INDEX TO SHEETS

SEE SHEET NO. 2

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

TDLR PROJECT#:
TABS2021014184

FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY
	TX	SEE TITLE SHEET			VARIOUS
STATE DISTRICT	COUNTY	CONTROL	SECTION	JOB	SHEET NO.
HOU	HARRIS	0912	00	641	1

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

PROJECT NO. F 2021(730)

HARRIS COUNTY
LIMITS: SL 8 AT ANTOINE DRIVE

BRAZORIA COUNTY
LIMITS: SH 35 AT CR 192
SH 35 AT CR 25

CSJ: 0912-00-641

PROJECT DESCRIPTION: IMPROVE TRAFFIC SIGNALS
(SL 8 AT ANTOINE, SH 35 AT CR 192,
& SH 35 AT CR 25)

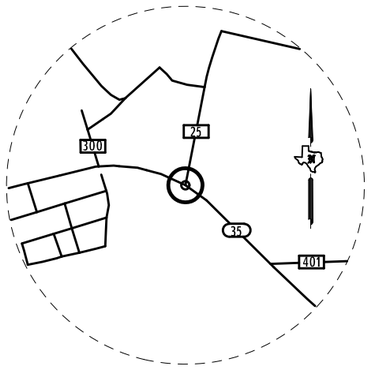
FUNCTIONAL CLASSIFICATION:
FREEWAY
DESIGN SPEED: 50MPH/35MPH

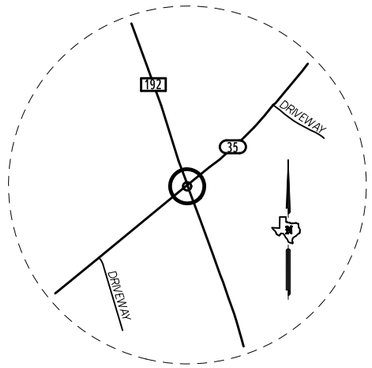
BW 8 @ ANTOINE DR
ADT(2021) = 115,900
ADT(2041) = 158,100

FUNCTIONAL CLASSIFICATION:
MINOR ARTERIAL
DESIGN SPEED: 60MPH/45MPH

SH 35 @ CR 192
ADT(2021) = 12,200
ADT(2041) = 14,900

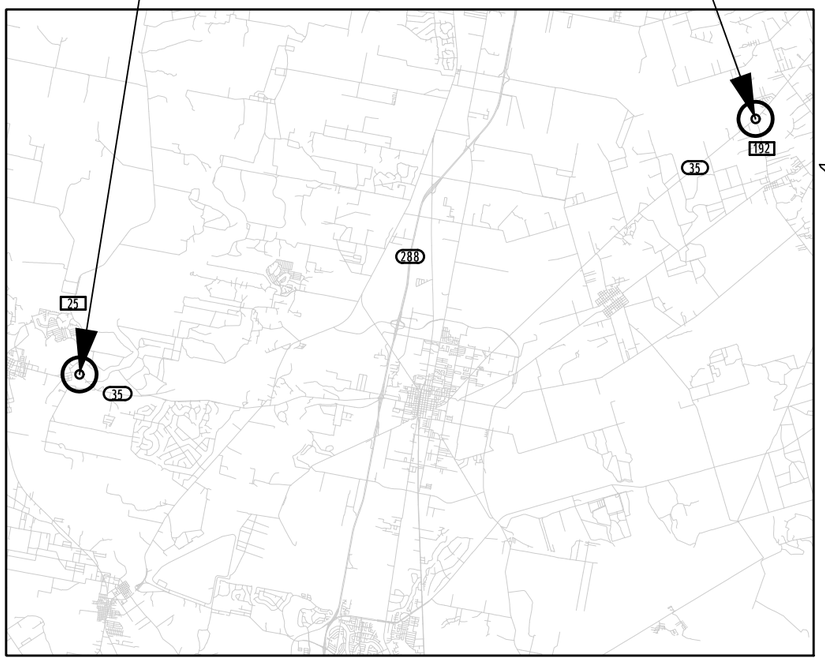
SH 35 @ CR 25
ADT(2021) = 17,700
ADT(2041) = 21,700





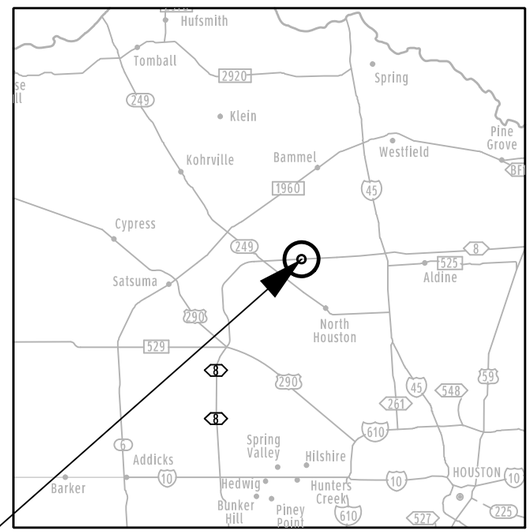
PROJECT LOCATION
SH 35 AT CR 25

PROJECT LOCATION
SH 35 AT CR 192



BRAZORIA COUNTY
VICINITY MAP - N.T.S.

PROJECT LOCATION
SL 8 (BELTWAY 8) AT ANTOINE DR



HARRIS COUNTY
VICINITY MAP - N.T.S.

NOTES:

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

2. FOR BARRICADES AND SIGNING AT INDIVIDUAL INTERSECTIONS UNDER SIGNAL CONSTRUCTION, REFER TO STANDARD SHEETS, WZ(BTS-1)-13 & WZ(BTS-2)-13.

NO EXCEPTIONS
NO RAILROAD CROSSINGS
NO EQUATIONS

STATE OF TEXAS
CHARLES R. STEVENS, JR
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 PHONE: (713) 828-4742
Houston, TX. 77095

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING 04/29/2021

P.E.
For DISTRICT TRAFFIC ENGINEER

APPROVED FOR LETTING 4/29/2021

DocuSigned by:
Larry W. Blackburn, P.E.
B9928A69E03E42F...
For DISTRICT ENGINEER

SHEET NO.		DESCRIPTION
		I. GENERAL
1		TITLE SHEET/VICINITY MAP
2		INDEX OF SHEETS
3, 3A-3H		GENERAL NOTES
4, 4A-4C		ESTIMATE AND QUANTITY SHEETS
5, 5A-5B		TRAFFIC SIGNAL SUMMARY OF QUANTITIES
6, 6A-6B		TRAFFIC SIGNAL NOTES
		II. INTERSECTIONS
		TRAFFIC SIGNAL-BELTWAY 8 AT ANTOINE DR
7-8		TRAFFIC SIGNAL EXISTING LAYOUT
9-11		TRAFFIC SIGNAL PROPOSED LAYOUT
12-16		TRAFFIC SIGNAL SIGNING & PAVEMENT MARKINGS
17		SMA-100(1)-12 - TSSS-SINGLE MAST ARM ASSEMBLY(100 MPH WIND ZONE)
18		TS-FD-12 - TRAFFIC SIGNAL POLE FOUNDATION
		TRAFFIC SIGNAL-SH 35 AT CR 192
19		TRAFFIC SIGNAL EXISTING LAYOUT
20-21		TRAFFIC SIGNAL PROPOSED LAYOUT
22		TRAFFIC SIGNAL SIGNING & PAVEMENT MARKINGS
23		SMA-100(1)-12 - TSSS-SINGLE MAST ARM ASSEMBLY(100 MPH WIND ZONE)
24		TS-FD-12 - TRAFFIC SIGNAL POLE FOUNDATION
		TRAFFIC SIGNAL-SH 35 AT CR 25
25		TRAFFIC SIGNAL EXISTING LAYOUT
26		TRAFFIC SIGNAL PROPOSED SIGNAL
27		TRAFFIC SIGNAL DETAILS
28		TRAFFIC SIGNAL PAVEMENT MARKINGS LAYOUT
29		REMOVAL PLAN LAYOUT SHEET
30		DMA-100(3)-12 - TSSS-DUAL MAST ARM ASSEMBLY(100 MPH WIND ZONE)
31		TS-FD-12 - TRAFFIC SIGNAL POLE FOUNDATION
32		LMA(5)-12 - LONG MAST ARM ASSEMBLY PARTS LIST
		III. TRAFFIC ITEMS
		TRAFFIC SIGNAL SUPPORT STRUCTURES (TSSS)
33	*	SMA-100(2)-12 - TSSS-SINGLE MAST ARM ASSEMBLY(100 MPH WIND ZONE)
34	*	DMA-100(1)-12 - TSSS-DUAL MAST ARM ASSEMBLY(100 MPH WIND ZONE)
35	*	DMA-100(2)-12 - TSSS-DUAL MAST ARM ASSEMBLY(100 MPH WIND ZONE)
36	*	LMA(1)-12 - TSSS-LONG MAST ARM ASSEMBLY(50 TO 65 FT)(80 AND 100 MPH WIND ZONE)
37	*	LMA(2)-12 - TSSS-LONG MAST ARM ASSEMBLY(50 TO 65 FT)(80 AND 100 MPH WIND ZONE)
38	*	LMA(3)-12 - TSSS-LONG MAST ARM ASSEMBLY(50 TO 65 FT)(80 AND 100 MPH WIND ZONE)
39	*	LMA(4)-12 - TSSS-LONG MAST ARM ASSEMBLY(50 TO 65 FT)(80 AND 100 MPH WIND ZONE)
		TRAFFIC CONTROL STANDARDS
40	*	BC(1)-14 - BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS
41	*	BC(2)-14 - BARRICADE AND CONSTRUCTION PROJECT LIMIT
42	*	BC(3)-14 - BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT
43	*	BC(4)-14 - BARRICADE AND CONSTRUCTION GENERAL TEMPORARY SIGN NOTES
44	*	BC(5)-14 - BARRICADE AND CONSTRUCTION GENERAL TYPICAL SIGN SUPPORT
45	*	BC(6)-14 - BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
46	*	BC(7)-14 - BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR
47	*	BC(8)-14 - BARRICADE AND CONSTRUCTION CHNNELIZING DEVICES
48	*	BC(9)-14 - BARRICADE AND CONSTRUCTION CHNNELIZING DEVICES
49	*	BC(10)-14 - BARRICADE AND CONSTRUCTION CHNNELIZING DEVICES
50	*	BC(11)-14 - BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS
51	*	BC(12)-14 - BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS
52	*	TCP(1-1)-18 - TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK
53	*	WZ(BTS-1)-13 - TRAFFIC SIGNAL WORK - TYPICAL DETAILS
54	*	WZ(BTS-2)-13 - TRAFFIC SIGNAL WORK - BARRICADES AND SIGNS
		TRAFFIC SIGNAL STANDARDS
55	*	SD/SCFD - SIGNAL DETAILS/STANDARDS - CONSTRUCTION DETAILS FOR POLE MOUNTED (APS) PEDESTRIAN SIGNALS (HOU)
56		SD/S BSM - SIGNAL DETAILS/STANDARDS - CONTROLLER FOUNDATION DETAIL (HOU)
57	*	OSNS/MD - SIGNAL DETAILS/STANDARDS - BBU SIDE MOUNT (HOU)

SHEET NO.		DESCRIPTION
		TRAFFIC SIGNAL STANDARDS
58	*	CD/PM(APS)PS - SIGNAL DETAILS/STANDARDS - OVERHEAD STREET NAME SIGN MOUNTING DETAILS (HOU)
59	*	ED(1)-14 - ELECTRICAL DETAILS - CONDUITS & NOTES
60	*	ED(3)-14 - ELECTRICAL DETAILS - CONDUCTORS
61	*	ED(4)-14 - ELECTRICAL DETAILS - GROUND BOXES
62	*	ED(5)-14 - ELECTRICAL DETAILS - SERVICE NOTES & DATA
63	*	ED(6)-14 - ELECTRICAL DETAILS - SERVICE ENCLOSURE & NOTES
64	*	ED(7)-14 - ELECTRICAL DETAILS - SERVICE SUPPORT TYPES SF & SP
65	*	ED(8)-14 - ELECTRICAL DETAILS - TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS
66	*	LUM-A-12 - STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES - ARM DETAILS
67	*	MA-C-12 - STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES - MAST ARM CONNECTIONS
68	*	MA-D-12 - TRAFFIC SIGNAL SUPPORT STRUCTURES - MAST ARM POLE DETAILS
69	*	MA-DPD-20 - MAST ARM DAMPING PLATE DETAILS
70	*	TS-BP-20 - TRAFFIC SIGNAL HEADWITH BACKPLATE
71	*	CFA-12 - CLAMP ON FITTING ASSEMBLY FOR LUMINAIRE MAST ARM
72		ACCRD - SIGNAL DETAILS/STANDARDS - CONSTRUCTION DETAILS FOR ACCESS PAD RAMP DETAIL (HOU)
73	*	PED-18 - PEDESTRIAN FACILITIES - CURB RAMPS (SHEET 1 OF 4)
74	*	PED-18 - PEDESTRIAN FACILITIES - CURB RAMPS (SHEET 2 OF 4)
75	*	PED-18 - PEDESTRIAN FACILITIES - CURB RAMPS (SHEET 3 OF 4)
76	*	PED-18 - PEDESTRIAN FACILITIES - CURB RAMPS (SHEET 4 OF 4)
76A	*	CCCG-12 - CONCRETE CURB AND CURB AND GUTTER
		SIGNING AND PAVEMENT MARKING STANDARDS
77	*	PM-20 - TYPICAL STANDARD PAVEMENT MARKINGS (HDS)
78	*	PM(2)-20 - POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS
79	*	PM(3)-20 - TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS
80	*	PM(4)-20 - CROSSWALK PAVEMENT MARKINGS
81	*	CPM(1)-14 - CONTRAST AND SHADOW PAVEMENT MARKINGS
82	*	SMD(GEN)-08 - SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS
83	*	SMD(SLIP-1)-08 - SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM
84	*	SMD(SLIP-2)-08 - SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM
85	*	TSR(4)-13 - TYPICAL SIGN REQUIREMENTS
86-86A		SMALL SIGN REMOVAL
87-87A		SUMMARY OF SMALL SIGNS
		ENVIRONMENTAL ISSUES
88	*	EC(1)-16 - TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE AND VERTICAL TRACKING
89	*	ECL-12 - EROSION CONTROL LOG (HOU)
90		EPIC - ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS
91		SWP3 - TxDOT STORM WATER POLLUTION PREVENTION PLAN (HOU)

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

HOU = HOUSTON DISTRICT STANDARDS

STATE OF TEXAS
CHARLES R. STEVENS, JR
101286
PROFESSIONAL LICENSED ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 Houston, TX. 77095 PHONE: (713) 828-4742

Texas Department of Transportation®

BELTWAY 8 AT ANTOINE DR
SH 35 AT CR 192
SH 35 AT CR 25
INDEX OF SHEETS

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		2
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

General Notes:

General:

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

Dock Gee, P.E. Project Engineer, (713) 802-5405 Dock.Gee@txdot.gov
Yannick Dwatie, P.E. Assistant Project Engineer, (713) 802-5378 Yannick.Dwatie@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals. Contractor questions will be reviewed by the Area Engineer or Assistant Area 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/

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, and CCSJ/Project Name.

The following standard detail sheets are modified:

Modified Standards

SMA-100 (1)-12
TS-FD-12
DMA-100 (3)-12
LMA-100 (5)-12

References to manufacturer's trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved, except for roadway illumination, electrical, and traffic signal items.

The cost for materials, labor, and incidentals to provide for traffic across the roadway and for ingress and egress to private property in accordance with Section 7.2.4 of the standard specifications is subsidiary to the various bid items. Restore access roadways to their original condition upon completing construction.

Grade street intersections and median openings for surface drainage.

If a foundation is to be placed where a riprap surface or an asphalt concrete surface presently exists, use caution in breaking out the existing surface for placement. Break out no greater area than is required to place the foundation. After placing the foundation, wrap the periphery with 0.5 in. pre-molded mastic expansion joint. Then replace the remaining portion of the broken out

surface with Class A or Class C concrete or cold mix asphalt concrete to the exact slope, pattern, and thickness of the existing riprap or asphalt. Payment for breaking out the existing surface, wrapping the foundation, and replacing the surface is subsidiary to the various bid items.

The lengths of the posts for ground mounted signs and the tower legs for the overhead sign supports are approximate. Verify the lengths before ordering these materials to meet the existing field conditions and to conform to the minimum sign mounting heights shown in the plans.

Furnish aluminum Type A signs instead of plywood signs for signs shown on the Summary of Small Signs sheet.

Clearly mark or highlight on the shop drawings, the items being furnished for this project. Submit required shop drawings in accordance with the shop drawing distribution list shown in the note for Item 5 for review and distribution.

Unless otherwise shown on the plans or otherwise directed, commence work after sunrise and ensure construction equipment is off the road by sunset.

General: Roadway Illumination and Electrical

For roadway illumination and electrical items, use materials from pre-qualified producers as shown on the Construction Division (CST) of the Department's material producers list. Check the latest link on the Department's website for this list. The category/item is "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials found on this list.

Perform electrical work in conformance with the National Electrical Code (NEC) and the Department's standard sheets.

The Contractor may make the electrical grounding connections and permissible splices using the thermal fusion process, Cadweld, ThermOweld, or approved equal, instead of bolted connections and splices.

The Area Engineer will arrange with the Contractor, an inspection of the completed electrical systems for the highway lighting systems before final acceptance for compliance with plans and specifications. The inspection will be made with personnel from the electrical section of the Department's District Transportation Operations Office. The city's electrical division personnel will also inspect lighting systems within the city limits. Portions of the work found to be deficient during this inspection will not be accepted.

General: Traffic Signals

For traffic signal items, use materials from the Pre-Qualified Producers List (located at http://www.dot.state.tx.us/GSD/purchasing/supps.htm) and the materials pre-qualified for illumination and electrical items (located at http://ftp.dot.state.tx.us/pub/txdot-info/cmd/mpl/riaes.pdf) as shown on the Department's Material Producers List and the Roadway

Illumination and Electrical Supplies List. Check the latest links on the Department's website for these lists. No substitutions will be allowed for materials found on these lists.

General: Site Management

Do not mix or store materials, or store or repair equipment, on top of concrete pavement or bridge decks unless authorized by the Engineer. Permission will be granted to store materials on surfaces if no damage or discoloration will result.

Personal vehicles of employees are not permitted to park within the right of way, including sections closed to public traffic. Employees may park on the right of way at the Contractor's office, equipment, and materials storage yard sites.

Assume ownership of debris and dispose of at an approved location. Do not dispose of debris on private property unless approved in writing by the District Engineer.

General: Traffic Control and Construction

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

General: Utilities

Consider the locations of underground utilities depicted in the plans as approximate and employ responsible care to avoid damaging utility facilities. Depending upon scope and magnitude of planned construction activities, advanced field confirmation by the utility owner or operator may be prudent. Where possible, protect and preserve permanent signs, markers, and designations of underground facilities.

If the Contractor damages or causes damage (breaks, leaks, nicks, dents, gouges, etc.) to the utility, contact the utility facility owner or operator immediately.

At least 72 hours before starting work, make arrangements for locating existing Department-owned above ground and underground fiber optic, communications, power, illumination, and traffic signal cabling and conduit. Do this by calling the Department's Houston District Traffic Signal Operations Office at 713-802-5662 to schedule marking of underground lines on the ground. Use caution if working in these areas to avoid damaging or interfering with existing facilities.

Install or remove poles and luminaires located near overhead or underground electrical lines using established industry and utility safety practices. Consult the appropriate utility company before beginning such work.

If overhead or underground power lines need to be de-energized, contact the electrical service provider to perform this work. Costs associated with de-energizing the power lines or other protective measures required are at no expense to the Department.

If working near power lines, comply with the appropriate sections of Texas State Law and Federal Regulations relating to the type of work involved.

Perform electrical work in conformance with the National Electrical Code (NEC) and Department's standard sheets.

Item 5: Control of Work

Submit shop drawings electronically for the fabrication of items as documented in Table 1 or Table 2 below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link, ftp://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf. References to 11 in. x 17 in. sheets in individual specifications for structural items imply electronic CAD sheets.

Table 1

2014 Construction Specification Required Shop/Working Drawing Submittals - TxDOT Generated Plans

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/ Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&.2	Construction Load Analyses	Y	Y	Y	B	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	A	WD
403	Temporary Special Shoring	Y	N	Y	C	WD
420	Formwork/Falsework	Y	N	Y	A	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	C	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	B	SD
425	Prestr Concr Sheet Piling	Y	Y	N	B	SD
425	Prestr Concr Beams	Y	Y	N	B	SD
425	Prestr Concr Bent	Y	Y	N	B	SD
426	Post Tension Details	Y	Y	N	B	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	B	SD
441	Bridge Protective Assembly	Y	Y	N	B	SD
441	Misc Steel (various steel assemblies)	Y	Y	N	B	SD
441	Steel Pedestals (bridge raising)	Y	Y	N	B	SD
441	Steel Bearings	Y	Y	N	B	SD
441	Steel Bent	Y	Y	N	B	SD
441	Steel Diaphragms	Y	Y	N	B	SD
441	Steel Finger Joint	Y	Y	N	B	SD
441	Steel Plate Girder	Y	Y	N	B	SD
441	Steel Tub-Girders	Y	Y	N	B	SD
441	Erection Plans, including Falsework	Y	N	Y	A	WD

449	Sign Structure Anchor Bolts	Y	Y	N	T	SD
450	Railing	Y	Y	N	A	SD
462	Concrete Box Culvert	Y	Y	N	C	SD
462	Concrete Box Culvert (Alternate Designs Only,calcs reqd.)	Y	Y	Y	B	SD
464	Reinforced Concrete Pipe (Jack and Bore only; ONLY when requested)	Y	Y	Y	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets	Y	Y	N	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets (Alternate Designs Only, calcs req'd.)	Y	Y	Y	B	SD
466	Pre-cast Headwalls and Wingwalls	Y	Y	N	A	SD
467	Pre-cast Safety End Treatments	Y	Y	N	A	SD
495	Raising Existing Structure (calcs reqd.)	Y	Y	Y	B	SD
610	Roadway Illumination Supports (Non-Standard only, calcs reqd.)	Y	Y	Y	BRG	SD
613	High Mast Illumination Poles (Non-standard only, calcs reqd.)	Y	Y	Y	BRG	SD
627	Treated Timber Poles	Y	Y	N	T	SD
644	Special Non-Standard Supports (Bridge Mounts, Barrier Mounts, Etc.)	Y	Y	Y	T	SD
647	Large Roadside Sign Supports	Y	Y	Y	T	SD
650	Cantilever Sign Structure Supports - Alternate Design Calcs.	Y	Y	Y	T	SD
650	Sign Structures	Y	Y	N	T	SD
680	Installation of Highway Traffic Signals	Y	Y	N	T	SD
682	Vehicle and Pedestrian Signal Heads	Y	Y	N	T	SD
684	Traffic Signal Cables	Y	Y	N	T	SD
685	Roadside Flashing Beacon Assemblies	Y	Y	N	T	SD
686	Traffic Signal Pole Assemblies (Steel) (Non-Standard only)	Y	Y	Y	T	SD
687	Pedestal Pole Assemblies	Y	Y	N	T	SD
688	Detectors	Y	Y	N	A	SD
784	Repairing Steel Bridge Members	Y	Y	Y	B	WD
SS	Prestr Concr Crown Span	Y	Y	N	B	SD
SS	Sound Barrier Walls	Y	Y	Y	A	SD
SS	Camera Poles	Y	Y	Y	TMS	SD
SS	Pedestrian Bridge (Calcs req'd.)	Y	Y	Y	B	SD
SS	Screw-In Type Anchor Foundations	Y	Y	N	T	SD
SS	Fiber Optic/Communication Cable	Y	Y	N	TMS	SD
SS	Spread Spectrum Radios for Signals	Y	Y	N	T	SD
SS	VIVDS System for Signals	Y	Y	N	T	SD
SS	CTMS Equipment	Y	Y	N	TMS	SD

Notes:

1. Document flow for Working Drawings differs from Shop Drawings in that Working Drawings must be submitted to the Engineer rather than the Engineer of Record and they are for the information of the Engineer only; an approval stamp and distribution to all project offices is not required.

Key to Reviewing Party

A - Area Office

Area Office	Email Address
Brazoria Area Office	HOU-BRZAShpDrwgs@txdot.gov
Fort Bend Area Office	HOU-FBAShpDrwgs@txdot.gov
Galveston Area Office	HOU-GALVAShpDrwgs@txdot.gov
Montgomery Area Office	HOU-MONTAShpDrwgs@txdot.gov
North Harris Area Office	HOU-NHAShpDrwgs@txdot.gov
Southeast Area Office	HOU-SEHAShpDrwgs@txdot.gov
Traffic Systems Construction Office	HOU-TSCShpDrwgs@txdot.gov
West/Central Harris Area Office	HOU-WWCHAOShpDrwgs@txdot.gov

B - Houston Bridge Engineer

Bridge Design (Houston TxDOT)	HOU-BrgShpDrwgs@txdot.gov

BRG - Austin Bridge Division

Bridge Design (Austin TxDOT)	BRG_ShopPlanReview@txdot.gov

C - Construction Office

Construction	HOU-ConstrShpDrwgs@txdot.gov
Laboratory	HOU-LabShpDrwgs@txdot.gov

T - Traffic Engineer

Traffic Operations	HOU-TrfShpDrwgs@txdot.gov

TMS – Traffic Management System

Computerized Traffic Management Systems (CTMS)	HOU-CTMSShpDrwgs@txdot.gov

Item 7: Legal Relations and Responsibilities

This project does not require a U.S. Army Corps of Engineers (USACE) Section 404 Permit before letting, but if a permit is needed during construction, assume responsibility for preparing the permit application. Submit the permit application to the Department's District Environmental Section for approval. Once the permit application is approved, the Department will submit it to the USACE. Assume responsibility for the requested revisions, in coordination with the Department's District Environmental Section.

No significant traffic generator events have been identified.

Item 8: Prosecution and Progress

The Department will not adjust the number of days for the project and milestones, if any, due to differences in opinion regarding any assumptions made in the preparation of the schedule or for errors, omissions, or discrepancies found in the time determination schedule.

Working days will be computed and charged based on a standard workweek in accordance with Section 8.3.1.4

The maximum number of days the time charges on this contract may be suspended due to contractor mobilization, and material fabrication/accumulation or processing delays is 120 days. The Engineer and the Contractor may mutually agree, in writing, to decrease this maximum number of days.

The Lane Closure Assessment Fee:

$2500 for the intersection of SL 8 at Antoine Drive

$300 for the intersection of SH 35 at CR192

$400 for the intersection of SH 35 at CR 25

This fee applies to the Contractor for closures or obstructions that overlap into restricted hour traffic for each hour or portion thereof, per lane, regardless of the length of lane closure or obstruction. For Restricted Hours subject to Lane Assessment Fee refer to the Item, "Barricades, Signs, and Traffic Handling."

Item 416: Drilled Shaft Foundations

Include the cost for furnishing and installing anchor bolts mounted in the drilled shafts in the unit bid price for the various diameter drilled shafts.

The Department may test using ultrasonic methods the anchor bolts for overhead sign supports, light standards, and traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 420: Concrete Substructures

Unless otherwise noted, use Class C concrete with an ordinary surface finish for signal, lighting, or sign structure foundations.

Item 502: Barricades, Signs, and Traffic Handling

Use a traffic control plan for handling traffic through the various phases of construction. Follow the phasing sequence unless otherwise agreed upon by the Area Engineer and the Project Manager. Ensure this plan conforms to the latest "Texas Manual on Uniform Traffic Control Devices" and the latest Barricade and Construction (BC) Standard Sheets. The latest versions of Work Zone Standard Sheets WZ (BTS-1) and WZ (BTS-2) are the traffic control plan for the signal installations.

Submit changes to the traffic control plan to the Area Engineer. Provide a layout showing the construction phasing, signs, striping, and signalizations for changes to the original traffic control plan.

Furnish and maintain the barricades and warning signs, including the necessary temporary and portable traffic control devices, during the various phases of construction. Place and construct these barricades and warning signs in accordance with the latest "Texas Manual on Uniform Traffic Control Devices" for typical construction layouts.

Cover work zone signs when work related to the signs is not in progress, or when any hazard related to the signs no longer exists.

Keep the delineation devices, signs, and pavement markings clean. This work is subsidiary to the Item, "Barricades, Signs, and Traffic Handling."

Cover or remove the permanent signs and construction signs that are incorrect or that do not apply to the current situation for a particular phase.

Replace the overhead signs, informational signs, and exit signs to be removed, with temporary signs providing the correct information to the traveling public. Size the replacement signs and include them in the traffic control plan.

Do not mount signs on drums or barricades, except those listed in the latest Barricades and Construction standard sheets.

Use traffic cones for daytime work only. Replace the cones with plastic drums during nighttime hours.

Place positive barriers to protect drop-off conditions greater than 2 ft. within the clear zone that remain overnight.

Use shadow vehicles with Truck Mounted Attenuators (TMA) for lane and shoulder closures.

Do not reduce the existing number of lanes open to traffic except as shown on the following time schedule:

One Lane Closure

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	9:00 AM -3:00 PM	N/A	5:00 AM – 9:00AM 3:00 PM – 9:00 PM
Tuesday	9:00 AM -3:00 PM	N/A	5:00 AM – 9:00AM 3:00 PM – 9:00 PM
Wednesday	9:00 AM -3:00 PM	N/A	5:00 AM – 9:00AM 3:00 PM – 9:00 PM

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Thursday	9:00 AM -3:00 PM	N/A	5:00 AM – 9:00AM 3:00 PM – 9:00 PM
Friday	9:00 AM -3:00 PM	N/A	5:00 AM – 9:00AM 3:00 PM – 9:00 PM
Saturday	N/A	N/A	N/A
Sunday	N/A	N/A	N/A

The above times are approved for the traffic control conditions listed. The Area Engineer may approve other closure times if traffic counts warrant. The Area Engineer may reduce the above times for special events.

Law enforcement assistance will be required for this project and is expected to be required for major traffic control changes and lane closures. Coordinate with local law enforcement and arrange for law enforcement as directed or agreed by the Engineer. Before payment will be made, complete the "Daily Report on Law Enforcement Force Account Work" (Form 318), provided by the Department and submit daily invoices that agree with this form for any day during the month in which approved services were provided.

Provide full-time, off-duty, uniformed, certified peace officers, as part of traffic control operations. The peace officers must be able to show proof of certification by the Texas Commission on Law Enforcement Officers Standards. The cost of the officers is paid for on a force account basis.

Before closing any one or more city street lanes, or entire city streets during construction, obtain a permit to do so from the City.

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 use of hay bales is not permitted as Storm Water Pollution Prevention Plan (SWP3) measures.

The Storm Water Pollution Prevention Plan (SWP3) consists of temporary erosion control measures needed and provided for under this Item. The disturbed area is less than one acre and use of erosion control measures is not anticipated. If physical conditions encountered at the job

site require necessary controls, BMP installation, maintenance, and removal will be paid as extra work on a force account basis per Articles 4.4 and 9.7. Since the disturbed area is less than 5 acres, a "Notice of Intent" (NOI) is not required.

Use appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction staging area. Remove and dispose of materials in compliance with State and Federal laws.

Before starting construction, review with the Engineer the SWP3 used for temporary erosion control as outlined on the plans. Before construction, place the temporary erosion and sedimentation control features as shown on the SWP3.

After completing earthwork operations, restore and reseed the disturbed areas in accordance with the Department's specifications for permanent or temporary erosion control.

Implement temporary and permanent erosion control measures to comply with the National Pollution Discharge Elimination System (NPDES) general permit under the Clean Water Act.

Before starting grading operations and during the project duration, place the temporary or permanent erosion control measures to prevent sediment from leaving the right of way.

Item 618: Conduit
Item 620: Electrical Conductors
Item 628: Electrical Services

If the specifications for electrical items require UL-listed products, this means UL-listed or CSA-listed.

Item 618: Conduit

When backfilling bore pits, ensure that the conduit is not damaged during installation or due to settling backfill material. Compact select backfill in 3 equal lifts to the bottom of the conduit; or if using sand, place it 2 in. above the conduit. Ensure backfill density is equal to that of the existing soil. Prevent material from entering the conduit.

Construct bore pits a minimum of 5 ft. from the edge of the base or pavement. Close the bore pit holes overnight.

Unless otherwise shown on the plans, install underground conduit a minimum of 24 in. deep. Install the conduit in accordance with the latest National Electrical Code (NEC) and applicable Department standard sheets. Place conduit under driveways or roadways a minimum of 24 in. below the pavement surface.

If using casing to place bored conduit, the casing is subsidiary to the conduit.

If placing the conduit under existing pavement to reach the service poles, bore the conduit in place and extend it a minimum distance of 5 ft. beyond the edge of shoulder or the back of curb.

Unless otherwise shown on the plans, place conduit runs behind curbs at locations where curbs exist.

Use schedule 80 PVC conduit to house conductor runs under paved riprap, roadway, or driveways, unless otherwise shown on the plans.

Use Rigid Metal Conduit (RMC) for exposed conduit.

Conduit elbows and rigid metal extensions required when installing PVC conduit systems are subsidiary to the various bid items.

Install a continuous bare or green insulated copper wire No. 8 AWG or larger in every conduit throughout the electrical system in accordance with the Electrical Detail Standard Sheets, and the latest edition of the NEC.

Item 620: Electrical Conductors

Test each wire of each cable or conductor after installation. Incomplete circuits or damage to the wire or the cable are cause for immediate rejection of the entire cable being tested. Remove and replace the entire cable at no expense to the Department. Also test the replacement cable after installation.

When pulling cables or conductors through the conduit, do not exceed the manufacturer's recommended pulling tensions. Lubricate the cables or conductors with a lubricant recommended by the cable manufacturer.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holders as shown on the Department's Construction Division (CST) material producers list. Check the latest link on the Department's website for this list. The category is "Roadway Illumination and Electrical Supplies." The fuse holder is shown on the list under Items 610 and 620. Provide 10 Amp time delay fuses. 3E

Ensure that circuits test clear of faults, grounds, and open circuits.

Split bolt connectors are allowed only for splices on the grounding conductors.

Item 624: Ground Boxes

The ground box locations are approximate. Alternate ground box locations may be used as directed, to avoid placing in sidewalks or driveways.

Ground metal ground box covers. Bond the ground box cover and ground conductors to a ground rod located in the ground box and to the system ground.

Ground the existing metal ground box covers as shown on the latest standard sheet ED (4)-14.

During construction and until project completion, provide personnel and equipment necessary to remove ground box lids for inspection. Provide this assistance within 24 hours of notification.

Construct concrete aprons in accordance with the latest standard sheet ED (4)-14. Make the depth of the concrete apron the same as the depth of the ground box, except for Type 1 and Type 2 ground boxes. For Type 1 or Type 2 ground boxes, construct the concrete apron in accordance with details shown on the "Ground Box Details Installations" standard.

Item 628: Electrical Services

Verify and coordinate the electrical service location with the engineering section of the appropriate utility district or company.

Identify the electrical service pole with an address number assigned by the Utility Service Provider. Provide 2-in. numerals visible from the highway. Provide numbers cut out aluminum figures nailed to wood poles or painted figures on steel poles or service cabinets.

Item 636: Signs

Furnish and install signs shown on the traffic signal "Summary of Traffic Signal Materials" sheet. Ensure that the legend on these sign panels is in accordance with the latest "Standard Highway Sign Designs for Texas" manual.

For design details not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Item 644: Small Roadside Sign Assemblies

Sign locations shown on the plans are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

Use the Texas Universal Triangular Slip Base with the concrete foundation for small ground mounted signs, unless otherwise shown in the plans.

Remove existing street name signs from existing stop signs and re-install them above the new stop signs. Removing and re-installing existing street name signs is subsidiary to the Item, "Small Roadside Sign Assemblies."

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Assume ownership of the removed existing signs.

Locations of the relocated signs are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

Replace existing signs that become damaged during relocation at no expense to the Department.

Item 666: Reflectorized Pavement Markings

Use Type III glass beads for thermoplastic and multipolymer pavement markings.

Use a 0.100 in. (100 mil) thickness for thermoplastic pavement markings, measured to the top of the thermoplastic, not including the exposed glass beads.

Use a 0.022 in. (22 mil) thickness for multipolymer pavement markings, measured to the top of the multipolymer, not including the exposed glass beads.

For roadways with asphalt surfaces to be striped with work zone or permanent thermoplastic markings, the Contractor has the option to apply paint and beads markings for a maximum 30-day period until placing the thermoplastic markings, or until starting the succeeding phase of work on the striped area. Maintain the paint and beads markings, at no expense to the Department, until placing the thermoplastic markings or starting the succeeding phase of work on the striped area. The work zone markings, whether paint and beads or thermoplastic, are paid under the Item, "Work Zone Pavement Markings" and the markings are paid for only once for the given phase of construction.

If using paint and bead markings as described above, purchase the traffic paint from the open market.

If the Type II markings become dirty and require cleaning by washing, brushing, compressed air, or other approved methods before applying the Type I thermoplastic markings, this additional cleaning is subsidiary to the Item, "Reflectorized Pavement Markings."

Establish the alignment and layout for work zone striping and permanent striping.

Stripe all roadways before opening them to traffic.

3F

Place pavement markings under these items in accordance with details shown on the plans, the latest "Texas Manual on Uniform Traffic Control Devices," or as directed.

When design details are not shown on the plans, provide pavement markings for arrows, words, and symbols conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Item 672: Raised Pavement Markers

If other operations are complete on the project and if the curing time period is not yet elapsed, the contract time will be suspended until the curing is done.

Before placing the raised pavement markers on concrete pavement, blast clean the surface using an abrasive-blasting medium. This work is subsidiary to the Item, "Raised Pavement Markers."

Provide epoxy adhesive that is machine-mixed or nozzle-mixed and dispensed. Equip the machine or nozzle with a mechanism to ensure positive mix measurement control.

Item 677: Eliminating Existing Pavement Markings and Markers

Remove existing pavement markings on concrete or asphalt surfaces by flail milling or as directed.

Item 678: Pavement Surface Preparation for Markings

Do not blast clean asphalt concrete pavement. Clean asphalt concrete pavement as required under the applicable specifications or as directed.

On new concrete pavement or on existing concrete pavement when placing a new stripe on a new location, remove the curing compounds and contamination from the pavement surface by flail milling or as directed. In addition, air-blast the surface with compressed air just before placing the new stripe.

On existing concrete pavement when placing a new stripe on an existing location, after removing the existing stripe under the Item, "Eliminating Existing Pavement Markings and Markers," air-blast the surface with compressed air just before placing the new stripe.

Do not clean concrete pavement by grinding.

Item 680: Highway Traffic Signals

Clearly mark or highlight on the shop drawings the items being furnished for this project.

Furnish labor, tools, equipment, and materials as shown on the plans and specifications for a complete and operating signal installation.

Furnish the type of controller cabinet specified on the plans. Refer to the table shown in the Departmental Material Specifications (DMS-11170, Fully Actuated, Solid-State Traffic Signal Controller Assembly), Section 11170.6.A, Type 2 cabinet, page 4 of 39, regarding the size of the cabinet, back panel configuration, and the size of the load bay. Use the following website to view this specification: http://www.txdot.gov/business/resources/dms.html

Complete traffic signal construction work, including correcting discrepancies shown on the Department inspector's "Traffic Signal Installation Inspection Report" before the beginning of the test period.

Provide a full-time qualified traffic signal technician responsible for installing, maintaining, or replacing traffic signal devices.

Staking in the field is subject to approval.

Make adjustments in project construction, if needed, due to conflicts with underground utilities.

Do not aim the luminaire arms mounted on traffic signal poles into the intersection. Aim each arm perpendicular to the centerline of the roadway it is intended to cover, to develop the proper illumination pattern for the intersection.

Provide continuous conductors without splices from signal controller to signal heads. Route the conductors for luminaires to the service enclosure. Splices or attachments to the terminal block in the access compartment of the mast arm pole are not permitted except for the luminaire cable.

Abrasions to the conductor insulation caused while pulling cable for the traffic signal system are cause for immediate rejection. Remove and replace the entire damaged cable at no expense to the Department.

When pulling cables or conductors through conduit, do not exceed the manufacturer's recommended pulling tensions. Lubricate the cables or conductors with a lubricant as recommended by the cable manufacturer.

Bond the controller housing, signal poles, conduit, and spans to a minimum No. 6 AWG stranded copper conductor. An equipment grounding conductor is required in every conduit to form a continuous grounding system. Effectively connect the grounding system to ground rods or concrete encased grounding electrodes as indicated in the plans.

Wrap signal heads with dark plastic or suitable material to conceal the signal faces from the time of installation until placing into operation. Do not use burlap.

Furnish signal heads from the same manufacturer.

Use Type B (high intensity prismatic) or Type D (diamond grade) retroreflective sheeting for signs mounted under or adjacent to the signal heads.

Furnish and attach compression type connectors. Install the connectors with a compression mechanical release hand-crimping tool to each individual conductor before making connections to the terminal strips.

Furnish solid conductors for traffic signal cable.

The Contractor may use ready mix concrete.

Apply membrane curing on concrete work in accordance with Section 420.4.10.3, "Membrane Curing."

The standard 4.5-in. galvanized pipe type poles, except the breakaway type, are subject only to the Engineer's inspection for their acceptance. Mill test reports or documentation will not be required.

Item 682: Vehicle and Pedestrian Signal Heads

Install two set screws on vehicle signal head mounting hardware fittings.

Furnish black housings for vehicle and pedestrian signals. Furnish black vehicle signal head back plates with 2 in. retroreflective yellow borders.

Item 686: Traffic Signal Pole Assemblies (Steel)

For a steel mast arm or steel strain pole assembly, hold the anchor bolts and conduits rigidly in place with a welded steel template.

Leave a minimum of one full diameter thread exposed on each anchor bolt securing a signal pole.

Set the anchor bolts for the steel strain poles so that two are in compression and two are in tension.

Use a Texas Cone Penetrometer reading of 10. The drilled shaft length is from the surface elevation to the bottom of the drilled shaft. Provide an additional length of the pole foundation from the surface level to the roadway level, if required for unusual locations. Provide the drilled shaft depth regardless of the length of the pole foundation. The pole foundation depth from the surface level to the roadway level is a maximum of 4 ft., or as approved.

Locate traffic signal pole assembly foundations a minimum of 4 ft. from the roadway curb or pavement edge, or as shown on the plans.

After the traffic signal pole assembly is plumb and the nuts are tight, tack-weld each anchor bolt nut in two places to its washer. Tack-weld each washer to the base plate in two places. Do not weld components to the bolt. Perform tack-welding in accordance with the Item, "Steel Structures." After tack-welding, repair galvanizing damage on bolts, nuts, and washers in accordance with Section 445.3.5, "Repairs."

The Department may test the anchor bolts using ultrasonic methods for traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 688: Pedestrian Detectors and Vehicle Loop Detectors

Provide pedestrian push buttons a minimum of 2 in. diameter in the smallest dimension.

Install a rubber grommet or bushing between the push button assembly and the signal pole to protect the conductors.

County: Harris / Brazoria **Control: 0912-00-641**

Highway: SL 8 / SH35

Provide pedestrian push buttons a minimum of 2 in. diameter in the smallest dimension.

Install a rubber grommet or bushing between the push button assembly and the signal pole to protect the conductors.

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

A total of one (1) shadow vehicle with a TMA/TA is required for the work with the exception of Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

A total of three (3) shadow vehicles with a TMA/TA are required for Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

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QUANTITY SHEET

CONTROLLING PROJECT ID 0912-00-641 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY Various

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0912-00-641**			
		PROJECT ID		**A00137606**			
		COUNTY		**Harris**			
		HIGHWAY		**Various**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	146.000		146.000	
	416-6033	DRILL SHAFT (TRF SIG POLE) (42 IN)	LF	17.000		17.000	
	416-6034	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF	21.000		21.000	
	479-6006	ADJUSTING INLET (CAP)	EA	1.000		1.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	6.000		6.000	
	529-6001	CONC CURB (TY I)	LF	200.000		200.000	
	531-6004	CURB RAMPS (TY 1)	EA	8.000		8.000	
	531-6054	CURB RAMPS (TY 21) (MOD)	EA	4.000		4.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	730.000		730.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	400.000		400.000	
	618-6053	CONDT (PVC) (SCH 80) (3")	LF	810.000		810.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	925.000		925.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	2,170.000		2,170.000	
	620-6011	ELEC CONDR (NO.4) BARE	LF	585.000		585.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	595.000		595.000	
	621-6005	TRAY CABLE (4 CONDR) (12 AWG)	LF	3,425.000		3,425.000	
	624-6009	GROUND BOX TY D (162922)	EA	13.000		13.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	10.000		10.000	
	628-6002	REMOVE ELECTRICAL SERVICES	EA	3.000		3.000	
	628-6145	ELC SRV TY D 120/240 060(NS)SS(E)SP(O)	EA	3.000		3.000	
	636-6001	ALUMINUM SIGNS (TY A)	SF	124.000		124.000	
	636-6007	REPLACE EXISTING ALUMINUM SIGNS(TY A)	SF	173.000		173.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	6.000		6.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	9.000		9.000	
	644-6067	IN SM RD SN SUP&AM (INST SIGN ONLY)	EA	19.000		19.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	7.000		7.000	
	666-6021	REFL PAV MRK TY I (W)6"(LNDP)(100MIL)	LF	520.000		520.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	770.000		770.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	220.000		220.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	9.000		9.000	
	666-6063	REFL PAV MRK TY I(W)(UTURN ARW)(100MIL)	EA	4.000		4.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	9.000		9.000	
	666-6099	REF PAV MRK TY I(W)18"(YLD TRI)(100MIL)	EA	20.000		20.000	
	666-6102	REF PAV MRK TY I(W)36"(YLD TRI)(100MIL)	EA	28.000		28.000	
	666-6156	REFL PAV MRK TY I(Y)(MED NOSE)(100MIL)	EA	2.000		2.000	
	666-6225	PAVEMENT SEALER 6"	LF	4,440.000		4,440.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0912-00-641 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY Various

			CONTROL SECTION JOB		**0912-00-641**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00137606**			
			COUNTY		**Harris**			
			HIGHWAY		**Various**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL		
	666-6226	PAVEMENT SEALER 8"		LF	570.000		570.000	
	666-6230	PAVEMENT SEALER 24"		LF	110.000		110.000	
	666-6231	PAVEMENT SEALER (ARROW)		EA	6.000		6.000	
	666-6232	PAVEMENT SEALER (WORD)		EA	6.000		6.000	
	666-6233	PAVEMENT SEALER (MED NOSE)		EA	2.000		2.000	
	666-6236	PAVEMENT SEALER (UTURN ARROW)		EA	4.000		4.000	
	666-6243	PAVEMENT SEALER (YLD TRI)		EA	48.000		48.000	
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)		LF	100.000		100.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)		LF	60.000		60.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)		LF	1,490.000		1,490.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)		LF	400.000		400.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)		LF	2,430.000		2,430.000	
	672-6007	REFL PAV MRKR TY I-C		EA	259.000		259.000	
	672-6009	REFL PAV MRKR TY II-A-A		EA	150.000		150.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")		LF	7,330.000		7,330.000	
	677-6003	ELIM EXT PAV MRK & MRKS (8")		LF	715.000		715.000	
	677-6005	ELIM EXT PAV MRK & MRKS (12")		LF	300.000		300.000	
	677-6006	ELIM EXT PAV MRK & MRKS (18")		LF	520.000		520.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")		LF	906.000		906.000	
	677-6008	ELIM EXT PAV MRK & MRKS (ARROW)		EA	10.000		10.000	
	677-6012	ELIM EXT PAV MRK & MRKS (WORD)		EA	22.000		22.000	
	677-6019	ELIM EXT PAV MRK & MRKS (36")(YLD TRI)		EA	20.000		20.000	
	677-6036	ELIM EXT PAV MRK & MRKS (UTURN ARROW)		EA	4.000		4.000	
	678-6002	PAV SURF PREP FOR MRK (6")		LF	8,762.000		8,762.000	
	678-6004	PAV SURF PREP FOR MRK (8")		LF	2,008.000		2,008.000	
	678-6008	PAV SURF PREP FOR MRK (24")		LF	950.000		950.000	
	678-6009	PAV SURF PREP FOR MRK (ARROW)		EA	14.000		14.000	
	678-6010	PAV SURF PREP FOR MRK (DBL ARROW)		EA	4.000		4.000	
	678-6012	PAV SURF PREP FOR MRK (UTURN ARR)		EA	4.000		4.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)		EA	30.000		30.000	
	678-6022	PAV SURF PREP FOR MRK (18")(YLD TRI)		EA	20.000		20.000	
	678-6023	PAV SURF PREP FOR MRK (36")(YLD TRI)		EA	28.000		28.000	
	678-6024	PAV SURF PREP FOR MRK (MED NOSE)		EA	2.000		2.000	
	680-6002	INSTALL HWY TRF SIG (ISOLATED)		EA	2.000		2.000	
	680-6003	INSTALL HWY TRF SIG (SYSTEM)		EA	1.000		1.000	
	680-6004	REMOVING TRAFFIC SIGNALS		EA	3.000		3.000	
	682-6001	VEH SIG SEC (12")LED(GRN)		EA	30.000		30.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0912-00-641 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY Various

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0912-00-641**			
		PROJECT ID		**A00137606**			
		COUNTY		**Harris**			
		HIGHWAY		**Various**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	9.000		9.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	30.000		30.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	7.000		7.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	30.000		30.000	
	682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	12.000		12.000	
	682-6007	VEH SIG SEC (12")LED(GRN U-TURN ARW)	EA	1.000		1.000	
	682-6008	VEH SIG SEC (12")LED(YEL U-TURN ARW)	EA	1.000		1.000	
	682-6009	VEH SIG SEC (12")LED(RED U-TURN ARW)	EA	2.000		2.000	
	682-6018	PED SIG SEC (LED)(COUNTDOWN)	EA	12.000		12.000	
	682-6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	30.000		30.000	
	682-6055	BACKPLATE W/REF BRDR(4 SEC)(VENT)ALUM	EA	8.000		8.000	
	684-6007	TRF SIG CBL (TY A)(12 AWG)(2 CONDR)	LF	2,435.000		2,435.000	
	684-6009	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	LF	2,495.000		2,495.000	
	684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	4,575.000		4,575.000	
	686-6035	INS TRF SIG PL AM(S)1 ARM(32')LUM	EA	1.000		1.000	
	686-6039	INS TRF SIG PL AM(S)1 ARM(36')LUM	EA	2.000		2.000	
	686-6043	INS TRF SIG PL AM(S)1 ARM(40')LUM	EA	1.000		1.000	
	686-6047	INS TRF SIG PL AM(S)1 ARM(44')LUM	EA	6.000		6.000	
	686-6055	INS TRF SIG PL AM(S)1 ARM(50')LUM	EA	1.000		1.000	
	686-6167	INS TRF SIG PL AM(S)2 ARM(44-36')LUM	EA	1.000		1.000	
	687-6001	PED POLE ASSEMBLY	EA	8.000		8.000	
	688-6001	PED DETECT PUSH BUTTON (APS)	EA	12.000		12.000	
	688-6003	PED DETECTOR CONTROLLER UNIT	EA	1.000		1.000	
	6038-6004	MULTIPOLYMER PAV MRK (W)(6")(SLD)	LF	712.000		712.000	
	6038-6005	MULTIPOLYMER PAV MRK (W)(6")(BRK)	LF	1,630.000		1,630.000	
	6038-6007	MULTIPOLYMER PAV MRK (W)(8")(SLD)	LF	1,438.000		1,438.000	
	6038-6013	MULTIPOLYMER PAV MRK (W)(24")(SLD)	LF	840.000		840.000	
	6038-6017	MULTIPOLYMER PAV MRK (Y)(6")(SLD)	LF	350.000		350.000	
	6038-6024	MULTIPOLYMER PAV MRK (BLK)(6")(BRK)	LF	1,630.000		1,630.000	
	6038-6025	MULTIYPOLYMER PAV MRK (W) (ARROW)	EA	8.000		8.000	
	6038-6026	MULTIPOLYMER PAV MRK (W) (DBL ARROW)	EA	4.000		4.000	
	6038-6027	MULTIPOLYMER PAV MRK (W) (WORD)	EA	24.000		24.000	
	6058-6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	3.000		3.000	
	6185-6002	TMA (STATIONARY)	DAY	30.000		30.000	
	6292-6004	RVDS(PRESENCE DET ONLY)(INSTALL ONLY)	EA	13.000		13.000	
	6292-6005	RVDS(ADVANCE DET ONLY)(INSTALL ONLY)	EA	6.000		6.000	
	14	PUBLIC UTILITY FORCE ACCT WORK (PARTICIPATING)	LS	1.000		1.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0912-00-641 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY Various

			CONTROL SECTION JOB		**0912-00-641**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00137606**		
			COUNTY		**Harris**		
			HIGHWAY		**Various**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	16	MATERIAL FURNISHED BY THE STATE (PARTICIPATING)	LS	19.000		19.000	
	18	LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

MATERIAL OF HIGHWAY TRAFFIC SIGNAL

ITEM	DESC CODE	DESCRIPTION	UNIT	ESTIMATE
416	6032	DRILL SHAFT (TRF SIG POLE) (36IN)	LF	87
479	6006	ADJUSTING INLET (CAP)	EA	1
502	6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	2
529	6001	CONC CURB (TY I)	LF	200
531	6004	CURB RAMPS (TY 1)	EA	8
531	6054	CURB RAMPS (TY 21)(MOD)	EA	4
618	6046	CONDT (PVC) (SCHD 80) (2")	LF	420
618	6053	CONDT (PVC) (SCHD 80) (3")	LF	510
618	6054	CONDT (PVC) (SCHD 80) (3") (BORE)	LF	610
620	6009	ELEC CONDR (NO. 6) BARE	LF	1325
620	6011	ELEC CONDR (NO. 4) BARE	LF	215
620	6012	ELEC CONDR (NO. 4) INSULATED	LF	430
621	6005	TRAY CABLE (4CONDR) (12AWG)	LF	2145
624	6009	GROUND BOX TY D (162922)	EA	12
624	6010	GROUND BOX TY D (162922)W/APRON	EA	1
628	6002	REMOVE ELECTRICAL SERVICE	EA	1
628	6145	ELC SRV TY D (120/240)060(NS)SS(E)SP(O)	EA	1
636	6001	ALUMINUM SIGNS (TY A)	SF	92
636	6007	REPLACE EXISTING ALUMINUM SIGNS(TY A)	SF	173
644	6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	6
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	4
644	6067	IN SM RD SN SUP&AM (INST SIGN ONLY)	EA	19
666	6021	REFL PAV MRK TY I(W)6"(LNDP)(100MIL)	LF	520
666	6063	REFL PAV MRK TY I(W)(UTURN ARW)(100MIL)	EA	4
666	6099	REFL PAV MRK TY I(W) 18"(YLD TRI)(100MIL)	EA	20
666	6102	REFL PAV MRK TY I(W) 36"(YLD TRI)(100MIL)	EA	28
666	6156	REFL PAV MRK TY I(Y)(MED NOSE)(100MIL)	EA	2
666	6225	PAVEMENT SEALER 6"	LF	520
666	6233	PAVEMENT SEALER (MED NOSE)	EA	2
666	6236	PAVEMENT SEALER (UTURN ARROW)	EA	4
666	6243	PAVEMENT SEALER (YLD TRI)	EA	48
672	6007	REFL PAV MRKR TY I-C	EA	200
672	6009	REFL PAV MRKR TY II-A-A	EA	20
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	4500
677	6003	ELIM EXT PAV MRK & MRKS (8")	LF	600
677	6005	ELIM EXT PAV MRK & MRKS (12")	LF	300
677	6007	ELIM EXT PAV MRK & MRKS (24")	LF	300
677	6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	6
677	6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	18
677	6036	ELIM EXT PAV MRK & MRKS (UTURN ARROW)	EA	4
678	6002	PAV SURF PREP FOR MRK (6")	LF	4842
678	6004	PAV SURF PREP FOR MRK (8")	LF	1438
678	6008	PAV SURF PREP FOR MRK (24")	LF	840
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	8
678	6010	PAV SURF PREP FOR MRK (DBL ARROW)	EA	4
678	6012	PAV SURF PREP FOR MRK (UTURN ARROW)	EA	4
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	24
678	6022	PAV SURF PREP FOR MRK (18")(YLD TRI)	EA	20
678	6023	PAV SURF PREP FOR MRK (36")(YLD TRI)	EA	28
678	6024	PAV SURF PREP FOR MRK (MED NOSE)	EA	2

MATERIAL OF HIGHWAY TRAFFIC SIGNAL

ITEM	DESC CODE	DESCRIPTION	UNIT	ESTIMATE
680	6003	INSTALL HWY TRF SIG (SYSTEM)	EA	1
	**	TRAFFIC SIGNAL CONTROLLER ASSEMBLY	EA	1
	**	CABINET FULL-ACTUATED	EA	1
	**	TRAFFIC SIGNAL CONTROLLER FOUNDATION	EA	1
	**	LED LUMINAIRE HEAD-EQUIVALENT TO 250W(HPS)	EA	6
	**	ROD,5/8" X 10' COPPER-CLAD GROUND (CONTROLLER ONLY)	EA	1
	**	"LEFT TURN SIGNAL" (30"X36")(R10-10L)	EA	2
	**	LEFT-THRU DIRECTIONAL SIGN (30"X36")(R3-6)	EA	2
	**	"ONE WAY" (12"x 36")(R6-1L)	EA	2
	**	"ONE WAY" (12"x 36")(R6-1R)	EA	2
	**	STREET NAME SIGN,"Antoine Dr" (66"x18")	EA	2
	**	STREET NAME SIGN,"Beltway 8" (66"x18")	EA	4
	**	DETECTOR UNIT (DUAL CHANNEL)	EA	12
	**	DETECTOR CARD RACK (8 SLOTS) AND (4 SLOTS)	EA	1
	**	MAST ARM DAMPER	EA	6
	**	CELLULAR MODEM (INSTALL ONLY)	EA	1
	**	18" CABINET BASE EXTENSION	EA	1
680	6004	REMOVING TRAFFIC SIGNALS	EA	1
682	6001	VEH SEC (12 IN) LED (GRN)	EA	18
682	6002	VEH SEC (12 IN) LED (GRN ARW)	EA	4
682	6003	VEH SEC (12 IN) LED (YEL)	EA	18
682	6004	VEH SEC (12 IN) LED (YEL ARW)	EA	2
682	6005	VEH SEC (12 IN) LED (RED)	EA	18
682	6006	VEH SEC (12 IN) LED (RED ARW)	EA	4
682	6018	PED SIG SEC (LED) (COUNTDOWN)	EA	12
682	6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	16
682	6055	BACKPLATE W/REF BRDR(4 SEC)(VENT)ALUM	EA	4
684	6007	TRAF SIG CBL(TY A) (12 AWG)(2 CONDR)	LF	2435
684	6009	TRAF SIG CBL(TY A) (12 AWG)(4 CONDR)	LF	2495
684	6012	TRAF SIG CBL(TY A) (12 AWG)(7 CONDR)	LF	2120
686	6039	INS TRF SIG PL AM(S) 1 ARM (36')LUM	EA	2
686	6047	INS TRF SIG PL AM(S) 1 ARM (44')LUM	EA	4
687	6001	PED POLE ASSEMBLY	EA	6
	**	SCREW IN ANCHOR FOUNDATION	EA	6
687	6001	PED POLE ASSEMBLY(20')	EA	2
	**	SCREW IN ANCHOR FOUNDATION	EA	2
688	6001	PED DETECT PUSH BUTTON (APS)	EA	12
	**	"PEDESTRIAN" (9"X15")(R10-3E(L))	EA	8
	**	"PEDESTRIAN" (9"X15")(R10-3E(R))	EA	4
688	6003	PED DETECTOR CONTROLLER UNIT	EA	1
6038	6004	MULTIPOLYMER PAV MRK(W)(6")(SLD)	LF	712
6038	6005	MULTIPOLYMER PAV MRK(W)(6")(BRK)	LF	1630
6038	6007	MULTIPOLYMER PAV MRK(W)(8")(SLD)	LF	1438
6038	6013	MULTIPOLYMER PAV MRK(W)(24")(SLD)	LF	840
6038	6017	MULTIPOLYMER PAV MRK(Y)(6")(SLD)	LF	350
6038	6024	MULTIPOLYMER PAV MRK(BLK)(6")(BRK)	LF	1630
6038	6025	MULTIPOLYMER PAV MRK(W)(ARROW)	EA	8
6038	6026	MULTIPOLYMER PAV MRK(W)(DBL ARROW)	EA	4
6038	6027	MULTIPOLYMER PAV MRK(W)(WORD)	EA	24
6058	6001	BBU SYSTEM(EXTERNAL BATT CABINET)	EA	1
6185	6002	TMA (STATIONARY)	DAY	10
6292	6004	RVSD(PRESENCE DETECTION ONLY)(INSTALL ONLY)	EA	6
	**	RVSD(RADAR PRESENCE DETECTOR POWER AND COMMUNICATION CABLE)	LF	1175
6292	6005	RVSD(ADVANCE DETECTION ONLY)(INSTALL ONLY)	EA	2
	**	RVSD(RADAR ADVANCE DETECTOR POWER AND COMMUNICATION CABLE)	LF	505
****	**	TXDOT FORCE ACCOUNT FOR (RADAR PURCHASING)	EA	8

** MATERIALS SUBSIDIARY TO PERTINENT ITEM

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 PHONE: (713) 828-4742
Houston, TX. 77095

Texas Department of Transportation®

BELTWAY 8 AT ANTOINE DRIVE

TRAFFIC SIGNAL SUMMARY OF QUANTITIES

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		5
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

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MATERIAL OF HIGHWAY TRAFFIC SIGNAL

ITEM	DESC CODE	DESCRIPTION	UNIT	ESTIMATE
416	6032	DRILL SHAFT (TRF SIG POLE) (36IN)	LF	59
502	6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	2
618	6046	CONDT (PVC) (SCHD 80) (2")	LF	35
618	6053	CONDT (PVC) (SCHD 80) (3")	LF	190
618	6054	CONDT (PVC) (SCHD 80) (3") (BORE)	LF	210
620	6009	ELEC CONDR (NO. 6) BARE	LF	415
620	6011	ELEC CONDR (NO. 4) BARE	LF	20
620	6012	ELEC CONDR (NO. 4) INSULATED	LF	40
621	6005	TRAY CABLE (4CONDR) (12AWG)	LF	710
624	6009	GROUND BOX TY D (162922)	EA	1
624	6010	GROUND BOX TY D (162922)W/APRON	EA	4
628	6002	REMOVE ELECTRICAL SERVICE	EA	1
628	6145	ELC SRV TY D (120/240)060(NS)SS(E)SP(O)	EA	1
636	6001	ALUMINUM SIGNS (TY A)	SF	32
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	2
644	6076	REMOVE SM RD SN SUP&AM	EA	2
666	6036	REFL PAV MRK TY I(W)8"(SLD)(100MIL)	LF	570
666	6048	REFL PAV MRK TY I(W)24"(SLD)(100MIL)	LF	110
666	6054	REFL PAV MRK TY I(W)(ARROW)(100MIL)	EA	6
666	6078	REFL PAV MRK TY I(W)(WORD)(100MIL)	EA	6
666	6225	PAVEMENT SEALER 6"	LF	3920
666	6226	PAVEMENT SEALER 8"	LF	570
666	6230	PAVEMENT SEALER 24"	LF	110
666	6231	PAVEMENT SEALER (ARROW)	EA	6
666	6232	PAVEMENT SEALER (WORD)	EA	6
666	6309	RE PM W/RET REQ TYI(W)6"(SLD)(100MIL)	LF	1490
666	6321	RE PM W/RET REQ TYI(Y)6"(SLD)(100MIL)	LF	2430
672	6007	REFL PAV MRKR TY I-C	EA	59
672	6009	REFL PAV MRKR TY II-A-A	EA	130
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	2730
677	6006	ELIM EXT PAV MRK & MRKS (18")	LF	520
677	6007	ELIM EXT PAV MRK & MRKS (24")	LF	586
677	6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	4
677	6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	4
678	6002	PAV SURF PREP FOR MRK(6")	LF	3920
678	6004	PAV SURF PREP FOR MRK(8")	LF	570
678	6008	PAV SURF PREP FOR MRK(24")	LF	110
678	6009	PAV SURF PREP FOR MRK(ARROW)	EA	6
678	6016	PAV SURF PREP FOR MRK(WORD)	EA	6
680	6002	INSTALL HWY TRF SIG (ISOLATED)	EA	1
	**	TRAFFIC SIGNAL CONTROLLER ASSEMBLY	EA	1
	**	CABINET FULL-ACTUATED	EA	1
	**	TRAFFIC SIGNAL CONTROLLER FOUNDATION	EA	1
	**	LED LUMINAIRE HEAD-EQUIVALENT TO 250W(HPS)	EA	4
	**	ROD,5/8" X 10' COPPER-CLAD GROUND (CONTROLLER ONLY)	EA	1
	**	"LEFT TURN SIGNAL" (30"x36")(R10-10L)	EA	2
	**	STREET NAME SIGN, "SH 35" (42"x18")	EA	2
	**	STREET NAME SIGN, "CR 192" (48"x18")	EA	2
	**	DETECTOR UNIT (DUAL CHANNEL)	EA	12
	**	DETECTOR CARD RACK (8 SLOTS) AND (4 SLOTS)	EA	1
	**	MAST ARM DAMPER	EA	4
	**	GPS COMMUNICATIONS UNIT	EA	1
	**	18" CABINET BASE EXTENSION	EA	1
680	6004	REMOVING TRAFFIC SIGNALS	EA	1

MATERIAL OF HIGHWAY TRAFFIC SIGNAL

ITEM	DESC CODE	DESCRIPTION	UNIT	ESTIMATE
682	6001	VEH SEC (12 IN) LED (GRN)	EA	8
682	6002	VEH SEC (12 IN) LED (GRN ARW)	EA	2
682	6003	VEH SEC (12 IN) LED (YEL)	EA	8
682	6004	VEH SEC (12 IN) LED (YEL ARW)	EA	2
682	6005	VEH SEC (12 IN) LED (RED)	EA	8
682	6006	VEH SEC (12 IN) LED (RED ARW)	EA	4
682	6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	8
682	6055	BACKPLATE W/REF BRDR(4 SEC)(VENT)ALUM	EA	2
684	6012	TRAF SIG CBL(TY A) (12 AWG)(7 CONDR)	LF	1195
686	6035	INS TRF SIG PL AM(S) 1 ARM (32')LUM	EA	1
686	6043	INS TRF SIG PL AM(S) 1 ARM (40')LUM	EA	1
686	6047	INS TRF SIG PL AM(S) 1 ARM (44')LUM	EA	2
6058	6001	BBU SYSTEM(EXTERNAL BATT CABINET)	EA	1
6185	6002	TMA (STATIONARY)	DAY	10
6292	6004	RVSD(PRESENCE DETECTION ONLY)(INSTALL ONLY)	EA	4
	**	RVSD(RADAR PRESENCE DETECTOR POWER AND COMMUNICATION CABLE)	LF	630
6292	6005	RVSD(ADVANCE DETECTION ONLY)(INSTALL ONLY)	EA	2
	**	RVSD(RADAR ADVANCE DETECTOR POWER AND COMMUNICATION CABLE)	LF	365
****	**	TXDOT FORCE ACCOUNT FOR (RADAR PURCHASING)	EA	6

** MATERIALS SUBSIDIARY TO PERTINENT ITEM

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 PHONE: (713) 828-4742
Houston, TX. 77095

Texas Department of Transportation®

SH 35 AT CR 192

TRAFFIC SIGNAL SUMMARY OF QUANTITIES

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		5A
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

ESTIMATE OF QUANTITIES

ITEM No.	DESC. CODE	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY
416	6033	DRILL SHAFT (TRF SIG POLE) (42 IN)	LF	17
416	6034	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF	21
502	6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	2
618	6046	CONDUIT (PVC) (SCHD 80)(2")	LF	275
618	6047	CONDUIT (PVC) (SCHD 80)(2")(BORE)	LF	400
618	6053	CONDUIT (PVC) (SCHD 80)(3")	LF	110
618	6054	CONDUIT (PVC) (SCHD 80)(3")(BORE)	LF	105
620	6009	ELEC CONDUCTOR (NO. 6) BARE	LF	430
620	6011	ELEC CONDUCTOR (NO. 4) BARE	LF	350
620	6012	ELEC CONDUCTOR (NO. 4) INSULATED	LF	125
621	6005	TRAY CABLE (4 CONDR) (12 AWG)	LF	570
624	6010	GROUND BOX TY D(162922) W/ APRON	EA	5
628	6002	REMOVE ELECTRICAL SERVICES	EA	1
628	6145	ELC SRV TY D 120 / 240 060(NS) SS(E) SP(O)	EA	1
644	6004	IN SM RD SN SUP & AM TY 10BWG(1)SA(T)	EA	3
644	6076	REMOVE SM RD SN SUP&AM	EA	5
666	6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	200
666	6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	110
666	6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	3
666	6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	3
666	6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	100
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	60
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	400
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	100
677	6003	ELIM EXT PAV MRK & MRKS (8")	LF	115
677	6007	ELIM EXT PAV MRK & MRKS (24")	LF	20
677	6019	ELIM EXT PAV MRK & MRKS (36")(YLD TRI)	EA	20
680	6002	INSTALL HWY TRF SIG (ISOLATED)	EA	1
	*	18" CABINET BASE EXTENSION	EA	1
	*	CONTROLLER CABINET FOUNDATION	EA	1
	*	TRAFFIC SIGNAL CABINET ITS	EA	1
	*	TRAFFIC SIGNAL CONTROLLER, FULL-ACTUATED	EA	1
	*	MAST ARM DAMPENER	EA	3
	*	ROD, 5/8" X 10' COPPER-CLAD GROUND (CONTROLLER ONLY)	EA	1
	*	SIGN, "U-TURN ONLY" (24"X30") (R3-8U)	EA	1
	*	SIGN, "LEFT ONLY, RIGHT ONLY" (32"X30") (R3-8)	EA	1
	*	SIGN, "SIGNAL AHEAD" (48"X48") (W3-3)	EA	3
	*	STREET NAME SIGN "SH 35" (48"X18") (D3-1)	EA	1
	*	STREET NAME SIGN "CR 25" (48"X18") (D3-1)	EA	2
	*	DETECTOR UNIT (DUAL CHANNEL)	EA	12
	*	DETECTOR CARD RACK (8 SLOT & 4 SLOT)	EA	1
	*	LUMINAIRE ARM (8-FT)	EA	2
	*	LED RDWY LUMINAIRE (250 W HPS EQ)	EA	2
	*	GPS COMMUNICATION UNIT	EA	1
680	6004	REMOVING TRAFFIC SIGNALS	EA	1
	*	REMOVING STOP SIGNS	EA	2
682	6001	VEH SIG SEC (12") LED (GRN)	EA	4
682	6002	VEH SIG SEC (12") LED (GRN ARW)	EA	3
682	6003	VEH SIG SEC (12") LED (YEL)	EA	4
682	6004	VEH SIG SEC (12") LED (YEL ARW)	EA	3
682	6005	VEH SIG SEC (12") LED (RED)	EA	4
682	6006	VEH SIG SEC (12") LED (RED ARW)	EA	4
682	6007	VEH SIG SEC (12") LED (GRN U-TURN ARW)	EA	1
682	6008	VEH SIG SEC (12") LED (YEL U-TURN ARW)	EA	1
682	6009	VEH SIG SEC (12") LED (RED U-TURN ARW)	EA	2
682	6054	BACK PLATE (12")(3 SEC)	EA	6
682	6055	BACK PLATE (12")(4 SEC)	EA	2
684	6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	1260
686	6055	TRF SIG PL AM(S)1 ARM(50')LUM	EA	1
686	6167	INS TRF SIG PL AM(S)2 ARM(44'-36')LUM	EA	1
6185	6002	TMA (STATIONARY)	DAY	10
6292	6004	RVDS (PRES DET ONLY) (INSTALL ONLY)	EA	3
	*	RVDS (#18/2C)(POWER)& (#22/4C) (COMM CABLE)	LF	635
6292	6005	RVDS (ADV DET ONLY) (INSTALL ONLY)	EA	2
	*	RVDS (#18/2C)(POWER)& (#22/4C) (COMM CABLE)	LF	635
6058	6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1

* ITEMS LISTED ARE FOR CONTRACTOR INFORMATION ONLY, AND ALL MATERIALS ARE SUBSIDIARY TO PERTINENT ITEMS.

STATE OF TEXAS
KETI B. HRISTOVA
90998
LICENSED
PROFESSIONAL ENGINEER

04/26/2021

KBH TRAFFIC ENGINEERING, LLC
TBPE Registration No. F-14592
430 SH 6 S, SUITE 120, HOUSTON TEXAS 77079

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
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TBPE Registration No. F-1046

Texas Department of Transportation
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SH 35 AT CR 25
TRAFFIC SIGNAL
SUMMARY OF QUANTITIES

SHEET 1 OF 1

FED RD DIV NO	PROJECT NO		HIGHWAY NO
6			SH35
STATE	DIST	COUNTY	
TEXAS	HOU	BRAZORIA	
CONT	SECT	JOB	SHEET NO
0912	00	641	5B

NOTES FOR PERMANENT TRAFFIC SIGNAL:

1. INSTALL SIGNALS HORIZONTALLY ON MAST ARM, 17FT.-6IN, ABOVE THE ROADWAY. ADD ADDITIONAL POLE FOUNDATION AS NEEDED TO ACHIEVE THIS CLEARANCE.

2. FURNISH BLACK HOUSING FOR VEHICLE AND PEDESTRIAN SIGNALS. FURNISH BLACK VEHICLE SIGNAL HEAD BACK PLATES WITH RETROREFLECTIVE YELLOW BORDERS.

3. FURNISH VEHICLE SIGNAL AND PEDESTRIAN HEADS WITH LIGHT EMITTING DIODE (LED) SIGNAL LAMP UNITS.

4. USE TYPE B HIGH INTENSITY PRISMATIC OR TYPE D DIAMOND GRADE RETROREFLECTIVE SHEETING FOR SIGNS MOUNTED UNDER OR ADJACENT TO THE SIGNAL HEADS.

5. ROUTE CABLE FOR LUMINAIRES (#12/4C-TRAY CABLE) TO THE SERVICE ENCLOSURE. SEE ELECTRICAL DETAIL SHEETS. DO NOT PASS THE LUMINAIRE CONDUCTORS THROUGH THE SIGNAL CONTROLLER CABINET.

6. FURNISH AND INSTALL FULL-ACTUATED CONTROLLER WITH INTERNAL TIME BASE COORDINATION UNIT IN A BASE MOUNTED CABINET.

7. THE TRAFFIC SIGNAL CONSTRUCTION AND MAINTENANCE OFFICE WILL PROVIDE PHASING AND TIMING FOR TEMPORARY AND PERMANENT TRAFFIC SIGNALS.

8. LOCATE CONTROLLER(S), MAST ARM POLES, DETECTORS, ETC., AS APPROVED.

9. THE VENDOR'S REPRESENTATIVES OF THE RADAR EQUIPMENT SUPPLIED FOR THIS PROJECT MUST SUPERVISE THE INSTALLATION AND SETUP AND TESTING OF THIS EQUIPMENT AND BE FACTORY CERTIFIED. THE REPRESENTATIVE MUST BE ON SITE DURING THIS TIME. ANY EQUIPMENT REQUIRED FOR SET UP AND OPERATION OF THE RADAR DEVICES MUST BE PROVIDED TO TXDOT UPON COMPLETION. THE VENDOR'S REPRESENTATIVE MUST PROVIDE TRAINING TO THE MUNICIPALITIES WHO WILL BE RESPONSIBLE FOR THE MAINTENANCE OF THE RADAR EQUIPMENT AFTER ACCEPTANCE OF THE PROJECT.

10. THE RADAR PRESENCE DETECTOR AND RADAR ADVANCE DETECTION DEVICES MUST BE COMPATIBLE WITH EACH OTHER AND FROM THE SAME MANUFACTURER.

11. RADAR PRESENCE DETECTION DEVICE MUST UTILIZE TRUE-PRESENCE DETECTION. SYSTEM USING LOCKING ALGORITHMS TO ATTEMPT PRESENCE DETECTION WILL NOT BE ACCEPTED.

12. RADAR ADVANCE DETECTION DEVICE MUST CONTINUOUSLY TRACK VEHICLE SPEED, DISTANCE, AND ESTIMATED TIME OF ARRIVAL.

13. ONCE THE CONTRACT HAS BEEN EXECUTED OR DURING THE KICK-OFF MEETING, THE ENGINEER (TXDOT) OR HIS/HER REPRESENTATIVE WILL COORDINATE OR ARRANGE FOR THE RADAR EQUIPMENT TO BE PROVIDED BY THE DEPARTMENT.

14. THE ENGINEER (TXDOT) OR HIS/HER REPRESENTATIVE WILL COORDINATE THE ORDERING OF THE RADAR EQUIPMENT BY USING THE FORCE ACCOUNT. ENGINEER (TXDOT) OR HIS/HER REPRESENTATIVE WILL CONTACT ARNOLD TREVINO AT 713-866-7101 TO ORDER THE RADAR EQUIPMENT.

15. COMMUNICATION AND POWER TO THE RADAR DEVICES SHALL BE VIA CONTINUOUS CABLE RUN OF UP TO 1000 FEET WITH THE USE OF REPEATERS.

16. SEAL EACH END OF THE COMMUNICATIONS CABLE THAT IS EXPOSED TO THE ELEMENTS DURING STORAGE OR AFTER INSTALLATION WITH A WATERPROOF SEALANT, OR AS PER MANUFACTURER RECOMMENDATIONS.

17. COMMUNICATION OR OTHER I.T.S. EQUIPMENT, SUCH AS WIMAX, OPTICOM, RADIO, FIBER OPTIC OR ETHERNET MAY EXIST AT THIS INTERSECTION PRIOR TO CONSTRUCTION. CONTRACTOR SHALL CONTACT TEXAS DEPARTMENT OF TRANSPORTATION AND CITY OF HOUSTON PUBLIC WORKS DEPARTMENT. EQUIPMENT WILL NEED TO BE REMOVED AND BE REINSTALLED BY OTHERS.

18. FINAL PLACEMENT OF RADAR DEVICES TO BE APPROVED BY ENGINEER (TXDOT).

19. REPAIR OR REPLACE PAVEMENT AND SIDEWALKS DAMAGED BY THE CONTRACTOR'S FORCES DURING CONSTRUCTION AT NO COST TO THE DEPARTMENT.

20. REMOVE THE EXISTING TRAFFIC SIGNALS, SIGNS AND THOSE ITEMS DEEMED SALVAGEABLE BY THE ENGINEER (TXDOT) AT ANTOINE DRIVE AND BELTWAY 8 AND STOCKPILE THOSE ITEMS ON THE RIGHT OF WAY. REMOVE AND DISPOSE OF OTHER ITEMS AT NO EXPENSE TO THE DEPARTMENT. EXISTING FIBER OPTIC CABLE SHALL BE RELOCATED TO THE NEW CONTROLLER CABINET.

21. SEAL ENDS OF ALL CONDUITS WITH DUCT SEAL, EXPANDABLE FOAM, OR BY OTHER METHODS APPROVED BY THE ENGINEER (TxDOT). 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.

22. CAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.

23. DO NOT PLACE SIGNAL HEADS OVER THE ROADWAY UNTIL ALL NECESSARY MATERIALS ARE ON HAND AS APPROVED.

24. INSTALL TWO SET SCREWS ON ALL VEHICLE SIGNAL HEAD MOUNTING HARDWARE FITTINGS.

25. CONTRACTOR TO ADJUST SIGNAL HEAD ALIGNMENT AS NEEDED USING ARTICULATING SIGNAL BRACKET ASSEMBLIES WITH A MINIMUM OF THREE ADJUSTABLE AXES, WHICH SHALL BE SUBSIDIARY TO THE PROJECT.

26. INSTALL A 5/8-IN. (MINIMUM) EYE BOLT FOR THE POINT OF ATTACHMENT BELOW THE SERVICE ENTRANCE WEATHERHEAD FOR THE SERVICE DROP TO STEEL OR WOOD POLE.

27. AIM LUMINAIRE ARMS MOUNTED ON TRAFFIC SIGNAL POLES PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY IT IS INTENDED TO COVER, TO DEVELOP THE PROPER ILLUMINATION PATTERN FOR THE INTERSECTION.

28. PROVIDE 250 WATT HPS EQUIVALENT LIGHT EMITTING DIODE(LED) LUMINAIRES OPERATING AT 240 VOLTS.

29. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.

30. GROUND ALL STEEL MAST ARM POLE ASSEMBLIES IN ACCORDANCE WITH THE REQUIREMENTS SHOWN ON THE LATEST TRAFFIC SIGNAL POLE FOUNDATION STANDARD. USE THE GROUNDING LUG ON THE POLE TO GROUND THE POLE TO THE GROUND CONDUCTORS FROM THE CONDUIT.

31. PLACE PAVEMENT MARKINGS AS SHOWN ON THE PLANS OR AS DIRECTED.

32. VERIFY THE CORRECT MAST ARM POLE LENGTHS FOR EACH SIGNALIZED INTERSECTION PRIOR TO ORDERING.

33. INSTALL A CLOSE NIPPLE WITH LOCK NUT AND BUSHING (SIZE AS REQUIRED) WHERE THE CABLE ENTERS THE UPPER PORTION OF THE SIGNAL POLE.

34. REFER TO TXDOT'S WEBSITE FOR PRE-QUALIFIED PRODUCTS LIST REGARDING RADARS, VEHICLE LED TRAFFIC SIGNAL LAMP UNITS, CONDUIT, GROUND BOXES, CONDUCTORS AND ELECTRICAL SERVICE. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.

STATE OF TEXAS
CHARLES R. STEVENS, JR
101286
PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — DATE: 4/27/2021

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 Houston, TX. 77095 PHONE: (713) 828-4742

Texas Department of Transportation®

BELTWAY 8 AT ANTOINE DRIVE

TRAFFIC SIGNAL PLAN LAYOUT NOTES

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		6
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

NOTES FOR PERMANENT TRAFFIC SIGNAL:

1. INSTALL SIGNALS HORIZONTALLY ON MAST ARM, 17FT.-6IN, ABOVE THE ROADWAY. ADD ADDITIONAL POLE FOUNDATION AS NEEDED TO ACHIEVE THIS CLEARANCE.

2. FURNISH BLACK HOUSING FOR VEHICLE SIGNALS. FURNISH BLACK VEHICLE SIGNAL HEAD BACK PLATES WITH RETROREFLECTIVE YELLOW BORDERS.

3. FURNISH VEHICLE SIGNAL HEADS WITH LIGHT EMITTING DIODE (LED) SIGNAL LAMP UNITS.

4. USE TYPE B HIGH INTENSITY PRISMATIC OR TYPE D DIAMOND GRADE RETROREFLECTIVE SHEETING FOR SIGNS MOUNTED UNDER OR ADJACENT TO THE SIGNAL HEADS.

5. ROUTE CABLE FOR LUMINAIRES (#12/4C-TRAY CABLE) TO THE SERVICE ENCLOSURE. SEE ELECTRICAL DETAIL SHEETS. DO NOT PASS THE LUMINAIRE CONDUCTORS THROUGH THE SIGNAL CONTROLLER CABINET.

6. FURNISH AND INSTALL FULL-ACTUATED CONTROLLER WITH INTERNAL TIME BASE COORDINATION UNIT IN A BASE MOUNTED CABINET.

7. THE TRAFFIC SIGNAL CONSTRUCTION AND MAINTENANCE OFFICE WILL PROVIDE PHASING AND TIMING FOR THE PERMANENT TRAFFIC SIGNALS.

8. LOCATE CONTROLLER(S), MAST ARM POLES, DETECTORS, ETC., AS APPROVED.

9. THE VENDOR'S REPRESENTATIVES OF THE RADAR EQUIPMENT SUPPLIED FOR THIS PROJECT MUST SUPERVISE THE INSTALLATION AND SETUP AND TESTING OF THIS EQUIPMENT AND BE FACTORY CERTIFIED. THE REPRESENTATIVE MUST BE ON SITE DURING THIS TIME. ANY EQUIPMENT REQUIRED FOR SET UP AND OPERATION OF THE RADAR DEVICES MUST BE PROVIDED TO TXDOT UPON COMPLETION. THE VENDOR'S REPRESENTATIVE MUST PROVIDE TRAINING TO THE MUNICIPALITIES WHO WILL BE RESPONSIBLE FOR THE MAINTENANCE OF THE RADAR EQUIPMENT AFTER ACCEPTANCE OF THE PROJECT.

10. THE RADAR PRESENCE DETECTOR AND RADAR ADVANCE DETECTION DEVICES MUST BE COMPATIBLE WITH EACH OTHER AND FROM THE SAME MANUFACTURER.

11. RADAR PRESENCE DETECTION DEVICE MUST UTILIZE TRUE-PRESENCE DETECTION. SYSTEM USING LOCKING ALGORITHMS TO ATTEMPT PRESENCE DETECTION WILL NOT BE ACCEPTED.

12. RADAR ADVANCE DETECTION DEVICE MUST CONTINUOUSLY TRACK VEHICLE SPEED, DISTANCE, AND ESTIMATED TIME OF ARRIVAL.

13. ONCE THE CONTRACT HAS BEEN EXECUTED OR DURING THE KICK-OFF MEETING, THE ENGINEER OR HIS/HER REPRESENTATIVE WILL COORDINATE OR ARRANGE FOR THE RADAR EQUIPMENT TO BE PROVIDED BY THE DEPARTMENT.

14. THE ENGINEER OR HIS/HER REPRESENTATIVE WILL COORDINATE THE ORDERING OF THE RADAR EQUIPMENT BY USING THE FORCE ACCOUNT. ENGINEER OR HIS/HER REPRESENTATIVE WILL CONTACT ARNOLD TREVINO AT 713-866-7101 TO ORDER THE RADAR EQUIPMENT.

15. COMMUNICATION AND POWER TO THE RADAR DEVICES SHALL BE VIA CONTINUOUS CABLE RUN OF UP TO 1000 FEET WITH THE USE OF REPEATERS.

16. FINAL PLACEMENT OF RADAR DEVICES TO BE APPROVED BY TxDOT ENGINEER.

17. DO NOT PLACE SIGNAL HEADS OVER THE ROADWAY UNTIL ALL NECESSARY MATERIALS ARE ON HAND AS APPROVED.

18. INSTALL TWO SET SCREWS ON ALL VEHICLE SIGNAL HEAD MOUNTING HARDWARE FITTINGS.

19. REPAIR OR REPLACE PAVEMENT AND SIDEWALKS DAMAGED BY THE CONTRACTOR'S FORCES DURING CONSTRUCTION AT NO COST TO THE DEPARTMENT.

20. REMOVE THE EXISTING TRAFFIC SIGNALS, SIGNS AND THOSE ITEMS DEEMED SALVAGEABLE BY THE ENGINEER (TXDOT) AT SH 35 & CR 192 AND STOCKPILE THOSE ITEMS ON THE RIGHT OF WAY. REMOVE AND DISPOSE OF OTHER ITEMS AT NO EXPENSE TO THE DEPARTMENT.

21. SEAL ENDS OF ALL CONDUITS WITH DUCT SEAL, EXPANDABLE FOAM, OR BY OTHER METHODS APPROVED BY THE ENGINEER (TxDOT). 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.

22. CAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.

23. INSTALL A 5/8-IN. (MINIMUM) EYE BOLT FOR THE POINT OF ATTACHMENT BELOW THE SERVICE ENTRANCE WEATHERHEAD FOR THE SERVICE DROP TO STEEL OR WOOD POLE.

24. AIM LUMINAIRE ARMS MOUNTED ON TRAFFIC SIGNAL POLES PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY IT IS INTENDED TO COVER, TO DEVELOP THE PROPER ILLUMINATION PATTERN FOR THE INTERSECTION.

25. PROVIDE 250 WATT HPS EQUIVALENT LIGHT EMITTING DIODE(LED) LUMINAIRES OPERATING AT 240 VOLTS.

26. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.

27. GROUND ALL STEEL MAST ARM POLE ASSEMBLIES IN ACCORDANCE WITH THE REQUIREMENTS SHOWN ON THE LATEST TRAFFIC SIGNAL POLE FOUNDATION STANDARD. USE THE GROUNDING LUG ON THE POLE TO GROUND THE POLE TO THE GROUND CONDUCTORS FROM THE CONDUIT.

28. PLACE PAVEMENT MARKINGS AS SHOWN ON THE PLANS OR AS DIRECTED.

29. VERIFY THE CORRECT MAST ARM POLE LENGTHS FOR EACH SIGNALIZED INTERSECTION PRIOR TO ORDERING.

30. INSTALL A CLOSE NIPPLE WITH LOCK NUT AND BUSHING (SIZE AS REQUIRED) WHERE THE CABLE ENTERS THE UPPER PORTION OF THE SIGNAL POLE.

31. REFER TO TXDOT'S WEBSITE FOR PRE-QUALIFIED PRODUCTS LIST REGARDING RADARS, VEHICLE LED TRAFFIC SIGNAL LAMP UNITS, CONDUIT, GROUND BOXES, CONDUCTORS AND ELECTRICAL SERVICE. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.

32. CONTRACTOR TO ADJUST SIGNAL HEAD ALIGNMENT, AS NEEDED, USING ARTICULATING SIGNAL BRACKET ASSEMBLIES WITH A MINIMUM OF THREE ADJUSTABLE AXES, SHICHE SHALL BE SUBSIDIARY TO THE PROJECT.

STATE OF TEXAS
CHARLES R. STEVENS, JR
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 Houston, TX. 77095
PHONE: (713) 828-4742

SH 35 AT CR 192

TRAFFIC SIGNAL PLAN LAYOUT NOTES

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		6A
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

1. ALL EQUIPMENT UTILIZED FOR THE TRAFFIC SIGNAL INSTALLATION MUST CONFORM TO, AND BE INSTALLED IN ACCORDANCE WITH, TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT) STANDARDS AND SPECIFICATIONS.

2. DETERMINE THE EXACT LOCATIONS FOR ALL UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. REPAIR ANY EXISTING UTILITIES DAMAGED DURING CONSTRUCTION BY THE CONTRACTOR AT NO EXPENSE TO TXDOT.

3. LOCATION OF UTILITIES SHOWN IS APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC OR PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD. ANY EXISTING UTILITES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED BY THE CONTRACTOR AT HIS/HER OWN EXPENSE.

4. VERIFY THE CORRECT MAST ARM POLE LENGTHS FOR THIS SIGNALIZED INTERSECTION PRIOR TO ORDERING THE EQUIPMENT.

5. ALL TRAFFIC SIGNAL POLE FOUNDATION LOCATIONS SHALL BE APPROVED BY THE ENGINEER OR REPRESENTATIVE IN THE FIELD PRIOR TO DRILLING.

6. EXACT LOCATION OF POLES, CABINET, SIGNAL HEADS AND PULL BOXES SHALL BE DETERMINED IN THE FIELD. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXACT LOCATIONS WITH TXDOT, PRIOR TO ANY CONSTRUCTION.

7. POWDER COAT STEEL MAST ARM POLE ASSEMBLIES BLACK IN ACCORDANCE WITH REQUIREMENTS SHOWN ON THE LATEST TRAFFIC SIGNAL POLE FOUNDATION STANDARD. SCRAPE OR SAND THE BASE PLATE, LEVELING NUT, WASHERS AND ANCHOR BOLTS DOWN TO THE GALVANIZING COATING SO THAT PROPER CONTACT IS MADE FOR GROUNDING. USE THE GROUNDING LUG ON THE POLE TO GROUND THE POLE TO THE GROUND CONDUCTORS FROM THE CONDUITS.

8. ALL CONDUIT UNDER NATURAL GROUND SHALL BE TRENCHED AND BURIED. CONTRACTOR SHALL BACK-FILL, COMPACT, AND RESTORE TRENCHED AREA TO ORIGINAL CONDITION AND MATCH EXISTING SURFACE CONDITION TO THE DENSITY OF ADJACENT GROUND.

9. ALL CONDUITS SHALL BE INSTALLED WITH A MINIMUM OF 30" GROUND COVER.

10. PROVIDE CONTINUOUS CONDUCTORS WITHOUT SPLICES FROM SIGNAL CONTROLLERS TO SIGNAL HEADS. PROVIDE CONTINUOUS CONDUCTORS WITHOUT SPLICES FROM LUMINARIES (IF REQUIRED) TO SERVICE ENCLOSURE. IF USING EXISTING SERVICE, PROVIDE NEW SERVICE ENCLOSURE (IF NECESSARY) WITH PHOTOELECTRIC CONTROL TO ACCOMMODATE THE LUMINAIRE CABLE.

11. INSTALL A 5/8 IN. (MINIMUM) EYE BOLT FOR THE POINT OF ATTACHEMENT BELOW THE SERVICE ENTRANCE WEATHERHEAD FOR THE SERVICE DROP (120/240 VOLT SERVICE) TO STEEL POLE.

12. ROUTE CABLE FOR LUMINAIRES (#12/4C TRAY CABLE) TO THE SERVICE ENCLOSURE. SEE ELECTRICAL DETAIL SHEETS. DO NOT PASS LUMINAIRE CONDUCTORS THROUGH THE SIGNAL CONTROLLER CABINET.

13. INSTALL SIGNS AND SIGNALS HORIZONTALLY ON MAST ARM 17 FT. 6 IN. MINIMUM ABOVE THE ROADWAY.

14. FURNISH BLACK HOUSING FOR PEDESTRIAN SIGNALS AND BLACK HOUSING FOR VEHICLE SIGNALS WITH 12 IN. LENS AND BLACK BACKPLATES.

15. FURNISH VEHICLE SIGNALS WITH LIGHT EMITTING DIODE (LED) SIGNAL LAMP UNITS.

16. USE TYPE C HIGH SPECIFIC INTENSITY GRADE SHEETING FOR SIGNS MOUNTED UNDER OR ADJACENT TO THE SIGNAL HEADS.

17. FURNISH AND INSTALL DUCT SEAL TO ENCLOSE THE ENDS OF EACH CONDUIT IMMEDIATELY AFTER INSTALLATION OF ALL SIGNAL AND ELECTRICAL CONDUCTORS.

18. THE CONTRACTOR SHALL INSTALL A CLOSED NIPPLE WITH LOCK NUT AND BUSHING (SIZE AS REQUIRED) TO PREVENT ABRASION TO SIGNAL CABLE WHERE THE CABLE ENTERS THE UPPER PORTION OF THE SIGNAL POLE.

19. INSTALL TWO SET SCREWS ON ALL VEHICLE SIGNAL HEAD MOUNTING HARDWARE FITTINGS.

20. DO NOT PLACE SIGNAL HEADS OVER THE ROADWAY UNTIL ALL NECESSARY MATERIALS ARE ON HAND AS APPROVED.

21. LUMINAIRES MOUNTED ON TRAFFIC SIGNAL POLES SHALL BE IN COMPLIANCE WITH TXDOT STANDARDS.

22. PROVIDE LIGHT-EMITTING DIODE (LED) LUMINAIRES EQUIVALENT TO "250 WATT HIGH PRESSURE SODIUM" LUMINAIRES, OPERATING AT 240 VOLTS.

23. AIM LUMINAIRE ARMS MOUNTED ON TRAFFIC SIGNAL POLES PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY IT IS INTENDED TO COVER TO DEVELOP THE PROPER ILLUMINATION PATTERN FOR THE INTERSECTION.

24. CAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.

25. WRAP THE SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF THE INSTALLATION UNTIL PLACING INTO OPERATION. DO NOT USE BURLAP.

26. WHEN REMOVING EXISTING INTERSECTION STOP CONTROL SIGNS, TXDOT WILL DETERMINE WHICH ITEMS WILL BE SALVAGED. ITEMS DEEMED SALVAGEABLE WILL BE DELIVERED TO TXDOT. CAREFULLY REMOVE THE MATERIALS SO THAT THEY WILL NOT BE MARRED OR DAMAGED. REPLACE MATERIALS THAT ARE SCARRED, BATTERED, OR BROKEN BY THE CONTRACTOR AT NO EXPENSE TO THE DEPARTMENT. DISPOSE OF OTHER ITEMS REMOVED BY THE CONTRACTOR AT NO EXPENSE TO TXDOT.

27. PHASING SEQUENCE AND SIGNAL TIMING WILL BE DETERMINED BY TXDOT AND IS SUBJECT TO THE APPROVAL OF THE ENGINEER.

28. THE CONTRACTOR SHALL FOLLOW MANUFACTURER SPECIFICATIONS FOR THE RADAR SYSTEM INSTALLATION.

29. WORK IN THE CONTROLLER CABINET SHALL INCLUDE INSTALLING THE EQUIPMENT AND PERFORMING THE WORK NECESSARY TO CONNECT AND OPERATE THE RADAR SYSTEM AT THE INTERSECTIONS.

30. COMMUNICATION AND POWER TO THE RADAR DEVICES SHALL BE VIA CONTINUOUS CABLE RUN OF UP TO 1000 FEET WITH THE USE OF REPEATERS.

31. FINAL PLACEMENT OF RADAR DEVICES TO BE APPROVED BY ENGINEER.

32. INSTALL FULL-ACTUATED, ETHERNET-CABLE CONTROLLER WITH INTERNAL TIME BASED COORDINATION UNIT AND COMMUNICATION IN A BASE MOUNTED CABINET.

33. ELECTRICAL POWER TO OPERATE THE TRAFFIC SIGNAL INSTALLATION WILL BE PLACED IN TXDOT'S NAME. THIS INCLUDES ALL POWER TO OPERATE THE SIGNAL DURING THE VARIOUS PHASES OF CONSTRUCTION AND DURING THE TEST PERIOD PRIOR TO ACCEPTANCE OF THE WORK BY TXDOT INSPECTOR.

34. ONCE THE CONTRACT HAS BEEN EXECUTED OR DURING THE KICK-OFF MEETING, THE ENGINEER OR HIS/HER REPRESENTATIVE WILL COORDINATE OR ARRANGE FOR THE RADAR EQUIPMENT TO BE PROVIDED BY THE DEPARTMENT.

35. THE ENGINEER OR HIS/HER REPRESENTATIVE WILL COORDINATE THE ORDERING OF THE RADAR EQUIPMENT BY USING THE FORCE ACCOUNT. ENGINEER OR HIS/HER REPRESENTATIVE WILL CONTACT ARNOLD TREVINO AT 713-866-7101 TO ORDER THE RADAR EQUIPMENT.

36. RESPOND IMMEDIATELY (24 HOURS A DAY) TO REPORTED TRAFFIC SIGNAL MALFUNCTIONS AT THE SIGNALIZED INTERSECTION AFTER ASSUMING RESPONSIBILITY FOR THE MAINTENANCE OF THE SIGNAL EQUIPMENT AS OUTLINED ABOVE.

37. PROVIDE A FULL TIME QUALIFIED TRAFFIC SIGNAL TECHNICIAN RESPONSIBLE FOR THE MAINTENANCE AND/OR REPLACEMENT OF ALL TRAFFIC SIGNAL DEVICES.

38. PROVIDE A UNIFORMED POLICE OFFICER FOR TRAFFIC CONTROL, AT NO EXPENSE TO TXDOT, DURING THE "SWITCH OVER" OF SIGNAL INSTALLATIONS AND DURING ANY PERIOD OF TIME THAT A SIGNAL INSTALLATION MAY BE OUT OF SERVICE. THE UNIFORMED POLICE OFFICER MUST HAVE JURISDICTION WITHIN THE PROJECT LIMITS.

39. REPLACE PAVEMENT, SIDEWALKS, OR CURBS DAMAGED BY THE CONTRACTOR DURING CONSTRUCTION AT NO COST TO TXDOT.

40. CONTRACTOR SHALL CLEAN THE JOBSITE OF ALL DEBRIS, LOOSEN EXCESS EXCAVATED MATERIALS, ETC. ACCUMULATED AS A RESULT OF WORK PERFORMED UNDER THIS CONTRACT.

41. ALL CONSTUCTION SIGNS AND BARRICADES SHALL CONFORM TO THE TMUTCD. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PLACE "SIGNAL WORK AHEAD" (SCW21-4D) AND "END SIGNAL WORK" (SG20-2A) SIGNS PRIOR TO ANY SIGNAL CONSTRUCTION.

42. PLACE PAVEMENT MARKINGS AS SHOWN ON THE PLANS OR AS DIRECTED.

43. PROVIDE A BLACK TUBE LOOP DETECTOR WIRE IN THE "INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION, INC." (IMSA) SPECIFICATION NO. 51-7,1997.

44. IF THE LOOP SEALANT SUPPLIED BY THE CONTRACTOR IS NOT ON THE DEPARTMENT'S PRE-QUALIFIED PRODUCT LIST, BEFORE APPLYING THE SEALANT PROVIDE A 5-GALLON CONTAINER OF LOOP SEALANT FOR TESTING.

STATE OF TEXAS
KETI B. HRISTOVA
90998
LICENSED
PROFESSIONAL ENGINEER

Keti Hristova

04/26/2021

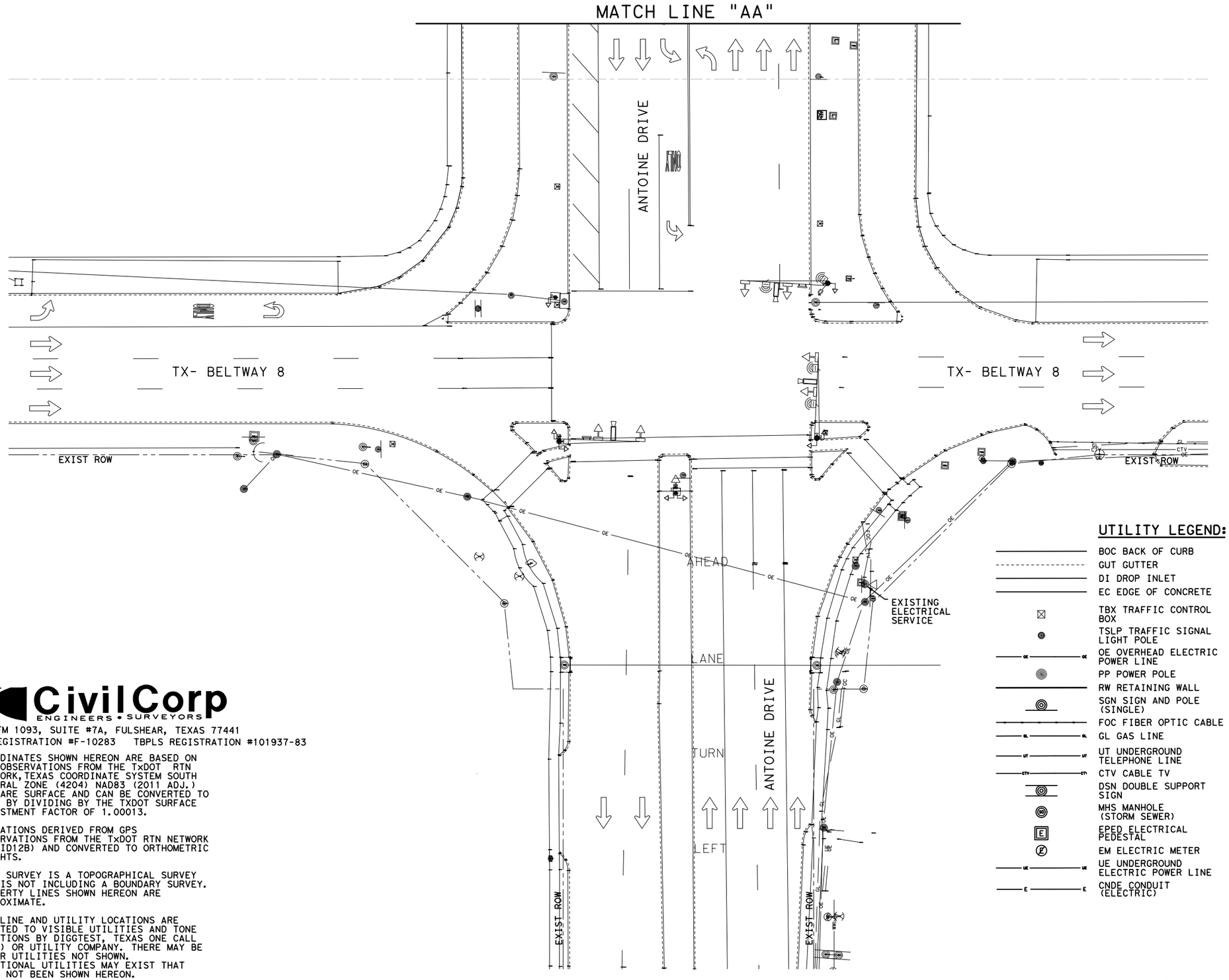
KBH TRAFFIC ENGINEERING
430 SH 6 S, SUITE 120, HOUSTON TEXAS 77079
TBPE Registration No. F-14592

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

Texas Department of Transportation

SH 35 AT CR 25
TRAFFIC SIGNAL NOTES

FED RD DIV NO	PROJECT NO		HIGHWAY NO
6			SH 35
STATE	DIST	COUNTY	
TEXAS	HOU	BRAZORIA	
CONT	SECT	JOB	SHEET NO
0912	00	641	6B



LEGEND:

- CONTROLLER CABINET
- SIGNAL HEAD HORIZONTAL
- SIGNAL GROUND BOX
- TRAFFIC SIGNAL POLE & MAST ARM
- VIVDS DETECTION CAMERA
- MAST ARM MOUNT SIGN
- LUMINAIRE
- PEDESTRIAN SIGNAL POLE
- PEDESTRIAN SIGNAL HEAD
- PEDESTRIAN PUSH BUTTON
- PRESENCE RADAR DETECTOR
- ADVANCE RADAR DETECTOR
- ELECTRICAL SERVICE
- DIRECTION OF FLOW

UTILITY LEGEND:

- BOC BACK OF CURB
- GUT GUTTER
- DI DROP INLET
- EC EDGE OF CONCRETE
- TBX TRAFFIC CONTROL BOX
- TSLP TRAFFIC SIGNAL LIGHT POLE
- OE OVERHEAD ELECTRIC POWER LINE
- PP POWER POLE
- RW RETAINING WALL
- SGN SIGN AND POLE (SINGLE)
- FOC FIBER OPTIC CABLE
- GL GAS LINE
- UT UNDERGROUND TELEPHONE LINE
- CTV CABLE TV
- DSN DOUBLE SUPPORT SIGN
- MHS MANHOLE (STORM SEWER)
- EPED ELECTRICAL PEDESTAL
- EM ELECTRIC METER
- UE UNDERGROUND ELECTRIC POWER LINE
- CNDE CONDUIT (ELECTRIC)

CivilCorp
ENGINEERS • SURVEYORS
29255 FM 1093, SUITE #7A, FULSHEAR, TEXAS 77441
TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #101937-83

1. COORDINATES SHOWN HEREON ARE BASED ON GPS OBSERVATIONS FROM THE TxDOT RTN NETWORK, TEXAS COORDINATE SYSTEM SOUTH CENTRAL ZONE (4204) NAD83 (2011 ADJ.) AND ARE SURFACE AND CAN BE CONVERTED TO GRID BY DIVIDING BY THE TXDOT SURFACE ADJUSTMENT FACTOR OF 1.00013.
2. ELEVATIONS DERIVED FROM GPS OBSERVATIONS FROM THE TxDOT RTN NETWORK (GEOID12B) AND CONVERTED TO ORTHOMETRIC HEIGHTS.
3. THIS SURVEY IS A TOPOGRAPHICAL SURVEY AND IS NOT INCLUDING A BOUNDARY SURVEY. PROPERTY LINES SHOWN HEREON ARE APPROXIMATE.
4. PIPELINE AND UTILITY LOCATIONS ARE LIMITED TO VISIBLE UTILITIES AND TONE LOCATIONS BY DIGGTEST, TEXAS ONE CALL (811) OR UTILITY COMPANY. THERE MAY BE OTHER UTILITIES NOT SHOWN. ADDITIONAL UTILITIES MAY EXIST THAT HAVE NOT BEEN SHOWN HEREON.

-TEXAS 811 LOCATE TICKET NUMBERS 2069688123, 2069688135, & 2069688138

PAVEMENT TYPE:
TX- BELTWAY 8= CONCRETE
ANTOINE DR = CONCRETE

POSTED SPEED LIMITS:
TX- BELTWAY 8 = 50 MPH
ANTOINE DR = 35 MPH

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
PROFESSIONAL ENGINEER
LICENSED

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 Houston, TX. 77095 PHONE: (713) 828-4742

Texas Department of Transportation®

BELTWAY 8 AT ANTOINE DRIVE
TRAFFIC SIGNAL EXISTING LAYOUT

SHEET 1 OF 2

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		7
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

Z:\1800111 TxDOT 3320 Prime WA1\6.0 Design\Combined Files\sheets\Antoine\007 - EXISTING CONDITIONS LAYOUT (1 OF 2).dgn FM

CivilCorp
ENGINEERS • SURVEYORS
29255 FM 1093, SUITE #7A, FULSHEAR, TEXAS 77441
TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #101937-83

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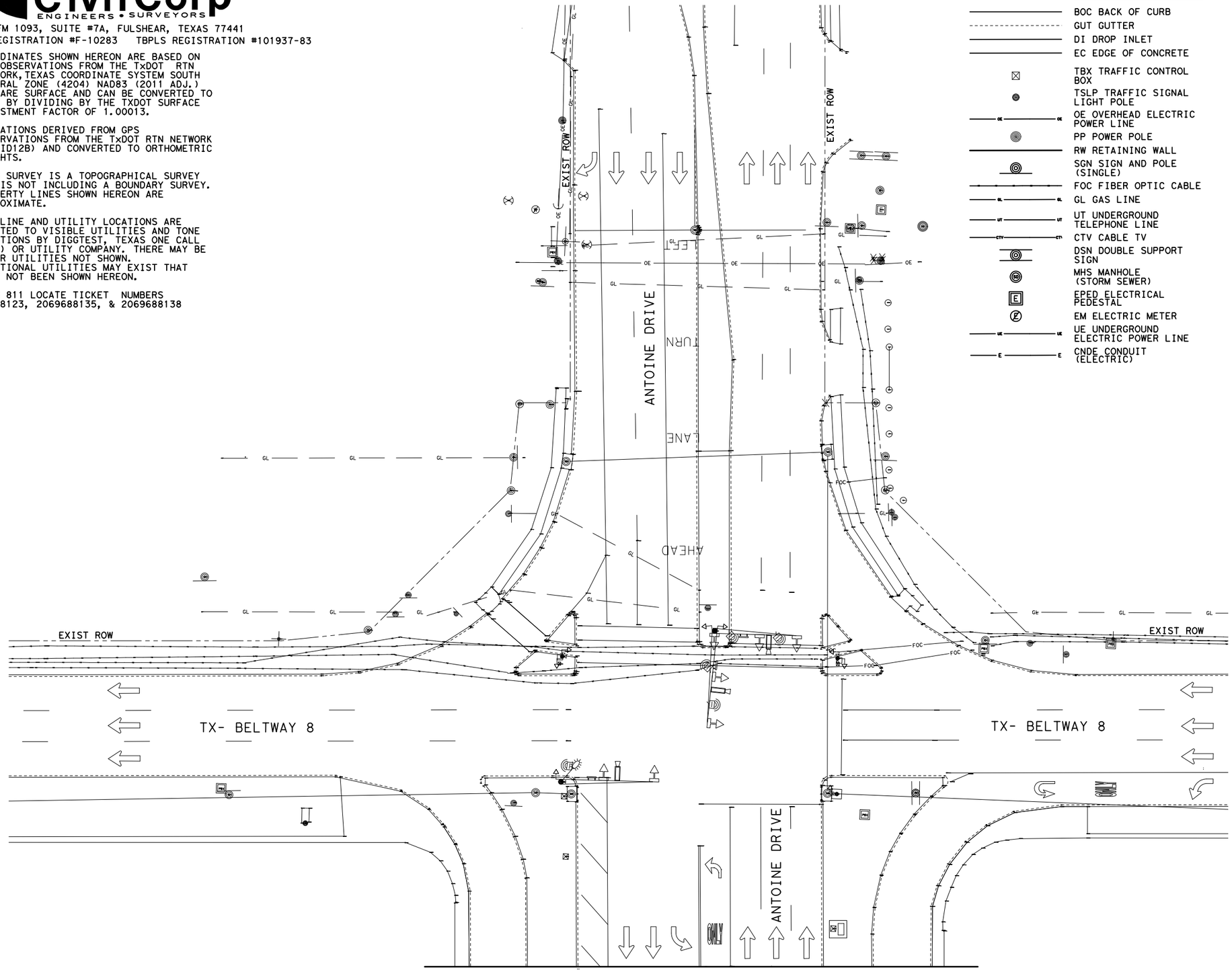

UTILITY LEGEND:

- BOC BACK OF CURB
- GUT GUTTER
- DI DROP INLET
- EC EDGE OF CONCRETE
- TBX TRAFFIC CONTROL BOX
- TSLP TRAFFIC SIGNAL LIGHT POLE
- OE OVERHEAD ELECTRIC POWER LINE
- PP POWER POLE
- RW RETAINING WALL
- SGN SIGN AND POLE (SINGLE)
- FOC FIBER OPTIC CABLE
- GL GAS LINE
- UT UNDERGROUND TELEPHONE LINE
- CTV CABLE TV
- DSN DOUBLE SUPPORT SIGN
- MHS MANHOLE (STORM SEWER)
- EPED ELECTRICAL PEDESTAL
- EM ELECTRIC METER
- UE UNDERGROUND ELECTRIC POWER LINE
- CNDE CONDUIT (ELECTRIC)

N

SCALE: 1" = 40'
0 20 40

LEGEND:

- CONTROLLER CABINET
- SIGNAL HEAD HORIZONTAL
- SIGNAL GROUND BOX
- TRAFFIC SIGNAL POLE & MAST ARM
- VIVDS DETECTION CAMERA
- MAST ARM MOUNT SIGN
- LUMINAIRE
- PEDESTRIAN SIGNAL POLE
- PEDESTRIAN SIGNAL HEAD
- PEDESTRIAN PUSH BUTTON
- PRESENCE RADAR DETECTOR
- ADVANCE RADAR DETECTOR
- ELECTRICAL SERVICE
- DIRECTION OF FLOW

PAVEMENT TYPE:
TX- BELTWAY 8 = CONCRETE
ANTOINE DR = CONCRETE

POSTED SPEED LIMITS:
TX- BELTWAY 8 = 50 MPH
ANTOINE DR = 35 MPH

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Houston, TX. 77095

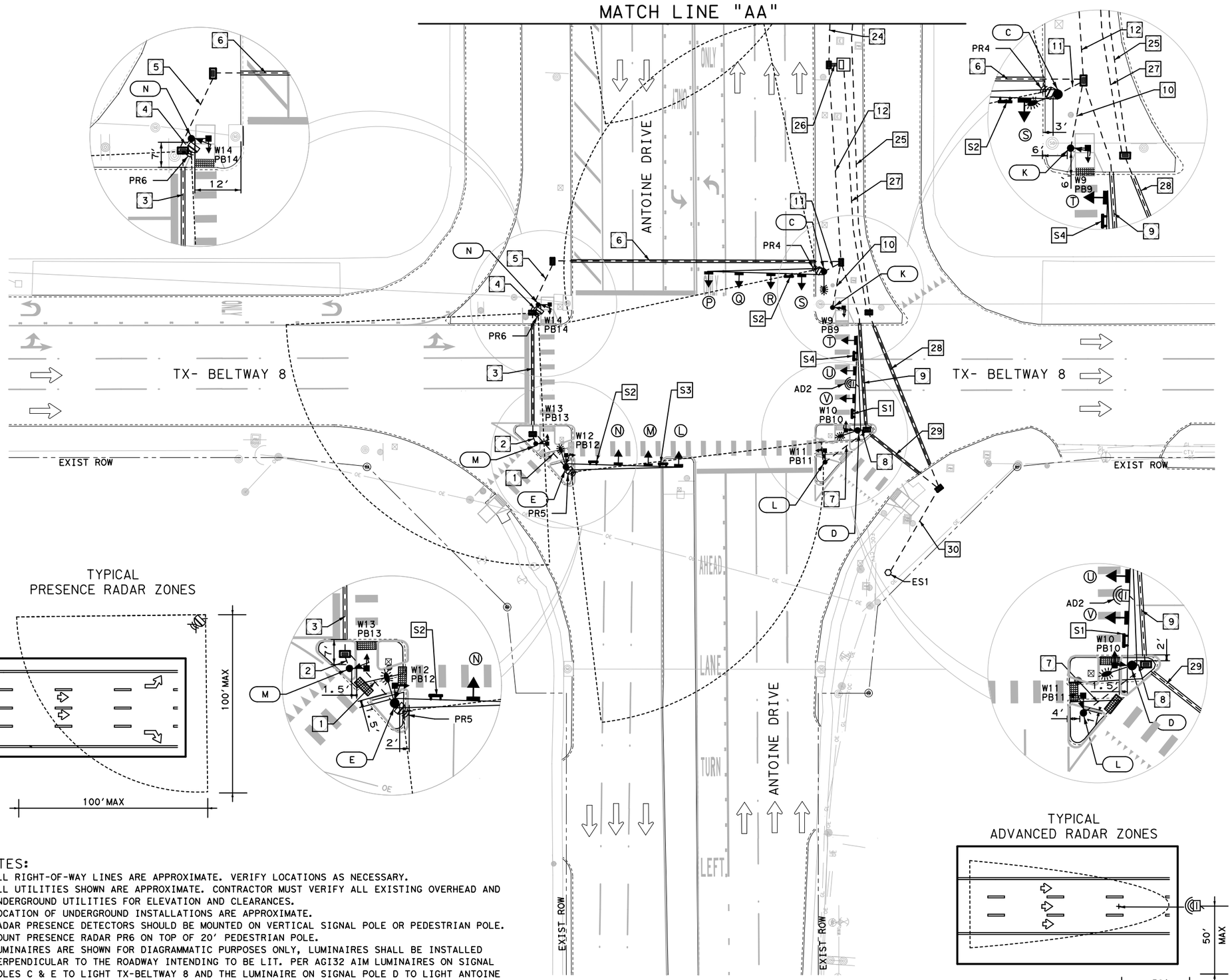
Texas Department of Transportation®

BELTWAY 8 AT ANTOINE DRIVE
TRAFFIC SIGNAL EXISTING LAYOUT

SHEET 2 OF 2

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		8
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

Z:\1800111 TxDOT 3320 Prime WA1\6.0 Design\Combined Files\sheets\Antoine\008 - EXISTING CONDITIONS LAYOUT (2 OF 2).dgn



PAVEMENT TYPE:
TX- BELTWAY 8 = CONCRETE
ANTOINE DR = CONCRETE

POSTED SPEED LIMITS:
TX- BELTWAY 8 = 50 MPH
ANTOINE DR = 35 MPH

N

SCALE: 1" = 40'
0 20 40

LEGEND:

- PROPOSED MAST ARM POLE
- PROPOSED LUMINAIRE
- PROPOSED TRAFFIC SIGNAL HEAD
- PROPOSED ROADWAY/STREET SIGN
- AD1 PROPOSED ADVANCE RADAR DETECTOR
- PR1 PROPOSED PRESENCE RADAR DETECTOR
- W PROPOSED PEDESTRIAN SIGNAL HEAD
- PB PROPOSED PEDESTRIAN PUSH BUTTON
- ES PROPOSED ELECTRICAL SERVICE POLE
- PROPOSED FULL-ACTUATED CONTROLLER W/CABINET, GPS MODULE AND BATTERY BACK-UP (BBU)
- PROPOSED GROUND BOX TY D
- PROPOSED CONDUIT (TRENCH)
- PROPOSED CONDUIT (BORE)
- DETECTABLE WARNING SURFACE FOR PEDESTRIAN ACCESS RAMP
- DIRECTION OF TRAFFIC FLOW

TYPICAL
PRESENCE RADAR ZONES

TYPICAL
ADVANCED RADAR ZONES

NOTES:
1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. LOCATION OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE.
4. RADAR PRESENCE DETECTORS SHOULD BE MOUNTED ON VERTICAL SIGNAL POLE OR PEDESTRIAN POLE. MOUNT PRESENCE RADAR PR6 ON TOP OF 20' PEDESTRIAN POLE.
5. LUMINAIRES ARE SHOWN FOR DIAGRAMMATIC PURPOSES ONLY, LUMINAIRES SHALL BE INSTALLED PERPENDICULAR TO THE ROADWAY INTENDING TO BE LIT. PER AGI32 AIM LUMINAIRES ON SIGNAL POLES C & E TO LIGHT TX-BELTWAY 8 AND THE LUMINAIRE ON SIGNAL POLE D TO LIGHT ANTOINE DRIVE.
6. RUN #26 INCLUDES SPARE CONDUIT.

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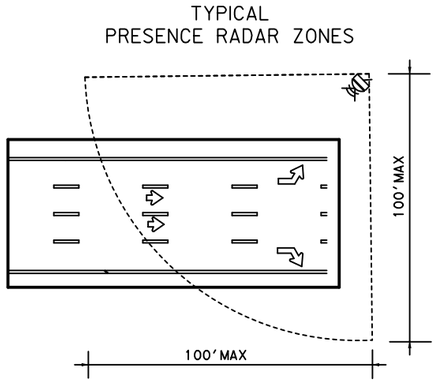
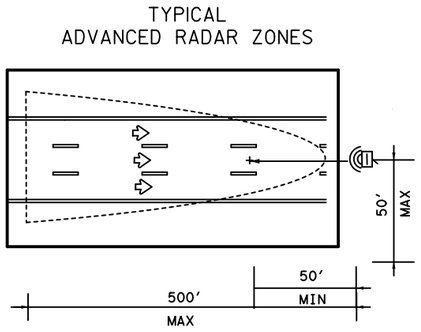
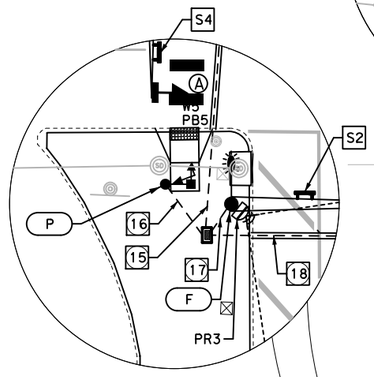
BELTWAY 8 AT ANTOINE DRIVE
TRAFFIC SIGNAL PROPOSED LAYOUT

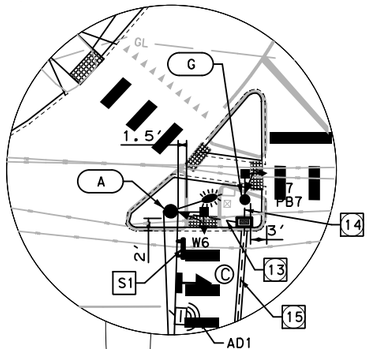
SHEET 1 OF 3

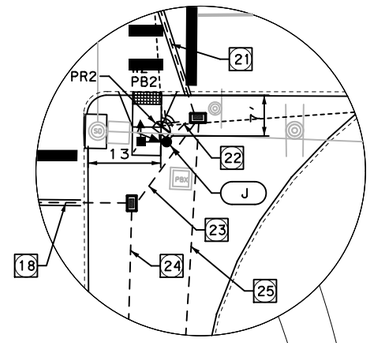
FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		9
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

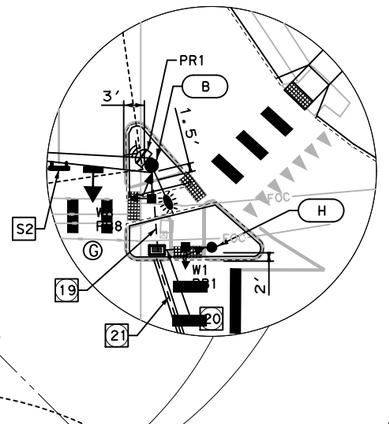


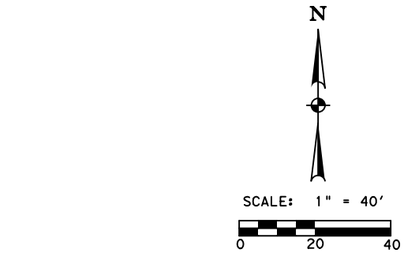






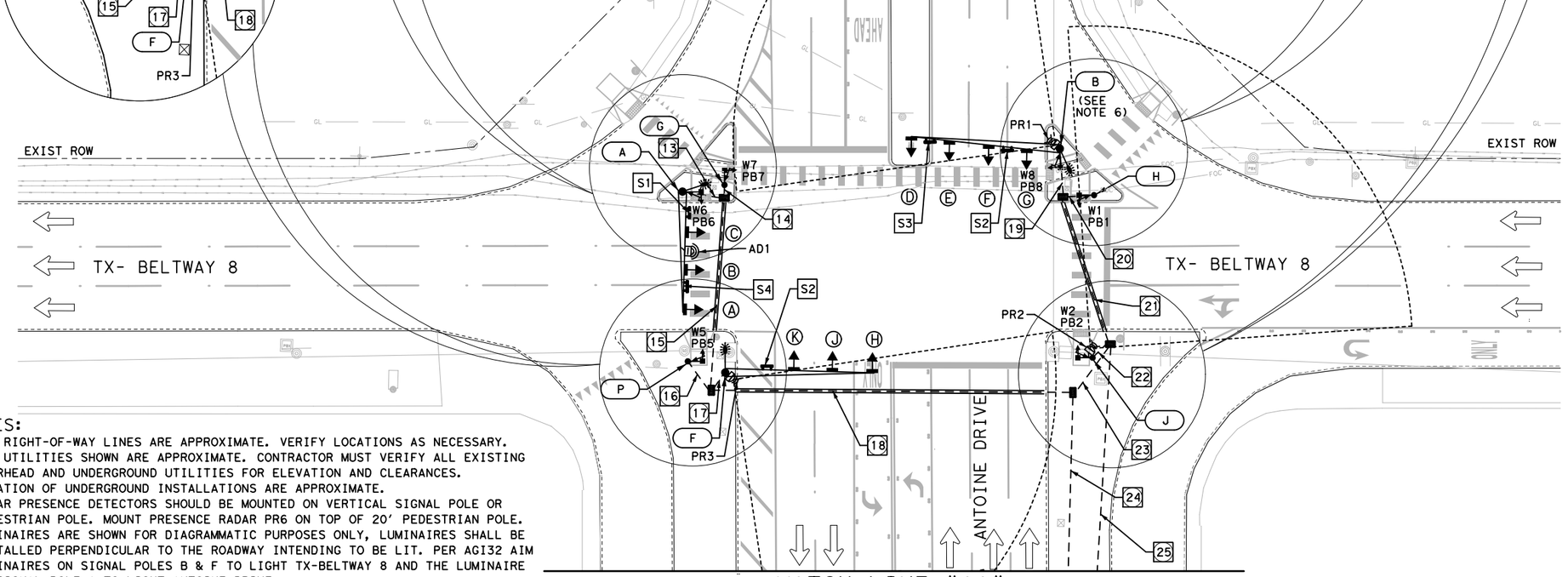






LEGEND:

- PROPOSED MAST ARM POLE
- PROPOSED LUMINAIRE
- PROPOSED TRAFFIC SIGNAL HEAD
- PROPOSED ROADWAY/STREET SIGN
- AD1 — PROPOSED ADVANCE RADAR DETECTOR
- PR1 — PROPOSED PRESENCE RADAR DETECTOR
- W — PROPOSED PEDESTRIAN SIGNAL HEAD
- PB — PROPOSED PEDESTRIAN PUSH BUTTON
- ES — PROPOSED ELECTRICAL SERVICE POLE
- PROPOSED CONTROLLER W/CABINET, GPS MODULE AND BATTERY BACK-UP (BBU)
- PROPOSED GROUND BOX TY D
- PROPOSED CONDUIT (TRENCH)
- PROPOSED CONDUIT (BORE)
- DETECTABLE WARNING SURFACE FOR PEDESTRIAN ACCESS RAMP
- DIRECTION OF TRAFFIC FLOW



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6. CONTRACTOR TO ADJUST/ROTATE SIGNAL POLE B SO THAT PROPOSED MAST ARM FALLS BEHIND EXISTING MAST ARM DURING CONSTRUCTION. ORIENT SIGNAL HEADS PERPENDICULAR TO TRAVEL LANES.

PAVEMENT TYPE:
TX- BELTWAY 8= CONCRETE
ANTOINE DR = CONCRETE

POSTED SPEED LIMITS:
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ANTOINE DR = 35 MPH

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Houston, TX. 77095

BELTWAY 8 AT ANTOINE DRIVE
TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 2 OF 3

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		10
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

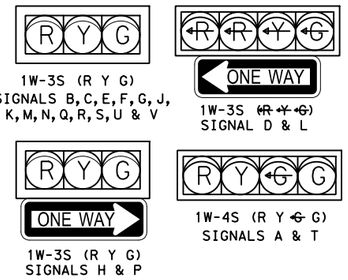
PROPOSED RADAR DETECTIONS SCHEDULE:

RADAR CHART	
PR1	SOUTHBOUND ANTOINE DR PRESENCE DETECTION
PR2	WESTBOUND BELTWAY 8 PRESENCE DETECTION
PR3	NORTHBOUND ANTOINE DR (LT)TURN PRESENCE DETECTION
PR4	SOUTHBOUND ANTOINE DR (LT)TURN PRESENCE DETECTION
PR5	NORTHBOUND ANTOINE DR PRESENCE DETECTION
PR6	EASTBOUND BELTWAY 8 PRESENCE DETECTION
AD1	WESTBOUND BELTWAY 8 ADVANCE DETECTION
AD2	EASTBOUND BELTWAY 8 ADVANCE DETECTION

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE NAME	CALL OUT	ELECTRICAL SERVICE DESCRIPTION(SEE ED(5)(6)(7)&(8)-14	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS ***	PANEL BD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CIRCUIT AMPS	BRANCH CKT. BRK. POLE/ AMPS	KVA LOAD
ANTOINE DRIVE AT BELTWAY 8	ES1	TY D (120/240)060 (NS)SS(E)SP(O)	1-1/2"	3/#6	N/A	2P/60	30	70	SIGNAL	40	1P/50	5.2
									LUMINAIRE	3	2P/20	

PROPOSED TRAFFIC SIGNAL HEAD SCHEDULE:



PROPOSED PEDESTRIAN SIGNAL HEAD (COUNTDOWN TYPE):

LED PEDESTRIAN COUNTDOWN SIGNAL
W1, W2, W5-W14

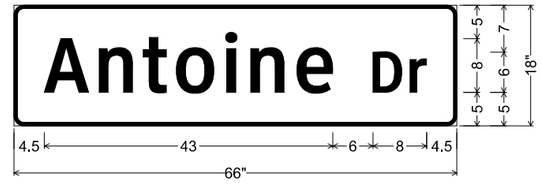
LEGEND:

- A — PROP. 36' MAST ARM POLE W/LUMINAIRE, ADVANCE RADAR DETECTOR AND PEDESTRIAN HEAD & PUSH BUTTON
- B — PROP. 44' MAST ARM POLE W/LUMINAIRE, PRESENCE RADAR DETECTOR AND PEDESTRIAN HEAD & PUSH BUTTON
- C — PROP. 44' MAST ARM POLE W/LUMINAIRE AND PRESENCE RADAR DETECTOR
- D — PROP. 36' MAST ARM POLE W/LUMINAIRE, ADVANCE RADAR DETECTOR AND PEDESTRIAN HEAD & PUSH BUTTON
- E — PROP. 44' MAST ARM POLE W/LUMINAIRE, PRESENCE RADAR DETECTOR AND PEDESTRIAN HEAD & PUSH BUTTON
- F — PROP. 44' MAST ARM POLE W/LUMINAIRE AND PRESENCE RADAR DETECTOR
- G — PROP. PEDESTRIAN POLE W/HEAD & PUSH BUTTON
- H — PROP. PEDESTRIAN POLE W/HEAD & PUSH BUTTON
- J — PROP. 20' PEDESTRIAN POLE W/HEAD & PUSH BUTTON AND PRESENCE RADAR DETECTOR
- K — PROP. PEDESTRIAN POLE W/HEAD & PUSH BUTTON
- L — PROP. PEDESTRIAN POLE W/HEAD & PUSH BUTTON
- M — PROP. PEDESTRIAN POLE W/HEAD & PUSH BUTTON
- N — PROP. 20' PEDESTRIAN POLE W/HEAD & PUSH BUTTON AND PRESENCE RADAR DETECTOR
- P — PROP. PEDESTRIAN POLE W/HEAD & PUSH BUTTON
- ES1 — PROP. SERVICE POLE TY D WITH METER AND (120/240 VOLT SERVICE), SERVICE ENCLOSURE AND SERVICE DISCONNECT

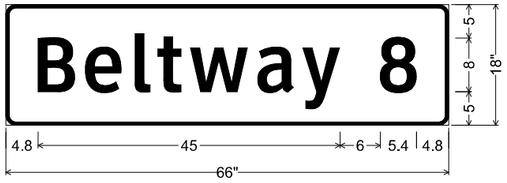
CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT(618) PVC 2" (SCHD 80) (6046) NO.	EA	TRENCH LF	3" (SCHD 80) (6053) NO.	EA	TRENCH LF	(6054) NO.	EA	BORE LF	CONDUCTORS(620) POWER #4 INSULATED (6012) NO.	EA	LENGTH LF	GROUND #4 BARE (6011) NO.	EA	LENGTH LF	#6 BARE (6009) NO.	EA	LENGTH LF	TRAY CABLE (621) LUMINAIRE #12/4C Tray Cable (6005) NO.	EA	LENGTH LF	SIGNAL #12/7C (6012) NO.	EA	LENGTH LF	#12/4C (6009) NO.	EA	LENGTH LF	#12/2C (6007) NO.	EA	LENGTH LF	RADAR(6292) PRES. RADAR #18/2C&#22/4C (6004) NO.	EA	LENGTH LF	RADAR(6292) ADV. RADAR #18/2C&#22/4C (6005) NO.	EA	LENGTH LF
1				1	20											1	20		1	20			2	20	1	20	1	20	1	20	1	20				
2	1	5														1	5								1	5	1	5								
3						1	50									1	50		1	50		2	50	2	50	2	50			1	50					
4	1	5														1	5								1	5	1	5			1	5				
5			1	20												1	20		1	20		2	20	3	20	3	20			2	20					
6						1	115									1	115		1	115		2	115	3	115	3	115			2	115					
7	1	20														1	20								1	20	1	20								
8			1	5												1	5		1	5		1	5	1	5	1	5							1	5	
9			1	25	1	45										1	70		2	70		1	70	2	70	2	70							1	70	
10	1	20														1	20								1	20	1	20								
11			1	10												1	10		1	10		1	10							1	10					
12			2	80												2	80					4	80	6	80	6	80	3	80			1	80			
13			1	15												1	15		1	15		1	15	1	15	1	15							1	15	
14	1	5														1	5								1	5	1	5								
15			1	15	1	45										1	60		1	60		1	60	2	60	2	60							1	60	
16	1	15														1	15								1	15	1	15								
17			1	10												1	10		1	10		1	10							1	10					
18					1	115										1	115		2	115		2	115	3	115	3	115			1	115			1	115	
19			1	15												1	15		1	15		2	15	1	15	1	15			1	15					
20	1	10														1	10								1	10	1	10								
21					1	50										1	50		1	50		2	50	2	50	2	50			1	50					
22	1	10														1	10								1	10	1	10			1	10				
23			1	20												1	20		2	20		2	20	3	20	3	20			1	20					
24			2	70												2	70					4	70	6	70	6	70	3	70			1	70			
25	1	190														1	190		3	190																
26			3	5												3	5					8	5	12	5	12	5	6	5	2	5					
27	1	100					2	100	1	100																										
28					2	75	2	75	1	75	1	75				3	75																			
29					1	40					1	40				3	40																			
30	1	40	1	40			2	40	1	40	1	40				6	40																			
POLE A																1	35		1	20		1	10	1	5					1	20				
POLE B																1	35		2	20		1	10	1	5	1	20								
POLE C																1	35		1	20						1	20								
POLE D																1	35		1	20		1	10	1	5					1	20				
POLE E																1	35		2	20		1	10	1	5	1	20								
POLE F																1	35		1	20						1	20								
POLE G																								1	10	1	5								
POLE H																								1	10	1	5								
POLE J																								1	10	1	5	1	20						
POLE K																								1	10	1	5								
POLE L																								1	10	1	5								
POLE M																								1	10	1	5								
POLE N																								1	10	1	5	1	20						
POLE O																								1	10	1	5								
MA																			1	35										1	20				
MB																			2	45															
MC																			1	45															
MD																			1	35										1	20				
ME																			2	45															
MF																			1	45															
TOTAL		420		510		610		430		215		1325		2145			2120			2495			2435		1175		505								

PROPOSED TRAFFIC SIGNAL SIGNS ON MAST ARMS:



66"x18"; S1
1.5" Radius, 0.5" Border, White on, Green;
"Antoine", ClearviewHwy-3-W specified length;
"Dr", ClearviewHwy-3-W specified length;



66"x18"; S2
1.5" Radius, 0.5" Border, White on, Green;
"Beltway", ClearviewHwy-3-W specified length;
"8", ClearviewHwy-3-W specified length;

S3 R10-10L (30"x36")

S4 R3-6L (30"x36")

PROPOSED PEDESTRIAN SIGNAL HEAD PUSH BUTTON WITH SIGN SCHEDULE:

R10-3eL (9"X15")

PB2, PB6-PB10, PB12 & PB14

R10-3eR (9"X15")

PB1, PB5, PB11 & PB13

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

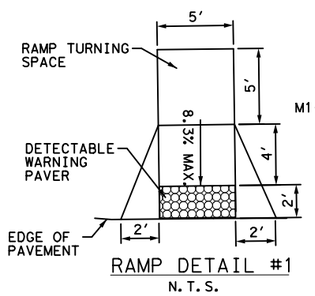
PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 PHONE: (713) 828-4742
Houston, TX. 77095

BELTWAY 8 AT ANTOINE DRIVE
TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 3 OF 3

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		11
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS



RAMP DETAIL #1
N.T.S.

INSTALL NEW SIGN PANELS ON EXISTING SIGN POST

M3-2*12x6;

M1-6B-2*24x24;

M6-1*12x9;

M3-2*12x9; (TOLL)

SAM HOUSTON TOLL

M6-1*12x10; (TOLL)

R3-6L (30"x36")

INSTALL NEW SIGN PANEL AND SIGN POST

INSTALL NEW SIGN PANELS ON EXISTING SIGN POST

R5-1

R3-8uT

MATCH LINE "AA"

INSTALL NEW SIGN PANELS ON EXISTING SIGN POST

M3-2*12x6;

M1-6B-2*24x24;

M6-1*12x9;

M3-2*12x9; (TOLL)

SAM HOUSTON TOLL

M6-1*12x10; (TOLL)

INSTALL NEW SIGN PANELS ON EXISTING SIGN POST

R1-2

PAVEMENT TYPE:
TX- BELTWAY 8 = CONCRETE
ANTOINE DR = CONCRETE

POSTED SPEED LIMITS:
TX- BELTWAY 8 = 50 MPH
ANTOINE DR = 35 MPH

N

SCALE: 1" = 40'

0 20 40

LEGEND:

- A MULTIPOLYMER PAV MRK(W)(6")(BRK)
- B MULTIPOLYMER PAV MRK(Y)(6")(SLD)
- C MULTIPOLYMER PAV MRK(W)(8")(SLD)
- D REF PAV MRK TY I(W)18"(YLD TRI)
- E REF PAV MRK TY I(W)36"(YLD TRI)
- F MULTIPOLYMER PAV MRK(W)(24")(SLD)
- G REFL PAV MRKR TY II-A-A
- H REFL PAV MRKR TY I-C
- J MULTIPOLYMER PAV MRK(W)(6")(SLD)
- K MULTIPOLYMER PAV MRK(W)(ARROW)
- L MULTIPOLYMER PAV MRK(W)(WORD)
- M MULTIPOLYMER PAV MRK(W)(DBL ARROW)
- N MULTIPOLYMER PAV MRK(BLK)(6")(BRK)
- P REFL PAV MRK TY I(Y)(MED NOSE)
- Q REFL PAV MRK TY I(W)6"(LNDP)
- R REFL PAV MRK TY I(W)(UTURN ARW)

⇦ DIRECTION OF TRAFFIC FLOW

MATCH LINE "CC"

TX- BELTWAY 8

EXIST ROW

INSTALL ONE TYPE 1 RAMP SEE RAMP DETAIL #1

INSTALL ONE TYPE 21 RAMP SEE RAMP DETAIL #6

INSTALL ONE TYPE 21 RAMP SEE RAMP DETAIL #5

INSTALL ONE TYPE 1 RAMP SEE RAMP DETAIL #2

REPLACE DAMAGED CURB (SEE NOTE 3)

ANTOINE DRIVE

XING

ONLY

@ 40'

TYP

MATCH LINE "DD"

TX- BELTWAY 8

EXIST ROW

INSTALL ONE TYPE 1 RAMP SEE RAMP DETAIL #3

AHEAD

LANE

TURN

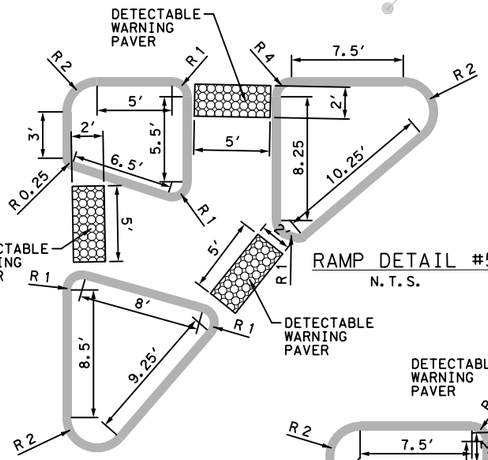
LEFT

ANTOINE DRIVE

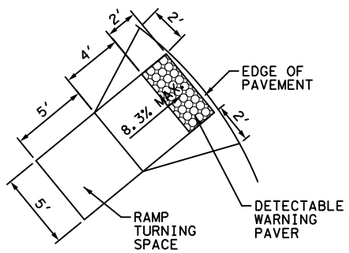
EXIST ROW

EXIST ROW

MATCH LINE "BB"



RAMP DETAIL #5
N.T.S.



RAMP DETAIL #3
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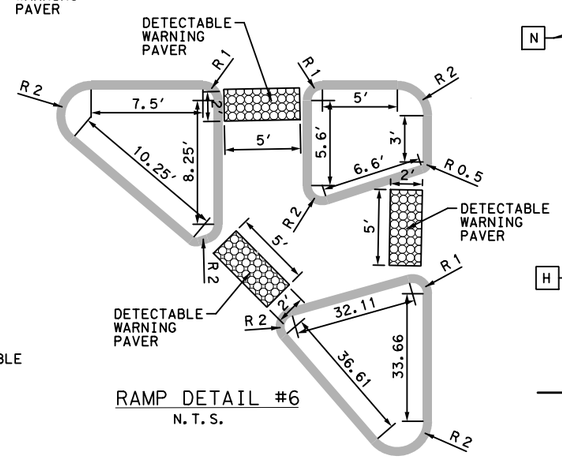

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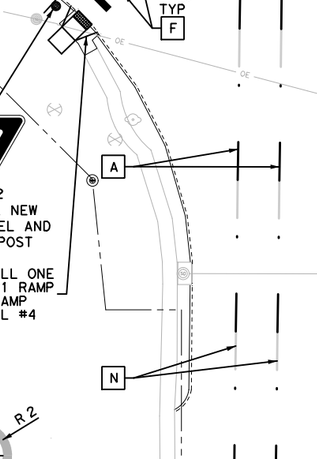
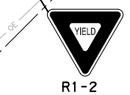


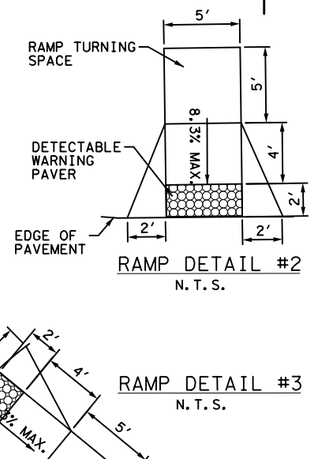
R5-1
INSTALL NEW SIGN PANEL ON EXISTING SIGN POST

R1-2
INSTALL NEW SIGN PANEL AND SIGN POST

INSTALL ONE TYPE 1 RAMP SEE RAMP DETAIL #4



R1-2
INSTALL NEW SIGN PANEL ON EXISTING SIGN POST



RAMP DETAIL #2
N.T.S.

NOTES:

1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. REPLACE DAMAGED CURB WITHIN TXDOT ROW AS INDICATED ON PLANS OR AS DIRECTED BY TXDOT.

STATE OF TEXAS
CHARLES R. STEVENS, JR
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

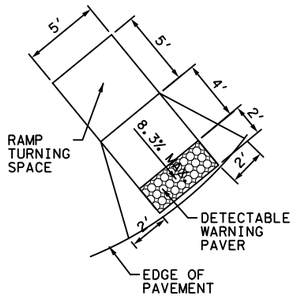
PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 Houston, TX. 77095 PHONE: (713) 828-4742

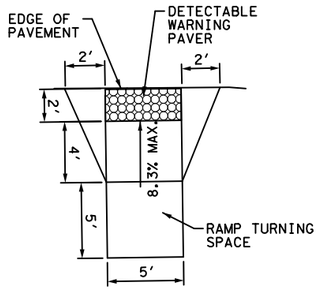
BELTWAY 8 AT ANTOINE DRIVE
TRAFFIC SIGNAL SIGNING & PAVEMENT MARKINGS

SHEET 1 OF 5

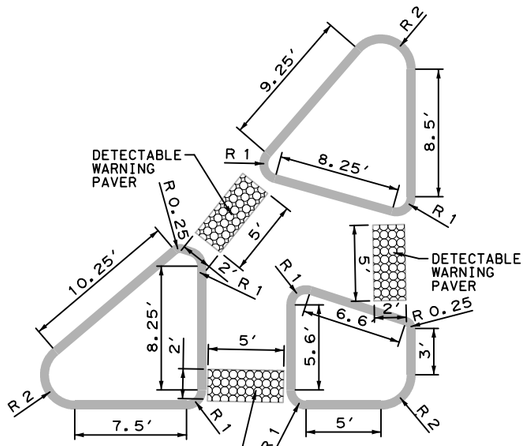
FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		12
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS



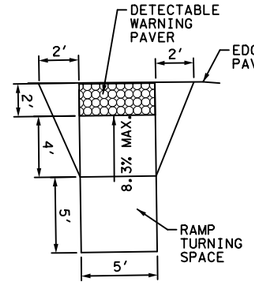
RAMP DETAIL #1
N.T.S.



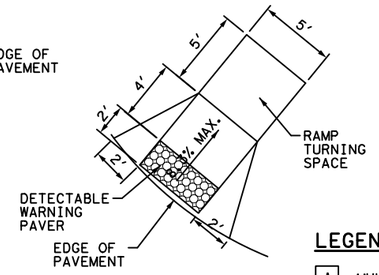
RAMP DETAIL #4
N.T.S.



RAMP DETAIL #5
N.T.S.



RAMP DETAIL #3
N.T.S.



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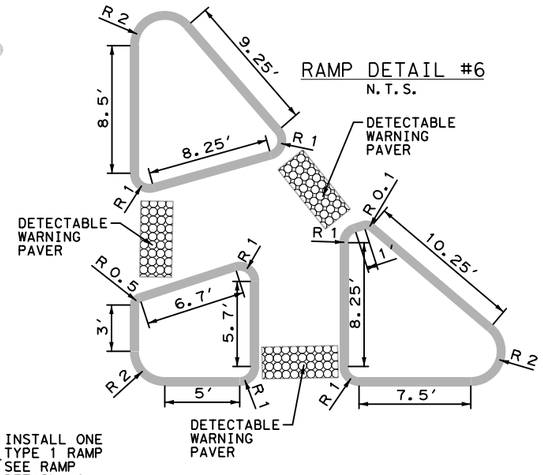
N.T.S.



RAMP DETAIL #6
N.T.S.

N

SCALE: 1" = 40'
0 20 40

LEGEND:

A	MULTIPOLYMER PAV MRK (W) (6") (BRK)
B	MULTIPOLYMER PAV MRK (Y) (6") (SLD)
C	MULTIPOLYMER PAV MRK (W) (8") (SLD)
D	REF PAV MRK TY I (W) 18" (YLD TRI)
E	REF PAV MRK TY I (W) 36" (YLD TRI)
F	MULTIPOLYMER PAV MRK (W) (24") (SLD)
G	REFL PAV MRKR TY II-A-A
H	REFL PAV MRKR TY I-C
J	MULTIPOLYMER PAV MRK (W) (6") (SLD)
K	MULTIPOLYMER PAV MRK (W) (ARROW)
L	MULTIPOLYMER PAV MRK (W) (WORD)
M	MULTIPOLYMER PAV MRK (W) (DBL ARROW)
N	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
P	REFL PAV MRK TY I (Y) (MED NOSE)
Q	REFL PAV MRK TY I (W) 6" (LNDP)
R	REFL PAV MRK TY I (W) (UTURN ARW)

⇦ DIRECTION OF TRAFFIC FLOW

INSTALL NEW SIGN PANEL ON EXISTING SIGN POST APPROX (1300' FROM INTERSECTION)
SPEED LIMIT 35
R2-1
M2-1 JCT
SAM HOUSTON TOLL
INSTALL NEW SIGN PANELS AND SIGN POST APPROX (950' FROM INTERSECTION)
EXIST ROW
ANTOINE DRIVE
LEFT TURN ONLY
AHEAD
INSTALL NEW SIGN PANEL AND SIGN POST
YIELD
R1-2
INSTALL ONE TYPE 1 RAMP SEE RAMP DETAIL #1
REPLACE DAMAGED CURB (SEE NOTE 3)
INSTALL ONE TYPE 21 RAMPS SEE RAMP DETAIL #5
INSTALL ONE TYPE 1 RAMPS SEE RAMP DETAIL #4
INSTALL ONE TYPE 21 RAMPS SEE RAMP DETAIL #6
INSTALL ONE TYPE 1 RAMPS SEE RAMP DETAIL #3
INSTALL ONE TYPE 1 RAMP SEE RAMP DETAIL #2
INSTALL NEW SIGN PANEL AND SIGN POST
INSTALL NEW SIGN PANEL ON EXISTING SIGN POST
DO NOT ENTER
R5-1
INSTALL NEW SIGN PANELS ON EXISTING SIGN POST
ONLY
R3-8uT
INSTALL NEW SIGN PANELS ON EXISTING SIGN POST
ONE WAY
R6-1L
REPAIR DAMAGED INLET (SEE NOTE 4)
R3-6L (30"x36")
INSTALL NEW SIGN PANEL AND SIGN POST
MATCH LINE "EE"
MATCH LINE "FF"
MATCH LINE "AA"
TX- BELTWAY 8
TYP
@ 40'

NOTES:

1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. REPLACE DAMAGED CURB WITHIN TXDOT ROW AS INDICATED ON PLANS OR AS DIRECTED BY TXDOT.
4. ADJUST INLET CAP ON DAMAGED INLET WITHIN TXDOT ROW AS INDICATED ON PLANS OR AS DIRECTED BY TXDOT.

PAVEMENT TYPE:
TX- BELTWAY 8 = CONCRETE
ANTOINE DR = CONCRETE

POSTED SPEED LIMITS:
TX- BELTWAY 8 = 50 MPH
ANTOINE DR = 35 MPH

STATE OF TEXAS
CHARLES R. STEVENS, JR
101286
PROFESSIONAL ENGINEER
LICENSED

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

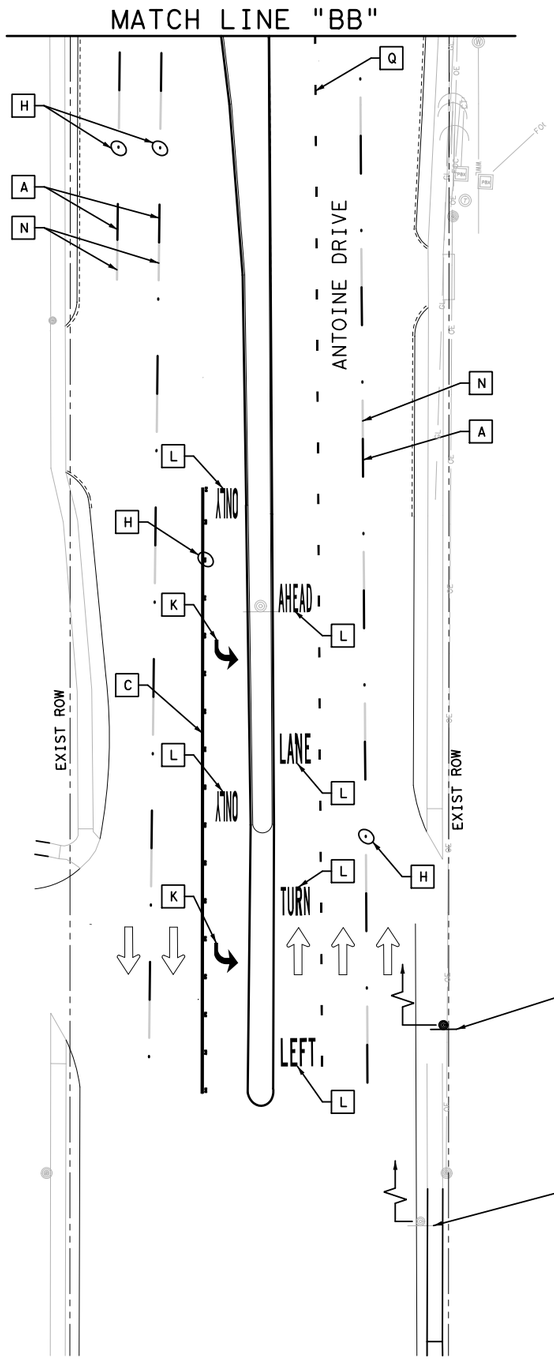
PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 Houston, TX. 77095 PHONE: (713) 828-4742

BELTWAY 8 AT ANTOINE DRIVE
TRAFFIC SIGNAL SIGNING & PAVEMENT MARKINGS

SHEET 2 OF 5

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		13
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS



INSTALL NEW SIGN PANELS AND SIGN POST (APPROX 950' FROM INTERSECTION)

INSTALL NEW SIGN PANEL ON EXISTING SIGN POST (APPROX 1300' FROM INTERSECTION)

R2-1

PAVEMENT TYPE:
TX- BELTWAY 8 = CONCRETE
ANTOINE DR = CONCRETE

POSTED SPEED LIMITS:
TX- BELTWAY 8 = 50 MPH
ANTOINE DR = 35 MPH

N

SCALE: 1" = 40'

0 20 40

LEGEND:

- A MULTIPOLYMER PAV MRK(W)(6")(BRK)
- B MULTIPOLYMER PAV MRK(Y)(6")(SLD)
- C MULTIPOLYMER PAV MRK(W)(8")(SLD)
- D REF PAV MRK TY I(W)18"(YLD TRI)
- E REF PAV MRK TY I(W)36"(YLD TRI)
- F MULTIPOLYMER PAV MRK(W)(24")(SLD)
- G REFL PAV MRKR TY II-A-A
- H REFL PAV MRKR TY I-C
- J MULTIPOLYMER PAV MRK(W)(6")(SLD)
- K MULTIPOLYMER PAV MRK(W)(ARROW)
- L MULTIPOLYMER PAV MRK(W)(WORD)
- M MULTIPOLYMER PAV MRK(W)(DBL ARROW)
- N MULTIPOLYMER PAV MRK(BLK)(6")(BRK)
- P REFL PAV MRK TY I(Y)(MED NOSE)
- Q REFL PAV MRK TY I(W)6"(LNDP)
- R REFL PAV MRK TY I(W)(UTURN ARW)

⇦ DIRECTION OF TRAFFIC FLOW

NOTES:

1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. REPLACE DAMAGED CURB WITHIN TXDOT ROW AS INDICATED ON PLANS OR AS DIRECTED BY TXDOT.

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
PROFESSIONAL LICENSED ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 PHONE: (713) 828-4742
Houston, TX. 77095

BELTWAY 8 AT ANTOINE DRIVE
TRAFFIC SIGNAL SIGNING & PAVEMENT MARKINGS

SHEET 3 OF 5

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		14
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

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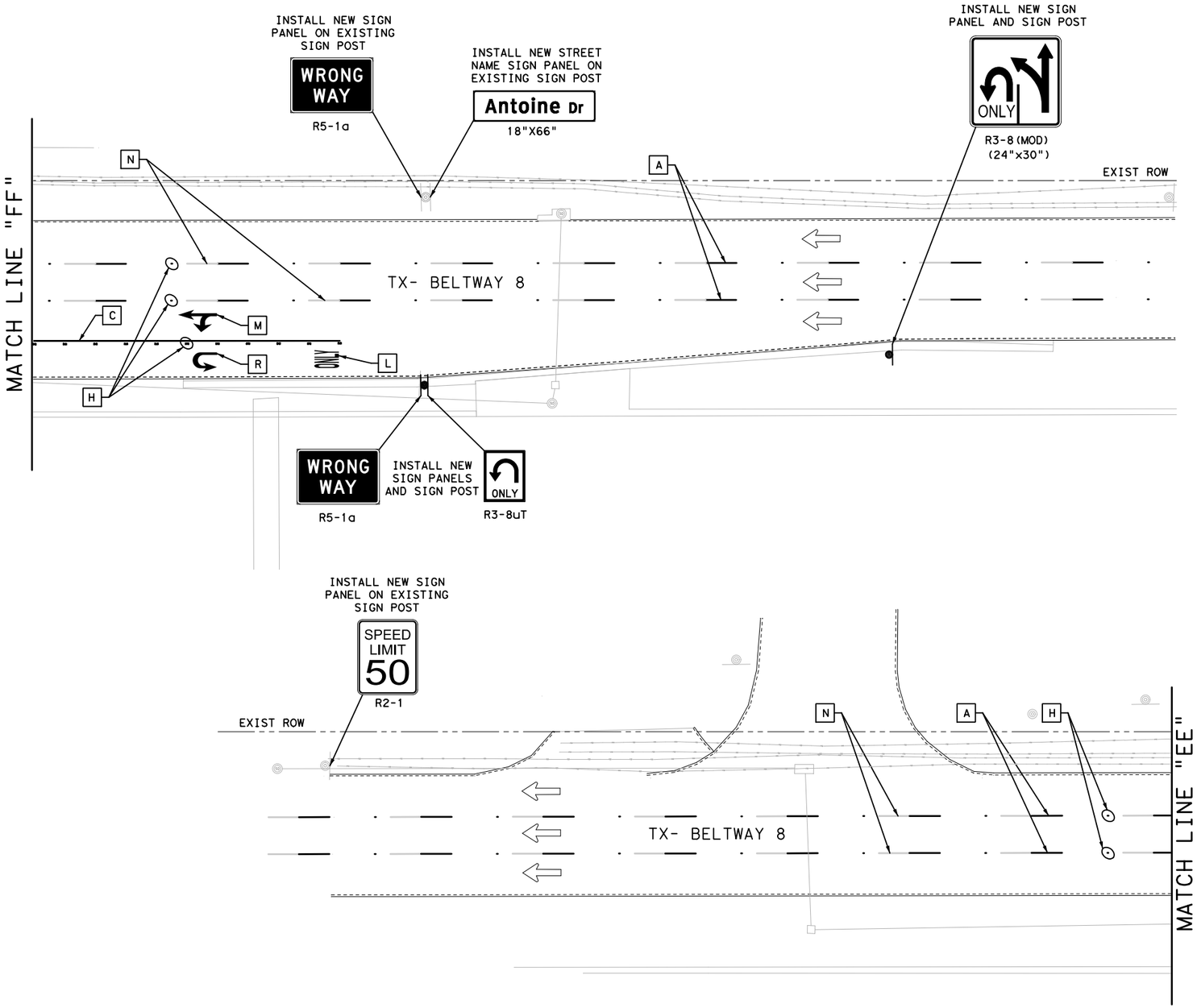

N

SCALE: 1" = 40'

0 20 40

LEGEND:

- [A] MULTIPOLYMER PAV MRK(W)(6")(BRK)
- [B] MULTIPOLYMER PAV MRK(Y)(6")(SLD)
- [C] MULTIPOLYMER PAV MRK(W)(8")(SLD)
- [D] REF PAV MRK TY I(W)18"(YLD TRI)
- [E] REF PAV MRK TY I(W)36"(YLD TRI)
- [F] MULTIPOLYMER PAV MRK(W)(24")(SLD)
- [G] REFL PAV MRKR TY II-A-A
- [H] REFL PAV MRKR TY I-C
- [J] MULTIPOLYMER PAV MRK(W)(6")(SLD)
- [K] MULTIPOLYMER PAV MRK(W)(ARROW)
- [L] MULTIPOLYMER PAV MRK(W)(WORD)
- [M] MULTIPOLYMER PAV MRK(W)(DBL ARROW)
- [N] MULTIPOLYMER PAV MRK(BLK)(6")(BRK)
- [P] REFL PAV MRK TY I(Y)(MED NOSE)
- [Q] REFL PAV MRK TY I(W)6"(LNDP)
- [R] REFL PAV MRK TY I(W)(UTURN ARW)
- DIRECTION OF TRAFFIC FLOW

NOTES:

1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. REPLACE DAMAGED CURB WITHIN TXDOT ROW AS INDICATED ON PLANS OR AS DIRECTED BY TXDOT.

PAVEMENT TYPE:
TX- BELTWAY 8 = CONCRETE
ANTOINE DR = CONCRETE

POSTED SPEED LIMITS:
TX- BELTWAY 8 = 50 MPH
ANTOINE DR = 35 MPH

STATE OF TEXAS
CHARLES R. STEVENS, JR
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

PRINT DATE	REVISION DATE
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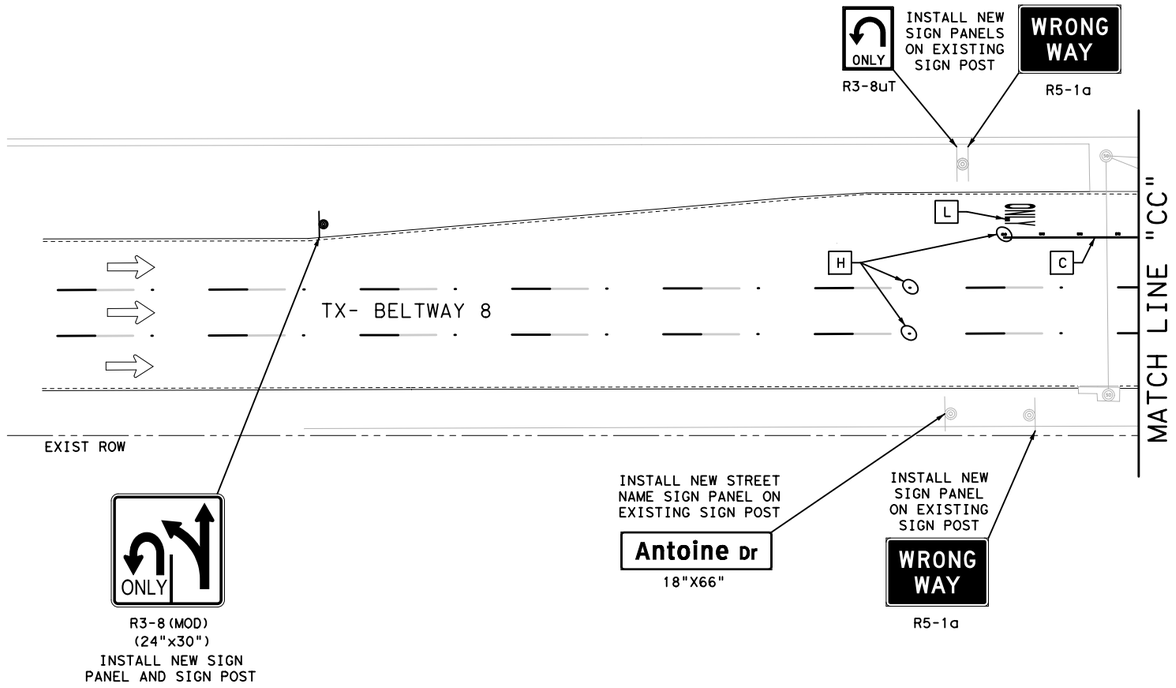
STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 PHONE: (713) 828-4742
Houston, TX. 77095

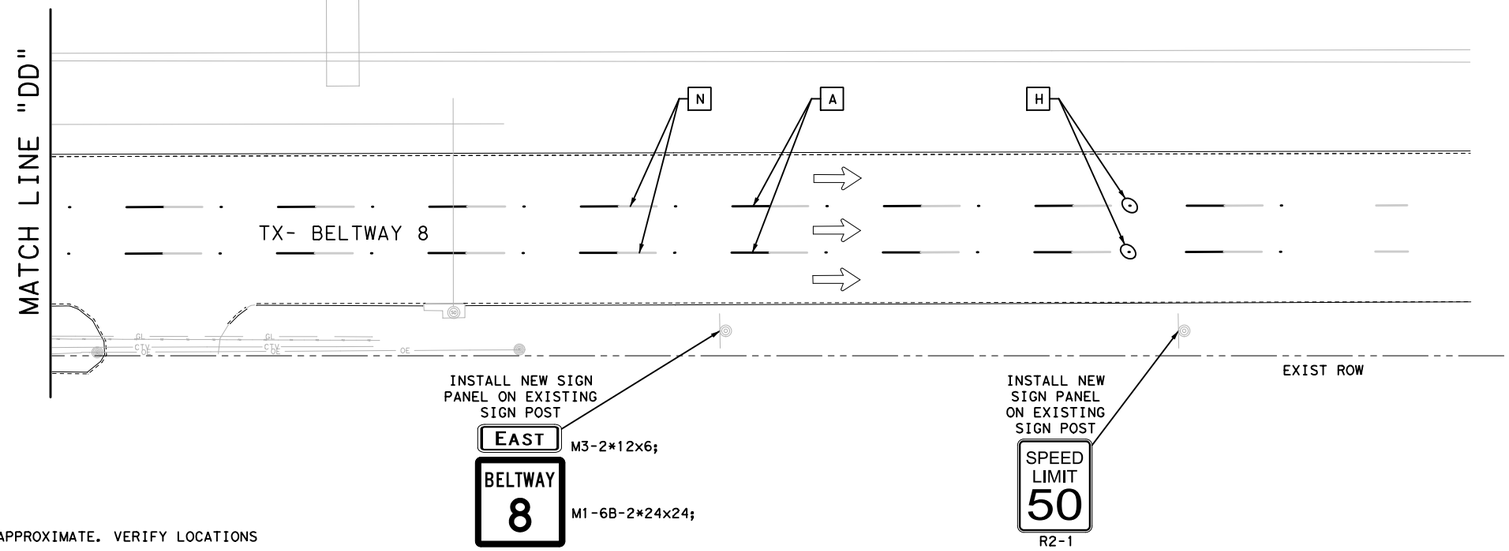
BELTWAY 8 AT ANTOINE DRIVE

TRAFFIC SIGNAL SIGNING & PAVEMENT MARKINGS

SHEET 4 OF 5

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		15
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS





N

SCALE: 1" = 40'

0 20 40

LEGEND:

- [A] MULTIPOLYMER PAV MRK(W)(6")(BRK)
- [B] MULTIPOLYMER PAV MRK(Y)(6")(SLD)
- [C] MULTIPOLYMER PAV MRK(W)(8")(SLD)
- [D] REF PAV MRK TY I(W)18"(YLD TRI)
- [E] REF PAV MRK TY I(W)36"(YLD TRI)
- [F] MULTIPOLYMER PAV MRK(W)(24")(SLD)
- [G] REFL PAV MRKR TY II-A-A
- [H] REFL PAV MRKR TY I-C
- [J] MULTIPOLYMER PAV MRK(W)(6")(SLD)
- [K] MULTIPOLYMER PAV MRK(W)(ARROW)
- [L] MULTIPOLYMER PAV MRK(W)(WORD)
- [M] MULTIPOLYMER PAV MRK(W)(DBL ARROW)
- [N] MULTIPOLYMER PAV MRK(BLK)(6")(BRK)
- [P] REFL PAV MRK TY I(Y)(MED NOSE)
- [Q] REFL PAV MRK TY I(W)6"(LNDP)
- [R] REFL PAV MRK TY I(W)(UTURN ARW)
- DIRECTION OF TRAFFIC FLOW

NOTES:

1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. REPLACE DAMAGED CURB WITHIN TXDOT ROW AS INDICATED ON PLANS OR AS DIRECTED BY TXDOT.

PAVEMENT TYPE:
TX- BELTWAY 8 = CONCRETE
ANTOINE DR = CONCRETE

POSTED SPEED LIMITS:
TX- BELTWAY 8 = 50 MPH
ANTOINE DR = 35 MPH

STATE OF TEXAS
CHARLES R. STEVENS, JR
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 Houston, TX. 77095 PHONE: (713) 828-4742

BELTWAY 8 AT ANTOINE DRIVE
TRAFFIC SIGNAL SIGNING & PAVEMENT MARKINGS

SHEET 5 OF 5

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		16
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

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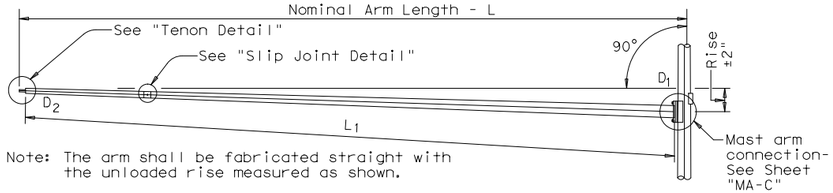
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
24	12.0	9.3	8.6	7.8	.239	13.0	10.0	9.2	8.3	.239	36-A
28	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
32	13.0	10.3	9.6	8.8	.239	14.0	11.0	10.2	9.3	.239	36-A
36	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
40	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
44	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B

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	8.0	5.3	.179	1′-8"	19.1	8.0	3.5	.179	1′-7"
24	23.1	9.0	5.8	.179	1′-9"	23.1	9.0	3.5	.179	1′-8"
28	27.1	9.5	5.7	.179	1′-10"	27.1	10.0	3.5	.179	1′-9"
32	31.0	9.5	5.2	.239	1′-11"	31.0	9.5	3.5	.239	1′-10"
36	35.0	10.0	5.1	.239	2′-0"	35.0	10.0	3.5	.239	1′-11"
40	39.0	10.5	5.1	.239	2′-3"	39.0	11.0	3.5	.239	2′-1"
44	43.0	11.0	5.1	.239	2′-8"	43.0	11.5	4.0	.239	2′-3"

D_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)

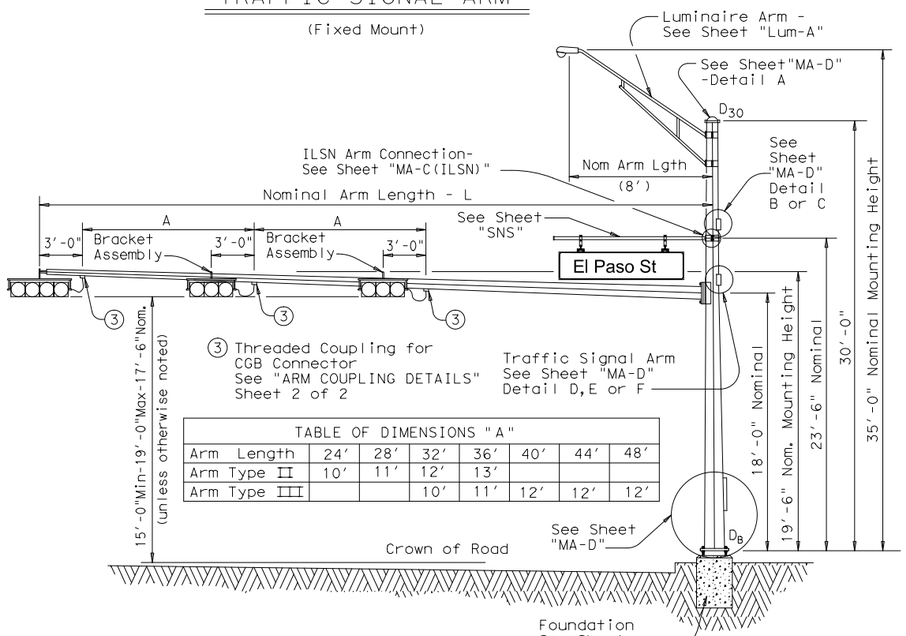


TABLE OF DIMENSIONS "A"							
Arm Length	24′	28′	32′	36′	40′	44′	48′
Arm Type II	10′	11′	12′	13′			
Arm Type III			10′	11′	12′	12′	12′

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-100		20S-100		20-100	
24	24L-100		24S-100		24-100	
28	28L-100		28S-100		28-100	
32	32L-100		32S-100		32-100	
36	36L-100	2	36S-100		36-100	
40	40L-100		40S-100		40-100	
44	44L-100	4	44S-100		44-100	

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-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	2
40					40III-100	
44					44III-100	4

Luminaire Arms (1 per 30′ pole)

Nominal Arm Length	Quantity
8′ Arm	6

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"	
1 ¾"	3′-10"	2
2"	4′-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.

SHEET 1 OF 2
(NOTE: SHEET 2 OF 2 CAN BE FOUND IN TRAFFIC STANDARDS SECTION ON SHEET 33)

ANTOINE DR. AT BELTWAY 8

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
PROFESSIONAL LICENSED ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(1)-12

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

REVISIONS
5-96
11-99
1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	VARIOUS
DIST	COUNTY		SHEET NO.
HOU	HARRIS		17

123A

DATE:
FILE:

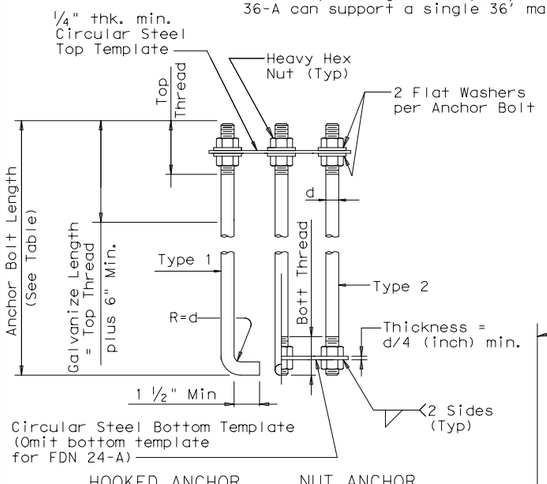
FOUNDATION DESIGN TABLE

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)

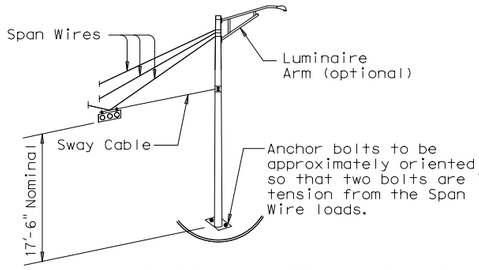
		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM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

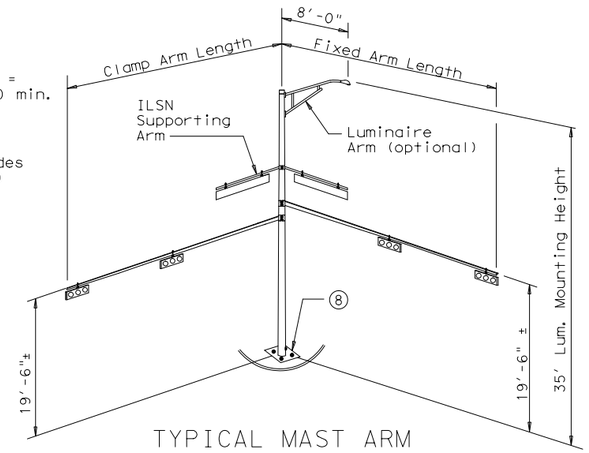


HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2)

ANCHOR BOLT ASSEMBLY

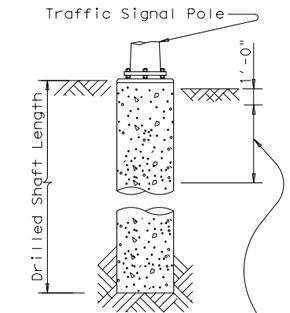


TYPICAL STRAIN POLE ASSEMBLY



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

TYPICAL MAST ARM ASSEMBLY



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.

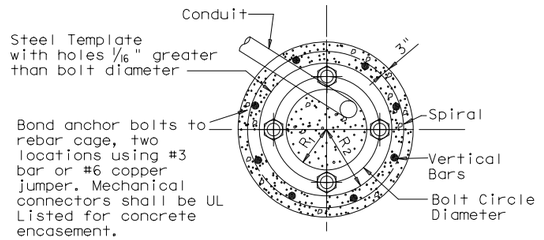
⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

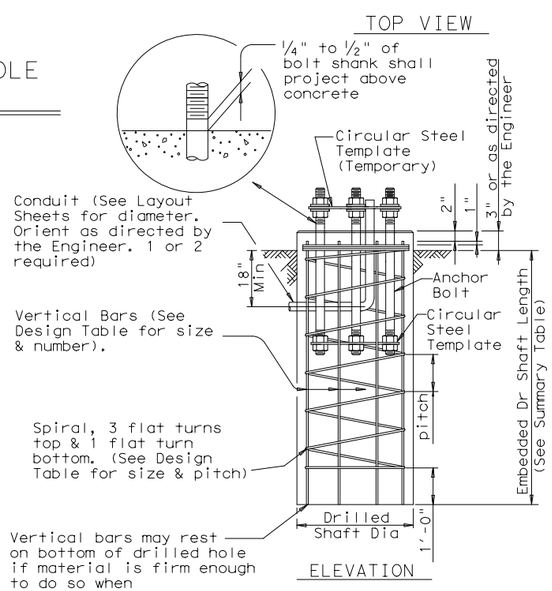
⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	Rt
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.





FOUNDATION DETAILS

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
ANTOINE DR @ BELTWAY 8								
POLE A	10	36-A	1			13.2		
POLE B	10	36-B	1				15.2	
POLE C	10	36-B	1				15.2	
POLE D	10	36-A	1			13.2		
POLE E	10	36-B	1				15.2	
POLE F	10	36-B	1				15.2	
TOTAL DRILLED SHAFT LENGTHS						26.4	60.8	

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".

ANTOINE DR AT BELTWAY 8

STATE OF TEXAS — CHARLES R. STEVENS, JR — 101286 — PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

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, 11-98, 1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	VARIOUS
DIST	COUNTY		SHEET NO.
HOU	HARRIS		18

11/14/2013

128

4/27/2021
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SIGNS:

(TO BE REMOVED)
S1

S2

S3

S4

S5

LEGEND:

- EXIST. SIGN ON POST
- EXIST. POWER POLE
- EXIST. FLASHER SIGNAL POLE
- EXIST. LUMINAIRE
- EXIST. SPAN WIRE
- EXIST. FLASHER SIGNAL HEAD
- EXIST. CONTROLLER CABINET ON FLASHER POLE
- EXIST. SERVICE METER ON FLASHER POLE
- —OE— OVERHEAD ELECTRIC
- —UT— UNDERGROUND COMMUNICATION
- —FOC— FIBER OPTIC CABLE
- DIRECTION OF TRAFFIC FLOW

N

SCALE: 1" = 40'
20 0 20

SIGNAL FLASHER POLE W/CONTROLLER CABINET AND SERVICE METER

"WELCOME TO THE CITY OF LIVERPOOL" SIGN & PLANTER

CULVERT & SAFETY END TREATMENT

24" RCP

EXIST ROW

CR 192

SH 35

NOTES:

1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.

PAVEMENT TYPE:
SH 35 = ASPHALT
CR 192 = ASPHALT

POSTED SPEED LIMITS:
SH 35 = 60 MPH
CR 192 = 45 MPH

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 PHONE: (713) 828-4742
Houston, TX. 77095

SH 35 AT CR 192

TRAFFIC SIGNAL EXISTING LAYOUT

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		19
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

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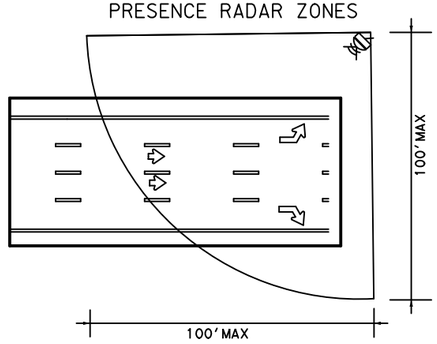

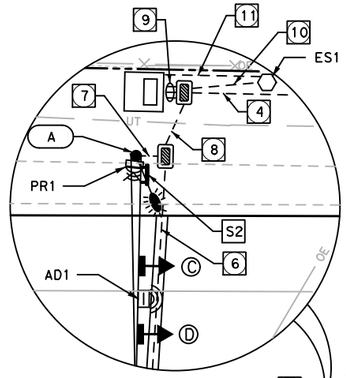

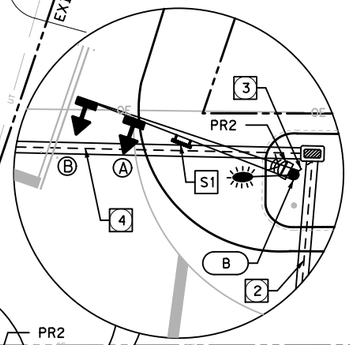

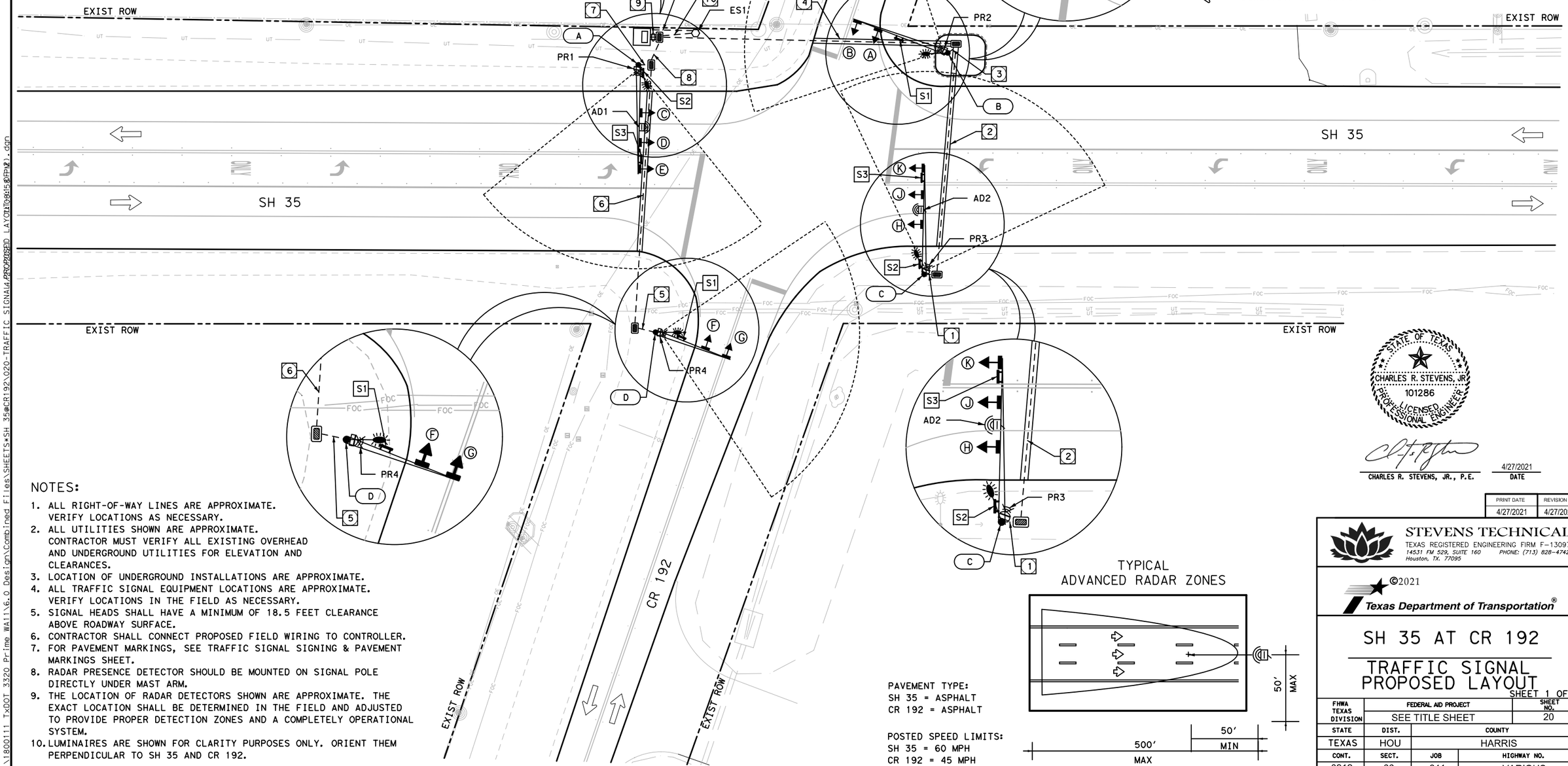

LEGEND:

- PROPOSED MAST ARM POLE
- PROPOSED LUMINAIRE
- PROPOSED TRAFFIC SIGNAL HEAD
- PROPOSED ROADWAY/STREET SIGN
- AD — PROPOSED ADVANCE RADAR DETECTOR
- PR — PROPOSED PRESENCE RADAR DETECTOR
- ES — PROPOSED ELECTRICAL SERVICE POLE
- PROPOSED FULL-ACTUATED CONTROLLER W/CABINET, GPS MODULE AND BATTERY BACK-UP (BBU)
- PROPOSED GROUND BOX TY D
- PROPOSED CONDUIT (TRENCH)
- PROPOSED CONDUIT (BORE)
- DIRECTION OF TRAFFIC FLOW

N

SCALE: 1" = 40'
20 0 20

NOTES:

1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. LOCATION OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE.
4. ALL TRAFFIC SIGNAL EQUIPMENT LOCATIONS ARE APPROXIMATE. VERIFY LOCATIONS IN THE FIELD AS NECESSARY.
5. SIGNAL HEADS SHALL HAVE A MINIMUM OF 18.5 FEET CLEARANCE ABOVE ROADWAY SURFACE.
6. CONTRACTOR SHALL CONNECT PROPOSED FIELD WIRING TO CONTROLLER.
7. FOR PAVEMENT MARKINGS, SEE TRAFFIC SIGNAL SIGNING & PAVEMENT MARKINGS SHEET.
8. RADAR PRESENCE DETECTOR SHOULD BE MOUNTED ON SIGNAL POLE DIRECTLY UNDER MAST ARM.
9. THE LOCATION OF RADAR DETECTORS SHOWN ARE APPROXIMATE. THE EXACT LOCATION SHALL BE DETERMINED IN THE FIELD AND ADJUSTED TO PROVIDE PROPER DETECTION ZONES AND A COMPLETELY OPERATIONAL SYSTEM.
10. LUMINAIRES ARE SHOWN FOR CLARITY PURPOSES ONLY. ORIENT THEM PERPENDICULAR TO SH 35 AND CR 192.

TYPICAL
ADVANCED RADAR ZONES

PAVEMENT TYPE:
SH 35 = ASPHALT
CR 192 = ASPHALT

POSTED SPEED LIMITS:
SH 35 = 60 MPH
CR 192 = 45 MPH

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED
PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 PHONE: (713) 828-4742
Houston, TX. 77095

Texas Department of Transportation®

SH 35 AT CR 192

TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 1 OF 2

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		20
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

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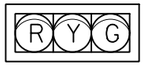
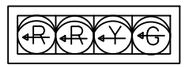
LEGEND:

A	PROP. 44' MAST ARM POLE W/LUMINAIRE, PRESENCE & ADVANCE RADAR DETECTORS
B	PROP. 40' MAST ARM POLE W/LUMINAIRE & PRESENCE RADAR DETECTOR
C	PROP. 44' MAST ARM POLE W/LUMINAIRE, PRESENCE & ADVANCE RADAR DETECTORS
D	PROP. 32' MAST ARM POLE W/LUMINAIRE & PRESENCE RADAR DETECTOR
ES1	PROP. SERVICE POLE TY D W/METER & 120/240 VOLT SERVICE, SERVICE ENCLOSURE & SERVICE DISCONNECT

PROPOSED TRAFFIC SIGNAL HEAD SCHEDULE:



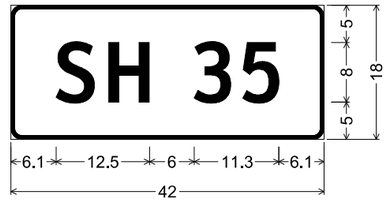
1W-3S (R Y G)
SIGNALS A, B, C, D, F, G, H & J



1W-4S ~~(R R Y G)~~
SIGNALS E & K

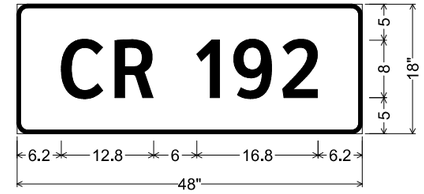
PROPOSED TRAFFIC SIGNAL SIGNS ON MAST ARMS:

S1

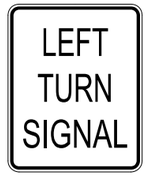


D3-1G-42"X18";
1.5" Radius, 0.5" Border, White on, Green;
"SH", ClearviewHwy-3-W;
"35", ClearviewHwy-3-W;

S2



D3-1G-48"X18";
1.5" Radius, 0.5" Border, White on, Green;
"CR", ClearviewHwy-3-W;
"192", ClearviewHwy-3-W;



R10-10L
(30"x36")
S3

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)						CONDUCTORS (620)						TRAY CABLE (621)		TRAF CABLE (684)		RADAR (6292)		RADAR (6292)	
	PVC						POWER		GROUND				LUMINAIRE		SIGNAL		PRES. RADAR		ADV. RADAR	
	2" (SCHD 80) (6046)		3" (SCHD 80) (6053)		(6054)		#4 INSULATED (6012)		#4 BARE (6011)		#6 BARE (6009)		#12/4C TRAY CABLE (6005)		#12/7C (6012)		#18/2C & #22/4C (6004)		#18/2C & #22/4C (6005)	
	NO.	TRENCH	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
1			1	5							1	5	1	5	2	5	1	5	1	5
2			1	15	1	85					1	100	1	100	2	100	1	100	1	100
3			1	5							1	5	1	5	1	5	1	5		
4			1	65	1	60					1	125	2	125	3	125	2	125	1	125
5			1	10							1	10	1	10	1	10	1	10		
6			1	40	1	65					1	105	1	105	1	105	1	105		
7			1	5							1	5	1	5	2	5	1	5	1	5
8			1	15							1	15	2	15	3	15	2	15	1	15
9			3	10							3	10			6	10	4	10	2	10
10	1	15									1	15	4	15						
11	1	20					2	20	1	20										
POLE A													1	35	2	20	1	20	1	20
POLE B													1	35	1	20	1	20		
POLE C													1	35	2	20	1	20	1	20
POLE D													1	35	1	20	1	20		
MA															2	45			1	25
MB															1	40				
MC															2	45			1	30
MD															1	35				
TOTAL		35		190		210		40		20		415		710		1195		630		365

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE NAME	CALL OUT	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)(6)(7)&(8)-14	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS ***	PANEL BD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CIRCUIT AMPS	BRANCH CKT. BRK. POLE/ AMPS	KVA LOAD
SH 35 AT CR 192	ES1	TY D (120/240)060 (NS)SS(E)SP(O)	1-1/2"	3/#6	N/A	2P/60	30	70	SIGNAL	40	1P/50	5.2
									LUMINAIRE	3	2P/20	

PROPOSED RADAR DETECTIONS SCHEDULE:

RADAR CHART	
PR1	NORTHBOUND SH 35 PRESENCE DETECTION
PR2	EASTBOUND CR 192 PRESENCE DETECTION
PR3	SOUTHBOUND SH 35 PRESENCE DETECTION
PR4	WESTBOUND CR 192 PRESENCE DETECTION
AD1	SOUTHBOUND SH 35 ADVANCE RADAR DETECTION
AD2	NORTHBOUND SH 35 ADVANCE RADAR DETECTION

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
PROFESSIONAL ENGINEER
LICENSED

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 PHONE: (713) 828-4742
Houston, TX. 77095

Texas Department of Transportation®

SH 35 AT CR 192

TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 2 OF 2

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		21
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

Z:\1800111 TxDOT 3320 Prime WA11\6.0 Design\Combined Files\SHEETS\SH 35@CR192\021-TRAFFIC SIGNAL PROPOSED LAYOUT.dgn

LEGEND:

- A RE PM W/RET REQ TY I(W)6"(SLD)(100MIL)
- B RE PM W/RET REQ TY I(Y)6"(SLD)(100MIL)
- C REFL PAV MRK TY I(W)8"(SLD)(100MIL)
- D REFL PAV MRK TY I(W)24"(SLD)(100MIL)
- E REFL PAV MRK TY I(W)(ARROW)(100MIL)
- F REFL PAV MRK TY I(W)(WORD)(100MIL)
- G REFL PAV MRKR TY I-C
- H REFL PAV MRKR TY II-A-A
- PROPOSED SIGN ON POST
- DIRECTION OF TRAFFIC FLOW

EXIST ROW

CR 192

EXIST ROW

ASPH DRIV

B

TYP H

EXIST ROW

ASPHALT DRIVEWAY

EXIST ROW

A

D

A

C SEE NOTE 6

SH 35

TYP H

TYP G

E F E TYP G F E F

B

TYP H

E F E F E

SH 35

C SEE NOTE 6

A

D

A

D

B

TYP H

EXIST ROW

EXIST ROW

CR 192

CONCRETE DRIVEWAY

EXIST ROW

24" RCP

W3-3
(48"x48")
INSTALL NEW SIGN
PANEL AND SIGN
POST (APPROX 400'
FROM INTERSECTION)

W3-3
(48"x48")
INSTALL NEW SIGN
PANEL AND SIGN
POST (APPROX 400'
FROM INTERSECTION)

SCALE: 1" = 40'
20 0 20

NOTES:

1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. LOCATION OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE.
4. THE NORTHBOUND LEFT TURN STORAGE BAY ON SH 35 SHALL BE 300 FEET LONG. THE SOUTHBOUND LEFT TURN STORAGE BAY ON SH 35 SHALL BE 270 FEET LONG.
5. ADD ADVANCE SIGNAL AHEAD WARNING SIGNS (W3-3) 400 FEET IN ADVANCE OF STOP BARS ON SH 35.
6. CONTRACTOR SHALL COMPLETELY OBLITERATE EXISTING 18" WIDE WHITE LEFT TURN LANE STRIPE ON SH 35 BEFORE INSTALLING PROPOSED 8" WIDE WHITE LEFT TURN LANE STRIPE.

PAVEMENT TYPE:
SH 35 = ASPHALT
CR 192 = ASPHALT

POSTED SPEED LIMITS:
SH 35 = 60 MPH
CR 192 = 45 MPH

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

PRINT DATE	REVISION DATE
4/27/2021	4/27/2021

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
14531 FM 529, SUITE 160 PHONE: (713) 828-4742
Houston, TX. 77095

Texas Department of Transportation®

SH 35 AT CR 192

TRAFFIC SIGNAL SIGNING & PAVEMENT MARKINGS

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		22
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	00	641	VARIOUS

Z:\1800111 TxDOT 3320 Prime WA1\6.0 Design\Combined Files\SHEETS\SH 35@CR192\022-TRAFFIC SIGNAL4.PROPOSED SPM, 7/2021 3:00 PM

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

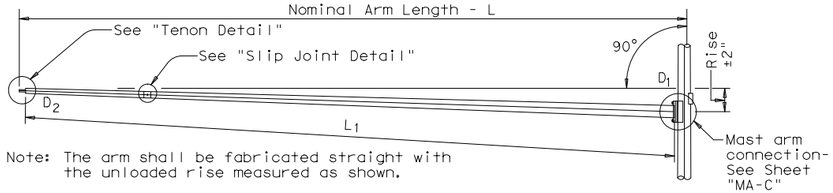
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
24	12.0	9.3	8.6	7.8	.239	13.0	10.0	9.2	8.3	.239	36-A
28	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
32	13.0	10.3	9.6	8.8	.239	14.0	11.0	10.2	9.3	.239	36-A
36	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
40	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
44	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B

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	8.0	5.3	.179	1′-8"	19.1	8.0	3.5	.179	1′-7"
24	23.1	9.0	5.8	.179	1′-9"	23.1	9.0	3.5	.179	1′-8"
28	27.1	9.5	5.7	.179	1′-10"	27.1	10.0	3.5	.179	1′-9"
32	31.0	9.5	5.2	.239	1′-11"	31.0	9.5	3.5	.239	1′-10"
36	35.0	10.0	5.1	.239	2′-0"	35.0	10.0	3.5	.239	1′-11"
40	39.0	10.5	5.1	.239	2′-3"	39.0	11.0	3.5	.239	2′-1"
44	43.0	11.0	5.1	.239	2′-8"	43.0	11.5	4.0	.239	2′-3"

D_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)

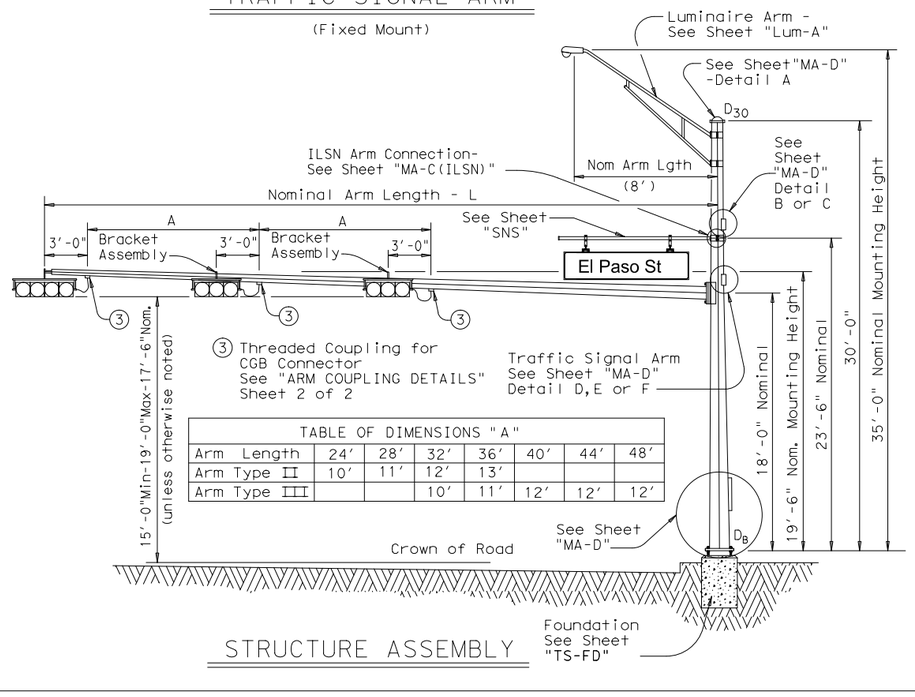


TABLE OF DIMENSIONS "A"							
Arm Length	24′	28′	32′	36′	40′	44′	48′
Arm Type II	10′	11′	12′	13′			
Arm Type III			10′	11′	12′	12′	12′

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-100		20S-100		20-100	
24	24L-100		24S-100		24-100	
28	28L-100		28S-100		28-100	
32	32L-100	1	32S-100		32-100	
36	36L-100		36S-100		36-100	
40	40L-100	1	40S-100		40-100	
44	44L-100	2	44S-100		44-100	

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-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100	1	32III-100	
36			36II-100		36III-100	
40					40III-100	1
44					44III-100	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	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3′-4"	
1 ¾"	3′-10"	1
2"	4′-3"	3

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.

(NOTE: SHEET 2 OF 2 CAN BE FOUND IN TRAFFIC STANDARDS SECTION ON SHEET 33)

SH 35 AT CR 192

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
PROFESSIONAL LICENSED ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(1)-12

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

REVISIONS
5-96
11-99
1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	VARIOUS
DIST	COUNTY		SHEET NO.
HOU	HARRIS		23

123A

DATE:
FILE:

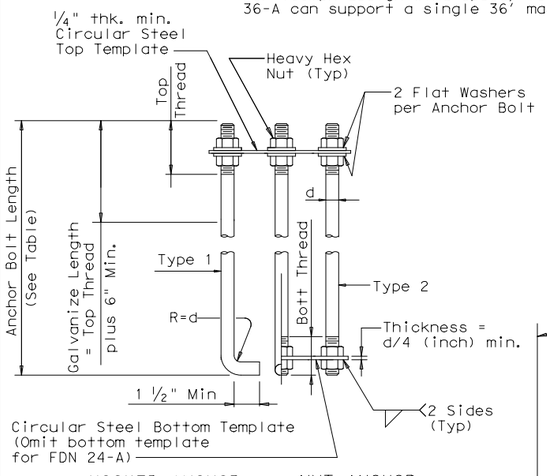
FOUNDATION DESIGN TABLE

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)

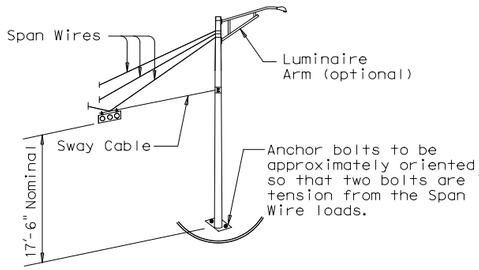
FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		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' ×24'	40' X 36'
					44' x 36'

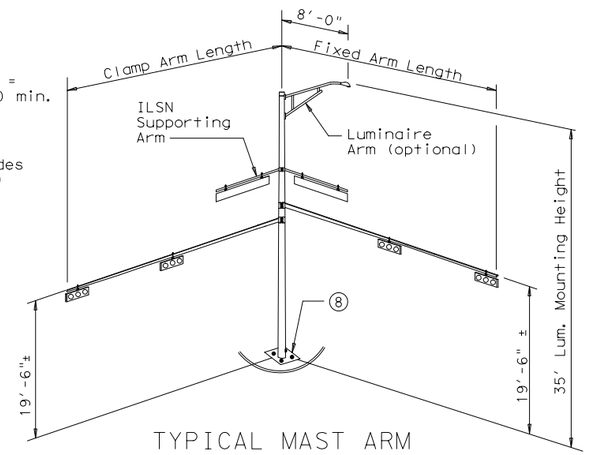
EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



ANCHOR BOLT ASSEMBLY

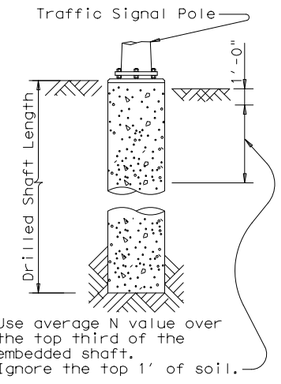


TYPICAL STRAIN POLE ASSEMBLY



TYPICAL MAST ARM ASSEMBLY

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



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.

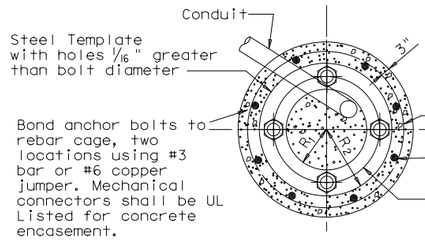
⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

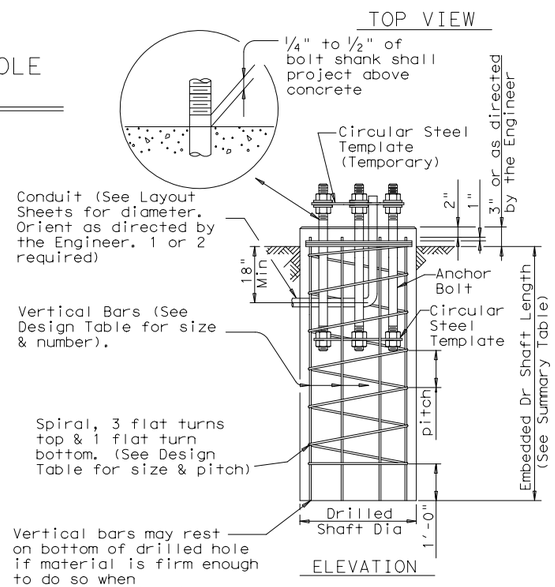
⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

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.





FOUNDATION DETAILS

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
SH 35 @ CR 192								
POLE A	10	36-B	1				15.2	
POLE B	10	36-B	1				15.2	
POLE C	10	36-B	1				15.2	
POLE D	10	36-A	1			13.2		
TOTAL DRILLED SHAFT LENGTHS						13.2	45.6	

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".

SH 35 AT CR 192

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

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

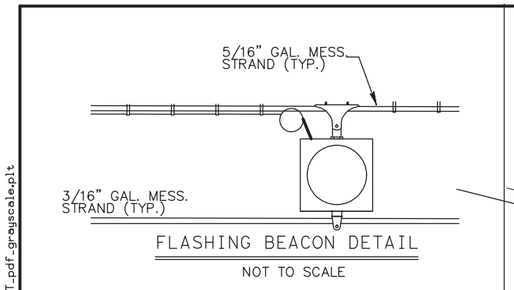
REVISIONS: 5-96, 11-99, 1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	VARIOUS
DIST	COUNTY		SHEET NO.
HOU	HARRIS		24

11/14/2013

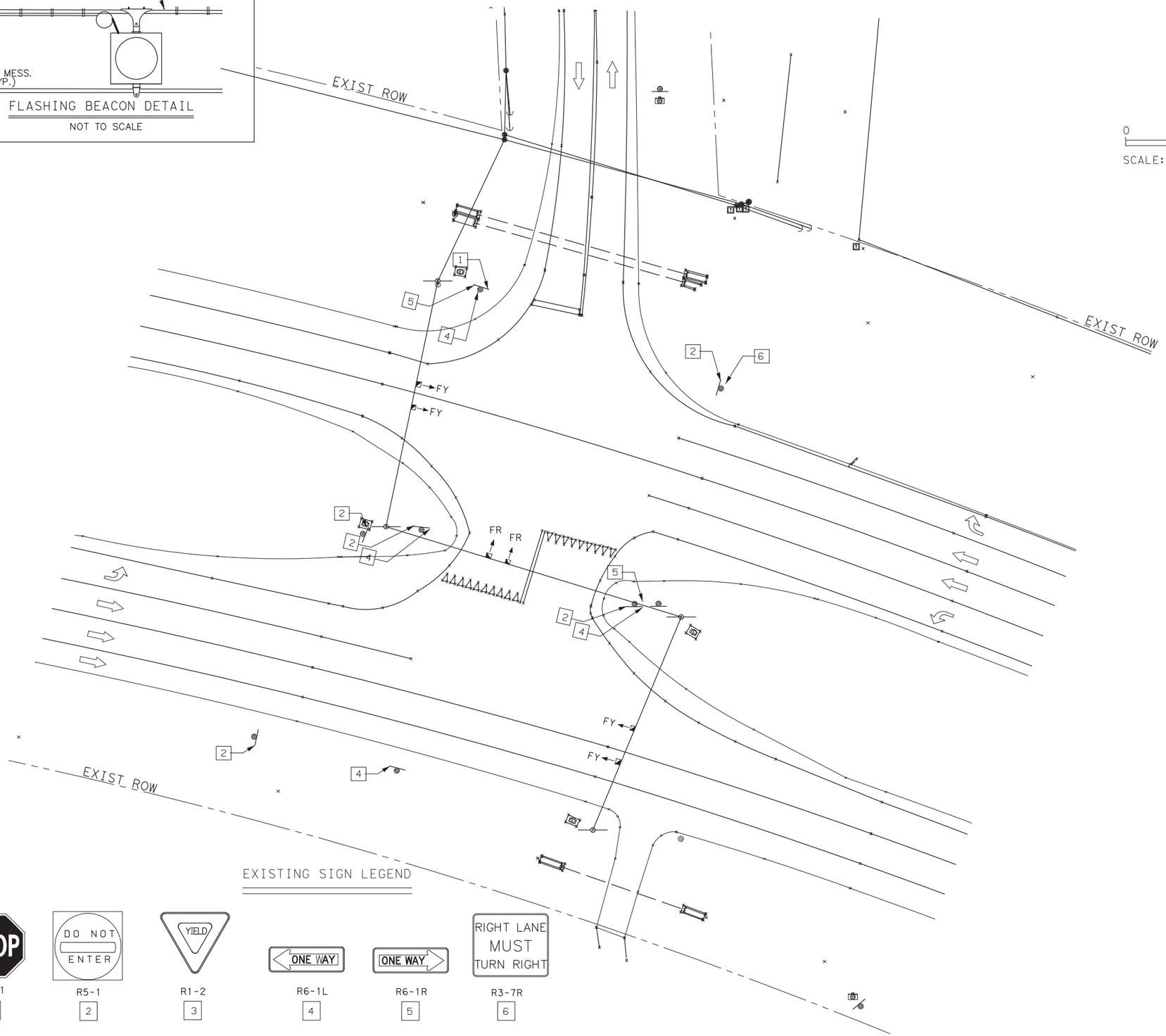
128

4/27/2021
Z:\1800111 TxDOT 3320 Prime WA11\6.0 Design\Combined Files\SHEETS*SH 35@CR192\024-TS-FD-12.DGN



FLASHING BEACON DETAIL

NOT TO SCALE



0 20 40

SCALE: 1" = 40'

LEGEND

- TRAFFIC SIGNAL POLE
- SIGN
- POWER POLE
- OH ELECTRIC
- TRAFFIC SIGNAL FLASHER
- DIRECTION OF TRAFFIC FLOW

EXISTING SIGN LEGEND

R1-1 (1) | R5-1 (2) | R1-2 (3) | R6-1L (4) | R6-1R (5) | R3-7R (6)

STATE OF TEXAS
KETI B. HRISTOVA
90998
LICENSED PROFESSIONAL ENGINEER

04/26/2021

KBH TRAFFIC ENGINEERING, LLC
TBPE Registration No. F-14592
430 SH 6 S, SUITE 120, HOUSTON TEXAS 77079

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

Texas Department of Transportation

SH 35 AT CR 25
EXISTING FLASHER

SHEET 1 OF 1

FED RD DIV NO	PROJECT NO		HIGHWAY NO
6			SH 35
STATE	DIST	COUNTY	
TEXAS	HOU	BRAZORIA	
CONT	SECT	JOB	SHEET NO
0912	00	641	25

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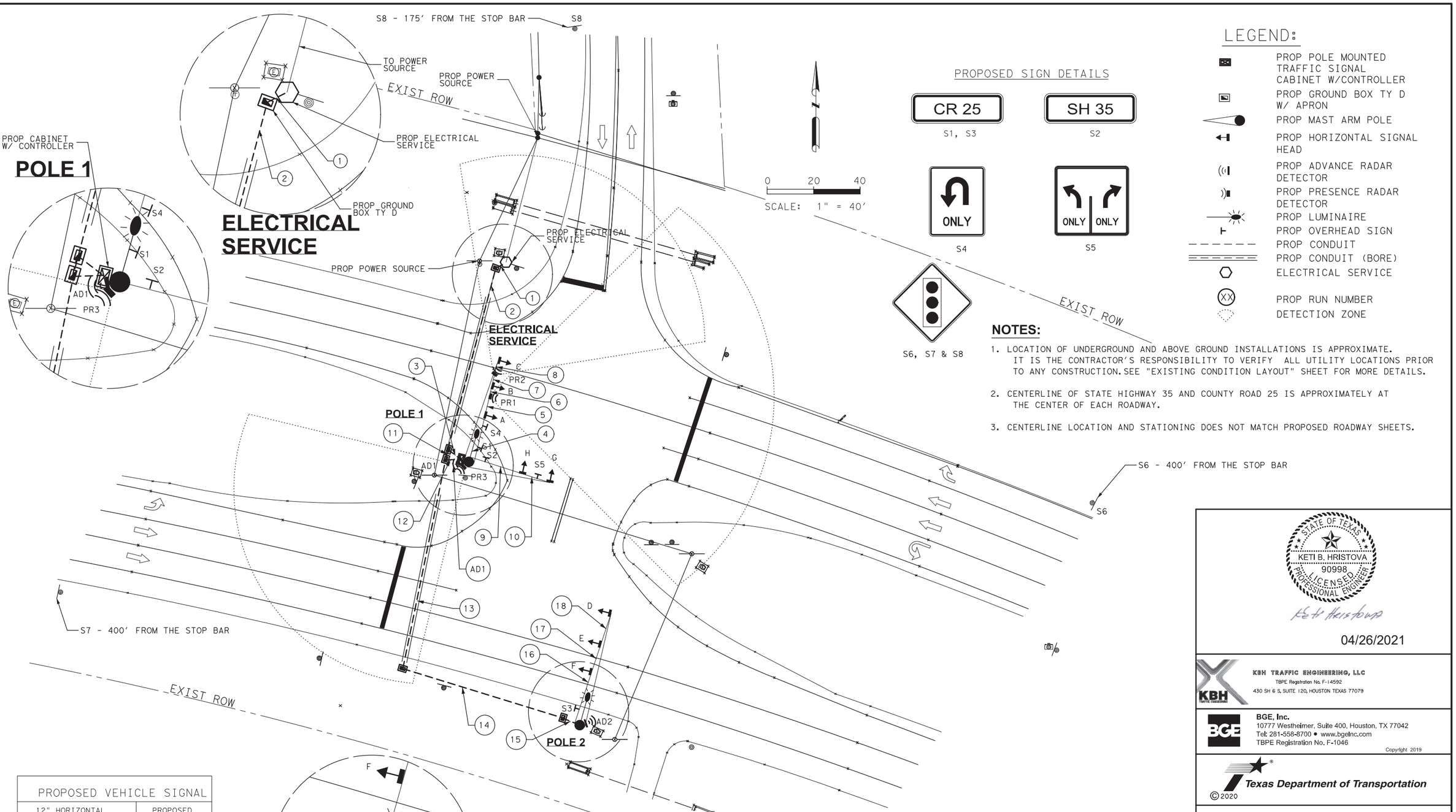


PROPOSED SIGN DETAILS

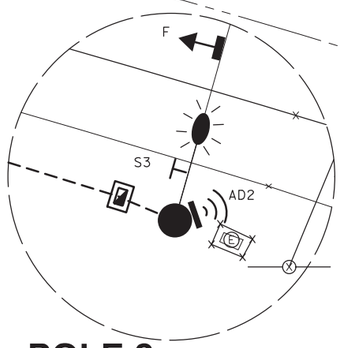
LEGEND:

- PROP POLE MOUNTED TRAFFIC SIGNAL CABINET W/CONTROLLER
- PROP GROUND BOX TY D W/ APRON
- PROP MAST ARM POLE
- PROP HORIZONTAL SIGNAL HEAD
- PROP ADVANCE RADAR DETECTOR
- PROP PRESENCE RADAR DETECTOR
- PROP LUMINAIRE
- PROP OVERHEAD SIGN
- PROP CONDUIT
- PROP CONDUIT (BORE)
- ELECTRICAL SERVICE
- PROP RUN NUMBER
- DETECTION ZONE

NOTES:

1. LOCATION OF UNDERGROUND AND ABOVE GROUND INSTALLATIONS IS APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION. SEE "EXISTING CONDITION LAYOUT" SHEET FOR MORE DETAILS.
2. CENTERLINE OF STATE HIGHWAY 35 AND COUNTY ROAD 25 IS APPROXIMATELY AT THE CENTER OF EACH ROADWAY.
3. CENTERLINE LOCATION AND STATIONING DOES NOT MATCH PROPOSED ROADWAY SHEETS.

PROPOSED VEHICLE SIGNAL	
12" HORIZONTAL (R Y G)	PROPOSED B, C, E, F G, H
12" HORIZONTAL (R R Y G)	PROPOSED D
12" HORIZONTAL (R R Y G)	PROPOSED A



PROPOSED POLE & CONTROLLER LOCATIONS				
POLE #	POLE TYPE	LATITUDE	LONGITUDE	ATTACHMENTS
P1	30'	29°8'44.08"N	95°36'31.44"W	DUAL MAST ARM POLE W/ 44' AND 36' ARMS, SIGNAL HEADS A, B, C, G 7 H PRESENCE DETECTORS PR1, PR2 & PR3, ADVANCE DETECTOR AD1, LUMINAIRE, AND SIGNS S1, S2, S4 & S5
P2	30'	29°8'42.90"N	95°36'30.85"W	50' MAST ARM POLE W/ SIGNAL HEADS F, E & D, ADVANCE DETECTOR AD2, LUMINAIRE, AND SIGN S3
ELECTRICAL SERVICE		29°8'44.08"N	95°36'31.44"W	ELECTRICAL SERVICE TYPE D (120/240)60 (NS) SS (E) SP (O)
CONTROLLER		29°8'44.08"N	95°36'31.44"W	POLE MOUNTED CABINET W/ CONTROLLER ON POLE 1

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SH 35 AT CR 25 TRAFFIC SIGNAL PROPOSED SIGNAL

SHEET 1 OF 1

FED RD DIV NO	PROJECT NO		HIGHWAY NO
6			SH35
STATE	DIST	COUNTY	
TEXAS	HOU	BRAZORIA	
CONT	SECT	JOB	SHEET NO
0912	00	641	26

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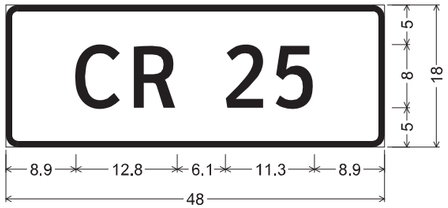
CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)										CONDUCTORS (620)						TRAY CABLE (621)		CABLES (684)						RADAR CABLE			
	PVC										GROUND		POWER				LUMINAIRE		PEDESTRIAN				SIGNAL		RDVS (6292)			
	2" (SCHD 80)				3" (SCHD 80)				4" (SCHD 80)		#6 BARE		#4 BARE		#6 INSULATED		#12/4C Tray Cable		#12/2C		#12/4C		#12/7C		#18/2C POWER		#22/4C COMM.	
	(6046)		(6047)		(6053)		(6054)		(6058)		(6009)		(6011)		(6010)		(6005)		(6007)		(6009)		(6012)		(6001)		(6002)	
	NO.	TRENCH	NO.	BORE	NO.	TRENCH	NO.	BORE	NO.	TRENCH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
1	2	5											1	10	1	10	2	15										
2			2	85									1	85	1	85	2	90										
3	2	15											1	15	1	15	1	45										
4																							3	50	3	100	3	100
5																							2	8	2	8	2	8
6																							2	5	1	5	1	5
7																							1	8	1	10	1	10
8																							1	10				
9																							2	55				
10																							1	15				
11	1	10											1	10			1	15										
12	2	15			1	15					2	15	1	15			1	15					3	15	1	15	1	15
13			2	95			1	95			2	95	1	95			1	100					3	100	1	100	1	100
14	2	75			1	75					2	75	1	75			1	80					3	80	1	80	1	80
15	2	10			1	10					2	10	1	10			1	50					3	40	1	50	1	50
16																							3	25				
17																							2	15				
18																							1	15				
19																												
20																												
21																												
22																												
23																												
24																												
25																												
TOTAL (LF)		250		360		100		95		0		390		315		110		515		0		0		1144		576		576
EST. TOTAL		275		400		110		105		0		430		350		125		570		0		0		1260		635		635

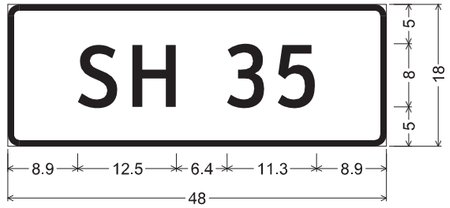
PROPOSED SIGN DETAILS

S1, S3



1.5" Radius, 0.8" Border, White on, Green;
"CR 25", ClearviewHwy-3-W;

S2



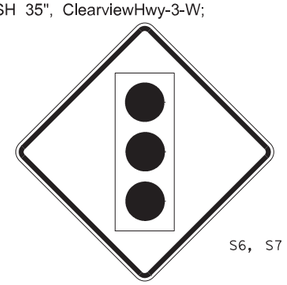
1.5" Radius, 0.8" Border, White on, Green;
"SH 35", ClearviewHwy-3-W;

S4

R3-8 U
(24"x30")

S5

R3-8
(32"x30")



S6, S7 & S8

W3-3
(48"X48")

RADAR DETECTOR CHART	
DETECTOR	DESCRIPTION
AD1	EASTBOUND APPROACH ADVANCE RADAR DETECTOR
AD2	WESTBOUND APPROACH ADVANCE RADAR DETECTOR
PR1	WESTBOUND APPROACH PRESENCE RADAR DETECTOR
PR2	SOUTHBOUND APPROACH PRESENCE RADAR DETECTOR
PR3	EASTBOUND APPROACH PRESENCE RADAR DETECTOR

ELECTRICAL SERVICE DATA

INTERSECTION	ELEC. SERV. CALLOUT	ELECTRICAL SERVICE DESCRIPTION (SEE ED (5, 6, 7,8)-14)	SERVICE CONDUIT SIZE(RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DIS-CONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS	PANELBD./ LOADCENTER APM RATING(MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
SH 35 AT CR 25	PROP ELECTRICAL SERVICE	TY D (120/240)060(NS)SS(E)SP(O)	1-1/4	3/#6	N/A	2P/60	30	100	TRAFFIC SIGNAL	1P/50	40	<6.2
									ILLUMINATION	2P/20	6	

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04/26/2021

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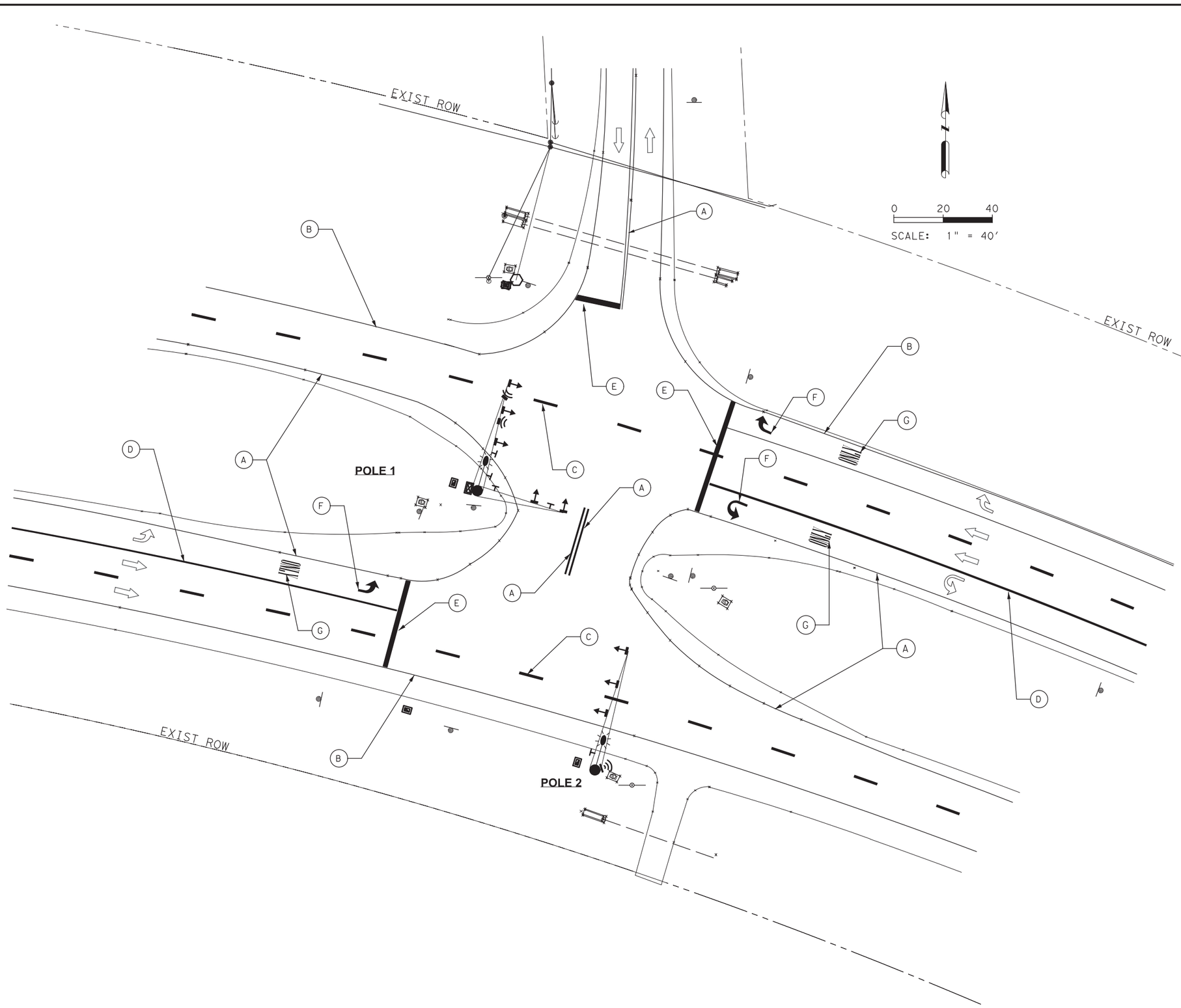
SH 35 AT CR 25 TRAFFIC SIGNAL DETAILS

SHEET 1 OF 1

FED RD DIV NO	PROJECT NO		HIGHWAY NO
6			SH35
STATE	DIST	COUNTY	
TEXAS	HOU	BRAZORIA	
CONT	SECT	JOB	SHEET NO
0912	00	641	27



LEGEND:

- (A) REF PAV MRK (Y) 4" (SLD)
- (B) REF PAV MRK (W) 4" (SLD)
- (C) REF PAV MRK (W) 4" (BRK)
- (D) REF PAV MRK (W) 8" (SLD)
- (E) REF PAV MRK (W) 24" (SLD)
- (F) REF PAV MRK (W) (ARROW)
- (G) REF PAV MRK (W) (WORD)
- DIRECTION OF TRAFFIC FLOW

STATE OF TEXAS
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SH 35 AT CR 25 PAVEMENT MARKINGS LAYOUT

SHEET 1 OF 1

FED RD DIV NO	PROJECT NO		HIGHWAY NO
6			SH35
STATE	DIST	COUNTY	
TEXAS	HOU	BRAZORIA	
CONT	SECT	JOB	SHEET NO
0912	00	641	28

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REMOVE EXISTING WARNING SIGN
"SIGNAL AHEAD" AT 190' FROM
THE STOP BAR

EXIST ROW

REMOVE PAVEMENT MARKINGS
24" WHITE SOLID (20 LF)

REMOVE EXISTING "STOP" SIGN

REMOVE EXISTING STRAIN POLE

REMOVE PAVEMENT MARKINGS
YIELD TRIANGLES SOLID 25 LF

REMOVE EXISTING "YIELD" SIGN

REMOVE EXISTING STRAIN POLE

REMOVE PAVEMENT MARKINGS
YIELD TRIANGLES SOLID 25 LF

REMOVE EXISTING WARNING SIGN
"CROSS ROAD ON LEFT" AT 700'
FROM THE STOP BAR

EXIST ROW

REMOVE PAVEMENT MARKINGS
8" WHITE SOLID (30 LF)

REMOVE PAVEMENT MARKINGS
8" YELLOW SOLID (60 LF)

REMOVE EXISTING STRAIN POLE

REMOVE PAVEMENT MARKINGS
8" WHITE SOLID (10 LF)

REMOVE PAVEMENT MARKINGS
8" WHITE SOLID (13 LF)

REMOVE EXISTING WARNING SIGN
"CROSS ROAD ON RIGHT" AT
480' FROM THE STOP BAR

REMOVE EXISTING STRAIN POLE

EXIST ROW

0 20 40

SCALE: 1" = 40'

LEGEND:

- SIGNING
- PROP. REMOVAL
- REMOVE PROP. REMOVAL CALLOUT

NOTE:

1. ALL REMOVALS COVERED UNDER BID ITEM 680-6004.

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SH 35 AT CR 25
REMOVAL PLAN
LAYOUT SHEET

SHEET 1 OF 1

FED RD DIV NO	PROJECT NO		HIGHWAY NO
6			SH35
STATE	DIST	COUNTY	
TEXAS	HOU	BRAZORIA	
CONT	SECT	JOB	SHEET NO
0912	00	641	29

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DATE:
FILE:

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	
		See note above plus: one (or two if ILSN attached) small hand hole, clamp-on simplex		See note above plus one small hand hole		See note above	
LF ft.	Lc ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20	2020L-100		2020S-100		2020-100	
24	20	2420L-100		2420S-100		2420-100	
	24	2424L-100		2424S-100		2424-100	
28	20	2820L-100		2820S-100		2820-100	
	24	2824L-100		2824S-100		2824-100	
	28	2828L-100		2828S-100		2828-100	
32	20	3220L-100		3220S-100		3220-100	
	24	3224L-100		3224S-100		3224-100	
	28	3228L-100		3228S-100		3228-100	
	32	3232L-100		3232S-100		3232-100	
36	20	3620L-100		3620S-100		3620-100	
	24	3624L-100		3624S-100		3624-100	
	28	3628L-100		3628S-100		3628-100	
	32	3632L-100		3632S-100		3632-100	
	36	3636L-100		3636S-100		3636-100	
40	20	4020L-100		4020S-100		4020-100	
	24	4024L-100		4024S-100		4024-100	
	28	4028L-100		4028S-100		4028-100	
	32	4032L-100		4032S-100		4032-100	
	36	4036L-100		4036S-100		4036-100	
44	20	4420L-100		4420S-100		4420-100	
	24	4424L-100		4424S-100		4424-100	
	28	4428L-100		4428S-100		4428-100	
	32	4432L-100		4432S-100		4432-100	
	36	4436L-100		4436S-100		4436-100	

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

Nominal Arm Length	Type I Arm (1 Signal) 1 CGB connector		Type II Arm (2 Signals) 1 Bracket Assembly and 2 CGB Connectors		Type III Arm (3 Signals) 2 Bracket Assemblies and 3 CGB Connectors	
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	1

Traffic Signal Arms (Clamp-On Mount) (1 per pole) Ship each arm w/ the 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, 3 CGB Connectors, and 1 clamp w/bolts and washers		Type III Arm (3 Signals) 2 Bracket Assembly, 4 CGB Connectors, and 1 clamp w/bolts and washers	
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	1	36III-100	

Luminaire Arms (1 per 30′ pole)

Nominal Arm Length	Quantity
8′ Arm	1

ILSN Arm (1 or 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 ¾"	3′-10"	
2"	4′-3"	
2 ¼"	4′-9"	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.

ARMS		ROUND POLES					POLYGONAL POLES					Foundation Type
LF	Lc	D_B	D_{19}	D_{24}	D_{30}	③ thk	D_B	D_{19}	D_{24}	D_{30}	③ thk	
ft.	ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	20	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
24	20	12.5	9.8	9.1	8.3	.239	13.5	10.5	9.7	8.8	.239	36-A
	24	12.5	9.8	9.1	8.3	.239	14.0	11.0	10.2	9.3	.239	36-A
28	20	13.0	10.3	9.6	8.8	.239	14.5	11.5	10.7	9.8	.239	36-A
	24	13.0	10.3	9.6	8.8	.239	15.0	12.0	11.2	10.3	.239	36-A
	28	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
32	20	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
	24	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
	28	14.0	11.3	10.6	9.8	.239	15.5	12.5	11.7	10.8	.239	36-B
	32	14.0	11.3	10.6	9.8	.239	15.5	12.5	11.7	10.8	.239	36-B
36	20	14.0	11.3	10.6	9.8	.239	15.5	12.5	11.7	10.8	.239	36-B
	24	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
	28	14.5	11.8	11.1	10.3	.239	16.0	13.0	12.2	11.3	.239	36-B
	32	14.5	11.8	11.1	10.3	.239	16.0	13.0	12.2	11.3	.239	36-B
	36	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B
40	20	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B
	24	15.0	12.3	11.6	10.8	.239	16.5	13.5	12.7	11.8	.239	36-B
	28	15.0	12.3	11.6	10.8	.239	17.0	14.0	13.2	12.3	.239	42-A
	32	15.0	12.3	11.6	10.8	.239	17.0	14.0	13.2	12.3	.239	42-A
	36	15.5	12.8	12.1	11.3	.239	17.5	14.5	13.7	12.8	.239	42-A
44	20	15.5	12.8	12.1	11.3	.239	17.5	14.5	13.7	12.8	.239	42-A
	24	15.5	12.8	12.1	11.3	.239	17.5	14.5	13.7	12.8	.239	42-A
	28	16.0	13.3	12.6	11.8	.239	18.0	15.0	14.2	13.3	.239	42-A
	32	16.0	13.3	12.6	11.8	.239	18.0	15.0	14.2	13.3	.239	42-A
	36	16.0	13.3	12.6	11.8	.239	18.0	15.0	14.2	13.3	.239	42-A

Arm L_F or L_C	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	③ thk	Rise	L_1	D_1	④ D_2	③ thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1′-8"	19.1	8.0	3.5	.179	1′-7"
24	23.1	9.0	5.8	.179	1′-9"	23.1	9.0	3.5	.179	1′-8"
28	27.1	9.5	5.7	.179	1′-10"	27.1	10.0	3.5	.179	1′-9"
32	31.0	9.5	5.2	.239	1′-11"	31.0	9.5	3.5	.239	1′-10"
36	35.0	10.0	5.1	.239	2′-0"	35.0	10.0	3.5	.239	1′-11"
40	39.0	10.5	5.1	.239	2′-3"	39.0	11.0	3.5	.239	2′-1"
44	43.0	11.0	5.1	.239	2′-8"	43.0	11.5	4.0	.239	2′-3"

D_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_F = Fixed Arm Length
L_C = Clamp-on Arm Length (36′ Max)

③ Thickness shown are minimums, thicker materials may be used.

④ D_2 may be increased by up to 1.0" for polygonal arms.

(NOTE: SHEET 1 OF 3 AND 2 OF 3 CAN BE FOUND IN TRAFFIC STANDARDS SECTION ON SHEETS 34 AND 35)

SH 35 AT CR 25

STATE OF TEXAS
KETI B. HRISTOVA
90998
LICENSED
PROFESSIONAL ENGINEER

Keti Hristova

04/26/2021

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
DUAL MAST ARM ASSEMBLY
(100 MPH WIND ZONE)
DMA-100 (3)-12

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

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	SH 35
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		30

125C

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FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft (4), (5), (6)			ANCHOR BOLT DESIGN (1)				FOUNDATION DESIGN LOAD (2)		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	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)

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.

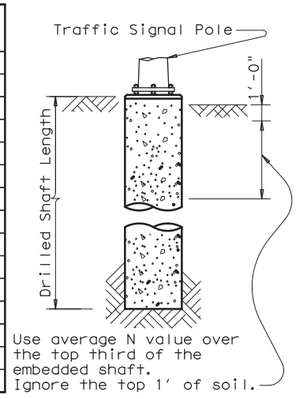
(6) Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

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
SH 35 AT CR 25	**10**	**42-A**	**1**					**17**
TOTAL DRILLED SHAFT LENGTHS								**17**

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'



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.

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".

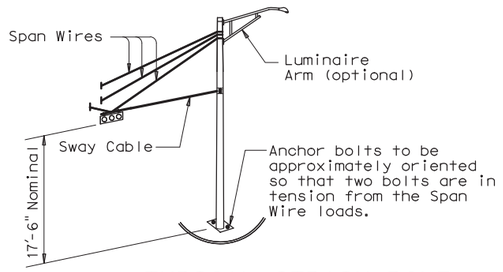
Concrete shall be Class "C".

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.

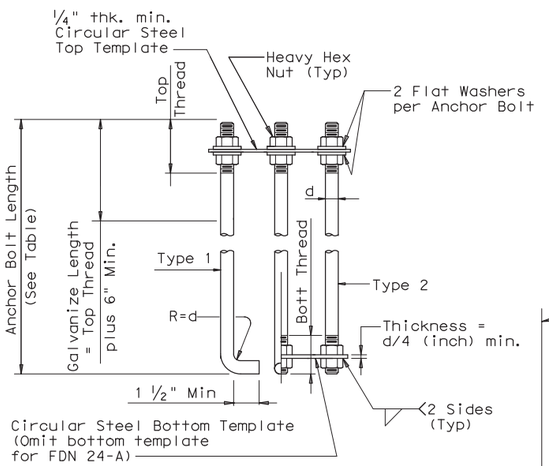
Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise 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".

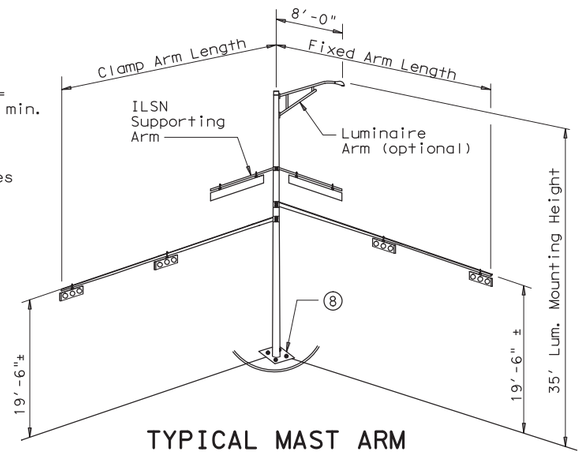
EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



TYPICAL STRAIN POLE ASSEMBLY

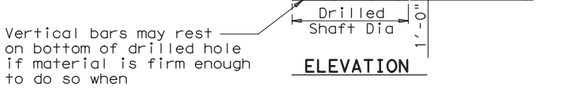


ANCHOR BOLT ASSEMBLY



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

TYPICAL MAST ARM ASSEMBLY



TOP VIEW

ELEVATION

FOUNDATION DETAILS

STATE OF TEXAS
KETI B. HRISTOVA
90998
LICENSED PROFESSIONAL ENGINEER

04/26/2021

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

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REVISIONS	CONT	SECT	JOB	HIGHWAY
5-96	0921	00	641	SH 35
11-98	DIST	COUNTY		SHEET NO.
1-12	HOU	BRAZORIA		31

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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	1	50S		50	
55	55L		55S		55	
60	60L		60S		60	
65	65L		65S		65	
Dual Mast Arm						
Lf ft. / Lc ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50 / 20	5020L		5020S		5020	
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
SH 35 AT CR 25	10	1	21
Total Drill Shaft Length			21

Notes

** Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

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

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	1
55	55IV	
60	60IV	
65	65IV	

Luminaire Arms (1 per 30′ pole)

Nominal Arm Length	Quantity
8′ Arm	1

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"	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.

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

SH 35 AT CR 25

STATE OF TEXAS
KETI B. HRISTOVA
90998
LICENSED
PROFESSIONAL ENGINEER

Keti Hristova

04/26/2021

(NOTE: SHEETS 1, 2, 3 AND 4 OF 5 CAN BE FOUND IN TRAFFIC SIGNAL STANDARD SHEETS 36, 37, 38 AND 39)

Texas Department of Transportation
Traffic Operations Division

LONG MAST ARM ASSEMBLY PARTS LIST

LMA(5)-12

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

REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	SH 35
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		32

131E

DATE:
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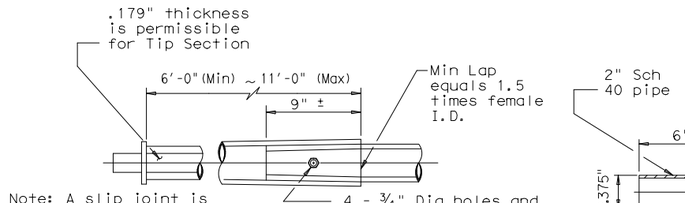

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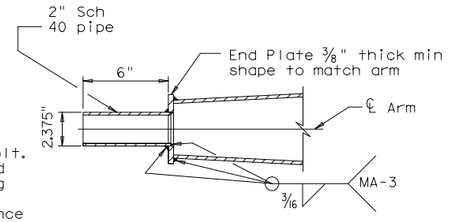


TENON DETAIL

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.

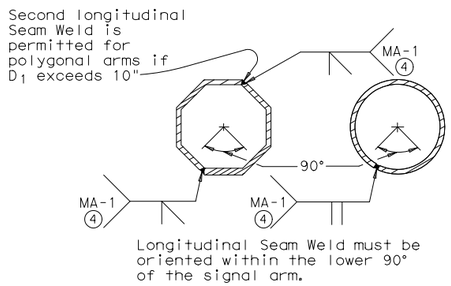
If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

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.

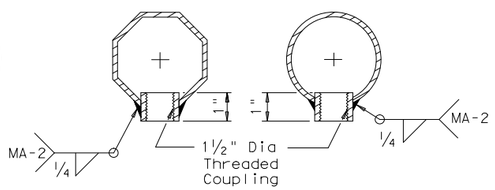
Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

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



ARM COUPLING DETAILS

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 100 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

(100 MPH WIND ZONE)

SMA-100(2)-12

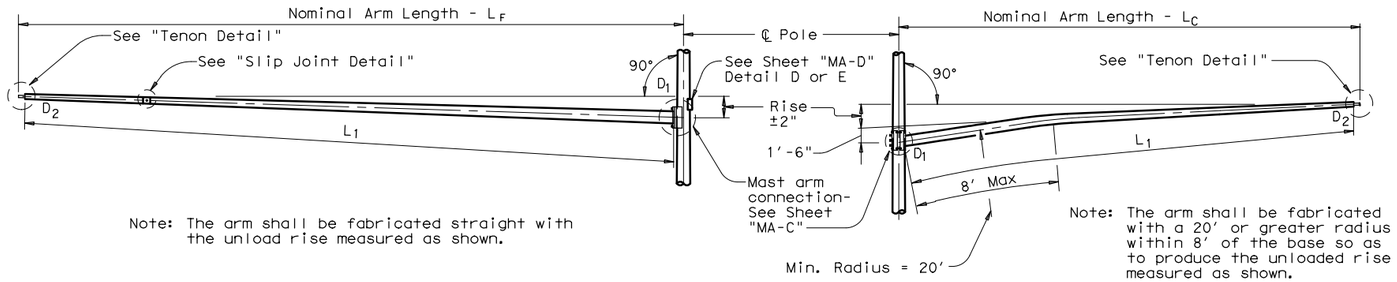
DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	ANTOINE DR
DIST	COUNTY		SHEET NO.
HOU	HARRIS/		33

123B

DATE:
FILE:

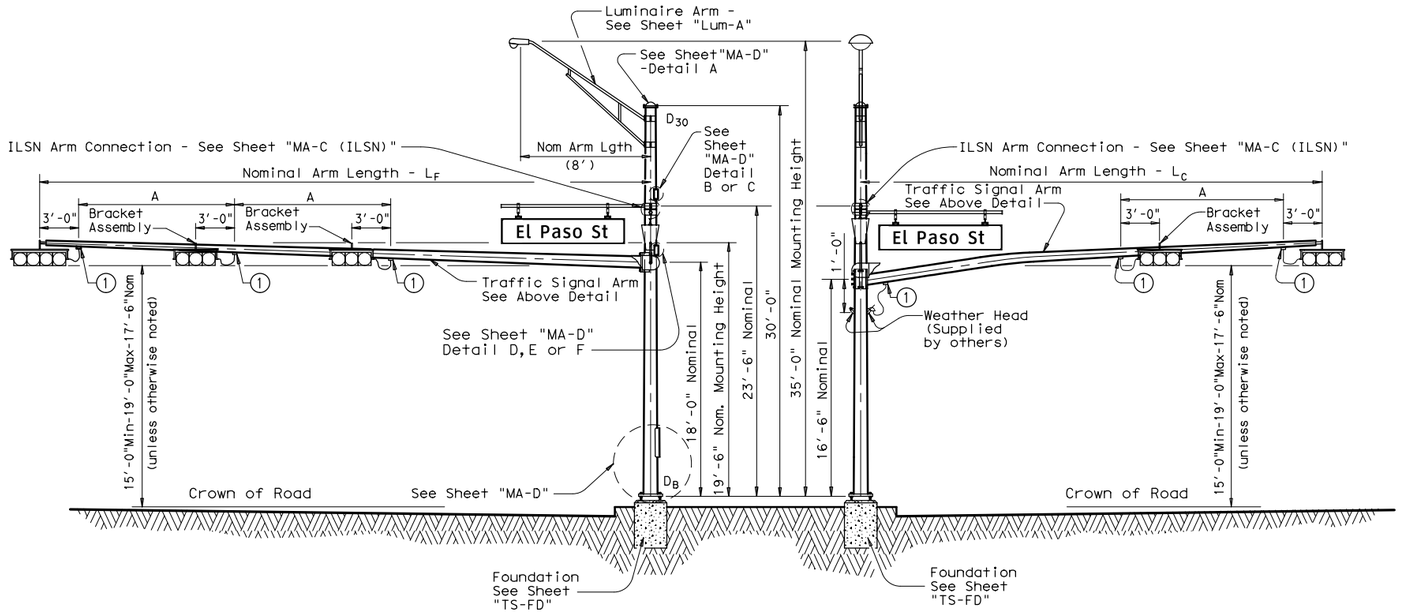


Note: The arm shall be fabricated straight with the unload rise measured as shown.

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

CLAMP-ON TRAFFIC SIGNAL ARM



ELEVATION

(Showing fixed mount arm)

STRUCTURE ASSEMBLY

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

ELEVATION

(Showing clamp mount arm)

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

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 100 mph plus a 1.3 gust factor. 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 signs and two traffic signal arms with length combinations as tabulated. The specified luminaire load applied at the end of 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 applied 4'-6" from the centerline of the pole equals 85 lbs vertical dead load plus the 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
DUAL MAST ARM ASSEMBLY
(100 MPH WIND ZONE)
DMA-100 (1)-12

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

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	SH 35
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		34

125A

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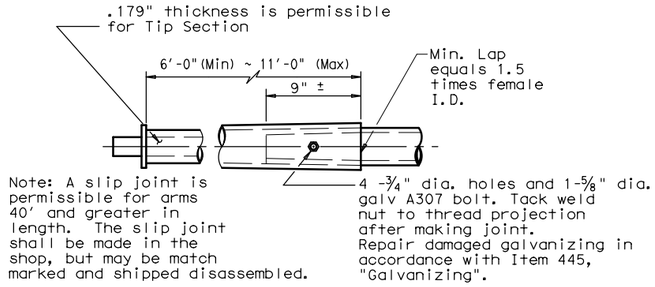
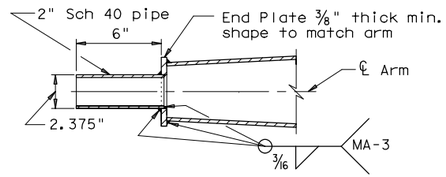


SLIP JOINT DETAIL



TENON DETAIL

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

BRACKET ASSEMBLY

VIBRATION WARNING

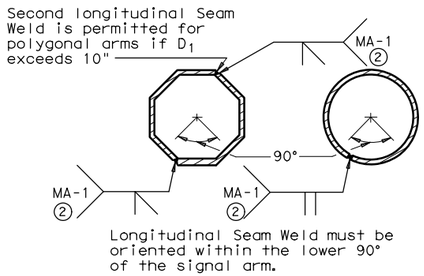
Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights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

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

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

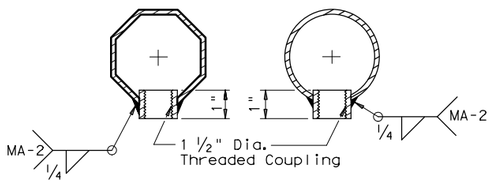
The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 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.



ARM WELD DETAIL

②60% Min. penetration
100% pemetration within 6" of circumferential base welds.



ARM COUPLING DETAILS

Texas Department of Transportation
Traffic Operations Division

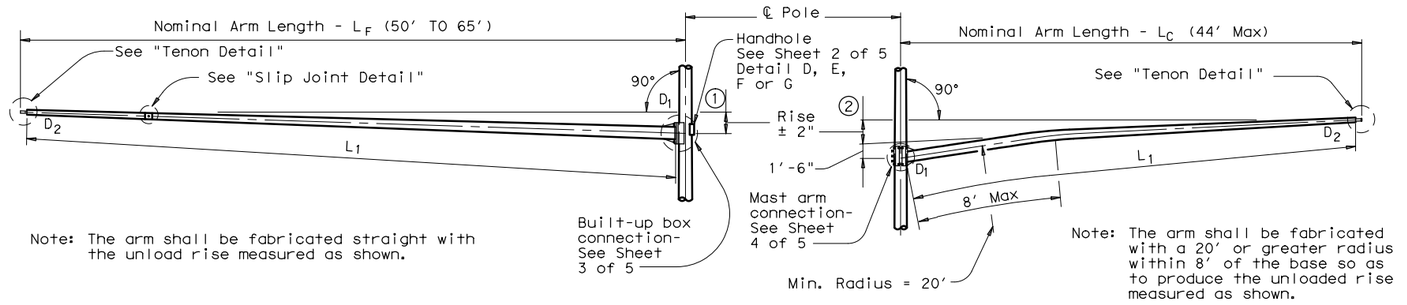
TRAFFIC SIGNAL SUPPORT STRUCTURES
DUAL MAST ARM ASSEMBLY
(100 MPH WIND ZONE)
DMA-100 (2)-12

DN: MS	CK: JSY	DW: MWF	CK: JSY

REVISIONS
05-96
1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	SH 35
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		35

DATE:
FILE:

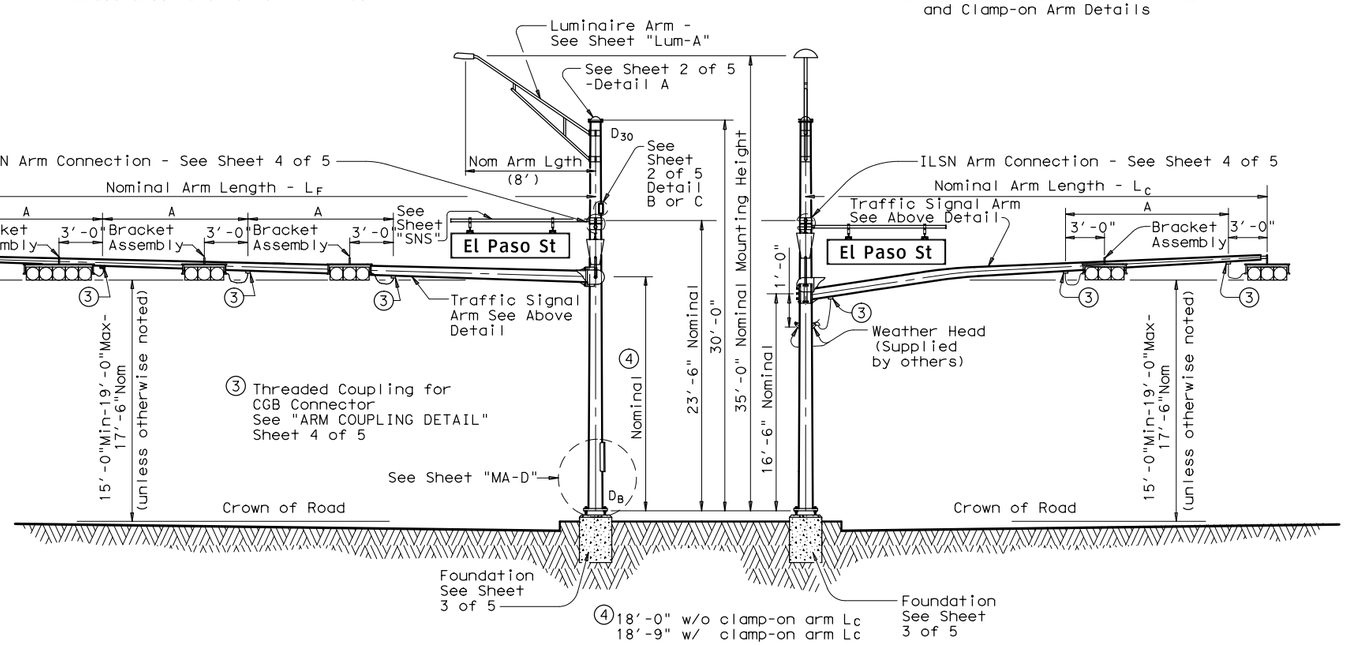


FIXED MOUNT TRAFFIC SIGNAL ARM

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

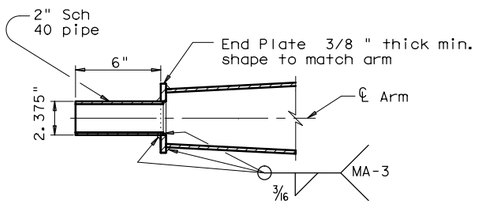


ELEVATION
(Showing fixed mount arm)

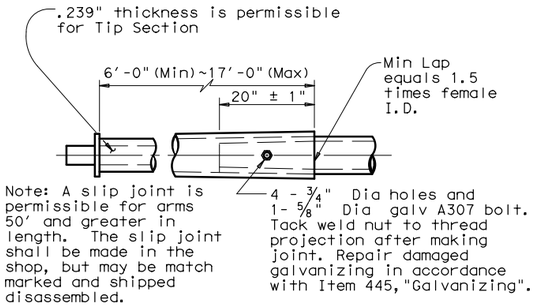
STRUCTURE ASSEMBLY

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.

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

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
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1-12	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		36

131A

DATE:
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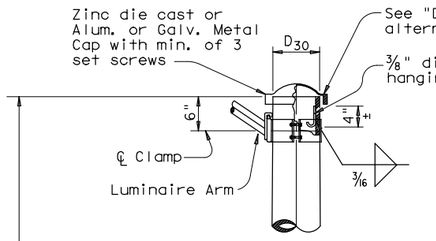
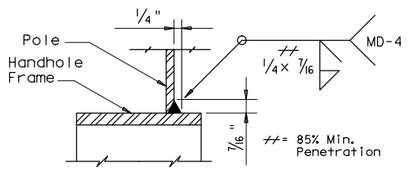
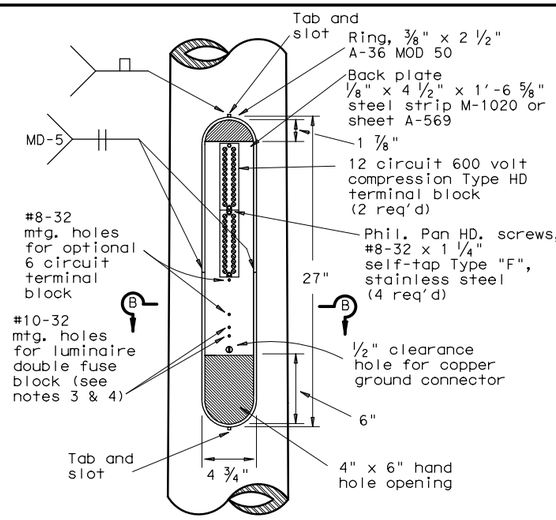


DETAIL A

(for pole with luminaire)



DETAIL H

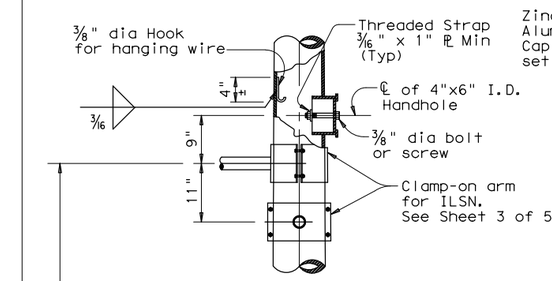


ACCESS COMPARTMENT

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

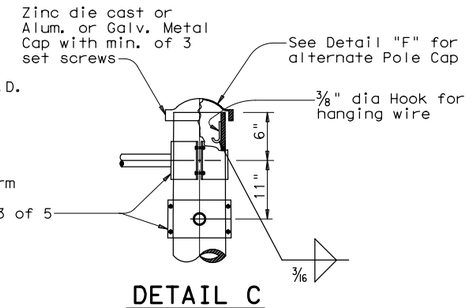
(7) ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

(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.

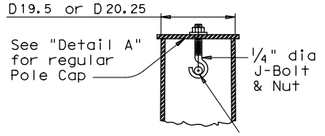


DETAIL B

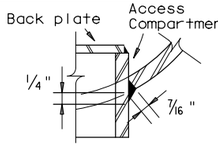
(If ILSN applied)



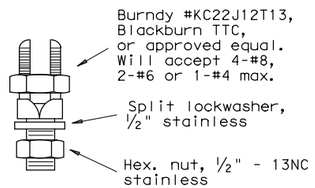
DETAIL C



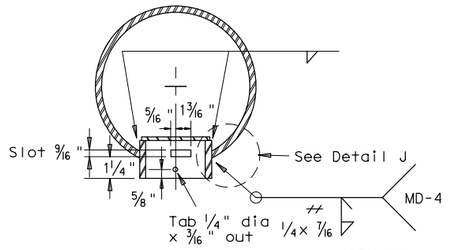
SECTION Y-Y



DETAIL J



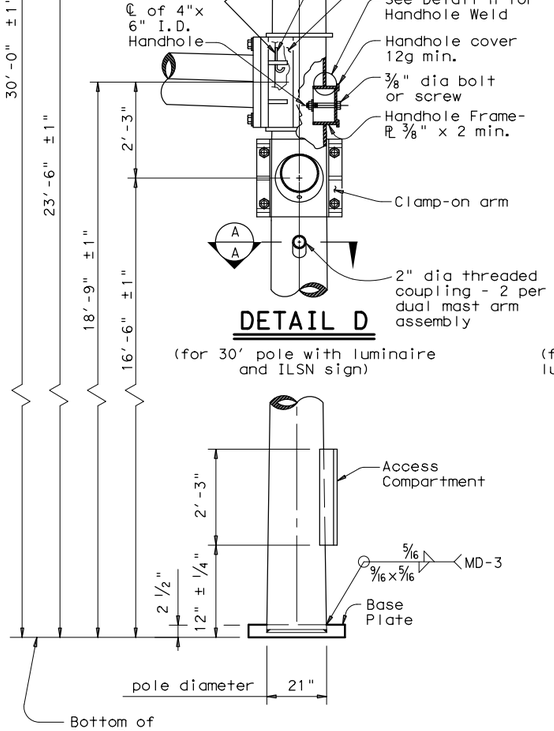
COPPER GROUND CONNECTOR



SECTION B-B

// = 85% Min. Penetration

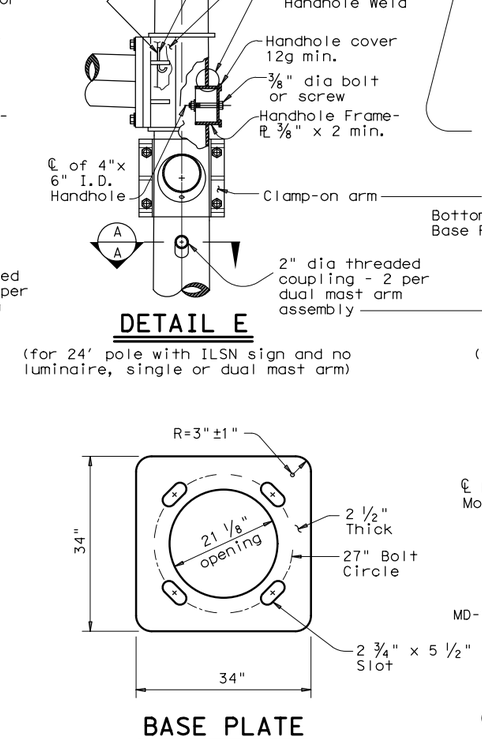
Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.



DETAIL D

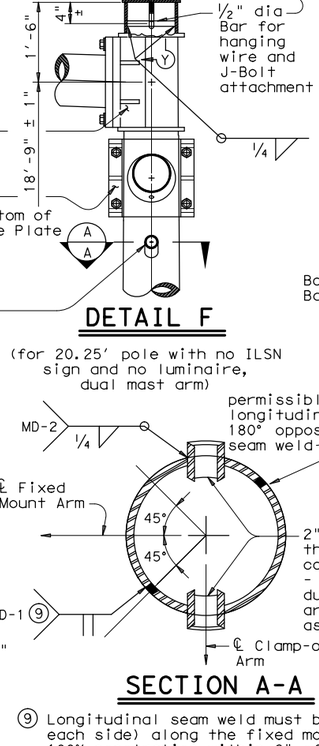
(for 30' pole with luminaire and ILSN sign)

POLE ELEVATION



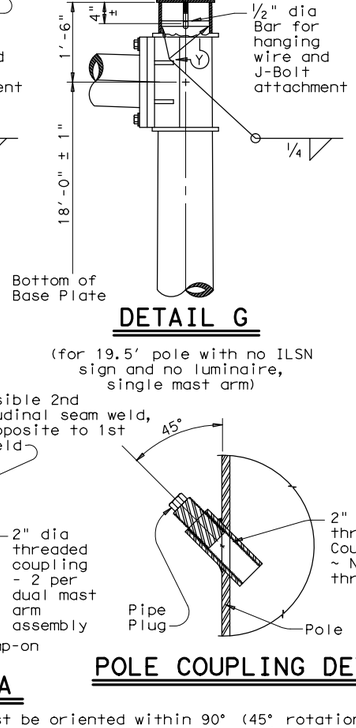
DETAIL E

(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)

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.

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.

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
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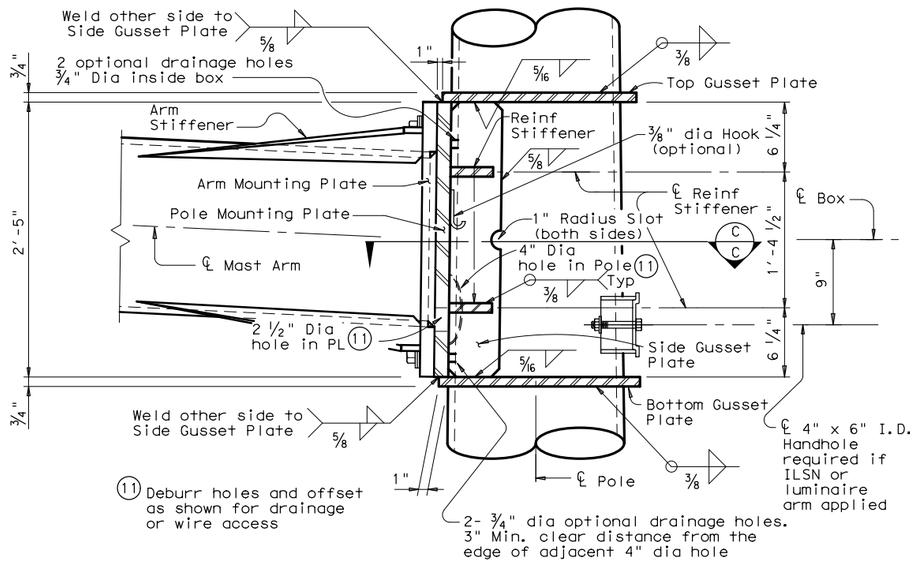
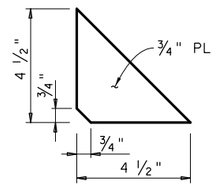
1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	SH 35
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		37

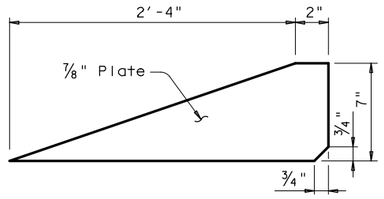
131B



BUILT-UP BOX CONNECTION

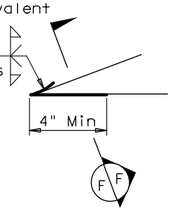


REINFORCING STIFFENER



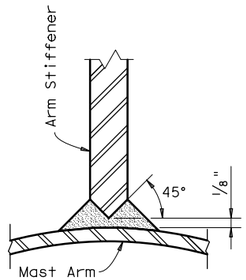
ARM STIFFENER
(Cut to match arm inclination and taper)

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.

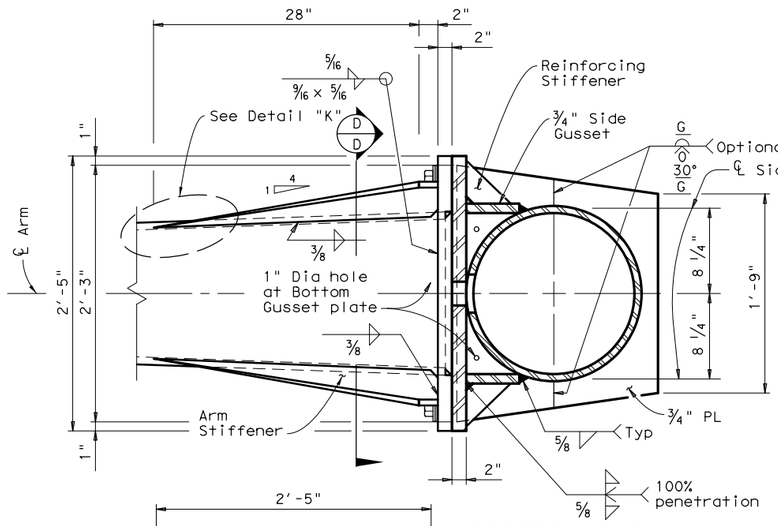
(13) Shaft profile 16-sided or 18-sided is considered to be equivalent to round section.

GENERAL NOTES:

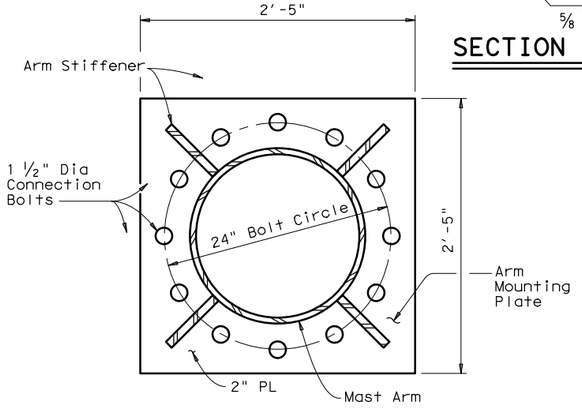
Built-up Box Connection: For the welded arm-to-pole connection as a build-up box configuration illustrated here is an example only, fabricators are required to submit a shop drawing of box connection for approval. The drawing shall specify the details of each box element, welds of arm-to-pole connection, 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.

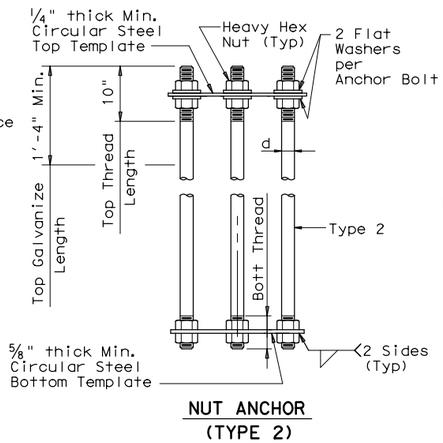
Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.



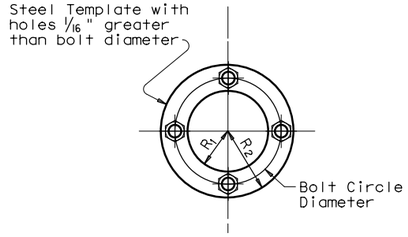
SECTION C-C



SECTION D-D



NUT ANCHOR
(TYPE 2)



TEMPLATE DETAIL

ANCHOR BOLT ASSEMBLY

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.

Texas Department of Transportation
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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
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CONT	SECT	JOB	HIGHWAY
0912	00	641	SH 35
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		38

131C

DATE:
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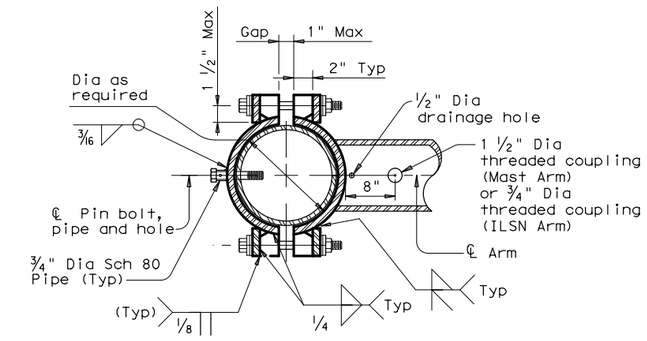
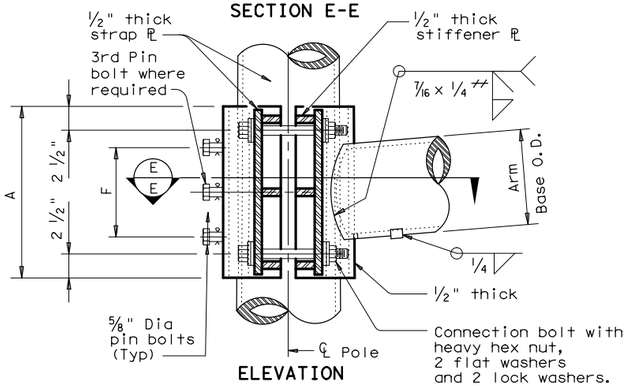


SECTION E-E



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"

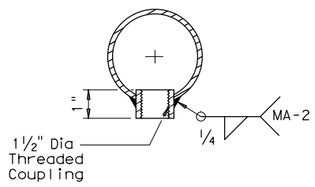
D1 = Arm Base O.D.
D2 = Arm End O.D.
L1 = Shaft Length
Lc = Clamp-on Arm Length

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

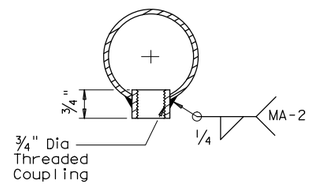
CLAMP-ON ARM CONNECTION

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

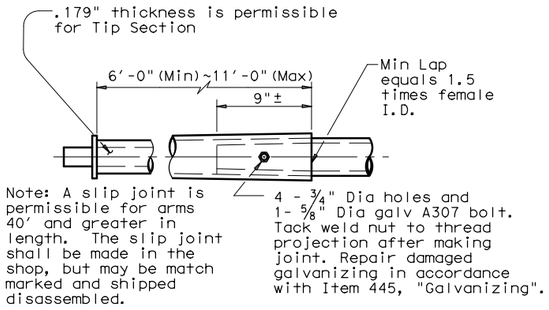
Mast Arm Size		A	F	4 Conn. Bolts	5/8" Dia. Pin Bolts
Base Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
6.5	.179	12	6	1	2
7.5	.179	14	8	1	2
8.0	.179	14	8	1	2
9.0	.179	16	10	1	2
9.5	.179	18	12	1 ¼	3
9.5	.239	18	12	1 ¼	3
10.0	.239	18	12	1 ¼	3
10.5	.239	18	12	1 ¼	3
11.0	.239	18	12	1 ¼	3
11.5	.239	18	12	1 ¼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



ARM COUPLING DETAIL



ILSN ARM COUPLING DETAIL

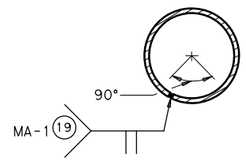


Note: A slip joint is permissible for arms 40' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

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 1/8" 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
0912	00	641	SH 35
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		39

131D

DATE:
FILE:

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. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

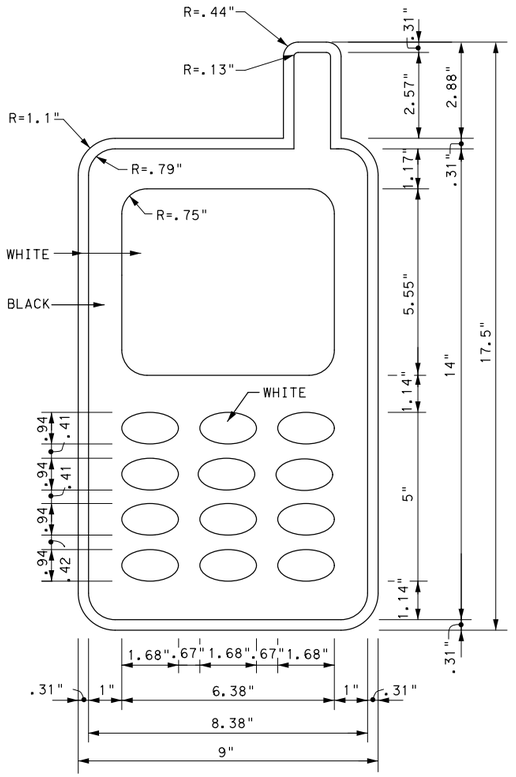
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

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 APPAREL 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.



3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange;
[TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	SH 35
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	HOU	BRAZORIA		40

DATE:
FILE:

DATE:
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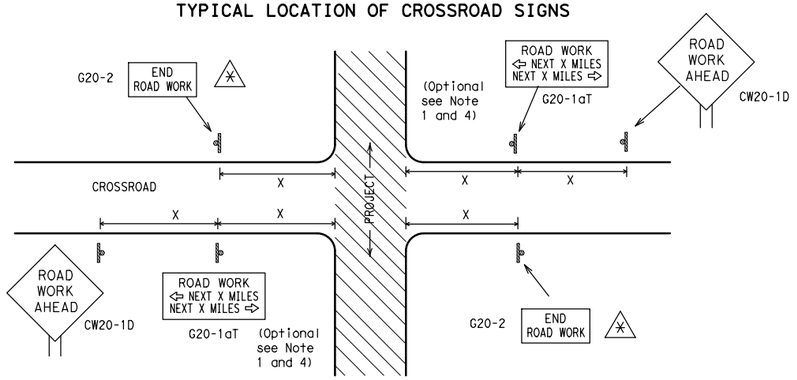
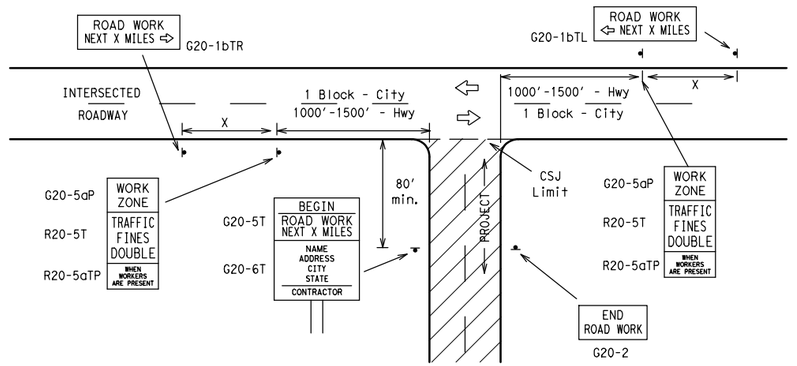
TYPICAL LOCATION OF CROSSROAD SIGNS



⁂ 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. 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]

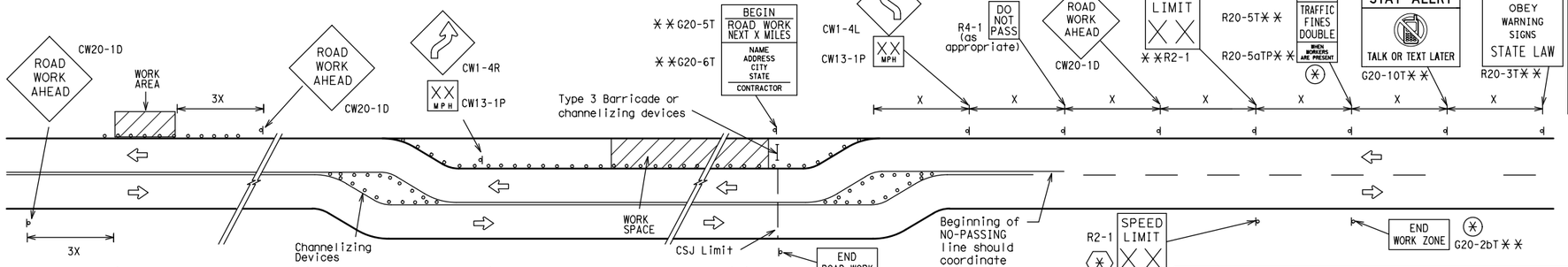
⁂ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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. 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.

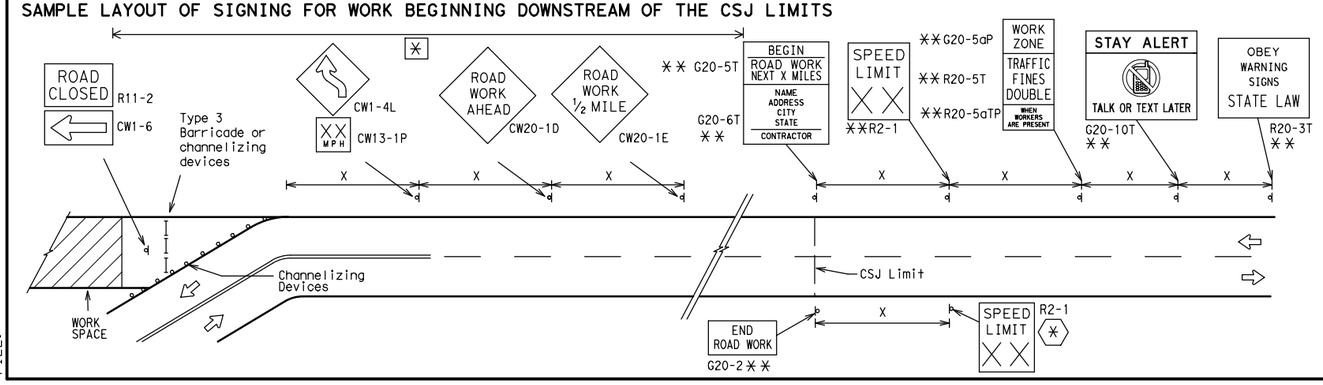
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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 AT THE CSJ LIMITS

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



NOTES

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

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

⁂⁂ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

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

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

LEGEND

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	SH 35
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	HOU	BRAZORIA		41

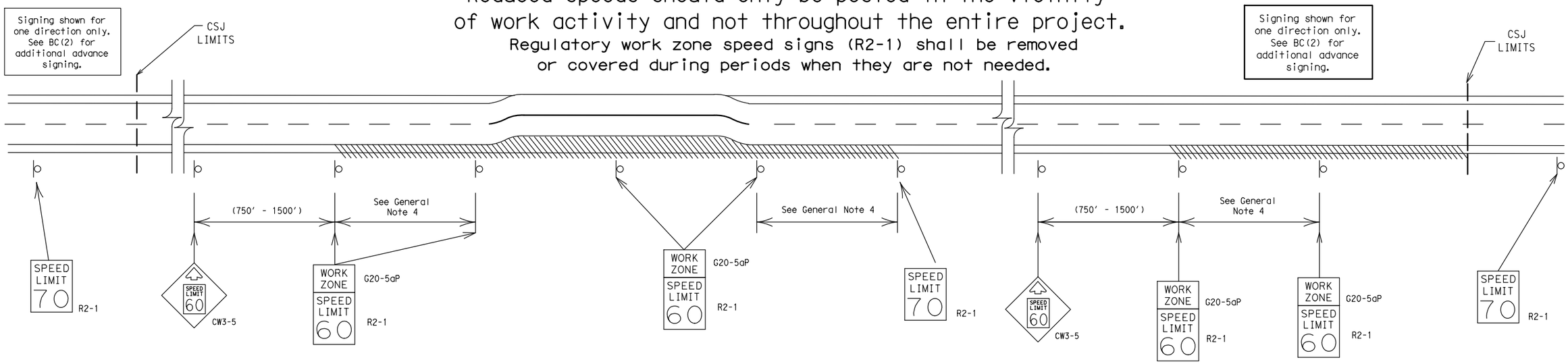
DATE:
FILE:

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

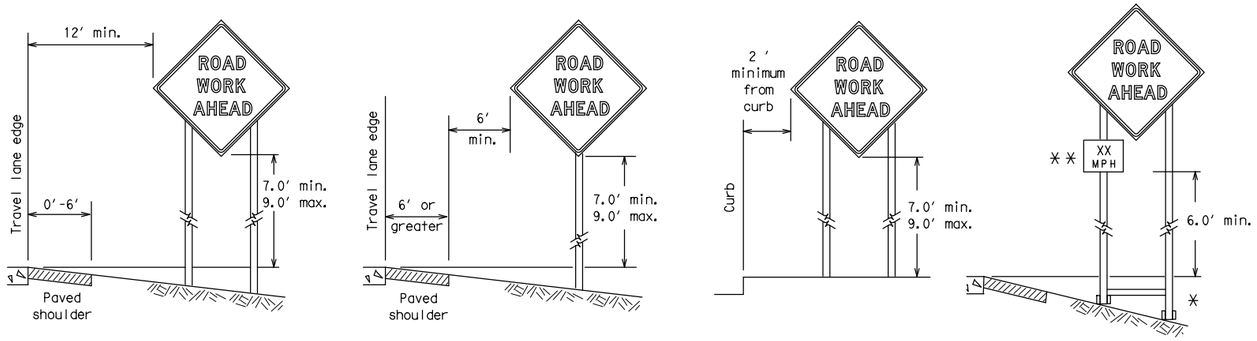
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0912	00	641	SH 35
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		42

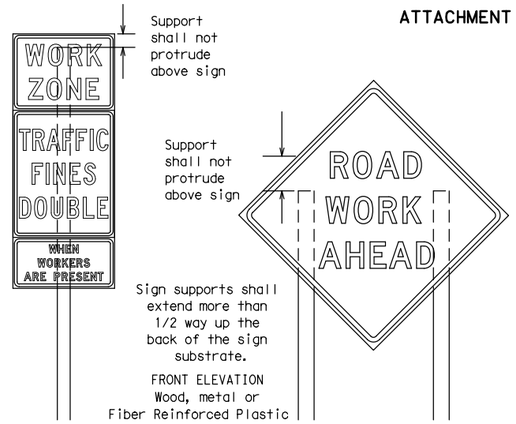
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

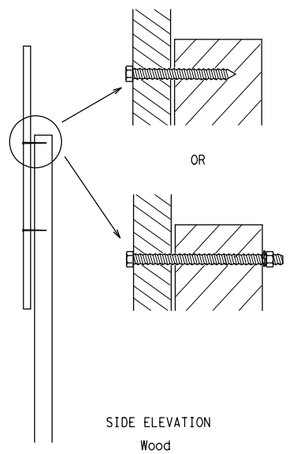


⚹ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⚹⚹ 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





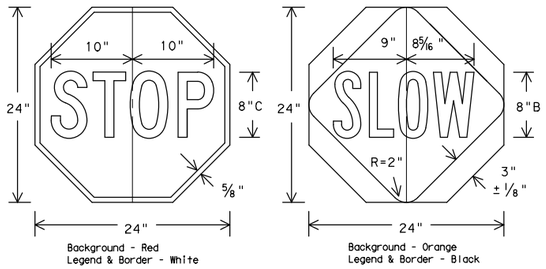
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
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.



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, 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.
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 sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
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). 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 Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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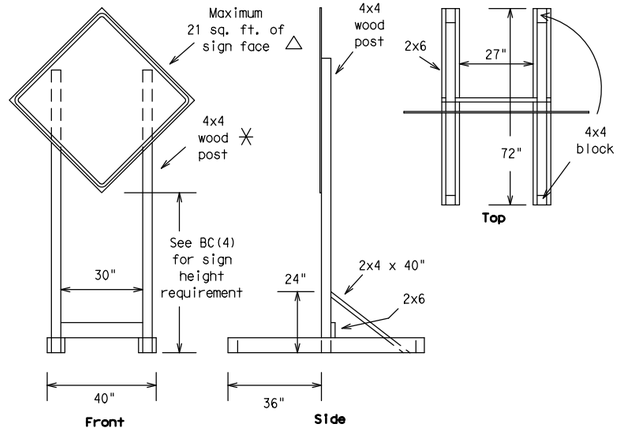
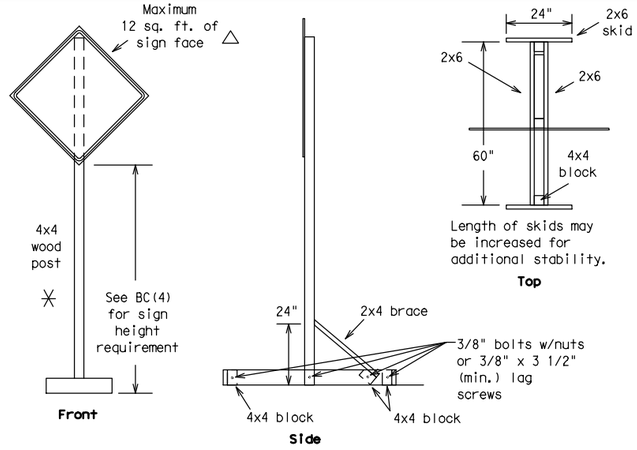
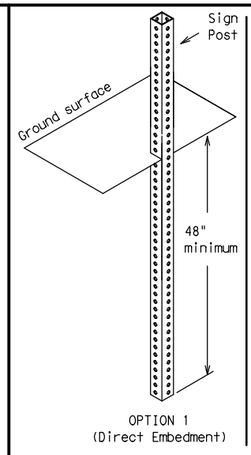
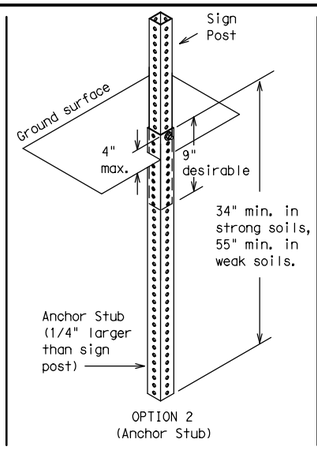


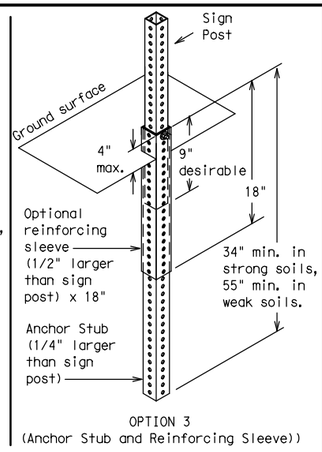


SKID MOUNTED WOOD SIGN SUPPORTS

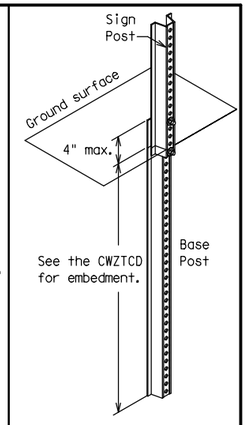
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □







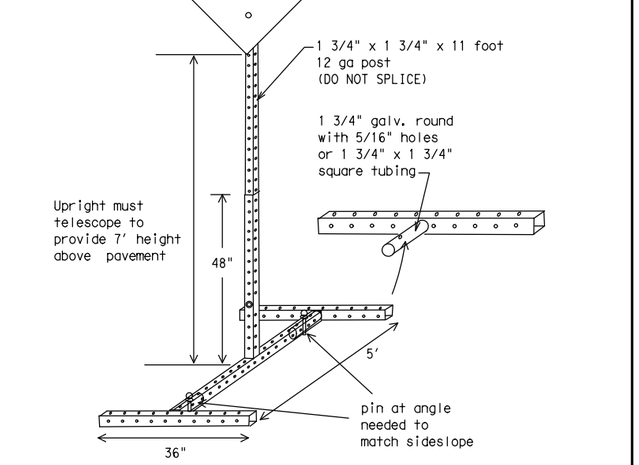
PERFORATED SQUARE METAL TUBING

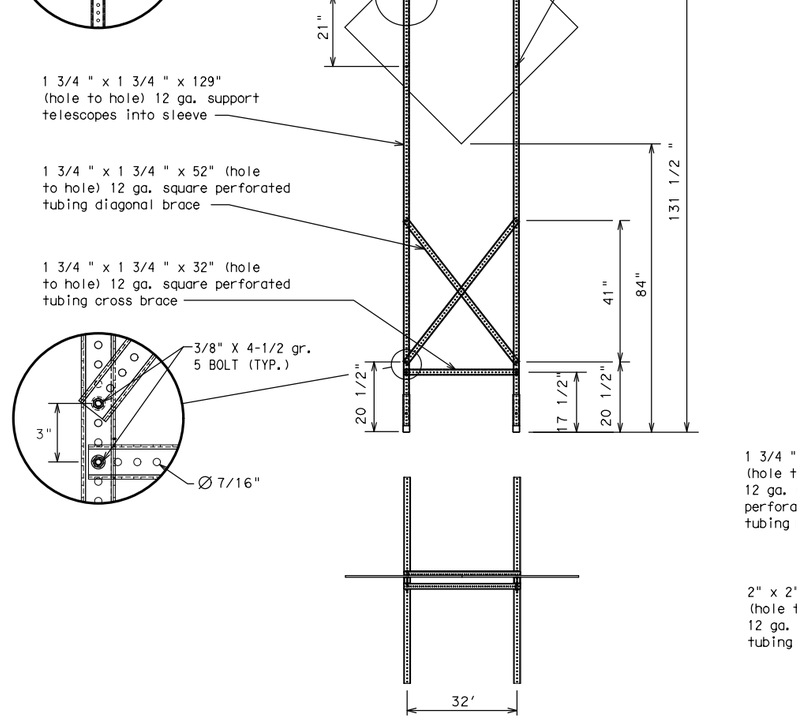


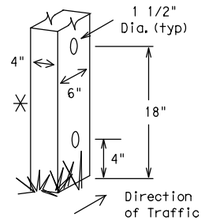
WING CHANNEL
Lap-splice/base bolted anchor

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.

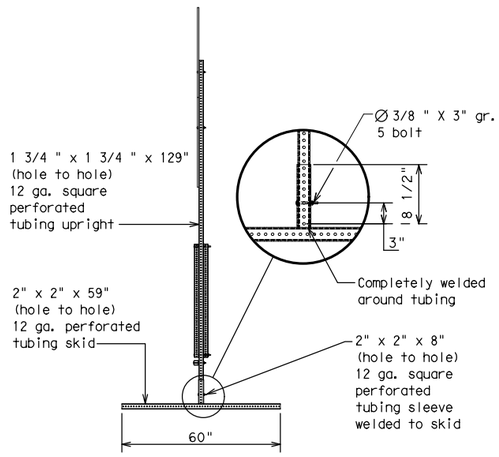






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND 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.

SHEET 5 OF 12

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

DATE:
FILE:

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 Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

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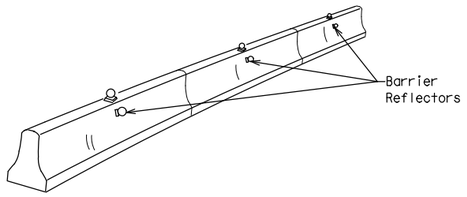
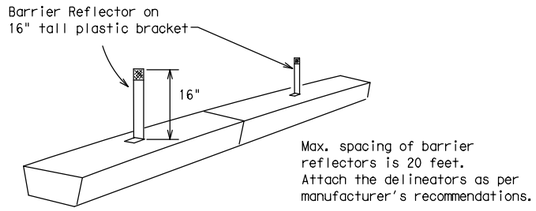
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

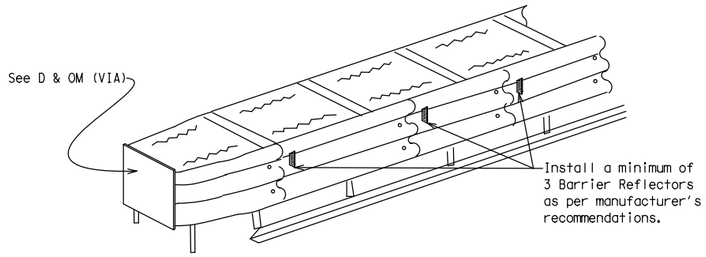


CONCRETE TRAFFIC BARRIER (CTB)

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



LOW PROFILE CONCRETE BARRIER (LPCB)

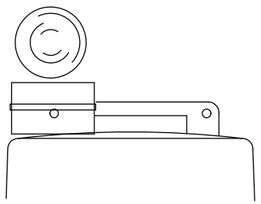


DELINEATION OF END TREATMENTS

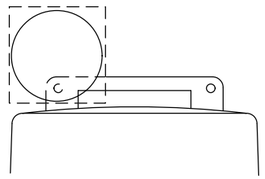
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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

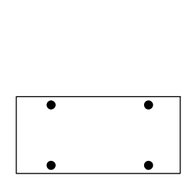
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

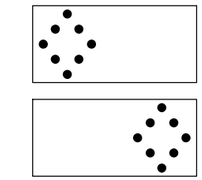
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

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:

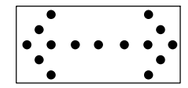


4 CORNER CAUTION

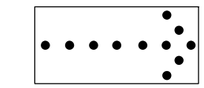
OR



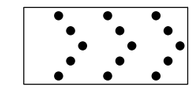
ALTERNATING DIAMOND CAUTION



DOUBLE ARROW



LEFT & RIGHT



CHEVRON ARROW
LEFT & RIGHT

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 National Cooperative Highway Research Report No. 350 (NCHRP 350) or 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 Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	SH 35
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	HOU	BRAZORIA		46

101

DATE:
FILE:

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:

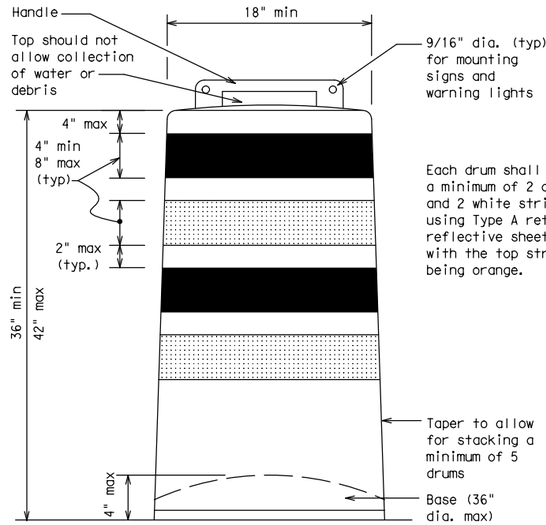
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

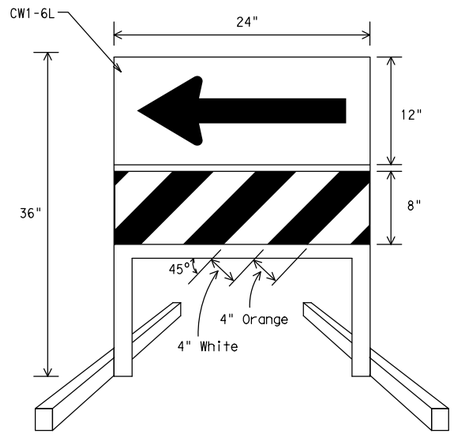
RETROREFLECTIVE SHEETING

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 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.

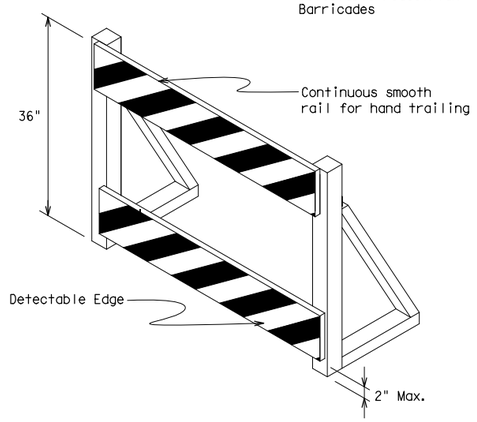




DIRECTION INDICATOR BARRICADE

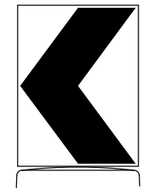
1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3.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

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

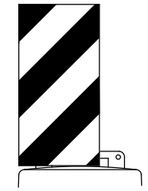


DETECTABLE PEDESTRIAN BARRICADES

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.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
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 for Buildings and Facilities (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 may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	SH 35
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	HOU	BRAZORIA		47

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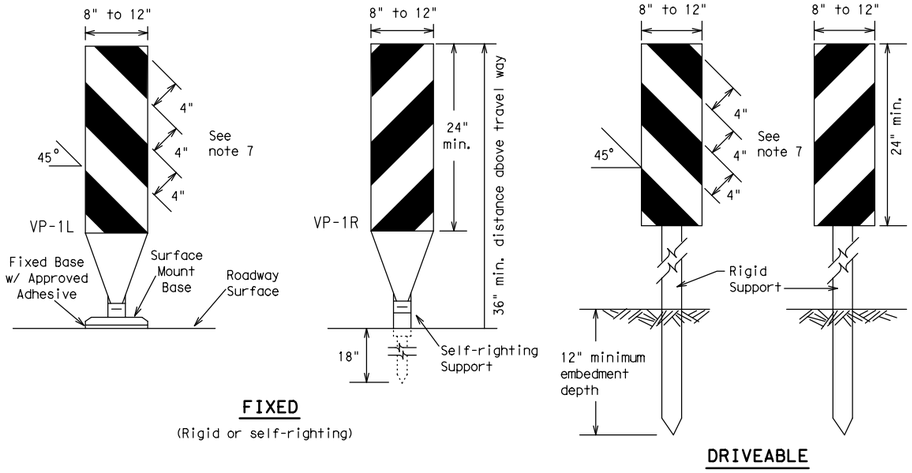
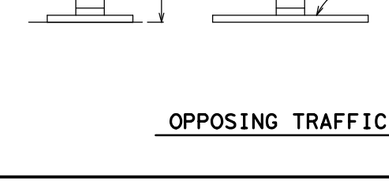


FIXED
(Rigid or self-righting)

DRIVEABLE

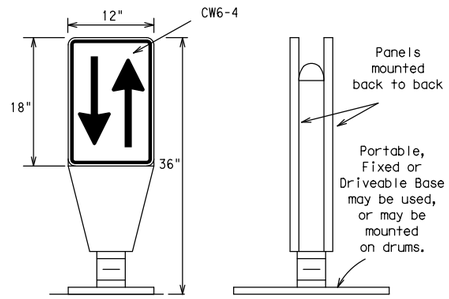


(Rigid or self-righting)

PORTABLE

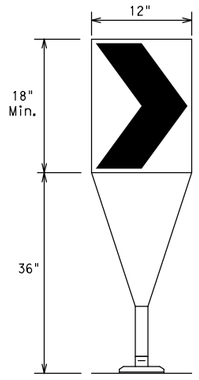
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of 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 conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



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

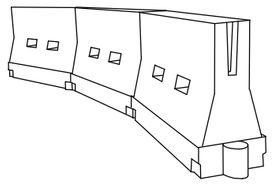
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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

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

CHEVRONS



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

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

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

GENERAL NOTES

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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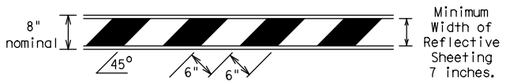
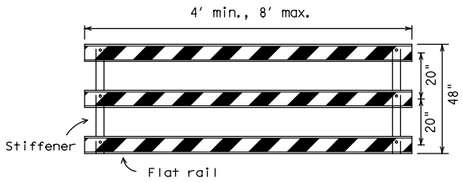
TYPE 3 BARRICADES

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 conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



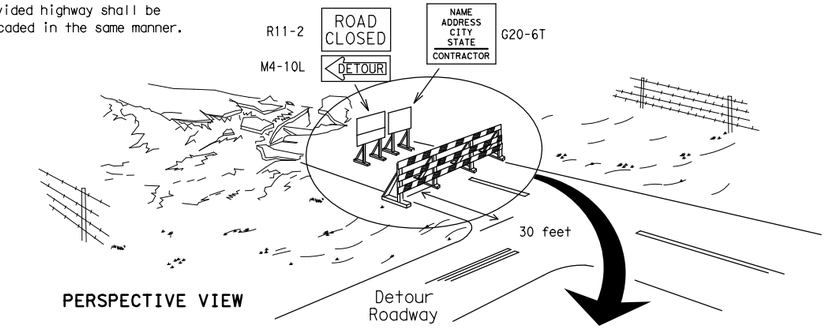
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

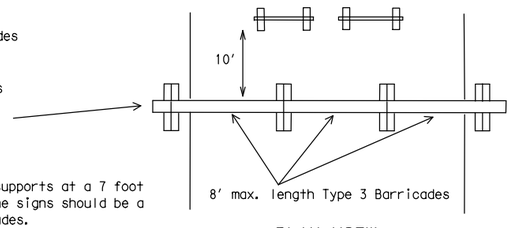
Each roadway of a divided highway shall be barricaded in the same manner.



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.

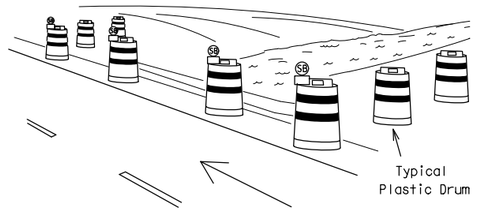
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

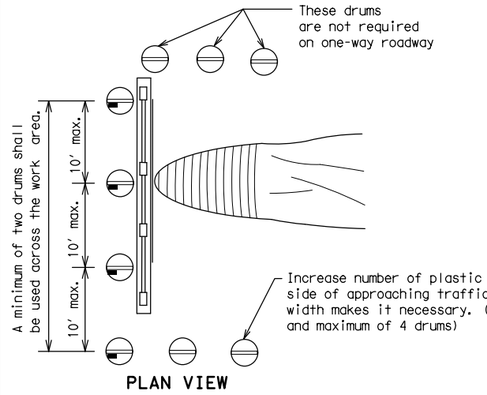
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

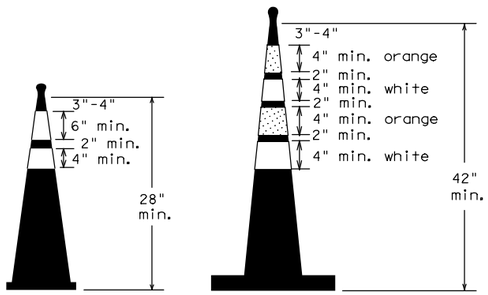
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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

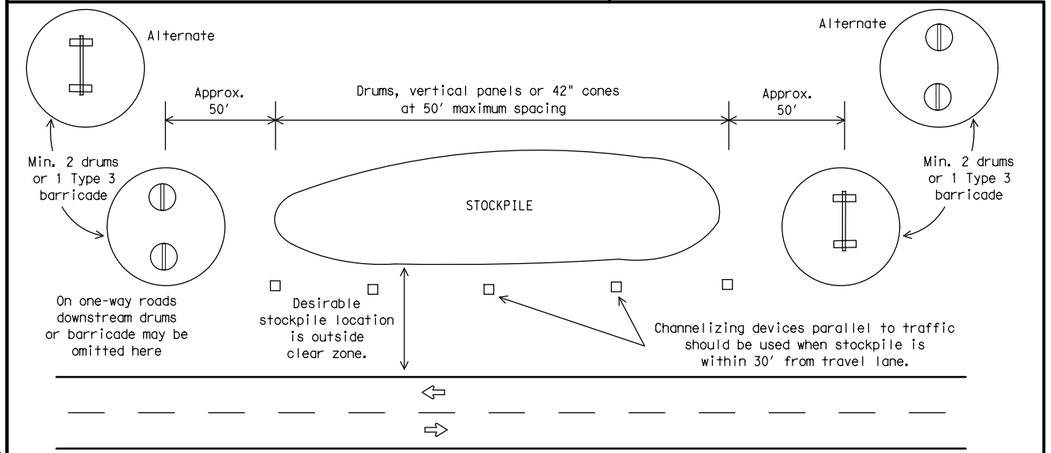
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

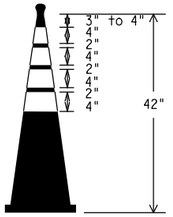
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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

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



EDGELINE CHANNELIZER

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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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.

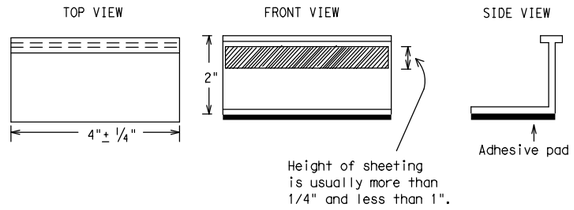
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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).

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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11-02 8-14				

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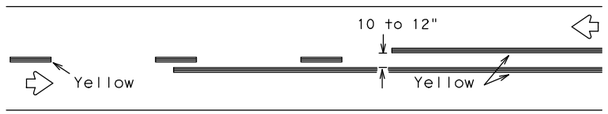
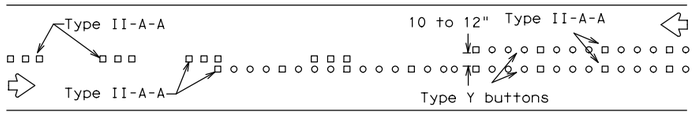
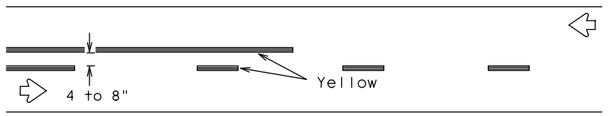
PAVEMENT MARKING PATTERNS



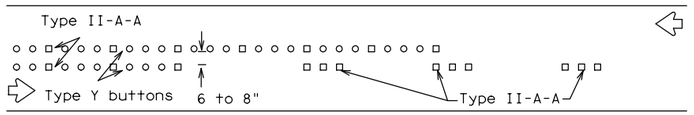
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



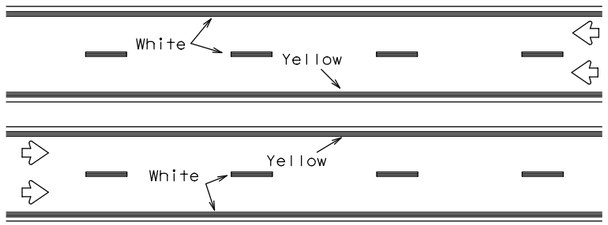
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



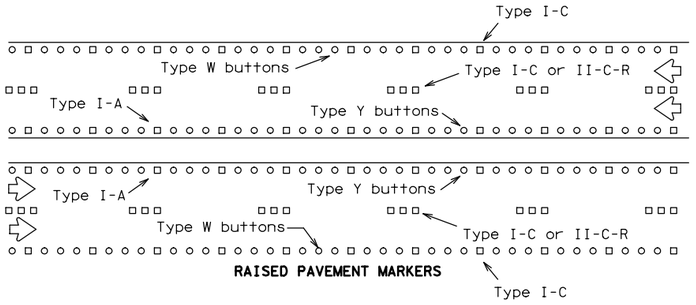
RAISED PAVEMENT MARKERS - PATTERN B

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

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



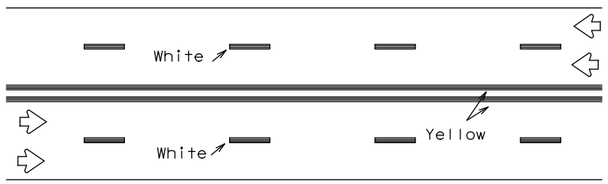
REFLECTORIZED PAVEMENT MARKINGS



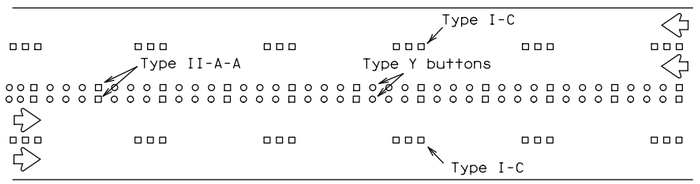
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



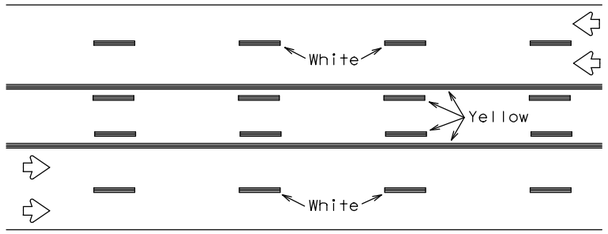
REFLECTORIZED PAVEMENT MARKINGS



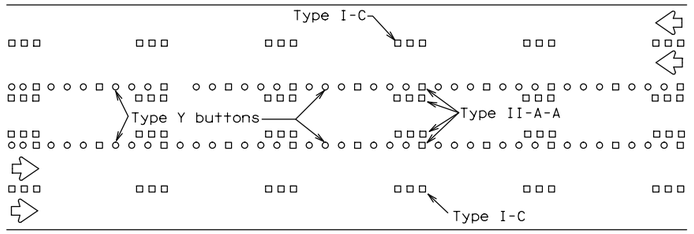
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

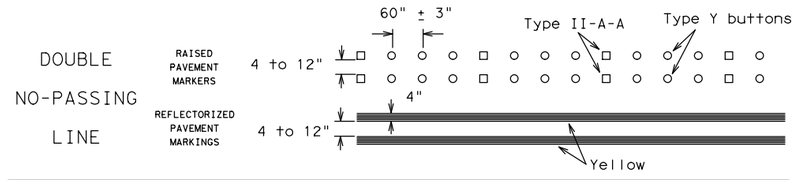
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

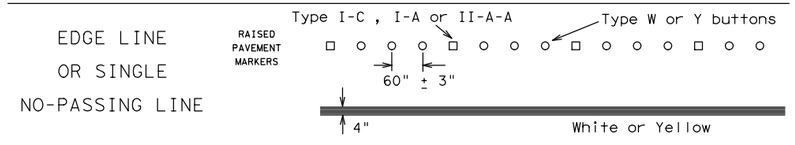
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

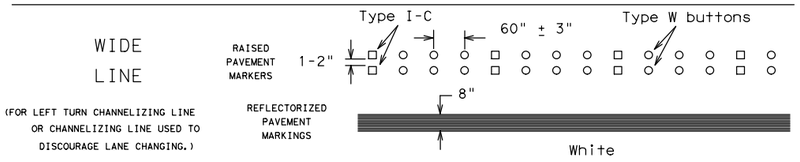


EDGE LINE OR SINGLE NO-PASSING LINE



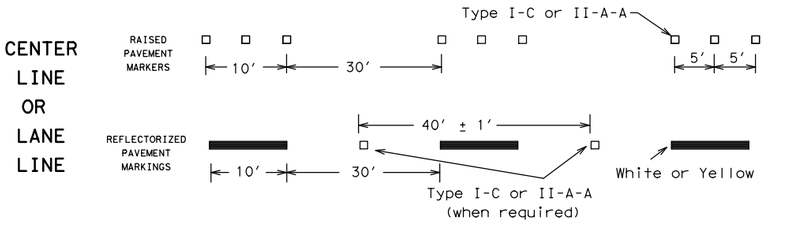
WIDE LINE

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

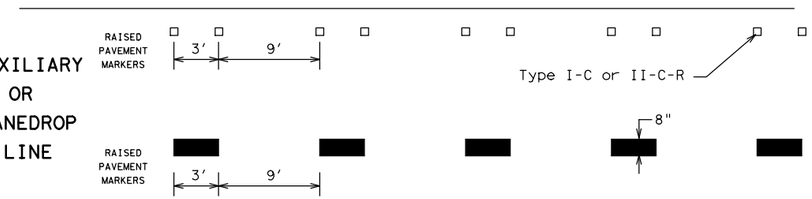


BROKEN LINES

CENTER LINE OR LANE LINE

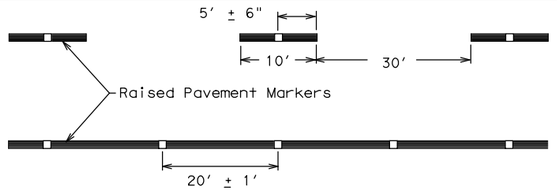


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

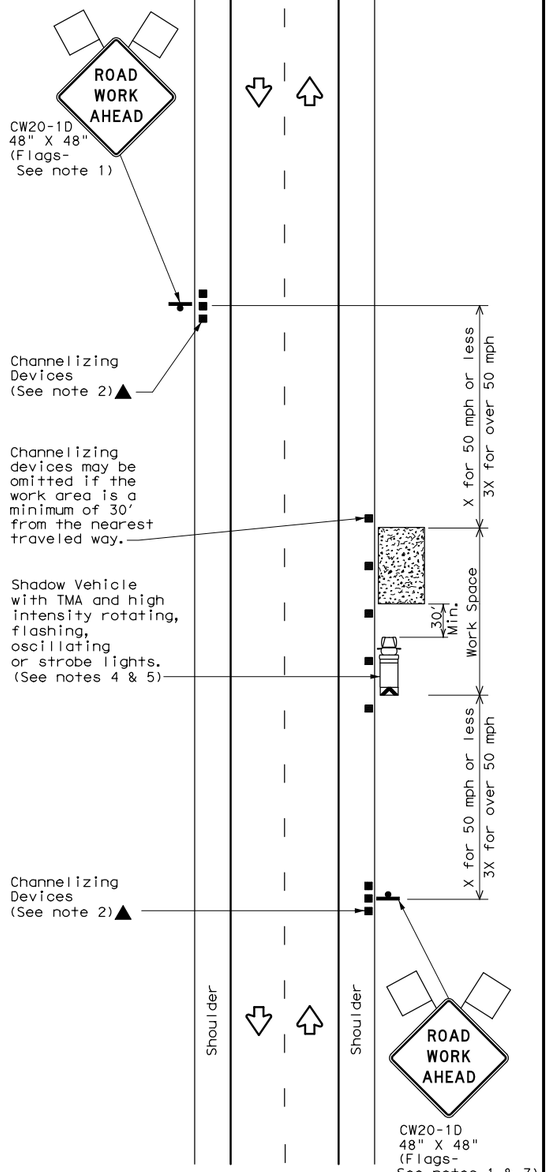
BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	SH 35
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	HOU	BRAZORIA		51
11-02 8-14				

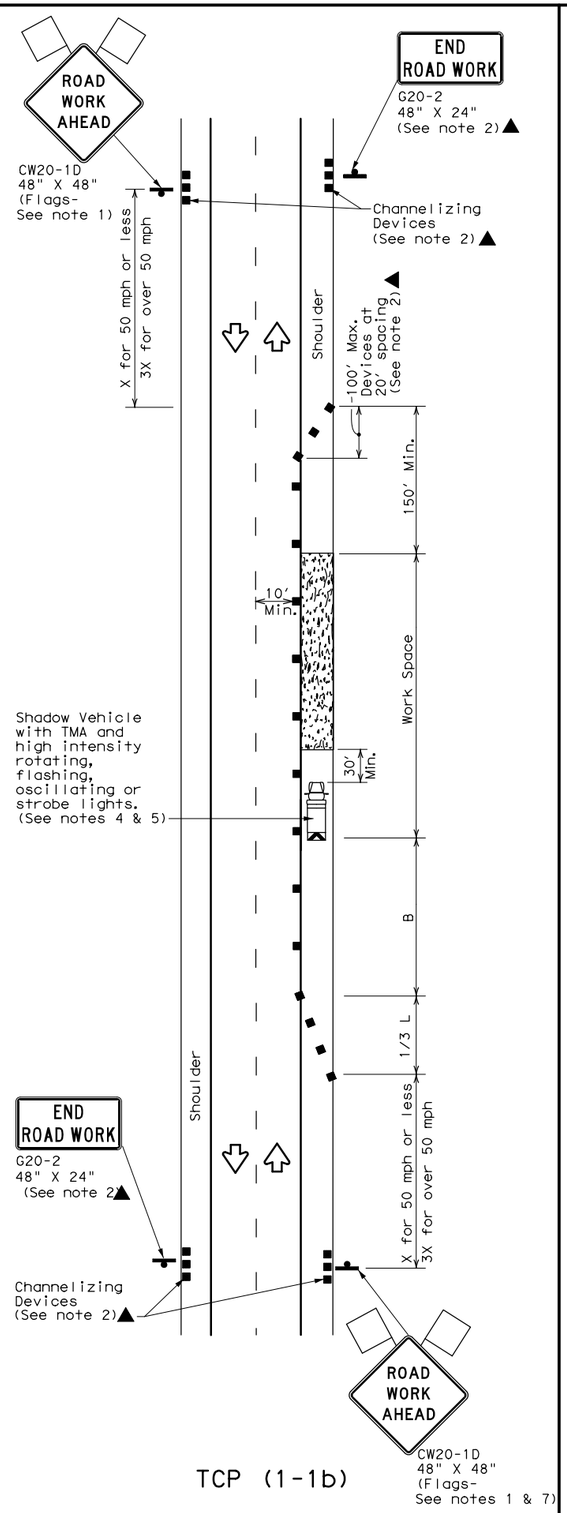
106

DATE:
FILE:



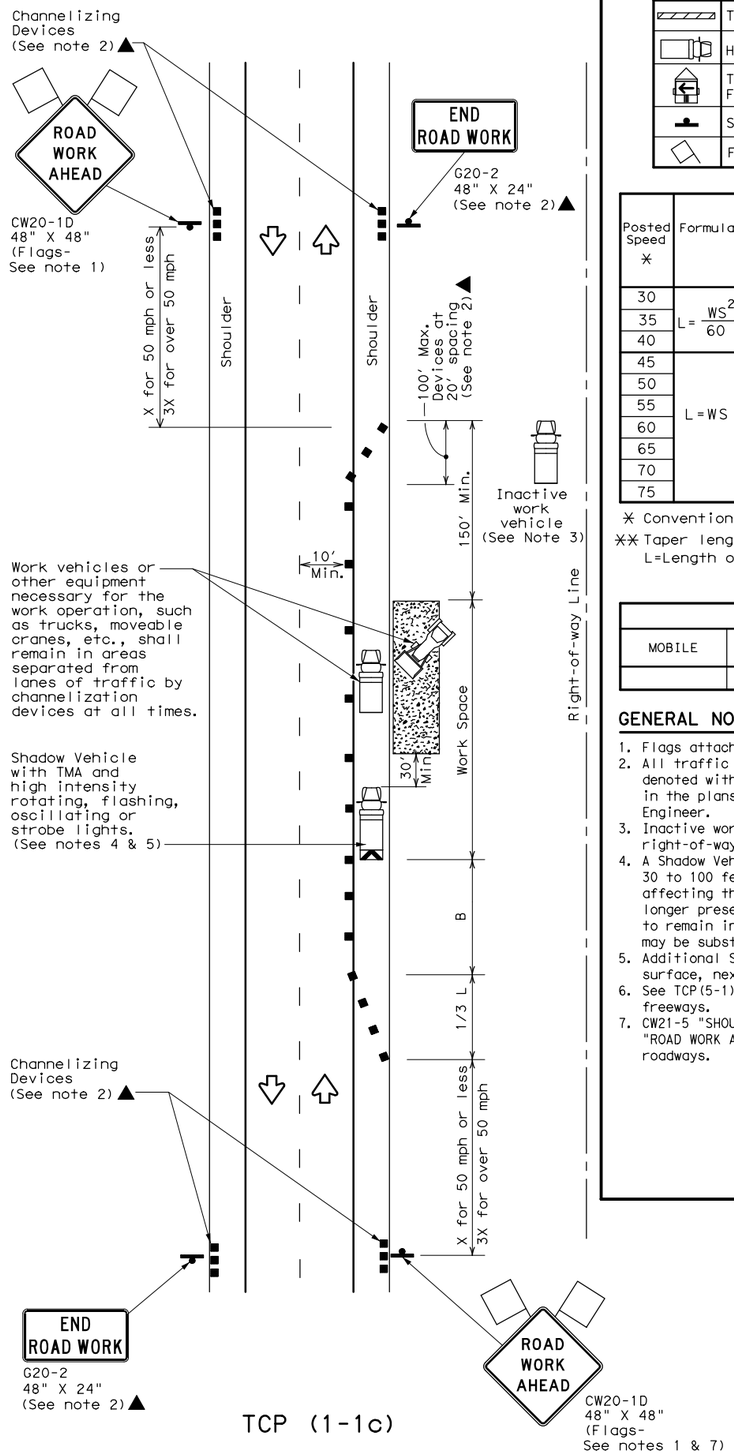
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	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. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. 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 wider work spaces.
6. See TCP(5-1)for shoulder work on divided highways, expressways and freeways.
7. 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(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	SH 35
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	BRAZORIA		52
1-97 2-18				

151

DATE:
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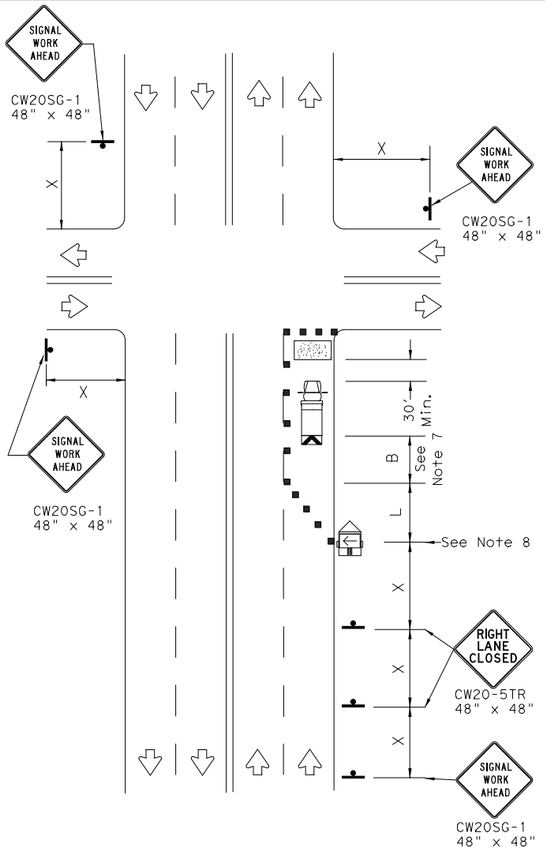
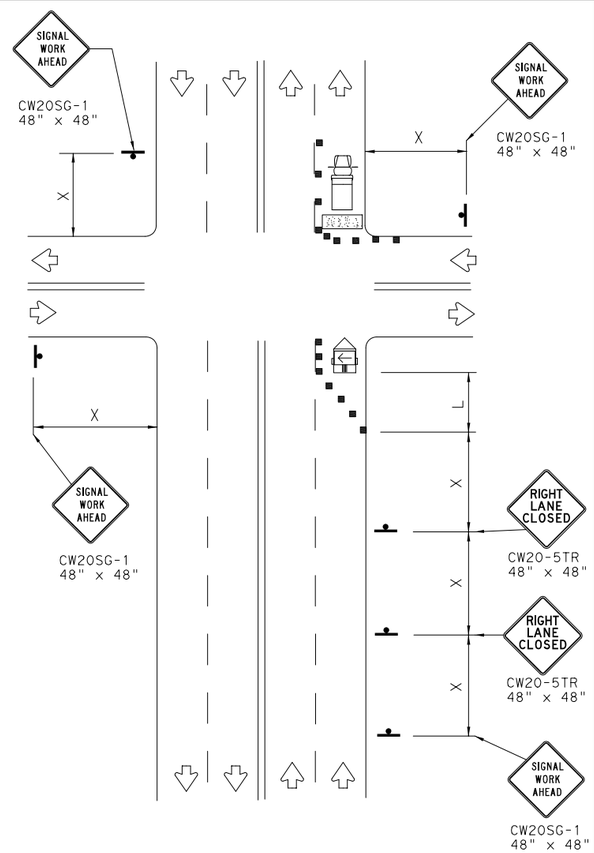


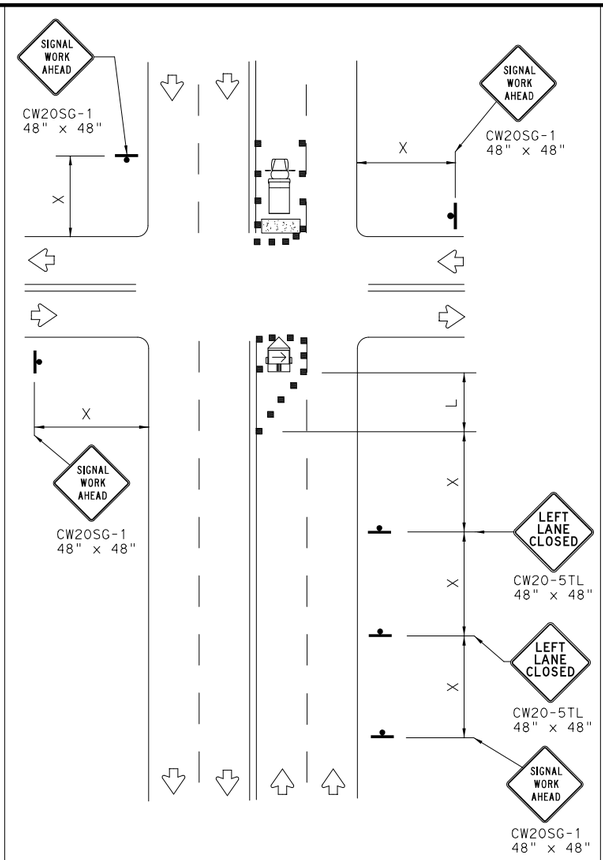
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



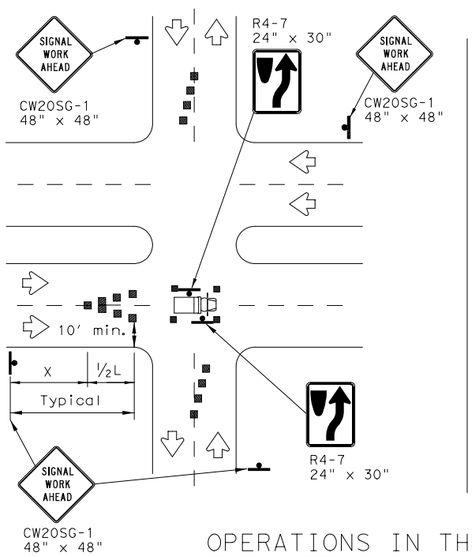
FAR SIDE RIGHT LANE CLOSURE

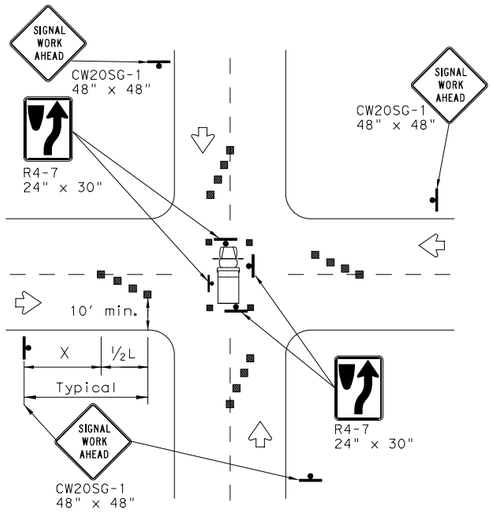
SHORT DURATION OR SHORT TERM STATIONARY



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	0912	00	641	ANTOINE DR
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	HOU	HARRIS/		53

DATE:
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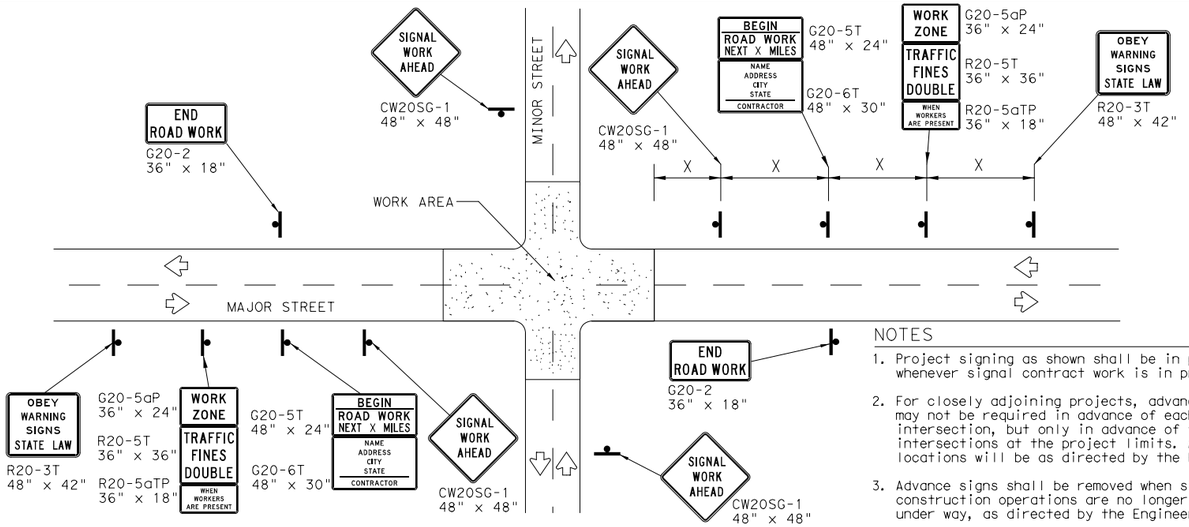


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

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 aluminum 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 back filled 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

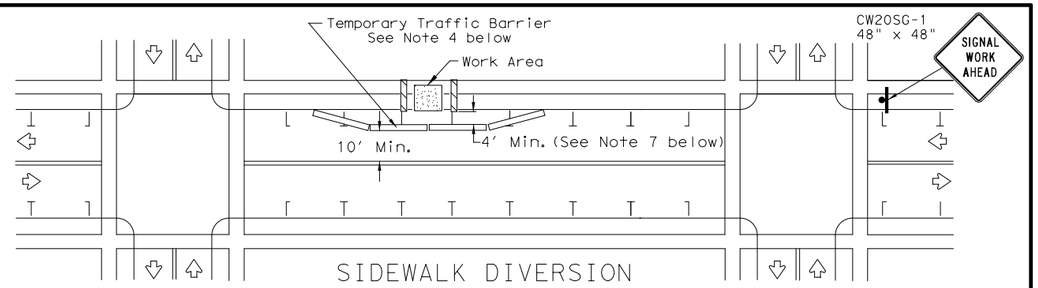
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support 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

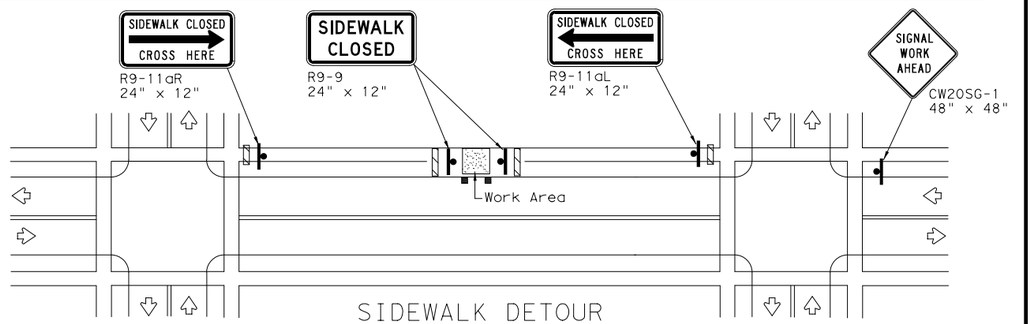
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

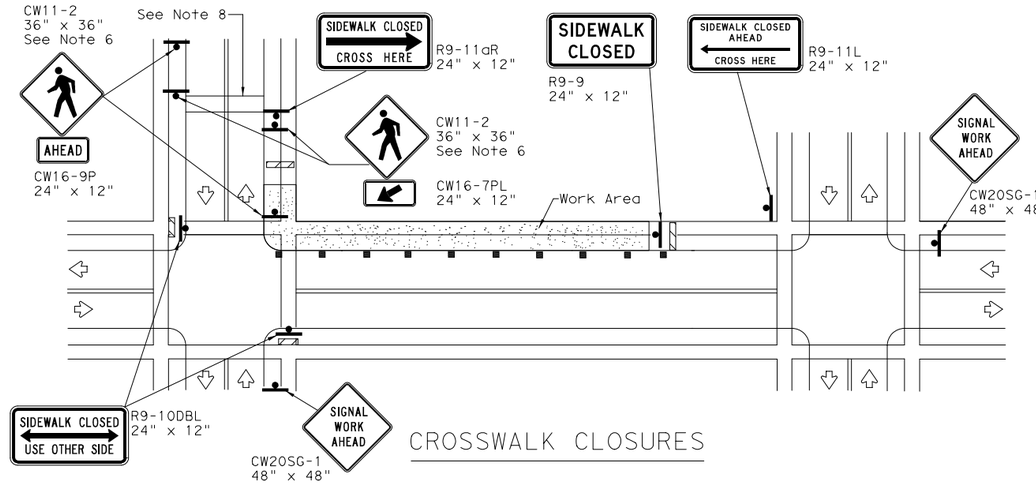
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



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

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
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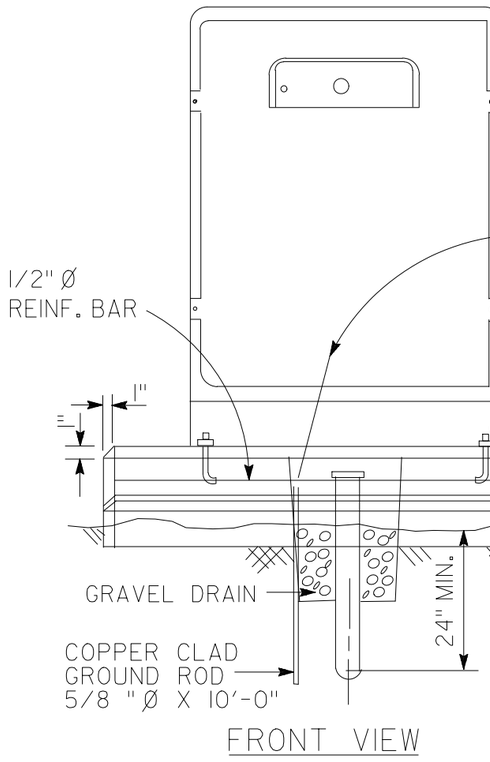
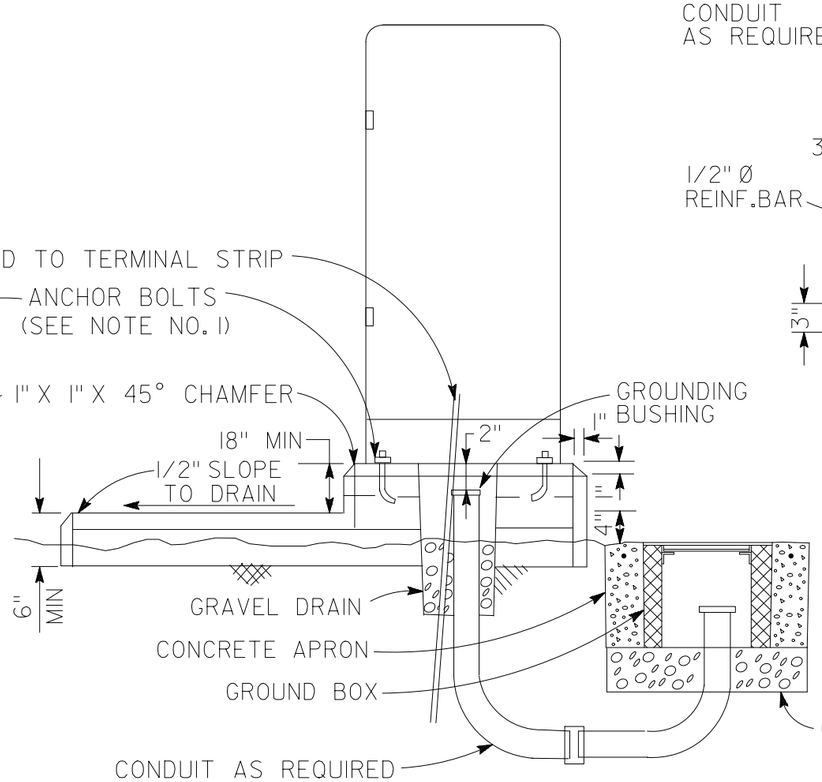
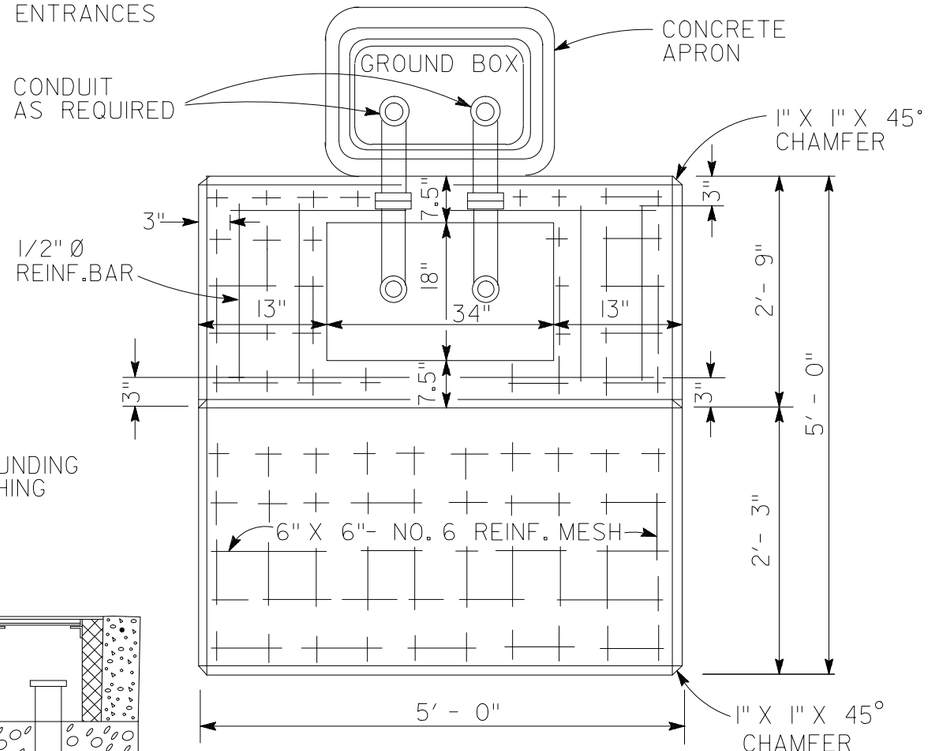
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	HOU	HARRIS/		54



FRONT VIEW



SIDE VIEW



TOP VIEW
(LESS CABINET)

NOTES:

1. CABINET MANUFACTURER TO PROVIDE DETAILS OF ANCHOR BOLT LOCATION.
2. MODIFY DIMENSIONS FOR CONCRETE BASE TO FIT EQUIPMENT FURNISHED, IF NECESSARY.
3. PROVIDE GRAVEL DRAIN FOR CONTROLLER AND ALL GROUND BOXES.
4. FURNISH CLASS "B" OR CLASS "C" CONCRETE.
5. SET CONTROLLER FOUNDATION LEVEL WITH THE PAVEMENT SURFACE OR AS APPROVED BY THE ENGINEER.
6. FURNISH AT NO COST TO THE DEPARTMENT ANY ADDITIONAL CONCRETE WHICH MAY BE NECESSARY TO STABILIZE THE FOUNDATION AT UNUSUAL LOCATIONS.
7. PLACE REINFORCING BARS AS DIRECTED.
8. UPON INSTALLING THE CONTROLLER CABINET, APPLY A SILICON-BASED CAULKING COMPOUND AROUND THE BASE OF THE CONTROLLER CABINET.

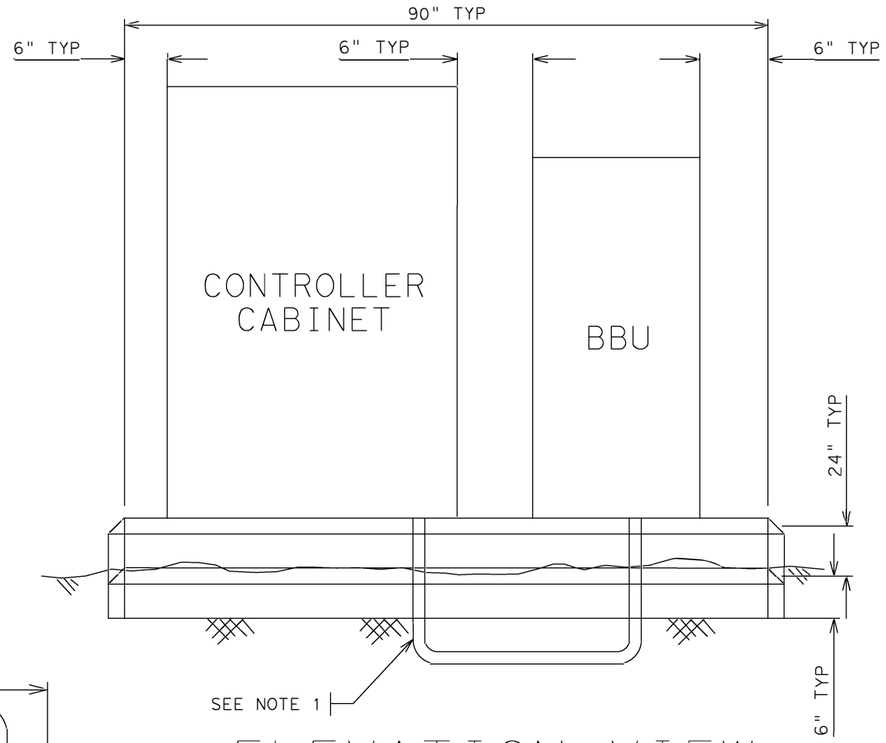
Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS CONTROLLER FOUNDATION DETAIL

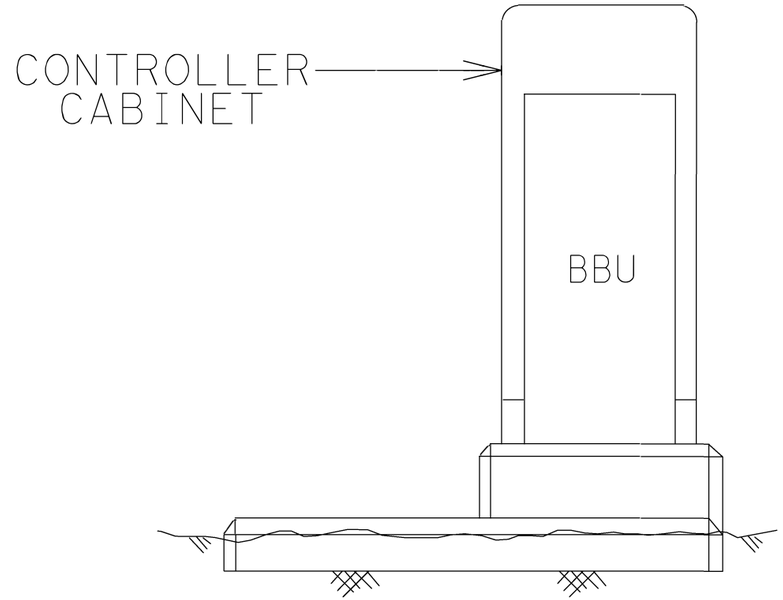
SD/SCFD

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 08-04 03-07	HOU	6	SEE TITLE SHEET	55
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS/	0912	00	641	ANTOINE DR

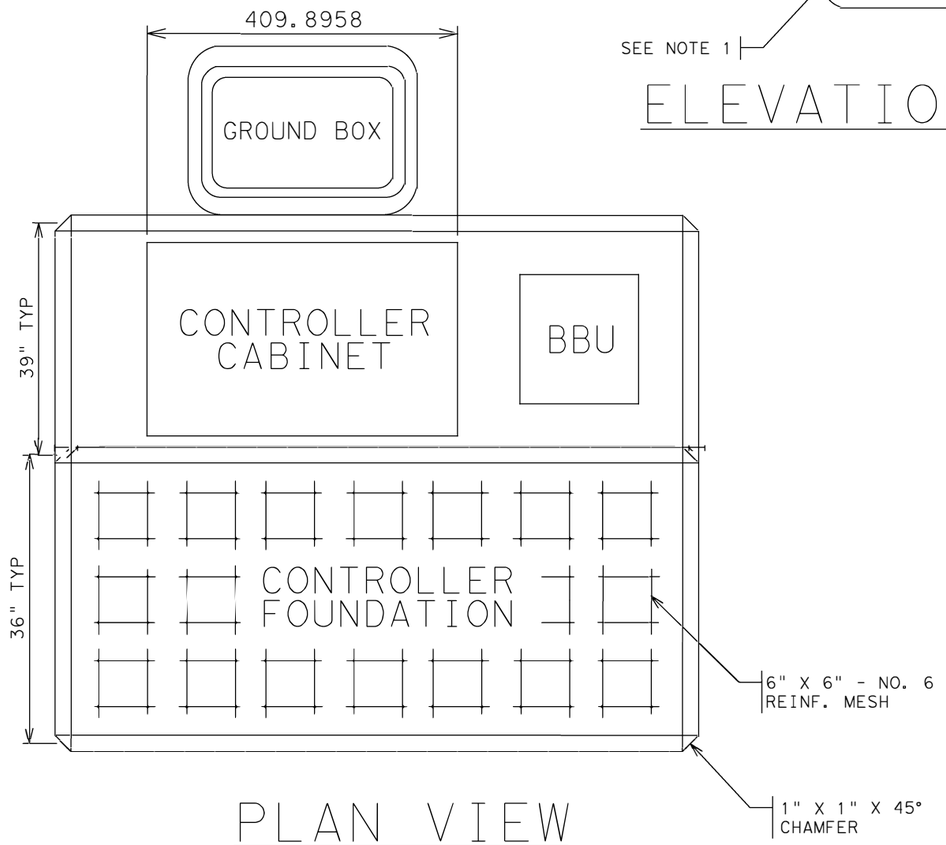
STD-M1



ELEVATION VIEW



SIDE VIEW



PLAN VIEW

NOTES:

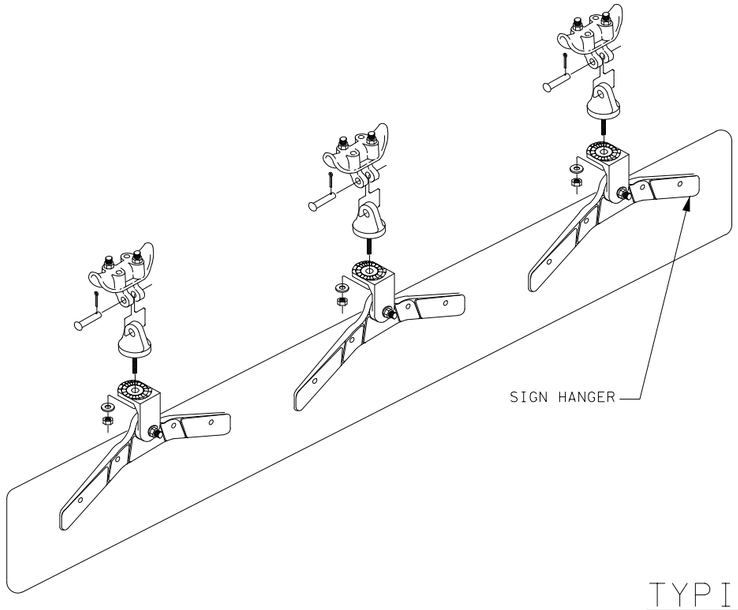
1. INSTALL 1-1/2 " PVC CONDUIT WITH FIVE #6 AWG CONDUCTORS, TWO #18 AWG CONDUCTORS AND ONE CAT 5 CABLE WITH CONNECTOR BETWEEN THE TWO CABINETS.
2. EXTEND THE CONCRETE CONTROLLER PAD (REFER TO SD/SCFD) UNDER THE BBU. MODIFY PAD DIMENSIONS TO FIT EQUIPMENT, AS NEEDED.
3. THE WORK PERFORMED AND MATERIALS FURNISHED WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO THE BBU ASSEMBLY.
4. FURNISH CLASS "B" OR CLASS "C" CONCRETE.
5. USE 6" X 6" - NO. 6 REINFORCING MESH IN FOUNDATION WITH 1" X 1" X 45° CHAMFER AT ALL CORNERS.

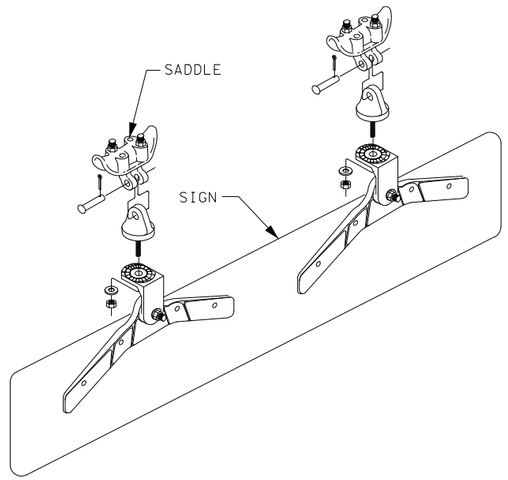
Texas Department of Transportation
Houston District

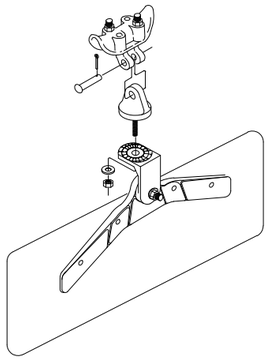
SIGNAL DETAILS/STANDARDS
BBU SIDE MOUNT

SD/S BSM

SCALE	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY
N.T.S.	6	TEXAS	SEE TITLE SHEET			ANTOINE DR
REVISIONS	STATE DISTRICT	COUNTY	CONTROL	SECTION	JOB	SHEET NO.
9/2019	HOU	HARRIS/	0912	00	641	56

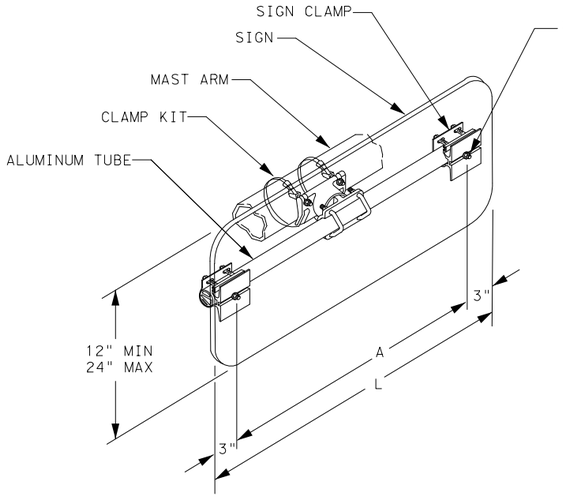


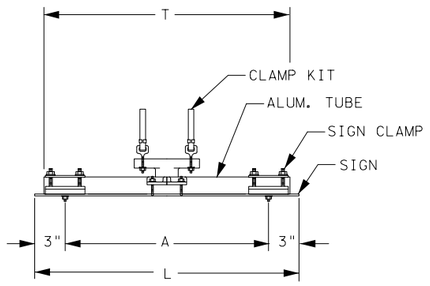


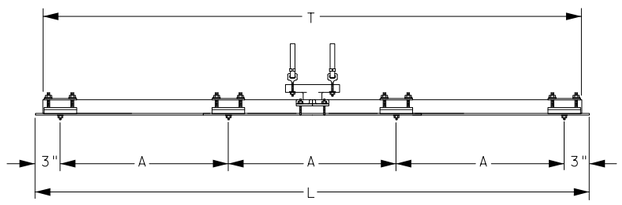


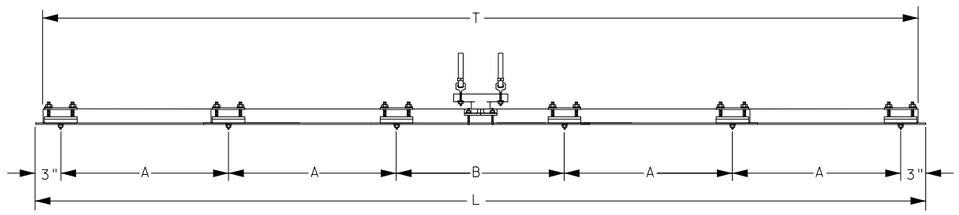
1. USE PELCO PARTS OR APPROVED EQUAL.
2. FURNISH HARDWARE FOR A COMPLETE INSTALLATION.
3. ATTACH THE 90 LB SPAN WIRE CLAMPS (SADDLES) TO TETHERS (SWAY CABLES).
4. FURNISH 1 ADJUSTABLE FREE SWINGING SIGN HANGER PER STREET NAME SIGN SMALLER THAN 3 FT. - 0 IN. SIGNS 3 FT - 0 IN. TO 6 FT.- 0 IN. REQUIRE 2 HANGERS. SIGNS LARGER THAN 6 FT. - 0 IN. REQUIRE 3 HANGERS.

TYPICAL SPAN WIRE SIGN HANGER DETAILS









SIGNS (1'-6" to 3'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A
1'-6"	16"	12"
2'-0"	22"	18"
2'-6"	28"	24"
3'-0"	34"	30"

SIGNS (3'-6" to 8'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A
3'-6"	40"	12"
4'-0"	46"	14"
4'-6"	52"	16"
5'-0"	58"	18"
5'-6"	64"	20"
6'-0"	70"	22"
6'-6"	76"	24"
7'-0"	82"	26"
7'-6"	88"	28"
8'-0"	94"	30"

SIGNS (8'-6" to 10'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A	B
8'-6"	100"	19"	20"
9'-0"	106"	20"	22"
9'-6"	112"	21"	24"
10'-0"	118"	22"	26"

SIGN CLAMP DETAIL

GUSSETED TUBE CROSS SECTION

TYPICAL MAST ARM SIGN MOUNT DETAILS

FILE: Overhead-Sign-mount-det-sp04.dgn

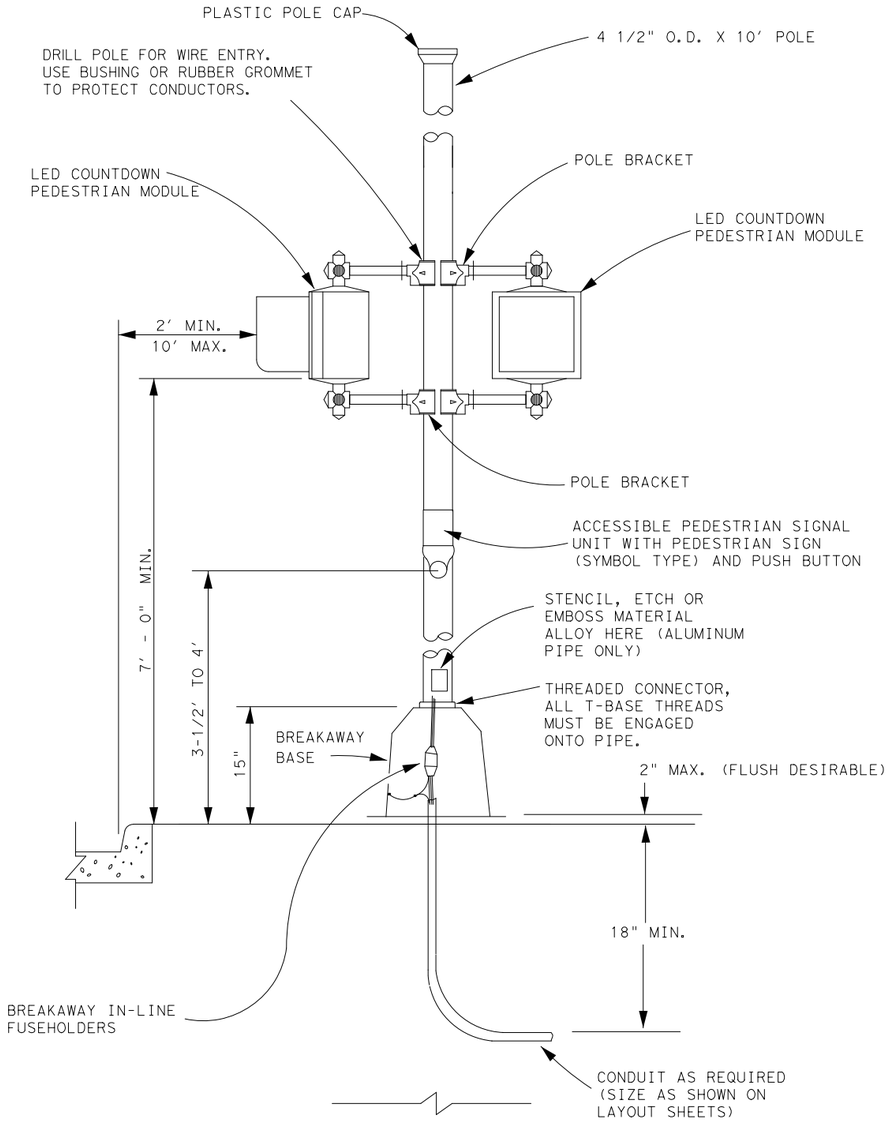
Texas Department of Transportation
Houston District

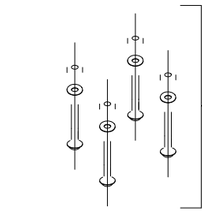
SIGNAL DETAILS/STANDARDS
OVERHEAD STREET NAME SIGN MOUNTING DETAILS

OSNS/MD

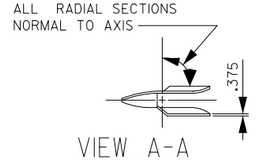
	DN:		CK:	DW:	CK:	
© TxDOT 2004	DIST	FED REG	PROJECT NO.			SHEET
	HOU	6	SEE TITLE SHEET			57
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS/		0912	00	641	ANTOINE DR

STD-M12

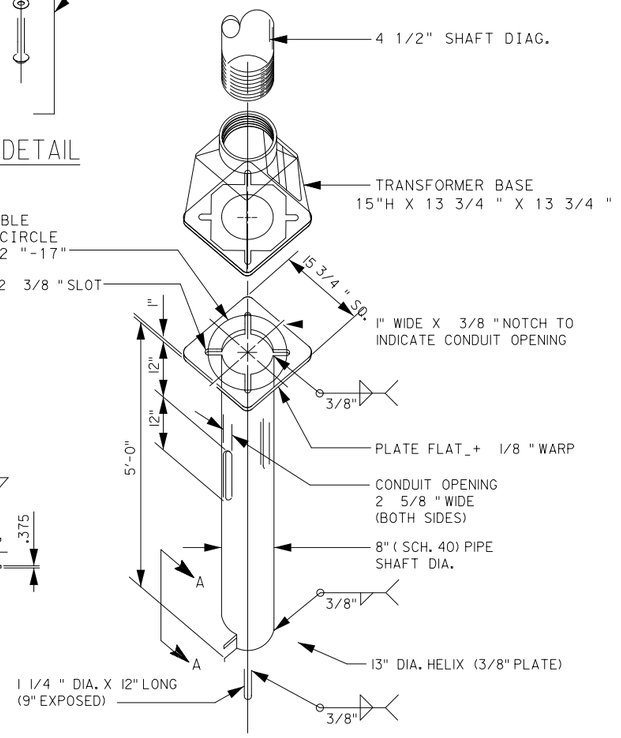




HARDWARE DETAIL



VIEW A-A



SCREW ANCHOR FOUNDATION DETAIL

NOTE:

SEE STANDARD (RFBA - 13) FOR NOTES AND
NON - FUSED BREAKAWAY ELECTRICAL CONNECTOR DETAILS

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS CONSTRUCTION DETAILS FOR POLE MOUNTED (APS) PEDESTRIAN SIGNALS

CD/PM(APS)PS

FILE:	DN:	CK:	DW:	CK:
©TxDOT 2012	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 07-14 02-15	HOU	6	SEE TITLE SHEET	58
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	00	641	ANTOINE DR

STD-M19

DATE:
FILE:

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:
	October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		0912	00	641	ANTOINE DR
		DIST	COUNTY		SHEET NO.
		HOU	HARRIS/		59

DATE: DATE TIME
FILE: DOCUMENT NAME

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.

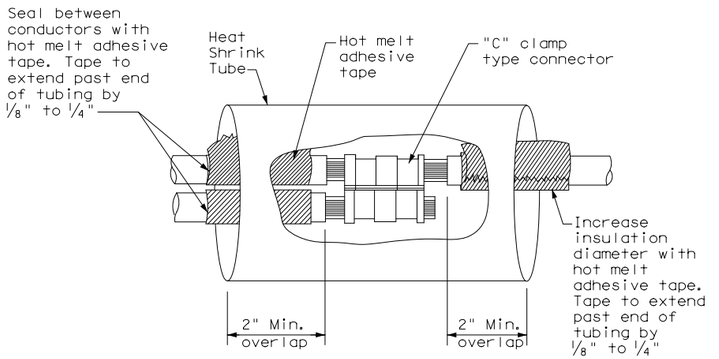
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

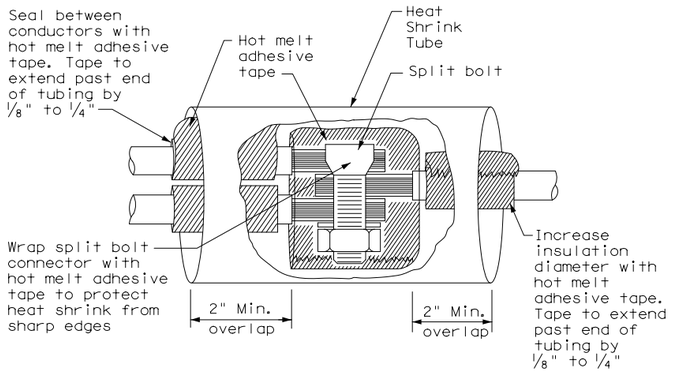
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

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.

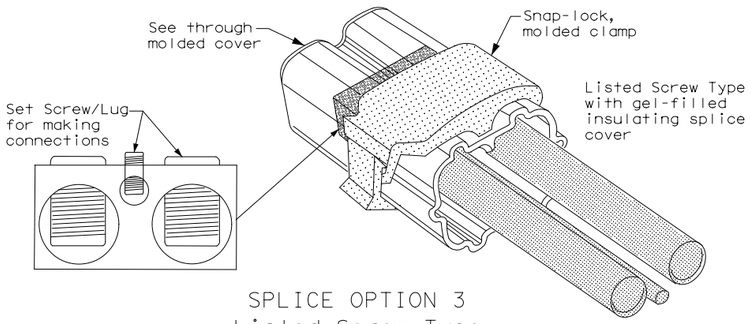
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



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

FILE:	ed3-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		0912	00	641	ANTOINE DR
		DIST	COUNTY		SHEET NO.
		HOU	HARRIS/		60

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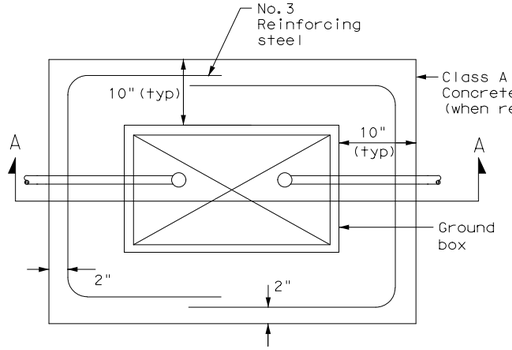
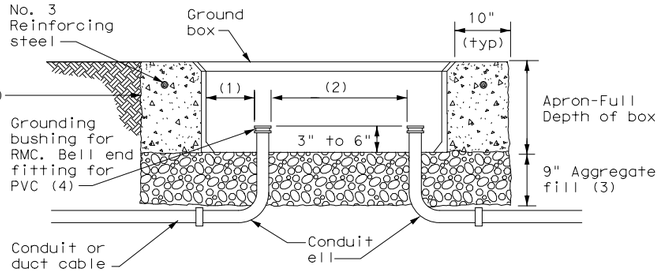


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

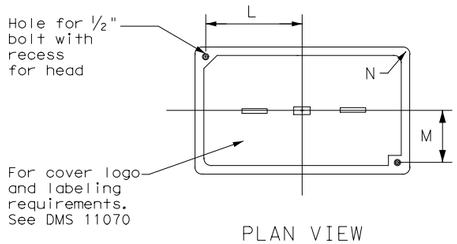
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

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

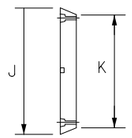
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

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

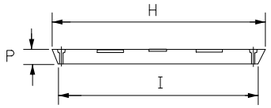
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



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

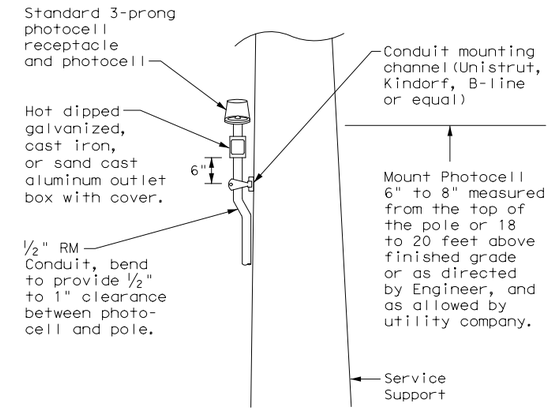
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

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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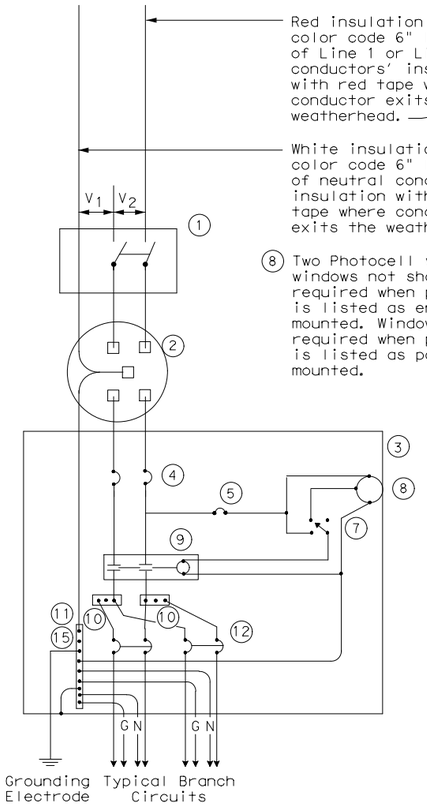
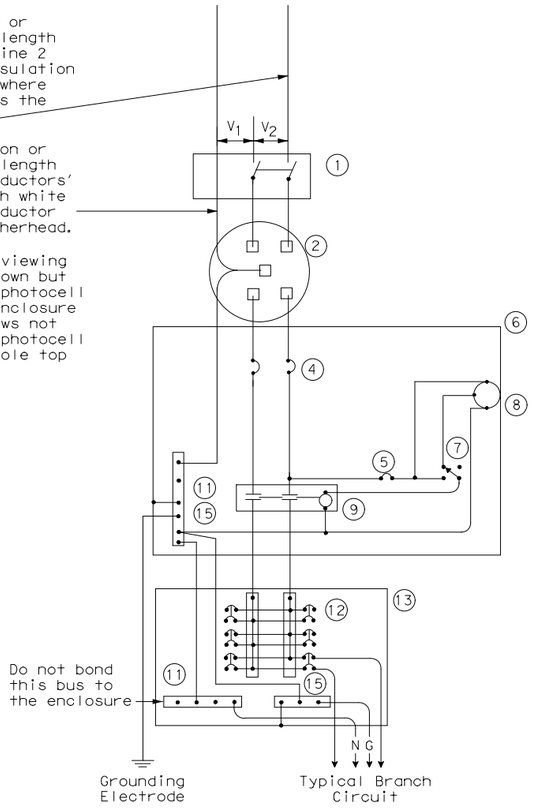
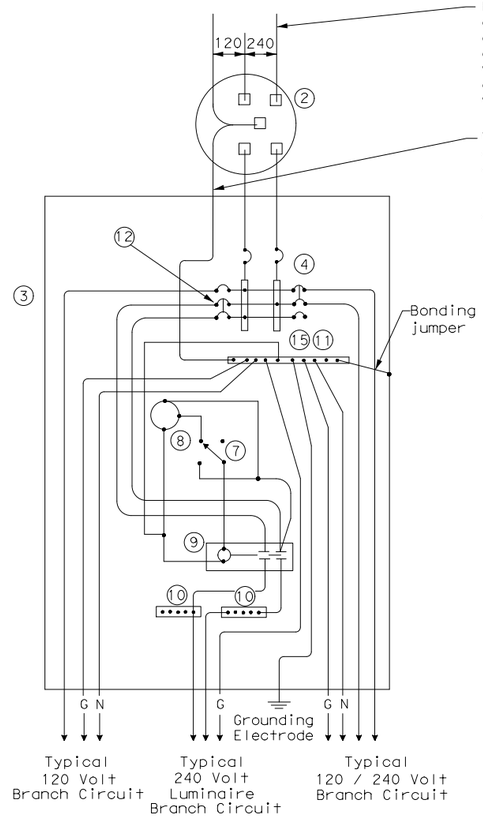


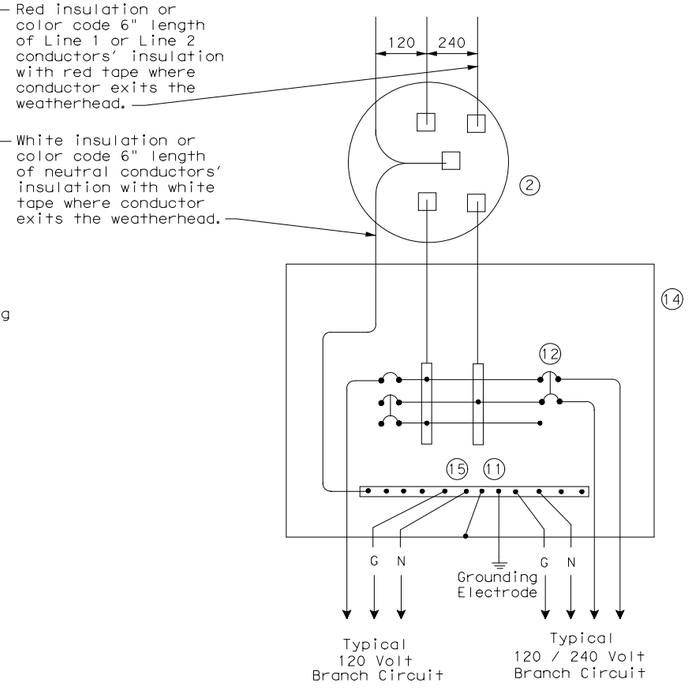
SCHEMATIC TYPE A
THREE WIRE



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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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.

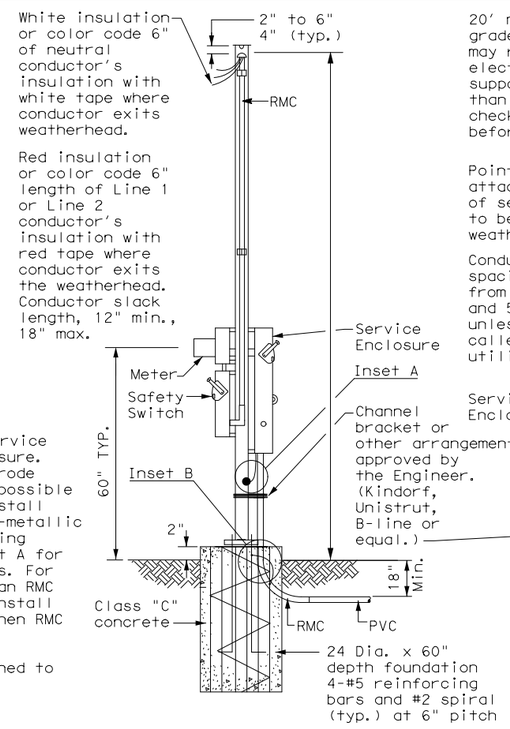
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode 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.

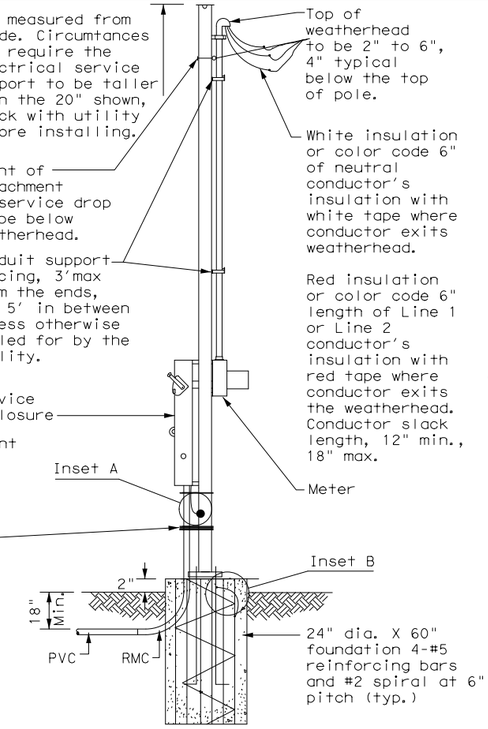
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

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.

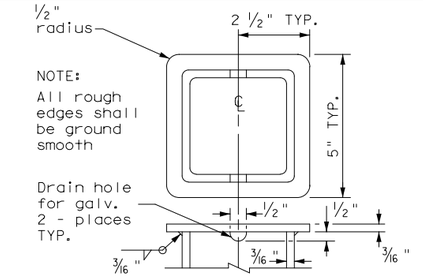


WITH SAFETY SWITCH

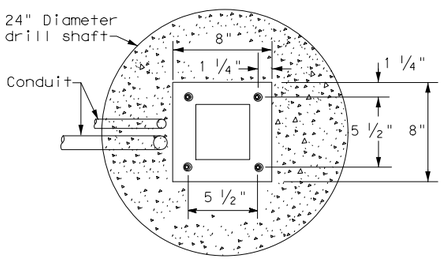


WITHOUT SAFETY SWITCH

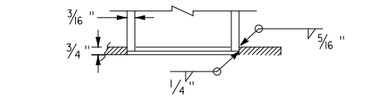
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE



BASE PLATE DETAIL



BOTTOM OF POLE

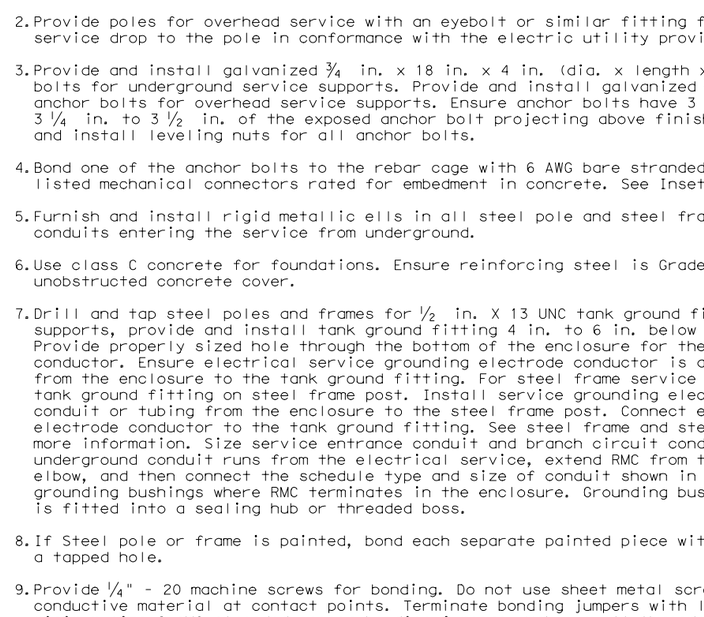
SERVICE SUPPORT TYPE SF & SP

FRONT VIEW
INSET A

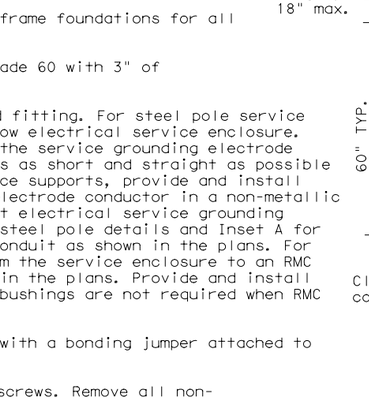
INSET B

TOP VIEW

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

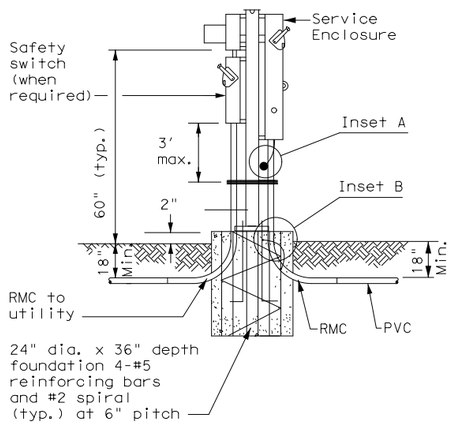


WITH SAFETY SWITCH
FRONT VIEW

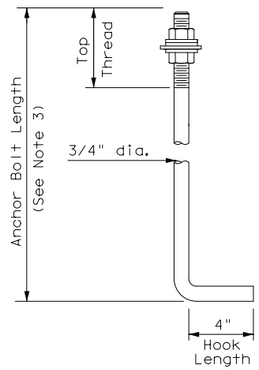


WITHOUT SAFETY SWITCH

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

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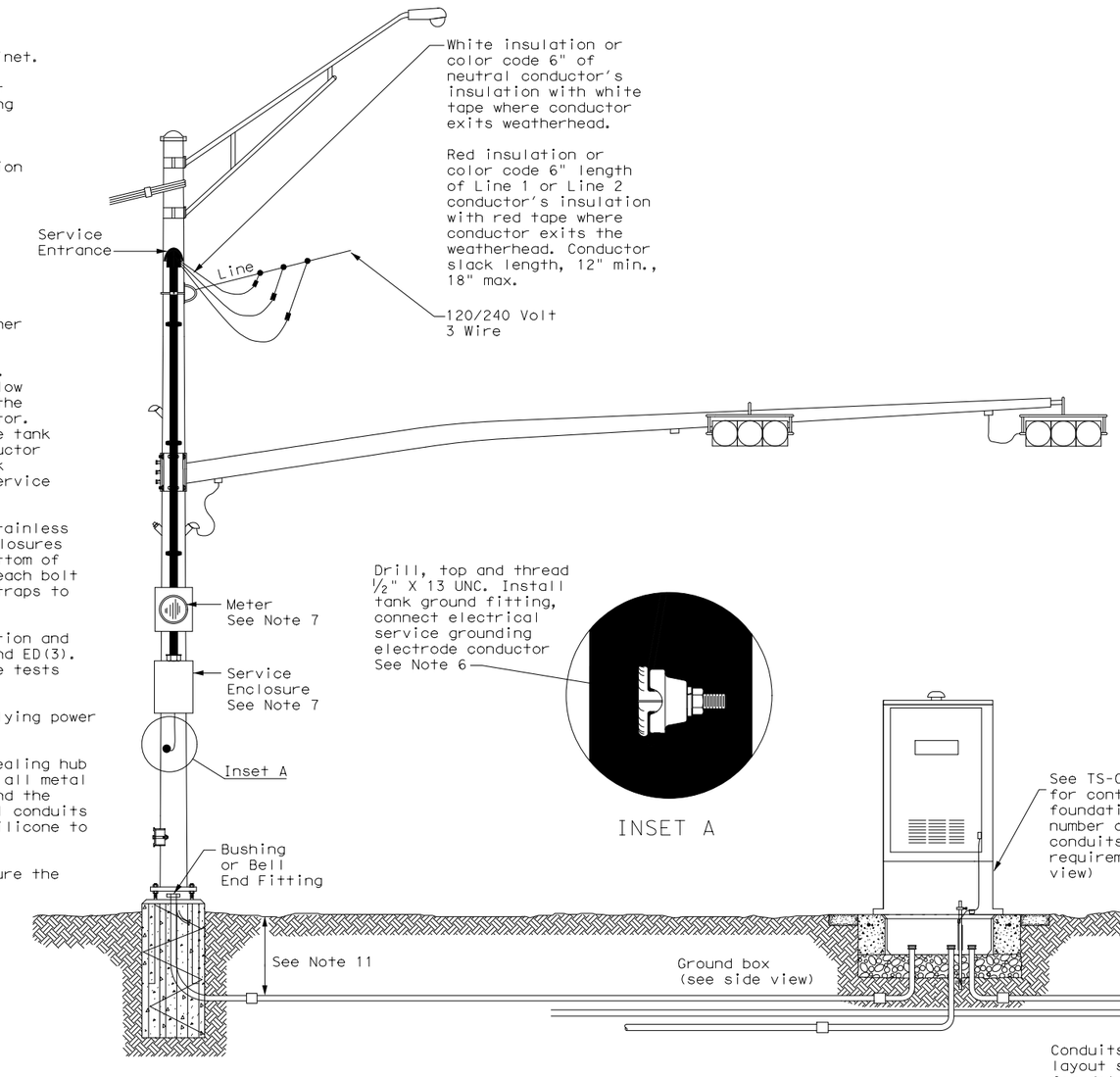
FILE:

TRAFFIC SIGNAL NOTES

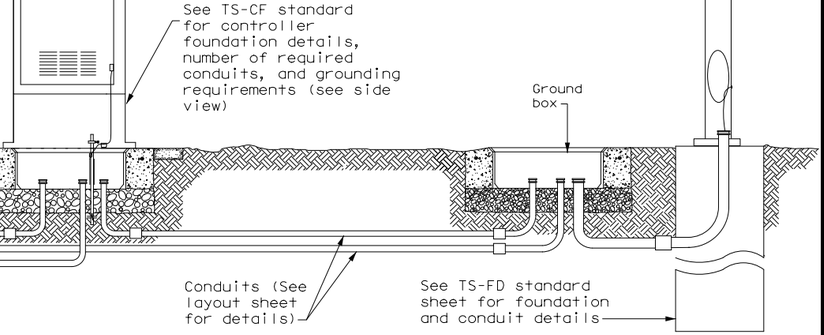
1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material 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".



INSET A

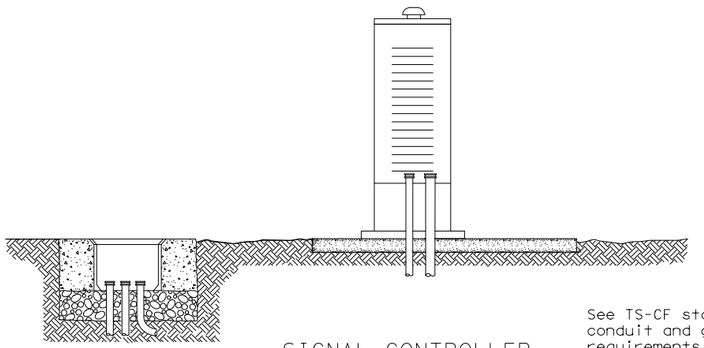
SIGNAL POLE WITH SERVICE

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



SIGNAL CONTROLLER FRONT VIEW

SIGNAL POLE



SIGNAL CONTROLLER SIDE VIEW

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

Texas Department of Transportation

Traffic Operations Division Standard

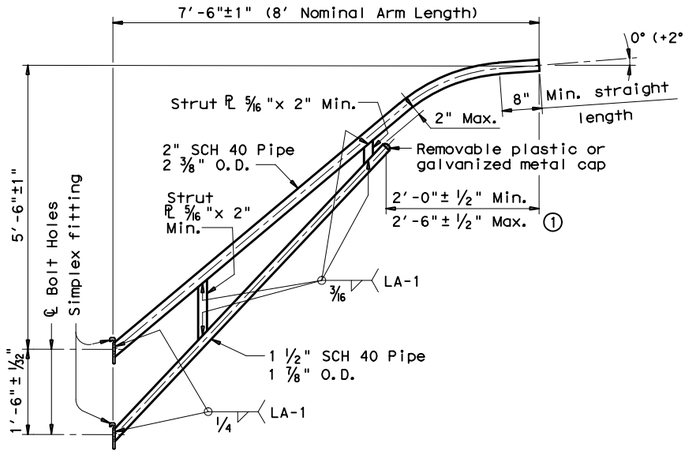
ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

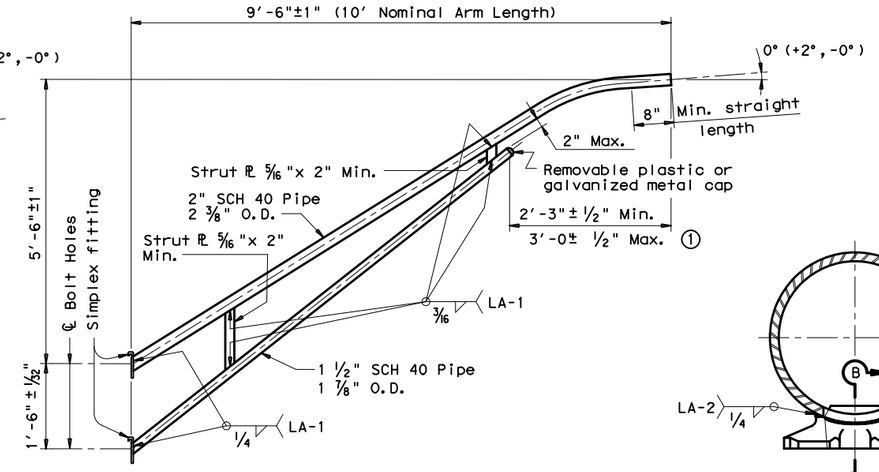
FILE: ed8-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	ANTOINE DR
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/		65

71H

DATE:
FILE:

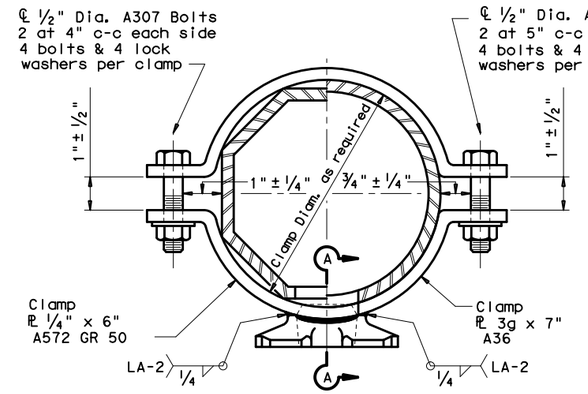


8-FOOT LUMINAIRE ARM



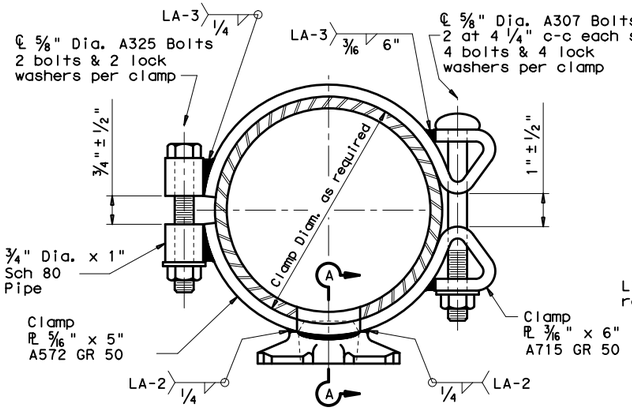
10-FOOT LUMINAIRE ARM

DIRECT ATTACHMENT DETAIL



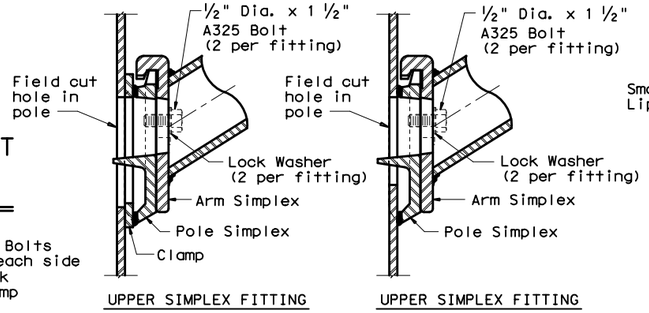
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



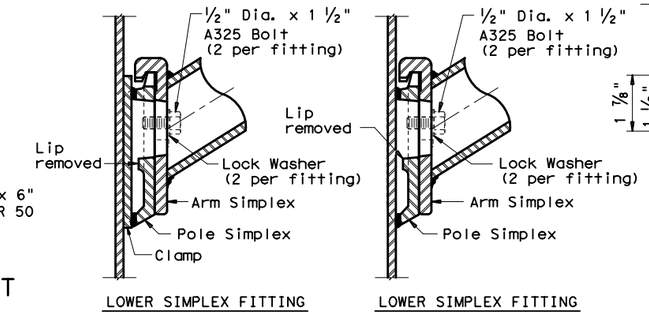
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)



UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING

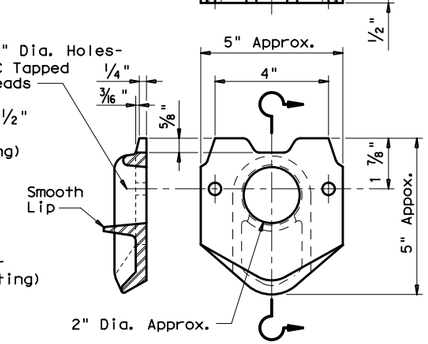


LOWER SIMPLEX FITTING

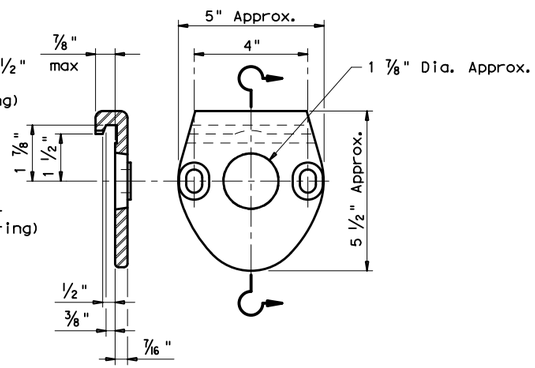
SECTON A-A

LOWER SIMPLEX FITTING

SECTON B-B



POLE SIMPLEX DETAIL



ARM SIMPLEX DETAIL

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

① Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

② Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

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

④ ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, 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
0912	00	641	ANTOINE DR
DIST	COUNTY		SHEET NO.
HOU	HARRIS/		66

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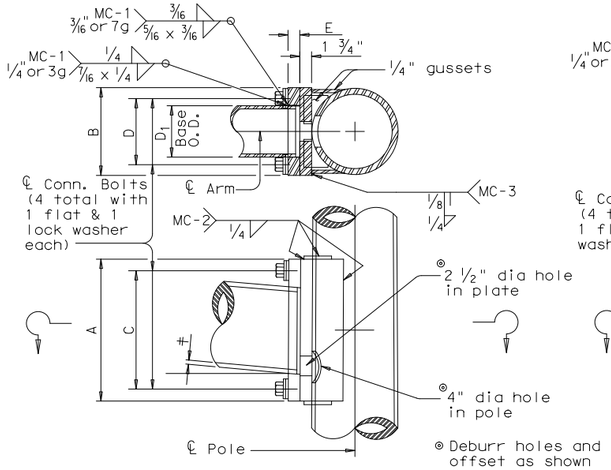
DATE:
FILE:

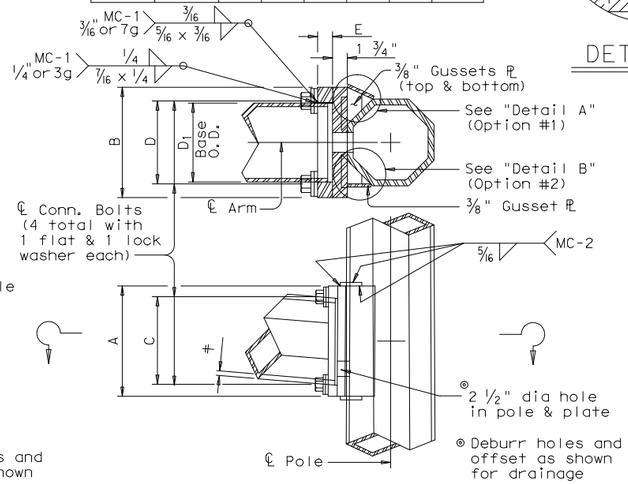
ARM SIZE D_1	ARM SIZE ǂ	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1 ¾	1
7.5	.179	13	9	10	6	1 ¾	1
8.0	.179	14	10	11	7	2	1 ¼
9.0	.179	16	11	13	8	2	1 ¼
9.5	.179	17	12	14	9	2	1 ¼
9.5	.239	18	12	15	9	2	1 ¼
10.0	.239	18	12	15	9	2	1 ¼
10.5	.239	18	13	15	10	3	1 ½
11.0	.239	18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



FIXED MOUNT DETAIL 1

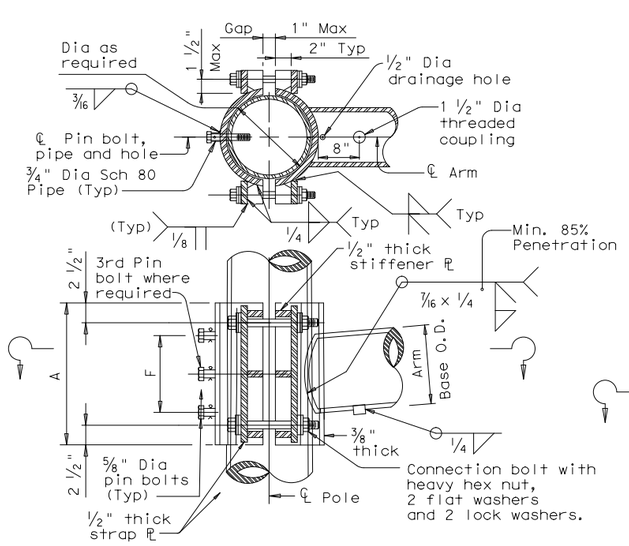
ARM SIZE D_1	ARM SIZE ǂ	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 ¼	3	5/8
9.5	.239	18	12	4	1 ¼	3	5/8
10.0	.239	18	12	4	1 ¼	3	5/8

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

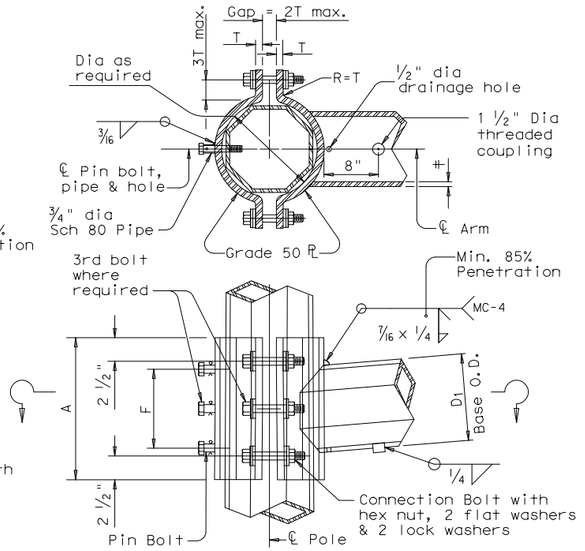


FIXED MOUNT DETAIL 2

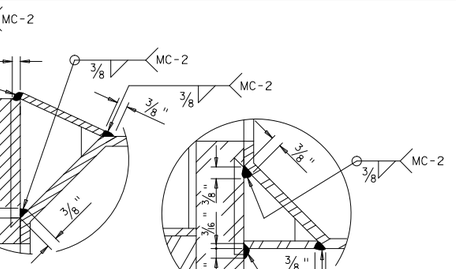
ARM SIZE D_1	ARM SIZE ǂ	A	F	T	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	in.	ea.	in.	ea.	in.
7.0	.179	12	6	¾	4	¾	2	5/8
7.5	.179	14	8	¾	4	¾	2	5/8
8.0	.179	14	8	¾	4	¾	2	5/8
9.0	.179	16	10	⅞	4	1	2	5/8
10.0	.179	18	10	⅞	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10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



CLAMP-ON DETAIL 1

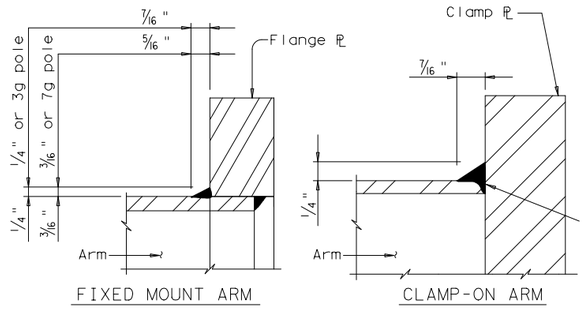


CLAMP-ON DETAIL 2



DETAIL A

DETAIL B

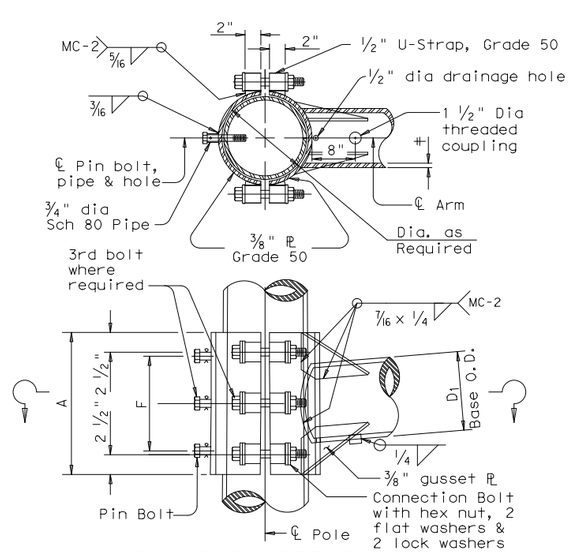


FIXED MOUNT ARM

CLAMP-ON ARM

ARM BASE WELD DETAILS

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

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
5-96
5-09
1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	ANTOINE DR
DIST	COUNTY		SHEET NO.
HOU	HARRIS/		67

126A

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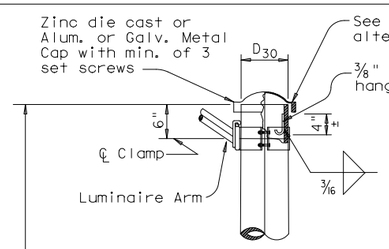
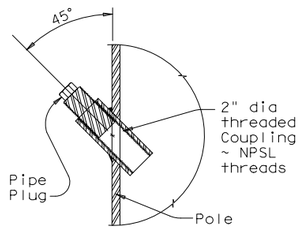
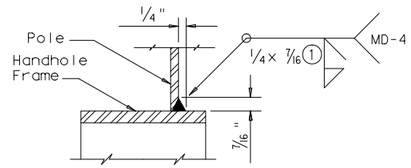


DETAIL A

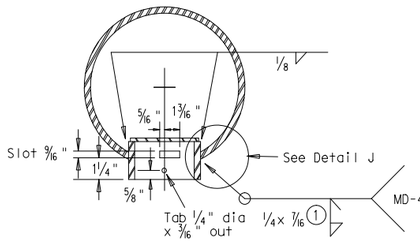
(for pole with luminaire)



POLE COUPLING DETAIL

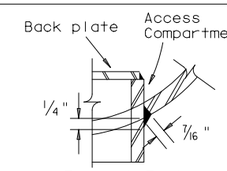


DETAIL G

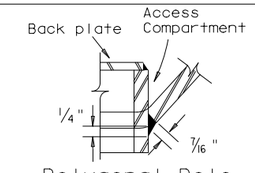


SECTION X-X

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

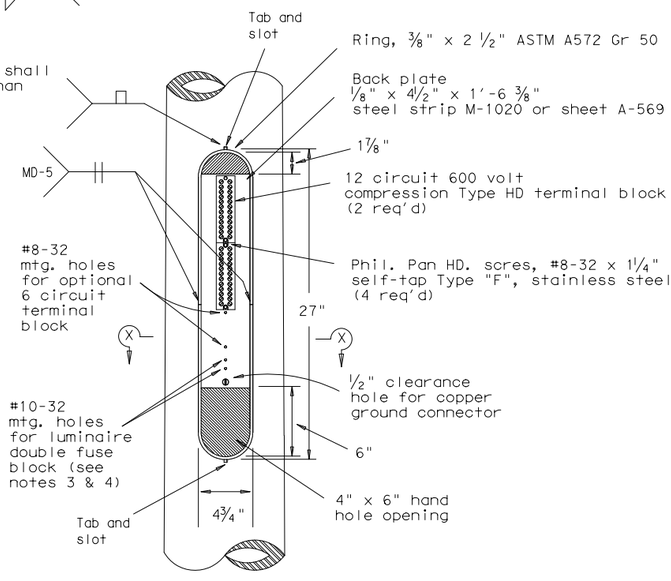


Round Pole

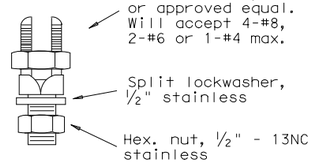


Polygonal Pole

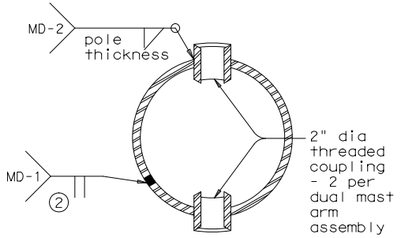
DETAIL J



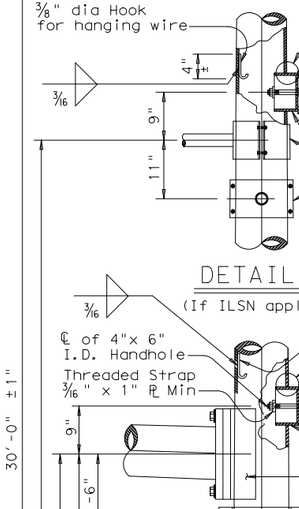
ACCESS COMPARTMENT



COPPER GROUND CONNECTOR

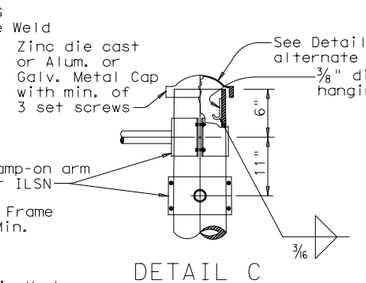


SECTION V-V

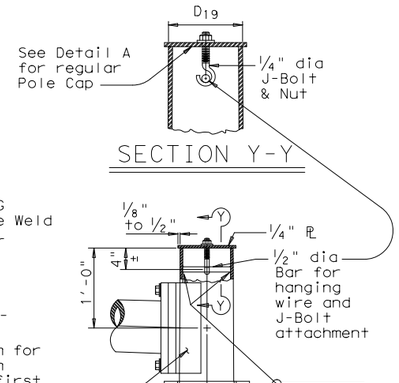


DETAIL B

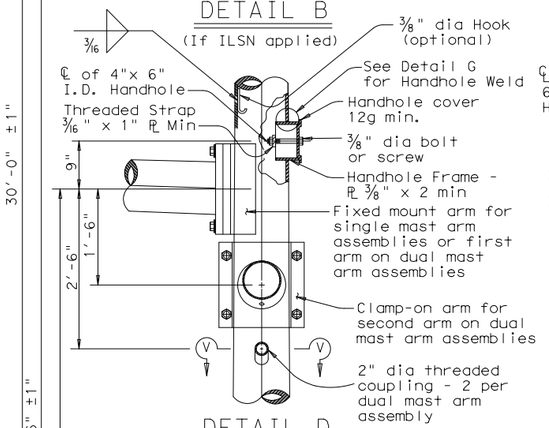
(If ILSN applied)



DETAIL C

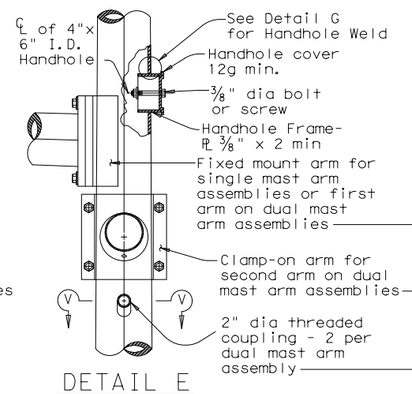


SECTION Y-Y



DETAIL D

(for 30' pole with luminaire and ILSN sign)



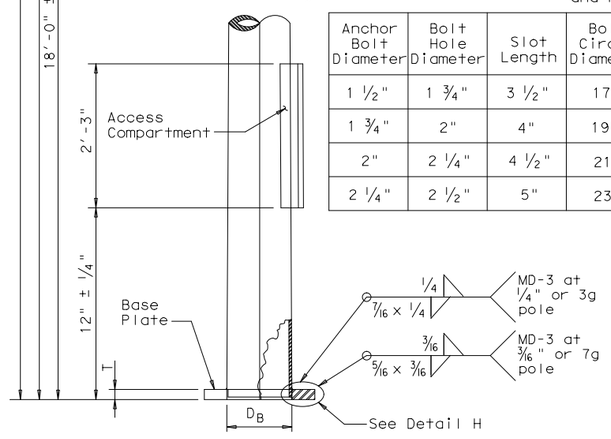
DETAIL E

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

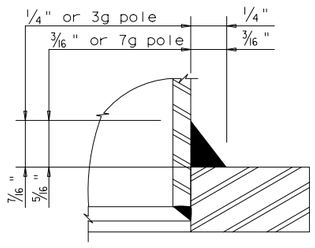
DETAIL F

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

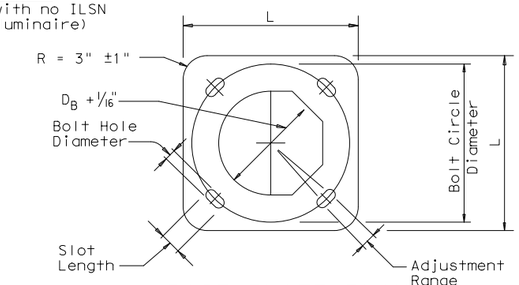
Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base ℞ Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



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

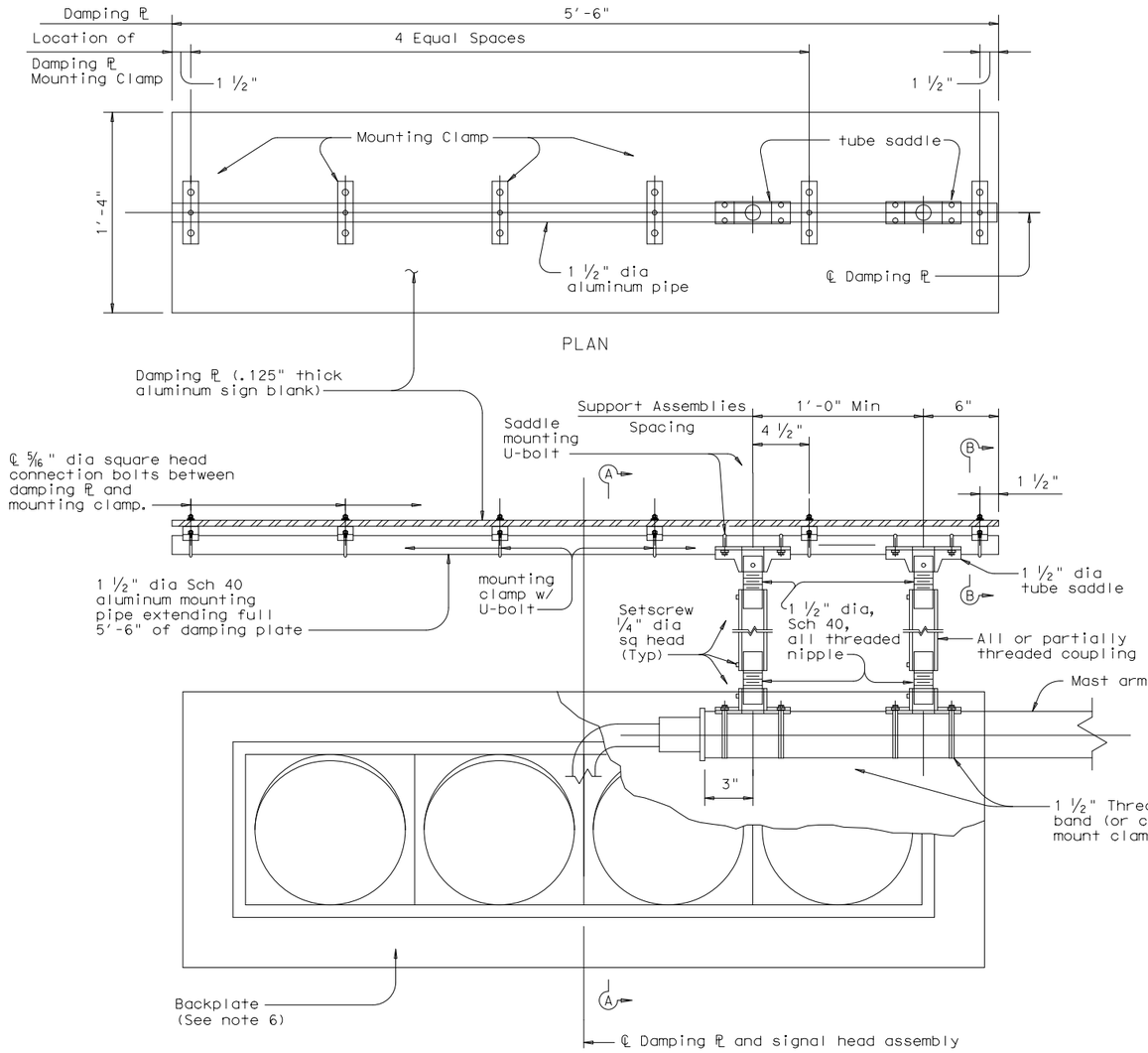
MA-D-12

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

REVISIONS
8-99
1-12

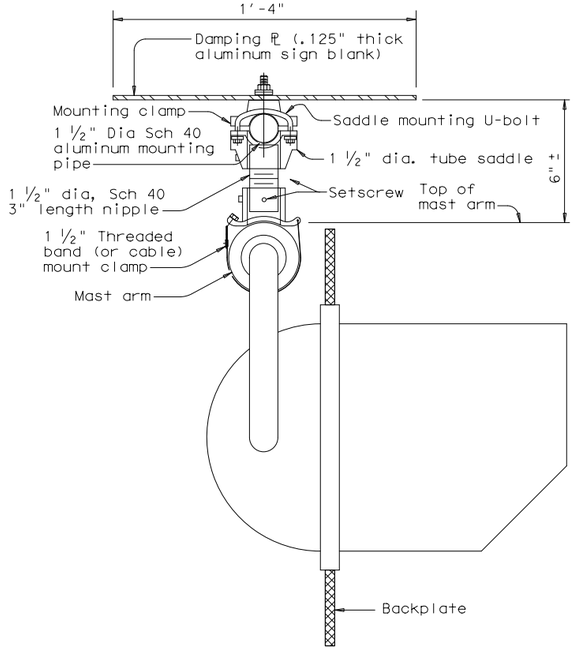
CONT	SECT	JOB	HIGHWAY
0912	00	641	ANTOINE DR
DIST	COUNTY		SHEET NO.
HOU	HARRIS/		68

DATE:
FILE:



DAMPING PLATE MOUNTING DETAILS

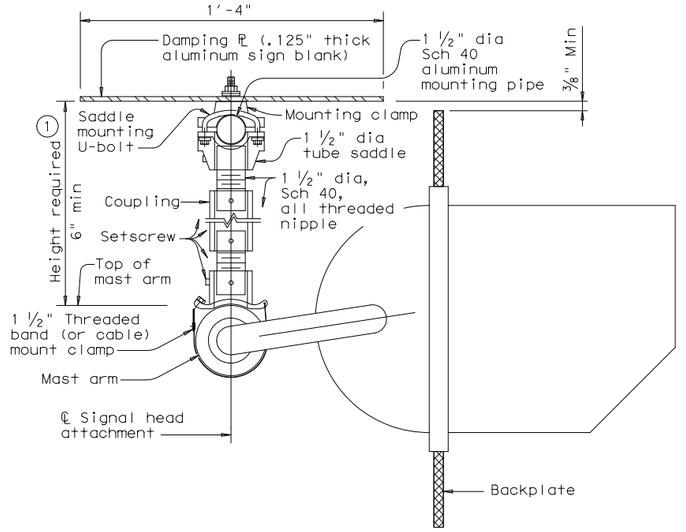
(Showing alternate placement of signal head)



SECTION A-A

(Showing standard placement of signal head)

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

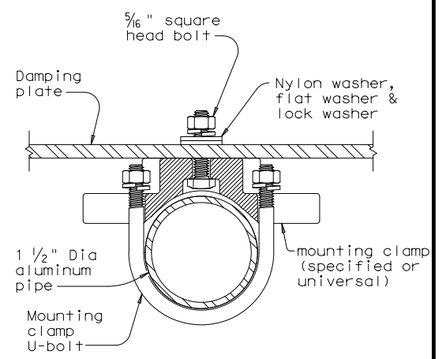


SECTION A-A

(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 June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	ANTOINE DR
4-20	DIST	COUNTY		SHEET NO.
6-20	HOU	HARRIS/		69

DATE:
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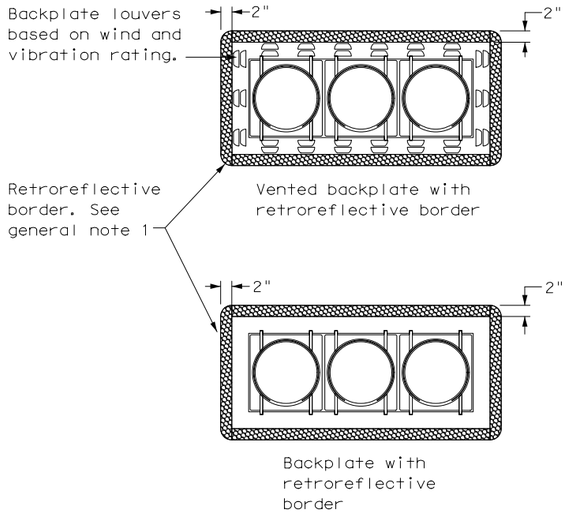
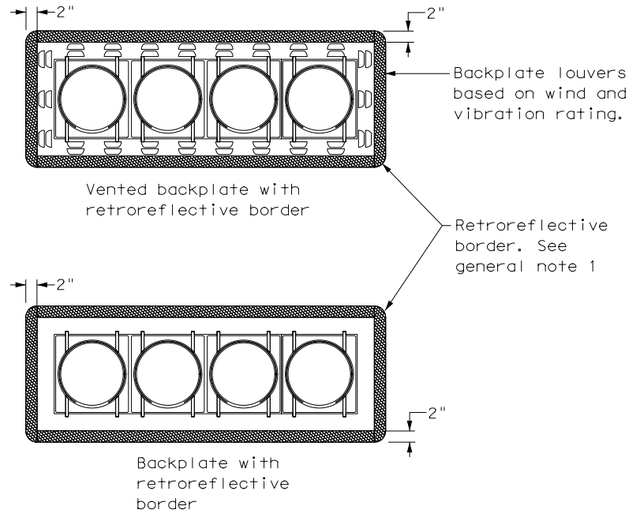
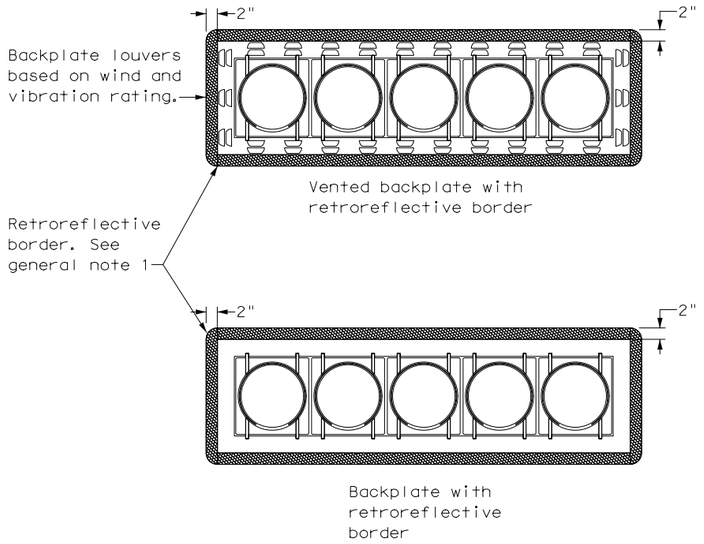


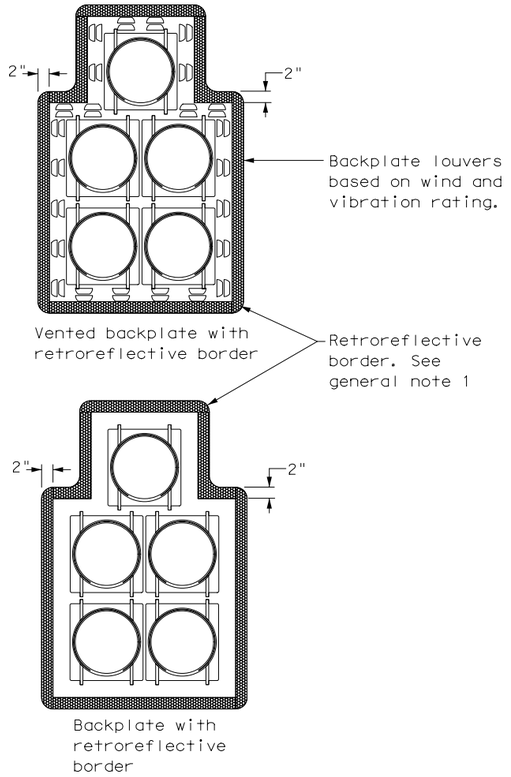
THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



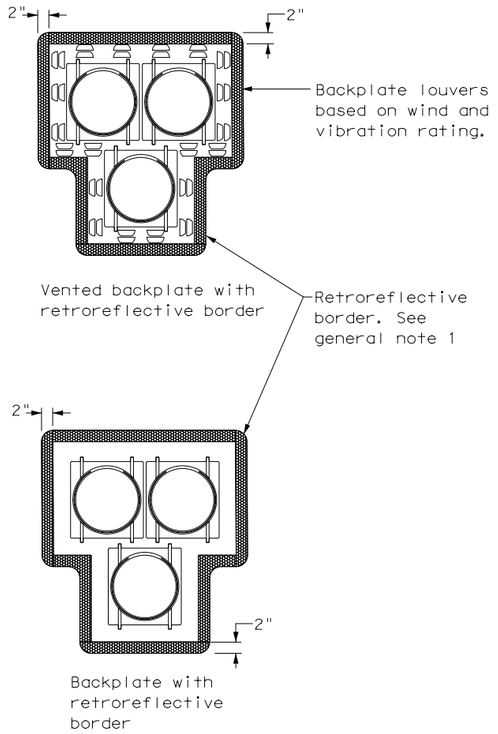
FOUR-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{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

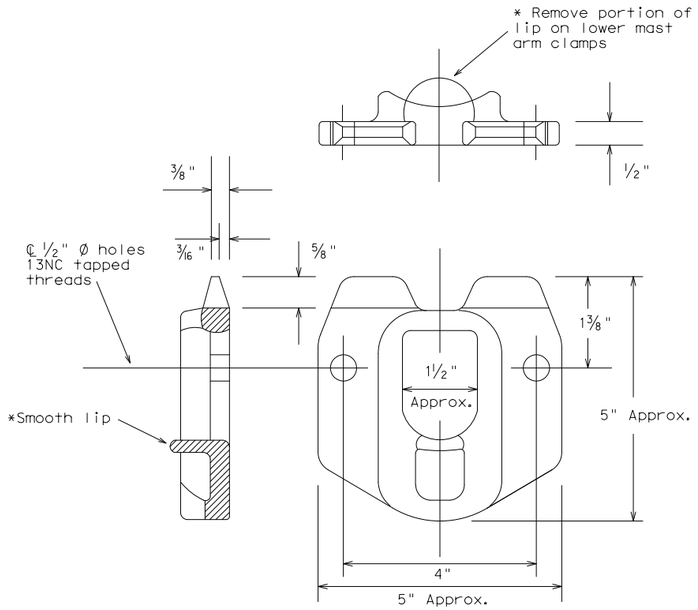
Traffic Safety Division Standard

TRAFFIC SIGNAL HEAD WITH BACKPLATE

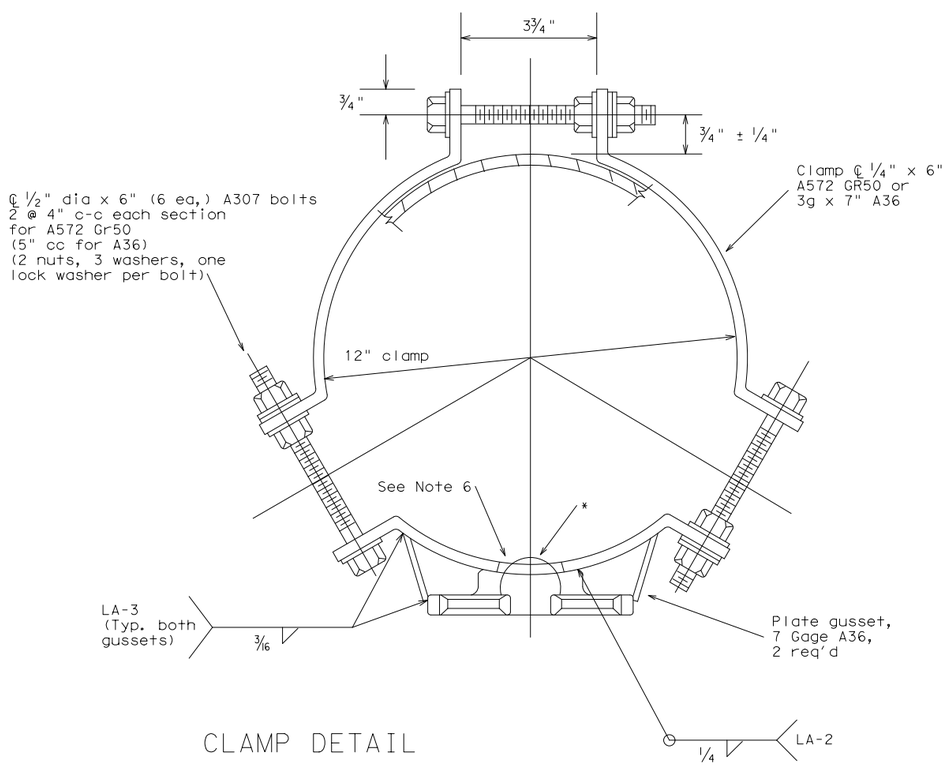
TS-BP-20

FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	ANTOINE DR
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/		70

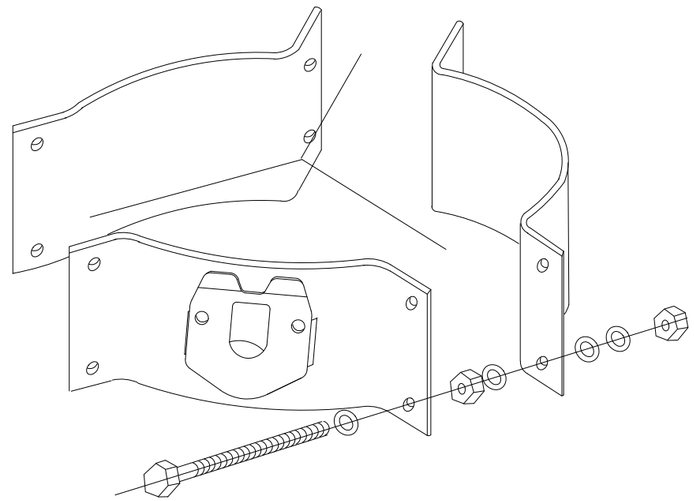
DATE:
FILE:



POLE SIMPLEX DETAILS



CLAMP DETAIL



PROJECTION

OTHER MATERIALS:

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

GENERAL NOTES:

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

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

Texas Department of Transportation
Traffic Operations Division

CLAMP ON FITTING ASSEMBLY FOR LUMINAIRE MAST ARM

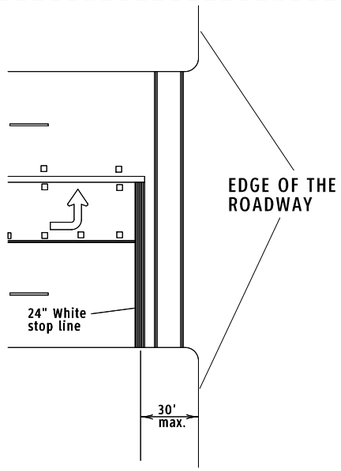
CFA-12

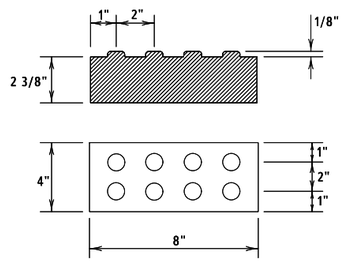
DN: KAB	CK: RES	DW: FDN	CK: CAL

REVISIONS
11-99
1-12

CONT	SECT	JOB	HIGHWAY
0912	00	641	ANTOINE DR
DIST	COUNTY		SHEET NO.
HOU	HARRIS/		71

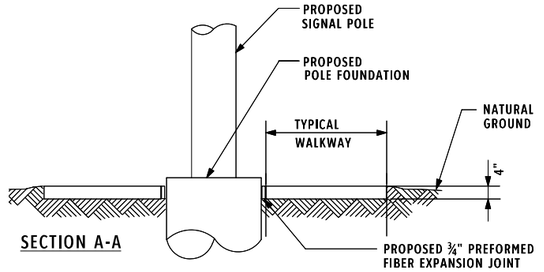
130

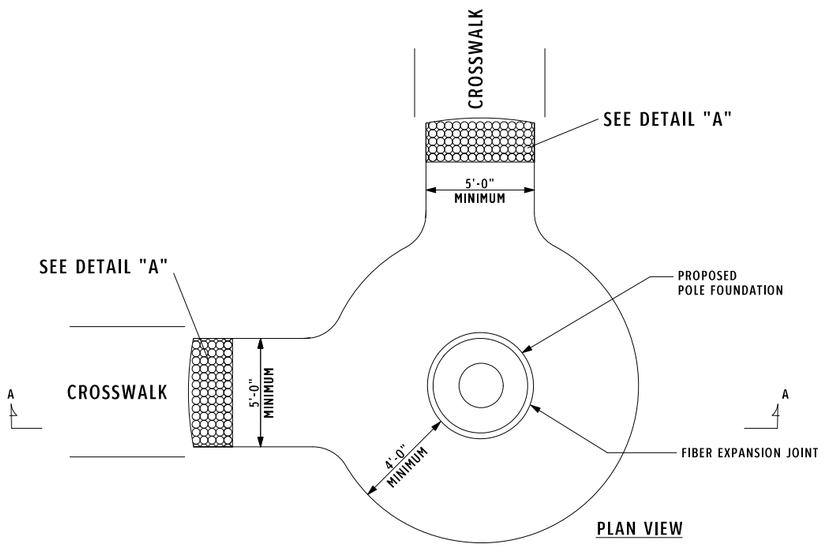




Detectable Warning Paver

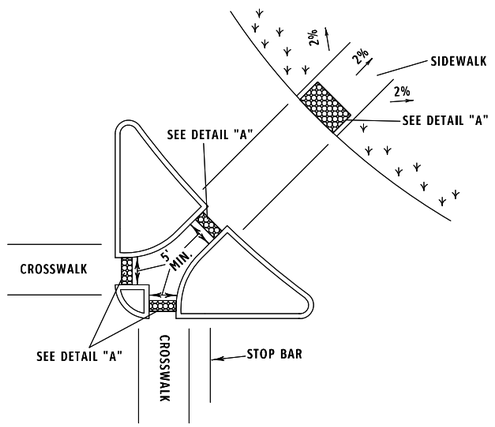
DETAIL "A"





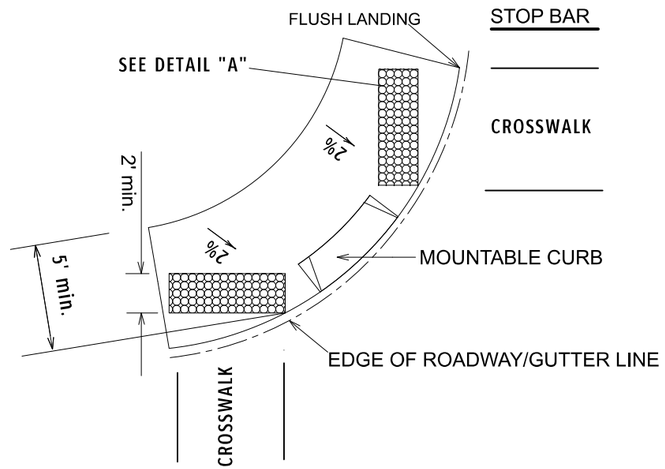
Pedestrian Facilities
General Notes

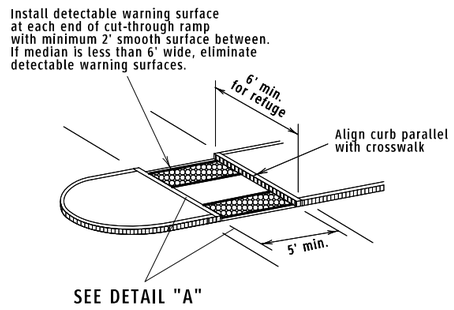
1. All slopes are maximum allowable. The least possible slope that will still drain properly should be used. Adjust access pad length or grade of approach sidewalks as directed.
2. Detectable Warning Paver shown in Detail "A" will be subsidiary to the Bid Item 531.
3. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the edge of pavement, a 6' sidewalk width is encouraged. Where a 5' sidewalk can not be provided due to site constraints, a minimum 3' sidewalk with 5'x 5' passing areas at intervals not to exceed 200' is required.
4. Landings shall be 5'x 5' minimum with a maximum 2% slope in any direction.
5. Maneuvering 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.
6. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
7. Additional information on access pads/sidewalks location, design, light reflective value and texture may be found in the current edition of the Texas Accessibility Standards (TAS) and 16 TAC §68.102.
8. To serve as a pedestrian refuge area, the median should be a minimum of 5' wide. Medians should be designed to provide accessible passage over or through them.
9. 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.
10. Existing features that comply with TAS may remain in place unless otherwise shown on the plans.
11. Access pads/side walks and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
12. Provide a smooth transition where the access pad/side walk connect to the street.



MODIFIED TYPE 5 RAMP

DIRECTIONAL DETECTABLE WARNING SURFACE





100% SUBMITTAL

THESE DOCUMENTS ARE FOR INTERIM REVIEW AND NOT FOR CONSTRUCTION, BIDDING OR PERMIT PURPOSES.

RESPONSIBLE ENGINEER:
STEVENS TECHNICAL SERVICES, INC.
CHARLES R. STEVENS, P.E.
TEXAS REGISTRATION NO. 101286

TEXAS DEPARTMENT OF TRANSPORTATION
HOUSTON DISTRICT

ACCESS PAD RAMP DETAILS

ACCRD

SCALE	FED. RD. DIV. NO.	STATE	PROJECT NO.		HIGHWAY	
N. T. S.	6	TEXAS	SEE TITLE SHEET		ANTOINE DR	
REVISIONS	STATE DISTRICT	COUNTY	CONTROL	SECTION	JOB	SHEET NO.
	HOU	HARRIS/	0912	00	641	72

DATE: 11/30/2020
FILE: Z:\1800111 TxDOT 3320 Prime WA1\6.0 Design\Combined Files\STANDARDS_Antoine\73 - 76 - ped18.dgn

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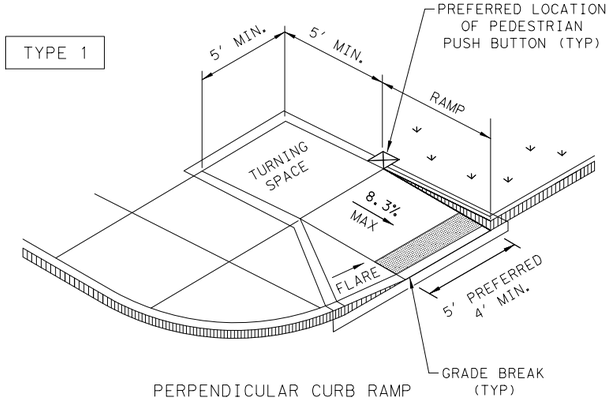
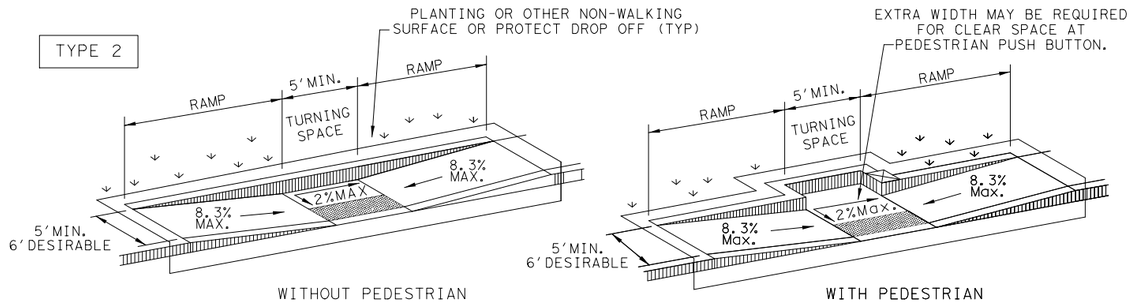


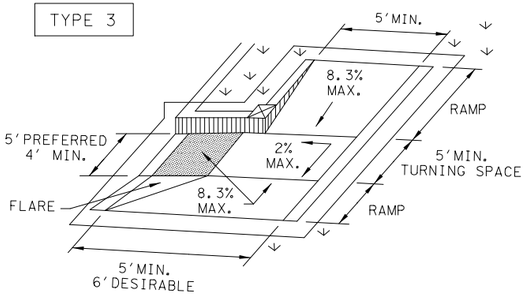
PERPENDICULAR CURB RAMP

TYPE 2



PARALLEL CURB RAMP

TYPE 3



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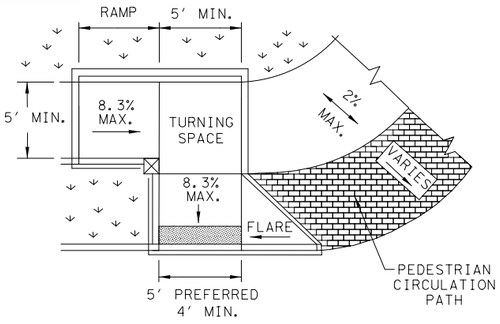
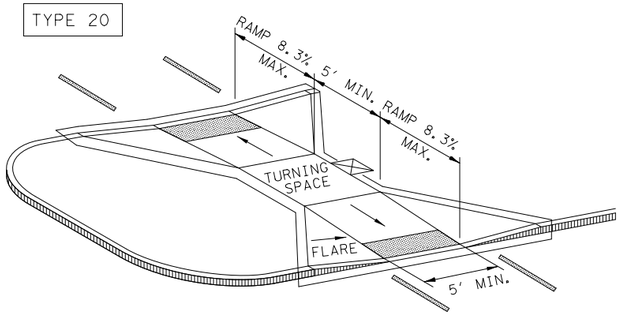


COMBINATION CURB RAMPS

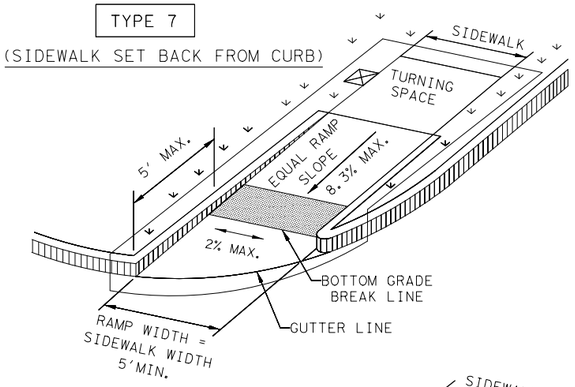
TYPE 20



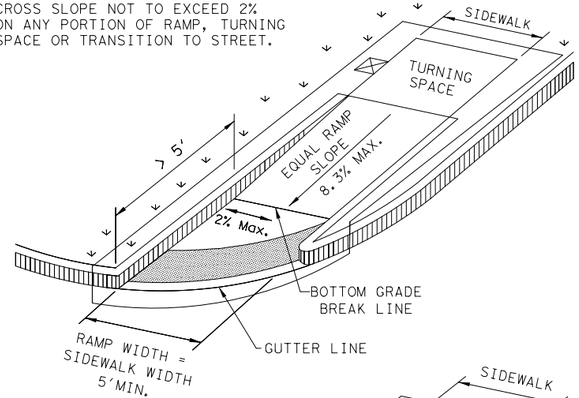
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

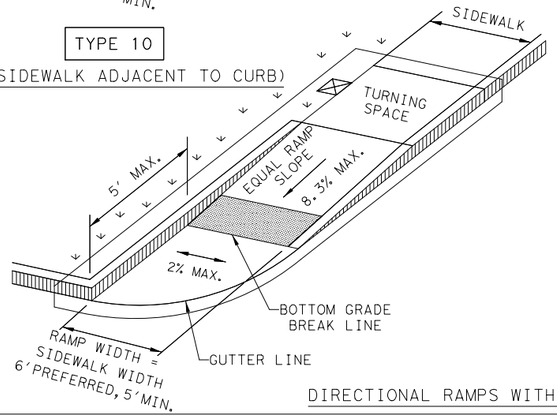


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



TYPE 10

(SIDEWALK ADJACENT TO CURB)



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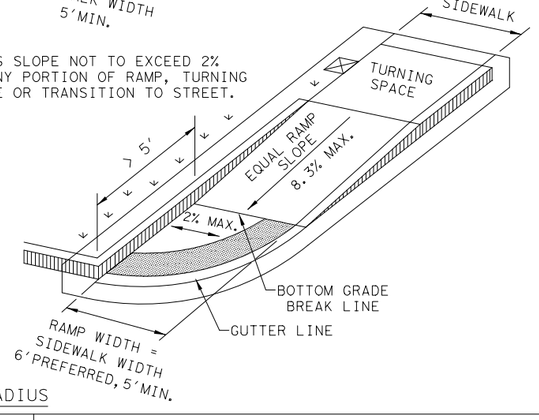
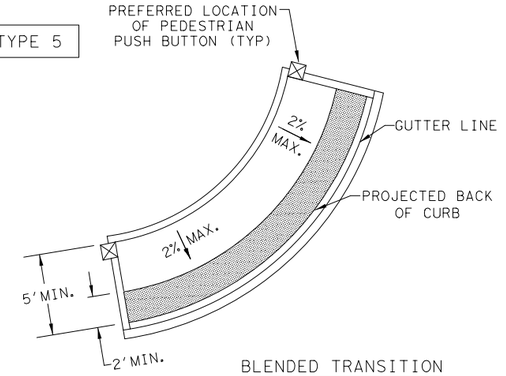


DIRECTIONAL RAMPS WITHIN RADIUS

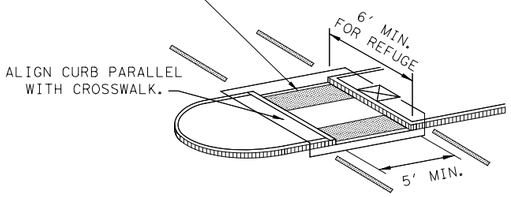
TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

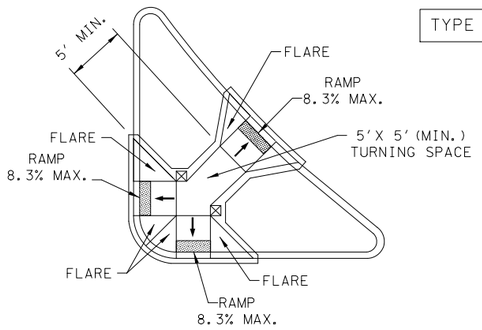
TYPE 21

INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.



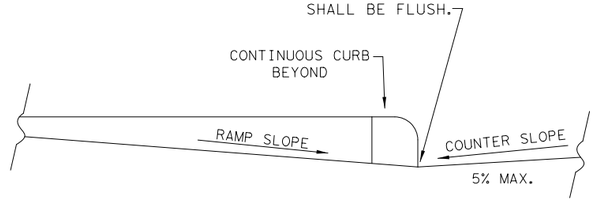
NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS

BOTTOM GRADE BREAK OF CURB RAMP WILL NORMALLY BE AT GUTTER LINE. SURFACE SLOPES AT GRADE BREAKS SHALL BE FLUSH.



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	0912	00	641	ANTOINE DR
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/		73

DATE: 11/30/2020
FILE: Z:\1800111 TxDOT 3320 Prime WA11\6.0 Design\Combined Files\STANDARDS_Antoine\73 - 76 - ped18.dgn

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

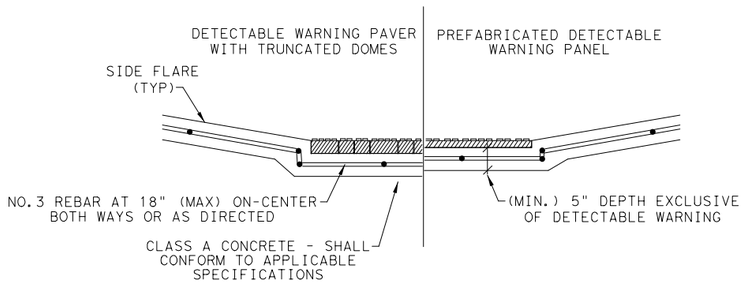
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material 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.

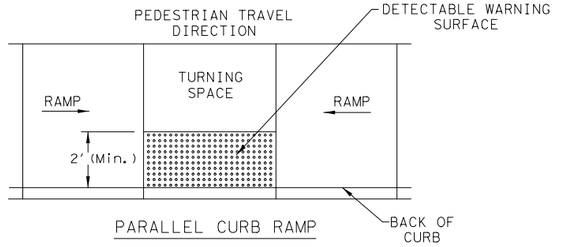
SIDEWALKS

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.

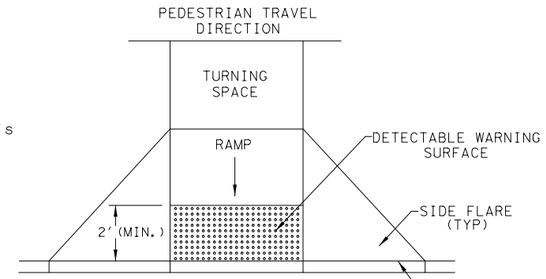


SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

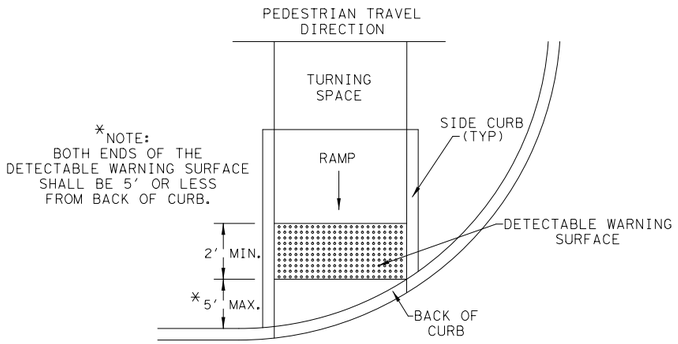
DETECTABLE WARNING SURFACE DETAILS



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

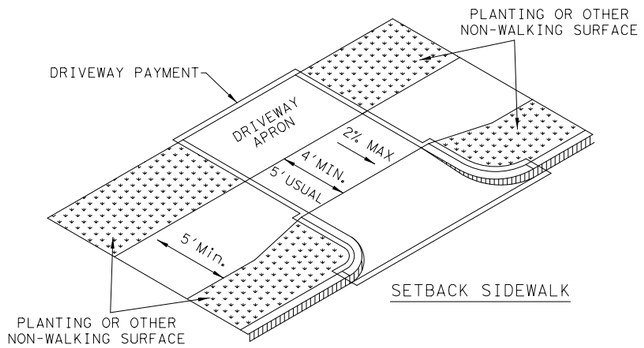
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

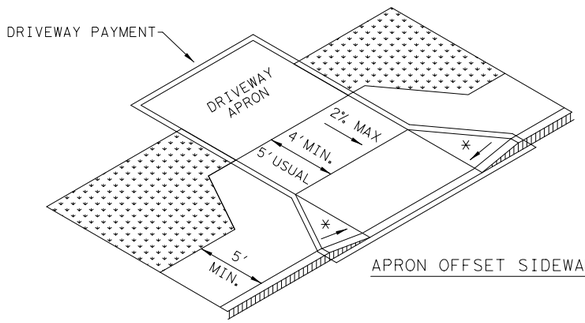
FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	ANTOINE DR
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/		74

DATE: 11/30/2020
FILE: Z:\1800111 TxDOT 3320 Prime WA11\6.0 Design\Combined Files\STANDARDS_Antoine\73 - 76 - ped18.dgn

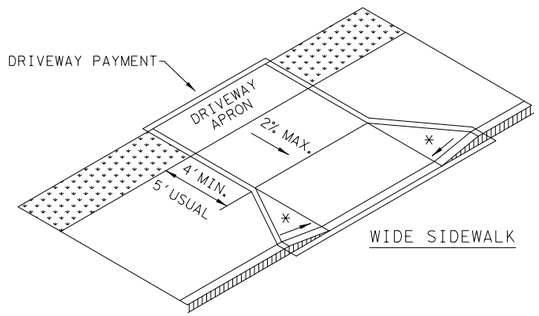
SIDEWALK TREATMENT AT DRIVEWAYS



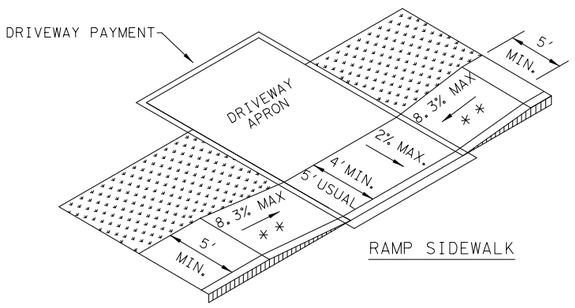
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

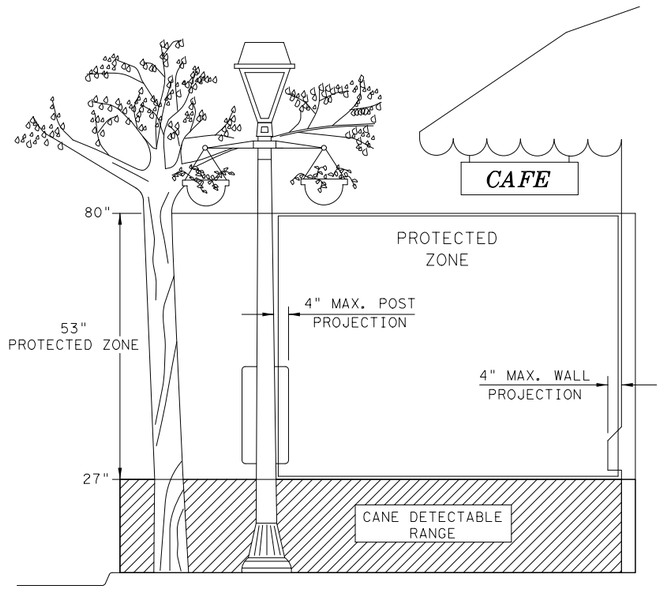


RAMP SIDEWALK

NOTES:

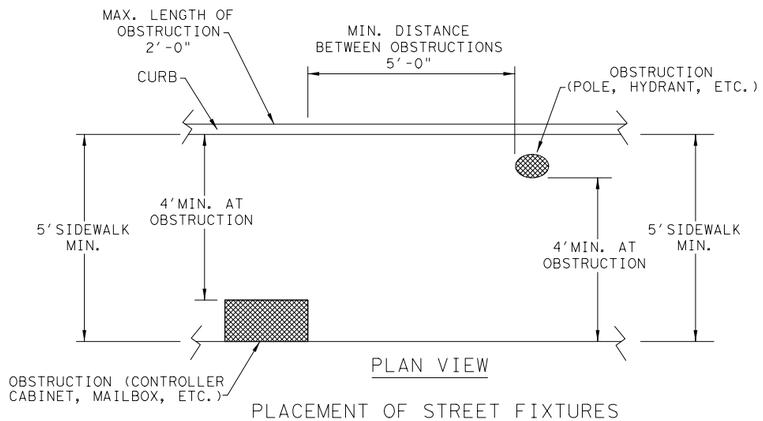
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * 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

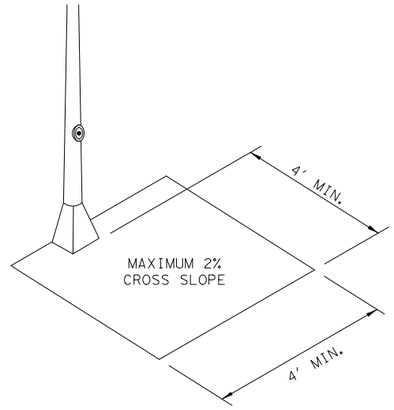
NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



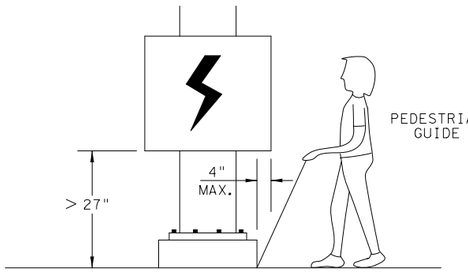
PLAN VIEW

PLACEMENT OF STREET FIXTURES

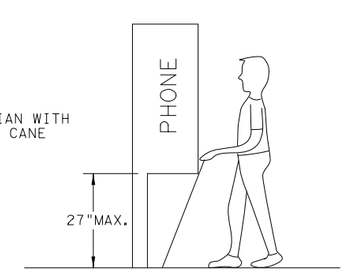
NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



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

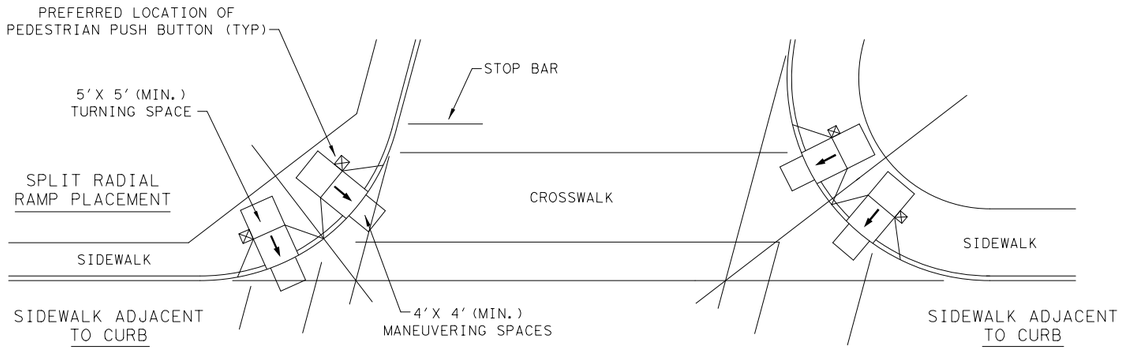
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

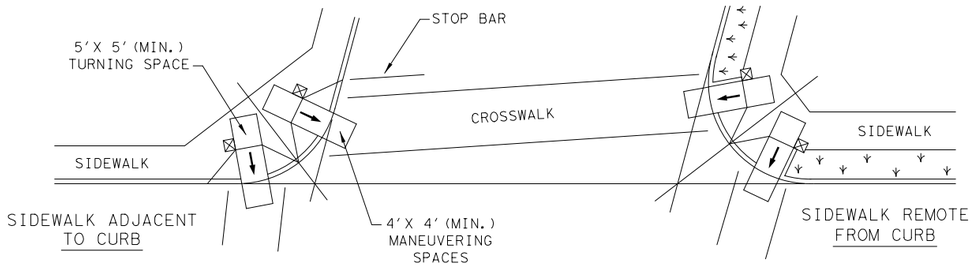
FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG	
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0912	00	641		ANTOINE DR	
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY			SHEET NO.	
	HOU	HARRIS/			75	

DATE: 11/30/2020
FILE: Z:\1800111 TxDOT 3320 Prime WA11\6.0 Design\Combined Files\STANDARDS_Antoine\73 - 76 - ped18.dgn

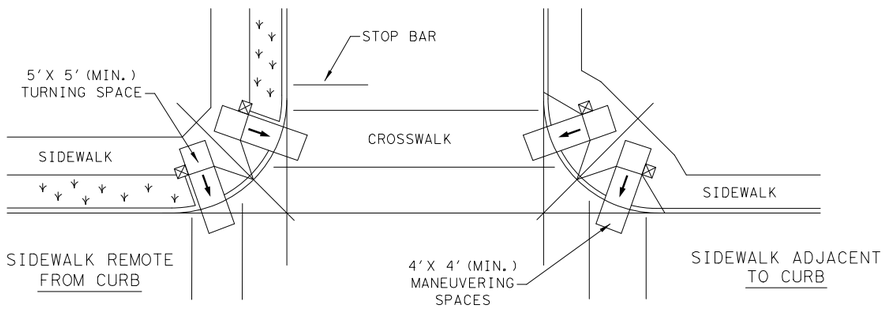
TYPICAL CROSSING LAYOUTS
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



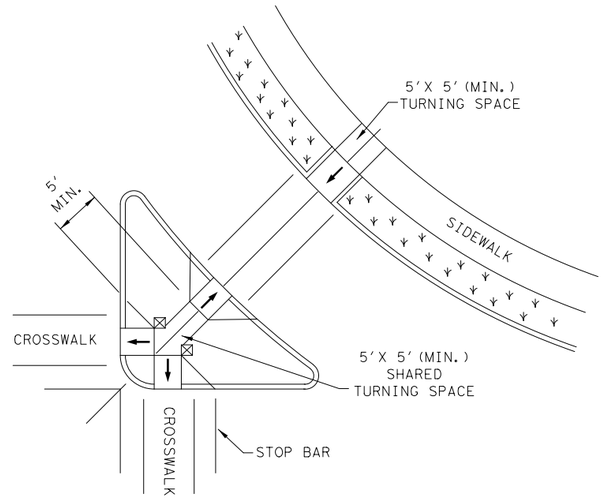
SKEWED INTERSECTION WITH "LARGE" RADIUS



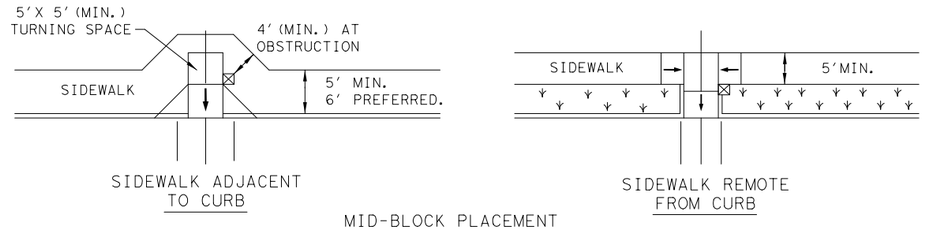
SKEWED INTERSECTION WITH "SMALL" RADIUS



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	0912	00	641	ANTOINE DR
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/		76

DATE: 1/13/2021 10:54:29 PM
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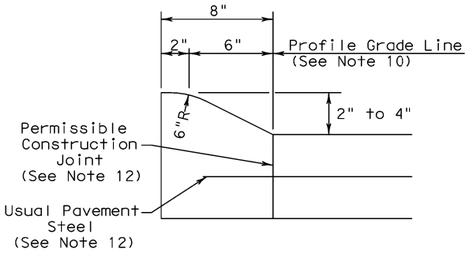
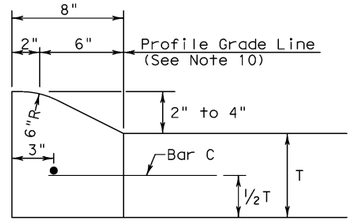
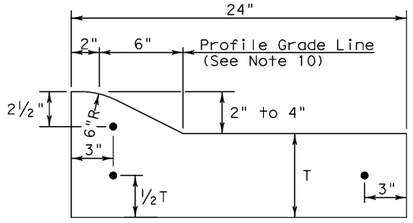


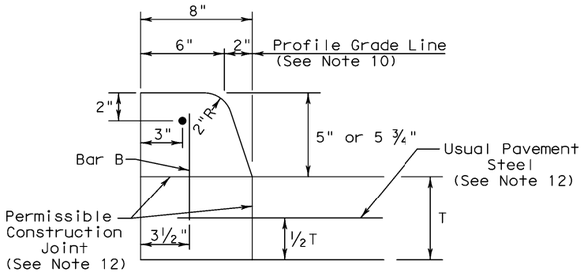
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



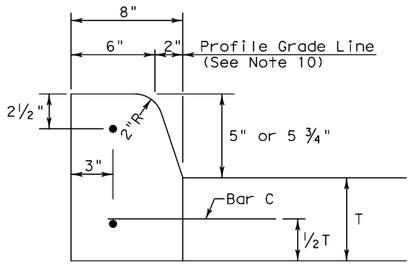
TYPE I CURB
2" - 4" HEIGHT



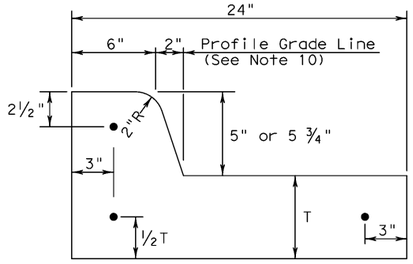
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



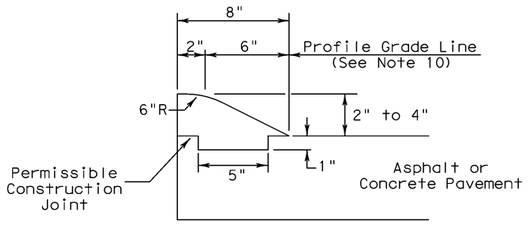
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



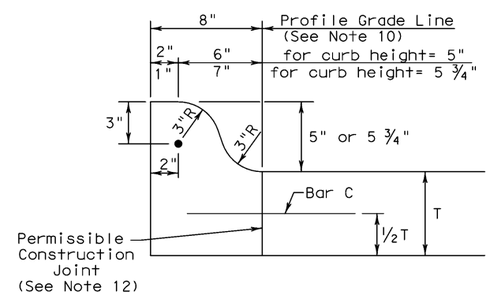
TYPE II CURB
5" - 5 ¾" HEIGHT



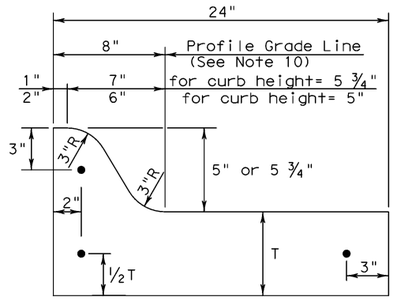
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



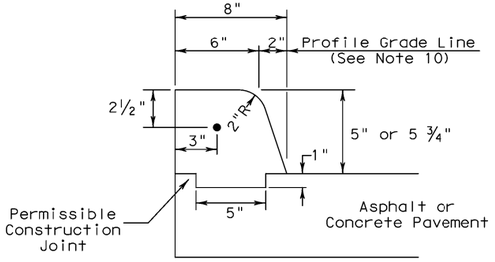
TYPE III CURB (KEYED)
2" - 4" HEIGHT



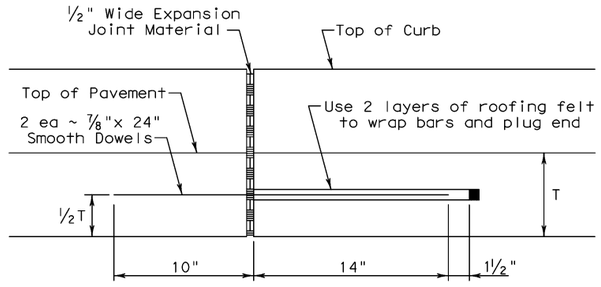
TYPE IIa CURB
5" - 5 ¾" HEIGHT



TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

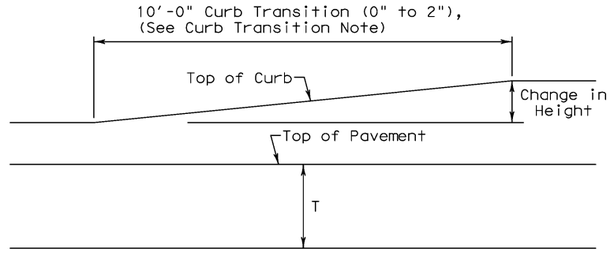


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

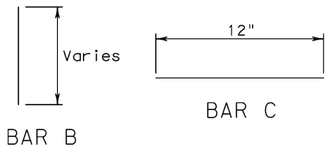
Curb Transition Note:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



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 synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
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 placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
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 vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.



BAR B BAR C

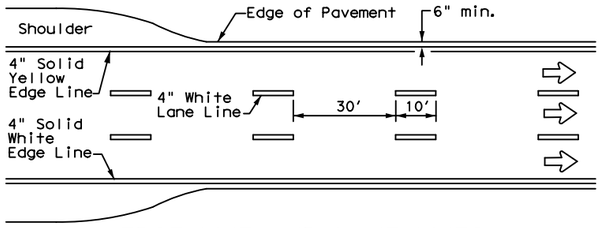
Texas Department of Transportation

Design Division Standard

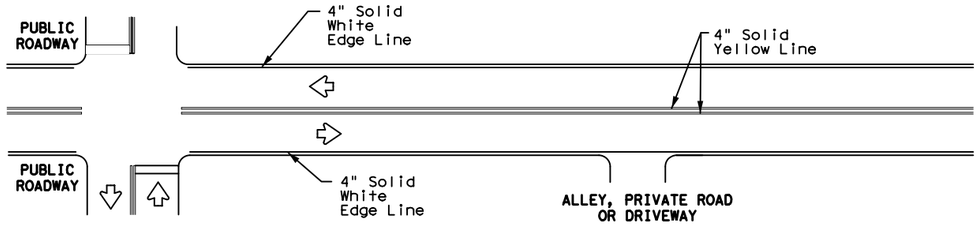
CURB AND GUTTER

CCCG-12

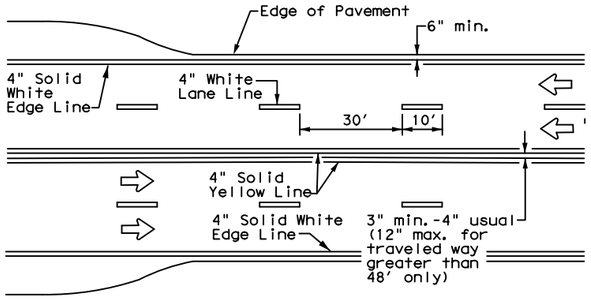
FILE: cccg12.dgn	DN: TxDOT	CK: AM	DW: VP	CK: VP
© TxDOT: 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS UPDATED 2012 - VP	0912	00	641	ANTOINE DR
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/ BRAZORIA		76A



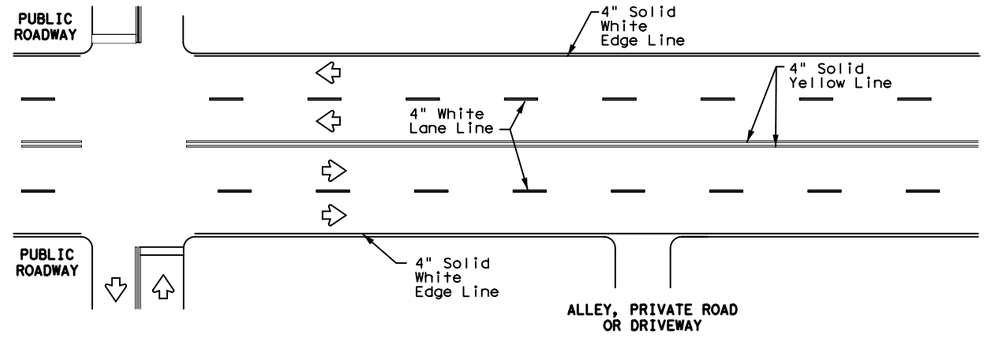
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



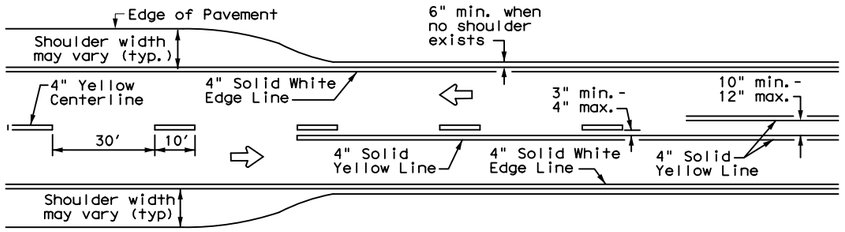
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



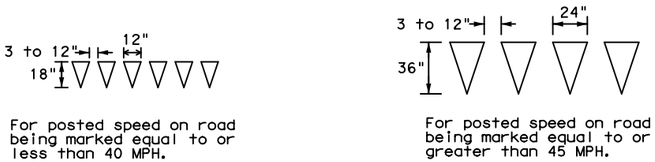
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



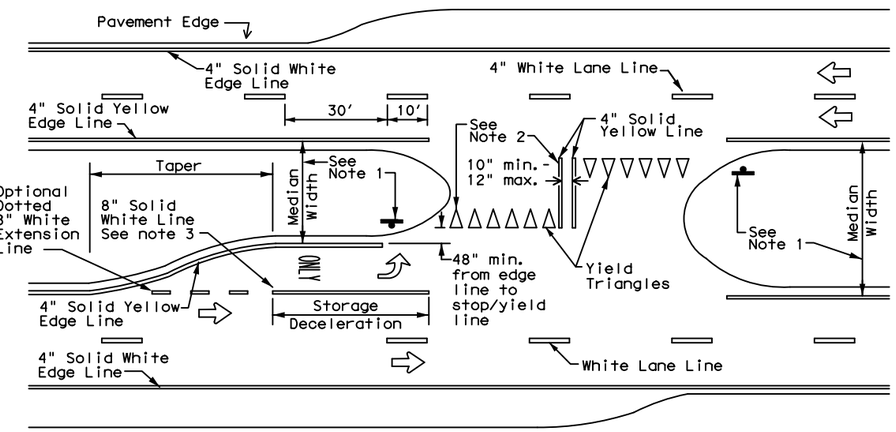
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTE:

1. Irrespective of shoulder, use 6in width lines (edge lines).
2. Use 4 in. width lines (edge and lane lines) when lane width is 10 ft. or less; and 6 in. width lines when lane width is greater than 10 ft.

NOTES

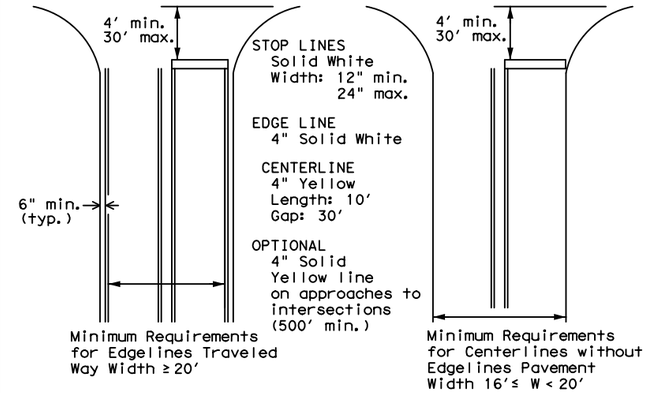
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling 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
HOUSTON DISTRICT STANDARD

TYPICAL STANDARD PAVEMENT MARKINGS

PM-20

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

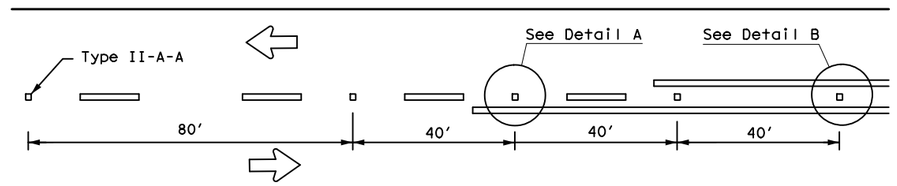
REVISIONS: 8-95 2-12; 5-00 8-16; 8-00 7-20; 3-03

CONT	SECT	JOB	HIGHWAY
0912	00	641	ANTOINE DR
DIST	COUNTY		SHEET NO.
HOU	HARRIS/		77

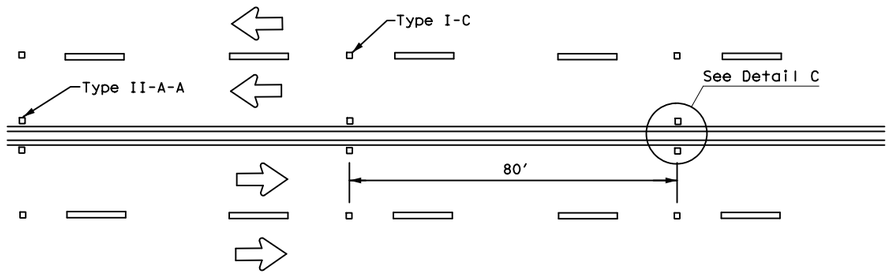
STD N-5a

DATE: 11/30/2020 2:44:47 PM
FILE: Z:\1800111 TxDOT 3320 Prime WA11\6.0 Design\Combined Files\STANDARDS\PM-20.dgn

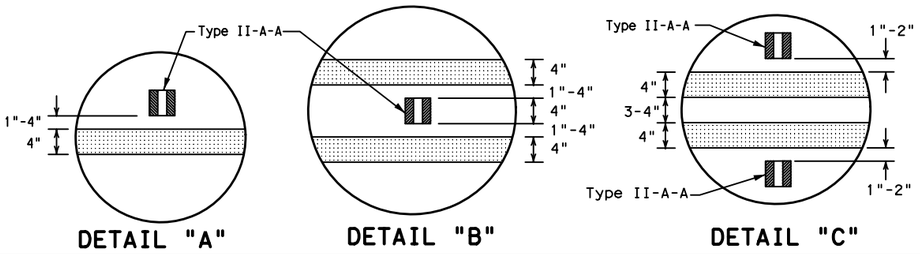
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



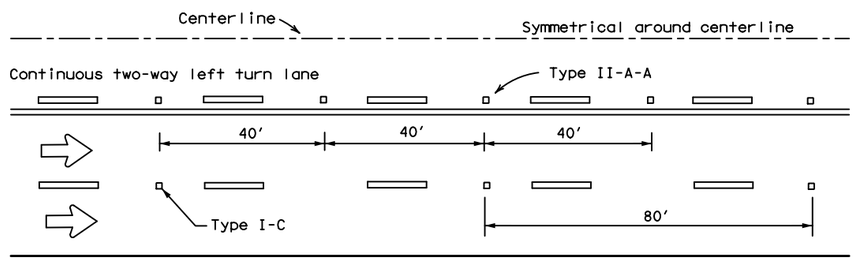
CENTERLINE FOR ALL TWO LANE ROADWAYS



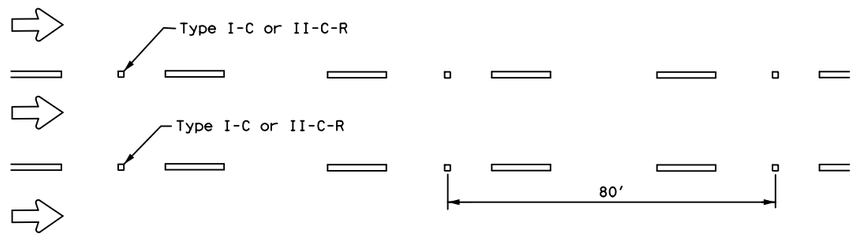
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



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

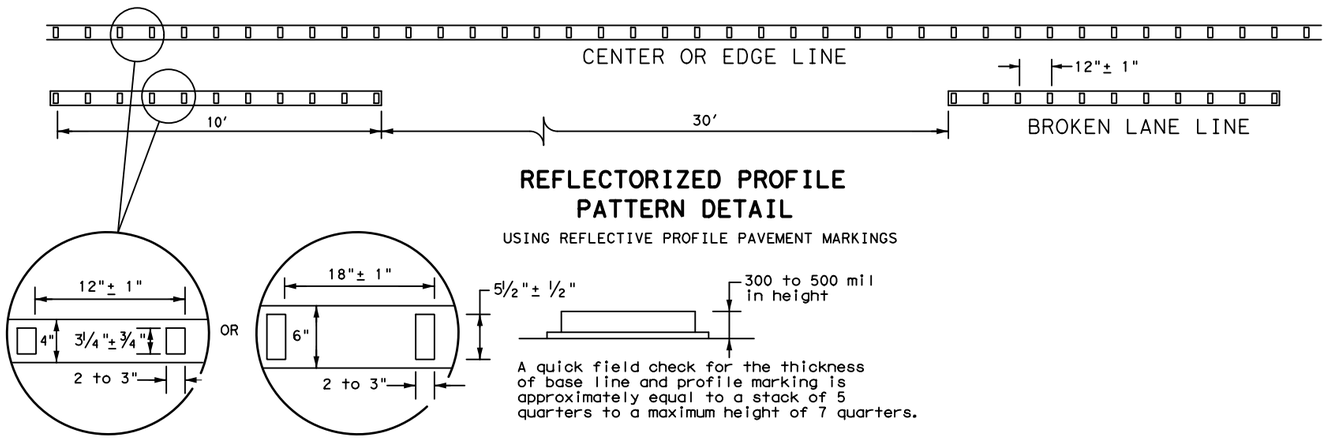


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

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.

NOTE

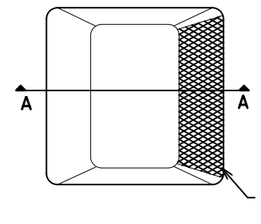
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

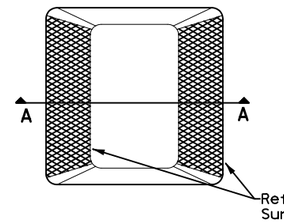
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

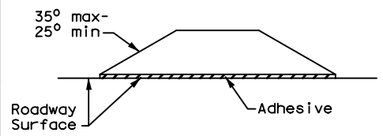
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

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 5-00 2-12 8-00 6-20	0912	00	641	ANTOINE DR
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/		78

22B

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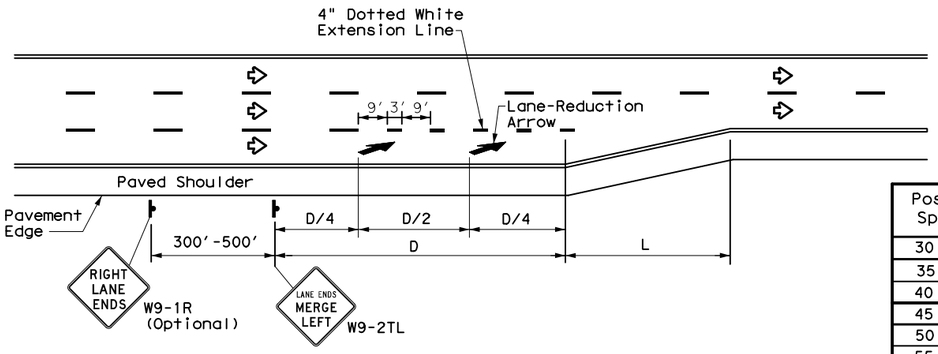
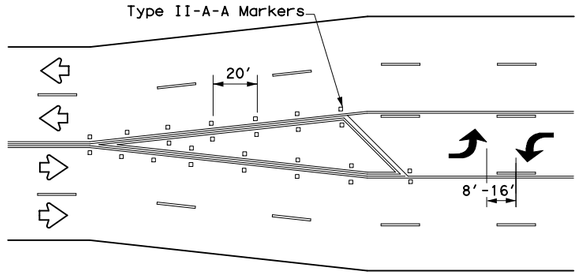


LANE REDUCTION

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.

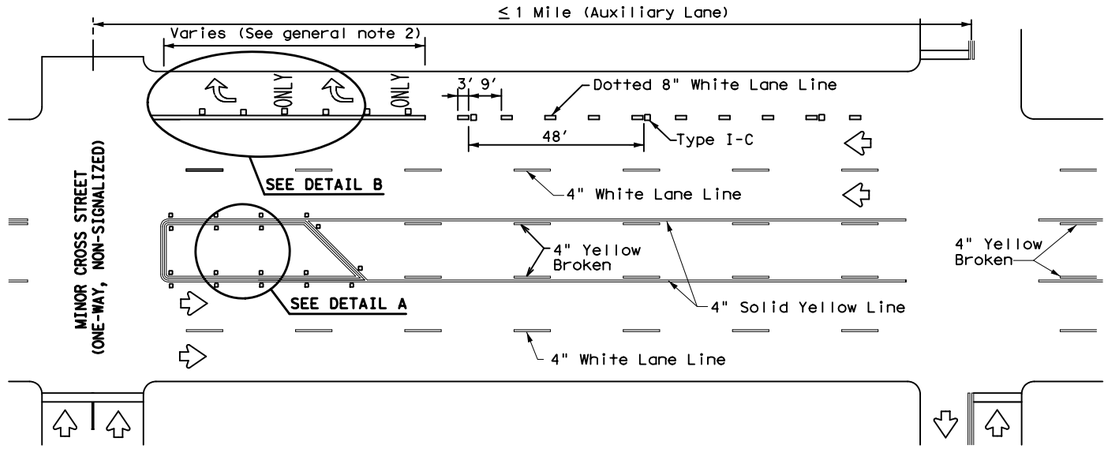
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

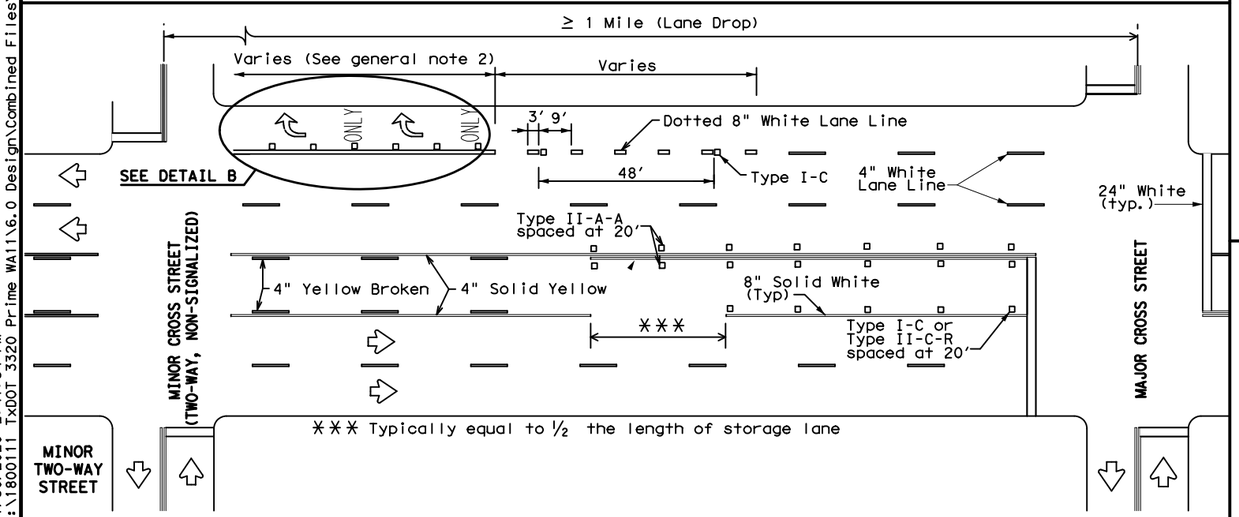
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn 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

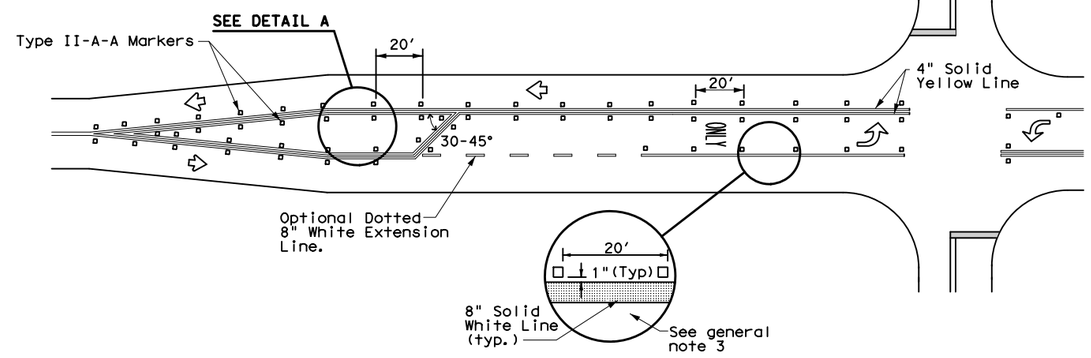
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



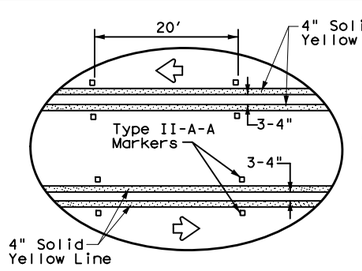
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



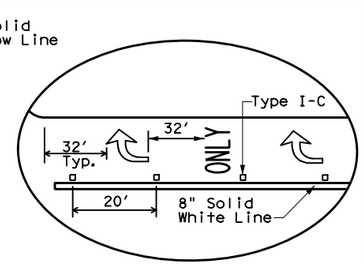
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A



DETAIL B

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	0912	00	641	ANTOINE DR
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	HOU	HARRIS/		79
3-03 6-20				

22D

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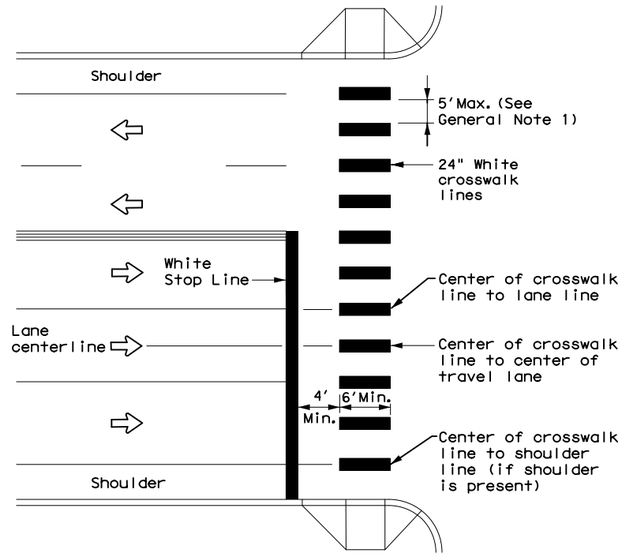


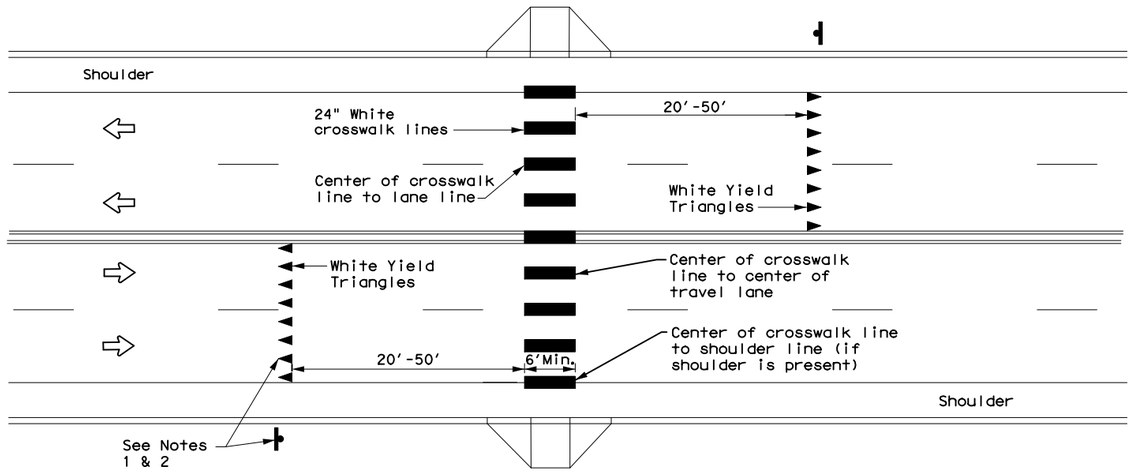
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

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/Yield Triangles 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 yield triangles with "Yield Here to Pedestrians" signs at unsignalized mid block crosswalks.
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

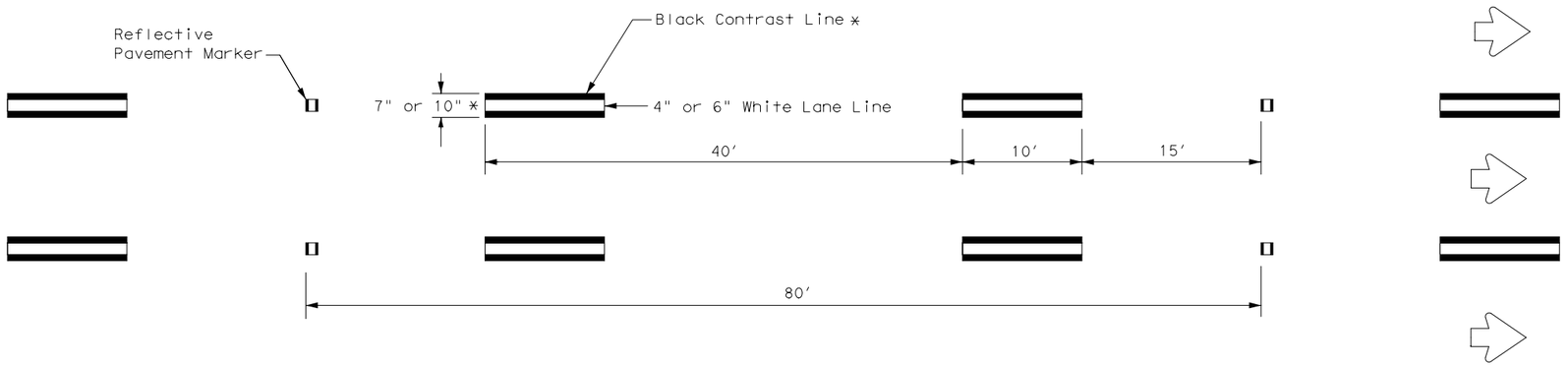
Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-20

FILE: pm4-20.dgn	DN:	CK:	DW:	CK:
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	ANTOINE DR
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/		80

22D



CONTRAST LANE LINE DESIGN

* See contrast line dimensions table for width of black line.

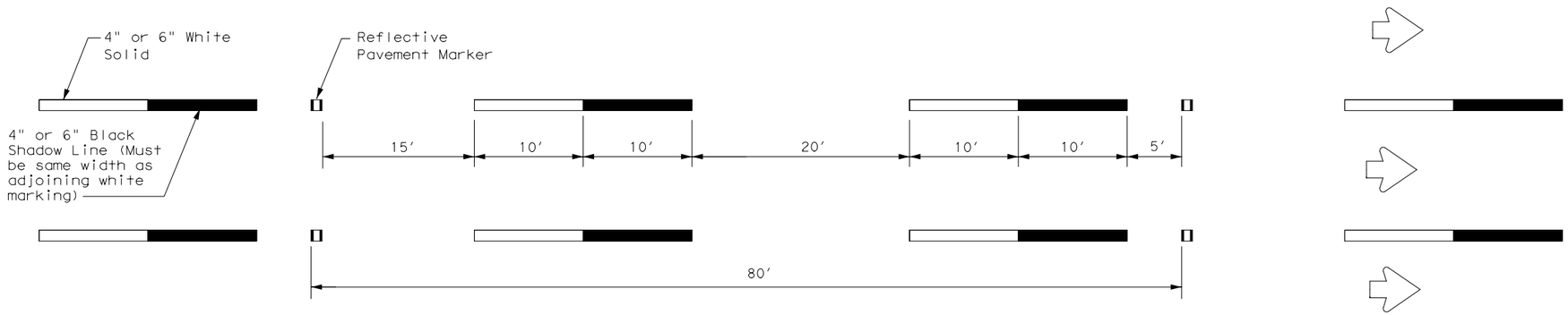
CONTRAST LINE DIMENSIONS		
White	Black (per side)	Total Width
4"	1.5"	7"
6"	2"	10"

GENERAL NOTES

1. Contrast and Shadow markings may only be used on concrete pavements.
2. Contrast and Shadow markings shall not be used on edge lines.
3. Contrast lane lines shall be permanent prefabricated pavement markings meeting DMS 8240.
4. Shadow lane line designs shall be a liquid markings system approved by TxDOT.
5. All raised reflective pavement markers placed in broken lines shall be placed in line with and midway between the white stripes.
6. See PM(2) for raised reflective pavement markings installation details.

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.



SHADOW LANE LINE DESIGN

Texas Department of Transportation

Traffic Operations Division Standard

CONTRAST AND SHADOW PAVEMENT MARKINGS

CPM(1)-14

FILE: CPM(1)14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	ANTOINE DR
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/		81

DATE:
FILE:

22N

DATE: 11/30/2020 2:52:29 PM
FILE: Z:\1800111 TxDOT 3320 Prime WA11\6.0 Design\Combined Files\STANDARDS*Antoine\082*smdgen.dgn

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)

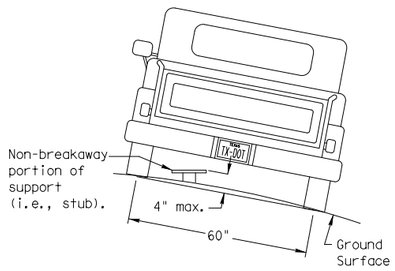
Anchor Type

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

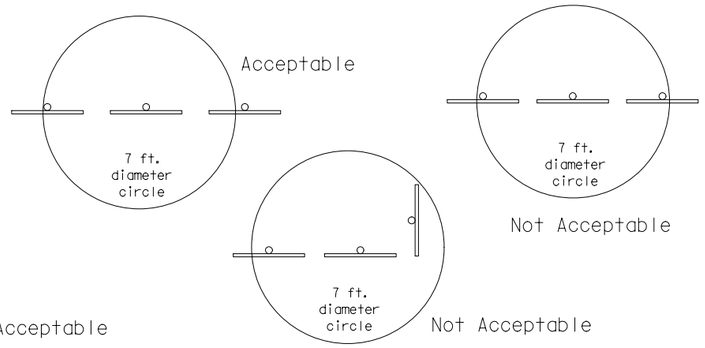
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
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



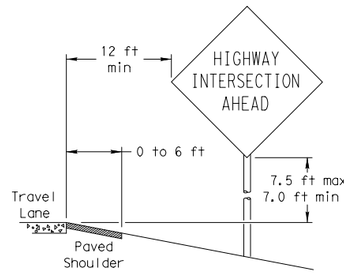
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

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



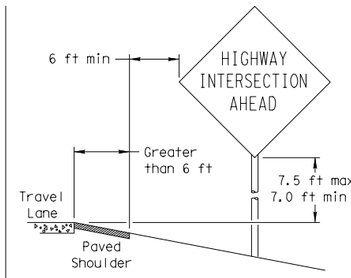
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

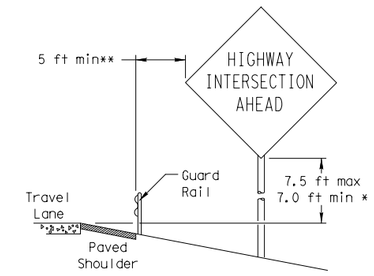
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



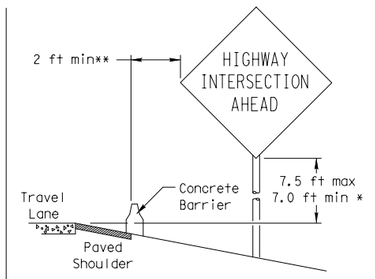
GREATER THAN 6 FT. WIDE

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.

BEHIND BARRIER



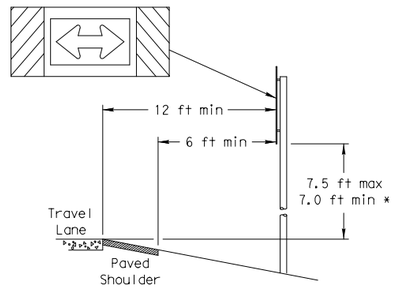
BEHIND GUARDRAIL



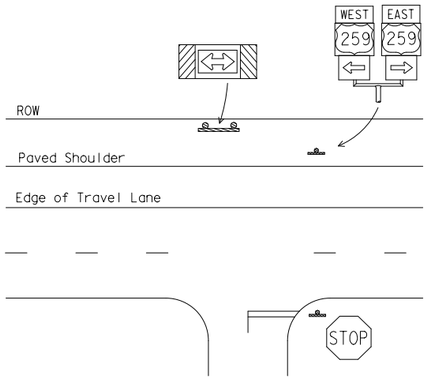
BEHIND CONCRETE BARRIER

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

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.



* 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.

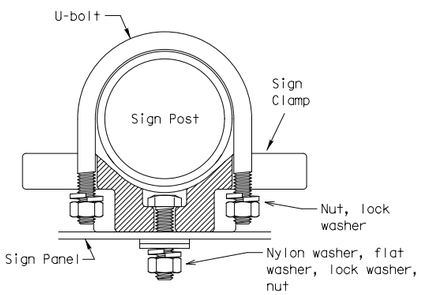
The maximum values may be increased when directed by the Engineer.

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

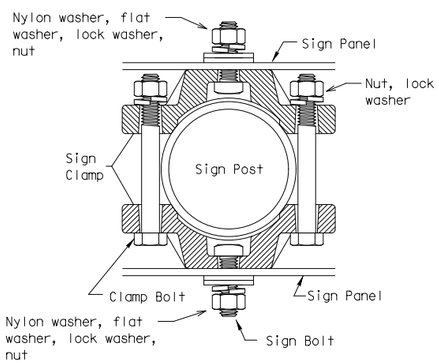


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

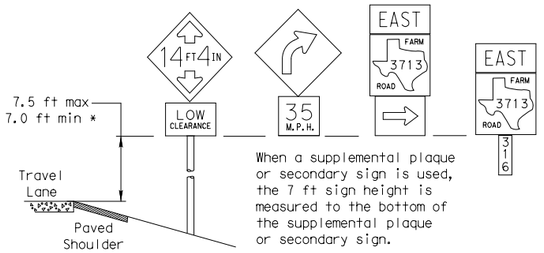
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



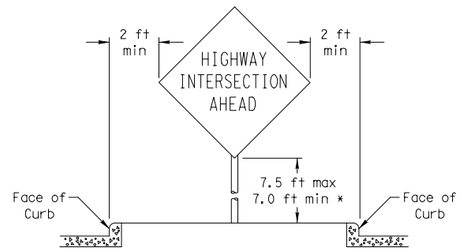
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



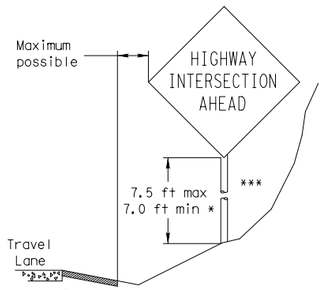
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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

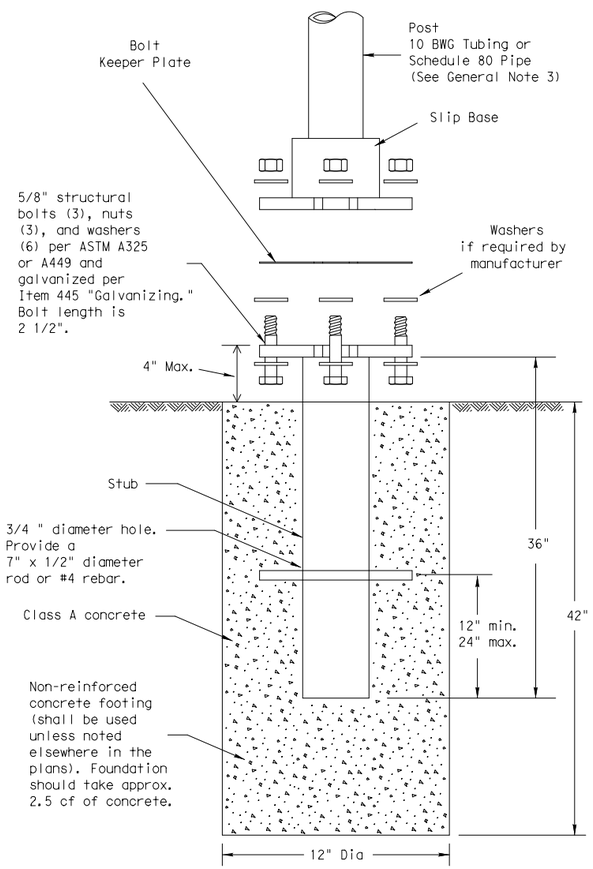
SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0912	00	641	ANTOINE DR
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/		82

26A

DATE: 11/30/2020 2:57:23 PM
FILE: Z:\1800111 TxDOT 3320 Prime WA11\6.0 Design\Combined Files\STANDARDS*Antoine\083*smds1.dgn

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:

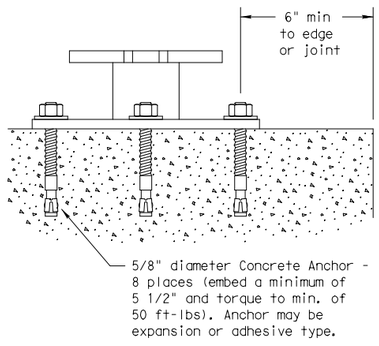
1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   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
0912	00	641	ANTOINE DR

DIST	COUNTY	SHEET NO.
HOU	HARRIS/	83

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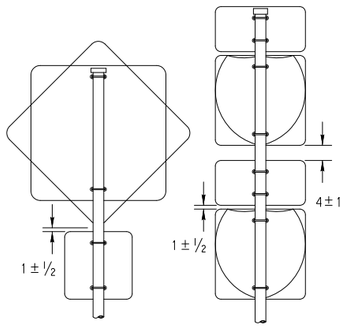
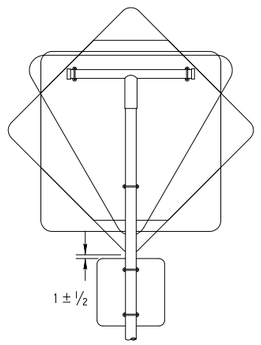


SM RD SGN ASSM TY XXXXX(1)XX(P)



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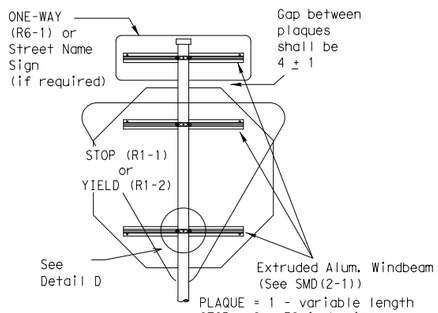
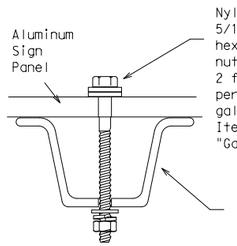
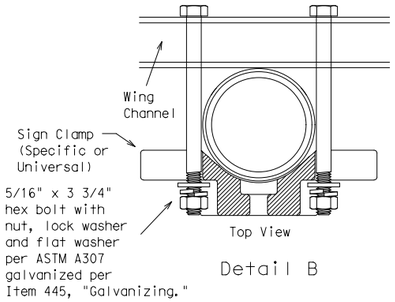


SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A



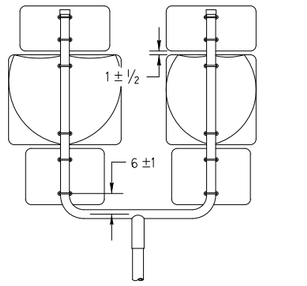
Detail B

GENERAL NOTES:

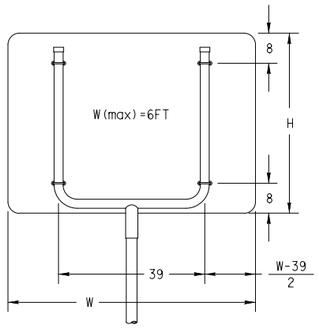
1.

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

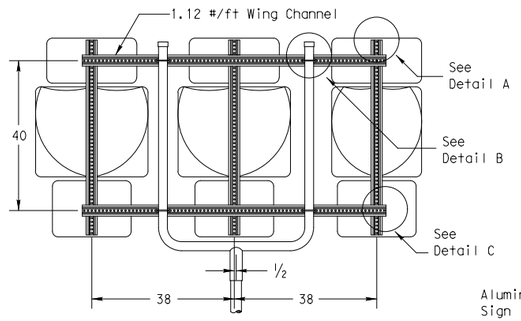
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material 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.



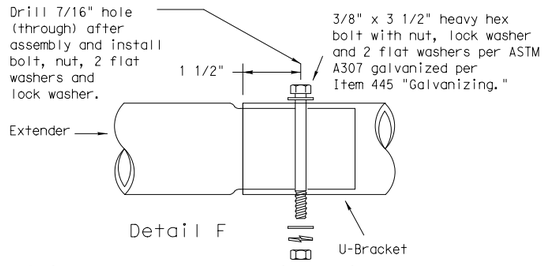
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

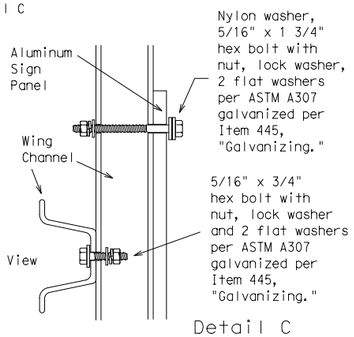


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)



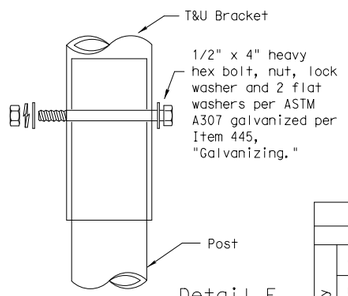
Detail F

Splices shall only be allowed behind the sign substrate.

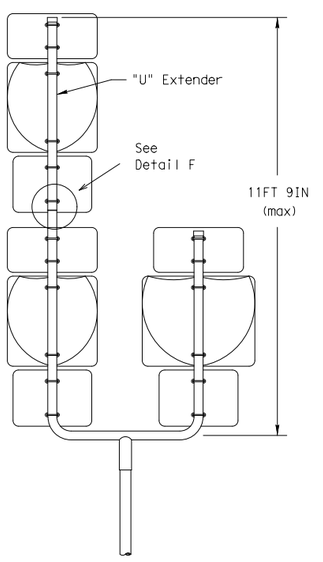


SIDE VIEW

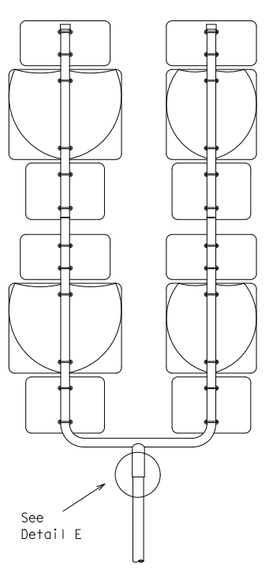
Detail C



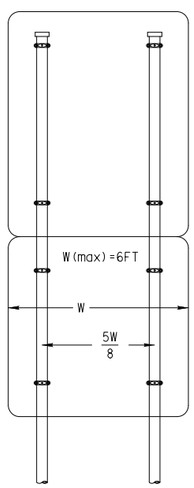
Detail E



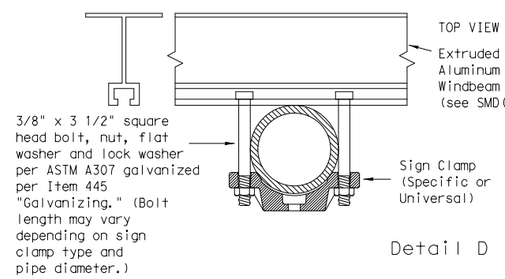
SM RD SGN ASSM TY S80(1)XX(U-1EXT)



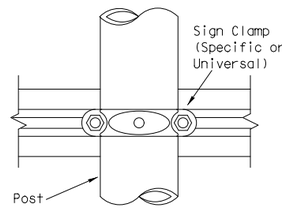
SM RD SGN ASSM TY S80(1)XX(U-2EXT)

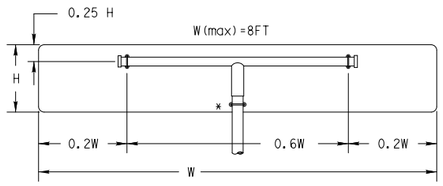


SM RD SGN ASSYM TY XXXXX(2)XX(P)



Detail D

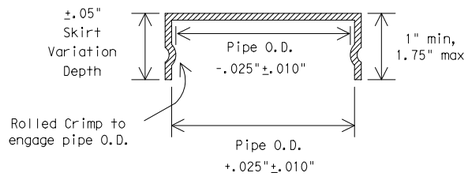




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

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.

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-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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	0912	00	641	ANTOINE DR
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/		84

26C

DATE: 1/13/2021 11:39:50 PM
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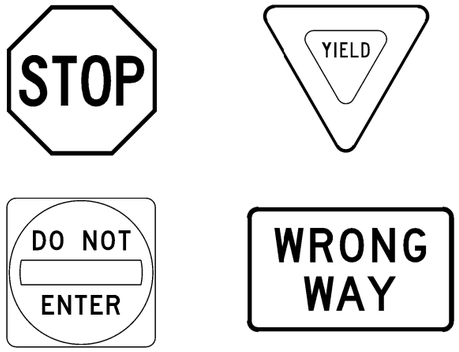
REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

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



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

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

REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

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

TYPICAL EXAMPLES

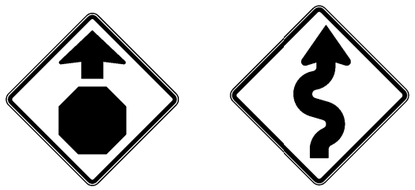
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

GENERAL NOTES

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

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-03 7-13 9-08	0912	00	641	ANTOINE DR
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS/BRAZORIA		85

SUMMARY OF SMALL SIGNS TO BE REMOVED

LABEL NUMBER	APPROXIMATE LOCATION	L/R	SHT NO	SIGN TEXT	REMOVE SIGN
			12	WEST	X
				BELTWAY 8	X
				←	X
				WEST	X
				SAM HOUSTON TOLLWAY	X
				←	X
			12	EAST	X
				BELTWAY 8	X
				←	X
				EAST	X
				SAM HOUSTON TOLLWAY	X
				←	X
			12	DO NOT ENTER	X
				ONLY	X
			12	YIELD	X
			12	ONE WAY	X
				YIELD	X
			12	DO NOT ENTER	X
			13	SPEED LIMIT 35	X
			13	SPEED LIMIT 35	X
			13	ONE WAY	X
				YIELD	X
			13	DO NOT ENTER	X
				ONLY	X
			13	DO NOT ENTER	X
			14	SPEED LIMIT 35	X
			15	WRONG WAY	X
				Antoine Dr	X
				TOTAL SIGNS REMOVED:	28

LABEL NUMBER	APPROXIMATE LOCATION	L/R	SHT NO	SIGN TEXT	REMOVE SIGN
			15	SPEED LIMIT 50	X
			16	WRONG WAY	X
				ONLY	X
			16	WRONG WAY	X
			16	Antoine Dr	X
			16	SPEED LIMIT 50	X
			16	EAST	X
				BELTWAY 8	X
				TOTAL SIGNS REMOVED:	8

DATE:
FILE:

Traffic Operations Division Standard

SMALL SIGN REMOVAL

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	VARIOUS
4-16	DIST	COUNTY		SHEET NO.
8-16	HOU	HARRIS		86

18

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

DATE:
FILE:

SUMMARY OF SMALL SIGNS TO BE REMOVED

LABEL NUMBER	APPROXIMATE LOCATION	L/R	SHT NO	SIGN TEXT	REMOVE SIGN		LABEL NUMBER	APPROXIMATE LOCATION	L/R	SHT NO	SIGN TEXT	REMOVE SIGN
			19	STOP	X							
			19	STOP	X							
				TOTAL SIGNS REMOVED:	2							

Texas Department of Transportation

Traffic Operations Division Standard

SMALL SIGN REMOVAL

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0912	00	641	VARIOUS
4-16		DIST	COUNTY		SHEET NO.
8-16		HOU	HARRIS		86A

SUMMARY OF SMALL SIGNS

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS (IN)	PLYWOOD SIGNS	ALUMINUM SIGNS TYPE A	644 - INS SM RD SN SUP & AM																			
							TYPE OF MOUNT																			
							6001 10BWG (1) SA (P) EA	6002 10BWG (1) SA (P-BM) EA	6004 10BWG (1) SA (T) EA	6005 10BWG (1) SA (T-2EXT) EA	6006 10BWG (1) SA (U) EA	6017 10BWG (2) SA (P) EA	6019 10BWG (2) SA (T-2EXT) EA	6027 S80 (1) SA (P) EA	6040 S80 (1) SA (P-BM) EA	6030 S80 (1) SA (T) EA	6031 S80 (1) SA (T-2EXT) EA	6033 S80 (1) SA (U) EA	6034 S80 (1) SA (U-1EXT) EA	6035 S80 (1) SA (U-2EXT) EA	6036 S80 (1) SA (U-BM) EA	6037 S80 (1) SA (U-WC) EA	6050 S80 (2) SA (P) EA	6052 S80 (2) SA (T-2EXT) EA	6067 INST SIGN ONLY EA
12		M3-2	WEST	12"X6"		1																				
		M1-6B	BELTWAY 8	24"X24"		1																				
		M6-1		12"X9"		1																				
		M3-2 (TOLL)	WEST	12"X9"		1																				1
		SAM HOUSTON (TOLL)	SAM HOUSTON TOLLWAY	STANDARD		1																				
		M6-1 (TOLL)		12"X10"		1																				
12		M3-2	EAST	12"X6"		1																				
		M1-6B	BELTWAY 8	24"X24"		1																				
		M6-1		12"X9"		1																				
		M3-2 (TOLL)	EAST	12"X9"		1																				1
		SAM HOUSTON (TOLL)	SAM HOUSTON TOLLWAY	STANDARD		1																				
		M6-1 (TOLL)		12"X10"		1																				
12		R5-1	DO NOT ENTER	30"X30"		1																				
		R3-8uT	ONLY	24"X30"		1																				1
12		R1-2	STOP	48"X48"X48"		1																				1
12		R6-1L	ONE WAY	24"X12"		1																				
		R1-2	STOP	48"X48"X48"		1																				1
12		R1-2	STOP	48"X48"X48"		1			1																	
12		R3-6L		30"X36"		1	1																			
12		R5-1	DO NOT ENTER	30"X30"		1																				1
13		R2-1	SPEED LIMIT 35	24"X30"		2																				2
13		M2-1 (TOLL)	JCT	12"X10"		1	1																			
		SAM HOUSTON (TOLL)	SAM HOUSTON TOLLWAY	STANDARD		1																				
13		R1-2	STOP	48"X48"X48"		2			2																	
13		R6-1L	ONE WAY	24"X12"		1																				
		R1-2	STOP	48"X48"X48"		1																				1
13		R3-6L		30"X36"		1	1																			
13		R5-1	DO NOT ENTER	30"X30"		1																				1
		R3-8uT	ONLY	24"X30"		1																				
13		R5-1	DO NOT ENTER	30"X30"		1																				1
14		M2-1 (TOLL)	JCT	12"X10"		1	1																			
		SAM HOUSTON (TOLL)	SAM HOUSTON TOLLWAY	STANDARD		1																				
14		R2-1	SPEED LIMIT 35	24"X30"		1																				1
15		R5-1a	WRONG WAY	18"X30"		1																				
		STREET NAME	Antoine Dr	18"X66"		1																				1
15		R3-8 (MOD)	ONLY	24"X30"		1	1																			
15		R2-1	SPEED LIMIT 50	24"X30"		1																				1
15		R5-1a	WRONG WAY	18"X30"		1																				
		R3-8uT	ONLY	24"X30"		1			1																	
16		R5-1a	WRONG WAY	18"X30"		1																				1
16		STREET NAME	Antoine Dr	18"X66"		1																				1
16		R3-8 (MOD)	ONLY	24"X30"		1	1																			
16		R2-1	SPEED LIMIT 50	24"X30"		1																				1

GENERAL NOTES:

ALL SIGNS SHALL BE ERECTED ACCORDING TO THE LOCATION SHOWN ON THE LAYOUT SHEETS EXCEPT THAT THE ENGINEER MAY SHIFT A SIGN IN ORDER TO SECURE A MORE DESIRABLE LOCATION. THE CONTRACTOR WILL STAKE ALL SIGN LOCATIONS, AND NO CHANGES IN THOSE LOCATIONS SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.

ALUMINUM SIGN BLANKS (TY A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

SUMMARY OF SMALL SIGNS
HARRIS COUNTY

STATE	DISTRICT	REGION	COUNTY	CONTROL	SECTION	JOB	PROJECT NO.	SHEET
	HOU	6	HARRIS	0912	00	641	SEE TITLE SHEET	87
							HIGHWAY	
							VARIOUS	

STD-N29

SUMMARY OF SMALL SIGNS

644 - INS SM RD SN SUP & AM

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS (IN)	ALUMINUM TYPE A SIGNS	PLYWOOD SIGNS	TYPE OF MOUNT: 6001 10BWG (1) SA (P) EA	6002 10BWG (1) SA (P-BM) EA	6004 10BWG (1) SA (T) EA	6005 10BWG (1) SA (T-2EXT) EA	6006 10BWG (1) SA (U) EA	6017 10BWG (2) SA (P) EA	6019 10BWG (2) SA (T-2EXT) EA	6027 S80 (1) SA (P) EA	6040 S80 (1) SA (P-BM) EA	6030 S80 (1) SA (T) EA	6031 S80 (1) SA (T-2EXT) EA	6033 S80 (1) SA (U) EA	6034 S80 (1) SA (U-1EXT) EA	6035 S80 (1) SA (U-2EXT) EA	6036 S80 (1) SA (U-BM) EA	6037 S80 (1) SA (U-WD) EA	6050 S80 (2) SA (P) EA	6052 S80 (2) SA (T-2EXT) EA	6067 INST SIGN ONLY EA
16		R5-1a	WRONG WAY	18"X30"	1																					1
		R3-8uT		24"X30"	1																					1
16		M3-2	EAST ONLY	12"X6"		1																				
		M1-6B	BELTWAY 8	24"X24"	1																					
22		W3-3		48"X48"	2				2																	

GENERAL NOTES:

ALL SIGNS SHALL BE ERECTED ACCORDING TO THE LOCATION SHOWN ON THE LAYOUT SHEETS EXCEPT THAT THE ENGINEER MAY SHIFT A SIGN IN ORDER TO SECURE A MORE DESIRABLE LOCATION. THE CONTRACTOR WILL STAKE ALL SIGN LOCATIONS, AND NO CHANGES IN THOSE LOCATIONS SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.

ALUMINUM SIGN BLANKS(TY A)

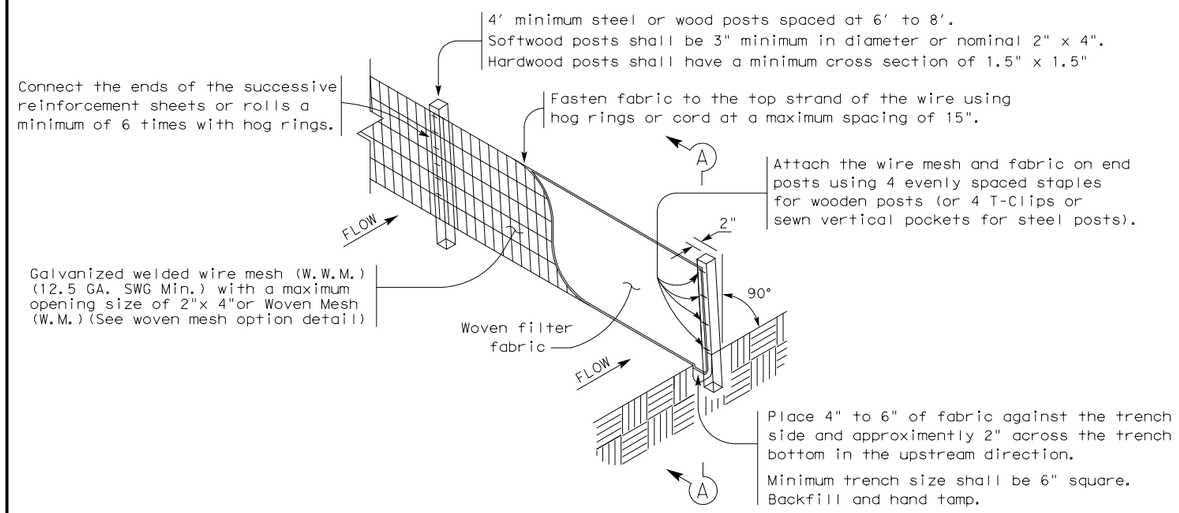
Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

SUMMARY OF SMALL SIGNS HARRIS COUNTY AND BRAZORIA COUNTY

 SHEET 1 OF 1

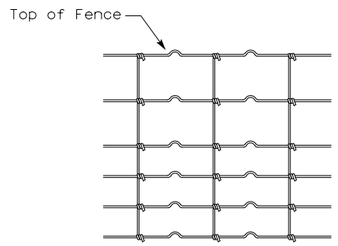
STATE DISTRICT	FEDERAL REGION	PROJECT NO.			SHEET
HOU	6	SEE TITLE SHEET			87A
COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.
HARRIS		0912	00	641	VARIOUS

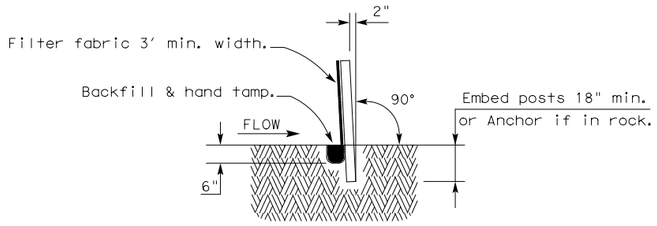
STD-N29



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

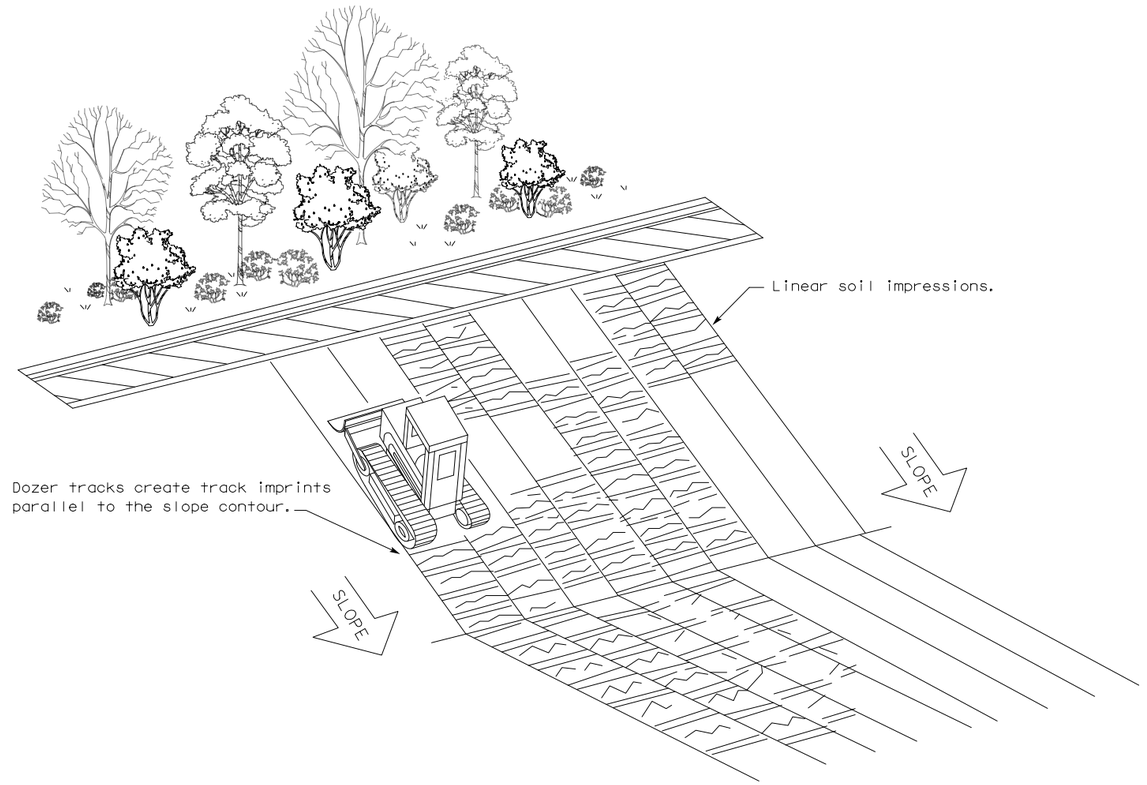
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

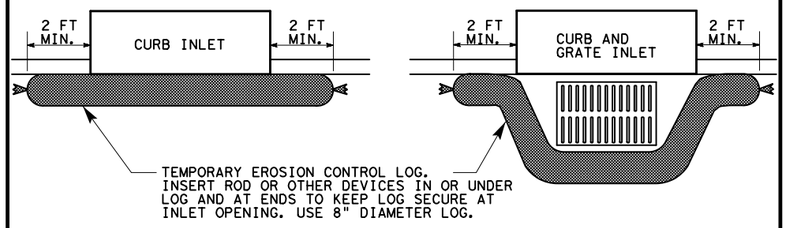
EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0912	00	641	ANTOINE DR	
	DIST	COUNTY		SHEET NO.	
	HOU	HARRIS/		88	

DATE
FILE

CURB INLETS
8" DIAMETER LOGS

ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8")



MATERIAL REQUIREMENTS

FILL:

Use 100% shredded mulch or other non-compost biodegradable material as fill for logs. No compost or fines.

DO NOT USE MATERIAL WHICH PROHIBITS WATER INFILTRATION.

LOG MESH:
Use mesh with 1/4" openings or larger. Mesh must allow water infiltration but also hold fill material in place.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment trap (erosion control log) may be used to filter sediment out of runoff draining from an unstabilized area.

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).

Sediment traps should be placed in the following locations:
1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

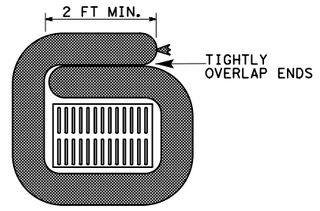
The trap should be cleaned when the capacity has been reduced by 1/2 or the sediment has accumulated to a depth of 1', whichever is less.

REQUIRED ITEMS:

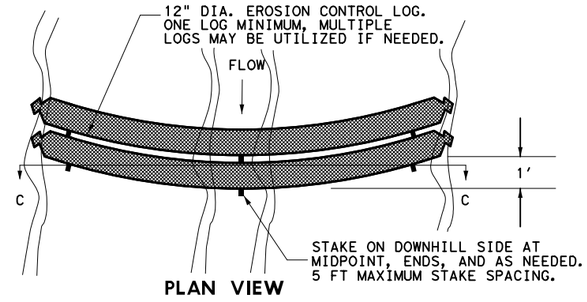
- ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF
- ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF
- ITEM 506-6043 BIODEG EROSN CONT LOGS (REMOVE) LF

DROP INLETS AND OTHER LOCATIONS
12" DIAMETER LOGS

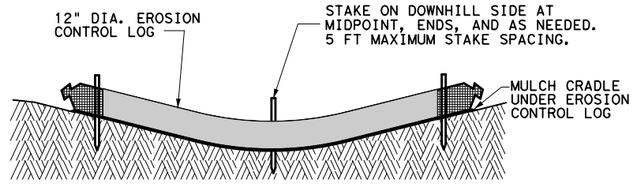
ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL)(12")



DROP INLETS

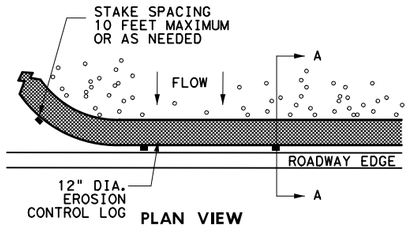


PLAN VIEW

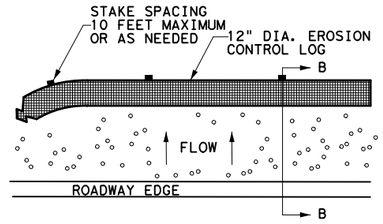


SECTION C-C

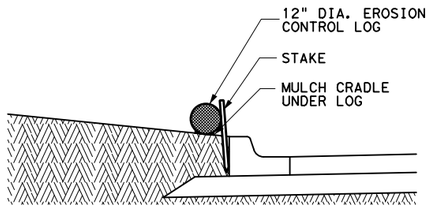
DRAINAGE SWALE OR DITCH



PLAN VIEW

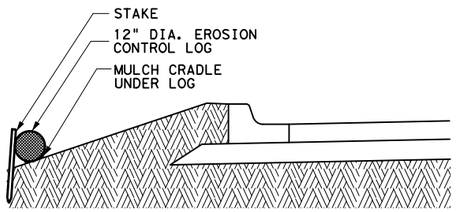


PLAN VIEW



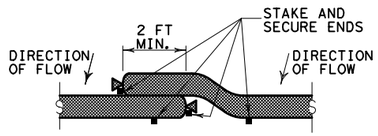
SECTION A-A

SLOPE TO ROADWAY EDGE

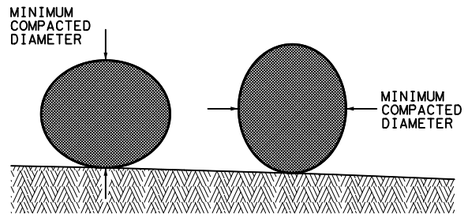


SECTION B-B

SLOPE AWAY FROM ROADWAY EDGE



END OF LOG OVERLAP



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation
Houston District

EROSION CONTROL LOG

ECL-12

FILE: STDG4a.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT 2014	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 3/15 MINOR CORRECTIONS	HOU	6	SEE TITLE SHEET	89
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS/	0912	00	641	ANTOINE DR

STD G-4A

I. STORMWATER POLLUTION PREVENTION

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is 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. Refer to Storm Water Pollution Prevention Plan (SWP3) Houston District standard plan.

No Additional Comments

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Army Corps (USACE) Permit Required

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.

☐ Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Coast Guard (USCG) Coordination Required

☐ United States Coast Guard (USCG) Permit

☐ United States Coast Guard (USCG) Exemption

No Additional Comments

III. CULTURAL RESOURCES

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

No Additional Comments

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

No Additional Comments

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document “Avoiding Migratory Birds and Handling Potential Violations” found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)

No Additional Comments

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor’s degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.

No Additional Comments

VII. OTHER ENVIRONMENTAL ISSUES

Comments:

DATE: Apr 28, 2021
FILE:

Version 2.1

Texas Department of Transportation

TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	00	641	BW 8 and SH 35
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	12	Harris		90

SITE DESCRIPTION

PROJECT LIMITS: ANTOINE DR AT BELTWAY 8
SH 35 AT CR 192
SH 35 AT CR 25

PROJECT DESCRIPTION:

IMPROVE TRAFFIC SIGNALS

MAJOR SOIL DISTURBING ACTIVITIES:

TRENCHING AND BORING FOR INSTALLAION OF CONDUITS
AND FOUNDATIONS FOR TRAFFIC SIGNAL WORKS

TOTAL PROJECT AREA: LESS THAN 1 ACRE

TOTAL AREA TO BE DISTURBED: LESS THAN 1 ACRE

WEIGHTED RUNOFF COEFFICIENT:
(AFTER CONSTRUCTION): N/A

EXISTING CONDITION OF SOIL & VEGETATIVE
COVER AND % OF EXISTING VEGETATIVE COVER:

EXISTING GROUND COVER APROXIMATELY 5% OF THE ARE
TO BE DISTURBED
THE PROPOSED CONDITION SHALL HAVE GROUND COVER
ON APROXIMATELY 5% OF THE ACRE TO BE DISTURBED.

NAME OF RECEIVING WATERS: N/A

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

___ TEMPORARY SEEDING
_X_ PERMANENT PLANTING, SODDING, OR SEEDING
___ MULCHING
___ SOIL RETENTION BLANKET
___ BUFFER ZONES
___ PRESERVATION OF NATURAL RESOURCES

OTHER:

STRUCTURAL PRACTICES:

_X_ SILT FENCES
___ HAY BALES
___ ROCK BERMS
___ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
___ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
___ DIVERSION DIKE AND SWALE COMBINATIONS
___ PIPE SLOPE DRAINS
___ PAVED FLUMES
___ ROCK BEDDING AT CONSTRUCTION EXIT
___ TIMBER MATTING AT CONSTRUCTION EXIT
___ CHANNEL LINERS
___ SEDIMENT TRAPS
___ SEDIMENT BASINS
___ STORM INLET SEDIMENT TRAP
___ STONE OUTLET STRUCTURES
___ CURBS AND GUTTERS
___ STORM SEWERS
___ VELOCITY CONTROL DEVICES
___ EROSION CONTROL LOGS

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

N/A

STORM WATER MANAGEMENT:

STORM WATER DRAINAGE WILL BE PROVIDED BY
EXISTING OPEN DITCH DRAINAGE.

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE: All erosion and sediment controls will be maintained in good working order. If a repair is necessary it will be done at the earliest date possible, but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The area adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.

INSPECTION: All inspections will be performed by a TxDOT inspector per one of the options below as directed by the Area Engineer
1. At least every 7 calendar days
2. At least every 14 days or after 0.5 inches or more of rainfall
An inspection and maintenance report should be made for each inspection. Based on the inspection results, the controls shall be revised according to the inspection report.

WASTE MATERIALS: The dumpster used to store all waste material will meet all state and local city solid waste management regulations. All trash and construction debris 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.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): In the event of a spill which may be considered hazardous, the Houston District Safety Office shall be contacted immediately at 713-802-5962.

SANITARY WASTE: All Sanitary Waste will be collected from the portable units as necessary or as required by local regulations by a licensed sanitary waste management contractor.

OFFSITE VEHICLE TRACKING:

___ HAUL ROADS DAMPENED FOR DUST CONTROL
___ LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
___ EXCESS DIRT ON ROAD REMOVED DAILY
___ STABILIZED CONSTRUCTION ENTRANCE

OTHER:

REMARKS: Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the sediment that may enter receiving waterways. Disposal areas shall not be located in any waterway, waterbody or streambed. Construction staging areas and vehicle maintenance areas shall be constructed by the contractor in a manner which minimizes the runoff of all pollutants. All waterways shall be cleared as soon as practical of temporary embankments, temporary bridges, matting, falsework, piling, debris, and other obstructions placed during construction operations that are not part of the finished work.

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 4/27/2021 DATE

Texas Department of Transportation
Houston District

TxDOT STORM WATER POLLUTION PREVENTION PLAN

SWP3

FILE: STDG1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
©TxDOT JANUARY 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6	SEE TITLE SHEET	91
9/2010 INSPECTION NOTE	COUNTY	CONTROL	SECT	JOB	HIGHWAY
9/2013 INSPECTION NOTE	HARRIS	0912	00	641	VARIOUS
11/2013 SW3P TO SWP3					
03/2015 2014 SPECS					

STD G-1