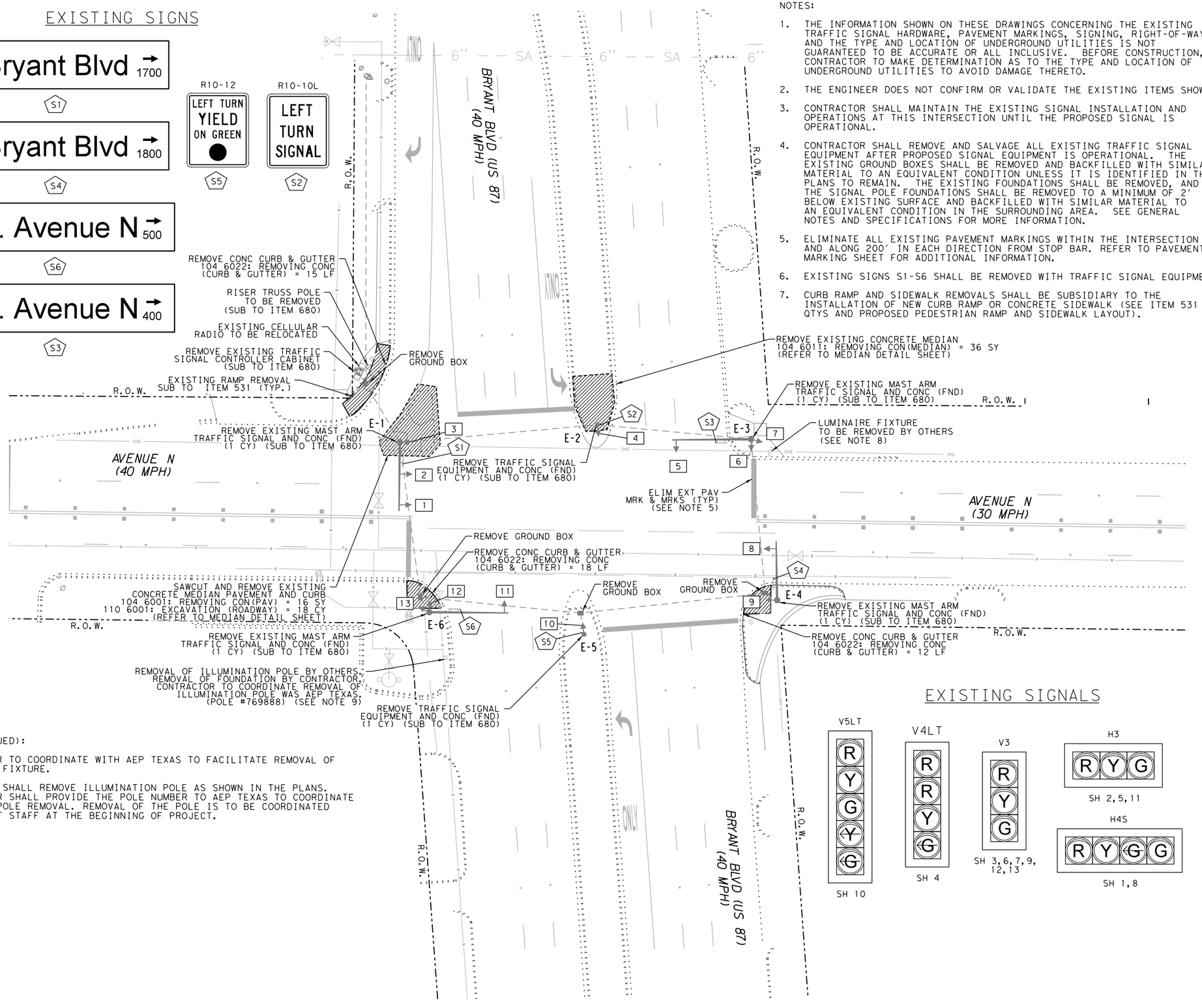
BRYANT BOULEVARD (US 87) AT AVENUE L

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	45
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_27_Bryant at Avenue L_Median.dgn
40.0000 ft / in.
BY: Abby.Axelson

EXISTING SIGNS





NOTES:

1. THE INFORMATION SHOWN ON THESE DRAWINGS CONCERNING THE EXISTING TRAFFIC SIGNAL HARDWARE, PAVEMENT MARKINGS, SIGNING, RIGHT-OF-WAY, AND THE TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. BEFORE CONSTRUCTION, CONTRACTOR TO MAKE DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES TO AVOID DAMAGE THERETO.
2. THE ENGINEER DOES NOT CONFIRM OR VALIDATE THE EXISTING ITEMS SHOWN.
3. CONTRACTOR SHALL MAINTAIN THE EXISTING SIGNAL INSTALLATION AND OPERATIONS AT THIS INTERSECTION UNTIL THE PROPOSED SIGNAL IS OPERATIONAL.
4. CONTRACTOR SHALL REMOVE AND SALVAGE ALL EXISTING TRAFFIC SIGNAL EQUIPMENT AFTER PROPOSED SIGNAL EQUIPMENT IS OPERATIONAL. THE EXISTING GROUND BOXES SHALL BE REMOVED AND BACKFILLED WITH SIMILAR MATERIAL TO AN EQUIVALENT CONDITION UNLESS IT IS IDENTIFIED IN THE PLANS TO REMAIN. THE EXISTING FOUNDATIONS SHALL BE REMOVED, AND THE SIGNAL POLE FOUNDATIONS SHALL BE REMOVED TO A MINIMUM OF 2' BELOW EXISTING SURFACE AND BACKFILLED WITH SIMILAR MATERIAL TO AN EQUIVALENT CONDITION IN THE SURROUNDING AREA. SEE GENERAL NOTES AND SPECIFICATIONS FOR MORE INFORMATION.
5. ELIMINATE ALL EXISTING PAVEMENT MARKINGS WITHIN THE INTERSECTION AND ALONG 200' IN EACH DIRECTION FROM STOP BAR. REFER TO PAVEMENT MARKING SHEET FOR ADDITIONAL INFORMATION.
6. EXISTING SIGNS S1-S6 SHALL BE REMOVED WITH TRAFFIC SIGNAL EQUIPMENT.
7. CURB RAMP AND SIDEWALK REMOVALS SHALL BE SUBSIDIARY TO THE INSTALLATION OF NEW CURB RAMP OR CONCRETE SIDEWALK (SEE ITEM 531 QTYS AND PROPOSED PEDESTRIAN RAMP AND SIDEWALK LAYOUT).

NOTES (CONTINUED):

8. CONTRACTOR TO COORDINATE WITH AEP TEXAS TO FACILITATE REMOVAL OF LUMINAIRE FIXTURE.
9. AEP TEXAS SHALL REMOVE ILLUMINATION POLE AS SHOWN IN THE PLANS. CONTRACTOR SHALL PROVIDE THE POLE NUMBER TO AEP TEXAS TO COORDINATE WITH THE POLE REMOVAL. REMOVAL OF THE POLE IS TO BE COORDINATED WITH TXDOT STAFF AT THE BEGINNING OF PROJECT.

0 10 20 40
ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 40'

LEGEND

- EXISTING TYPICAL MAST ARM COMBINATION SIGNAL \ WITH PEDESTRIAN SIGNAL, PUSH BUTTON, LED LUMINAIRE, AND SIGNAGE
- EXISTING TRAFFIC SIGNAL CONTROLLER CABINET
- EXISTING GROUND BOX
- EXISTING CONDUIT
- EXISTING ELECTRICAL SERVICE
- 1 — SIGNAL HEAD NUMBER
- S1 — SIGN LABEL
- E-# — EXISTING TRAFFIC SIGNAL POLE NUMBER
- REMOVAL

EXISTING SIGNALS

5/25/2022

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THE CITY OF SAN ANGELO TEXAS

Texas Department of Transportation

TRAFFIC SAFETY IMPROVEMENTS

EXISTING CONDITIONS AND REMOVALS

BRYANT BOULEVARD (US 87) AT AVENUE N

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK HMF	TEXAS	SJT	TOM GREEN	46
CHECK HMF	CONTROL	SECTION	JOB	
	0907	24	054	

PLOTTED: 5/25/2022
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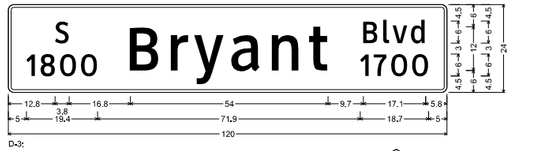
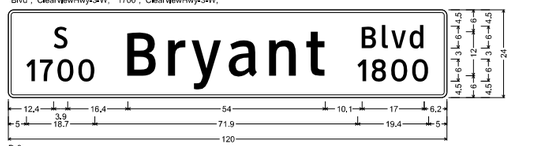
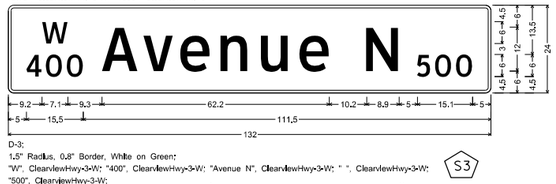
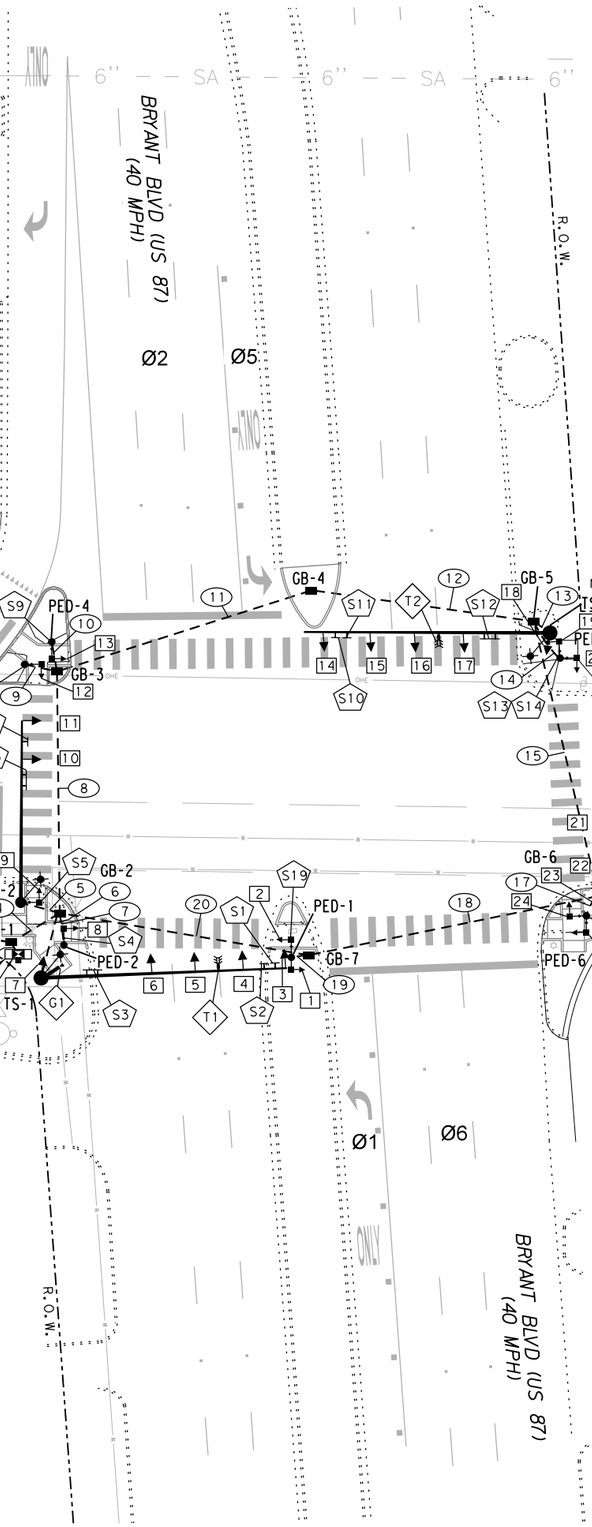
40.0000 ft / in.
BY: Abby.Axelson

PROPOSED SIGNS

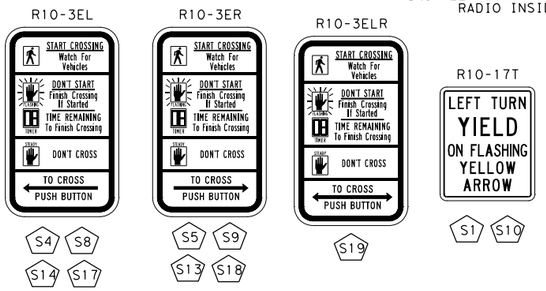


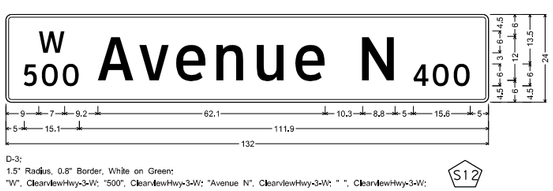




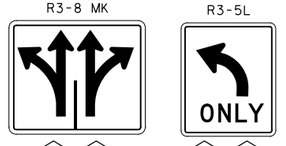


PROPOSED SIGNS

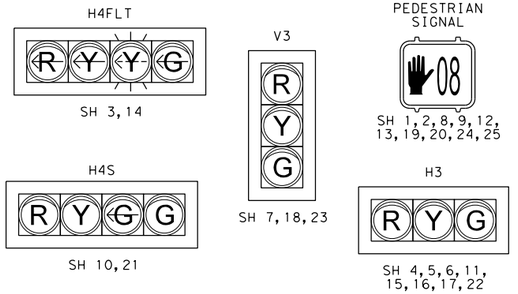




PROPOSED SIGNS



PROPOSED SIGNALS



NOTES:

1. THE INFORMATION SHOWN ON THESE DRAWINGS CONCERNING THE TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. BEFORE CONSTRUCTION, CONTRACTOR TO MAKE DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES TO AVOID DAMAGE THERETO.
2. CONTRACTOR TO CONTACT TxDOT TRAFFIC SIGNAL OFFICE AT (325-947-9266) 48 HOURS IN ADVANCE TO COORDINATE WORK. CONTRACTOR TO COORDINATE WITH TXDOT TO PULL REQUIRED PERMITS, PRIOR TO STARTING WORK.
3. THE LOCATION OF THE PROPOSED SIGNAL POLES, SIGNAL HEADS, DETECTORS, CONDUIT, GROUND BOXES, AND CONDUCTORS ARE DIAGRAMMATIC ONLY AND MAY BE SHIFTED BY THE ENGINEER TO ACCOMMODATE FIELD CONDITIONS.
4. CONTRACTOR SHALL COORDINATE WITH AEP TEXAS CONCERNING TRAFFIC SIGNAL ELECTRICAL SERVICE. CONTACT AEP TEXAS (GARY PITTMAN AT 325-657-2821) REGARDING POINT OF DELIVERY AND DISTRIBUTION TO ELECTRICAL SERVICE. REFER TO GENERAL NOTES FOR ADDITIONAL INFORMATION.
5. INSTALL BASE MOUNTED CONTROLLER CABINET (TYPE TS2 CABINET) AND FOUNDATION.
6. SIGNAL POLES SHALL BE GALVANIZED STEEL FINISH.
7. IF SIGNAL POLES CANNOT BE INSTALL IN THE LOCATIONS SHOWN ON THE PLANS, THE CONTRACTOR SHALL CONTACT TXDOT AND ENGINEER TO MEET ON SITE TO DISCUSS NEW LOCATIONS.
8. CONTRACTOR SHALL COORDINATE THE TRAFFIC SIGNAL POLE FOUNDATION WORK WITH THE CURB RAMP AND SIDEWALK INSTALLATION. IF CURB RAMPS ARE CONSTRUCTED FIRST, CONTRACTOR SHALL NOTIFY THE CITY AND ENGINEER SO A FIELD MEETING CAN BE SCHEDULED TO DETERMINE IF FOUNDATIONS NEED TO BE SHIFTED TO BE ADJACENT TO THE LANDING AREAS. IF SIGNAL POLE FOUNDATIONS ARE INSTALLED FIRST, THE CURB RAMPS AND SIDEWALKS SHALL BE MODIFIED SO THAT THE CURB RAMP LANDING AREAS ARE ADJACENT TO THE PUSH BUTTONS AND THE SIDE REACH TO THE PUSH BUTTONS ARE 10" OR LESS.
9. PROPOSED APS UNITS SHALL BE PLACED ADJACENT TO A LEVEL LANDING AREA (2% MAX IN ANY DIRECTION). IF THE DISTANCE FROM THE PUSH BUTTON TO THE EDGE OF ACCESSIBLE PATH EXCEEDS 10", THE CONTRACTOR SHALL FURNISH AND INSTALL A PUSH BUTTON EXTENDER TO MAKE THE REACH 10" OR LESS. MEASUREMENT AND PAYMENT SHALL BE CONSIDERED SUBSIDIARY TO THE INSTALLATION OF THE TRAFFIC SIGNAL EQUIPMENT.

NOTES CONTINUED ON NEXT SHEET:

0 10 20 40
ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 40'

LEGEND

- TYPICAL PROPOSED MAST ARM COMBINATION SIGNAL\ WITH PEDESTRIAN SIGNAL, PUSH BUTTON, LED LUMINAIRE (250W E.Q.), AND SIGNAGE
- TRAFFIC SIGNAL CONTROLLER CABINET AND CONCRETE PAD
- EXISTING GROUND BOX
- PROPOSED TYPE C GROUND BOX W/ APRON
- PROPOSED CONDUIT
- (1) CONDUIT RUN NUMBER
- [1] SIGNAL HEAD NUMBER
- (S1) SIGN LABEL
- G1 PROPOSED GRIDSMART DETECTOR
- T1 PROPOSED OPTICOM
- (S) PROPOSED ELECTRICAL SERVICE
- TS-# PROPOSED TRAFFIC SIGNAL POLE NUMBER
- PED-# PROPOSED PEDESTRIAN SIGNAL POLE NUMBER
- PB-# PROPOSED PEDESTRIAN PUSH BUTTON NUMBER
- WIRELESS COMMUNICATION ANTENNA

5/25/2022

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THE CITY OF SAN ANGELO TEXAS

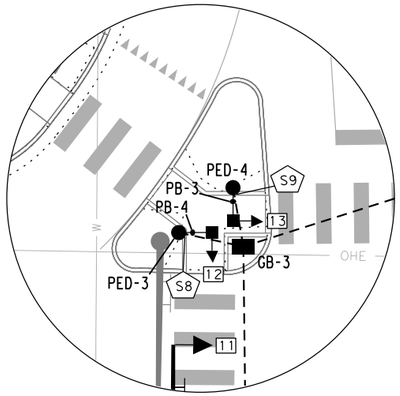
TRAFFIC SAFETY IMPROVEMENTS

PROPOSED CONDITIONS

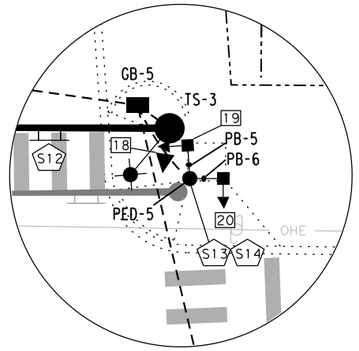
BRYANT BOULEVARD (US 87) AT AVENUE N

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	47
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

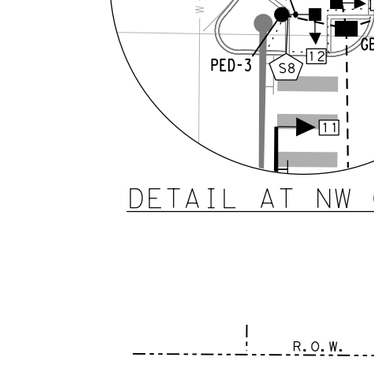
PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_32_Bryant at Avenue N_Proposed.dgn
40.0000 ft / in.
BY: Abby.Axelson



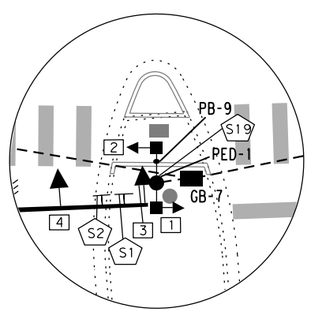
DETAIL AT NW CORNER



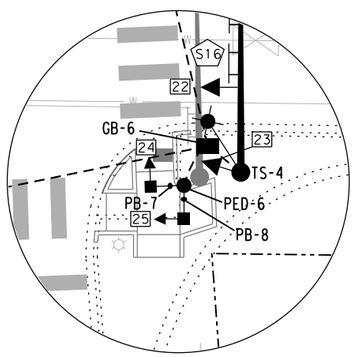
DETAIL AT NE CORNER



DETAIL AT SW CORNER



DETAIL AT S MEDIAN



DETAIL AT SE CORNER

NOTES CONTINUED:

10. PROPOSED CURB RAMP LANDING SHALL BE POURED UP TO THE SIGNAL FOUNDATION, LEAVING NO GAPS.

11. CONTRACTOR TO MAINTAIN FULL ACCESS TO A MINIMUM OF TWO PEDESTRIAN CROSSINGS AT ALL TIMES DURING CONSTRUCTION.

0 10 20 40
ORIGINALLY PLOTTED SCALE:
SCALE: 1" = 40'

LEGEND

- TYPICAL PROPOSED MAST ARM COMBINATION SIGNAL\ WITH PEDESTRIAN SIGNAL, PUSH BUTTON, LED LUMINAIRE (250W E.Q.), AND SIGNAGE
- TRAFFIC SIGNAL CONTROLLER CABINET AND CONCRETE PAD
- EXISTING GROUND BOX
- PROPOSED TYPE C GROUND BOX W/ APRON
- PROPOSED CONDUIT
- (1) CONDUIT RUN NUMBER
- [1] SIGNAL HEAD NUMBER
- S1 SIGN LABEL
- G1 PROPOSED GRIDSMART DETECTOR
- T1 PROPOSED OPTICOM
- S PROPOSED ELECTRICAL SERVICE
- TS-# PROPOSED TRAFFIC SIGNAL POLE NUMBER
- PED-# PROPOSED PEDESTRIAN SIGNAL POLE NUMBER
- PB-# PROPOSED PEDESTRIAN PUSH BUTTON NUMBER
- WIRELESS COMMUNICATION ANTENNA

5/25/2022

STATE OF TEXAS
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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

PROPOSED CONDITIONS (CORNER DETAILS)

BRYANT BOULEVARD (US 87) AT AVENUE N

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	48
CHECK HMF	CONTROL	SECTION	JOB	
CHECK HMF	0907	24	054	

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_32_Bryant at Avenue N_Proposed Blowups.dgn
40.0000 ft / in.
BY: Abby.Axelson

CONDUIT AND CABLE CHART
WIRE SIZE AND TYPE

RUN NO	CONDUIT STATUS	ITEM 618 CONDUIT (SCH 80)										CABLE STATUS	ITEM 620 ELECTRICAL CONDUCTORS								ITEM 684 TRAFFIC SIGNAL CABLES										CAT5E CABLE		OPTICOM CABLE		TOTAL LENGTH OF RUN	RUN NO
		2" PVC SCH 80 (RISER)		2" PVC (TRENCHED)		3" PVC (TRENCHED)		4" PVC (TRENCHED)		4" PVC (BORED)			NO. 8 XHHW WIRE (POWER)		NO. 8 XHHW WIRE (LUMINAIRES)		NO. 8 BARE WIRE		NO. 12 XHHW WIRE		TY C 2 CNDR NO. 12		TY A 5 CNDR NO. 14		TY A 7 CNDR NO. 14		TY A 10 CNDR NO. 14		TY A 20 CNDR NO. 14		GRIDSMART CABLE					
		Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len		Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len	Qty	Len		
1	I	TO BE INSTALLED BY OTHERS																																70	1
2	I	1	10	1	65							I	2	130			1	65																65	2
3	I			1	5							I	2	10	4	20	1	5																5	3
	I							1	5			I					1	5			9	45									4	20	1	5	2	10		
	I							1	5			I					1	5											6	30								
4	I							2	30			I			4	60	1	15			9	135							6	90	4	60	1	15	2	30	15	4
5	I					1	15					I			4	60	1	15			1	15									1	15			15	5
6	I					1	20					I			4	80	1	20													1	20	1	20	20	6
7	I					1	10					I					1	10			1	10							1	10					10	7
8	I									1	65	I			2	130	1	65			2	130							2	130					1	65	65	8
9	I					1	10					I					1	10			1	10							1	10					10	9
10	I					1	10					I					1	10			1	10							1	10					10	10
11	I									1	70	I			2	140	1	70																	1	70	70	11
12	I									1	60	I			2	120	1	60																	1	60	60	12
13	I					1	5					I			2	10	1	5													1	5			1	5	5	13
14	I					1	15					I					1	15			2	30							1	15							15	14
15	I									1	75	I					1	75			2	150							1	75	1	75					75	15
16	I					1	5					I			2	30	1	15													1	15					5	16
17	I					1	10					I					1	20			2	40							1	20							10	17
18	I									1	80	I			2	180	1	90			4	360							2	180	2	180					80	18
19	I					1	5					I					1	15			1	15							1	15							5	19
20	I									1	70	I			2	160	1	80			5	400							3	240	2	160					70	20
SUBTOTAL			10		70		105		40		420			140		990		670		0		1350		0		0		825		550		40		260			
PED-1	P											I												20												VARIES	PED-1
PED-2	P											I												10												VARIES	PED-2
TS-1	P											I								160				200		85							30		70	VARIES	TS-1
TS-2	P											I								160				70		70										VARIES	TS-2
PED-3	P											I												10												VARIES	PED-3
PED-4	P											I												10												VARIES	PED-4
TS-3	P											I								80				185		80									50	VARIES	TS-3
PED-5	P											I												20												VARIES	PED-5
TS-4	P											I								80				45		45										VARIES	TS-4
PED-6	P											I												20												VARIES	PED-6
SUBTOTAL			0		0		0		0		0			0		0		0		400		0		590		280		0		0		30		120			
TOTAL			10		70		105		40		420			140		990		670		400		1350		590		280		825		550		70		380			

CONDUIT STATUS: I=INSTALL; E=EXISTING; P=WIRE TO BE INSTALLED INSIDE STEEL POLE; A=ABANDON; REM=REMOVE AND SALVAGE

P-# - REFERS TO WIRING WITHIN THE SIGNAL POLE AND MAST ARM.

* - AEP TEXAS WILL INSTALL THE ELECTRICAL CONDUCTORS AND AERIAL RUN FROM THE POINT OF DELIVERY TO THE ELECTRICAL SERVICE POLE.

SIGNAL HEAD AND POLE PLACEMENT (FT)

POLE NUMBER	STATUS	A (FT)	B (FT)	C (FT)	D (FT)	E (FT)	F (FT)	G (FT)	H (FT)	I (FT)	NO. OF HEADS (EA)*	SUB TO 680 GRIDSMART DET. (EA)	LUM	DRILLED SHAFT LENGTH (FT) 24" DIA SUB TO ITEM 687	30" DIA TYPE A ITEM 416	36" DIA TYPE A ITEM 416	48" DIA TYPE A ITEM 416	FDN. TYPE WIND ZONE 80 MPH
PED-1	I	7	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	-	24-A
PED-2	I	6	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	-	24-A
TS-1	I	13	28	11	13	11	65**	19	30	13	4	1	Y	-	-	-	22	48-A
TS-2	I	5	38	10	-	-	48	19	30	13	2	-	Y	-	-	13	-	36-A
PED-3	I	5	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	-	24-A
PED-4	I	5	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	-	24-A
TS-3	I	8	22	13	12	12	60**	19	30	13	4	-	Y	-	-	-	22	48-A
PED-5	I	9	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	-	24-A
TS-4	I	5	10	12	-	-	28	19	30	13	2	-	Y	-	11	-	-	30-A
PED-6	I	8	PEDESTRIAN SIGNAL POLE					10	-	-	-	-	N	6	-	-	-	24-A
											TOTAL:	1		36	11	13	44	

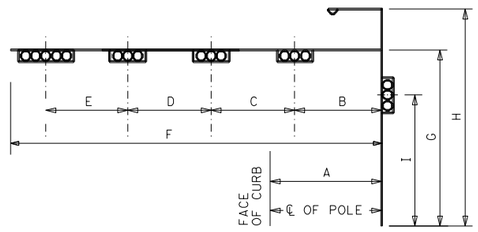
SIGNAL POLE STATUS: I=INSTALL; E=EXISTING; REM=REMOVE; F=INSTALL IN FUTURE PHASE

*- DOES NOT INCLUDE VERTICAL SIDEMOUNT SIGNAL HEADS OR PEDESTRIAN SIGNAL HEADS

**- INSTALL MAST ARM MITIGATOR ON TS-1 AND TS-3

ELECTRICAL SERVICE DATA

ELEC. SERVICE ID	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUCTORS NO. / SIZE	SAFETY SWITCH AMPS	MAIN CKT. BRK. POLE / AMPS	TWO-POLE CONTACTOR AMPS	PANELBD / LOADCENTER AMP RATING (MIN)	BRANCH CIRCUIT ID	BRANCH CKT. BRK. POLE / AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
ES-02	TY D (120/240) 070 (NS) SS (E) SP (O)	3 / #6	N/A	2P / 70	30	100	T.S.	1P / 50	23	<7.1
							LIGHTING	2P / 20	4	



THE FOLLOWING CHART SUMMARIZES THE TRAFFIC SIGNAL EQUIPMENT. ALL EQUIPMENT TO BE PROCURED AND INSTALLED BY THE CONTRACTOR.

SUMMARY OF TRAFFIC SIGNAL EQUIPMENT

ITEM	TxDOT ITEM NUMBER	DESCRIPTION
CABINET	SUB TO 680	TS2-TY2 BASE MOUNTED CONTROLLER CABINET AND FOUNDATION
CONTROLLER	SUB TO 680	ECONOLITE COBALT CONTROLLER
MMU	SUB TO 680	EDI MMU-16 LEip SMART MONITOR
COMMUNICATIONS	6062	CEULLULAR RADIO ANTENNA (RELOCATED)
COMMUNICATIONS CABLE	6089	CAT 5E CABLE FOR CELLULAR ROUTER
DETECTION	SUB TO 680	GRIDSMART DETECTION W/ PERFOMANCE MODULE
DETECTION CABLE	6089	CAT 5E CABLE FOR GRIDSMART DETECTOR
SIGNAGE	SUB TO 680	ALL SIGNS AND MOUNTING HARDWARE
OPTICOM SYSTEM	SUB TO 680	OPTICOM SYSTEM
APS PUSH BUTTONS	688	POLARA iNS iNAVIGATOR PUSH BUTTONS
BATTERY BACK-UP UNIT (BBU)	6058	ALPHA FXMHP 2000 BATTERY BACK-UP UNIT (BBU)
MAST ARM DAMPENER	SUB TO 680	VALMONT MITIGATOR (DST-1)

Notes:
1. Any additional items not explicitly stated shall be procured and installed by the contractor.
2. Contractor to submit shop drawings to City of San Angelo Traffic Operations Department to review and approve prior to equipment procurement.

5/25/2022

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THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS
PROPOSED QUANTITIES

BRYANT BOULEVARD (US 87) AT AVENUE N

SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	49
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\Project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_33_Bryant at Avenue N_Quantities (1 of 3).dgn
BY: Abby.Axelson
40.0000 ft / in.

CABLE TERMINATION CHART

CNDR. NO.	CONDUCTOR COLOR	CABLE 1 10 CNDR. FROM PED-1 TO CNTRL.	CABLE 2 20 CNDR. FROM TS-1 TO CNTRL.	CABLE 3 10 CNDR. FROM PED-2 TO CNTRL.	CABLE 4 20 CNDR. FROM TS-2 TO CNTRL.	CABLE 5 10 CNDR. FROM PED-3 TO CNTRL.	CABLE 6 10 CNDR. FROM PED-4 TO CNTRL.	CABLE 7 20 CNDR. FROM TS-3 TO CNTRL.	CABLE 8 10 CNDR. FROM PED-5 TO CNTRL.	CABLE 9 20 CNDR. FROM TS-4 TO CNTRL.	CABLE 10 10 CNDR. FROM PED-6 TO CNTRL.
1	BLACK	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
2	WHITE	SH COM	SH COM	SH COM	SH COM	SH COM	SH COM	SH COM	SH COM	SH COM	SH COM
3	RED	SPARE	SH 4,5,6,7 - Ø2 R	SPARE	SH 10,11 - Ø4 R	SPARE	SPARE	SH 15,16,17,18 - Ø6 R	SPARE	SH 21,22,23 - Ø3 R	SPARE
4	GREEN	SPARE	SH 4,5,6,7 - Ø2 G	SPARE	SH 10,11 - Ø4 G & G LT ARW	SPARE	SPARE	SH 15,16,17,18 - Ø6 G	SPARE	SH 21,22,23 - Ø3 G & G LT ARW	SPARE
5	ORANGE	SPARE	SH 4,5,6,7 - Ø2 Y	SPARE	SH 10,11 - Ø4 Y	SPARE	SPARE	SH 15,16,17,18 - Ø6 Y	SPARE	SH 21,22,23 - Ø3 Y	SPARE
6	BLUE	SH 1 - Ø3 DW	SPARE	SH 8 - Ø3 DW	SPARE	SH 12 - Ø2 DW	SH 13 - Ø4 DW	SPARE	SH 19 - Ø4 DW	SPARE	SH 24 - Ø6 DW
7	WHITE/BLACK	SH 1 - Ø3 W	SPARE	SH 8 - Ø3 W	SPARE	SH 12 - Ø2 W	SH 13 - Ø4 W	SPARE	SH 19 - Ø4 W	SPARE	SH 24 - Ø6 W
8	RED/BLACK	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
9	GREEN/BLACK	SH 2 - Ø3 DW	SPARE	SPARE	SH 9 - Ø2 DW	SPARE	SPARE	SPARE	SH 20 - Ø6 DW	SPARE	SH 25 - Ø3 DW
10	ORANGE/BLACK	SH 2 - Ø3 W	SPARE	SPARE	SH 9 - Ø2 DW	SPARE	SPARE	SPARE	SH 20 - Ø6 W	SPARE	SH 25 - Ø3 W
11	BLUE/BLACK		SPARE		SPARE			SPARE		SPARE	
12	BLACK/WHITE		SPARE		SPARE			SPARE		SPARE	
13	RED/WHITE		SH 3 - OLC R (LT ARW)		SPARE			SH 14 - OLA R (LT ARW)		SPARE	
14	GREEN/WHITE		SH 3 - Ø5 G (LT ARW)		SPARE			SH 14 - Ø1 G (LT ARW)		SPARE	
15	BLUE/WHITE		SH 3 - OLC Y (LT ARW)		SPARE			SH 14 - OLA Y (LT ARW)		SPARE	
16	BLACK/RED		SPARE		SPARE			SPARE		SPARE	
17	WHITE/RED		SPARE		SPARE			SPARE		SPARE	
18	ORANGE/RED		SPARE		SPARE			SPARE		SPARE	
19	BLUE/RED		SH 3 - OLC FY (LT ARW)		SPARE			SH 14 - OLA FY (LT ARW)		SPARE	
20	RED/GREEN		SPARE		SPARE			SPARE		SPARE	

*NOTE: HOME RUN 2 CONDR. TO ALL POLES WITH PED HEADS FOR PED CALL

SIGNS SUMMARY

SIGN *	SIGN TYPE	SIGN LEGEND	STATUS	SUPPORT	SIGN DIMENSION (in x in)
S1	R10-17T	LEFT TURN YIELD ON FLASHING YELLOW ARROW	I	TS-1	36" x 30"
S2	R3-5L	LEFT-TURN ONLY	I	TS-1	36" x 30"
S3	STREET NAME	W. AVENUE N	I	TS-1	24" x 132"
S4	R10-3EL	PED PUSH BUTTON	I	PED-2	9" x 15"
S5	R10-3ER	PED PUSH BUTTON	I	PED-3	9" x 15"
S6	STREET NAME	BRYANT BLVD	I	TS-2	24" x 120"
S7	R3-8 MK	LANE ASSIGNMENT	I	TS-2	36" x 36"
S8	R10-3EL	PED PUSH BUTTON	I	PED-3	9" x 15"
S9	R10-3ER	PED PUSH BUTTON	I	PED-4	9" x 15"
S10	R10-17T	LEFT TURN YIELD ON FLASHING YELLOW ARROW	I	TS-3	36" x 30"
S11	R3-5L	LEFT-TURN ONLY	I	TS-3	36" x 30"
S12	STREET NAME	W. AVENUE N	I	TS-3	24" x 132"
S13	R10-3ER	PED PUSH BUTTON	I	PED-5	9" x 15"
S14	R10-3EL	PED PUSH BUTTON	I	PED-5	9" x 15"
S15	R3-8 MK	LANE ASSIGNMENT	I	TS-4	36" x 36"
S16	STREET NAME	BRYANT BLVD	I	TS-4	24" x 120"
S17	R10-3EL	PED PUSH BUTTON	I	PED-6	9" x 15"
S18	R10-3ER	PED PUSH BUTTON	I	PED-6	9" x 15"
S19	R10-3ELR	PED PUSH BUTTON	I	PED-1	9" x 15"

STATUS: I=INSTALL; E=EXISTING; REM=EXISTING TO BE REMOVED; REL=EXISTING TO BE RELOCATED

*- ALL SIGNS TO BE FURNISH AND INSTALL BY THE CONTRACTOR (SUB TO ITEM 680).

GROUND BOX SUMMARY

ITEM NO.	DESCRIPTION	UNIT	QTY.
0624	GROUND BOX TY C (162911)W/APRON	EA	7

5/25/2022

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THE CITY OF SAN ANGELO TEXAS

Texas Department of Transportation

TRAFFIC SAFETY IMPROVEMENTS

PROPOSED QUANTITIES

BRYANT BOULEVARD (US 87) AT AVENUE N

SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	50
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

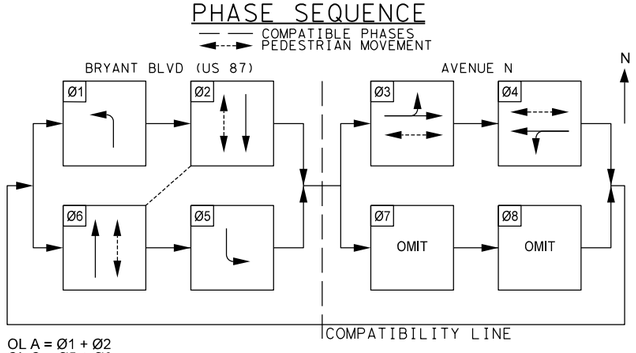
PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\project\06458903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_34_Bryant at Avenue N_Quantities (2 of 3).dgn
40.0000 ft / in.
BY: Abby.Axelson

APS MESSAGE CHART			
POLE LOCATION	PEDESTRIAN MOVEMENT	FUNCTIONS	SPEECH MESSAGE/SOUND DETAILS
PED-2	Phase 3	BUTTON PUSH ON DW	WAIT
		EXTENDED BUTTON PUSH	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE N
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	RAPID TICK
TS-2	Phase 2	BUTTON PUSH ON DW	WAIT
		EXTENDED BUTTON PUSH	WAIT TO CROSS AVENUE N AT BRYANT BOULEVARD
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	RAPID TICK
PED-3	Phase 2	BUTTON PUSH ON DW	WAIT TO CROSS AVENUE N AT BRYANT BOULEVARD
		EXTENDED BUTTON PUSH	WAIT TO CROSS AVENUE N AT BRYANT BOULEVARD
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	AVENUE N, WALK SIGN IS ON TO CROSS AVENUE N
PED-4	Phase 4	BUTTON PUSH ON DW	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE N
		EXTENDED BUTTON PUSH	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE N
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	BRYANT BOULEVARD, WALK SIGN IS ON TO CROSS BRYANT BOULEVARD
PED-5	Phase 4	BUTTON PUSH ON DW	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE N
		EXTENDED BUTTON PUSH	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE N
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	BRYANT BOULEVARD, WALK SIGN IS ON TO CROSS BRYANT BOULEVARD
PED-5	Phase 6	BUTTON PUSH ON DW	AVENUE N, WALK SIGN IS ON TO CROSS AVENUE N
		EXTENDED BUTTON PUSH	WAIT TO CROSS AVENUE N AT BRYANT BOULEVARD
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	AVENUE N, WALK SIGN IS ON TO CROSS AVENUE N
PED-6	Phase 3	BUTTON PUSH ON DW	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE N
		EXTENDED BUTTON PUSH	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE N
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	BRYANT BOULEVARD, WALK SIGN IS ON TO CROSS BRYANT BOULEVARD
PED-6	Phase 6	BUTTON PUSH ON DW	WAIT TO CROSS AVENUE N AT BRYANT BOULEVARD
		EXTENDED BUTTON PUSH	WAIT TO CROSS AVENUE N AT BRYANT BOULEVARD
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	AVENUE N, WALK SIGN IS ON TO CROSS AVENUE N
PED-1	Phase 3	BUTTON PUSH ON DW	WAIT
		EXTENDED BUTTON PUSH	WAIT TO CROSS BRYANT BOULEVARD AT AVENUE N
		LOCATOR TONE	SLOW TICK
		WALK INDICATION	RAPID TICK

SIGNAL HEADS (ITEM 682)											
SIGNAL HEAD NUMBER	12" LED SIGNAL INDICATION										PED SIG SEC (LED) (COUNTDOWN)
	SIGNAL HEAD TYPE	STATUS	BACK PLATE		LED SIGNAL LAMPS						
			3 SEC	4 SEC	<-G-	G	<-Y-	Y	<-R-	R	
			EA	EA	EA	EA	EA	EA	EA	EA	EA
1	PED	I									1
2	PED	I									1
3	H4FLT	I		1	1		2		1		
4	H3	I	1			1		1		1	
5	H3	I	1			1		1		1	
6	H3	I	1			1		1		1	
7	V3	I	1			1		1		1	
8	PED	I									1
9	PED	I									1
10	H4S	I		1	1	1		1		1	
11	H3	I	1			1		1		1	
12	PED	I									1
13	PED	I									1
14	H4FLT	I		1	1		2		1		
15	H3	I	1			1		1		1	
16	H3	I	1			1		1		1	
17	H3	I	1			1		1		1	
18	H3	I	1			1		1		1	
19	PED	I									1
20	PED	I									1
21	H4S	I		1	1	1		1		1	
22	H3	I	1			1		1		1	
23	V3	I	1			1		1		1	
24	PED	I									1
25	PED	I									1
	TOTAL (NEW)		11	4	4	13	4	13	2	13	10

STATUS: I=INSTALL; E=EXISTING; REM=EXISTING TO BE REMOVED; REL=RELOCATE

PHASE SEQUENCE



OL A = Ø1 + Ø2
OL C = Ø5 + Ø6

NOTE: Ø1 AND Ø5 SHALL NOT RUN CONCURRENTLY AND SHALL USE LEAD/LAG SEQUENCING.

5/25/2022

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TRAFFIC SAFETY IMPROVEMENTS

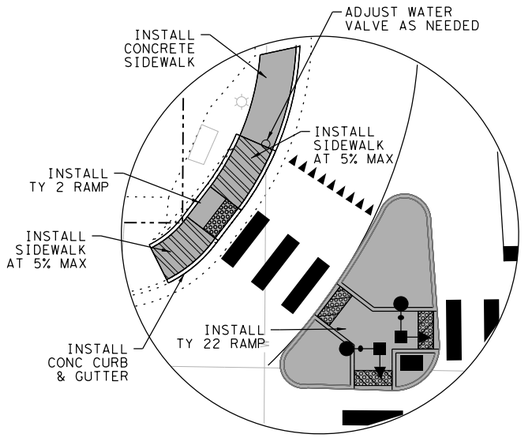
PROPOSED QUANTITIES

BRYANT BOULEVARD (US 87) AT AVENUE N

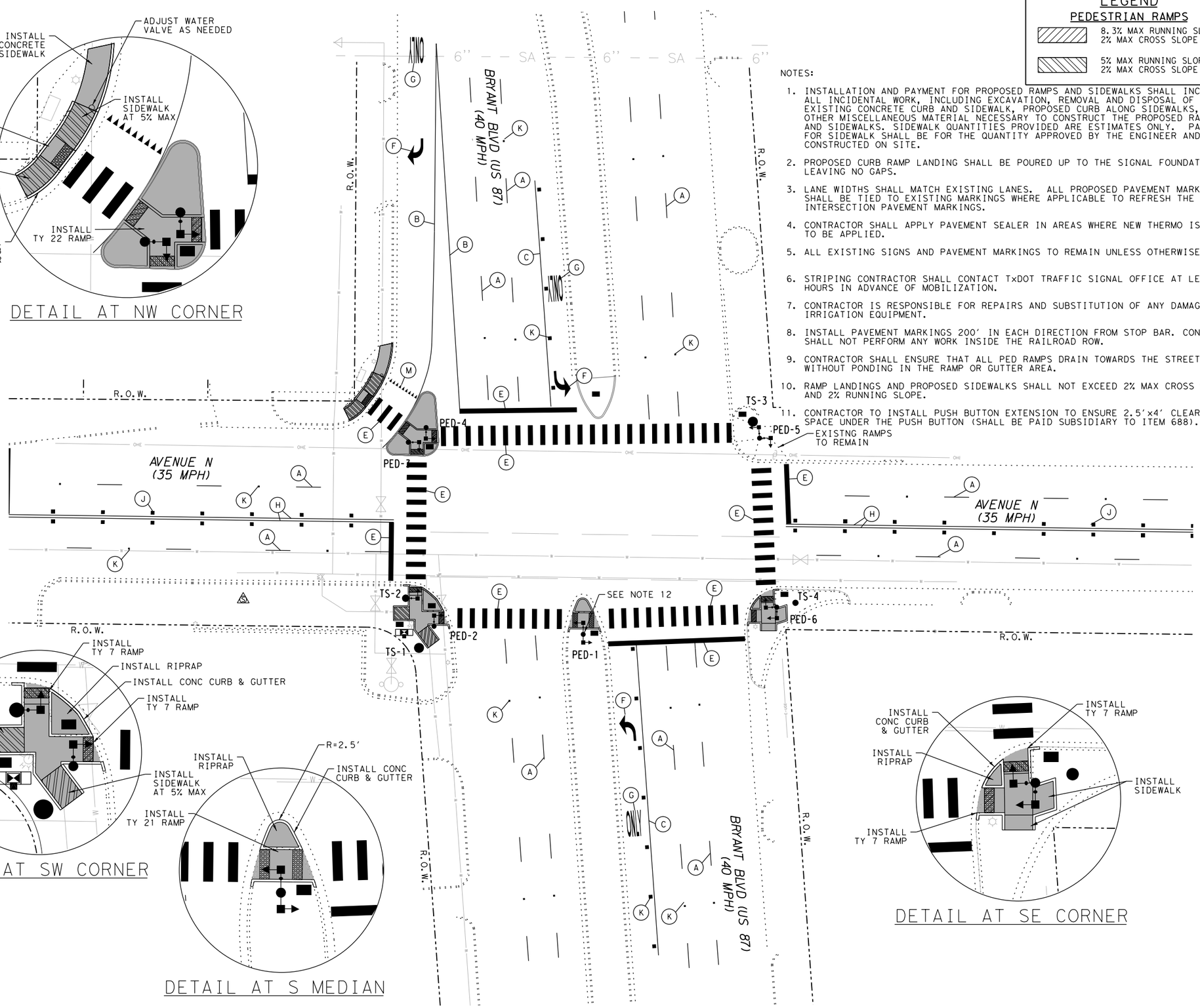
SHEET 3 OF 3

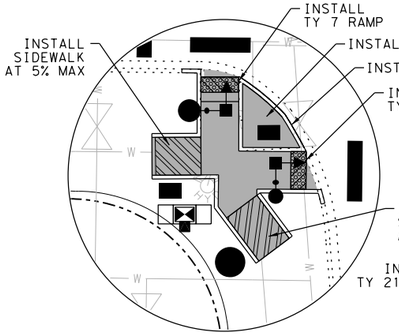
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
ASA	TEXAS	SJT	TOM GREEN	51
CHECK	CONTROL	SECTION	JOB	
HMF	0907	24	054	
CHECK				
HMF				

PLOTTED: 5/25/2022
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_35_Bryant at Avenue N_Quantities (3 of 3).dgn
40.0000 ft / in.
BY: Abby.Axelson



DETAIL AT NW CORNER





DETAIL AT SW CORNER

DETAIL AT S MEDIAN

DETAIL AT SE CORNER

LEGEND
PEDESTRIAN RAMPS

- 8.3% MAX RUNNING SLOPE, 2% MAX CROSS SLOPE
- 5% MAX RUNNING SLOPE, 2% MAX CROSS SLOPE

PEDESTRIAN RAMP DETAILS : SCALE: 1" = 20'

ORIGINALLY PLOTTED SCALE: SCALE: 1" = 40"

NOTES:

1. INSTALLATION AND PAYMENT FOR PROPOSED RAMPS AND SIDEWALKS SHALL INCLUDE ALL INCIDENTAL WORK, INCLUDING EXCAVATION, REMOVAL AND DISPOSAL OF EXISTING CONCRETE CURB AND SIDEWALK, PROPOSED CURB ALONG SIDEWALKS, AND OTHER MISCELLANEOUS MATERIAL NECESSARY TO CONSTRUCT THE PROPOSED RAMPS AND SIDEWALKS. SIDEWALK QUANTITIES PROVIDED ARE ESTIMATES ONLY. PAYMENT FOR SIDEWALK SHALL BE FOR THE QUANTITY APPROVED BY THE ENGINEER AND CONSTRUCTED ON SITE.
2. PROPOSED CURB RAMP LANDING SHALL BE POURED UP TO THE SIGNAL FOUNDATION, LEAVING NO GAPS.
3. LANE WIDTHS SHALL MATCH EXISTING LANES. ALL PROPOSED PAVEMENT MARKINGS SHALL BE TIED TO EXISTING MARKINGS WHERE APPLICABLE TO REFRESH THE INTERSECTION PAVEMENT MARKINGS.
4. CONTRACTOR SHALL APPLY PAVEMENT SEALER IN AREAS WHERE NEW THERMO IS TO BE APPLIED.
5. ALL EXISTING SIGNS AND PAVEMENT MARKINGS TO REMAIN UNLESS OTHERWISE NOTED.
6. STRIPING CONTRACTOR SHALL CONTACT TxDOT TRAFFIC SIGNAL OFFICE AT LEAST 24 HOURS IN ADVANCE OF MOBILIZATION.
7. CONTRACTOR IS RESPONSIBLE FOR REPAIRS AND SUBSTITUTION OF ANY DAMAGED IRRIGATION EQUIPMENT.
8. INSTALL PAVEMENT MARKINGS 200' IN EACH DIRECTION FROM STOP BAR. CONTRACTOR SHALL NOT PERFORM ANY WORK INSIDE THE RAILROAD ROW.
9. CONTRACTOR SHALL ENSURE THAT ALL PED RAMPS DRAIN TOWARDS THE STREET WITHOUT PONDING IN THE RAMP OR GUTTER AREA.
10. RAMP LANDINGS AND PROPOSED SIDEWALKS SHALL NOT EXCEED 2% MAX CROSS SLOPE AND 2% RUNNING SLOPE.
11. CONTRACTOR TO INSTALL PUSH BUTTON EXTENSION TO ENSURE 2.5'x4' CLEAR FLOOR SPACE UNDER THE PUSH BUTTON (SHALL BE PAID SUBSIDIARY TO ITEM 688).

LEGEND
PAVEMENT MARKING

A	RE PM W/RET REQ TY I (W)4"(BRK)(090MIL)
B	RE PM W/RET REQ TY I (W)4"(SLD)(090MIL)
C	REFL PAV MRK TY I (W)8"(SLD)(090MIL)
D	REFL PAV MRK TY I (W)12"(SLD)(090MIL)
E	REFL PAV MRK TY I (W)24"(SLD)(090MIL)
F	PREFAB PAV MRK TY C (W)(ARROW)
G	PREFAB PAV MRK TY C (W)(WORD)
H	RE PM W/RET REQ TY I (Y)4"(SLD)(090MIL)
I	REFL PAV MRK TY I (Y)24"(SLD)(090MIL)
J	REFL PAV MRK TY II A-A
K	REFL PAV MRK TY I-C
L	REFL PAV MRK TY I (W)6"(BRK)(090MIL) (PUPPY TRACKS)
M	REFL PAV MRK TY I (W)18"(YLD TRI) (≤40mph)
N	RE PM W/RET REQ TY I (W)6"(SLD)(090MIL)

6/2/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
PROFESSIONAL ENGINEER

Kimley»Horn
F-928
13455 Noel Road
Two Galleria Office Tower, Suite 700
Dallas, Texas 75240
Tel No. (972) 770-1300
Fax No. (972) 239-3820

THE CITY OF SAN ANGELO TEXAS

TRAFFIC SAFETY IMPROVEMENTS

PROPOSED PAVEMENT MARKINGS AND PEDESTRIAN RAMPS

BRYANT BOULEVARD (US 87) AT AVENUE N

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
ASA	6	(SEE TITLE SHEET)		US 87
GRAPHICS ASA	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK HMF	TEXAS	SJT	TOM GREEN	52
CHECK HMF	CONTROL	SECTION	JOB	
	0907	24	054	

PLOTTED: 6/2/2022
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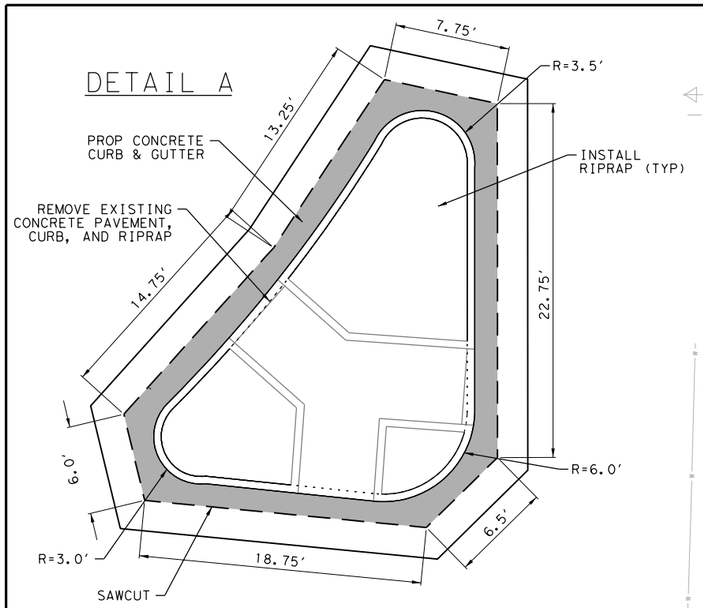
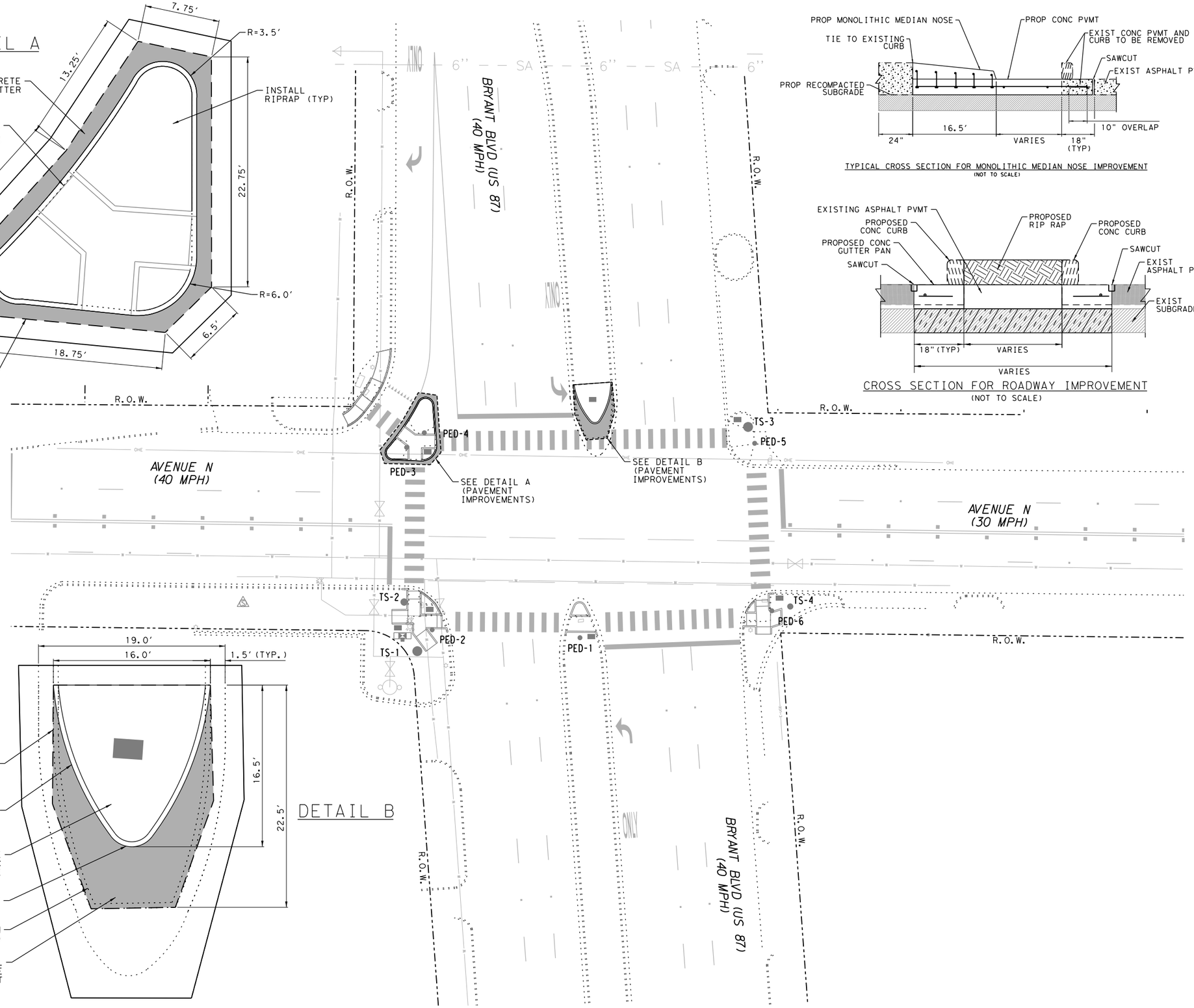
40.0000 ft / in.
BY: hiron.fernando





PLOTTED: 5/25/2022 40.0000 ft / in. BY: Abby.Axelson
FILENAME: K:\DAL_TPTO\project\064586903 - San Angelo RTZ Signal Design\CADD\COSA-RTZ_37_Bryant at Avenue N_Median.dgn

TYPICAL CROSS SECTION FOR MONOLITHIC MEDIAN NOSE IMPROVEMENT
(NOT TO SCALE)

CROSS SECTION FOR ROADWAY IMPROVEMENT
(NOT TO SCALE)

LEGEND

▨	CONCRETE PAVEMENT

NOTES:

1. REFER TO EXISTING CONDITIONS AND REMOVALS SHEET FOR ADDITIONAL INFORMATION.
2. REFER TO PROPOSED CONDITION SHEET FOR ADDITIONAL INFORMATION.

5/25/2022
HIRON M. FERNANDO
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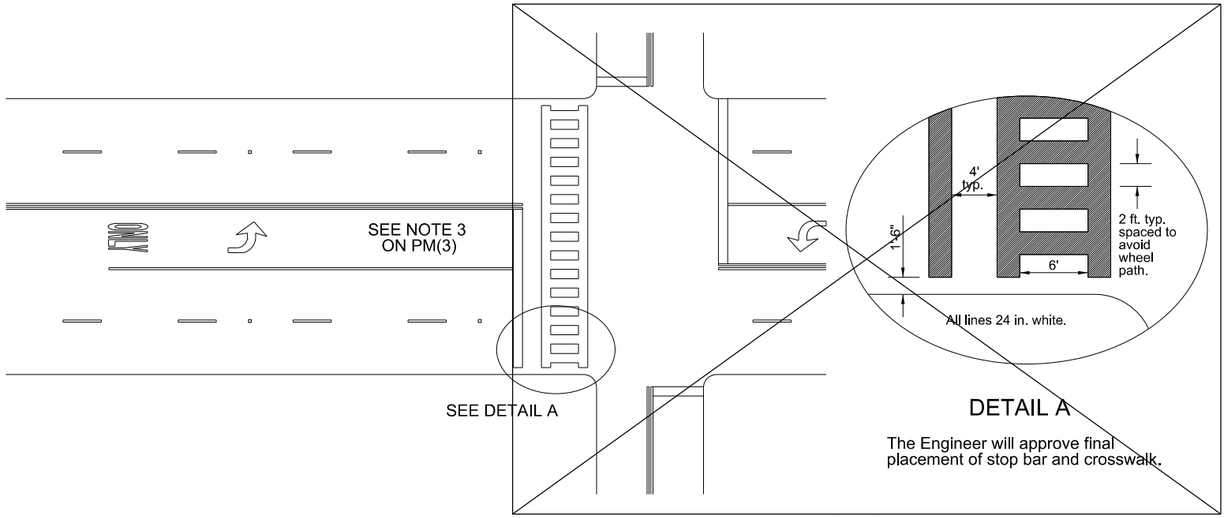
Texas Department of Transportation

TRAFFIC SAFETY IMPROVEMENTS

PROPOSED MEDIAN AND ISLAND DETAILS

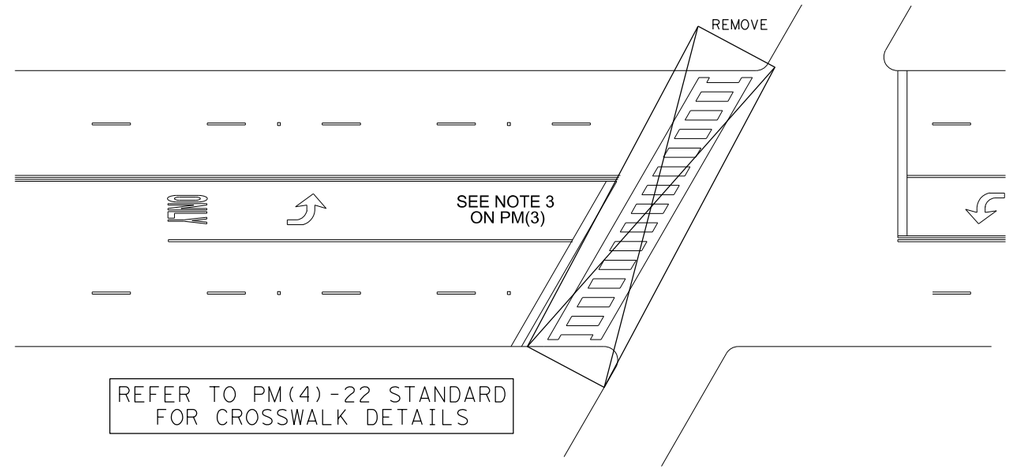
BRYANT BOULEVARD (US 87)
AT AVENUE N

DESIGN ASA	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS ASA	6	(SEE TITLE SHEET)		US 87
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK HMF	TEXAS	SJT	TOM GREEN	53
	CONTROL	SECTION	JOB	
CHECK HMF	0907	24	054	

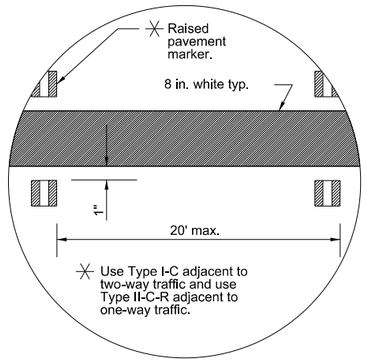


DETAILS FOR
TYPICAL INTERSECTION
WITH PERPENDICULAR CROSSWALK

REFER TO PM(4)-22 STANDARD
FOR CROSSWALK DETAILS



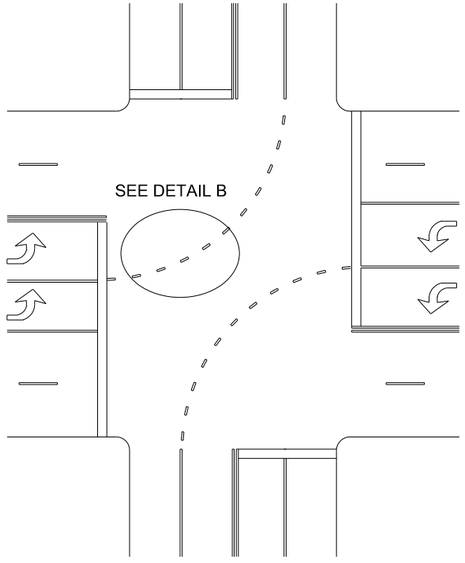
DETAILS FOR
TYPICAL INTERSECTION
WITH SKEWED CROSSWALK



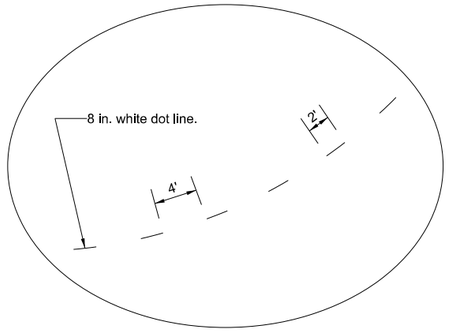
DETAIL C

PROJECT QUANTITIES OF WORDS AND ARROWS

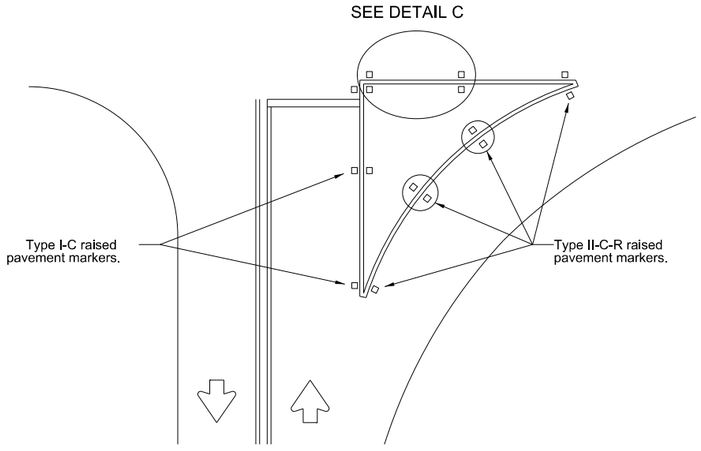
ONLY	STOP	AHEAD				
7	0	0	7	1	0	4
0	0	0	0	0	0	0



DETAILS FOR
TYPICAL INTERSECTION
WITH "CAT TRACKS"



DETAIL B



DETAILS FOR
TYPICAL INTERSECTION
WITH UNCURBED
CHANNELIZING ISLAND

5/25/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
PROFESSIONAL ENGINEER

THE AFFIXED SEAL ABOVE APPLIES
ONLY TO INFORMATION FILLED BY
ABOVE STATED ENGINEER.

Texas Department of Transportation

San Angelo District

PAVEMENT MARKING DETAILS (URBAN)

SHEET 1 OF 1 NOT TO SCALE

SHEET ISSUED OR LAST REVISED
11-19

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		54

DATE: 5/25/2022 8:20:22 PM
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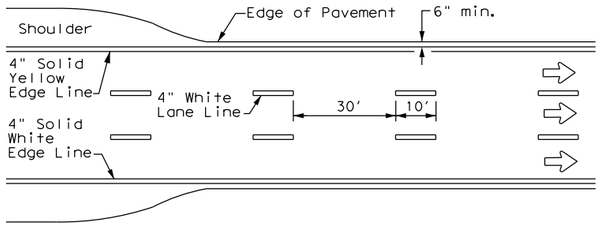
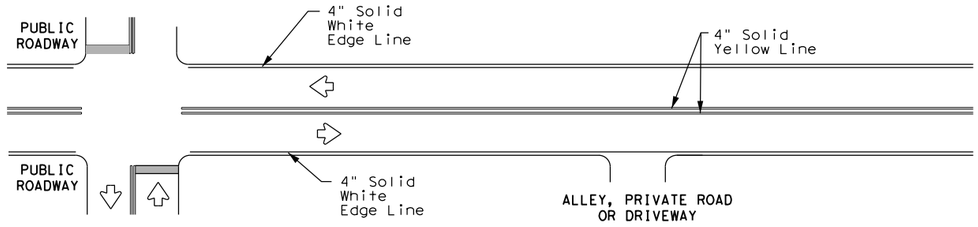
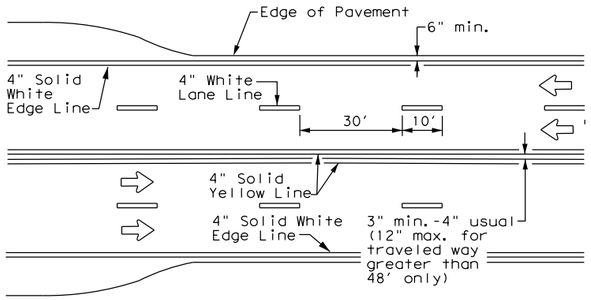


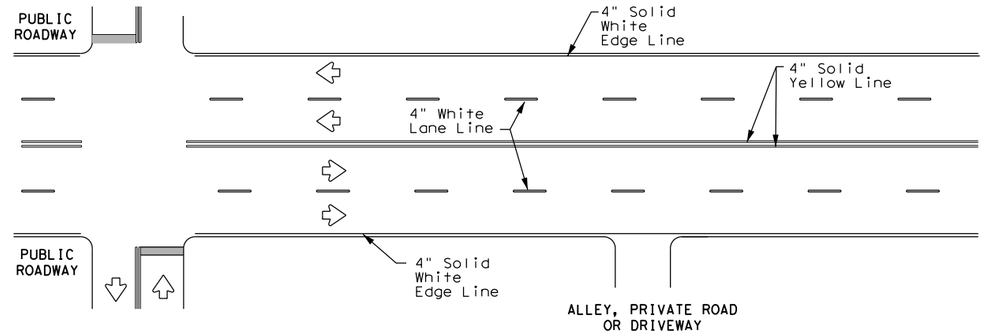
EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



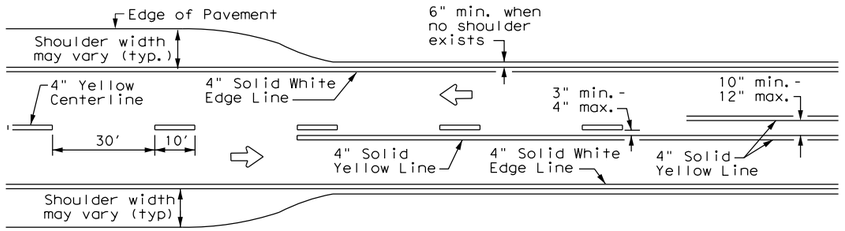
TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



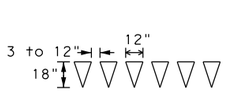
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



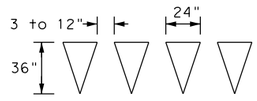
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

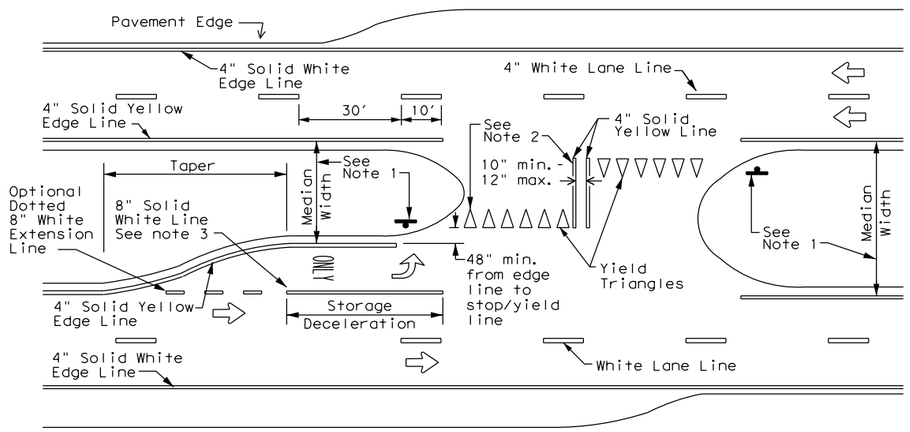


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

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

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

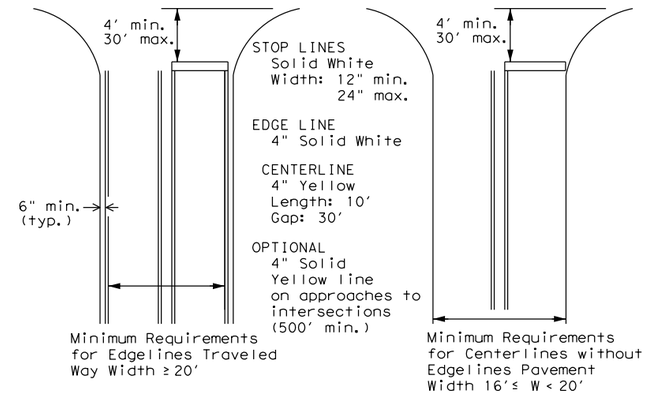
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

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

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



GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths
for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

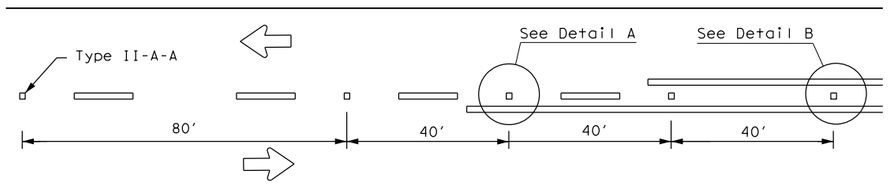
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0907	24	54	US 87
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	SJT	TOM GREEN		55

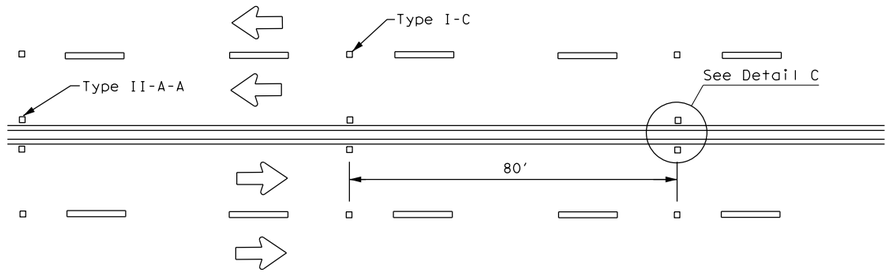
22A

DATE: DATE TIME
FILE: DOCUMENT NAME

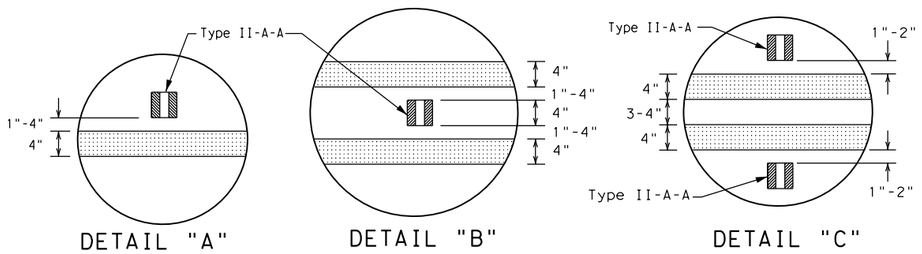
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



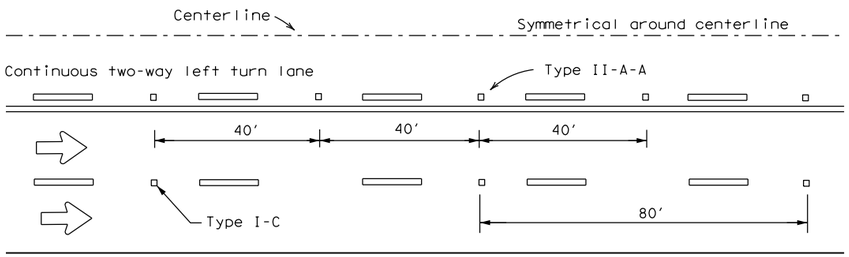
CENTERLINE FOR ALL TWO LANE ROADWAYS



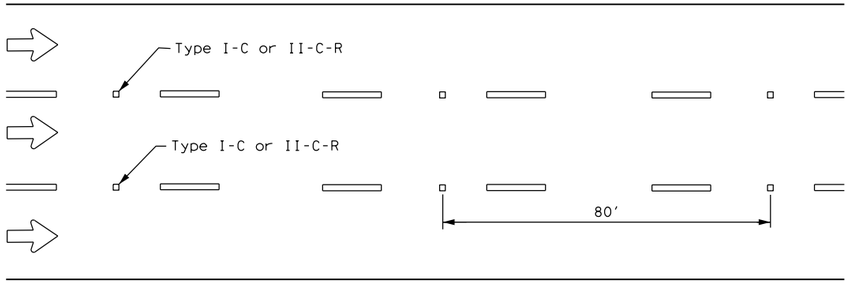
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" DETAIL "B" DETAIL "C"



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

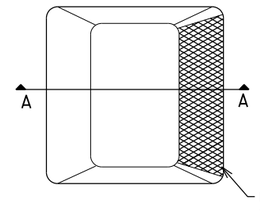


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

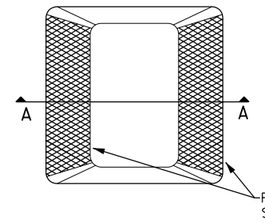
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

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

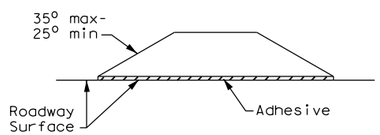
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

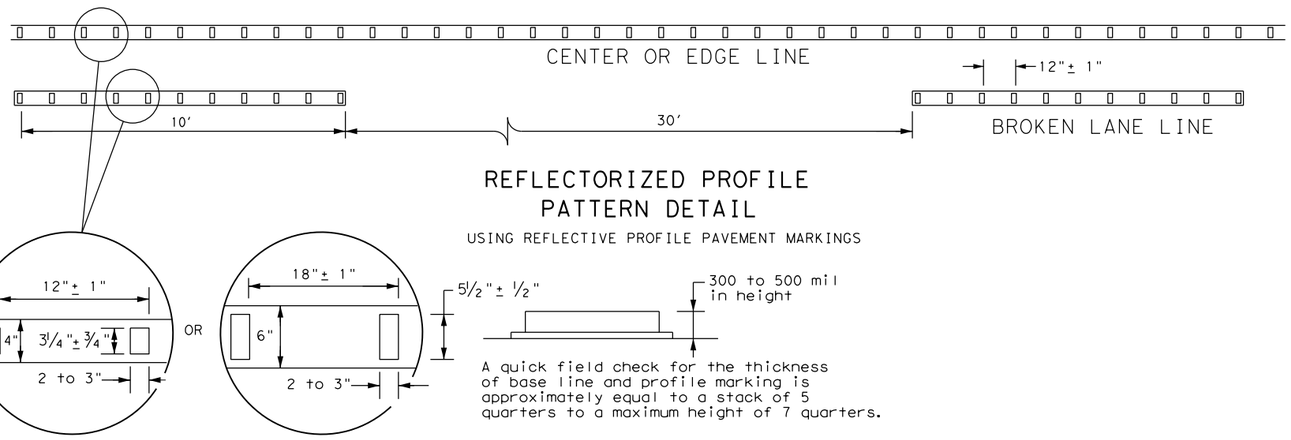


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

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

GENERAL NOTES

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

Texas Department of Transportation

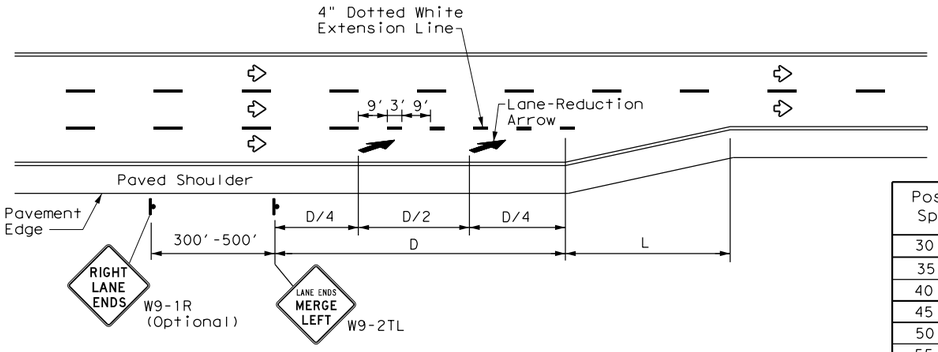
Traffic Safety Division Standard

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

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10	0907	24	54	US 87
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	SJT	TOM GREEN		56

22B

DATE: DATE TIME
FILE: DOCUMENT NAME

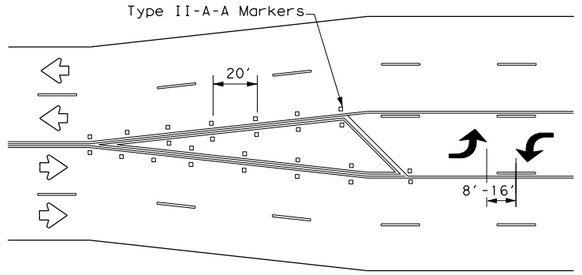


LANE REDUCTION

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

NOTES

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



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

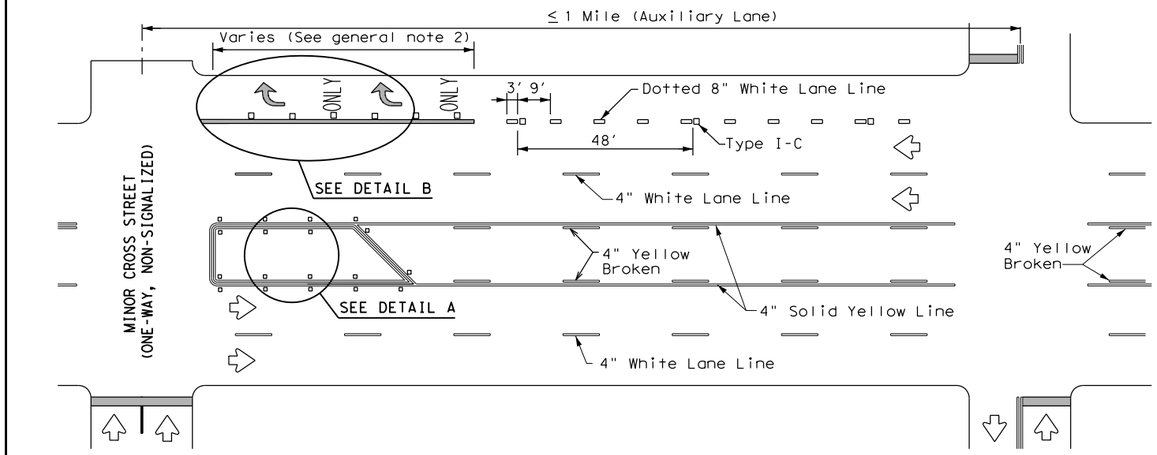
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

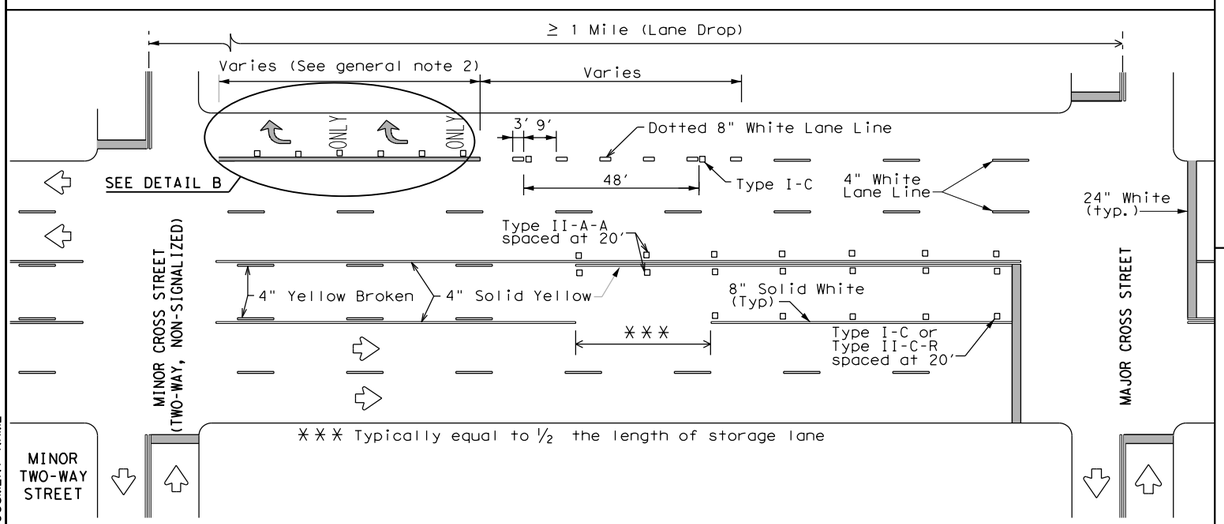
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn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

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

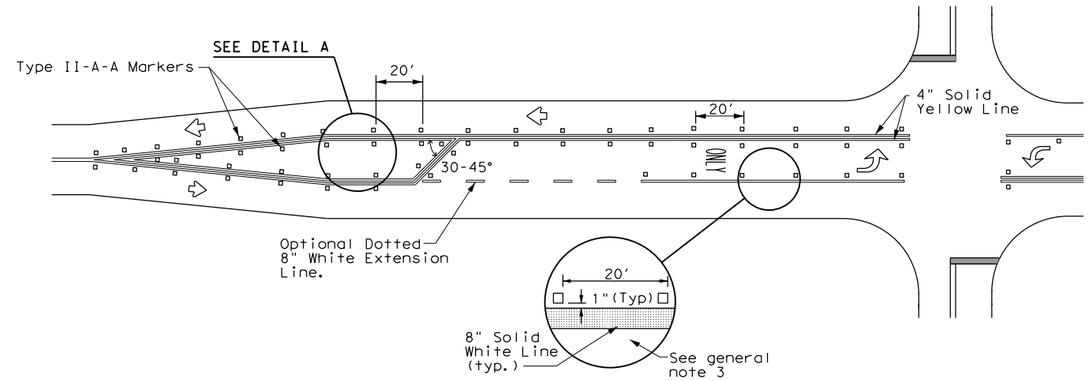
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



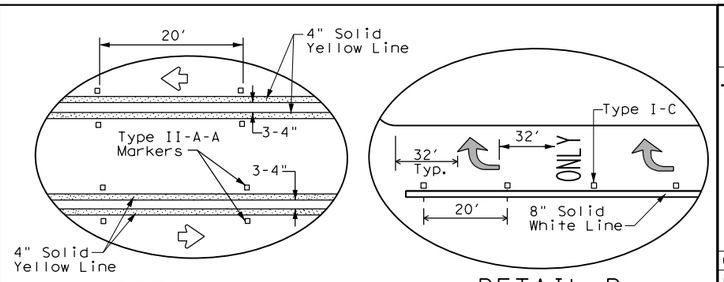
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



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



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



Texas Department of Transportation

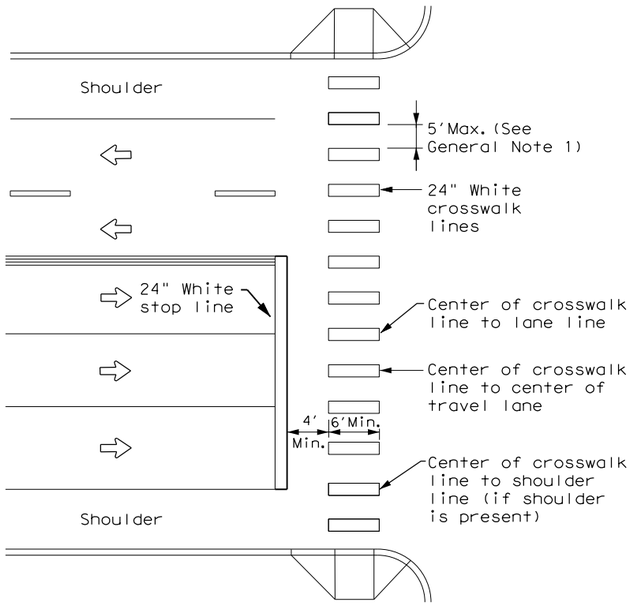
Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	SJT	TOM GREEN		57
3-03 6-20				

22C

DATE: DATE TIME
FILE: DOCUMENT NAME



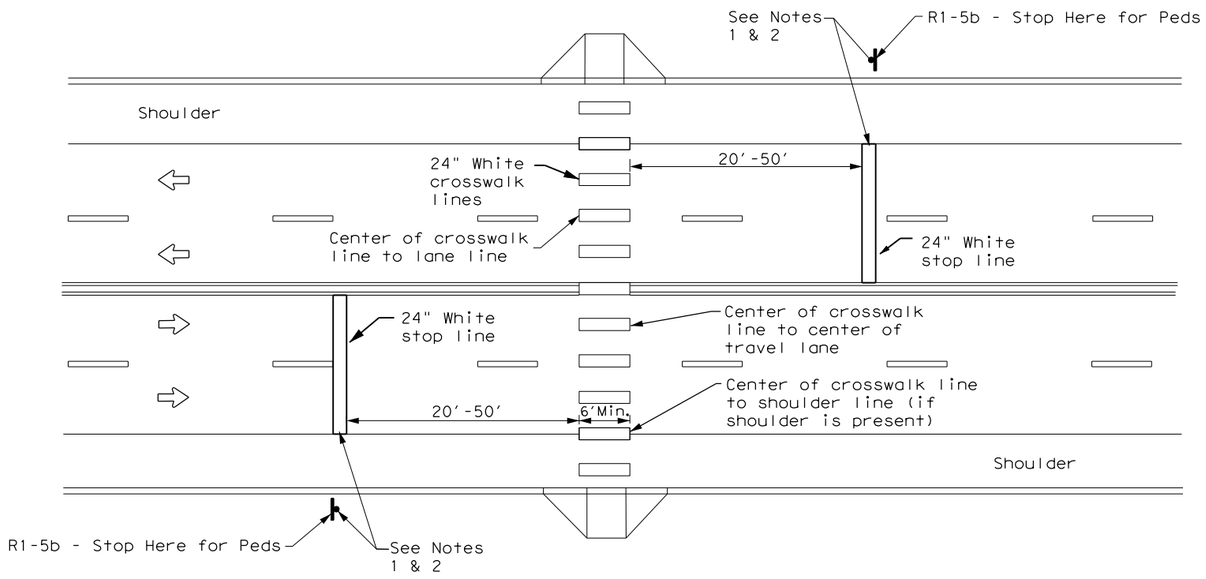
HIGH-VISIBILITY LONGITUDINAL CROSSWALK
AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

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

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



UNSIGNALIZED MID BLOCK HIGH-VISIBILITY
LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with "Stop Here for Pedestrians" signs at unsignalized mid block cross walks.
2. Use stop bars with "Stop Here on Red" signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation | Traffic Safety Division Standard

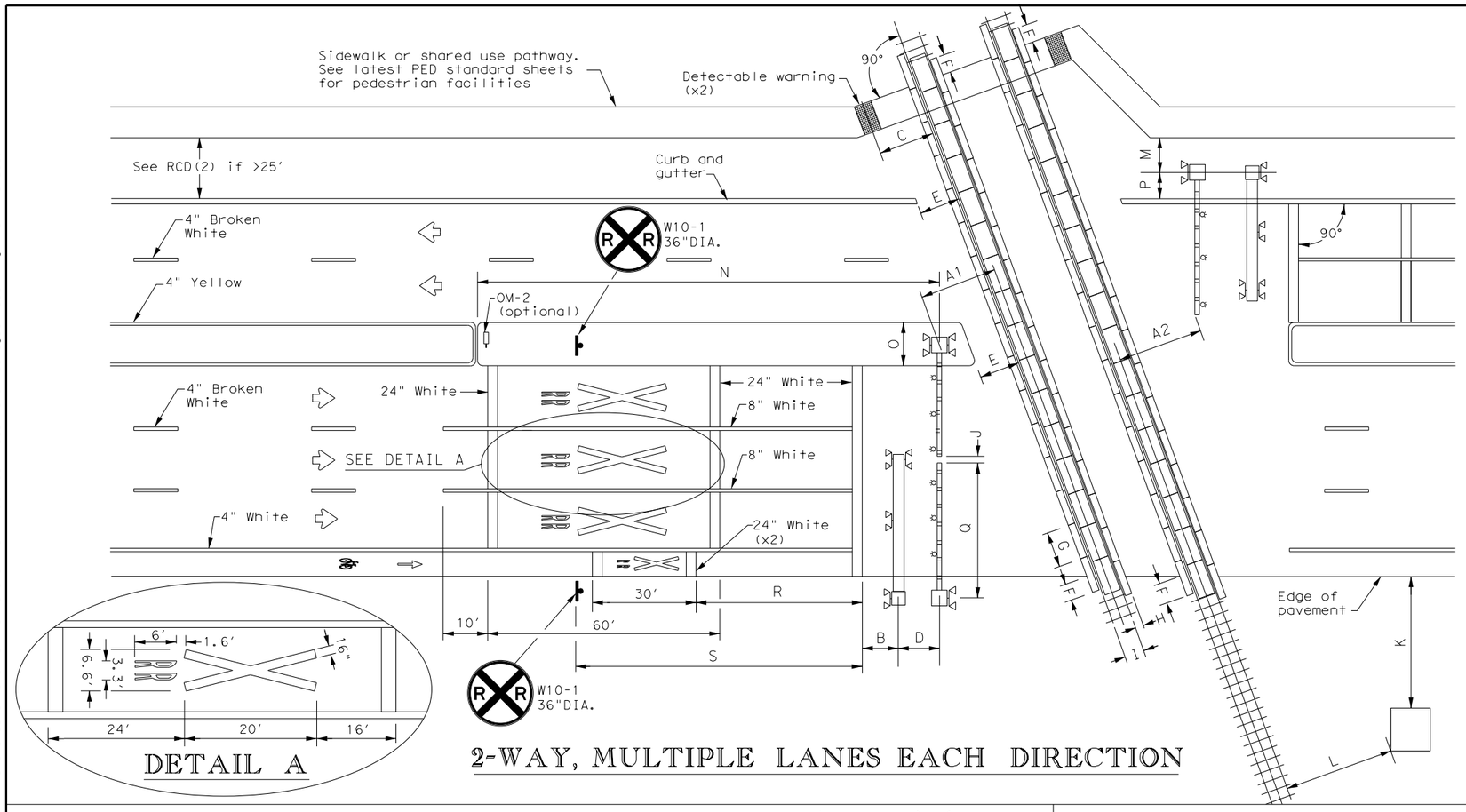
CROSSWALK PAVEMENT MARKINGS

PM(4)-22

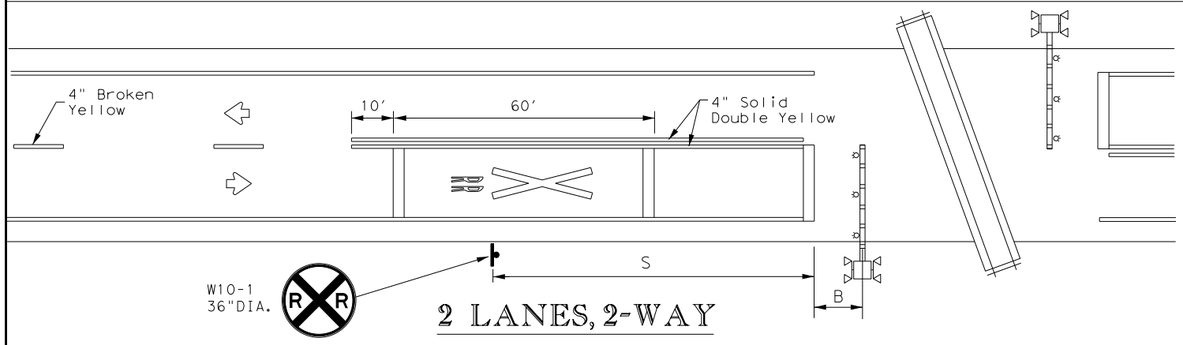
FILE: pm4-22.dgn	DN:	CK:	DW:	CK:
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 3-22	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		58

22D

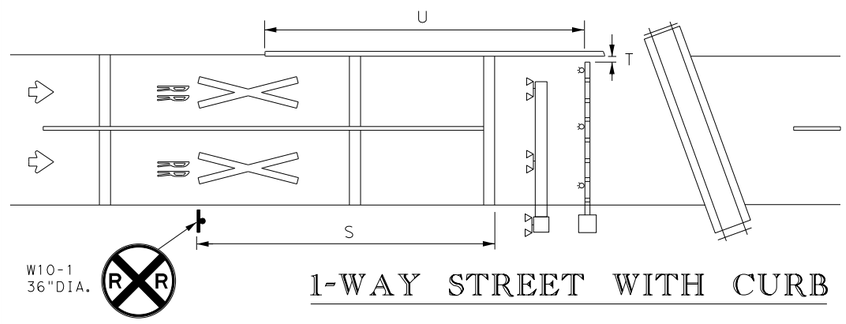
DATE: DATE TIME
FILE: DOCUMENT NAME



2-WAY, MULTIPLE LANES EACH DIRECTION



2 LANES, 2-WAY

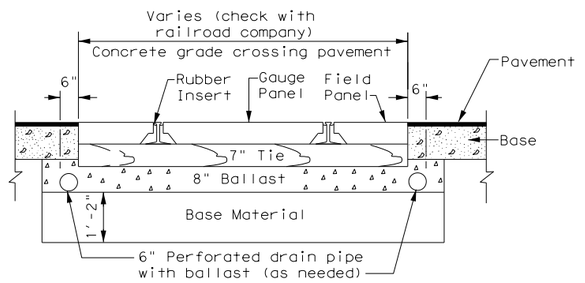


1-WAY STREET WITH CURB

NOTES

T: Tip of gate to edge of curb: 1' max for Quiet Zone SSM, 90% of traveled way covered by gates for all other locations

U: Non-traversable curb length from gate: 100' min. for a Quiet Zone SSM, 10' min for all other locations.



CROSSING SURFACE CROSS SECTION

NOTES

A1: Center of RR mast to center of rail: 12' minimum, 15' typical.

A2: Tip of gate to center of rail: 12' minimum, 15' typical.

B: Center of mast (cantilever, gate, or mast flasher) of nearest active traffic control device to stop line: 8' (NOTE: Stop line may be moved as needed, but should be at least 8' back from gates, if present).

C: Center of detectable warning device to nearest rail: 6' minimum

D: Center of gate mast to center of cantilever mast: 6' typical. NOTE: Cantilever may be located in front or behind gates.

E: Edge of median or curb to nearest rail: 10' typical. NOTE: Design median edge to be parallel with rail.

F: Edge of planking panel from edge of pavement or sidewalk: 3' minimum. NOTE: Field panels need not be in line with gauge panels.

G: Length of panels along rail: 8' typical.

H: Width of field panel: 2' typical (check with railroad company).

I: Distance between rails: 4'-8.5".

J: Tip of gate to tip of gate: 2' maximum for Quiet Zone SSM or 90% of traveled way covered by gates for all other locations.

K: Nearest edge of RR cabin from edge of pavement: 30' typical. NOTE: Cabinet not required to be parallel to edge of pavement.

L: Nearest edge of RR cabin from nearest rail: 25' typical.

M: Center of RR mast to edge of sidewalk: 6' minimum.

N: Center of gate mast to leading edge of non-traversable median: 100' minimum to qualify as a Quiet Zone SSM. NOTE: 60'will suffice if there is a street intersection within the 100' and all street intersections within 60' are closed.

O: Width of median: 8'-6" minimum, 10' typical when using median gates. NOTE: Center of gate mast minimum 4'-3" from face of curb.

P: Center of RR mast to face of curb: 4'-3" minimum.
Center of RR mast to edge of pavement (with shoulder): 6' minimum
Center of RR mast to edge of pavement (no shoulder): 8'-3" minimum
NOTE: BNSF prefers 5'-3", 7', and 9'-3" minimums, respectively.

Q: Gate length: 28' or less typical, but railroad company may allow up to 32'under special circumstances.

R: Stop line to first RR Crossing transverse line (bike lane): 50' typical.

S: Stop line to GRADE CROSSING ADVANCE WARNING (W10-1) sign and adjacent RR Crossing pavement markings. See Table 1. See RCD(2) for other signs.

TABLE 1	
Approach Speed(mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

LEGEND	
	Sign
	Object Marker
	Traffic Flow
	Cantilever
	Gate Assembly
	Mast Flasher Pair

GENERAL NOTES

1. Medians and curbs must be non-traversable to qualify as a Quiet Zone Supplementary Safety Measure (SSM). Non-traversable curbs in Quiet Zones are 6" tall minimum and used on roadways where speed does not exceed 40 mph.
2. Raised pavement markers may be used to supplement striping. See PM(2) and PM(3) standard sheets.
3. Medians preferred whenever possible to prevent vehicles from driving around gates.
4. Longitudinal edge striping may be continued thru crossing as needed. Illumination may also be considered for nighttime visibility.
5. See SMD standard sheets for sign mounting details.
6. See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.

Texas Department of Transportation

Traffic Operations Division Standard

RAILROAD CROSSING DETAILS SIGNING, STRIPING, AND DEVICE PLACEMENT

RCD(1)-16

FILE: rcd1-16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		59

DATE: DATE TIME
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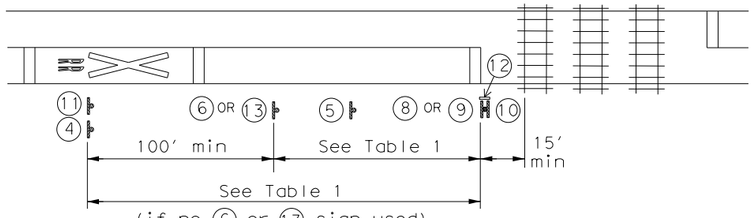
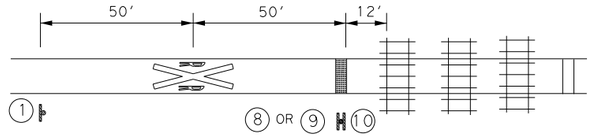


NOTES

1. Stop or yield sign may also be installed to the left of the crossbuck sign, rather than below it.
2. A 2" white retroreflective strip shall be installed on front and back of crossbuck sign post.

PASSIVE CROSSING



NOTES

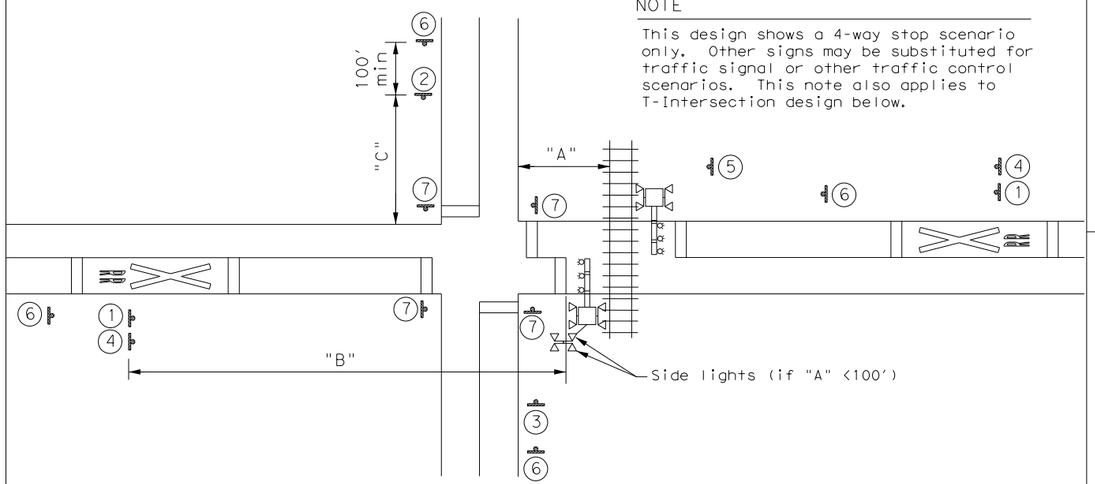
1. A shared use pathway is considered a separate pathway crossing when more than 25′ from traveled way of adjacent roadway.
2. Detectable warning used at stop bar.
3. Smaller sign sizes preferred than shown to the right on this sheet.

PATHWAY CROSSING

TABLE 1	
Approach Speed (mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

GENERAL NOTES

1. Railroad company to provide active traffic control devices, CROSSBUCK (R15-1), NUMBER OF TRACKS Plaque (R15-2P) (if more than 1 track), and EMERGENCY NOTIFICATION (I-13) signs.
2. LOW GROUND CLEARANCE (W10-5) signs may be relocated further upstream of crossing to provide advance warning of alternate route.
3. GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-2) signs may be modified as needed to fit roadway geometry.
4. Table 1 placement distances may vary per Sect. 2C.05 of the TMUTCD.
5. See Table 1 to determine placement of STOP AHEAD (W3-1) and YIELD AHEAD (W3-2) signs unless shown otherwise.
6. DO NOT STOP ON TRACKS (R8-8) signs installed when potential for vehicles stopping on tracks is significant as determined by sealing engineer. Install so sign does not block view of RR mast.
7. See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.

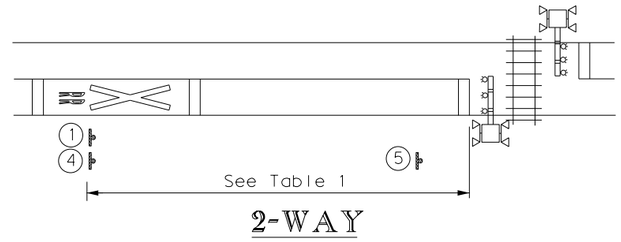


NOTE

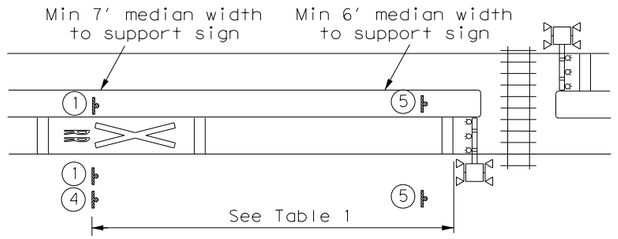
This design shows a 4-way stop scenario only. Other signs may be substituted for traffic signal or other traffic control scenarios. This note also applies to T-Intersection design below.

	"A" <100′	"A" ≥100′
"B"	See Table 1. Place pavement markings and signs on opposite side of intersection from rail if spacing from Table 1 would put markings within intersection.	See Table 1. Place pavement markings and signs between rail and intersection if spacing from Table 1 would put markings within intersection.
"C"	See Table 1.	GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-2, W10-3, W10-4) signs should only be installed if W10-1 sign is not between intersection and railroad crossing. If needed, see Table 1.

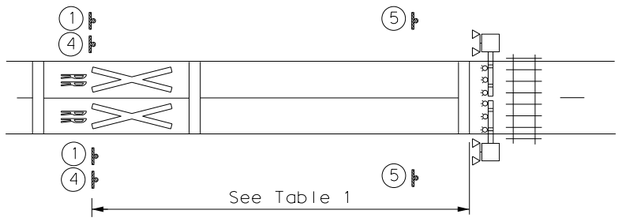
GRADE CROSSING NEAR A PARALLEL STREET



2-WAY

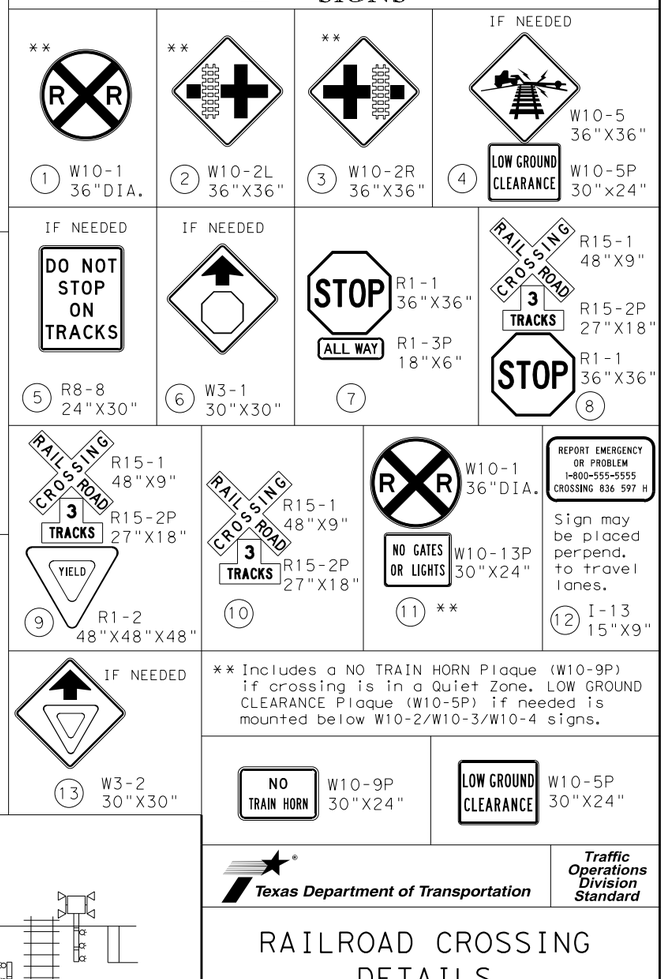


2-WAY WITH MEDIAN

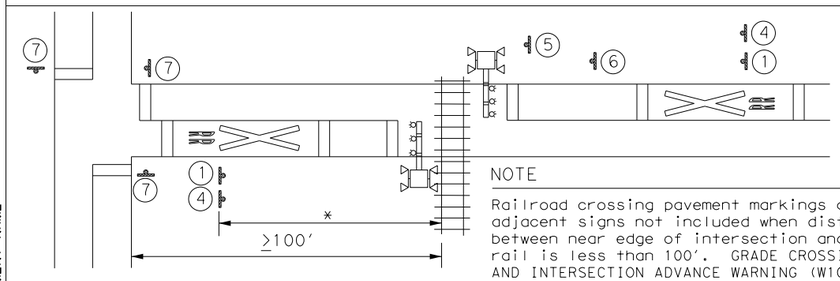


1-WAY

SIGNS



** Includes a NO TRAIN HORN Plaque (W10-9P) if crossing is in a Quiet Zone. LOW GROUND CLEARANCE Plaque (W10-5P) if needed is mounted below W10-2/W10-3/W10-4 signs.

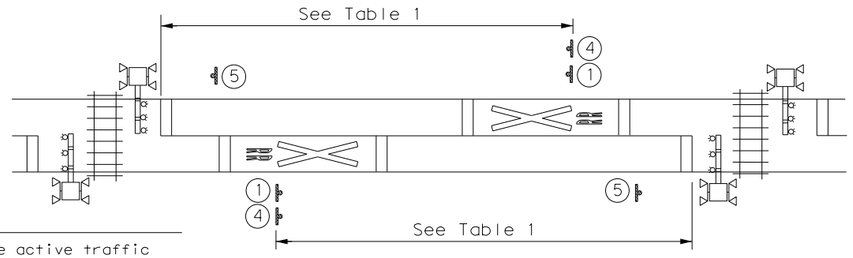


*Use Table 1 if sufficient space exists.

NOTE

Railroad crossing pavement markings and adjacent signs not included when distance between near edge of intersection and near rail is less than 100′. GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-3) signs installed on roadway parallel with rail in this case.

T-INTERSECTION



NOTE

Separate active traffic control devices, railroad crossing pavement markings, and adjacent signs required when tracks are more than 100′ apart.

2 ADJACENT CROSSINGS

Texas Department of Transportation

Traffic Operations Division Standard

RAILROAD CROSSING DETAILS SIGNING & STRIPING

RCD(2)-16

FILE: rcd2-16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		60

DATE: DATE TIME
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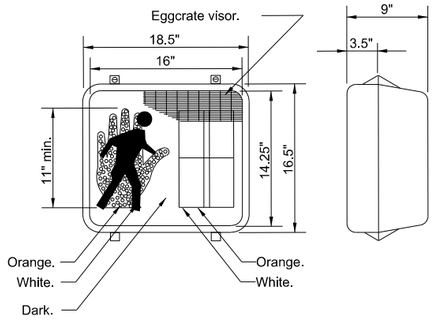
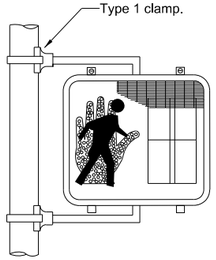


LED COUNTDOWN PEDESTRIAN HEAD DETAILS

Pedestrian signal heads shall be equipped with eggcrate visors and shall comply with material specifications TO-7062 and TO-7063. Both symbolic pedestrian signal indications shall be solid. Outlined indications are not acceptable.



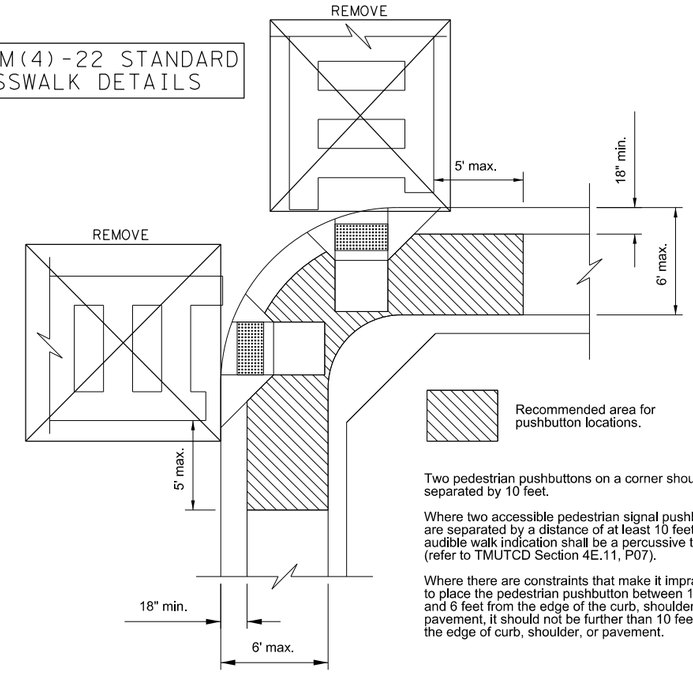
PEDESTRIAN SIGNAL HEAD MOUNTING FOR ONE PEDESTRIAN SIGNAL HEAD

The pole on this drawing is shown as an example only. Poles of similar design for any cross section which meets the specifications shown on these drawings and are approved by the Engineer will be deemed acceptable.

GENERAL NOTES

1. Mount pedestrian signal heads with Type 1 clamps and appropriate tubing.
2. Install pole mounted pedestrian heads on the away-from-traffic side of the pedestal or mast arm pole.
3. Totally enclose wiring for pedestrian signals within the signal mounting hardware.
4. All pedestrian signal heads and pushbutton signs shall display the symbolized messages shown.

REFER TO PM(4)-22 STANDARD FOR CROSSWALK DETAILS

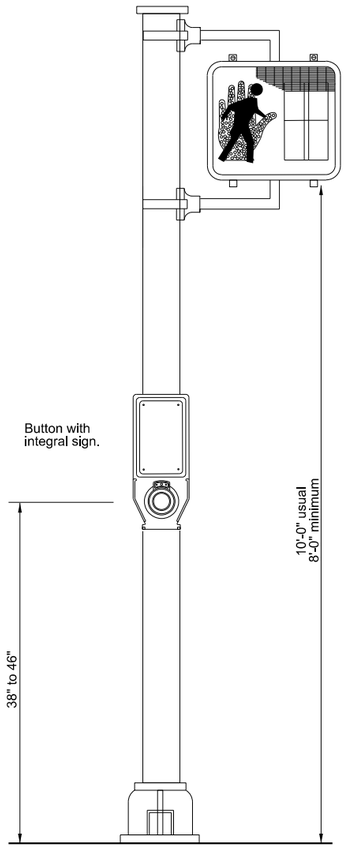


Two pedestrian pushbuttons on a corner should be separated by 10 feet.

Where two accessible pedestrian signal pushbuttons are separated by a distance of at least 10 feet, the audible walk indication shall be a percussive tone (refer to TMUTCD Section 4E.11, P07).

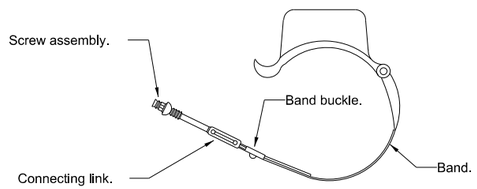
Where there are constraints that make it impracticable to place the pedestrian pushbutton between 1.5 feet and 6 feet from the edge of the curb, shoulder, or pavement, it should not be further than 10 feet from the edge of curb, shoulder, or pavement.

PUSHBUTTON LOCATION AREA



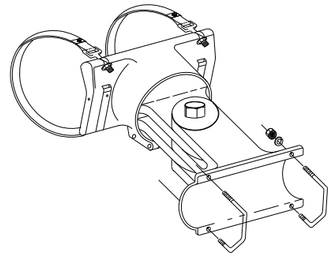
PEDESTAL POLE

Tactile arrows shall be located on the pushbutton and shall be aligned parallel to the direction of travel on the associated crosswalk (refer to TMUTCD Section 4E.12, P01).



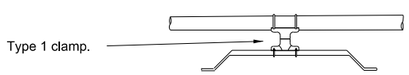
TYPE 1 CLAMP

Clam shell mounting hardware may be used instead of mounting hardware shown above, as approved by the Engineer. These shall be ICC P/N 4805 or McCain Quickmount, or approved equal.

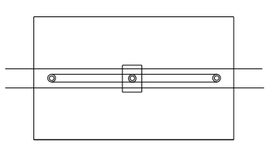


TYPE 2 CLAMP KIT

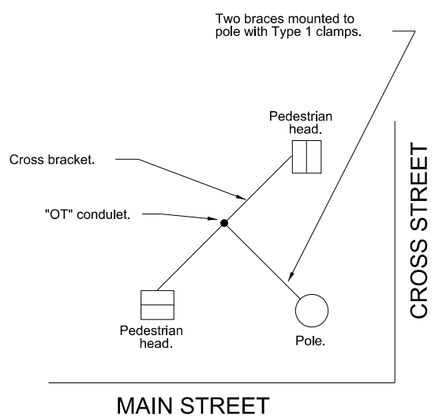
Furnish and install Type 2 clamp kit when rotation about the horizontal and vertical axes is required.



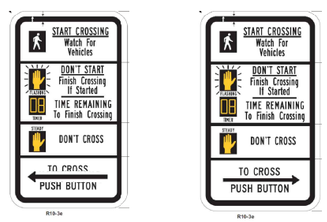
Use one clamp on signs less than or equal to 10 ft. long.
Use two clamps on signs greater than 10 ft. long.



SIGN ATTACHMENT FOR MAST ARMS



PEDESTRIAN SIGNAL HEAD MOUNTING FOR TWO PEDESTRIAN SIGNAL HEADS



sign R10-3eL 9"X15"

sign R10-3eR 9"X15"

SIGN DETAILS

5/25/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
PROFESSIONAL ENGINEER

THE AFFIXED SEAL ABOVE APPLIES ONLY TO INFORMATION FILLED BY ABOVE STATED ENGINEER.

Texas Department of Transportation

San Angelo District

TRAFFIC SIGNAL DETAILS

SHEET 1 OF 1 NOT TO SCALE

©TxDOT $YEAR$	CONT	SECT	JOB	HIGHWAY
SHEET ISSUED OR LAST REVISED	0907	24	54	US 87
11-19	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		61

DATE: 5/25/2022 8:20:24 PM
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5/25/2022 6:45:35 PM
K:\DAL*TPTO\Project\064586903 - San Angelo RTZ Signal Design\CADD\Standards\SMA-80(1)-12.dgn

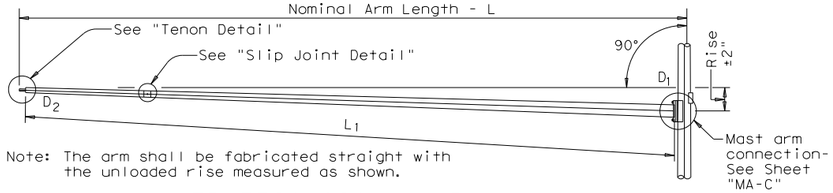
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	10.5	7.8	7.1	6.3	.179	11.5	8.5	7.7	6.8	.179	30-A
24	11.0	8.3	7.6	6.8	.179	12.0	9.0	8.2	7.3	.179	30-A
28	11.5	8.8	8.1	7.3	.179	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	② 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.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 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)

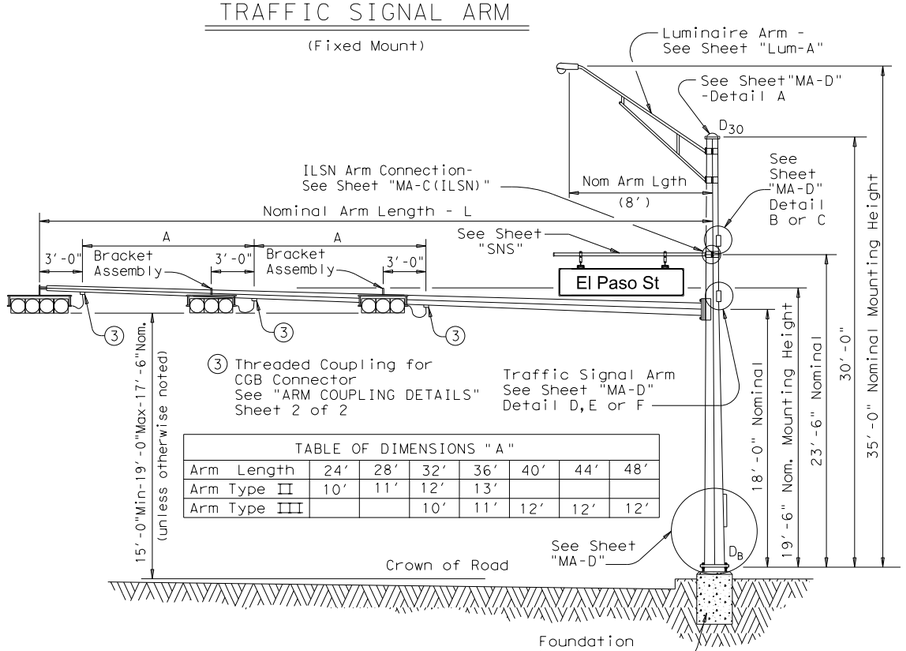


TABLE OF DIMENSIONS "A"							
Arm Length	24′	28′	32′	36′	40′	44′	48′
Arm Type II	10′	11′	12′	13′			
Arm Type III			10′	11′	12′	12′	12′

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

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

Nominal Arm Length	30′ Poles With Luminaire		24′ Poles With ILSN		19′ Poles With No Luminaire and No ILSN	
	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	2	28S-80		28-80	
32	32L-80	1	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	1	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	2		
32			32II-80	1	32III-80	
36			36II-80		36III-80	
40					40III-80	
44					44III-80	
48					48III-80	1

Luminaire Arms (1 per 30′ pole)

Nominal Arm Length	Quantity
8′ Arm	4

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 ½"	3′-4"	3
1 ¾"	3′-10"	1

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

Templates may be removed for shipment.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(1)-12

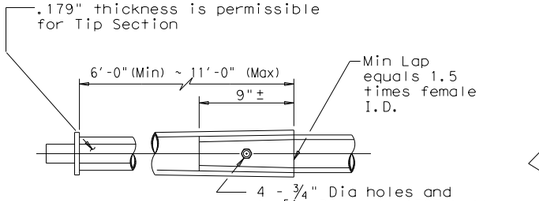
DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
11-99
1-12

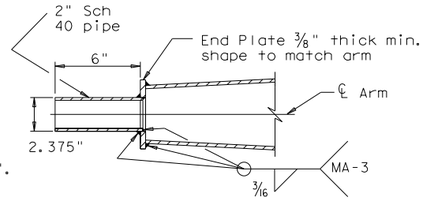
CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		62

122A

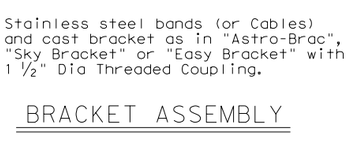
DATE:
FILE:



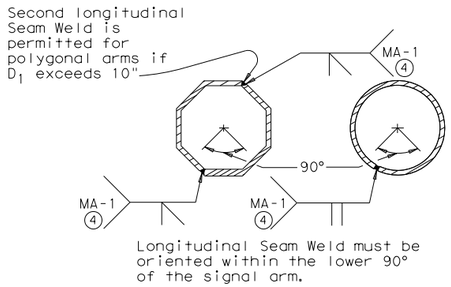
SLIP JOINT DETAIL



TENON DETAIL

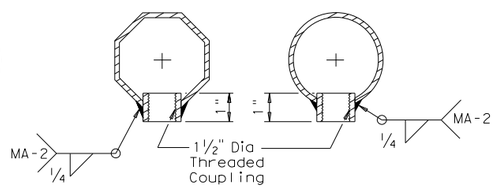


BRACKET ASSEMBLY



ARM WELD DETAIL

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



ARM COUPLING DETAILS

VIBRATION WARNING

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

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

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

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

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

GENERAL NOTES:

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

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

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

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

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

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

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(2)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		63

122B

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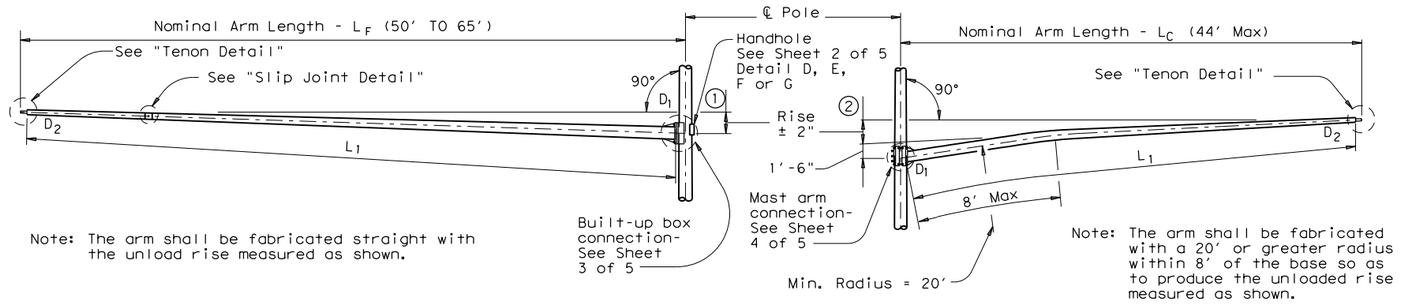


Note: The arm shall be fabricated straight with the unload rise measured as shown.

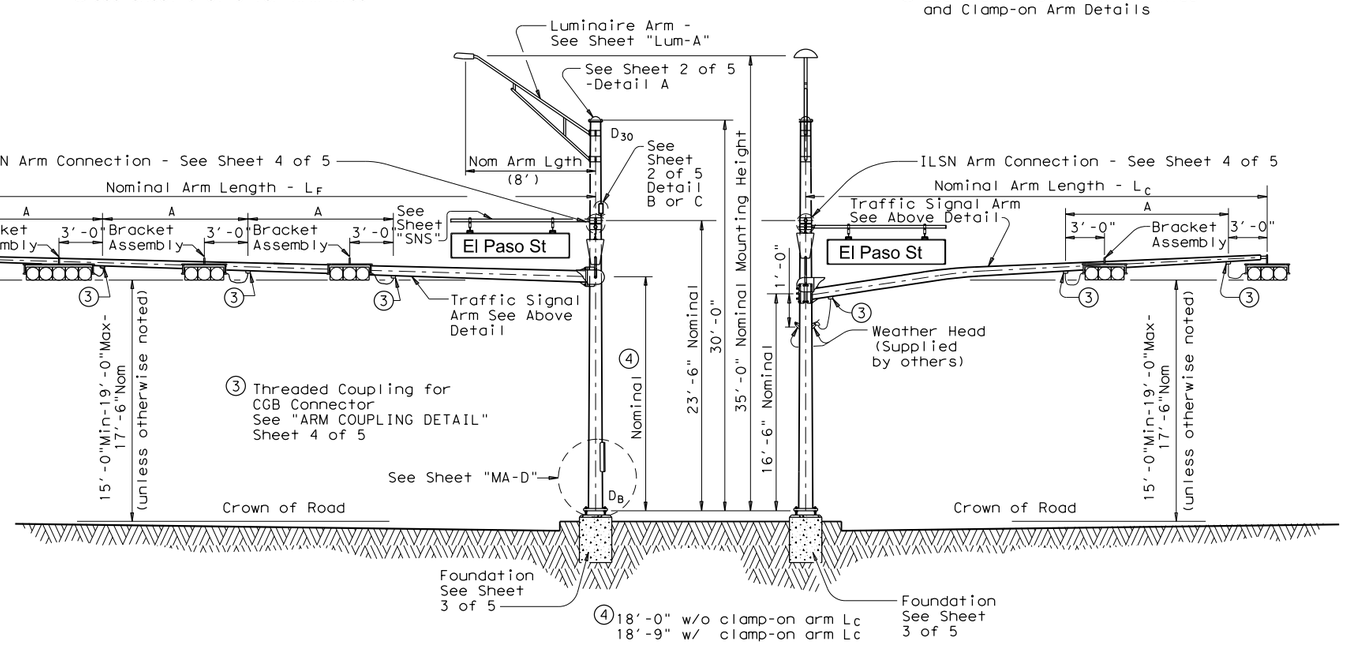
Note: The arm shall be fabricated with a 20' or greater radius within 8' of the base so as to produce the unloaded rise measured as shown.

FIXED MOUNT TRAFFIC SIGNAL ARM

① See Sheet 3 of 5 for Arm Rise

CLAMP-ON TRAFFIC SIGNAL ARM (IF REQUIRED)

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



ELEVATION

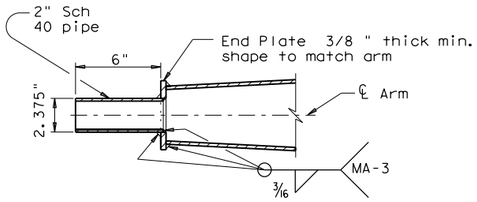
(Showing fixed mount arm)

STRUCTURE ASSEMBLY

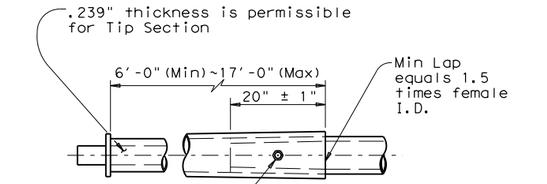
ELEVATION

(Showing clamp-on arm)

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



TENON DETAIL



Note: A slip joint is permissible for arms 50' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

4 - ¾" Dia holes and 1- ⅝" Dia galv A307 bolt. Tack weld nut to thread projection after making joint. Repair damaged galvanizing in accordance with Item 445, "Galvanizing".

SLIP JOINT DETAIL (FIXED MOUNT ARM)

GENERAL NOTES:

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

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

Each arm with its related attachment is shown below

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

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

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

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

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

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

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

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

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

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

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

LMA(1)-12

Sheet 1 of 5

REVISIONS
4-20-01
1-12

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

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		64

131A

DATE:
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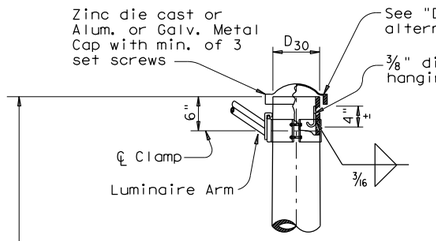
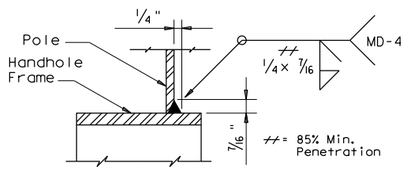
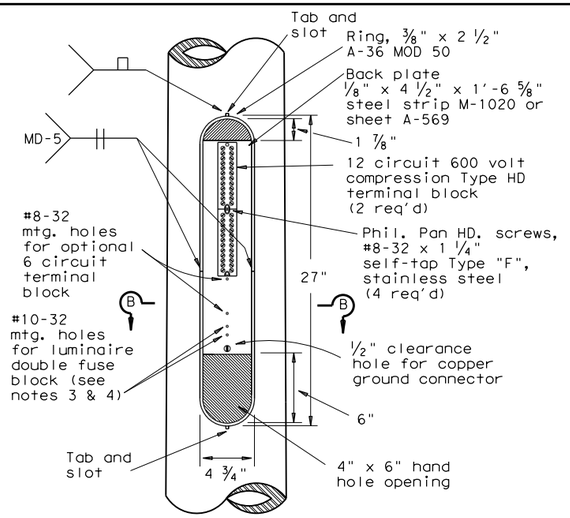


DETAIL A

(for pole with luminaire)



DETAIL H

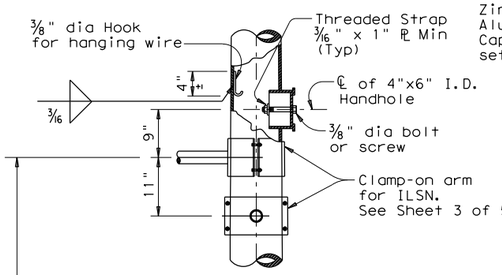


ACCESS COMPARTMENT

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

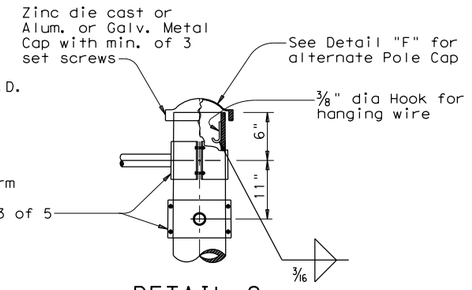
(7) ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

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

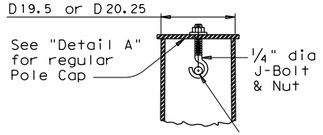


DETAIL B

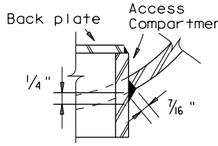
(If ILSN applied)



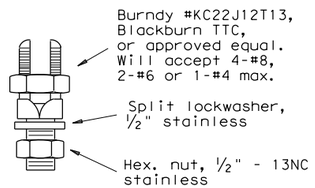
DETAIL C



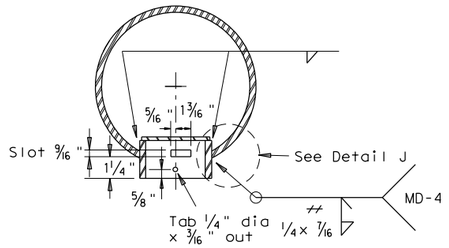
SECTION Y-Y



DETAIL J



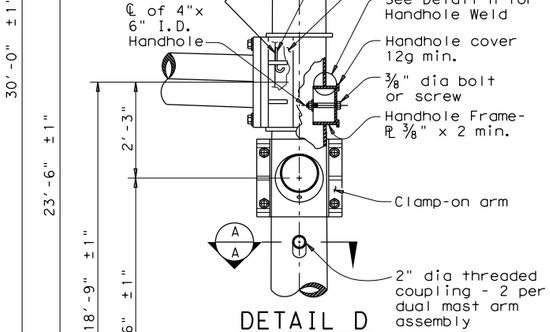
COPPER GROUND CONNECTOR



SECTION B-B

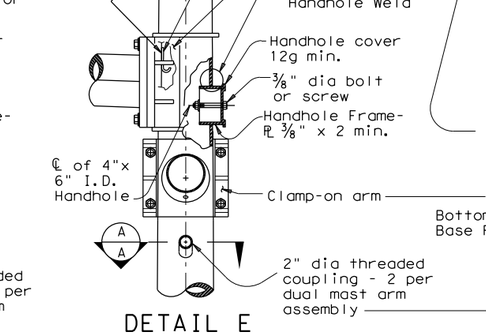
// = 85% Min. Penetration

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.



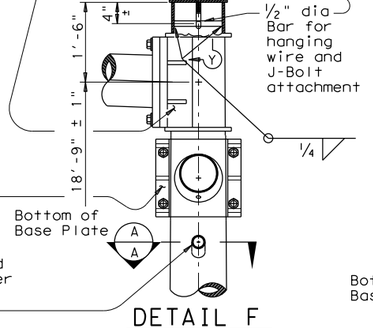
DETAIL D

(for 30' pole with luminaire and ILSN sign)



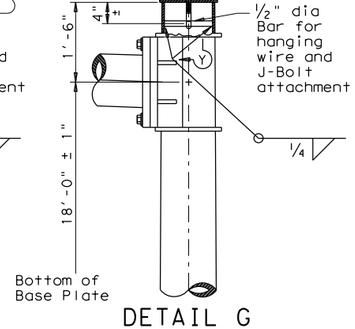
DETAIL E

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



DETAIL F

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

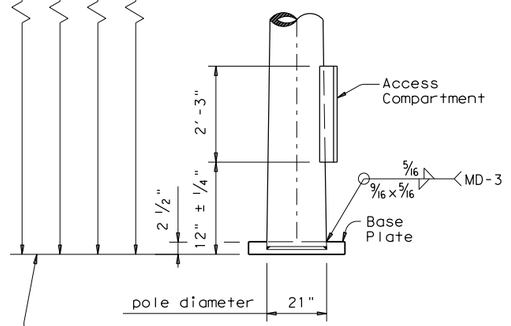


DETAIL G

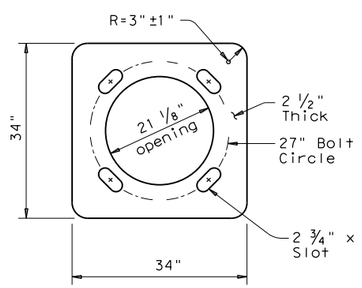
(for 19.5' pole with no ILSN sign and no luminaire, single mast arm)

ACCESS COMPARTMENT NOTES:

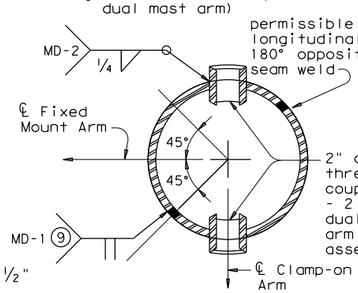
1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. 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 Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. 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.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.



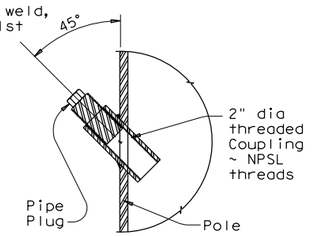
POLE ELEVATION



BASE PLATE



SECTION A-A



POLE COUPLING DETAIL

(9) Longitudinal seam weld must be oriented within 90° (45° rotation each side) along the fixed mount arm. 60% min penetration required, 100% penetration within 6" of circumferential base weld.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

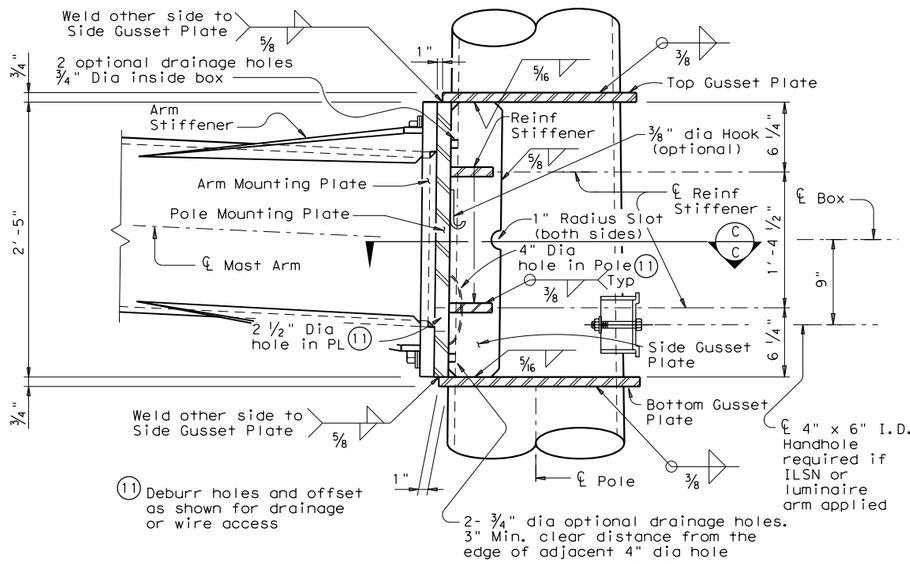
Sheet 2 of 5

LMA(2)-12

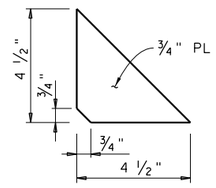
DN: JSY	CK: ARC	DW: TGG	CK: JSY

REVISIONS	CONT	SECT	JOB	HIGHWAY
4-20-01 1-12	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		65

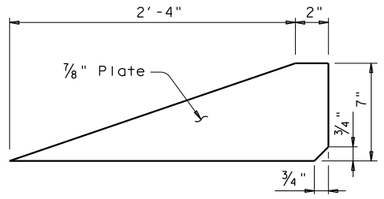
131B



BUILT-UP BOX CONNECTION

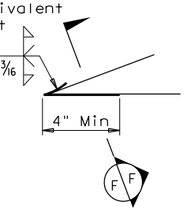


REINFORCING STIFFENER



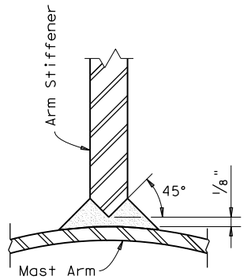
ARM STIFFENER
(Cut to match arm inclination and taper)

Provide Detail shown in SECTION F-F or equivalent 100% complete joint penetration weld from both sides.



Only 4" length at tip of Arm Stiffener requires a complete joint penetration weld. Smooth weld radius to connect Stiffener. Only a fillet weld is required for the remaining weld length.

DETAIL "K"



SECTION F-F

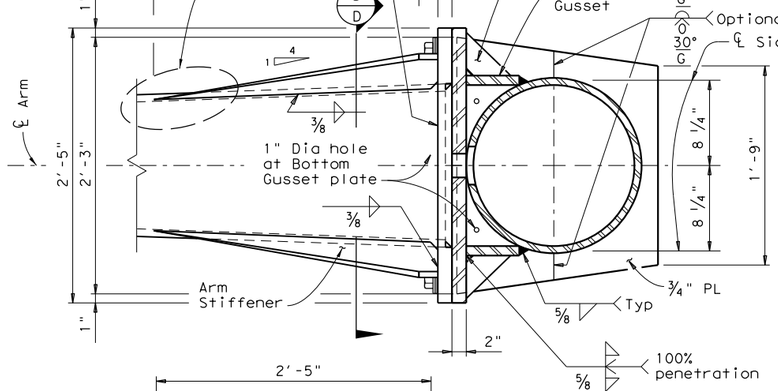
Fixed Mount Arm L_F	ROUND POLES (13)					Foundation Type
	D_B	$D_{19.5}$ or $D_{20.25}$	D_{24}	D_{30}	(12) thk	
ft.	in.	in.	in.	in.	in.	
50', 55' 60', 65'	21.0	18.2	17.6	16.8	.3125	48-A

Fixed Mount Arm L_F	ROUND ARMS (13)				
	L_1	D_1	D_2	(12) thk	Rise
ft.	ft.	in.	in.	in.	
50	49	18.5	11.7	.3125	3'- 3"
55	54	18.5	11.0	.3125	3'- 7"
60	59	18.5	10.3	.3125	3'-11"
65	64	18.5	9.6	.3125	4'- 4"

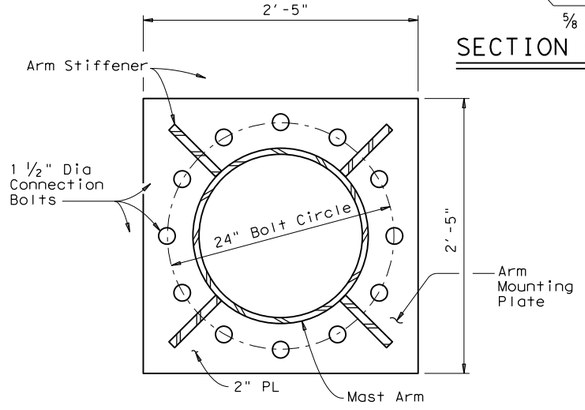
D_B = Pole Base O.D.
$D_{19.5}$ = Pole Top O.D. with no Luminaire and no ILSN (single mast arm)
$D_{20.25}$ = Pole Top O.D. with no Luminaire and no ILSN (dual mast arm)
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L_F = Fixed Arm Length

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

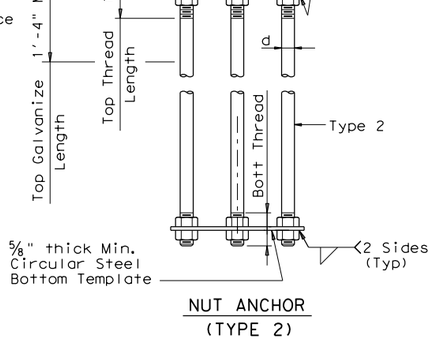
(13) Shaft profile 16-sided or 18-sided is considered to be equivalent to round section.



SECTION C-C

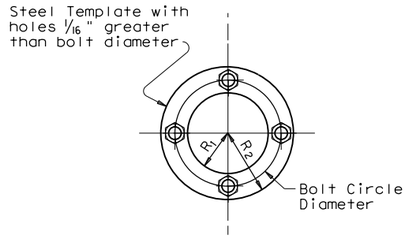


SECTION D-D



NUT ANCHOR
(TYPE 2)

ANCHOR BOLT ASSEMBLY



TEMPLATE DETAIL

ANCHOR BOLT & TEMPLATE SIZE						
Bolt Dia in.	Length ‡	Top Thread	Bottom Thread	Bolt Circle	R_2	R_1
2 1/2"	5'-2"	10"	6 1/2"	27"	16"	11"

‡ Min dimension given, longer bolts are acceptable.

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

SEE SHEET "TS-FD" FOR ADDITIONAL DETAILS.

(14) Anchor bolt design develops the foundation capacity given under Foundation Design Laods.

(15) Foundation Design Loads are the allowable moments and shears at the base of the structure.

(16) Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

(17) If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

(18) Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

GENERAL NOTES:

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

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

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

Texas Department of Transportation

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

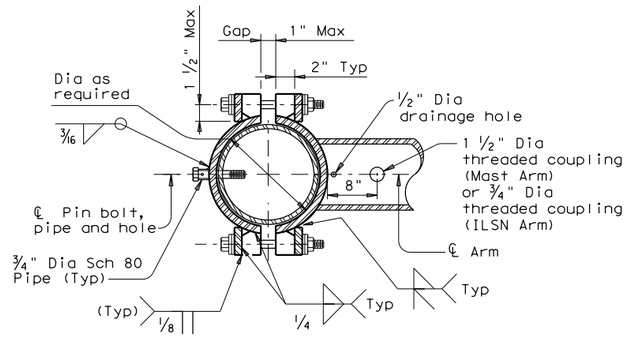
Sheet 3 of 5 LMA(3)-12

DN: JSY	CK: ARC	DW: TGG	CK: JSY

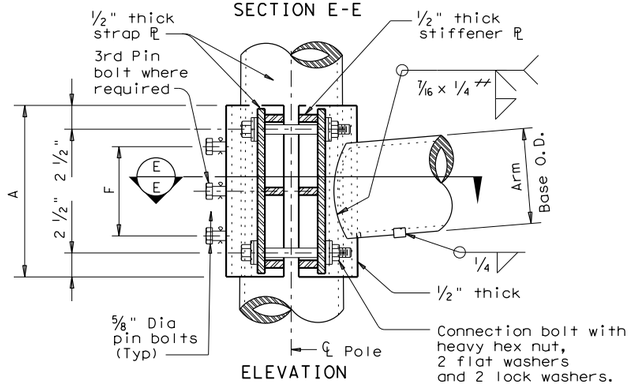
REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		66

131C



SECTION E-E



ELEVATION
(Mast Arm or ILSN Arm to pole)

= 85% Min. Penetration

CLAMP-ON CONNECTION

80 MPH WIND

Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	thk (12)	Rise	L_1	D_1	D_2	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-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"

100 MPH WIND

Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	thk (12)	Rise	L_1	D_1	D_2	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

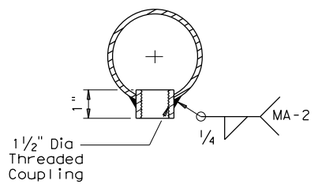
D1 = Arm Base O.D.
D2 = Arm End O.D.
L1 = Shaft Length
Lc = Clamp-on Arm Length

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

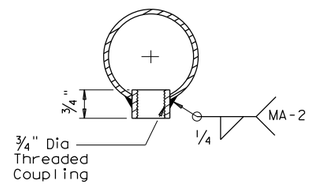
CLAMP-ON ARM CONNECTION

ILSN Arm Size		A	F	4 Conn. Bolts	5/8" Dia. Pin Bolts
Sch 40 pipe Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
3	.216	10	4	¾	2

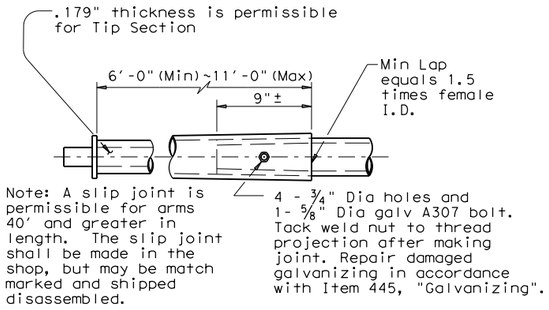
Mast Arm Size		A	F	4 Conn. Bolts	5/8" Dia. Pin Bolts
Base Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
6.5	.179	12	6	1	2
7.5	.179	14	8	1	2
8.0	.179	14	8	1	2
9.0	.179	16	10	1	2
9.5	.179	18	12	1 ¼	3
9.5	.239	18	12	1 ¼	3
10.0	.239	18	12	1 ¼	3
10.5	.239	18	12	1 ¼	3
11.0	.239	18	12	1 ¼	3
11.5	.239	18	12	1 ¼	3



ARM COUPLING DETAIL



ILSN ARM COUPLING DETAIL

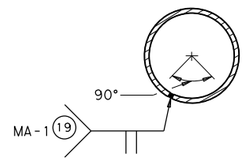


Note: A slip joint is permissible for arms 40' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

SLIP JOINT DETAIL (CLAMP-ON ARM)

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

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

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies or ILSN arm support. For a clamp-on mast arm, a maximum 1 ½" wide vertical slotted hole may be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1". For an ILSN arm, a 1 ½" diameter hole shall be cut in the front clamp plate for wire access. A matched hole shall be field drilled through the pole to provide wire access after arm is oriented. Deburr both holes.

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

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces. Pin bolts shall be ASTM A325 with threads excluded from the shear plane. Pin bolt and ¾" diameter pipe shall have 3/16" diameter holes for a ⅛" diameter galvanized cotter pin. Back clamp plate shall be furnished with a ¾" diameter hole for each pin bolt. An 11/16" diameter 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

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

Sheet 4 of 5 — LMA(4)-12

DN: JK	CK: GRB	DW: FDN	CK: CAL

REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		67

DATE:
FILE:

131D

DATE: 5/25/2022 6:45:51 PM
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Shipping Parts List

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

Nominal Arm Length	30' Poles with Luminaire: See note above plus: one (or two if ILSN attached) small hand hole, clamp-on simplex		24' Poles with ILSN: See note above plus one small hand hole		19.50' (Single Mast Arm) 20.25' (Dual Mast Arm) Poles with no Luminaire and no ILSN: See note above	
Single Mast Arm						
Lf ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50	50L		50S		50	
55	55L		55S		55	
60	60L	2	60S		60	
65	65L	2	65S		65	
Dual Mast Arm						
Lf ft. / Lc ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50 / 20	5020L		5020S		5020	
50 / 24	5024L		5024S		5024	
50 / 28	5028L		5028S		5028	
50 / 32	5032L		5032S		5032	
50 / 36	5036L		5036S		5036	
50 / 40	5040L		5040S		5040	
50 / 44	5044L		5044S		5044	
55 / 20	5520L		5520S		5520	
55 / 24	5524L		5524S		5524	
55 / 28	5528L		5528S		5528	
55 / 32	5532L		5532S		5532	
55 / 36	5536L		5536S		5536	
55 / 40	5540L		5540S		5540	
55 / 44	5544L		5544S		5544	
60 / 20	6020L		6020S		6020	
60 / 24	6024L		6024S		6024	
60 / 28	6028L		6028S		6028	
60 / 32	6032L		6032S		6032	
60 / 36	6036L		6036S		6036	
60 / 40	6040L		6040S		6040	
60 / 44	6044L		6044S		6044	
65 / 20	6520L		6520S		6520	
65 / 24	6524L		6524S		6524	
65 / 28	6528L		6528S		6528	
65 / 32	6532L		6532S		6532	
65 / 36	6536L		6536S		6536	
65 / 40	6540L		6540S		6540	
65 / 44	6544L		6544S		6544	

Foundation Summary Table **

Location Ident.	Avg. N Blow/ft.	No. Each	Drill Shaft *** Length (feet)
			48-A
BRYANT BLVD AT AVENUE L	10	2	44
BRYANT BLVD AT AVENUE N	10	2	44
Total Drill Shaft Length			88

Notes

** Foundations may be listed separately

information only.

*** Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

Shipping Parts List

Traffic Signal Arms (Fixed Mount) (1 per pole)
Ship each arm with listed equipment attached

Nominal Arm Length	Type IV Arm (4 Signals) 3 Bracket Assembly and 4 CGB Connectors	
ft.	Designation	Quantity
50	50IV	
55	55IV	
60	60IV	2
65	65IV	2

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	4

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

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Traffic Signal Arms (80 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp w/bolts and washers		Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp w/bolts and washers	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80			
32			32II-80		32III-80	
36			36II-80		36III-80	
40					40III-80	
44					44III-80	

Traffic Signal Arms (100 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached

Nominal Arm	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp		Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	
40					40III-100	
44					44III-100	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
2 1/2 "	5' - 3"	4

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.

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

Texas Department of Transportation
Traffic Operations Division

LONG MAST ARM ASSEMBLY PARTS LIST

LMA(5)-12

Sheet 5 of 5

DN: JK	CK: GRB	DW: FDN	CK: CAL

REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		68

131E

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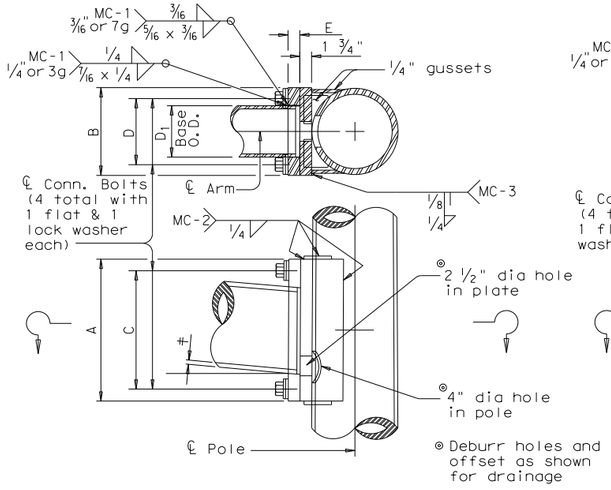
DATE:
FILE:

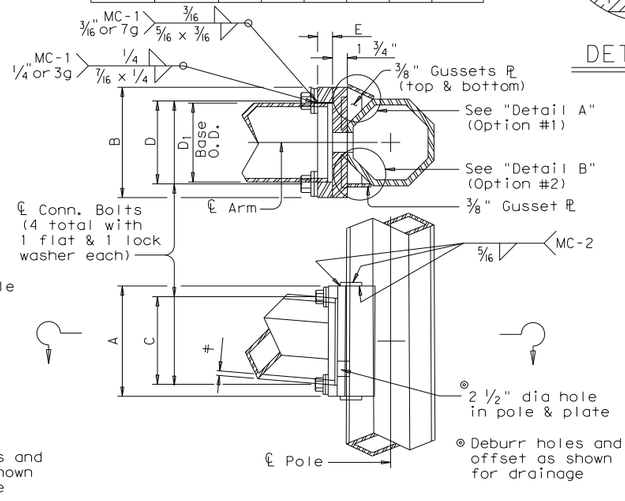
ARM SIZE D_1	ARM SIZE ǂ	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1 ¾	1
7.5	.179	13	9	10	6	1 ¾	1
8.0	.179	14	10	11	7	2	1 ¼
9.0	.179	16	11	13	8	2	1 ¼
9.5	.179	17	12	14	9	2	1 ¼
9.5	.239	18	12	15	9	2	1 ¼
10.0	.239	18	12	15	9	2	1 ¼
10.5	.239	18	13	15	10	3	1 ½
11.0	.239	18	13	15	10	3	1 ½



FIXED MOUNT DETAIL 1

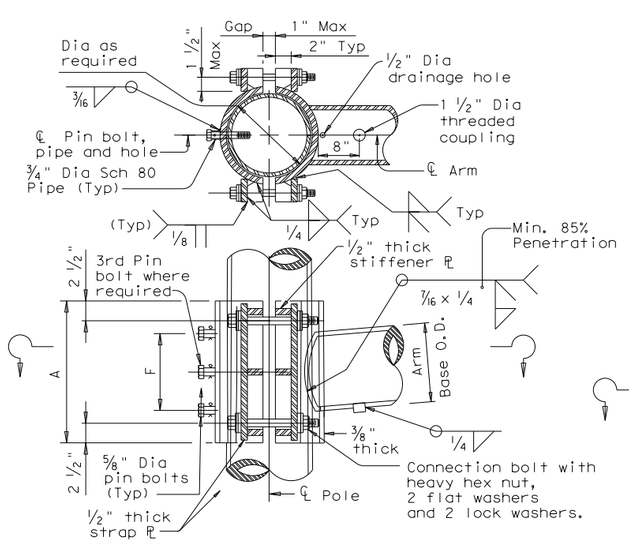
ARM SIZE D_1	ARM SIZE ǂ	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 1/4	3	5/8
9.5	.239	18	12	4	1 1/4	3	5/8
10.0	.239	18	12	4	1 1/4	3	5/8

ARM SIZE D_1	ARM SIZE ǂ	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
7.0	.179	11	11	8	8	1 ¾	1 ¼
7.5	.179	11	11	8	8	1 ¾	1 ¼
8.0	.179	11	11	8	8	2	1 ¼
9.0	.179	13	13	10	10	2	1 ¼
10.0	.179	13	13	10	10	2	1 ¼
9.5	.239	13	13	10	10	2	1 ¼
10.0	.239	14	14	11	11	2	1 ½
11.0	.239	14	14	11	11	3	1 ½
11.5	.239	14	14	11	11	3	1 ½

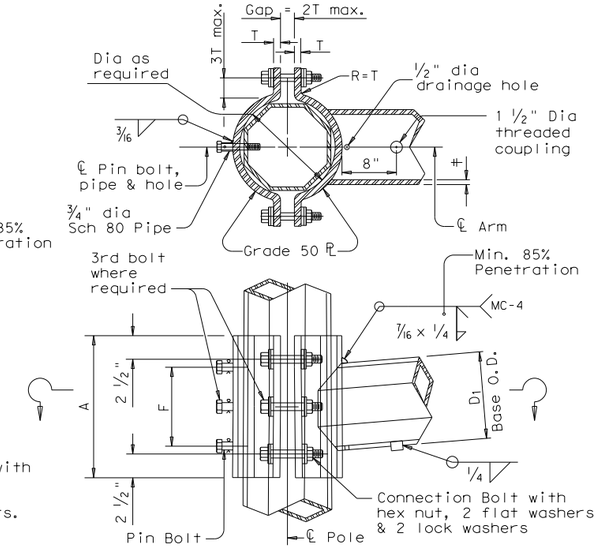


FIXED MOUNT DETAIL 2

ARM SIZE D_1	ARM SIZE ǂ	A	F	T	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	in.	ea.	in.	ea.	in.
7.0	.179	12	6	¾	4	¾	2	5/8
7.5	.179	14	8	¾	4	¾	2	5/8
8.0	.179	14	8	¾	4	¾	2	5/8
9.0	.179	16	10	⅞	4	1	2	5/8
10.0	.179	18	10	⅞	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

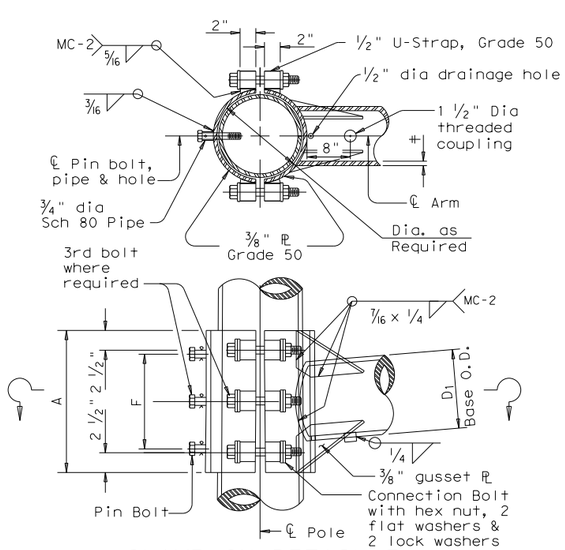


CLAMP-ON DETAIL 1

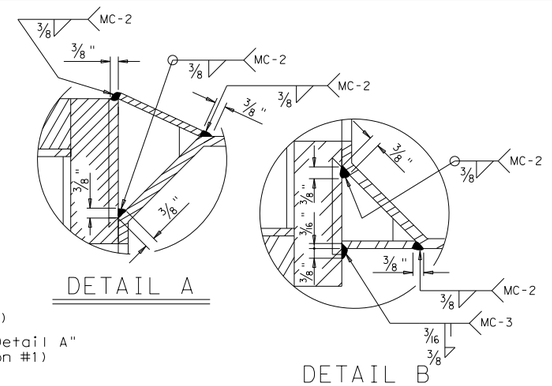


CLAMP-ON DETAIL 2

ARM SIZE D_1	ARM SIZE ǂ	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8

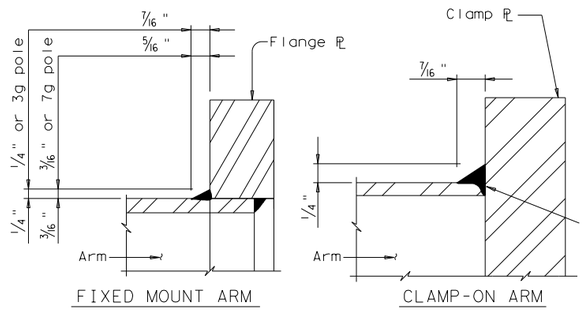


CLAMP-ON DETAIL 3



DETAIL A

DETAIL B



FIXED MOUNT ARM

CLAMP-ON ARM

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 ½" 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 ¾" dia pipe shall have 5/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a ¾" dia hole for each pin bolt. An 11/16" 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

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
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5-09
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CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
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SJT	TOM GREEN		69

126A

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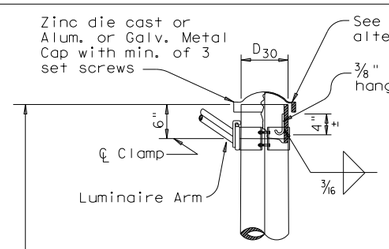
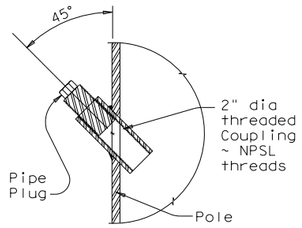
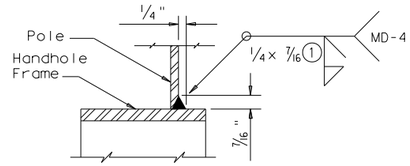


DETAIL A

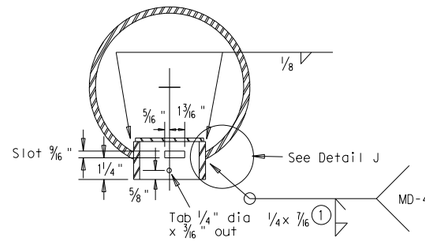
(for pole with luminaire)



POLE COUPLING DETAIL

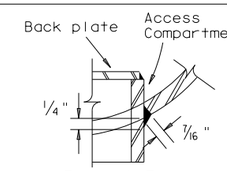


DETAIL G

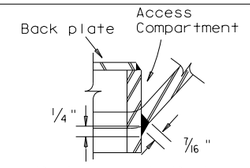


SECTION X-X

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.

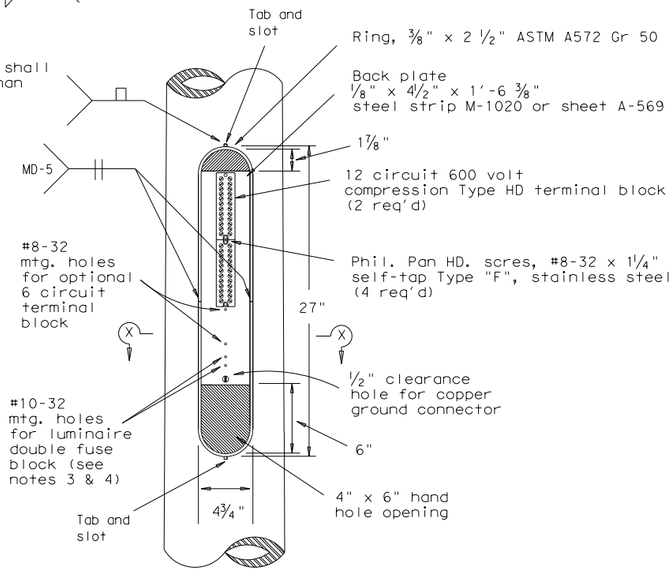


Round Pole

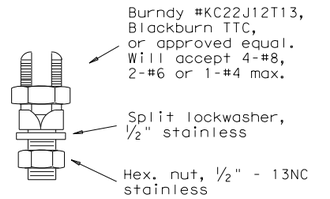


Polygonal Pole

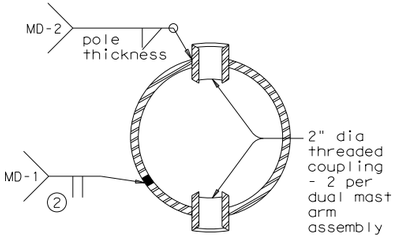
DETAIL J



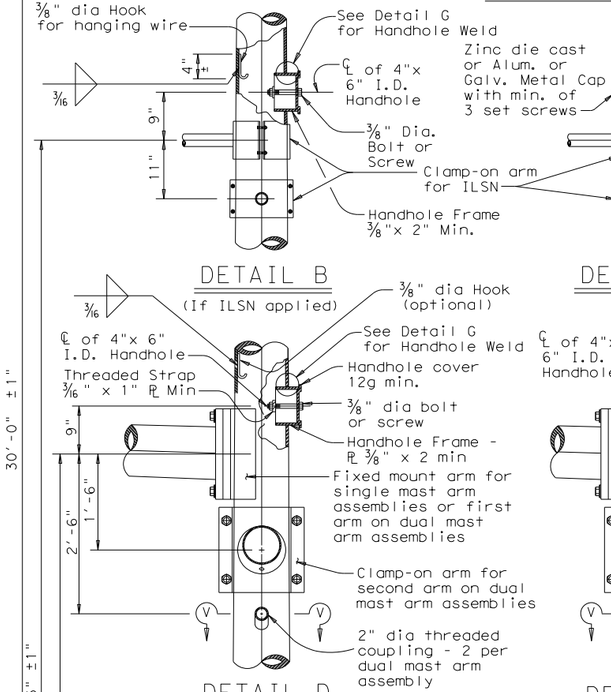
ACCESS COMPARTMENT



COPPER GROUND CONNECTOR

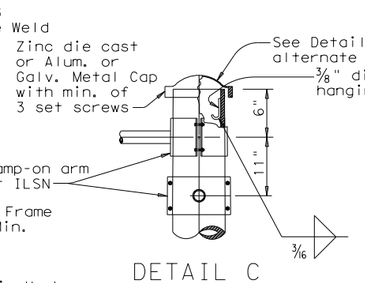


SECTION V-V

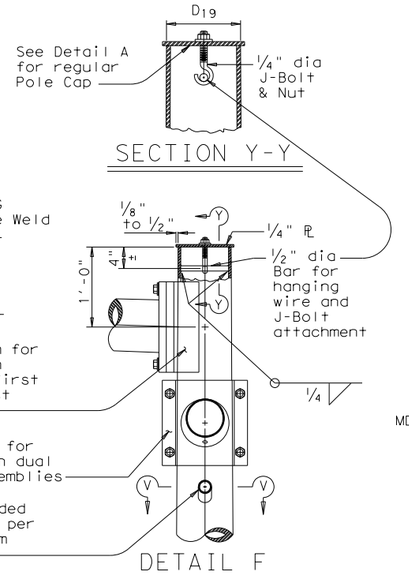


DETAIL B

(If ILSN applied)



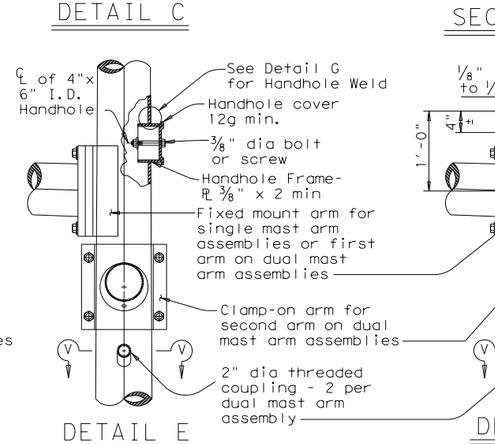
DETAIL C



SECTION Y-Y

DETAIL D

(for 30' pole with luminaire and ILSN sign)



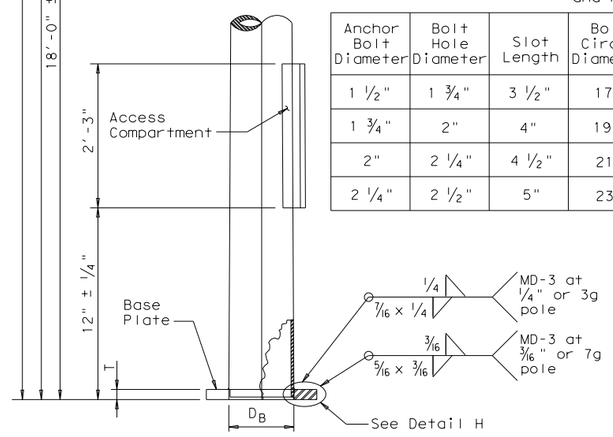
DETAIL E

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

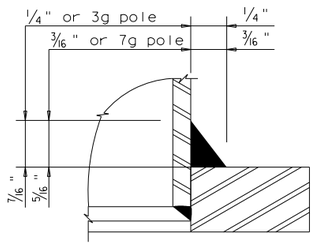
DETAIL F

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

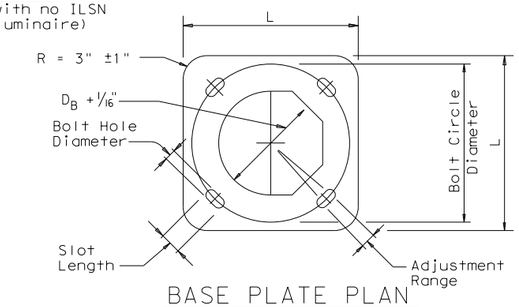
Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base ℞ Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



POLE ELEVATION



DETAIL H



BASE PLATE PLAN

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

NOTES:

1. 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.
2. 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 Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. 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.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
Traffic Operations Division

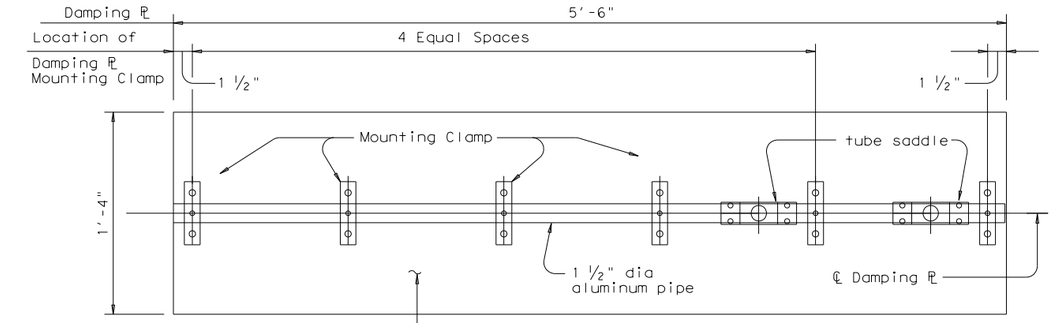
TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

MA-D-12

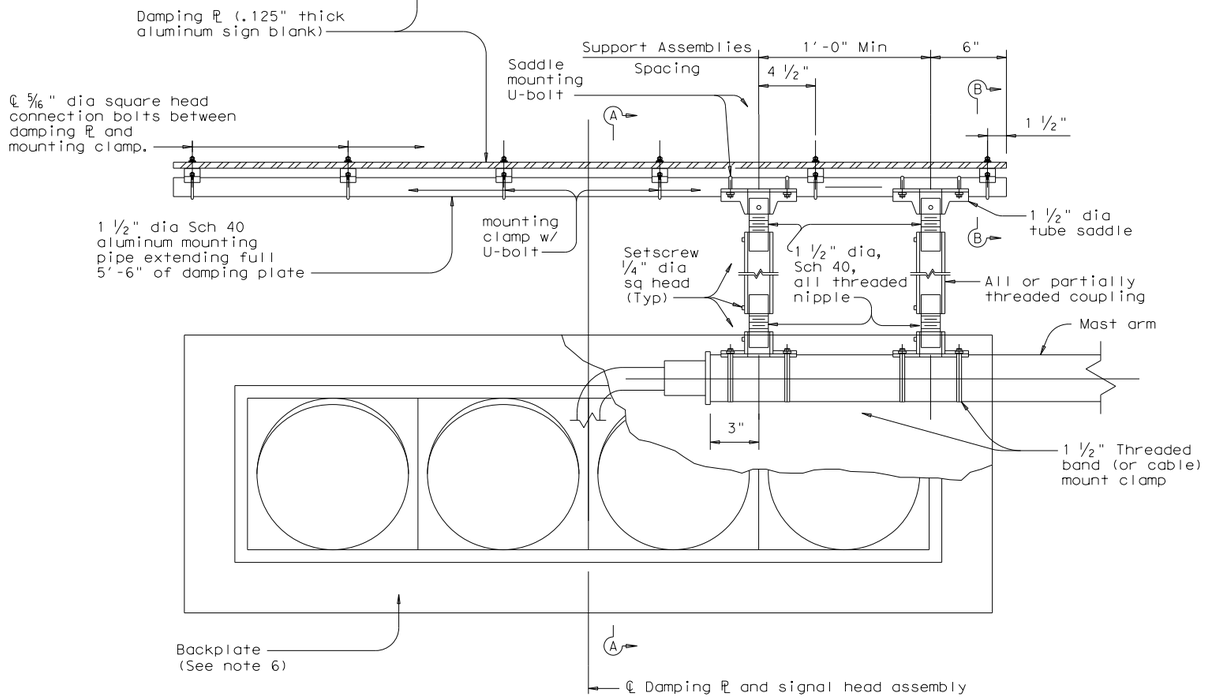
DN: MS	CK: JSY	DW: FDN	CK: CAL

REVISIONS
8-99
1-12

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		70



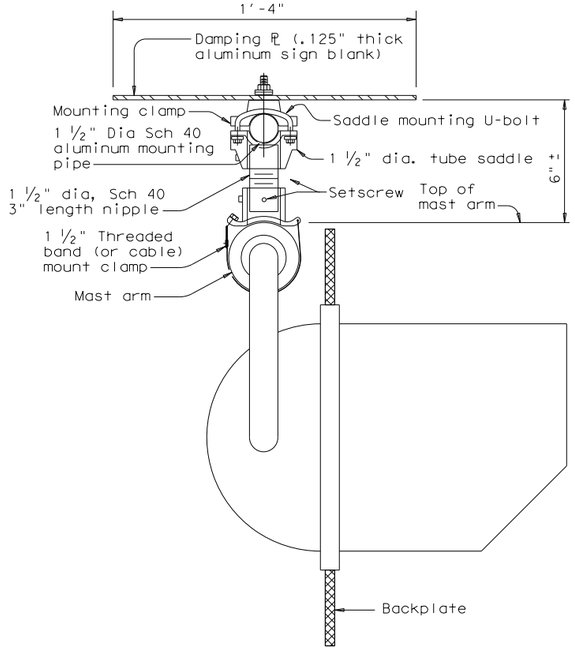
PLAN



ELEVATION

DAMPING PLATE MOUNTING DETAILS

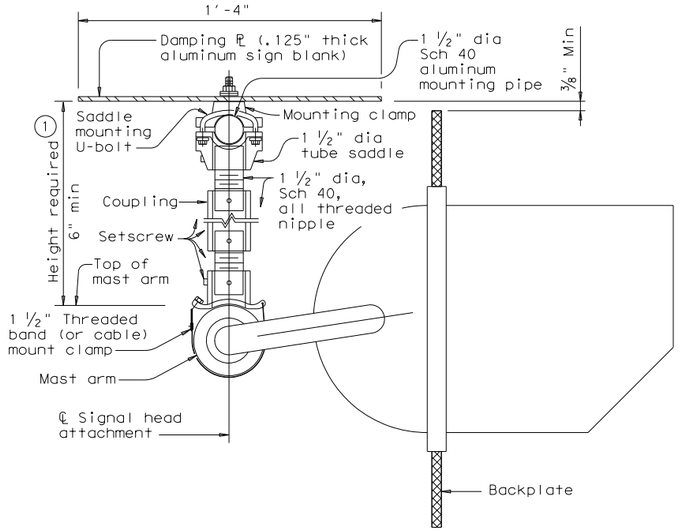
(Showing alternate placement of signal head)



SECTION A-A

(Showing standard placement of signal head)

(Mounting clamp U-bolt is not shown for clarity)

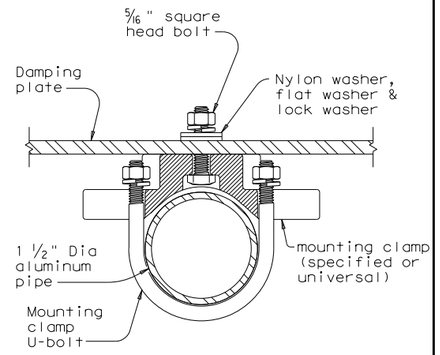


SECTION A-A

(Showing alternate placement of signal head)

(Mounting clamp U-bolt is not shown for clarity)

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 ¾"	3"	-	-
7"-8 ½"	4"	-	-
9"-10 ½"	6"	-	-
11"-15 ½"	-	4"	5"
16"-24"	-	6"	10"



SECTION B-B

(Showing damping plate attachment)

GENERAL NOTES:

1. 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.

2. 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.

3. 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.

4. Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".

5. Contractor will verify applicable field dimensions before the installation.

6. Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

Texas Department of Transportation

Traffic Safety Division Standard

MAST ARM DAMPING PLATE DETAILS

MA-DPD-20

FILE: ma-dpd-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
6-20	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		71

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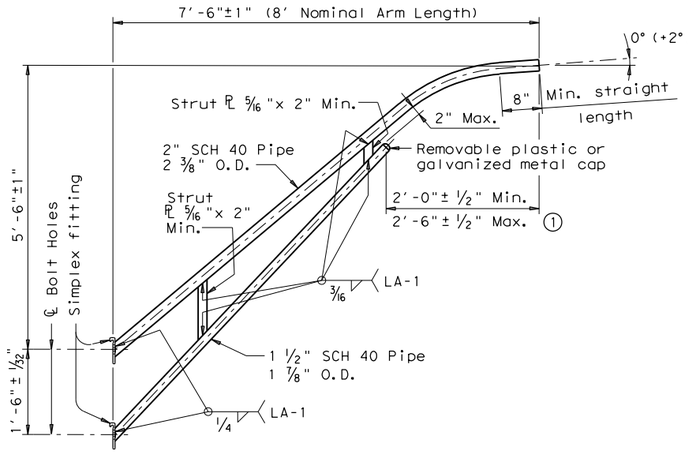
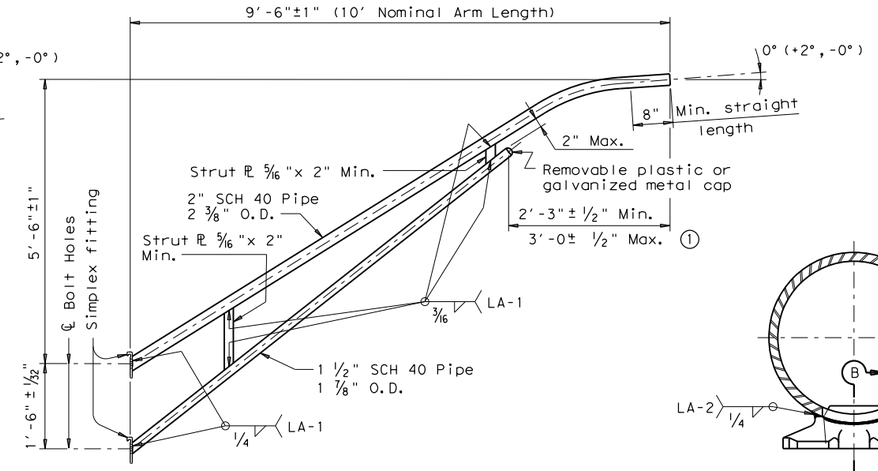
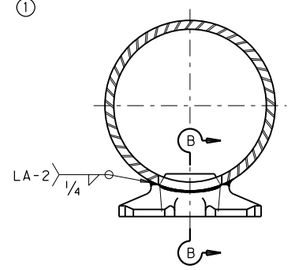
DATE:
FILE:



8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

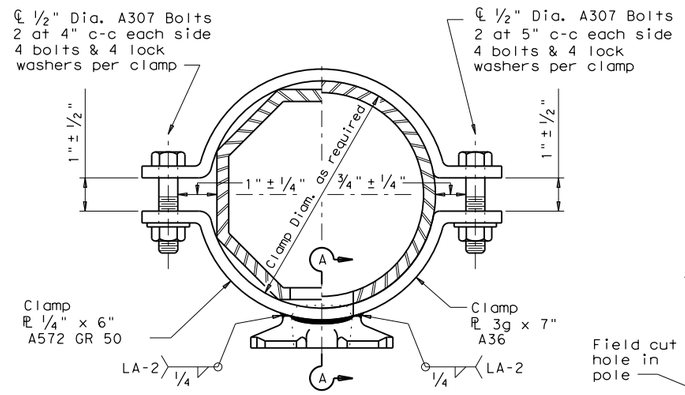
MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 (3), or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 (4), or A1011 HSLAS-F Gr.50 (4)
Arm Strut Plates (2)	ASTM A36, A572 Gr.50 (4), or A588
Misc.	ASTM designations as noted

(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.

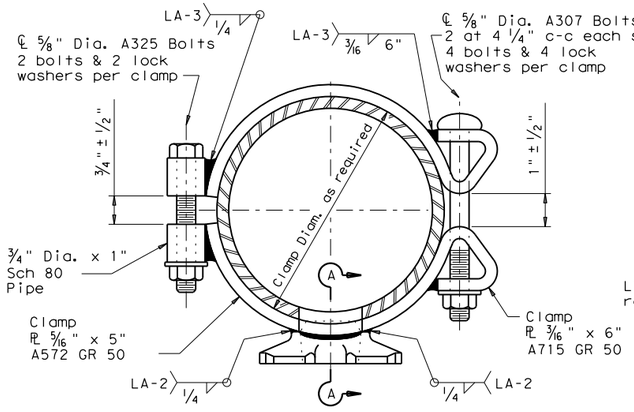
(3) A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

(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.



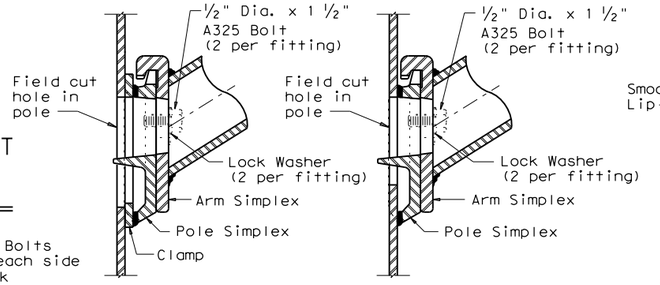
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



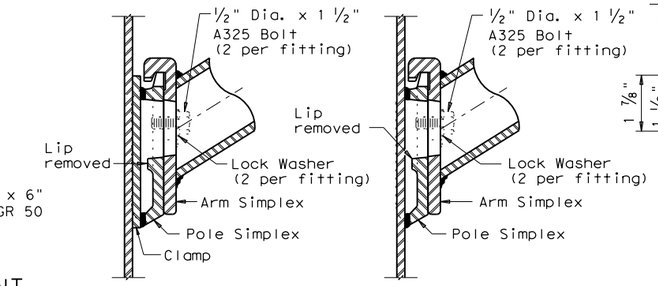
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)



UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING

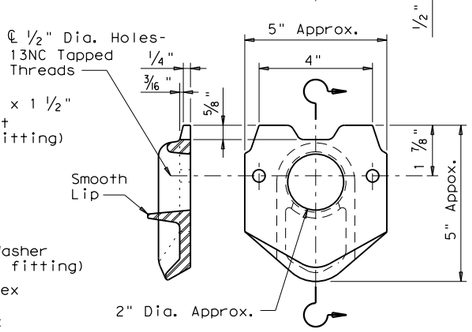


LOWER SIMPLEX FITTING

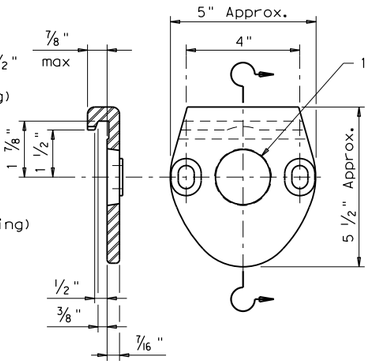
LOWER SIMPLEX FITTING

SECTON A-A

SECTON B-B



POLE SIMPLEX DETAIL



ARM SIMPLEX DETAIL

GENERAL NOTES:

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 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 absense of specified Fabricaton 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

DN: LEH	CK: JSY	DW: LTT	CK: TEB

REVISIONS
5-96
1-99
1-12

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		72

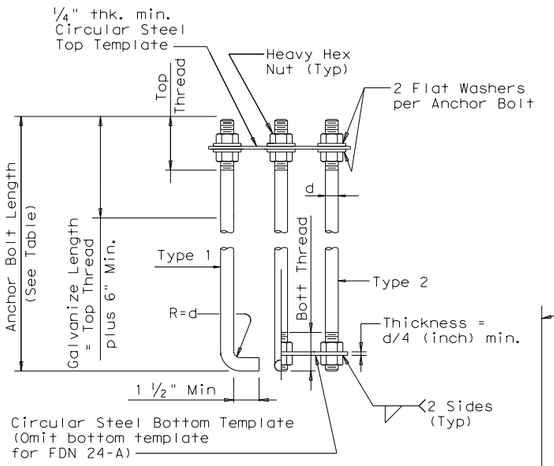
FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft (4), (5), (6)			ANCHOR BOLT DESIGN (1)				FOUNDATION DESIGN LOAD (2)		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

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

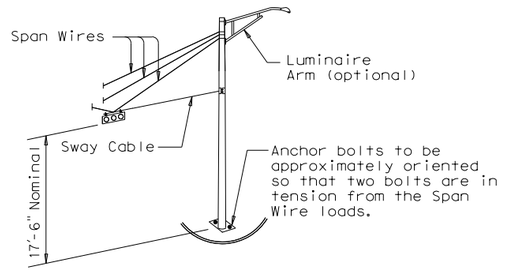
		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.

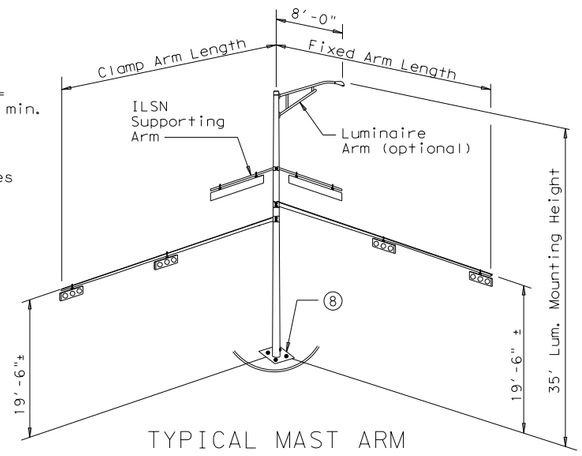


ANCHOR BOLT ASSEMBLY

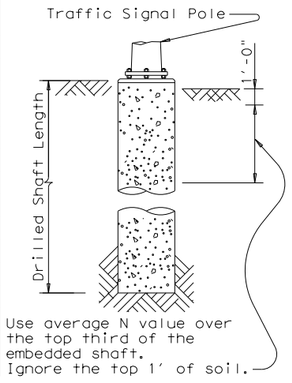
⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.

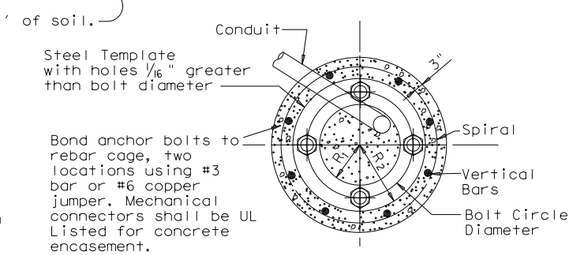


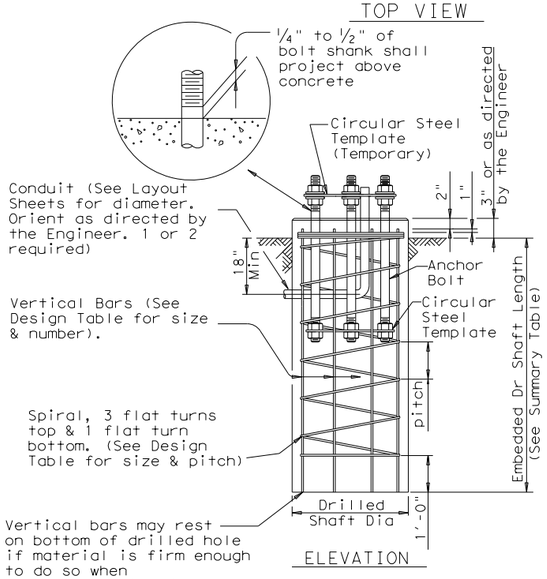
TYPICAL STRAIN POLE ASSEMBLY



TYPICAL MAST ARM ASSEMBLY







FOUNDATION DETAILS

ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.

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

FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET) 24-A	30-A	36-A	36-B	42-A
BRYANT BLVD AT AVENUE L	10	24-A	6	36				
	10	30-A	2		22			
BRYANT BLVD AT AVENUE N	10	24-A	6	36				
	10	30-A	1		11			
	10	36-A	1			13		
TOTAL DRILLED SHAFT LENGTHS				72	33	13		

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

5/25/2022
STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED PROFESSIONAL ENGINEER

THE AFFIXED SEAL ABOVE APPLIES ONLY TO INFORMATION FILLED BY ABOVE STATED ENGINEER.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB

REVISIONS: 5-96, 11-99, 1-12

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		73

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GENERAL NOTES FOR ALL ELECTRICAL WORK

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

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

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

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

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

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

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

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

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

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

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

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

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

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

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

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

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

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
© TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		0907	24	54	US 87
		DIST	COUNTY		SHEET NO.
		SJT	TOM GREEN		74

ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

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

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

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

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

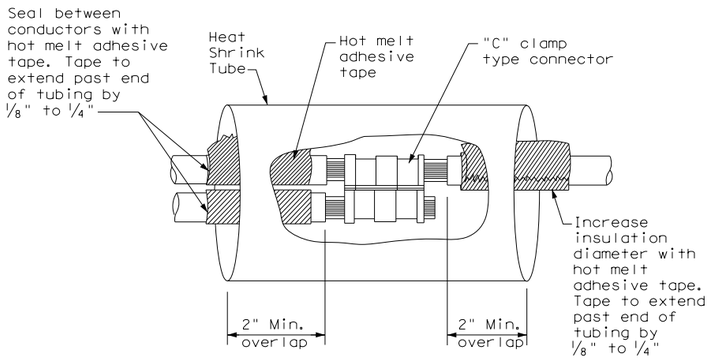
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

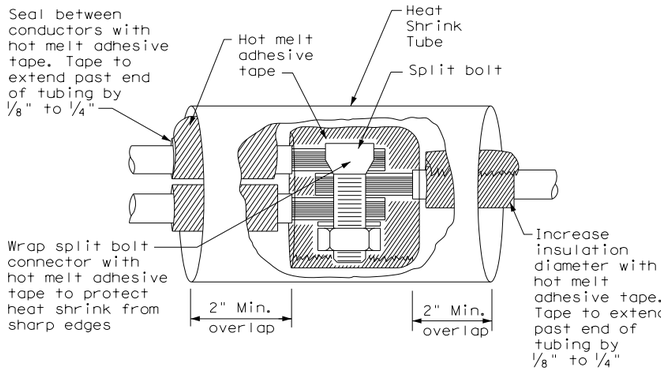
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

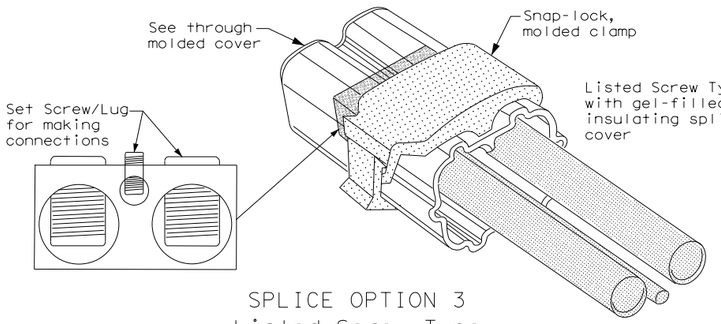
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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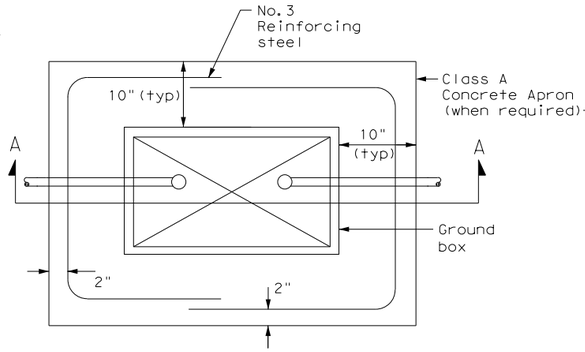
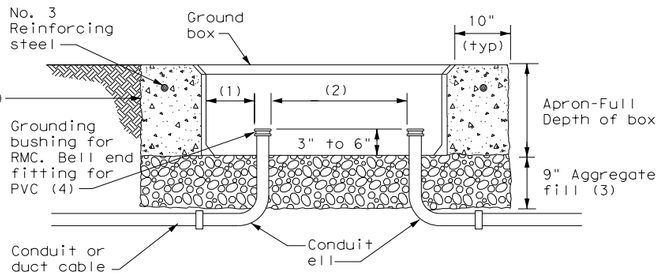


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

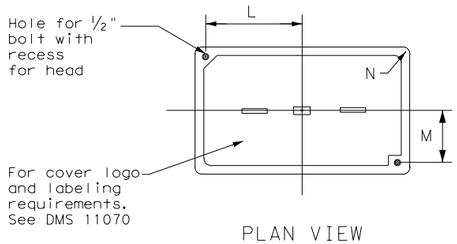
(2) Maintain sufficient space between conduits to allow for proper installation of bushings.

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

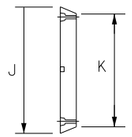
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

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

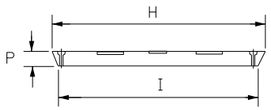
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

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

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

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

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

B. CONSTRUCTION METHODS

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

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

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

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

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

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

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

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4)-14

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

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

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

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

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

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

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

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

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

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

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

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

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

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

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

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

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

Schematic Type

Service Voltage V / V

Disconnect Amp Rating
000 indicates main lug only/
Typically Type T

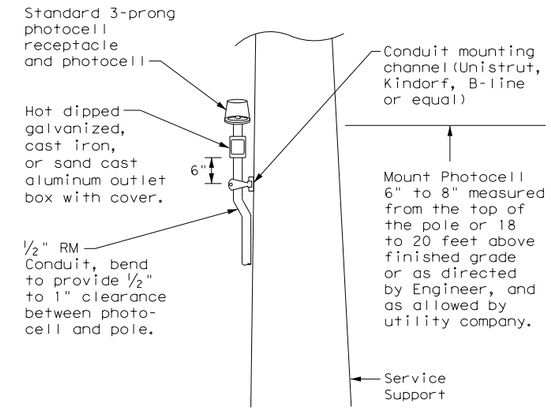
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

Enclosure Type
GS= Galvanized steel("off the shelf")
SS= Stainless steel(Custom Enclosure)See MPL
AL= Aluminum (Custom Enclosure)See MPL

Photocell Mounting Location
(E)= Inside Service/Enclosure Mounted
(T)= Top of pole
(L)= Luminaire mounted
(N)= None/No Photocell or Lighting Contactor Required

Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Service on traffic signal pole
PS= Pedestal Service

O= Overhead Service Feed from Utility
U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

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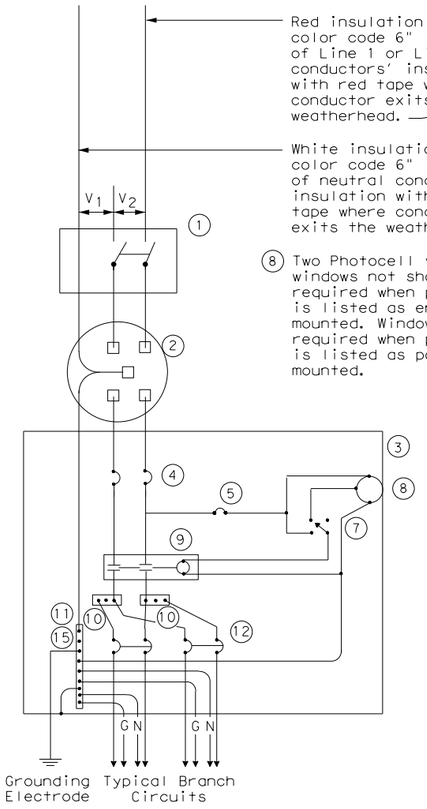
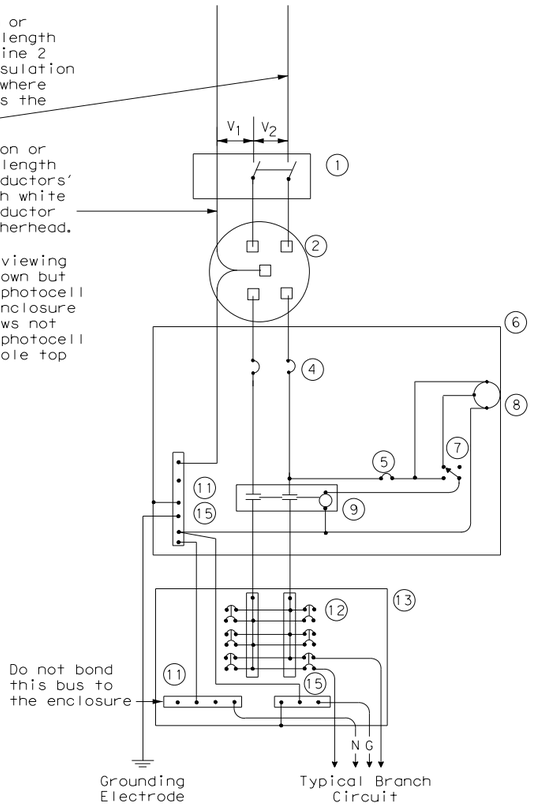
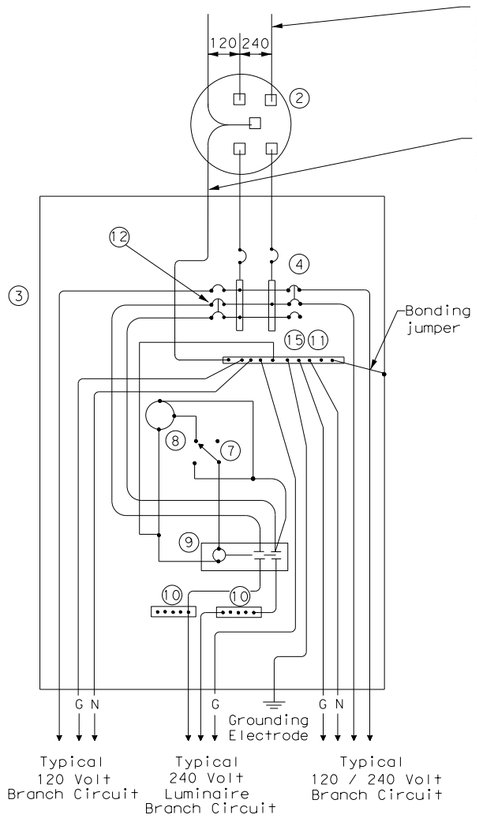


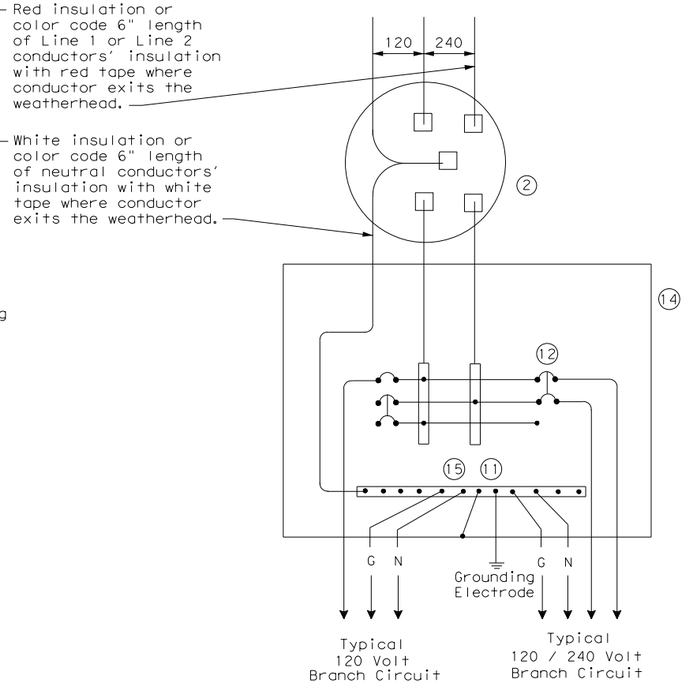
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



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



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

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

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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	SJT	TOM GREEN		78

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DATE: DATE TIME
FILE: DOCUMENT NAME

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

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

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

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

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

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

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

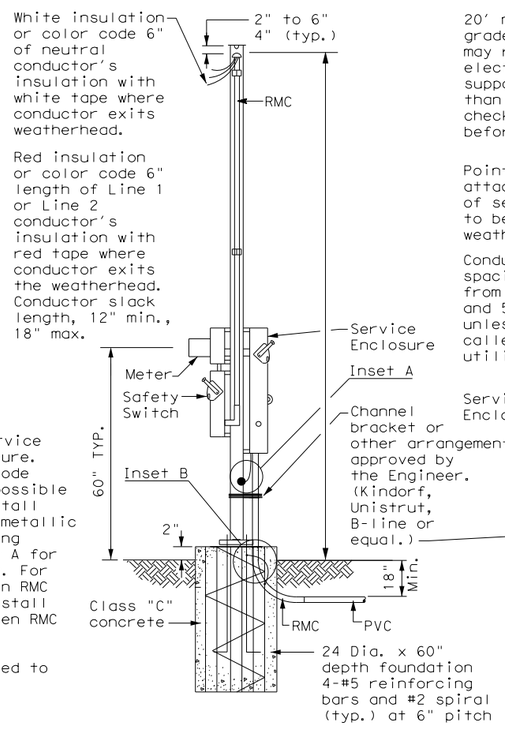
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode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

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

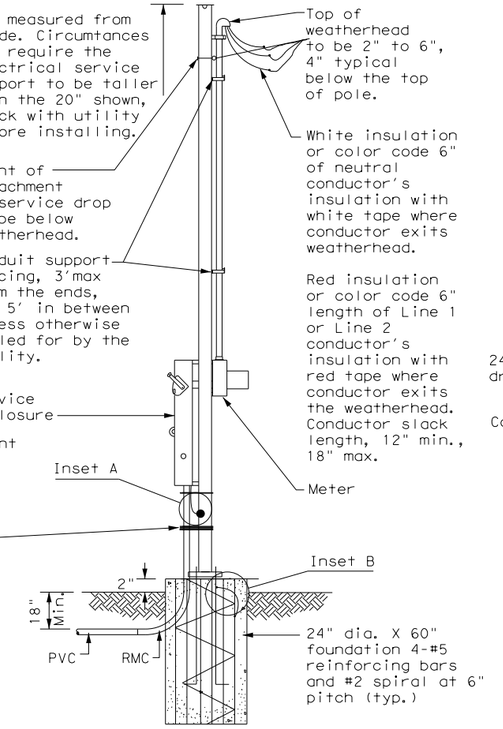
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

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

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

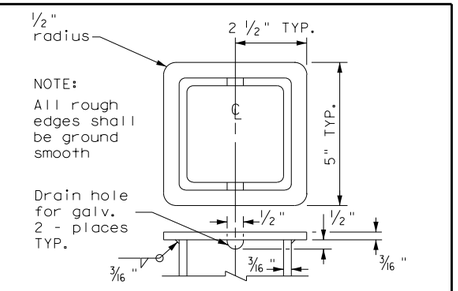


WITH SAFETY SWITCH

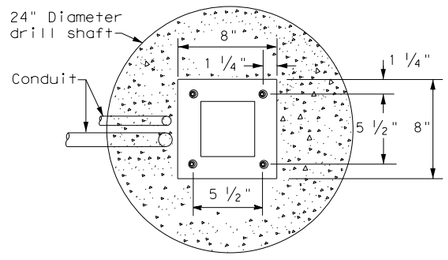


WITHOUT SAFETY SWITCH

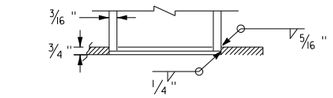
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

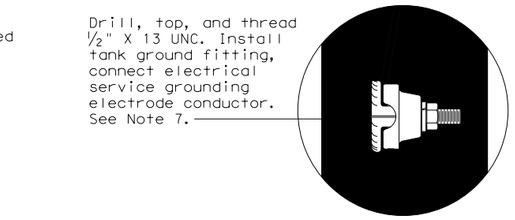


BASE PLATE DETAIL

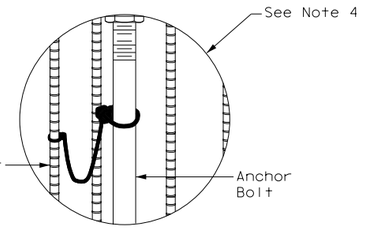


BOTTOM OF POLE

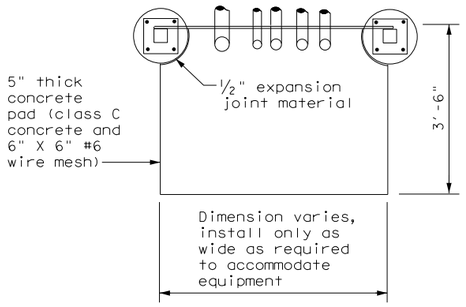
SERVICE SUPPORT TYPE SF & SP



FRONT VIEW
INSET A

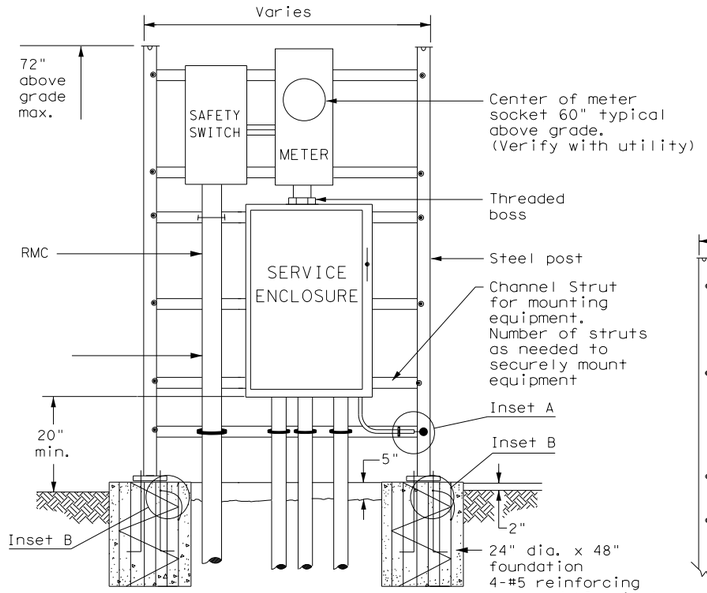


INSET B

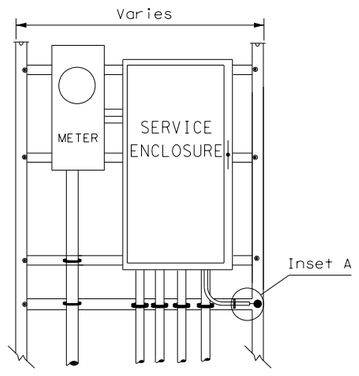


TOP VIEW

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

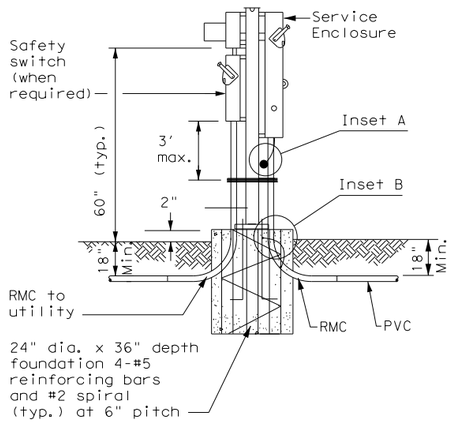


WITH SAFETY SWITCH
FRONT VIEW

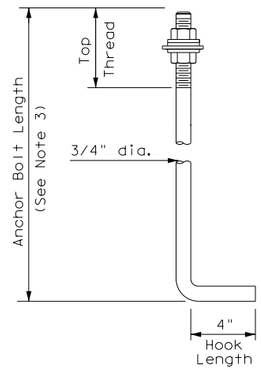


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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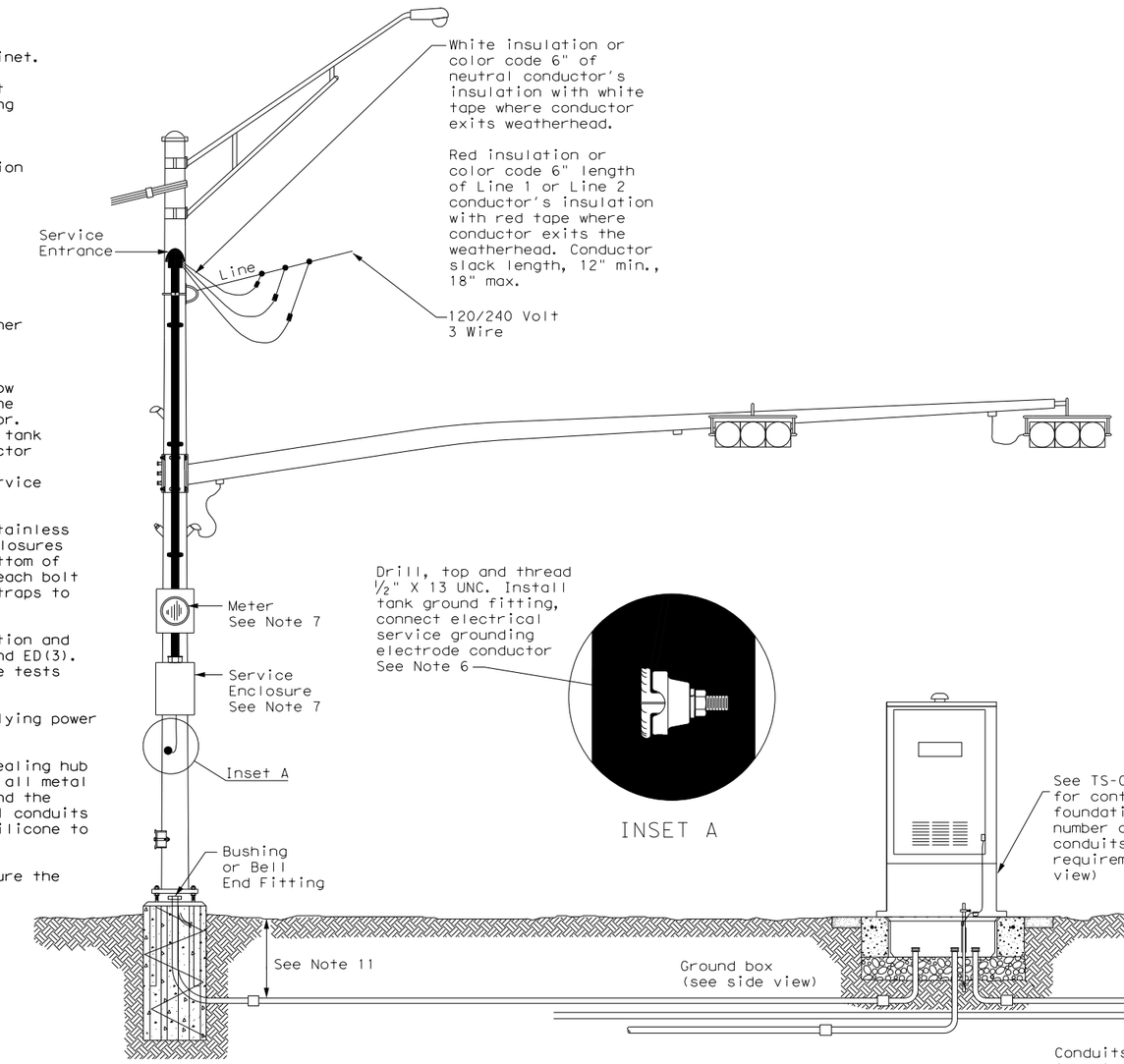
REVISIONS	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		79

71G

DATE:
FILE:

TRAFFIC SIGNAL NOTES

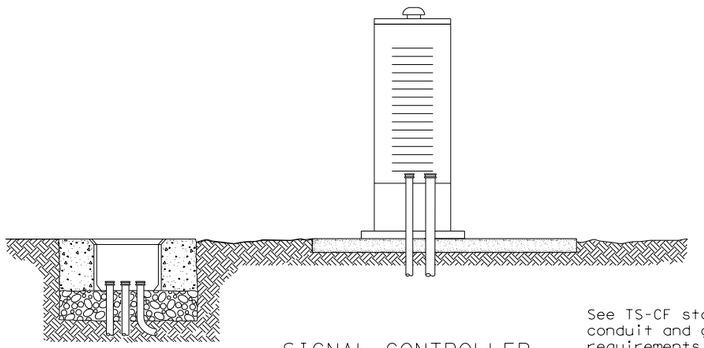
1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material 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 ½ 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 ¾ 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. Bond 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

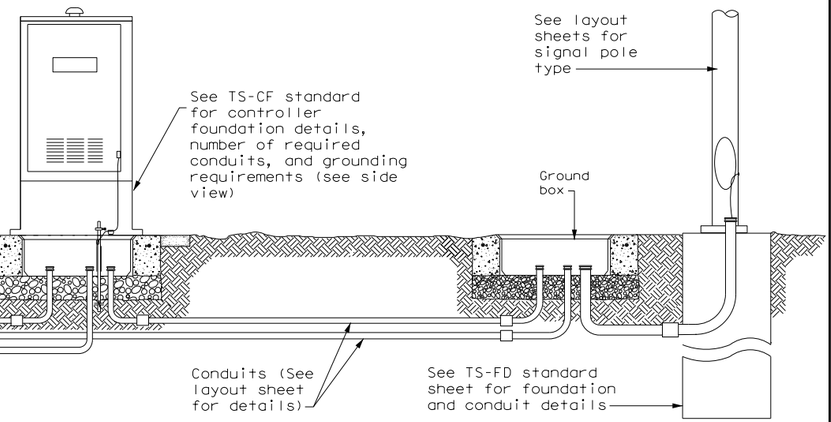
Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

INSET A



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.



SIGNAL CONTROLLER FRONT VIEW

SIGNAL POLE

Texas Department of Transportation

Traffic Operations Division Standard

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

FILE: ed8-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		80

71H

SUMMARY OF SMALL SIGNS

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

POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION	
			PREFABRICATED	
FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels

BRIDGE MOUNT CLEARANCE SIGNS (See Note 2): TY = TYPE; TY N, TY S

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (LENGTH X WIDTH)	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY	BRIDGE MOUNT CLEARANCE SIGNS
39	S1	R10-17T	LEFT TURN YIELD ON FLASHING YELLOW ARROW	36" x 42"	X		MAST ARM MOUNTED	
	S2	R3-5L	ONLY	30" x 36"	X		MAST ARM MOUNTED	
	S3	D3-1G	W 400 Avenue L 500	132" x 24"	X		MAST ARM MOUNTED	
	S4	R3-1		36" x 36"			SIGNAL POLE MOUNTED	
	S5	R10-3EL		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED	
	S6	R10-3ER		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED	
	S7	R3-8R	ONLY	36" x 36"	X		MAST ARM MOUNTED	
	S8	D3-1G	S 1600 Bryant Blvd 1500	120" x 24"	X		MAST ARM MOUNTED	
	S9	R10-3ER		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED	
	S10	R10-3EL		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED	
	S11	R10-3ELR		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED	
	S12	R10-17T	LEFT TURN YIELD ON FLASHING YELLOW ARROW	36" x 42"	X		MAST ARM MOUNTED	
	S13	R3-5L	ONLY	30" x 36"	X		MAST ARM MOUNTED	
	S14	D3-1G	W 500 Avenue L 400	132" x 24"	X		MAST ARM MOUNTED	
	S15	R10-3EL		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED	
	S16	R10-3ER		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED	
	S17	R3-8(MOD)		36" x 36"	X		MAST ARM MOUNTED	
	S18	D3-1G	S 1500 Bryant Blvd 1600	120" x 24"	X		MAST ARM MOUNTED	
	S19	R10-3ER		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED	
	S20	R10-3EL		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED	

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

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

NOTE:

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

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Texas Department of Transportation — Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 4-16 8-16	0907	24	054	US 87
	DIST		COUNTY	SHEET NO.
	SJT		TOM GREEN	81

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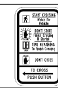
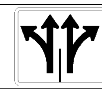
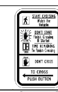
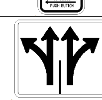
SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (LENGTH X WIDTH)	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX): POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION: PREFABRICATED	MOUNTING DESIGNATION	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY N TY S
47	S1	R10-17T		36" x 42"	X		MAST ARM MOUNTED					
	S2	R3-5L		30" x 36"	X		MAST ARM MOUNTED					
	S3	D3-1G	W 400 Avenue N 500	132" x 24"	X		MAST ARM MOUNTED					
	S4	R10-3EL		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED					
	S5	R10-3ER		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED					
	S6	D3-1G	S 1800 Bryant Blvd 1700	120" x 24"	X		MAST ARM MOUNTED					
	S7	R3-8 MK		36" x 36"	X		MAST ARM MOUNTED					
	S8	R10-3EL		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED					
	S9	R10-3ER		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED					
	S10	R10-17T		36" x 42"	X		MAST ARM MOUNTED					
	S11	R3-5L		30" x 36"	X		MAST ARM MOUNTED					
	S12	D3-1G	W 500 Avenue N 400	132" x 24"	X		MAST ARM MOUNTED					
	S13	R10-3ER		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED					
	S14	R10-3EL		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED					
	S15	R3-8 MK		36" x 36"	X		MAST ARM MOUNTED					
	S16	D3-1G	S 1700 Bryant Blvd 1800	120" x 24"	X		MAST ARM MOUNTED					
	S17	R10-3EL		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED					
	S18	R10-3ER		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED					
	S19	R10-3ELR		9" x 15"	X		PED POLE OR SIGNAL POLE MOUNTED					

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

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2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS) Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

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Texas Department of Transportation — Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

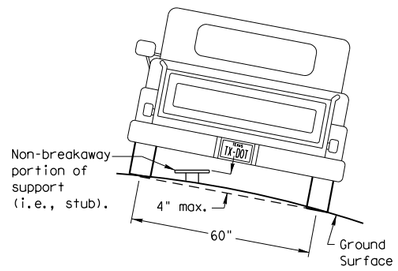
Anchor Type

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

Sign Mounting Designation

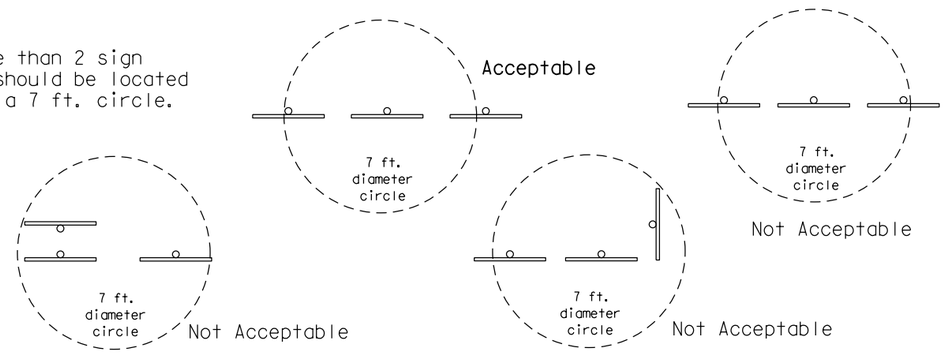
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))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

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



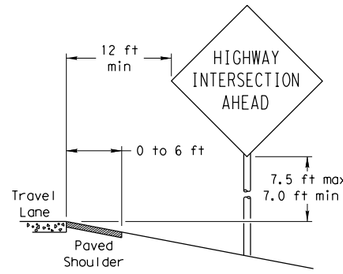
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

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



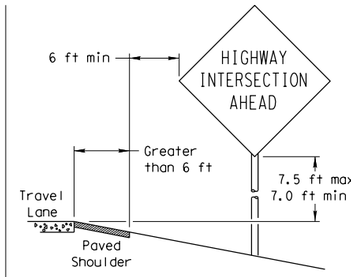
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

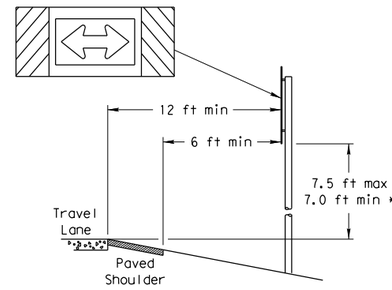
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



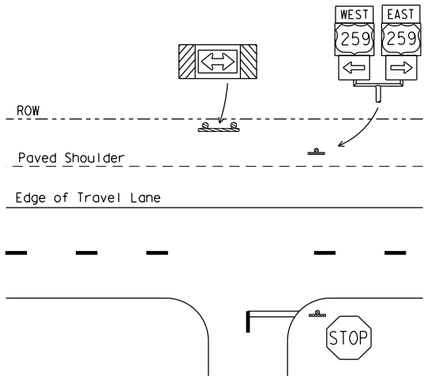
GREATER THAN 6 FT. WIDE

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

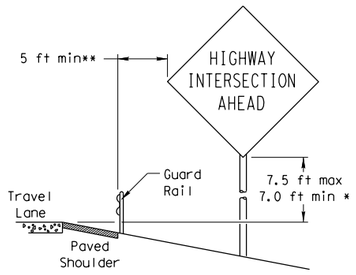
T-INTERSECTION



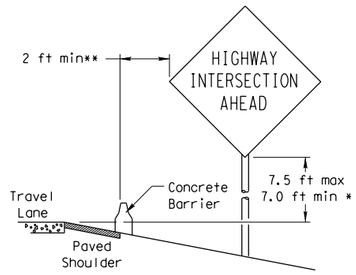
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

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

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

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

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

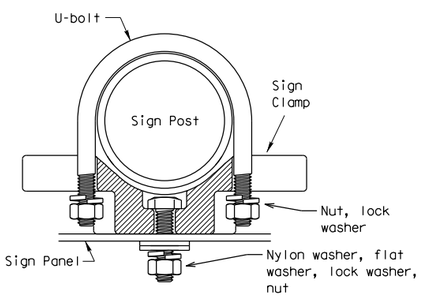
The maximum values may be increased when directed by the Engineer.

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

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

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

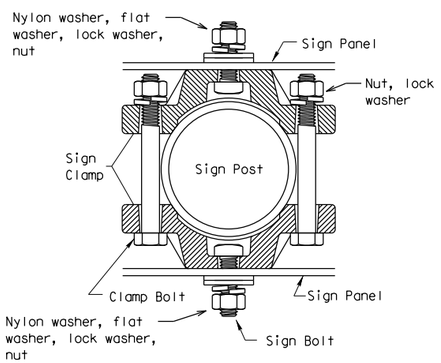


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

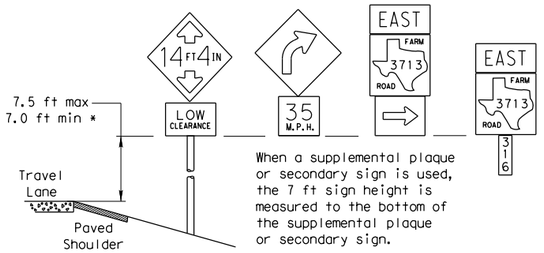
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



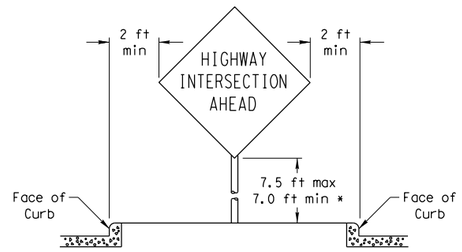
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



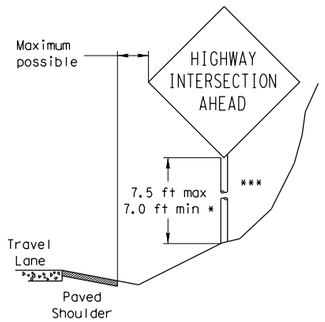
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

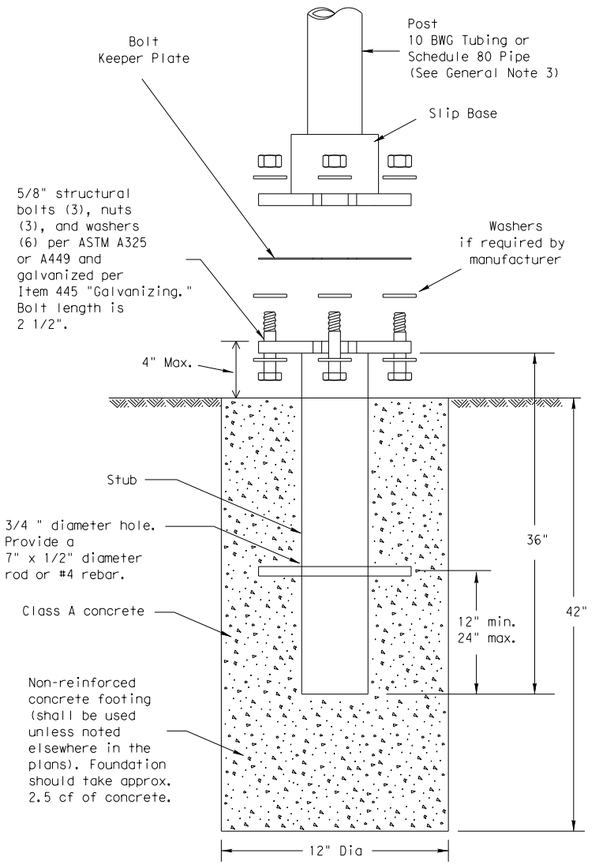
SMD(GEN)-08

© TxDOT July 2002	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		83

26A

DATE:
FILE:

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

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

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

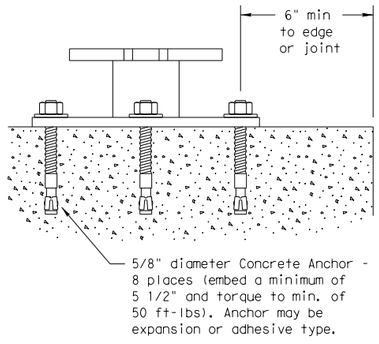
Foundation

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

Support

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

CONCRETE ANCHOR



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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

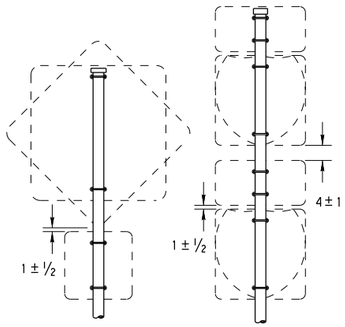
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87

DIST	COUNTY	SHEET NO.
SJT	TOM GREEN	84

DATE:
FILE:



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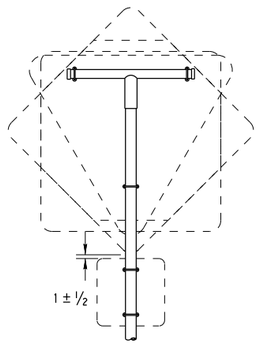

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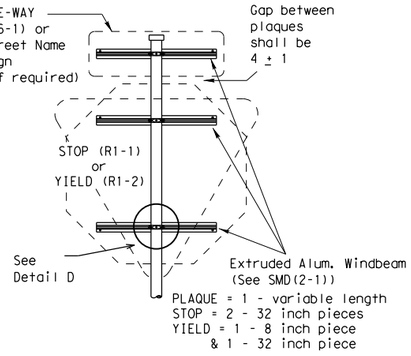

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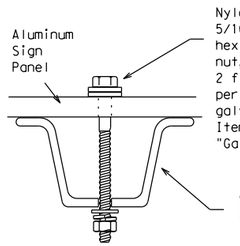
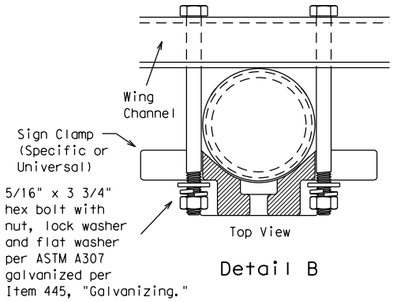
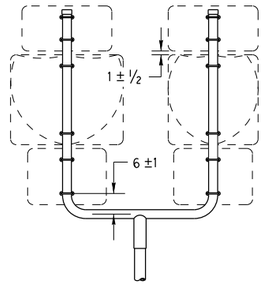


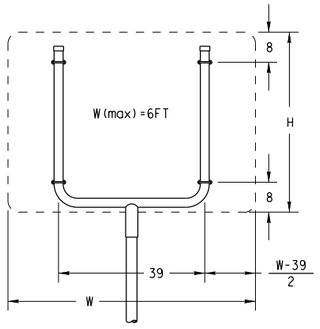
Detail A



Detail B



SM RD SGN ASSM TY XXXXX(1)XX(U)



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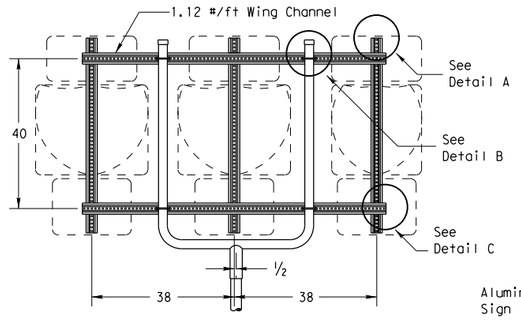
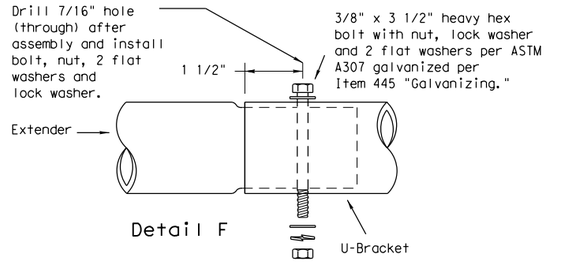
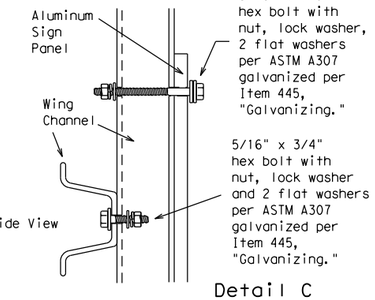


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

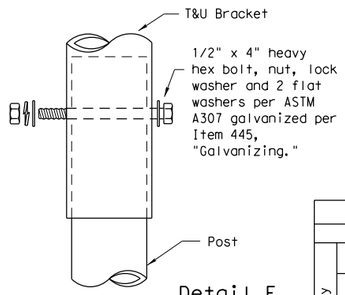


Detail F

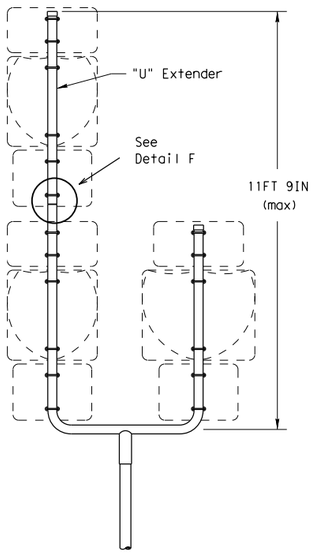
Splices shall only be allowed behind the sign substrate.



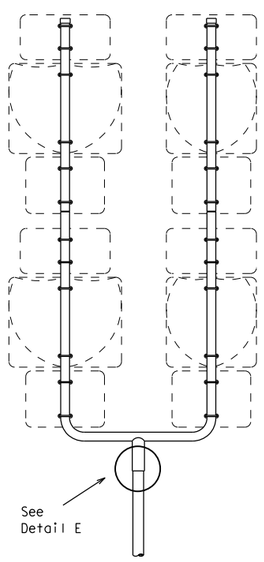
Detail C



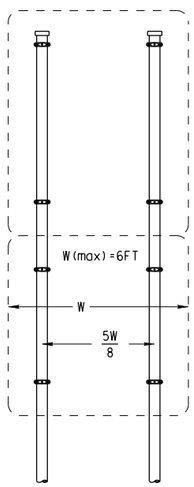
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

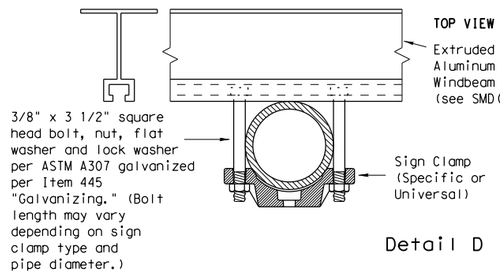


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

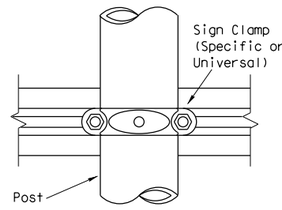


SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D



GENERAL NOTES:

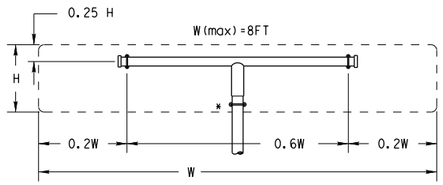
1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

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

REQUIRED SUPPORT

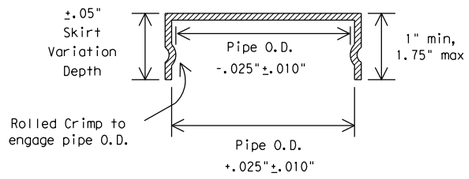
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs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



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

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

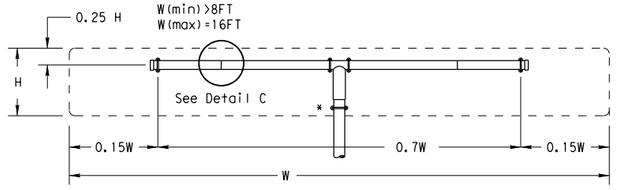
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

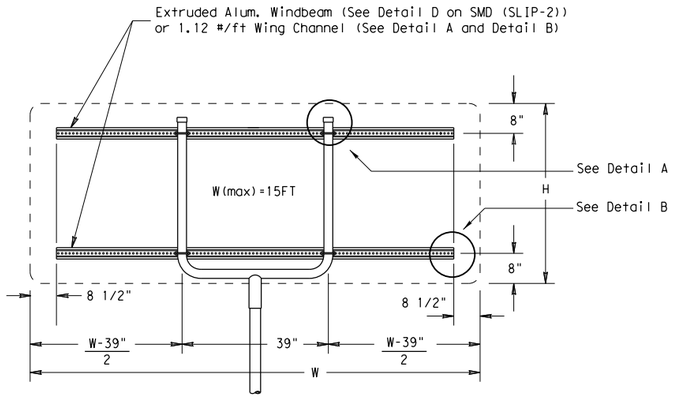
REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		85

DATE:
FILE:

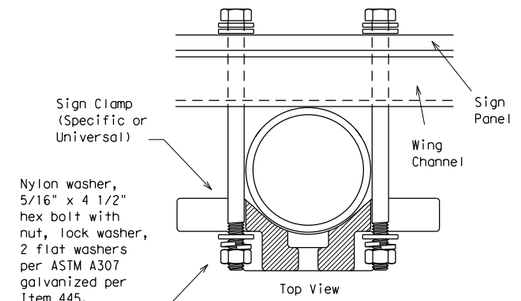


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

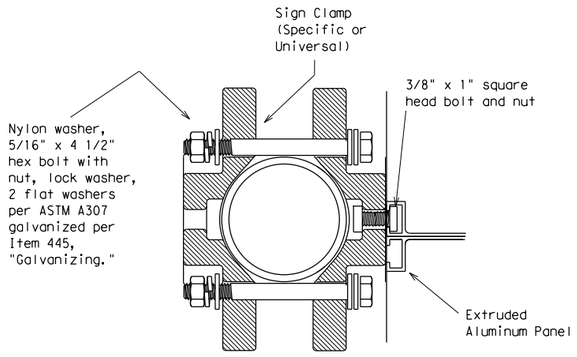
(* - See Note 12)



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

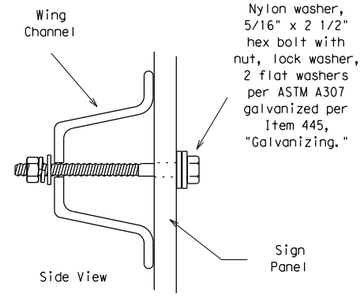


Detail A

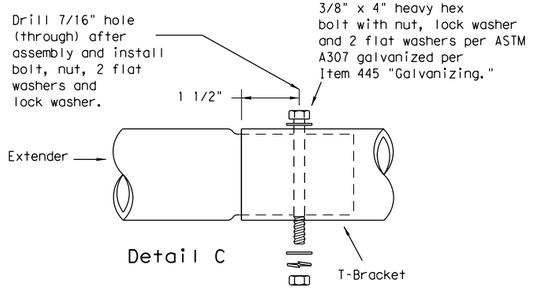


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

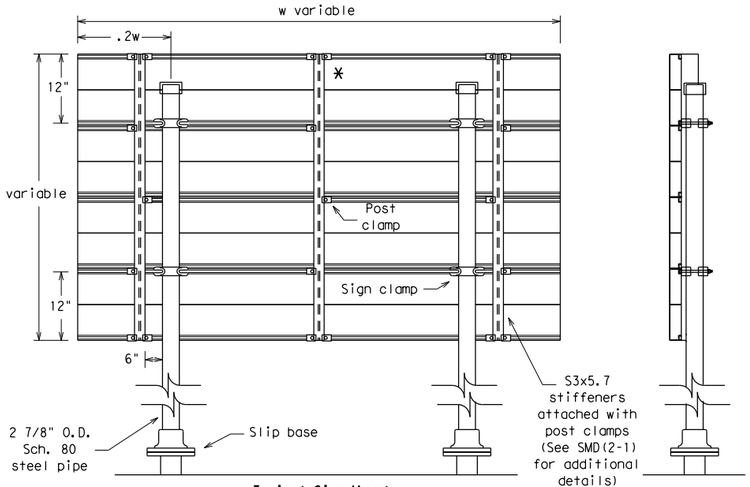


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

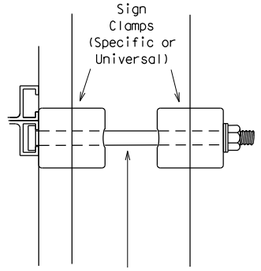


Typical Sign Mount

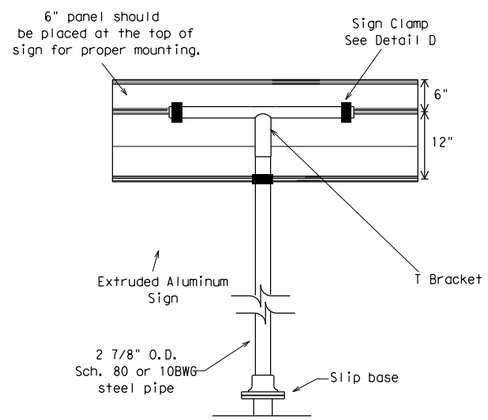
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

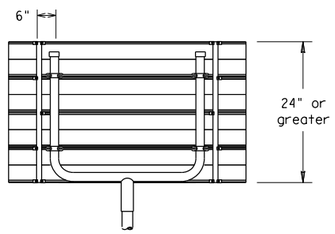
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



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

See Detail E
for clamp installation

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

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

REQUIRED SUPPORT

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		86

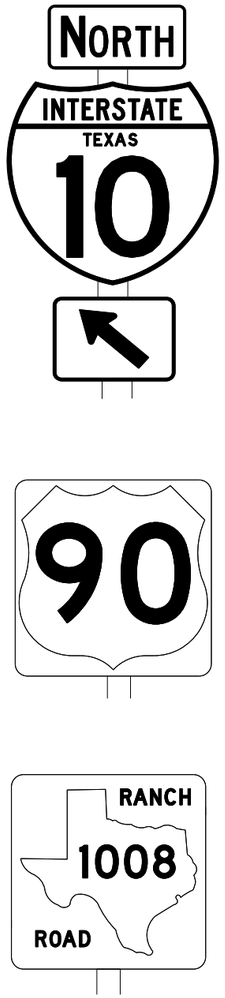
26D

DATE:
FILE:

DATE:
FILE:

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

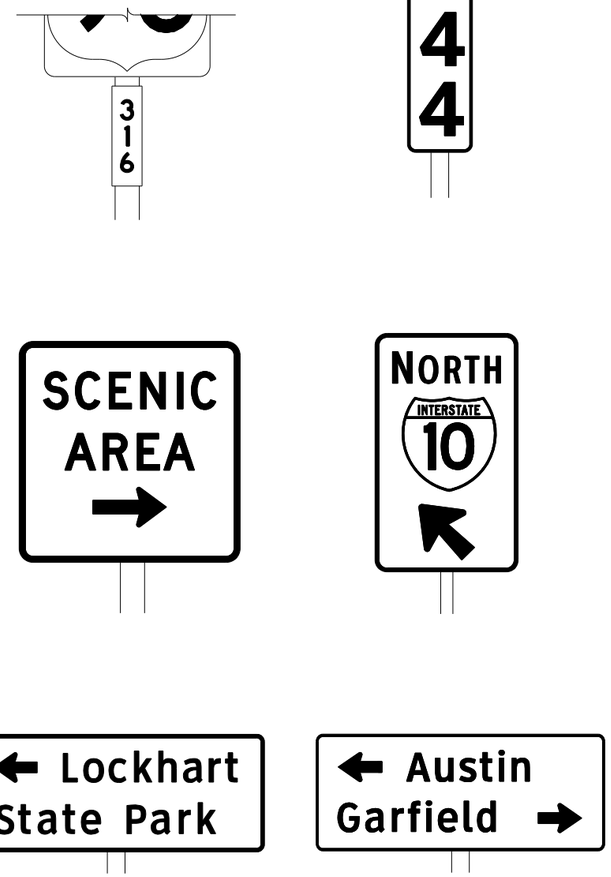
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

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

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



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

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

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

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

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

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

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

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

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

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

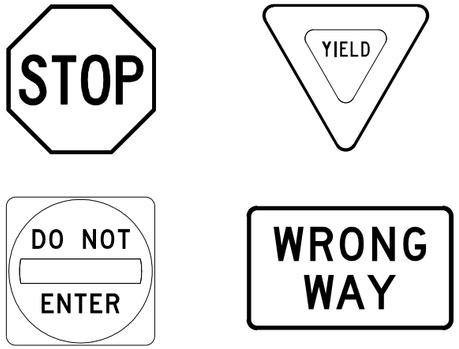
FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	SJT	TOM GREEN		87

3

DATE:
FILE:

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

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



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

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

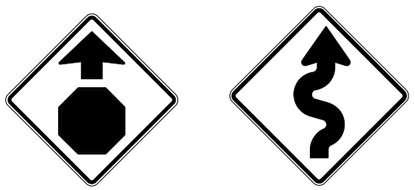
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

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

TYPICAL EXAMPLES

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

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

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

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
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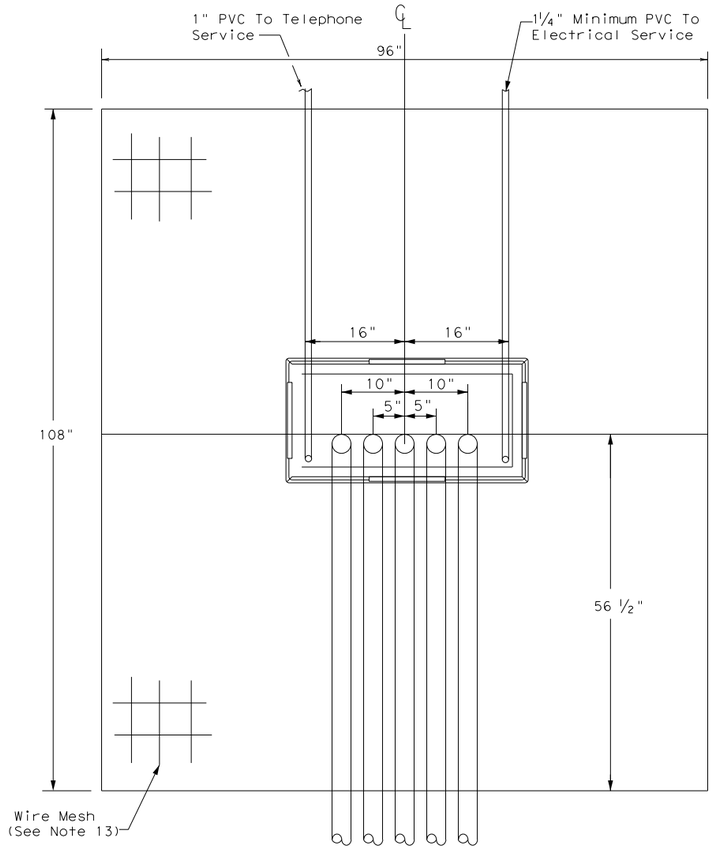
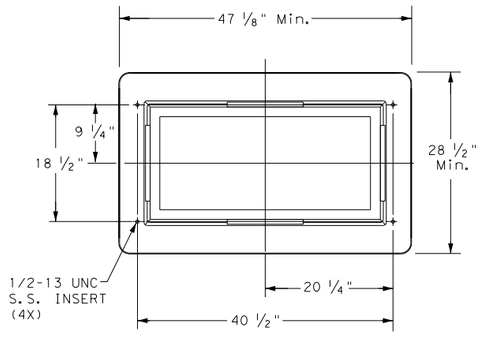
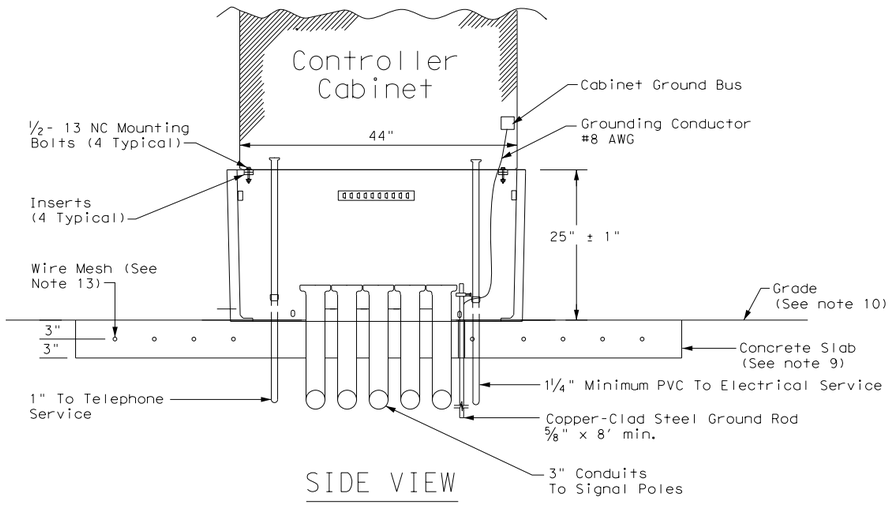
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	SJT	TOM GREEN		88



TOP VIEW



CABINET BASE



SIDE VIEW

TRAFFIC SIGNAL CONTROLLER BASE:

1. Provide a traffic signal controller base (cabinet base) manufactured of polymer concrete material consisting of calcareous 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 # A6001848X24, Quazite Model # PG3048Z709, or other as approved by TxDOT Traffic Safety 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 four 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#16x 3#16inch steel channel with eight T-slots spaced at 1-1/2 inches. The cable racks must easily accommodate the insertion of tie wraps to attach field 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. Grade earthwork such that it is flush with the concrete pad on all four sides, unless otherwise shown on the plans. Subsidiary to ITEM 680, four inch rip rap may be used in lieu of earthwork. Slopes shall gradually contour to match plans.

11. 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.

12. Install a PVC sleeve to prevent the ground rod from direct embedment in the slab.

13. 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.

14. Provide Class B concrete minimum for the slab in accordance with Item 421. Construct the slab in accordance with Item 531.

CONDUITS:

15. 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.

16. Extend conduits for future use at least 18-inches from the edge of the slab, terminate underground with a coupling, and cap and seal so that the seal can be removed without damaging the coupling. This must also apply to unused telephone conduit.

17. Stub up two separate conduits through the slab from the electrical and telephone services. Run the conduit for the electrical feed directly to the electrical service enclosure. Run the conduit for the telephone line directly to the telephone service, usually located on the same pole as the electrical service. Telephone must not under any circumstance share a conduit with any other function.

18. Terminate electric and telephone conduits 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:

19. Anchor the controller cabinet to the base using four stainless steel 1/2-13 NC bolts.

20. The silicone caulk bead specified in Item 680.3.B must be RTV 133.

PAYMENT:

21. Bid TS-CF as subsidiary to Item 680.

Texas Department of Transportation

Traffic Safety Division Standard

TRAFFIC SIGNAL CONTROLLER CABINET BASE AND PAD

TS-CF-21

FILE: ts-cf-21.dgn	DN:	CK:	DW:	CK:
© TxDOT October 2000	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
12-04	DIST	COUNTY		SHEET NO.
2-21	SJT	TOM GREEN		89

132

DATE: DATE TIME
FILE: DOCUMENT NAME

DATE: DATE TIME
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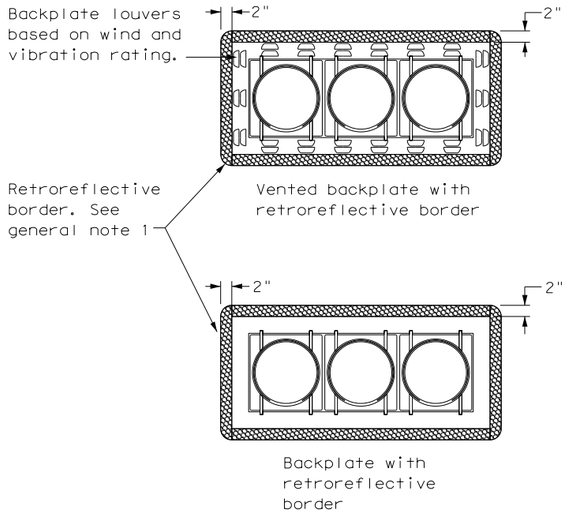
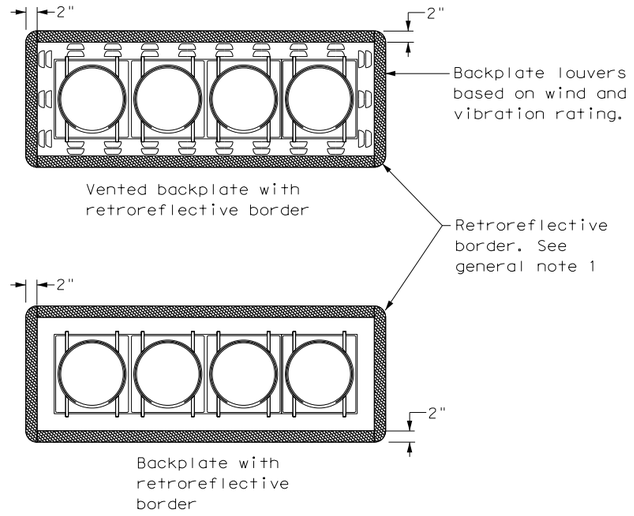


THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



FOUR-SECTION HEAD
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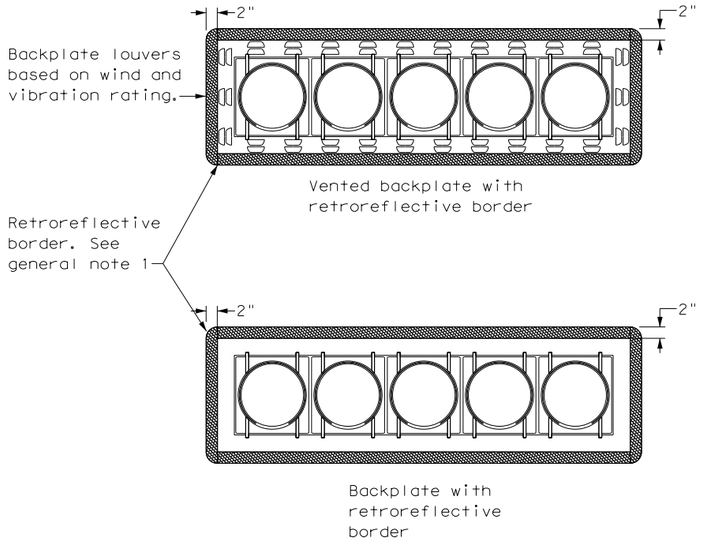

FIVE-SECTION HEAD
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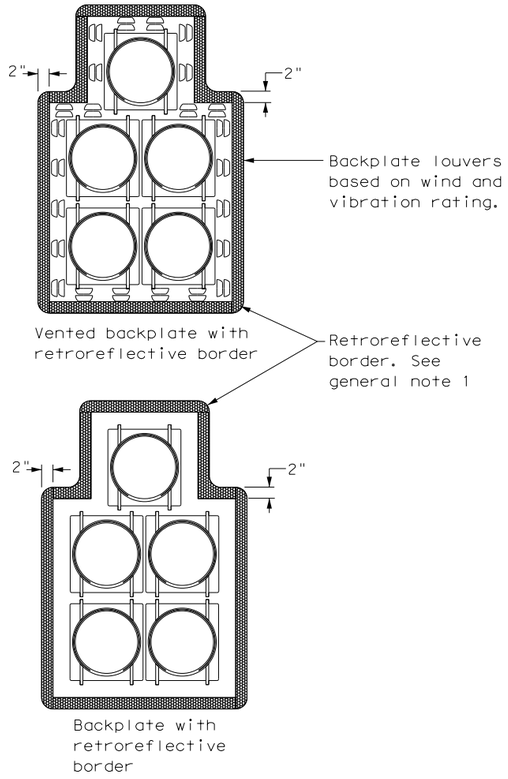
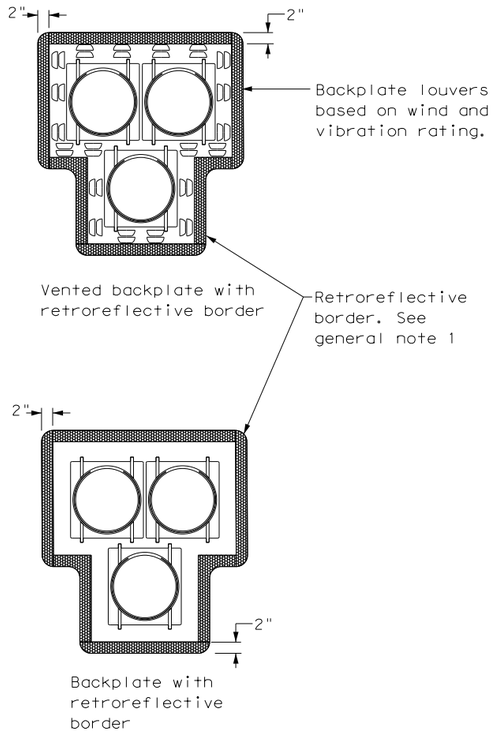


FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

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

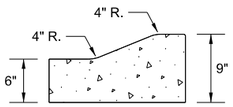
Texas Department of Transportation

Traffic Safety Division Standard

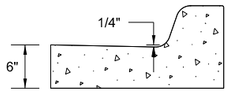
TRAFFIC SIGNAL HEAD WITH BACKPLATE

TS-BP-20

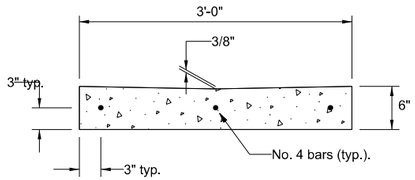
FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		90



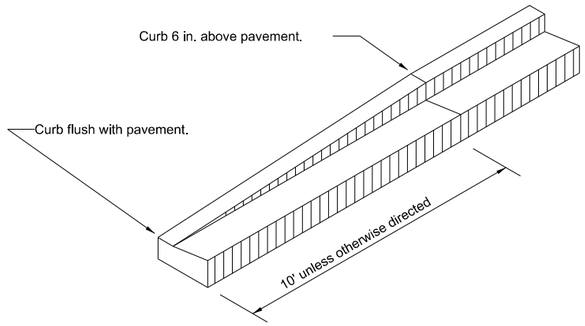
CONCRETE CURB AND GUTTER
(TYPE I)



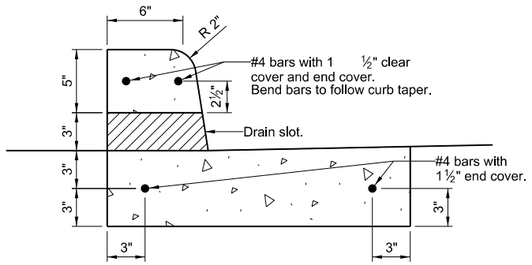
CONCRETE CURB AND GUTTER
(TYPE II)



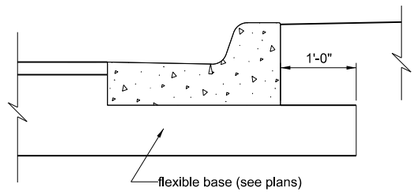
CONCRETE VALLEY GUTTER



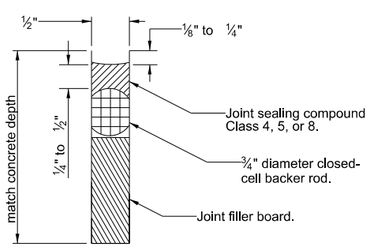
TRANSITION AT END OF CURB



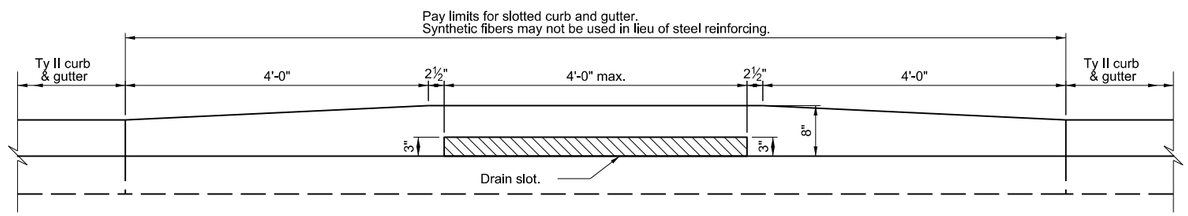
SECTION THRU CURB WITH DRAIN SLOT



FLEXIBLE BASE DETAILS



SEALED EXPANSION JOINT



ELEVATION OF CURB WITH DRAIN SLOT

PAY ITEMS

0529 6007 CONC CURB & GUTTER (TY I) LF
0529 6008 CONC CURB & GUTTER (TY II) LF
0529 6021 CONC CURB & GUTTER (SLOTTED) LF
0529 6023 CONC CURB & GUTTER(VALLEY GUTTER)(36") LF

GENERAL NOTES

1. Acceptable joint sealing compounds are listed on the Department's "Joint Sealers" Material/Producer List.
2. Joint filler boards shall conform to the requirements of DMS-6310, "Joint Sealants and Fillers."
3. Reinforcing steel shall conform to the requirements of Item 440, "Reinforcement for Concrete."
4. Curb and valley gutter shall have no contraction joints.
5. Construct sealed expansion joints in curb at points of curvature and at intervals no greater than 120 ft.
6. Reinforcing bars in curb and valley gutter shall be lapped a minimum of 15 in.
7. No. 4 steel reinforcing bars shall be used in concrete valley gutter. Synthetic fibers may not be used in lieu of steel reinforcing in concrete valley gutter.
8. Before final acceptance of the project, remove discoloration caused by tire marks, mud, asphalt, paint or other similar material to achieve a uniform color and texture of the finished surface exposed to view.
9. Synthetic fibers may not be used in lieu of steel reinforcing in concrete radius curb placed at roadway intersections.
10. See Standard Sheet CCCG for curb steel reinforcing details and additional information.
11. Unless otherwise shown in the plans, furnish and install 8 in. of flexible base beneath curb and gutter and valley gutter. Unless otherwise shown in the plans, Flexible base shall conform to the requirements of Item 247, "Flexible Base," Type A, Grade 5 (without minimum strengths or classification).
12. Drain slots are required where shown on the plans.

5/25/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
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PROFESSIONAL ENGINEER

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Texas Department of Transportation

San Angelo District

CURB DETAILS

SHEET 1 OF 1 NOT TO SCALE

SHEET ISSUED OR LAST REVISED	CONT	SECT	JOB	HIGHWAY
11-19	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		91

DATE: 5/25/2022 8:20:29 PM
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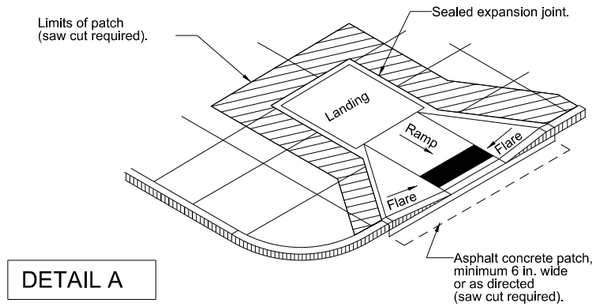
DETAIL A NOTES

1. Limits and extent of patch vary. Some locations may not require patch. Construct a formed edge if placing new concrete adjacent to asphalt concrete pavement.
2. Slopes of new concrete and asphalt concrete pavement used to patch adjacent to new curb ramps shall be 50:1 or less, unless otherwise approved. Adjust patch as directed to avoid obstructions or to remain within right of way limits.
3. Mark and saw cut straight lines at the boundaries of patch. Do not saw cut until the lines are approved.
4. Changes in level greater than 1/4 inch are not permitted.
5. Construct sealed expansion joints and tooled joints in new concrete patch to match locations of existing adjacent joints.
6. Construct sealed expansion joint between curb ramp and concrete patch.
7. Where asphalt concrete pavement is used, place a minimum thickness of two inches on compacted subgrade.

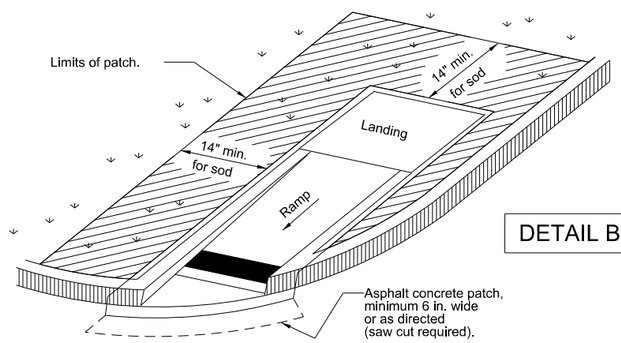


DETAIL A

CURB RAMP RETROFIT WITH ADJACENT CONCRETE OR ASPHALT CONCRETE PAVEMENT SURFACE

DETAIL B NOTES

1. Limits and extent of patch vary. If patch is less than four inches wide, backfill with topsoil, and do not place sod. If patch is more than four inches wide, provide a minimum sod width of 14 inches, unless obstructions exist. Do not create earth slopes steeper than 4:1 adjacent to new curb ramps unless otherwise approved. Adjust patch as directed to avoid obstructions or to remain within right of way limits.
2. Mark the limits of the proposed excavation, and do not excavate until the marks are approved.
3. Construct a formed edge at limits of new concrete.
4. Where earth backfill is required, place imported topsoil or suitable topsoil from adjacent excavations.
5. Where sodding is required, excavate or fill as necessary, then place two inches of imported topsoil. Place block Bermudagrass or St. Augustine sod as directed. Apply vegetative watering on all new sod. Furnish a minimum of ten daily applications of vegetative watering, all within two weeks of initial placement of sod, at a rate of 1/2 inch per application or three gallons per square yard. No vegetative watering is required on days when at least 1/2 inch of rainfall occurs. Place sod only between April 15 and September 15, unless otherwise directed. At all other times of the year, place cellulose fiber mulch seeding in lieu of sod.
6. Remove and/or relocate any existing irrigation system components and plant material that conflict with locations of proposed construction as directed.

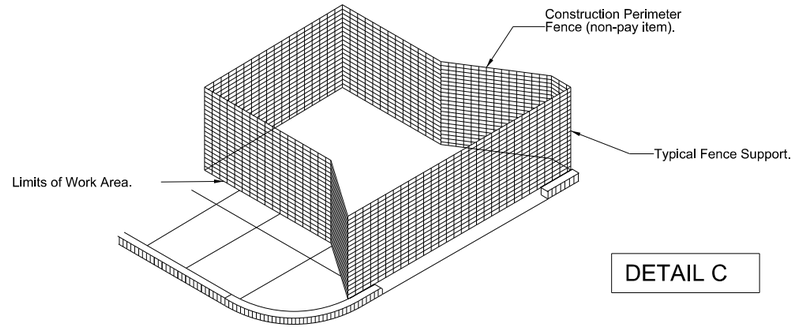


DETAIL B

CURB RAMP RETROFIT WITH ADJACENT GRASS OR UNPAVED SURFACE

DETAIL C NOTES

1. Furnish and install construction perimeter fence at end of work day around open excavations and uncured concrete in areas of sidewalk and curb ramp construction.
2. For those ramps that are complete with the exception of placement of paver-type detectable warnings, furnish and install temporary compacted fill material in detectable warning area as approved.
3. Place other additional appropriate warning or protective devices as directed for pedestrian safety. Provide access for pedestrians through and around work areas.
4. As directed, furnish and install signs R9-8 "PEDESTRIAN CROSSWALK", R9-9 "SIDEWALK CLOSED", R9-10DBL "SIDEWALK CLOSED USE OTHER SIDE", R9-11L(R) "SIDEWALK CLOSED AHEAD CROSS HERE", and R9-11aL(R) "SIDEWALK CLOSED CROSS HERE". Place other additional appropriate warning or protective devices as directed for pedestrian safety.
5. Construction perimeter fence shall conform to the requirements of Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls".
6. When approved by the Engineer, provide 28 in. traffic cones instead of construction perimeter fence.

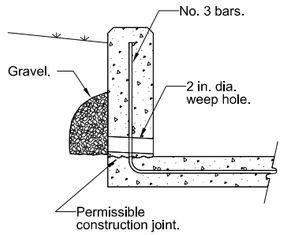


DETAIL C

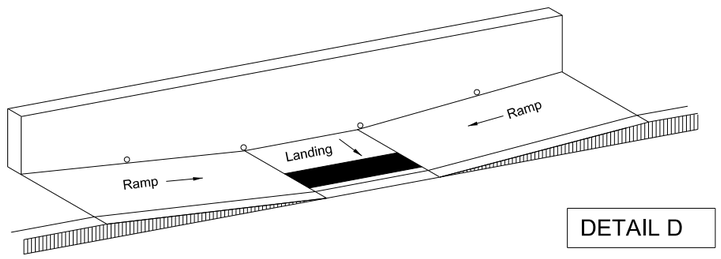
PEDESTRIAN PROTECTION FOR SIDEWALK AND CURB RAMP CONSTRUCTION

DETAIL D NOTES

1. No additional compensation will be made for the extended height wall.
2. Wall shall be 6 in. thick and shall have 3/4 in. chamfers. Length and height of wall shall be as shown on the plans or as directed. Maximum height for this wall design is 2 ft. Unless otherwise directed, provide a 2 in. reveal at top of wall.
3. Place 2 in. diameter weep holes through lowest exposed portion of wall at maximum 5 ft. spacing. Form with PVC pipe and cut off flush. Place one cubic foot of gravel and galvanized hardware cloth at each weep hole.
4. Reinforce wall with No. 3 bars placed 12 in. on center each way. Provide 2 in. clear cover for reinforcing. Lap lengths shall be 16 in. minimum and bends shall be 2.25 in. minimum inside diameter.
5. Obtain approval of forms before ordering concrete.
6. Place wall concrete in a single, uninterrupted pour. Consolidate thoroughly by the use of immersible vibrators.
7. Remove forms within 24 hours and immediately provide a rub finish to exposed surfaces of wall in accordance with Item 427, "Surface Finishes for Concrete".
8. Backfill the wall with excavated materials or other non-select backfill as approved. Compact as directed.



SECTION THRU WALL



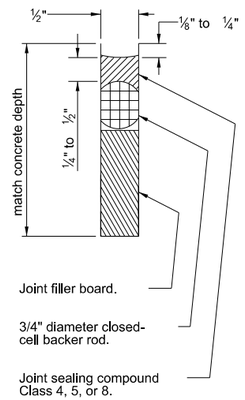
DETAIL D

EXTENDED HEIGHT WALL AT CURB RAMP

Parallel Curb Ramp shown - others similar

GENERAL NOTES

1. Unless otherwise indicated on the plans, the work performed, materials furnished, equipment, labor, tools, and incidentals for patches and pedestrian protection (including all pertinent items described on this sheet) will not be measured or paid directly, but will be considered as included in payment for Item 531, "Sidewalks."
2. Walking surfaces include ramps, landings, flares, and sidewalk and will be denoted in the plans as "concrete" or "asphalt" and require treatment as shown on Detail A. Non-walking surfaces will be denoted in the plans as "sod," "seed," or "unpaved" and require treatment as shown on Detail B.
3. Refer to PED Standard Sheets for additional details.
4. Concrete for patches adjacent to new curb ramps shall be 5 in. thick, reinforced with synthetic fiber listed on the Department's "Fibers for Class A and Class B Concrete Applications" Material/Producer List, and shall conform to the requirements of Item 421, "Hydraulic Cement Concrete," Class A.
5. Asphalt concrete for patches adjacent to new curb ramps shall be two inches thick and shall conform to the requirements of the following:
   a. Item 330, "Limestone Rock Asphalt Pavement",
   b. Item 334, "Hot-Mix Cold-Laid Asphalt Concrete Pavement",
   c. Item 340, "Dense-Graded Hot-Mix Asphalt (Small Quantity)",
   d. Item 341, "Dense-Graded Hot-Mix Asphalt",
   e. Item 344, "Superpave Mixtures", or
   f. Other material as approved.
6. Imported topsoil for patches adjacent to new curb ramps and beneath new sod or seeding shall conform to the requirements of Item 160, "Topsoil."
7. Block sod for patches adjacent to new curb ramps shall conform to the requirements of Item 162, "Sodding for Erosion Control."
8. Cellulose fiber mulch seeding for patches adjacent to new curb ramps shall conform to the requirements of Item 164, "Seeding For Erosion Control." Seed mix shall conform to Table 1, Table 2, Table 3, or Table 4 as directed by the Engineer.
9. Vegetative watering shall conform to the requirements of Item 168, "Vegetative Watering."
10. Acceptable joint sealing compounds are listed on the Department's "Joint Sealers" Material/Producer List.
11. Joint filler boards shall conform to the requirements of DMS-6310, "Joint Sealants and Fillers."
12. Furnish and install 2 in. of flexible base under curb ramps. Flexible base shall conform to the requirements of Item 247, "Flexible Base," Type A, Grade 5 (without minimum strengths or classification). Recycled asphalt pavement (RAP) may be incorporated into the flexible base or may used in place of flexible base. Flexible base used as a foundation for sidewalks and curb ramps will not be measured and paid for separately, but will be considered as included in payment for the pertinent items.
13. Plastic drums shall conform to the requirements of Standard Sheet BC(8).
14. Compact soils beneath new patch materials as directed.
15. Prior to final inspection by Registered Accessibility Specialist, remove accumulated sediment on ramps and clean detectable warning surfaces.
16. If approved, perform planing in front of new curb ramp as an alternative to asphalt concrete patch.
17. Vertical walls adjacent to ramps and landings shall be 6 in. wide.
18. Detectable warnings are required on curb ramps crossing public alleys but are not required on curb ramps crossing unsignalized private driveways.



SEALED EXPANSION JOINT

5/25/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
PROFESSIONAL ENGINEER

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Texas Department of Transportation

San Angelo District

CURB RAMPS SUPPLEMENTARY INFORMATION

SHEET 1 OF 1 NOT TO SCALE

SHEET ISSUED OR LAST REVISED
11-19

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		92

DATE: 5/25/2022 8:20:31 PM
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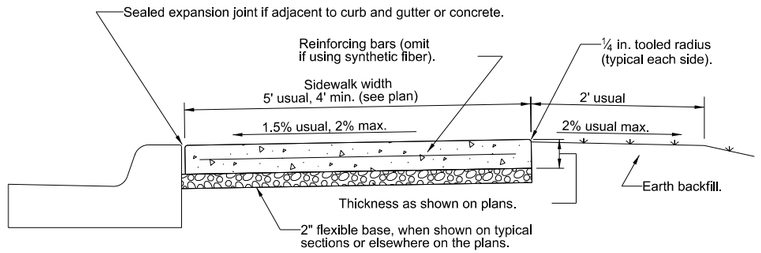
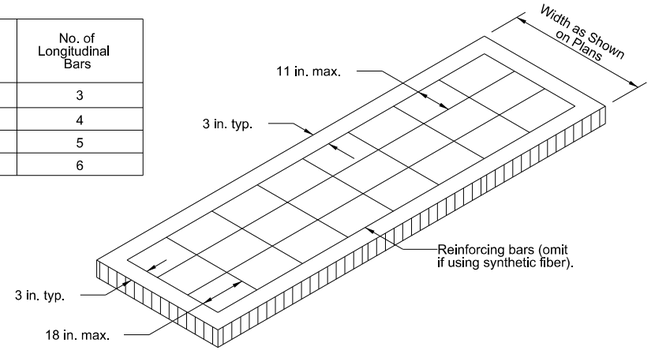
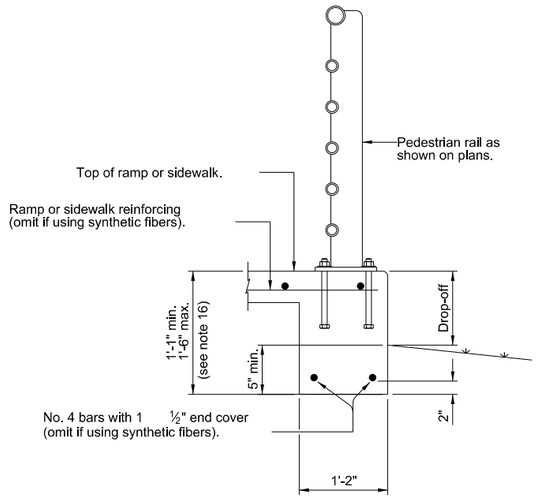


TYPICAL SECTION THROUGH SIDEWALK

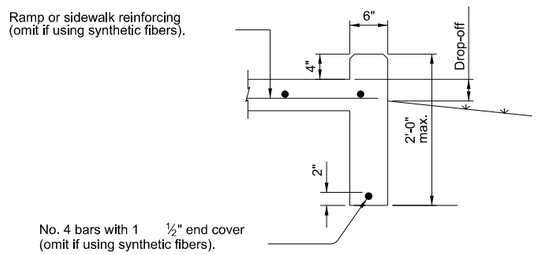
Sidewalk Width	No. of Longitudinal Bars
3 ft.	3
4 ft.	4
5 ft.	5
6 ft.	6



SIDEWALK STEEL REINFORCING



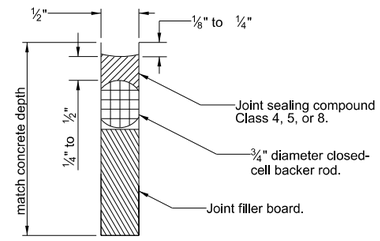
SECTION THRU SIDEWALK
WITH PEDESTRIAN RAIL FOOTING



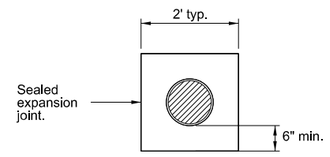
SECTION THRU SIDEWALK
WITH EDGE CURB PROTECTION

GENERAL NOTES

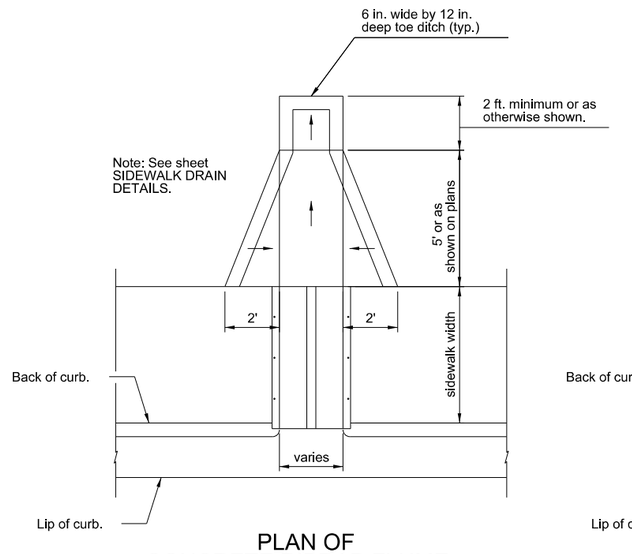
1. The work performed, materials furnished, equipment, labor, tools, and incidentals for flexible base, sealed expansion joints and earth backfill will not be measured or paid directly, but will be considered as included in payment for Item 531, "Sidewalks."
2. Acceptable joint sealing compounds are listed on the Department's "Joint Sealers" Material/Producer List.
3. Joint filler boards shall conform to the requirements of DMS-6310, "Joint Sealants and Fillers."
4. Reinforcing steel shall conform to the requirements of Item 440, "Reinforcement for Concrete."
5. Where earth backfill is required, place imported topsoil or suitable topsoil from adjacent excavations. Limits and extent of backfill vary. Adjust backfill as directed to avoid obstructions or to remain within right of way limits. Slopes of earth backfill used to patch adjacent to new sidewalk shall be 3:1 or less, unless otherwise directed.
6. Remove and/or relocate any existing irrigation system components, plant material, and other landscaping items that conflict with locations of proposed construction as directed. Unless otherwise identified on the plans, this will not be measured or paid directly, but will be considered as included in payment for Item 531, "Sidewalks."
7. Construct 1/4 in. radius transverse contraction (tooled) joints at intervals equal to the sidewalk width, unless otherwise directed.
8. Construct sealed expansion joints at intervals not to exceed 40 ft. and where new concrete sidewalk abuts curbs, driveways, storm drain inlets, and existing concrete or buildings.
9. Sidewalks crossing driveways shall conform to the driveway details as shown elsewhere in the plans.
10. Flexible base shall conform to the requirements of Item 247, "Flexible Base," Type A, Grade 5 (without minimum strengths or classification). Recycled asphalt pavement (RAP) may be incorporated into the flexible base or may used in place of flexible base.
11. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber is listed on the Department's "Fibers for Class A and Class B Concrete Applications" Material/Producer List.
12. If used, reinforcing steel shall be No. 3 uncoated deformed bars, placed at the vertical mid-point of the sidewalk thickness. Securely tie reinforcing steel where bars lap, intersect, or cross. Equivalent welded wire reinforcement may be substituted.
13. Where obstructions to remain exist, sidewalk width may be decreased to 3 ft. for a distance not to exceed 200 ft. When approved, sidewalk width may be decreased at obstructions to 32 in. for a distance not to exceed 2 ft. provided that reduced width segments are separated by segments that are 4 ft. long minimum and 3 ft. wide minimum.
14. Concrete for pedestrian rail footing and edge curb protection will be measured and paid for as Item 420.
15. Construct concrete riprap flumes 5 in. thick. Flumes adjacent to curbs are not intended for use in urban areas or within sidewalks. Slope flumes to match surrounding grades.
16. Use details on sheet SIDEWALK RETAINING WALL DETAILS if pedestrian rail footing height exceeds 1'-6".



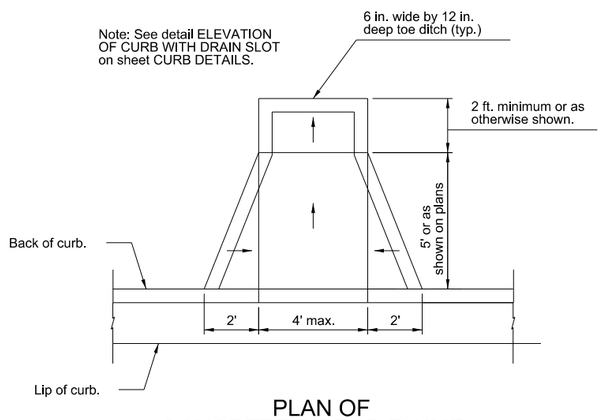
SEALED EXPANSION JOINT



JOINT LAYOUT
AT OBSTRUCTION



PLAN OF
CONCRETE RIPRAP FLUME
ADJACENT TO SIDEWALK DRAIN



PLAN OF
CONCRETE RIPRAP FLUME
ADJACENT TO CURB

SIDEWALK EDGE PROTECTION GUIDANCE

HAZARD TYPE	EDGE PROTECTION
drop-off < 1/2" or drop-off beyond 2' from sidewalk edge	none required
drop-off between 1/2" and 10" within 2' from sidewalk edge	edge curb or handrail
drop-off > 10" within 2' from sidewalk edge	handrail
slope > 2:1 within 2' from sidewalk edge and total drop-off > 30"	

PAY ITEMS

0420 6012 CL B CONC (MISC)	CY
0432 6044 RIPRAP (CONC)(FLUME)	CY
0531 6001 CONC SIDEWALKS (4")	SY
0531 6002 CONC SIDEWALKS (5")	SY
0531 6003 CONC SIDEWALKS (6")	SY

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SIDEWALK DETAILS

SHEET 1 OF 1 NOT TO SCALE

SHEET ISSUED OR LAST REVISED 11-19

CONT	SECT	JOB	HIGHWAY
0907	24	54	US 87
DIST	COUNTY		SHEET NO.
SJT	TOM GREEN		93

DATE: 5/25/2022 8:20:33 PM
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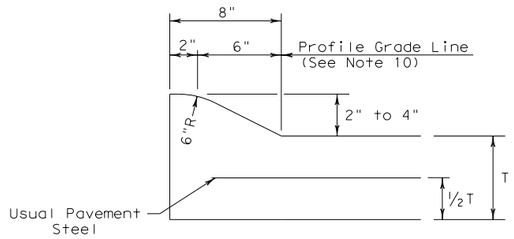
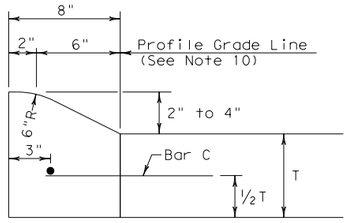
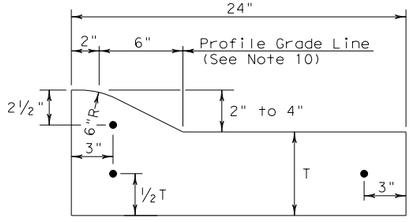


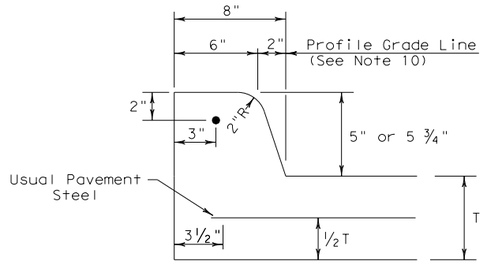
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



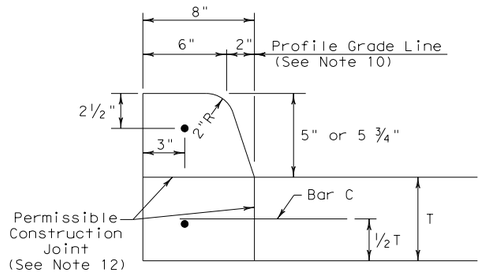
TYPE I CURB
2" - 4" HEIGHT



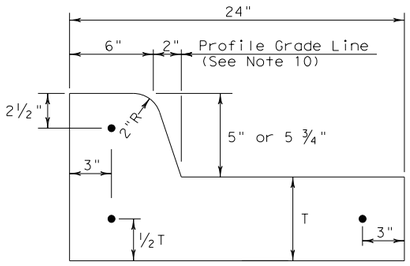
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



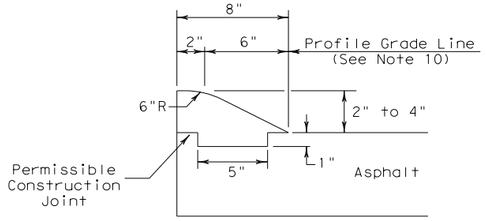
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



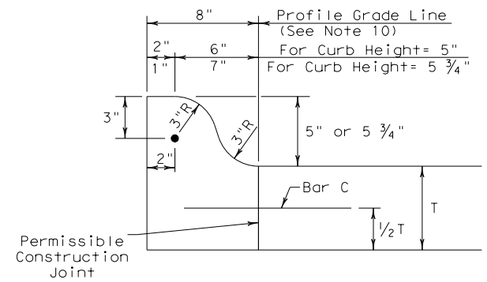
TYPE II CURB
5" - 5 ¾" HEIGHT



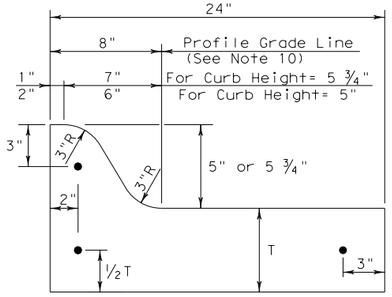
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



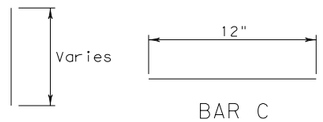
TYPE III CURB (KEYED)
2" - 4" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

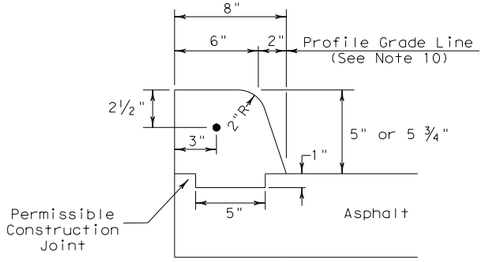


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

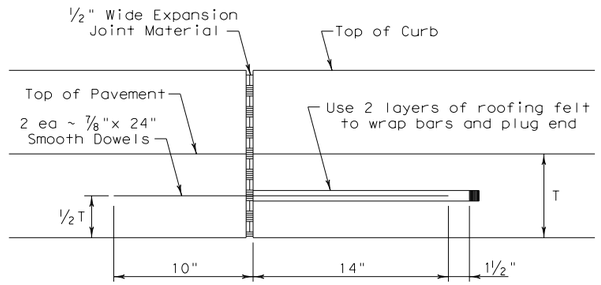


BAR B

BAR C

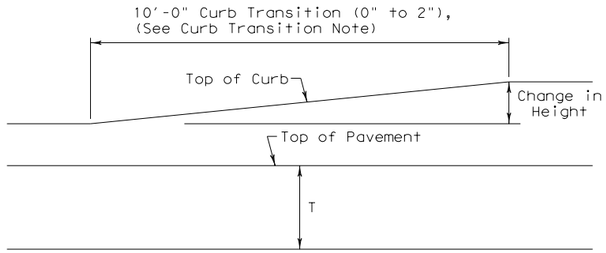


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and the grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B used as needed to support curb reinforcing steel during concrete placement.

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

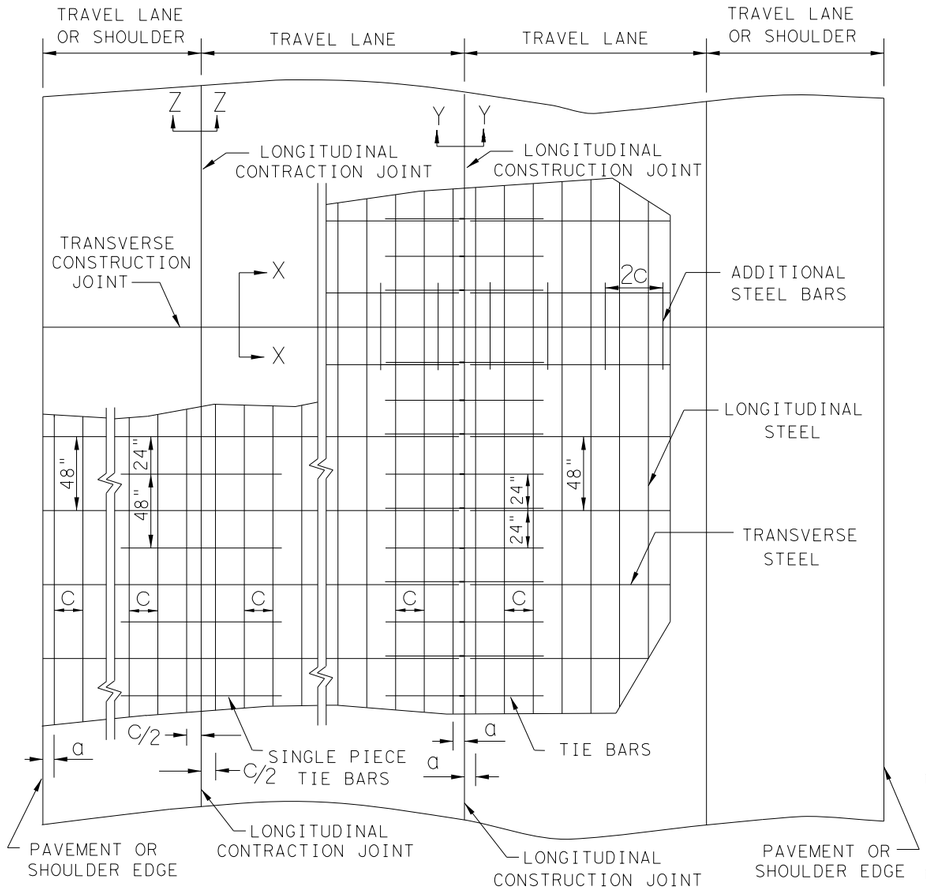
CCCG-21

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: SS	CK: KM
©TxDOT: FEBRUARY 2021 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		94

DATE:
FILE:

TABLE NO.1 LONGITUDINAL STEEL					
SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING a (IN.)	SPACING 2 X C (IN.)	LENGTH L (IN.)
7.0	#5	6.5	3 TO 4	13	50
7.5	#5	6.0	3 TO 4	12	50
8.0	#6	9.0	3 TO 4	18	50
8.5	#6	8.5	3 TO 4	17	50
9.0	#6	8.0	3 TO 4	16	50
9.5	#6	7.5	3 TO 4	15	50
10.0	#6	7.0	3 TO 4	14	50
10.5	#6	6.75	3 TO 4	13.5	50
11.0	#6	6.5	3 TO 4	13	50
11.5	#6	6.25	3 TO 4	12.5	50
12.0	#6	6.0	3 TO 4	12	50
12.5	#6	5.75	3 TO 4	11.5	50
13.0	#6	5.5	3 TO 4	11	50

TABLE NO.2 TRANSVERSE STEEL AND TIE BARS						
SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
7.0 - 7.5	#5	48	#5	48	#5	24
8.0 - 13.0	#5	48	#6	48	#6	24

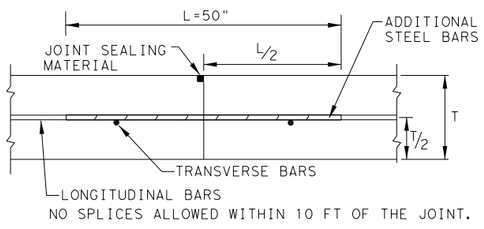


TYPICAL PAVEMENT LAYOUT

PLAN VIEW (NOT TO SCALE)

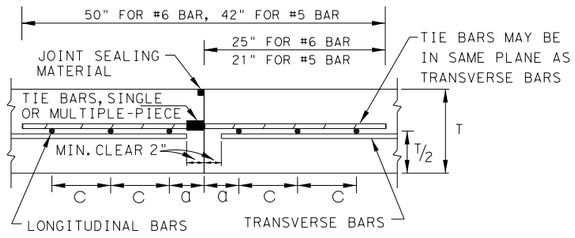
GENERAL NOTES

1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. USE COARSE AGGREGATES WITH A RATED COEFFICIENT OF THERMAL EXPANSION (CoTE) OF NOT MORE THAN 5.5 X 10^{-6} IN/IN/ °F AS LISTED IN THE CONCRETE RATED SOURCE QUALITY CATALOG (CRSQC).
3. ALL THE REINFORCING STEEL AND TIE BARS SHALL BE DEFORMED STEEL BARS CONFORMING TO ASTM A 615 (GRADE 60) OR ASTM A 996 (GRADE 60) OR ABOVE. STEEL BAR SIZES AND SPACINGS SHALL CONFORM TO TABLE NO.1 AND TABLE NO.2.
4. WHEN COARSE AGGREGATE WITH A RATED CoTE OF NOT MORE THAN 4.3 X 10^{-6} IN/IN/ °F IS USED, TABLE NO.1A MAY BE USED FOR LONGITUDINAL STEEL AS APPROVED BY THE ENGINEER.
5. STEEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1 IN. HORIZONTALLY AND +/- 0.5 IN. VERTICALLY. CALCULATED AVERAGE BAR SPACING (CONCRETE PLACEMENT WIDTH / NUMBER OF LONGITUDINAL BARS) SHALL CONFORM TO TABLE NO.1 OR TABLE NO.1A.
6. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
7. THE SAW CUT DEPTH FOR THE LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS (T/3).
8. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
9. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN.10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
10. OMIT TIE BARS LOCATED WITHIN 18-IN. OF THE TRANSVERSE CONSTRUCTION JOINTS (SECTION X-X). USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL FORMED JOINTS.
11. LONGITUDINAL REINFORCING STEEL SPLICES SHALL BE A MINIMUM OF 25 IN. STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT.
12. THE DETAIL FOR THE JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



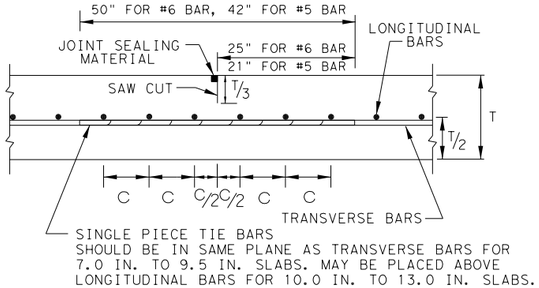
TRANSVERSE CONSTRUCTION JOINT

SECTION X - X



LONGITUDINAL CONSTRUCTION JOINT

SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT

SECTION Z - Z

SHEET 1 OF 2

Texas Department of Transportation

Design Division Standard

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

ONE LAYER STEEL BAR PLACEMENT
T - 7 to 13 INCHES

CRCP(1)-17

FILE: crcp117.dgn	DN: TxDOT	CK: AN	DW: HC	CK:VP/KM
© TxDOT: May 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10/10/2011 ADD GN #12 04/09/2013 REMOVE 6" AND 6.5" ADD CTE REQUIREMENTS 05/05/2017 CoTE AS RATED 4.3	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		95

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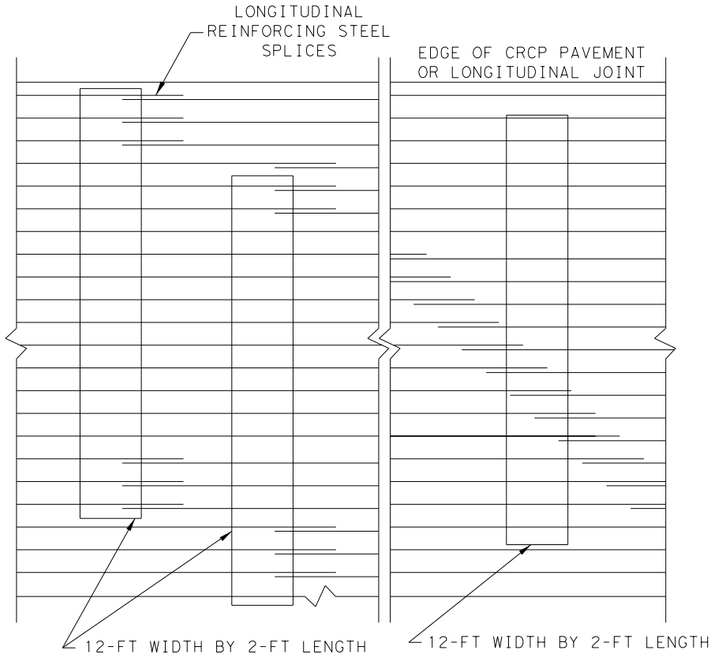
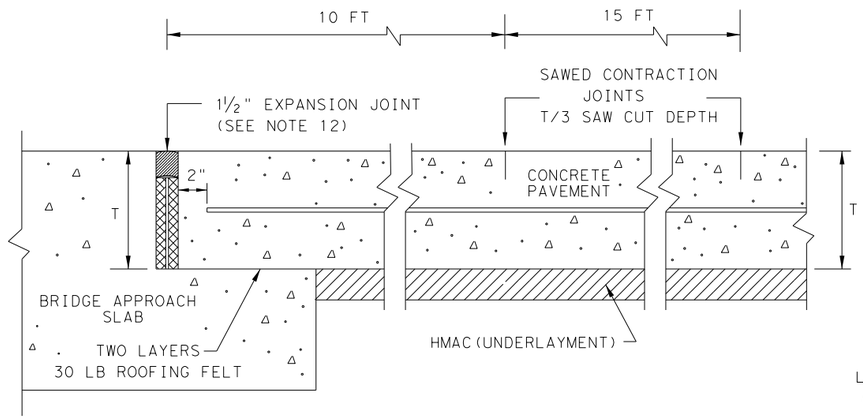
TABLE NO. 1A LONGITUDINAL STEEL FOR LOW CoTE CONCRETE AS APPROVED BY THE ENGINEER					
SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING c (IN.)	SPACING a (IN.)	SPACING 2 x c (IN.)	LENGTH L (IN.)
7.0	#5	7.5	3 TO 4	15	50
7.5	#5	7.0	3 TO 4	14	50
8.0	#6	10.0	3 TO 4	20	50
8.5	#6	9.5	3 TO 4	19	50
9.0	#6	9.0	3 TO 4	18	50
9.5	#6	8.5	3 TO 4	17	50
10.0	#6	8.0	3 TO 4	16	50
10.5	#6	7.5	3 TO 4	15	50
11.0	#6	7.0	3 TO 4	14	50
11.5	#6	6.75	3 TO 4	13.5	50
12.0	#6	6.50	3 TO 4	13	50
12.5	#6	6.25	3 TO 4	12.5	50
13.0	#6	6.0	3 TO 4	12	50

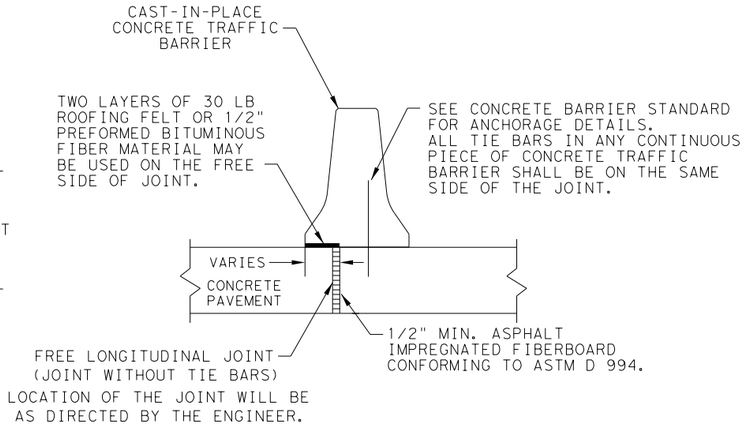


STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT. ANY OTHER LAP CONFIGURATION MEETING THIS REQUIREMENT WILL BE ALLOWED.

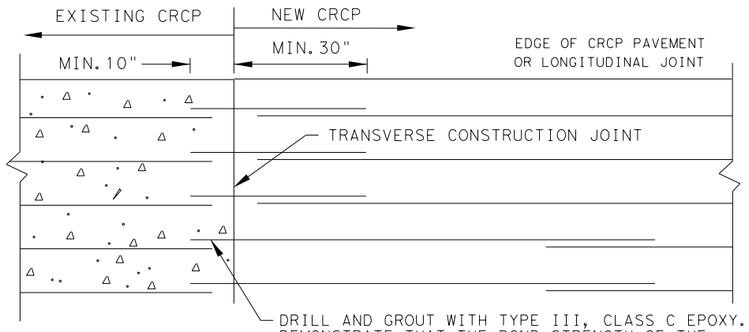
EXAMPLES OF LAP CONFIGURATION
PLAN VIEW (NOT TO SCALE)



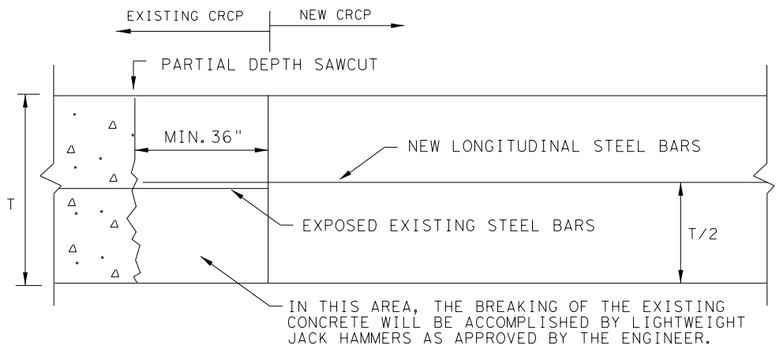
TRANSVERSE EXPANSION JOINT DETAIL
AT BRIDGE APPROACH



FREE LONGITUDINAL JOINT DETAIL

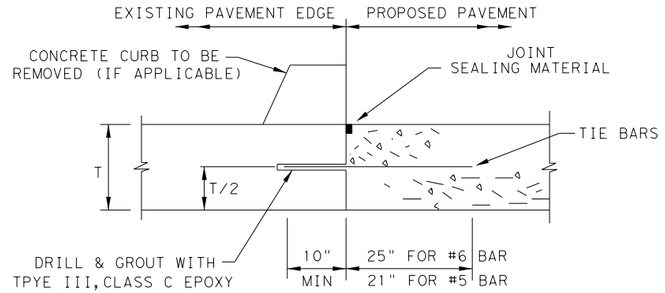


OPTION A: DRILL AND EPOXY
PLAN VIEW (NOT TO SCALE)



OPTION B: BREAKBACK AND LAP

TRANSVERSE TIE JOINT DETAIL
EXISTING CRCP TO NEW CRCP



1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQURIMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 TIE BARS FOR 8" AND THICKER SLABS, USE #5 TIE BARS FOR LESS THAN 8" THICK SLABS.

LONGITUDINAL WIDENING JOINT DETAIL

Texas Department of Transportation

Design Division Standard

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

ONE LAYER STEEL BAR PLACEMENT
T - 7 to 13 INCHES

CRCP(1)-17

FILE: crcp117.dgn	DN: TxDOT	CK: AN	DW: HC	CK: VP/KM
©TxDOT: May 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
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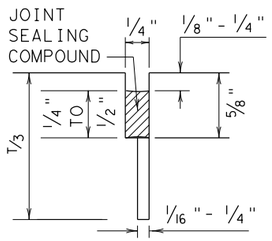
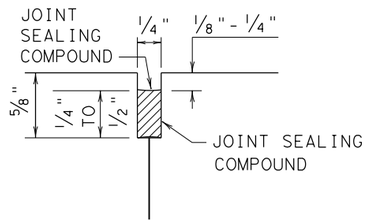
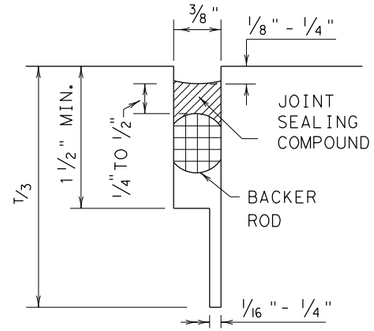
METHOD B: JOINT SEALING COMPOUND



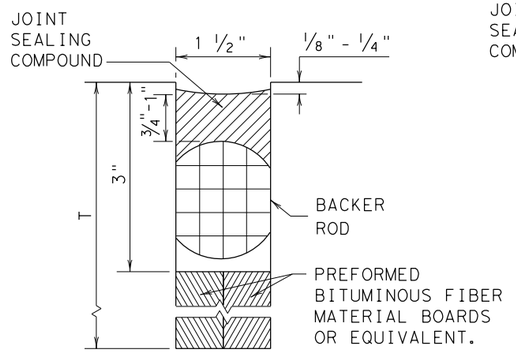
LONGITUDINAL SAWED CONTRACTION JOINT



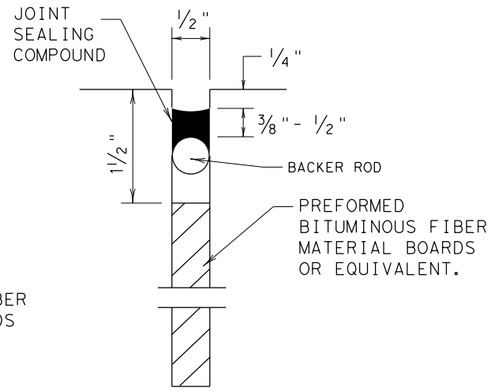
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

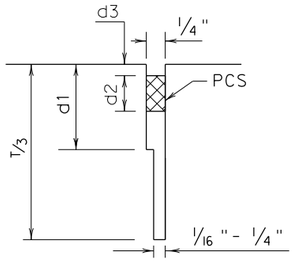


TRANSVERSE FORMED EXPANSION JOINT

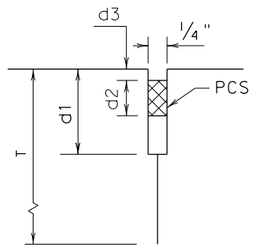


FORMED ISOLATION JOINT

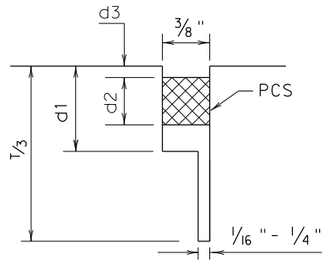
METHOD A: PREFORMED COMPRESSION SEALS (PCS)(DMS-6310 CLASS 6)



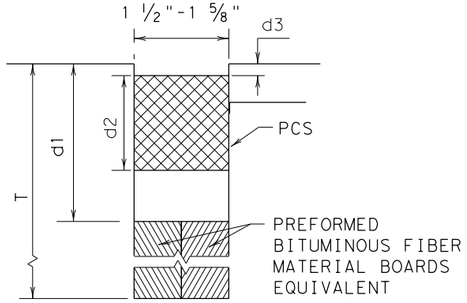
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
2. THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
3. THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
4. DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
5. REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
6. FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
7. FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4,5,7,OR 8 FOR MAINTAINING EXISTING JOINTS.
8. THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
9. ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

Texas Department of Transportation

Design Division Standard

CONCRETE PAVING DETAILS

JOINT SEALS

JS-14

FILE: js14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
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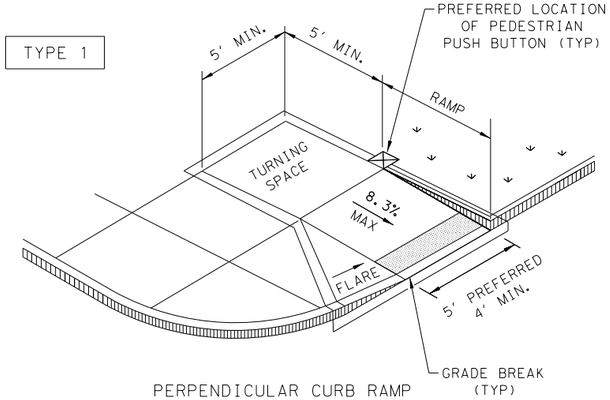
REVISIONS	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		97

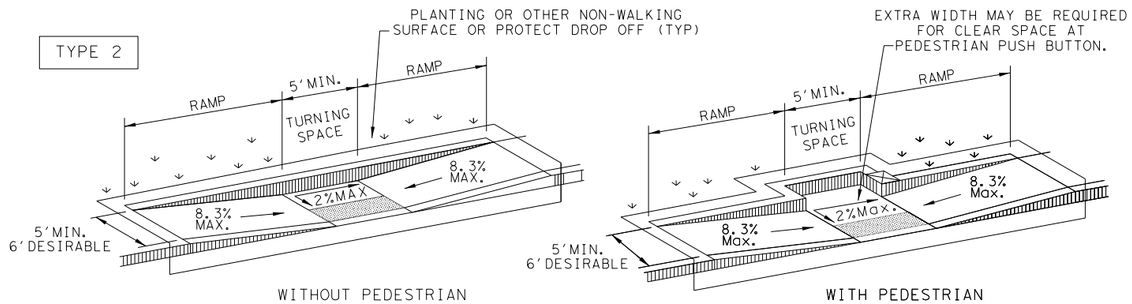
DATE:
FILE:

TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

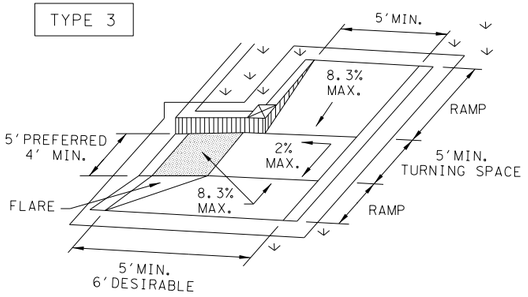


WITHOUT PEDESTRIAN PUSH BUTTON

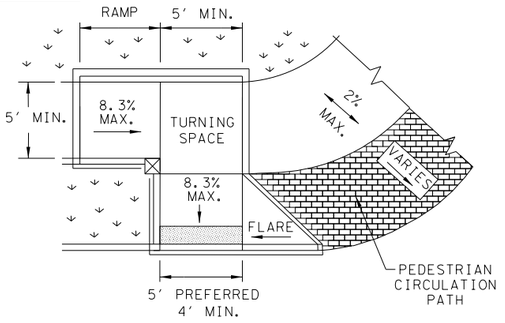
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

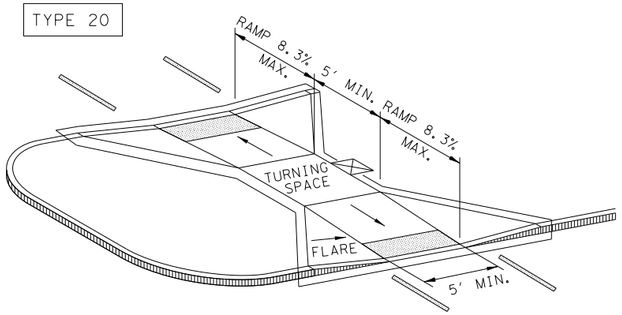


TYPE 6



COMBINATION CURB RAMPS

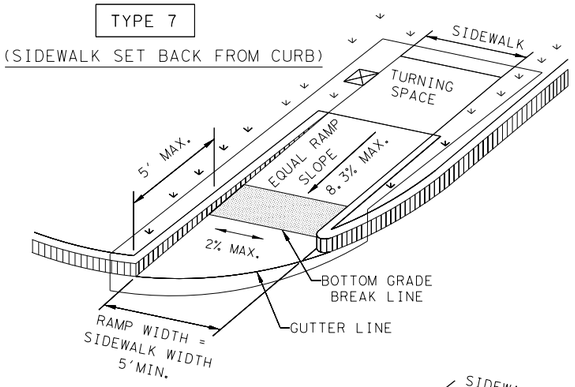
TYPE 20



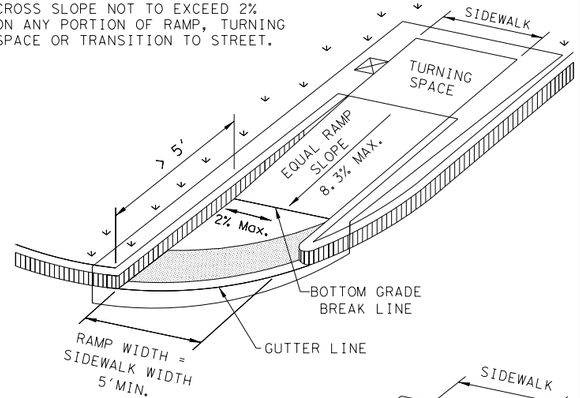
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

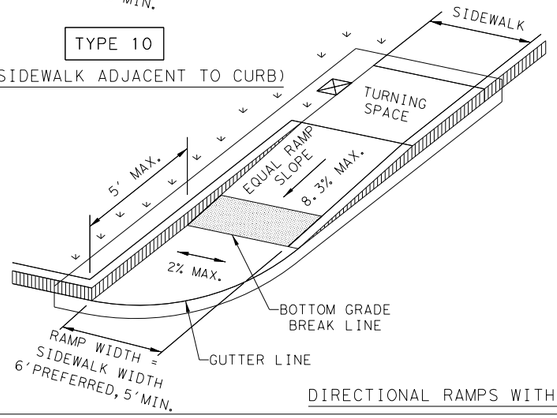


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

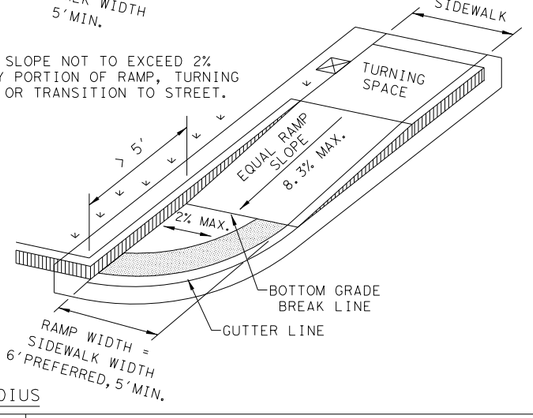


TYPE 10

(SIDEWALK ADJACENT TO CURB)

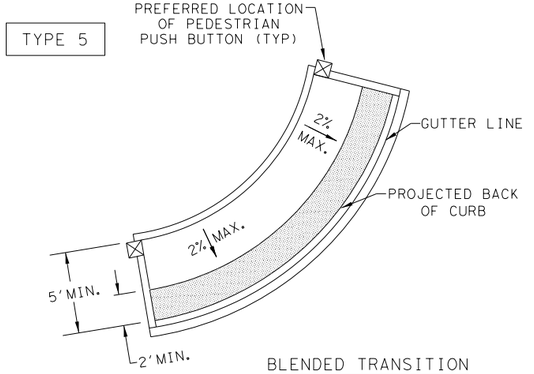


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



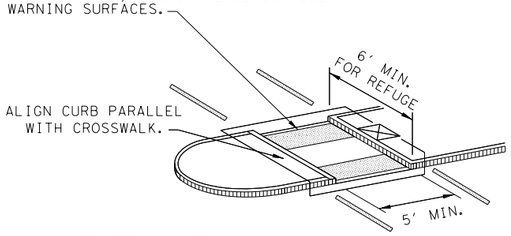
DIRECTIONAL RAMPS WITHIN RADIUS

TYPE 5



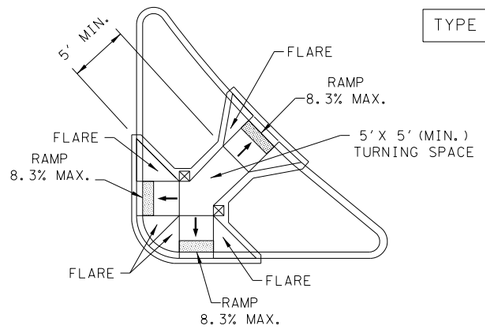
BLENDED TRANSITION
(FLUSH LANDING)

TYPE 21

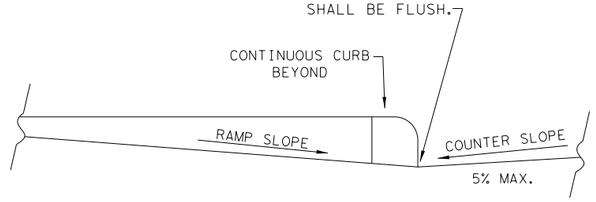


NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

SHEET 1 OF 4

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		98

DATE:
FILE:

GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5′. Where the sidewalk is adjacent to the back of curb, a 6′ sidewalk width is desirable. Where a 5′ sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4′ for short distances. 5′x 5′ passing areas at intervals not to exceed 200′ are required.
5. Turning Spaces shall be 5′x 5′ minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4′x 4′ wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6′ wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5′x 5′ landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

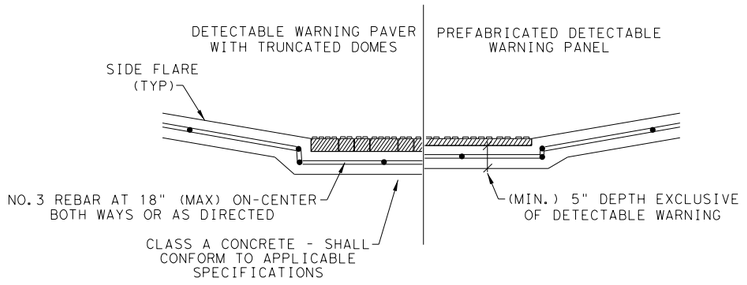
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

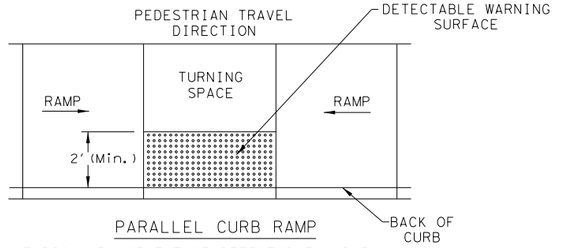
SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.



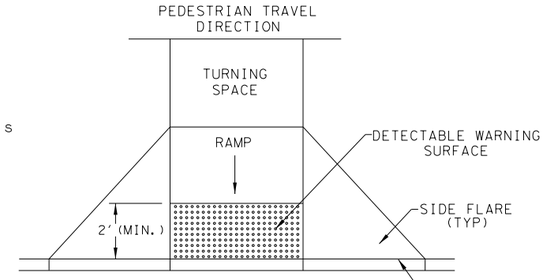
SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

DETECTABLE WARNING SURFACE DETAILS



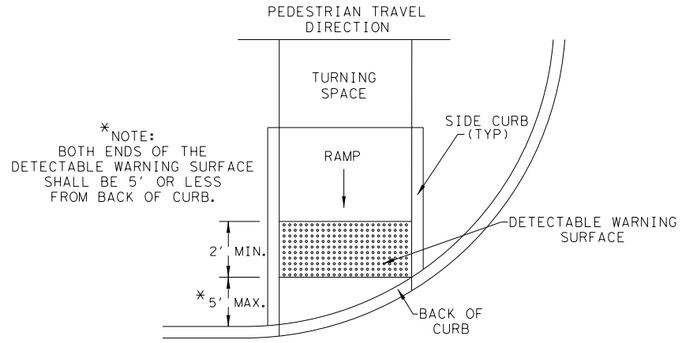
PARALLEL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

Texas Department of Transportation

Design Division Standard

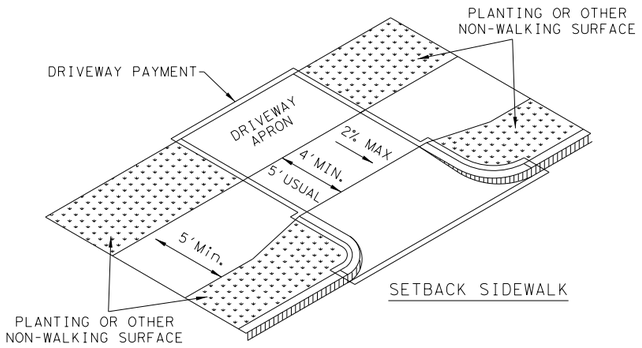
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

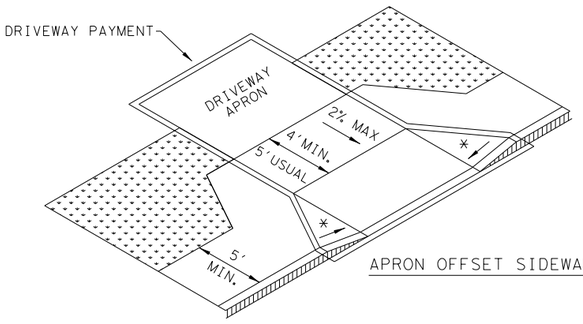
FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
	CONT	SECT	JOB		HIGHWAY
REVISIONS REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	0907	24	54		US 87
	DIST		COUNTY		SHEET NO.
	SJT		TOM GREEN		99

DATE:
FILE:

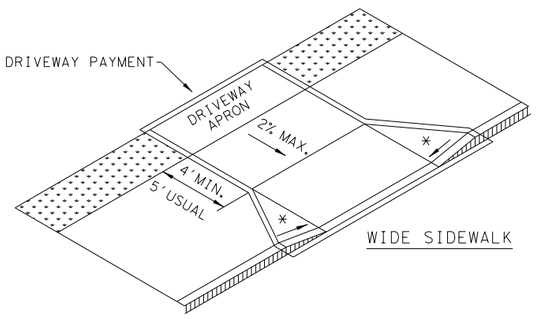
SIDEWALK TREATMENT AT DRIVEWAYS



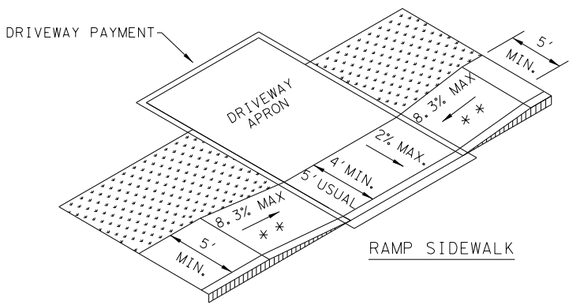
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

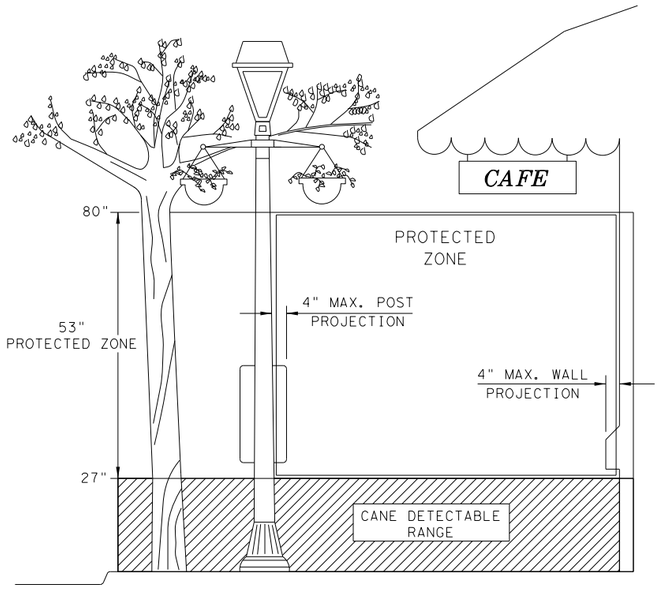


RAMP SIDEWALK

NOTES:

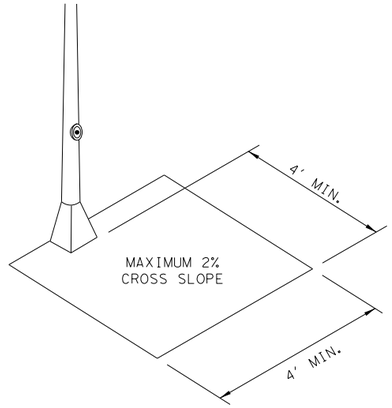
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.

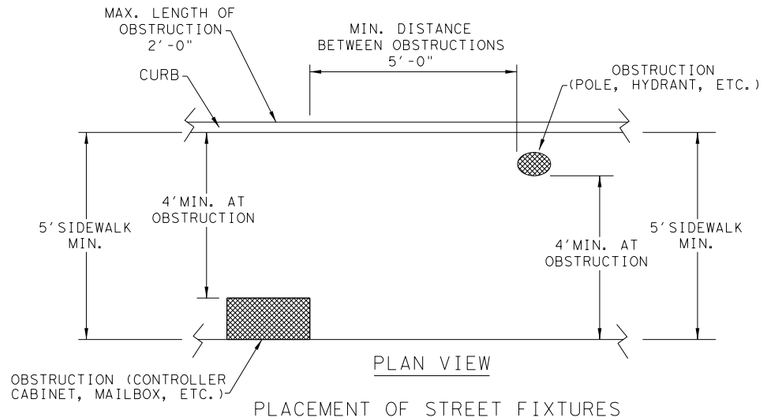


PROTECTED ZONE

NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



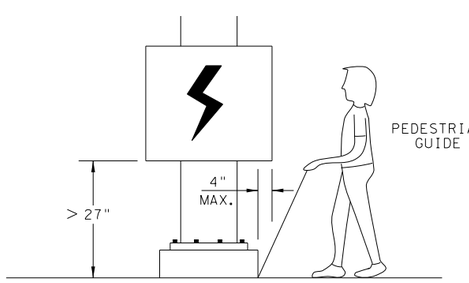
CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



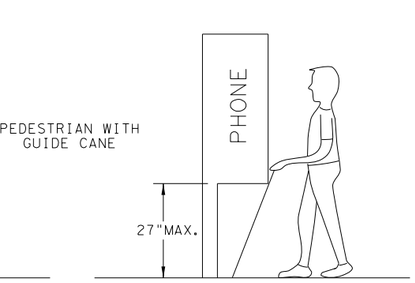
PLAN VIEW

PLACEMENT OF STREET FIXTURES

NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT ≤ 27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

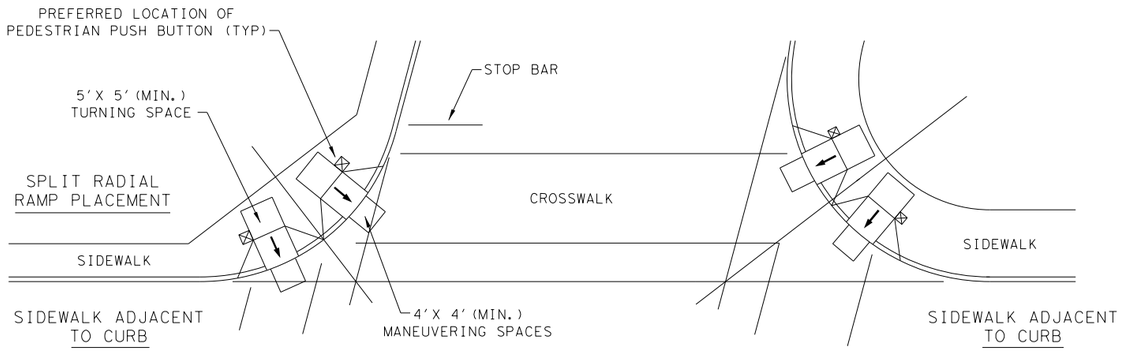
PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		100

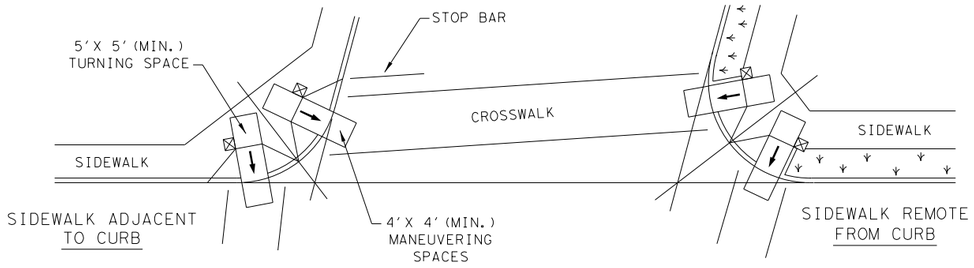
DATE:
FILE:

TYPICAL CROSSING LAYOUTS

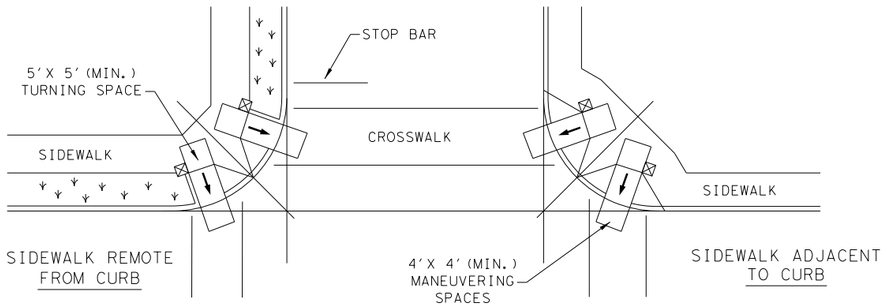
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



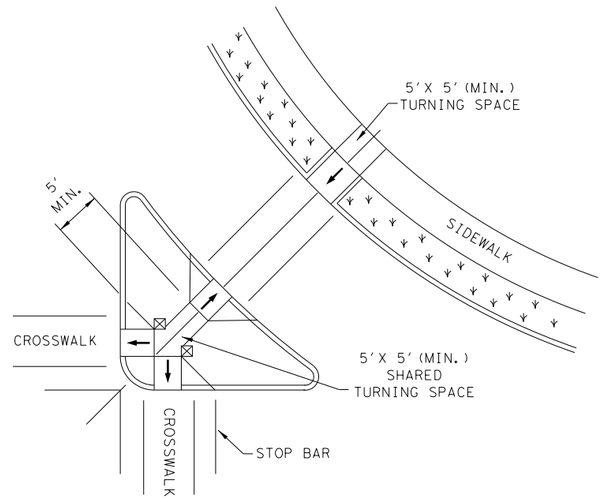
SKEWED INTERSECTION WITH "LARGE" RADIUS



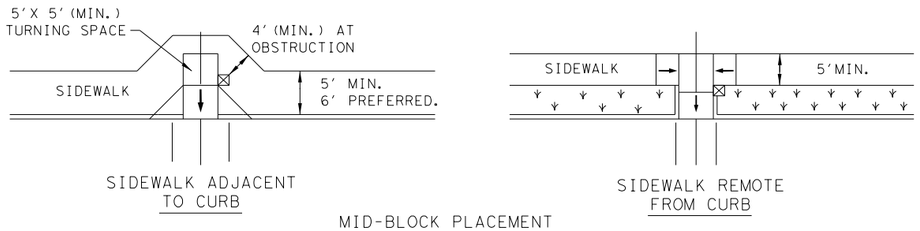
SKEWED INTERSECTION WITH "SMALL" RADIUS



NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ⊠

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

SHEET 4 OF 4

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES
CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	0907	24	54		US 87
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY			SHEET NO.
	SJT	TOM GREEN			101

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or CGP required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator that may receive discharges from this project. The MS4 Operator may need to be notified prior to construction activities.

1. N/A

☐ NO ACTION REQUIRED ☑ ACTION REQUIRED

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000.
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post CSN with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When PSL's increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

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

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

Adhere to all of the terms and conditions associated with the following permit(s):

☑ No Permit Required
☐ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP#

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

Required Actions: List waters of the U.S. that the permit applies to, the location in project, and check BMP's planned to control erosion, sedimentation and post-construction TSS.

1. N/A

BEST MANAGEMENT PRACTICES

EROSION

☐ SEEDING OR SODDING
☐ MULCHING
☐ SOIL RETENTION BLANKETS
☑ BIODEGRADABLE EROSION CONTROL LOGS
☐ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
☐ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
☐ TOPSOIL OR COMPOST
☐ FLEXIBLE CHANNEL LINERS
☐ GROUND COVER

SEDIMENTATION

☐ ROCK FILTER DAMS
☐ TEMPORARY SEDIMENT CONTROL FENCES
☐ TRIANGULAR FILTER DIKES
☐ TOPSOIL OR COMPOST
☑ BIODEGRADABLE EROSION CONTROL LOGS
☐ SEDIMENT BASINS
☐ SAND BAG BERMS
☐ STRAW BALE DIKES
☐ BRUSH BERMS
☐ STORM INLET SEDIMENT TRAPS

POST-CONSTRUCTION TSS

☐ VEGETATIVE FILTER STRIPS
☐ RETENTION/IRRIGATION SYSTEMS
☐ EXTENDED DETENTION BASINS
☐ CONSTRUCTED WETLANDS
☐ WET BASINS
☐ TOPSOIL OR COMPOST
☐ BIODEGRADABLE EROSION CONTROL LOGS
☐ VEGETATION LINED DITCHES
☐ SAND FILTER SYSTEMS
☐ GRASSY SWALES

III. CULTURAL RESOURCES

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

☑ NO ACTION REQUIRED ☐ ACTION REQUIRED

1. N/A

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.

Adhere to specification requirements of Items 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ NO ACTION REQUIRED ☑ ACTION REQUIRED

1. Contractor to adhere to specifications listed above.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

☐ NO ACTION REQUIRED ☑ ACTION REQUIRED

1. The Migratory Bird Treaty Act of 1918 states that it is unlawful to kill, capture, collect, possess, buy, sell, trade, or transport any migratory bird, nest, young, feather, or egg in part or in whole, without a federal permit issued in accordance with the Act's policies and regulations. Migration patterns would not be affected by the proposed project. Remove non-active migratory bird nests from structures where work would be performed from September 1 through the end of February. Prevent migratory birds from building nests from March 1 to August 31. In the event that migratory birds are encountered on-site during project construction, avoid adverse impacts on protected birds, active nests, eggs, and/or young.

ABBREVIATIONS USED

BMP - Best Management Practice
CGP - Construction General Permit
CSN - Construction Site Notice
DSHS - Texas Department of State Health Services
EPA - U.S. Environmental Protection Agency
MS4 - Municipal Separate Stormwater Sewer System
MSDS - Material Safety Data Sheet
NOI - Notice of Intent
NWP - Nationwide Permit
PCN - Pre-Construction Notification
PSL - Project Specific Location
SW3P - Storm Water Pollution Prevention Plan
TCEQ - Texas Commission on Environmental Quality
TPDES - Texas Pollutant Discharge Elimination System
TSS - Total Suspended Solids
USACE - U.S. Army Corps of Engineers

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

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

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

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

Contact the Engineer if any of the following are detected:

Dead or distressed vegetation (not identified as normal)
Trash piles, drums, canister, barrels, etc.
Undesirable smells or odors
Evidence of leaching or seepage of substances

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

☐ YES ☑ NO

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

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

☐ YES ☑ NO

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

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

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

Any other evidence indicating possible hazardous materials or contamination discovered on site (hazardous materials or contamination issues specific to this project):

☑ NO ACTION REQUIRED ☐ ACTION REQUIRED

1. N/A

VII. OTHER ENVIRONMENTAL ISSUES

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

☑ NO ACTION REQUIRED ☐ ACTION REQUIRED

1. N/A

5/25/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
PROFESSIONAL ENGINEER

THE AFFIXED SEAL ABOVE APPLIES ONLY TO INFORMATION FILLED BY ABOVE STATED ENGINEER.

Texas Department of Transportation

San Angelo District

ENVIRONMENTAL PERMITS ISSUES AND COMMITMENTS

SHEET 1 OF 1 NOT TO SCALE

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
SHEET ISSUED OR LAST REVISED	0907	24	54	US 87
11-19	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		102

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SITE DESCRIPTION

The site description is accomplished using various sheets, each revealing separate details. This sheet's purpose is to direct the user to the appropriate location where the information required by the NPDES CGP can be found.

General location map, project limits, and project description: see title sheet of plans.

Intended sequence of major soil disturbing activities: Soil disturbing activites may include but are not limited to: Right-of-Way preparation, excavation and/or embankment to improve roadway profile, final grading and placement of topsoil for planting and seeding and the following: replacing or upgrading structure on improved roadway alignment.

Total project area (acres): 1.6

Total area to be disturbed (acres): 0.16

Pre-construction weighted runoff coefficient: N/A

Post-construction weighted runoff coefficient: N/A

Existing condition of soil and vegetative cover: N/A

Percent of existing vegetative cover: 5 - 10%

Name and segment number of receiving waters: North Concho River

Storm water management: Storm water runnoff will be managed along grassed channels. Erosion control logs will be utilized as necessary to control runoff from the project area.

Endangered species information is referenced on EPIC sheet.

Historic preservation effect information is referenced on EPIC sheet.

Drainage patterns, locations where storm water discharges to surface waters, slopes after major grading activities, typical areas of soil disturbance, areas which will not be disturbed, locations of control measures, and locations where stabilization practice will occur are depicted: N/A

Sediment must be removed from sediment traps and sedimentation ponds no later than the time that design capacity has been reduced by 50%.

If sediment escapes the site, accumulations must be removed at a frequency to minimize further negative effects, and whenever feasible, prior to the next rain.

Dust will be minimized by watering as necessary.

SW3P REQUIREMENTS

THE SWP3 MUST HAVE A DETAILED SITE MAP INDICATING THE FOLLOWING:

A detailed site map (or maps) indicating the following:

(i) drainage patterns and approximate slopes anticipated after major grading activities: This is usually addressed by adding a copy of the typical sections to the living document.

(ii) areas where soil disturbance will occur;

(iii) locations of all controls and buffers, either planned or in place;

(iv) locations where temporary or permanent stabilization practices are expected to be used;

(v) locations of construction support activities, including off-site activities, that are authorized under the permittee's NOI, including material, waste, borrow, fill, or equipment or chemical storage areas;

(vi) surface waters (including wetlands) either at, adjacent, or in close proximity to the site, and also indicating those that are impaired waters;

(vii) locations where storm water discharges from the site directly to a surface water body or a municipal separate storm sewer system;

(viii) vehicle wash areas; and

(ix) designated points on the site where vehicles will exit onto paved roads (for instance, this applies to construction transition from unstable dirt areas to exterior paved roads).

THE SW3P MUST INCLUDE A DESCRIPTION OF CONSTRUCTION AND WASTE MATERIALS EXPECTED TO BE STORED ON-SITE AND A DESCRIPTION OF CONTROLS TO MINIMIZE POLLUTANTS FROM THESE MATERIALS.

THE SW3P MUST INCLUDE VELOCITY DISSIPATION DEVICES AT DISCHARGE LOCATIONS AND ALONG THE LENGTH OF ANY OUTFALL CHANNEL (I.E. RUNOFF CONVEYANCE) TO PROVIDE A NON-EROSIVE FLOW VELOCITY FROM THE STRUCTURE TO A WATER COURSE, SO THAT THE NATURAL PHYSICAL AND BIOLOGICAL CHARACTERISTICS AND FUNCTIONS ARE MAINTAINED AND PROTECTED.

CONTROLS

(Check all that apply)

INTERIM SOIL STABILIZATION PRACTICES:

- ☐ SEEDING OR SODDING
- ☐ MULCHING
- ☐ SOIL RETENTION BLANKETS
- ☐ TOPSOIL OR COMPOST
- ☐ FLEXIBLE CHANNEL LINERS
- ☐ GROUND COVER

PERMANENT SOIL STABILIZATION PRACTICES:

- ☐ SEEDING OR SODDING
- ☐ MULCHING
- ☐ SOIL RETENTION BLANKETS
- ☐ TOPSOIL OR COMPOST
- ☐ FLEXIBLE CHANNEL LINERS
- ☐ GROUND COVER

INTERIM STRUCTURAL PRACTICES:

- ☐ TEMPORARY SEDIMENT CONTROL FENCE
- ☐ BALED HAY FOR EROSION CONTROL
- ☐ ROCK FILTER DAMS
- ☐ PIPE SLOPE DRAINS
- ☐ CHANNEL LINERS
- ☐ STORM SEWERS
- ☐ STORM INLET SEDIMENT TRAPS
- ☐ STONE OUTLET STRUCTURES
- ☐ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- ☐ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- ☐ PAVED FLUMES
- ☐ CONSTRUCTION EXITS
- ☐ DROP INLET SEDIMENT TRAPS
- ☐ CURB INLET SEDIMENT TRAPS
- ☐ SEDIMENT BASINS
- ☐ CURB AND GUTTER
- ☐ VELOCITY CONTROL DEVICES
- ☑ BIODEGRADABLE EROSION CONTROL LOGS

PERMANENT STRUCTURAL PRACTICES:

- ☐ TEMPORARY SEDIMENT CONTROL FENCE
- ☐ BALED HAY FOR EROSION CONTROL
- ☐ ROCK FILTER DAMS
- ☐ PIPE SLOPE DRAINS
- ☐ CHANNEL LINERS
- ☐ STORM SEWERS
- ☐ STORM INLET SEDIMENT TRAPS
- ☐ STONE OUTLET STRUCTURES
- ☐ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- ☐ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- ☐ PAVED FLUMES
- ☐ CONSTRUCTION EXITS
- ☐ DROP INLET SEDIMENT TRAPS
- ☐ CURB INLET SEDIMENT TRAPS
- ☐ SEDIMENT BASINS
- ☐ CURB AND GUTTER
- ☐ VELOCITY CONTROL DEVICES
- ☐ BIODEGRADABLE EROSION CONTROL LOGS

NARRATIVE (sequence of construction for storm water management activities)
The order of activities will be as follows:

NOTE: Limit the disturbed area such that construction activities will commence in that portion of the site within 14 days. Place stabilization measures in portions of the site no later than 14 days after construction activity has temporarily ceased.

The above indicated practices are proposed to control pollutants in storm water discharges. These practices are based on information contained in TxDOT storm water management guidelines. The schedule of implementation of these practices will be based on the intended sequence of major soil disturbing activities. Stabilization measures shall be initiated no later than 14 days after construction activity in that portion of the site has temporarily or permanently ceased.

Describe construction and waste materials expected to be stored on site and proposed controls to reduce pollutants from these materials (include storage practices, spill prevention and response):

Expected construction waste may include concrete rubble and concrete washout waste. Construction waste shall be removed from the project. Temporary stockpiles for waste material shall be located at an upland location approved by the Engineer. Any rubble waste stockpiled for more than 14 days shall require sedimentation control. This will not be paid for directly, but shall be considered subsidiary to the various bid items. Concrete wash-out waste shall be placed on concrete truck cleanout box and then disposed off project.

Describe pollutant sources from areas other than construction and measures implemented at those sites to minimize pollutant discharges:

Storm sewer system (if present) will be protected with structural controls.

Sedimentation basins are required in drainage areas having disturbance of 10 or more acres.

ABBREVIATIONS USED

BMP - Best Management Practice
CGP - Construction General Permit
EPIC - Environmental Permits, Issues, and Commitments
MSDS - Material Safety Data Sheet
NOI - Notice of Intent
NOT - Notice of Termination
NPDES - National Pollutant Discharge Elimination System
SW3P - Storm Water Pollution Prevention Plan

INFORMATION

MAINTENANCE:
All erosion and sediment control and other protective measures identified in the SW3P must be maintained in effective operating conditions. If site inspections required by this permit identify BMP's that are not operating effectively, maintenance shall be performed before the next anticipated storm event, or as necessary to maintain the continued effectiveness of storm water controls. If maintenance prior to the next anticipated storm event impracticable, maintenance must be scheduled and accomplished as soon as possible.

INSPECTION:
Qualified personnel shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures, and locations where vehicles enter or exit the site, at intervals as indicated by check mark below:

- ☑ At least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater as recorded on a non-freezing rain gauge to be located at the project site.
- ☐ At least once every 7 calendar days. An inspection must occur regardless of whether or not there has been a rainfall event since the previous inspection.

Disturbed areas that are exposed to precipitation shall be inspected for evidence of, or the potential for pollutants entering the drainage system. Sediment and erosion control measures identified on the SW3P shall be observed to ensure that they are operating correctly. Locations where vehicles enter or exit site shall be inspected for evidence of off-site sediment tracking.
Based on the result of the inspection, the SW3P shall be revised to include additional or modified BMP's designed to correct the observed deficiency.
A report summarizing the scope, date, name and qualifications of inspector, and major observations relating to the implementation of the SW3P shall be produced and retained as part of the SW3P for three years from date of final stabilization.

WASTE MATERIALS:
All waste materials will be collected and stored in a securely lidded metal dumpster. The dumpster will meet all state and local city solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied as necessary or as required by local regulation, and the trash will be hauled to a local dump. No construction waste material will be buried on-site. This will not be paid directly, but shall be considered subsidiary to the various SW3P items.

SANITARY WASTE:
All sanitary waste will be collected from the portable units as necessary or as required by local regulation, by a licensed sanitary waste management contractor.

HAZARDOUS WASTE:
Hazardous waste includes paints, cleaning solvents, asphalt products, chemical additives for soil stabilization, or concrete curing compounds and additives. All hazardous waste shall be disposed of in accordance with all federal, state, and local regulations.
Provide MSDS sheets prior to beginning work.

REMARKS:
Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, water body or stream bed.
Construction staging areas and vehicle maintenance areas shall be constructed by the Contractor in a manner to minimize the runoff of pollutants.
All waterways shall be cleared as soon as practicable of temporary embankment, temporary bridges, matting, false work, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.

INSPECTOR PAPERWORK CHECKLIST:

- ☑ Contact Form (*)
- ☑ NOI (* and %)
- ☑ NOT (%)
- ☑ Project Diary (%)
- ☑ SW3P Plan (%)
- ☑ Inspection and Maintenance Report (%)
- ☑ SW3P Certification Statement (signed by Area Engineer) (%)
- ☑ NPDES General Permit (Federal Register, dated July 6, 1998) (%)
- ☑ Historic Resources Information - EPIC Sheet (%)
- ☑ Inspector Qualification Form (%)
- ☑ Delegation of Signature Authority (all inspectors signing reports) (%)
- ☑ Endangered Species and Critical Habitat Information - EPIC Sheet (%)

The symbol (*) indicates that the information should be displayed on the Project Bulletin Board.

The symbol (%) indicates that the information should be a part of the permanent SW3P file maintained at the office managing construction.

Any reportable quantity of Hazardous Material release must be reported to National Response Center at (800) 424-8802.

A copy of the Construction General Permit is a part of the SW3P.

5/25/2022

STATE OF TEXAS
HIRON M. FERNANDO
123288
LICENSED
PROFESSIONAL ENGINEER

THE AFFIXED SEAL ABOVE APPLIES ONLY TO INFORMATION FILLED BY ABOVE STATED ENGINEER.

Texas Department of Transportation

San Angelo District

SW3P INDEX

SHEET 1 OF 1 NOT TO SCALE

©TxDOT 2022	CONT	SECT	JOB	HIGHWAY
SHEET ISSUED OR LAST REVISED	0907	24	054	US 87
11-19	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		103

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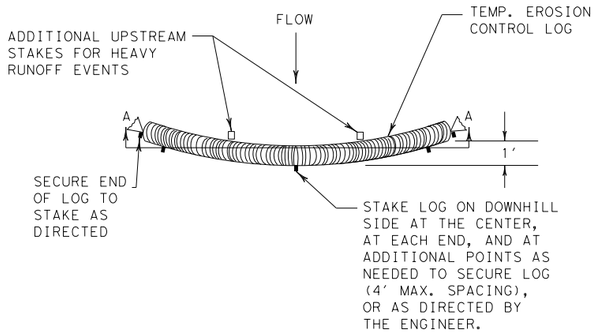

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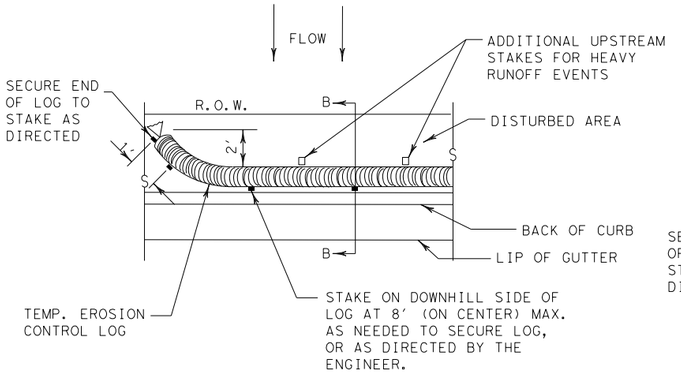

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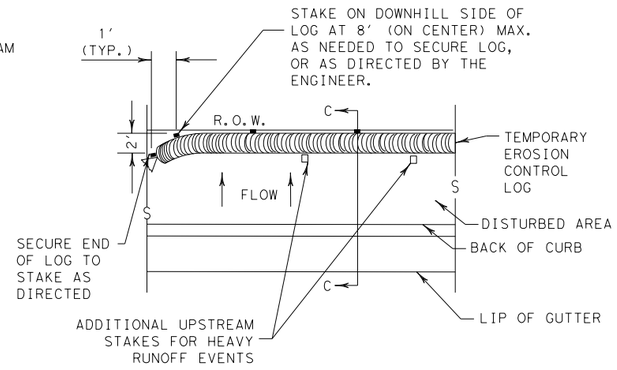

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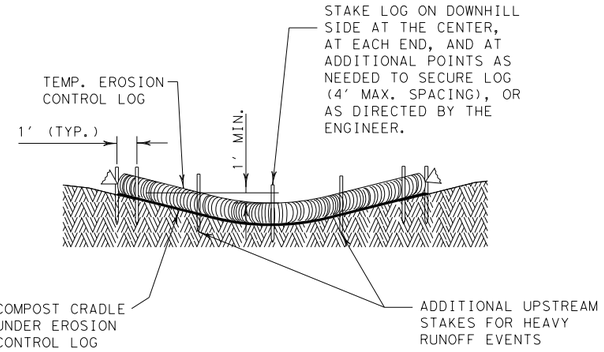
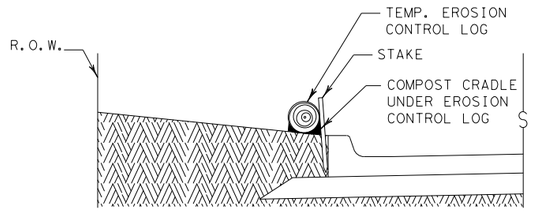


SECTION A-A

EROSION CONTROL LOG DAM

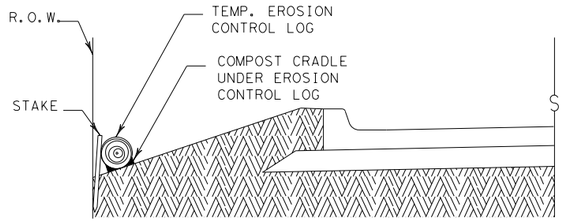
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

CL-BOC



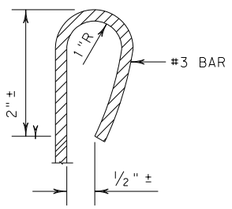
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW

LEGEND

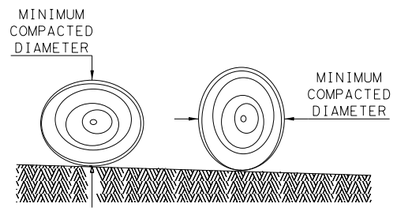
- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET



REBAR STAKE DETAIL

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0907	24	54	US 87	
	DIST	COUNTY		SHEET NO.	
	SJT	TOM GREEN		104	

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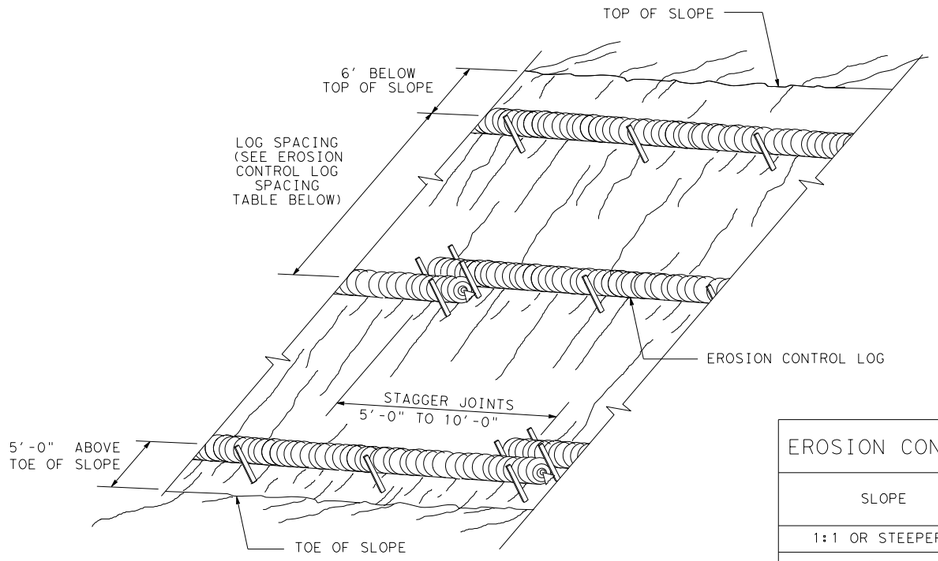
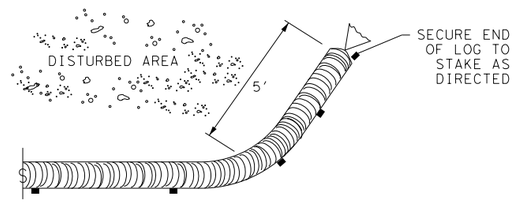


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

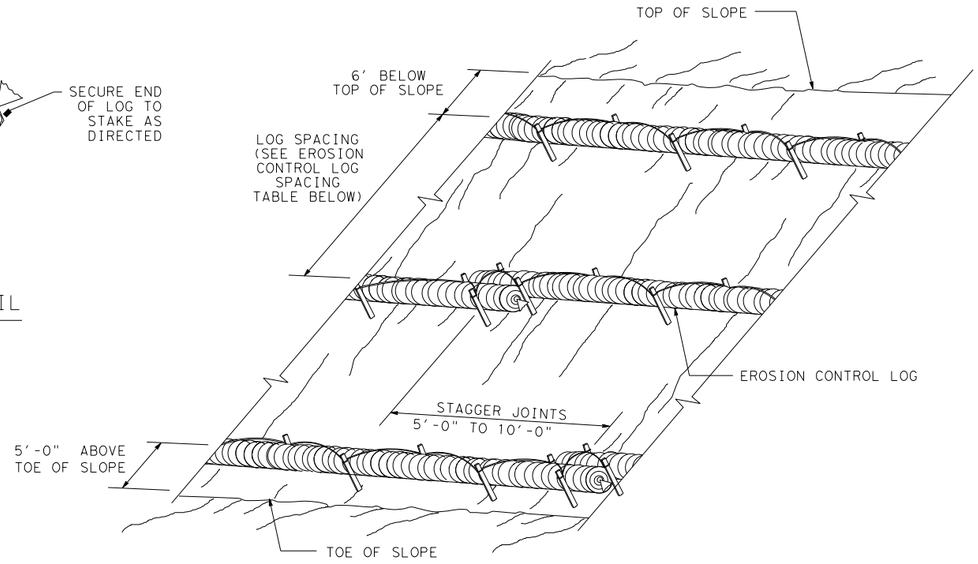
CL-SST



END SECTION RAP DETAIL

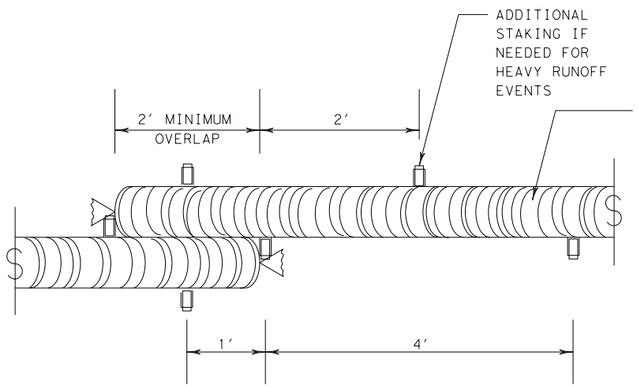
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

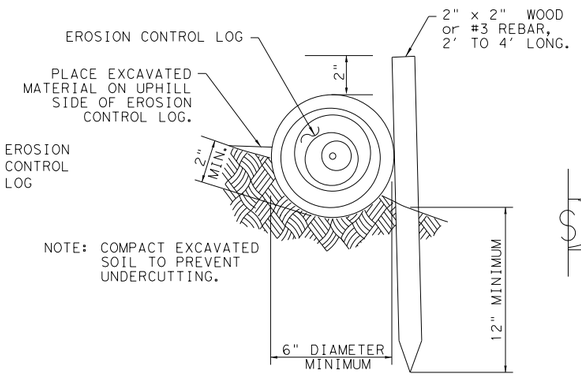
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

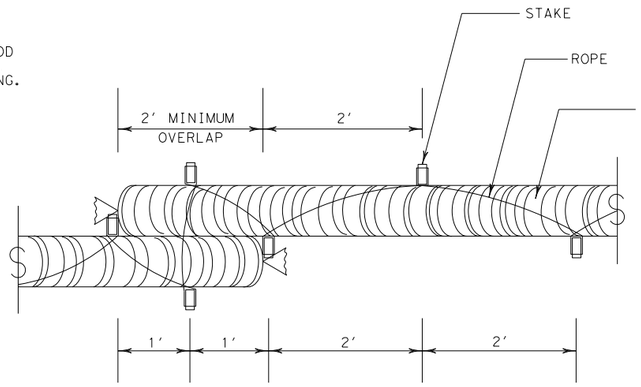


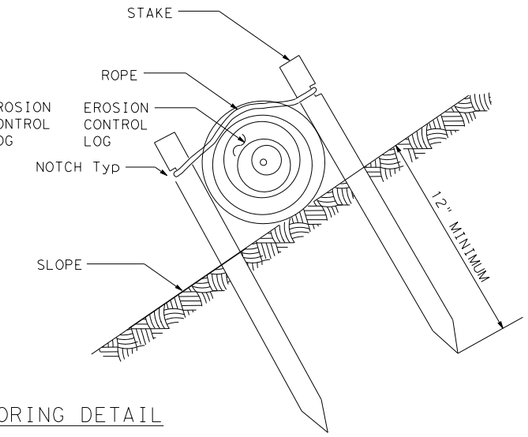


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

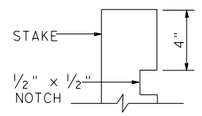
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
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	SJT	TOM GREEN		105

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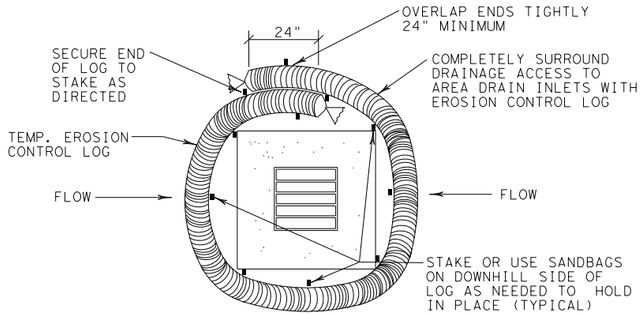
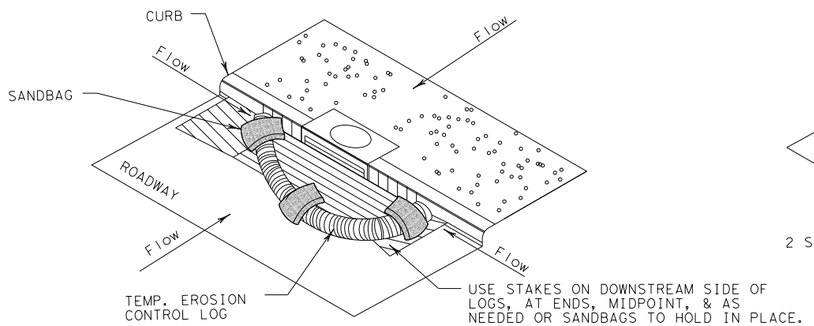


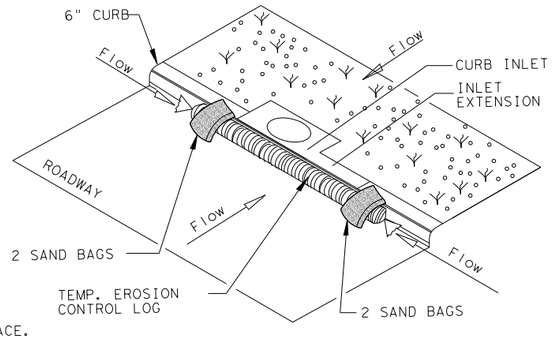
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

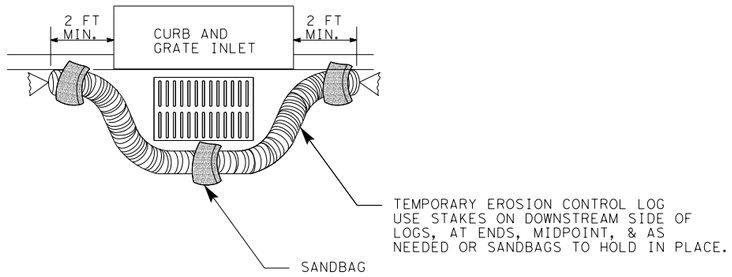
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

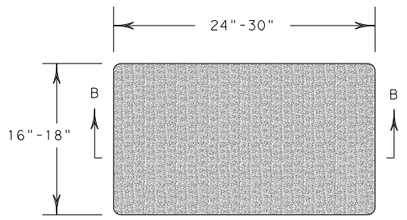
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0907	24	54	US 87
	DIST	COUNTY		SHEET NO.
	SJT	TOM GREEN		106