

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	F 2022 (736)		1
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	REEVES, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0003	08	064, ETC.	BI 20B, ETC.

STATE OF TEXAS

DEPARTMENT OF TRANSPORTATION

INDEX OF SHEETS

SEE SHEET 2

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

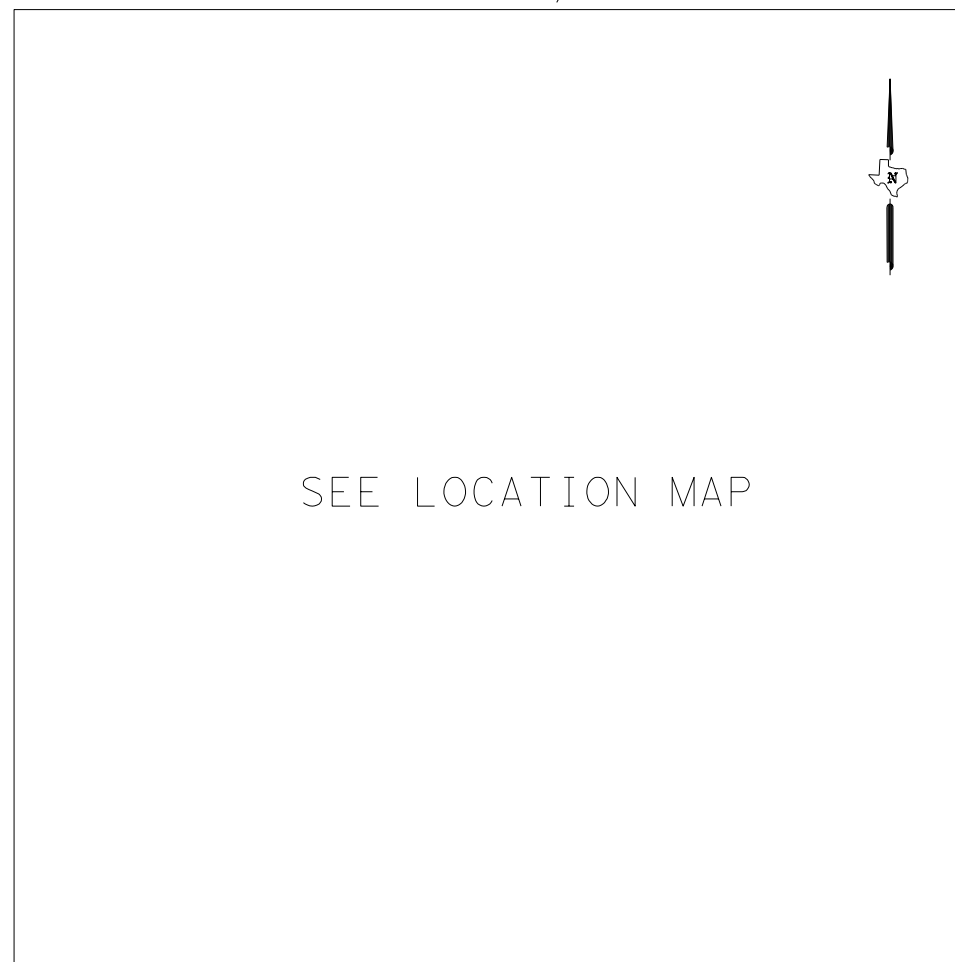
FEDERAL AID PROJECT NO.: F 2022(736)

COUNTY: REEVES, ETC.

HIGHWAY: B10020B, ETC.

LIMITS: 0003-08-064 - B10020B AT CR 117
 2298-01-017 - RM 2401 AT FM 3095
 0229-01-047 - US 385 AT ANTIGUA DR
 0229-01-048 - US 385 AT VALENCIA ST
 0463-03-054 - SH 158 AT FM 1379
 0292-05-018 - SH 18 AT FM 1450

FOR THE CONSTRUCTION OF SAFETY IMPROVEMENT PROJECTS
 CONSISTING OF SAFETY LIGHTING , FLASHING BEACONS & SIGNS



FINAL PLANS

CONTRACTOR:

 LETTING DATE:

 DATE CONTRACTOR BEGAN WORK:

 DATE WORK WAS COMPLETED:

 DATE WORK WAS ACCEPTED:

 FINAL CONTRACT COST: \$

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED 5/23/2022
 FOR LETTING: _____20__

DocuSigned by:

 _____, P. E.
470B0C0852E495... AREA ENGINEER

RECOMMENDED 5/24/2022
 FOR LETTING: _____20__

DocuSigned by:

 _____, P. E.
 DIRECTOR OF TRANSPORTATION
 PLANNING AND DEVELOPMENT

APPROVED 5/24/2022
 FOR LETTING: _____20__

DocuSigned by:

 _____, P. E.
BFFC08A73444D DISTRICT ENGINEER

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

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

EXCEPTIONS: NONE
 EQUATIONS: NONE
 RR CROSSINGS: NONE

1	2	3	4	5	6	7	8	9
11	12	13	14	15	16	17	18	
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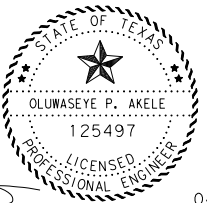
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76	ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

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

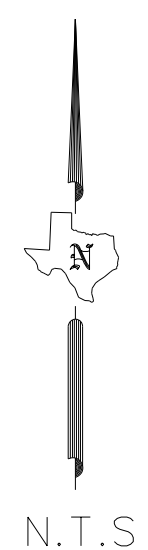
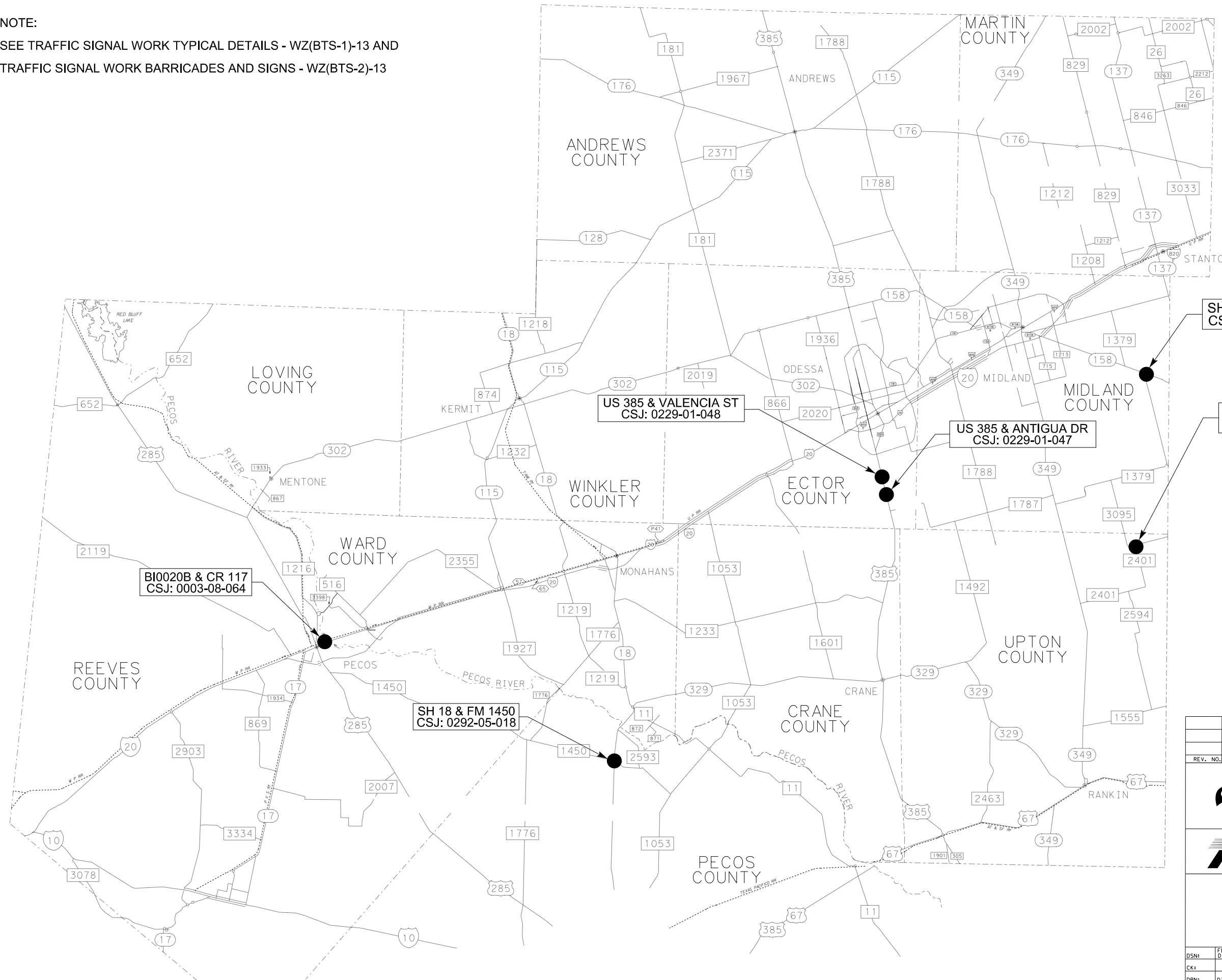


[Signature] 04/20/2022

REV. NO.	DATE	DESCRIPTION							
 Design & Consultancy for natural and built assets									
FIRM #533									
									
INDEX OF SHEETS									
DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.		HIGHWAY NO.				
CK:	6	TEXAS	F 2022 (736)		BI 20B, E+C.				
DRN:	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.			
CK:	ODA	REEVES, ETC.	0003	08	064, ETC.	2			

NOTE:

SEE TRAFFIC SIGNAL WORK TYPICAL DETAILS - WZ(BTS-1)-13 AND
 TRAFFIC SIGNAL WORK BARRICADES AND SIGNS - WZ(BTS-2)-13



SH158 & FM 1379
 CSJ: 0463-03-054

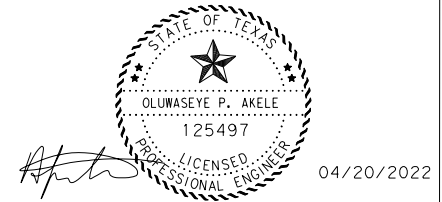
RM 2401 & FM 3095
 CSJ: 2298-01-017

US 385 & VALENCIA ST
 CSJ: 0229-01-048

US 385 & ANTIGUA DR
 CSJ: 0229-01-047

BI0020B & CR 117
 CSJ: 0003-08-064

SH 18 & FM 1450
 CSJ: 0292-05-018



REV. NO.	DATE	DESCRIPTION	BY



LOCATION MAP

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.		
CK:	6	TEXAS	F 2022 (736)	BI 20B, Etc.		
DRN:	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK:	ODA	REEVES, Etc.	0003	08	064, ETC.	3

General Notes:

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

- Kelly Daniel Kelly.Daniel@txdot.gov
- Robert Martinez Robert.Martinez@txdot.gov

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

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

<https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/>

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

Item 6: Control of Materials

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

Properly dispose of any waste generated from servicing equipment on the project.

Item 7: Legal Relations and Responsibilities

Utilities (public, private and TxDOT) exist throughout the project. Prior to any excavation, investigate to determine the utility locations within the project right-of-way. Contact the TxDOT Odessa Traffic Operations shop at 432-498-4690 to investigate and determine the location of any TxDOT utility that may exist within the project right-of-way. Exercise caution when excavating in areas where investigations have determined that utilities exist.

No significant traffic generator events identified.

Manage construction to minimize disruption to traffic. Maintain the roadway in a good and passable condition, including proper drainage and provide for ingress and egress to adjacent property.

Item 8: Prosecution and Progress

The following portions of the plans may affect the Contractor's planned construction sequencing. Direct attention to the appropriate plan sheet or standard sheet.

-Traffic Control Plan

-Storm Water Pollution Prevention Plan

-Environmental Permit, Issues And Commitments (EPIC)

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

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

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

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

Item 416: Drilled Shaft Foundations

For drilled shaft foundations for roadway illumination assemblies, provide class "C" concrete with 6-1/2" slump for dry type placements in accordance with Table 2, Slump Requirements.

Item 432: Riprap

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

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

Broom finish all riprap on this project unless otherwise directed.

Polypropylene fiber may not be used in lieu of reinforcing steel.

In addition to reinforcing steel, polypropylene fiber is required at a rate of 1.5 lbs. /cy.

Item 449: Anchor Bolts

Prior to installation of nuts for traffic signal poles, roadway illumination poles, high mast illumination poles, or overhead sign support structures, coat the entire length of exposed anchor bolt threads with Crouse-Hinds T1-2, O-Z Gedney Stl, Or Thomas & Betts Kopr-Shield compound electrically conducting protective thread lubricant.

Item 502: Barricades, Signs, and Traffic Handling

Furnish flaggers to warn equipment operators of approaching traffic.

Relocate or remove temporary signs as necessary. This work is considered subsidiary to various bid items.

Provide an advanced warning flashing arrow panel as a standby unit on the job site; the standby unit shall be in good working condition and ready for immediate use.

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

It is not anticipated that erosion control devices will be needed on this project. In the event that devices are needed, the Storm Water Pollution Prevention Plan shall consist of using the following items and/or items as directed by the Engineer. Payment for the work may be determined in accordance with Item 4, Article 4. "Changes in the Work".

Item 610: Roadway Illumination Assemblies

Changes in the locations of poles, conduit, pull boxes, or other items as shown on the plans may be made in those instances deemed necessary, or when requested by the Contractor and approved. The luminaires should be 15'-20' from the travel lane if possible. The luminaires should not be more than 270 feet apart and should not be located at the corner/radius of intersection, to minimize being run over by trucks.

Limitations On Use Of The RIP-11 Standard

The Roadway Illumination Pole (RIP-11) Standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. Not more than) 25' above the elevation of surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 4TH edition (2001) (AASHTO design specifications). For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25' above the surrounding terrain, the Contractor shall provide poles meeting the following requirements:

Submittals. Following the electronic shop drawing submittal process (see ftp://ftp.dot.state.tx.us/pub/TxDOTinfo/library/pubs/bus/bridge/e_submit_guide.pdf), the Contractor shall submit to the Engineer, for approval, fabrication drawings and calculations for the poles. The drawings and calculations shall be sealed by a Texas registered or licensed professional Engineer (P.E.).

Luminaire structural support requirements. Lighting poles, arms, and anchor bolt assemblies shall have a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the current edition of the AASHTO design specifications. For transformer base poles, the fabricator shall include transformer base and connecting hardware in calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.

Item 618: Conduit

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

When trenched conduit is proposed beneath roadways under construction, install conduit after grading operations have been completed and before any surfacing begins at that location.

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

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

Use an approved ditching method. Place and backfill conduit proposed beneath existing pavement in accordance with the section shown in the plans. Schedule and complete work so that all lanes open to traffic at night.

For conduit raceways that are intended to remain empty or unused, extend the lower end of conduit from the face of the foundation to a minimum of 1' beyond the edge of the foundation or the riprap apron, whichever is farthest, and use conduit cap fittings for both ends of conduit. Do not glue caps or use duct tape when capping ends of conduit raceways that are intended to remain empty. Prevent dirt and debris from entering raceways during construction by temporarily capping both ends of open raceways. Other than conduit raceways that are intended to remain unused, fit each exposed end of raceways with a bushing. Where steel raceway is used, install a ground-type bushing and connect the bushing and ground rod with a bonding jumper.

Item 620: Electrical Conductors

In accordance with ED(3), Electrical Details-Conductors, identify the conductors of each branch circuit on this project with permanent non-metallic tags at every accessible location. Fasten each tag to the conductors with two plastic straps. Match tag numbers for branch circuits with circuit numbers as shown on the plans.

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

Do not exceed four hundred and fifty feet (450') between ground boxes where conduit and conductor are used.

Item 628: Electrical Services

Initiate and complete the construction of all electrical services at the earliest possible time to facilitate lead-time required to coordinate with utility companies and establish power for the proposed electrical service(s.)

Electrical service poles shall be located as close to the ROW as possible.

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

Physically identify the location for each proposed electrical service on the project and request the physical address for each proposed electrical service identified; the Engineer will provide the physical address for each respective location. Permanently mark the physical address of any proposed electrical service on the respective meter base lid. Use one of two methods for permanent marking. For the preferred method of marking, use an approved die-stamp, with a minimum ½” height of alpha-numeric characters and stamp physical address on meter base lid. After stamping, apply coating of zinc-rich paint to the stamped area. Do not damage meter base. Replace meter base if determined by the Engineer as damaged or unacceptable. No additional compensation will be made for replacement of meter bases in the event that an unacceptable determination is made. When approved, use an alternate method of marking by providing a brass or aluminum plate tag with the physical address embossed by a machine-stamp process. Affix this tag to the meter base by a method approved by the Engineer. Provide a sample of a stamped plate tag for approval of this alternate method. The permanent physical address is required to be marked on the meter base prior to initiation of electrical service. Materials, labor, tools, equipment and incidentals necessary to complete this work will be considered as subsidiary to Item628, electrical services.

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

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

Install photocell(s) facing north when practical.

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

General Note 5 of TCP (1-1)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as “required” plus the ‘additional shadow vehicle’ is the quantity that has been estimated for this operation.

General Note 5 of TCP (2-1)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as

“required” plus the ‘additional shadow vehicle’ is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (5-1)-18; the shadow vehicle(s) with TMA specified on the traffic control plan as “required” is the quantity that has been estimated for this operation.

Standard	Required	Optional	Total
TCP (1-1)-18	1		1
TCP (2-1)-18	1		1
TCP (5-1)-18	1		1

The estimated number of stationary TMAs per location as determined by the applicable TCP standards above is 1; however, two locations may be constructed concurrently therefore the estimated number of stationary TMAs is 2.

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

Item 6227: Solar Powered LED Roadside Sign

The Contractor shall provide edge lit LED sign as shown in this plan set at locations described.

The sign assemblies and sign panels that are removed for this item will become the property of the Department and shall be returned to District Traffic Signal Shop. Contact the Project Engineer to coordinate delivery of these items.



Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0003-08-064

DISTRICT Odessa
HIGHWAY BI 20B, RM 2401, SH 158, SH 18, US 385

COUNTY Ector, Midland, Pecos, Reeves, Upton

CONTROL SECTION JOB				0003-08-064		0229-01-047		0229-01-048		0292-05-018		0463-03-054		2298-01-017	
PROJECT ID				A00176619		A00176964		A00176965		A00176933		A00176938		A00176682	
COUNTY				Reeves		Ector		Ector		Pecos		Midland		Upton	
HIGHWAY				BI 20B		US 385		US 385		SH 18		SH 158		RM 2401	
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	32.000		24.000		32.000		64.000		88.000		48.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	2.000		1.500		2.000		4.000		5.500		3.000	
	500-6001	MOBILIZATION	LS	1.000											
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	6.000		2.000		3.000		3.000		2.000		3.000	
	529-6008	CONC CURB & GUTTER (TY II)	LF											1,595.000	
	529-6012	CONC CURB (SLOTTED)	LF											45.000	
	536-6004	CONC DIRECTIONAL ISLAND	SY											13.000	
	610-6304	IN RD IL (TY AL) 50T-10 (400W EQ) LED	EA	3.000						8.000		11.000		6.000	
	610-6305	IN RD IL (TY AL) 50T-10(400W EQ)LED	EA	1.000		3.000		4.000							
	618-6023	CONDT (PVC) (SCH 40) (2")	LF	376.000		360.000		581.000		1,404.000		1,947.000		879.000	
	618-6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	445.000		185.000		198.000		254.000		330.000		139.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	855.000		606.000		860.000		1,604.000		2,414.000		1,062.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	1,807.000		1,212.000		1,720.000		3,429.000		4,962.000		2,241.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	7.000		3.000		3.000		8.000		6.000		6.000	
	628-6045	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	EA	1.000		1.000		1.000		1.000		1.000		1.000	
	636-6001	ALUMINUM SIGNS (TY A)	SF	36.500						73.000		36.500		76.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA							2.000		1.000		3.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	1.000						6.000		3.000		4.000	
	666-6102	REF PAV MRK TY I(W)36"(YLD TRI)(100MIL)	EA											4.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	4.000						8.000		4.000		6.000	
	682-6033	BACK PLATE (12")(1 SEC)(VENTED)ALUM	EA	4.000						8.000		4.000		6.000	
	684-6009	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	LF	46.000						92.000		38.000		78.000	
	685-6004	INSTL RDS D FLSH BCN ASSM (SOLAR PWRD)	EA	2.000						4.000		2.000		3.000	
	6185-6002	TMA (STATIONARY)	DAY	20.000		20.000		20.000		20.000		20.000		40.000	
	6227-6001	SOLAR POWERED LED WARNING SIGN	EA	1.000						2.000		1.000		1.000	
08		CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)	LS	1.000											
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)	LS	1.000											



CONTROLLING PROJECT ID 0003-08-064

DISTRICT Odessa
HIGHWAY BI 20B, RM 2401, SH 158, SH 18, US 385

COUNTY Ector, Midland, Pecos, Reeves, Upton

Estimate & Quantity Sheet

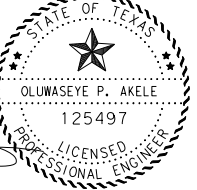
CONTROL SECTION JOB				TOTAL EST.	TOTAL FINAL
PROJECT ID					
COUNTY					
HIGHWAY					
ALT	BID CODE	DESCRIPTION	UNIT		
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	288.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	18.000	
	500-6001	MOBILIZATION	LS	1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	19.000	
	529-6008	CONC CURB & GUTTER (TY II)	LF	1,595.000	
	529-6012	CONC CURB (SLOTTED)	LF	45.000	
	536-6004	CONC DIRECTIONAL ISLAND	SY	13.000	
	610-6304	IN RD IL (TY AL) 50T-10 (400W EQ) LED	EA	28.000	
	610-6305	IN RD IL (TY AL) 50T-10(400W EQ)LED	EA	8.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF	5,547.000	
	618-6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	1,551.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	7,401.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	15,371.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	33.000	
	628-6045	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	EA	6.000	
	636-6001	ALUMINUM SIGNS (TY A)	SF	222.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	6.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	14.000	
	666-6102	REF PAV MRK TY I(W)36"(YLD TRI)(100MIL)	EA	4.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	22.000	
	682-6033	BACK PLATE (12")(1 SEC)(VENTED)ALUM	EA	22.000	
	684-6009	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	LF	254.000	
	685-6004	INSTL RDS D FLSH BCN ASSM (SOLAR PWRD)	EA	11.000	
	6185-6002	TMA (STATIONARY)	DAY	140.000	
	6227-6001	SOLAR POWERED LED WARNING SIGN	EA	5.000	
08		CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)	LS	1.000	
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)	LS	1.000	





DISTRICT	COUNTY	CCSJ	SHEET
Odessa	Reeves	0003-08-064	5A

CONSOLIDATED SUMMARY												
SHEET	416-6029	432-6001	529-6008	529-6012	536-6004	610-6304	610-6305	618-6023	618-6024	620-6009	620-6010	624-6002
	DRILL SHAFT (RDWY ILL POLE) (30 IN)	RIPRAP	CONC CURB & GUTTER (TY II)	CONC CURB (SLOTTED)	CONC DIRECTIONAL ISLAND	IN RD IL (TY AL) 50T-10(400W EQ) LED	IN RD IL (TY AL) 50T-10-10(400W EQ) LED	CONDT (PVC) (SCH 40) (2")	CONDT (PVC) (SCH 40) (2") (BORE)	ELEC CONDR (NO. 6) BARE	ELEC CONDR (NO. 6) INSULATED	GROUND BOX TY A (122311) W/APRON
	LF	CY	LF	LF	SY	EA	EA	LF	LF	LF	LF	EA
CSJ: 2298-01-017 - RM 2401 AT FM 3095	48	3	1595	45	13	6	-	879	139	1062	2241	6
CSJ: 0229-01-047 - US 385 AT ANTIGUA DR	24	1.5	-	-	-	-	3	360	185	606	1212	3
CSJ: 0229-01-048 - US 385 AT VALENCIA ST	32	2	-	-	-	-	4	581	198	860	1720	3
CSJ: 0463-03-054 - SH 158 AT FM 1379	88	5.5	-	-	-	11	-	1947	330	2414	4962	6
CSJ: 0292-05-018 - SH 18 AT FM 1450	64	4	-	-	-	8	-	1404	254	1604	3429	8
CSJ: 0003-08-064 - BI0020B AT CR 117	32	2	-	-	-	3	1	376	445	855	1807	7
TOTAL	288	18	1595	45	13	28	8	5547	1551	7401	15371	33

CONSOLIDATED SUMMARY											
SHEET	628-6045	636-6001	644-6004	644-6076	666-6102	682-6003	682-6033	684-6009	685-6004	6227-6001	6185-6002
	ELC SRV TY A 240/480060 (NS)SS(E)SP(O)	ALUMINIUM SIGNS (TY A)	IN SM RD SN SUP&AM TY10BWG(1)S A(T)	REMOVE SM RD SN SUP&AM	REF PAV MRK TY I(W)36"(YLD TRI)(100MIL)	VEH SIG SEC (12") LED (YEL)	BACK PLATE (12") (1 SEC)(VENTED) ALUM	TRF SIG CBL (TYA) (12 AWG) (4 CONDR)	INSTR RDSD FLSH BCN ASSM (SOLAR PWRD)	SOLAR POWERED LED WARNING	TMA (STATIONARY)
	EA	SF	EA	EA	EA	EA	EA	LF	EA	EA	DAYS
CSJ: 2298-01-017 - RM 2401 AT FM 3095	1	76	3	4	4	6	6	78	3	1	40
CSJ: 0229-01-047 - US 385 AT ANTIGUA DR	1	-	-	-	-	-	-	-	-	-	20
CSJ: 0229-01-048 - US 385 AT VALENCIA ST	1	-	-	-	-	-	-	-	-	-	20
CSJ: 0463-03-054 - SH 158 AT FM 1379	1	36.5	1	3	-	4	4	38	2	1	20
CSJ: 0292-05-018 - SH 18 AT FM 1450	1	73	2	6	-	8	8	92	4	2	20
CSJ: 0003-08-064 - BI0020B AT CR 117	1	36.5	1	1	-	4	4	46	2	1	20
TOTAL	6	222	7	14	4	22	22	254	11	5	140


 OLUWASEYE P. AKELE
 125497
 LICENSED PROFESSIONAL ENGINEER
 04/20/2022

REV. NO.	DATE	DESCRIPTION	BY
 Design & Consultancy for natural and built assets			
FIRM #533			
			
CONSOLIDATED SUMMARY			
DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.
CK:	6	TEXAS	F 2022 (736)
DRN:	STATE DISTRICT	COUNTY	CONTROL NO.
CK:	ODA	REEVES, ETC.	0003
			SECTION NO.
			08
			JOB NO.
			064, ETC.
			SHEET NO.
			6

6. Consolidated Summary.dgn

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

WORKER SAFETY NOTES:

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

SHEET 1 OF 12



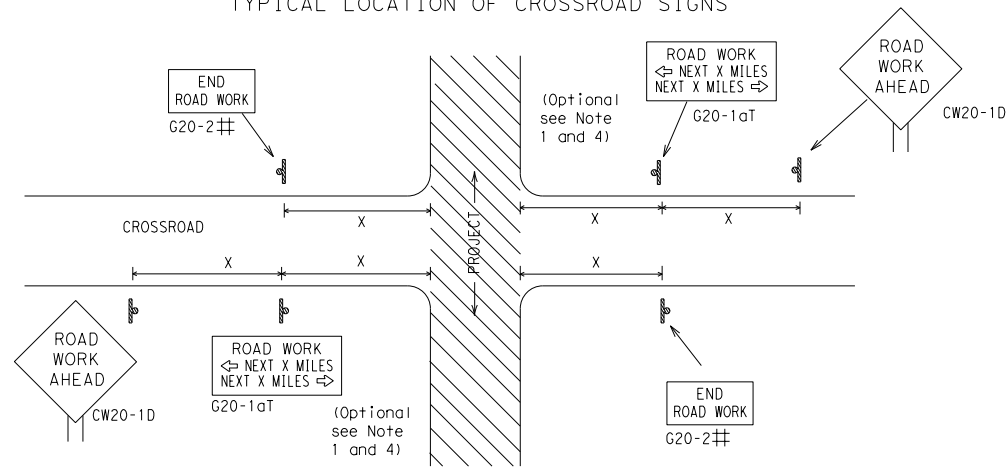
BARRICADE AND CONSTRUCTION
 GENERAL NOTES
 AND REQUIREMENTS

BC (1) - 21

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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0003	08	064, ETC.	BI 20B, Etc.				
4-03	7-13	DIST		COUNTY	SHEET NO.				
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5-10	5-21								
95									

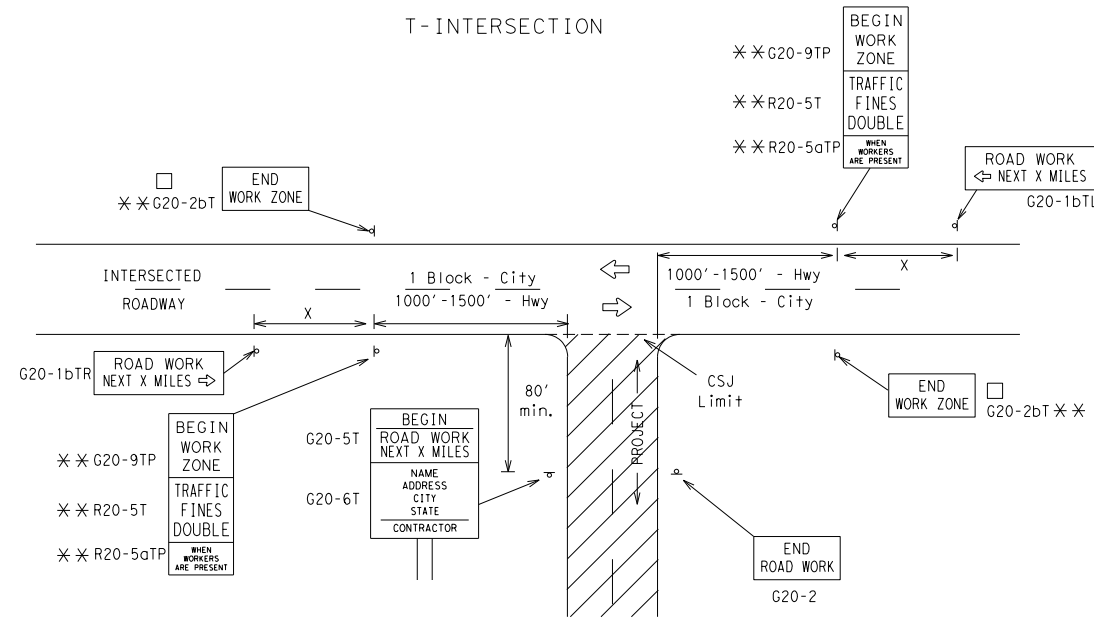
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TYPICAL LOCATION OF CROSSROAD SIGNS



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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING^{1,5,6}

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

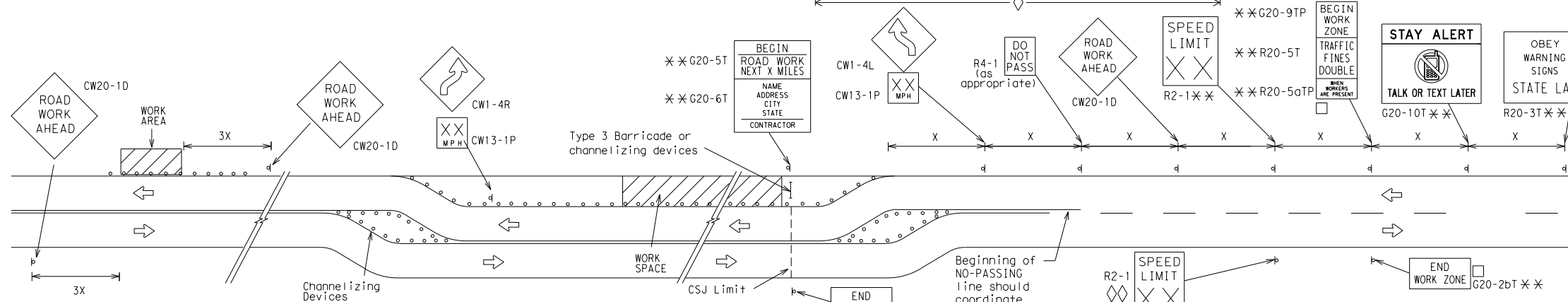
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

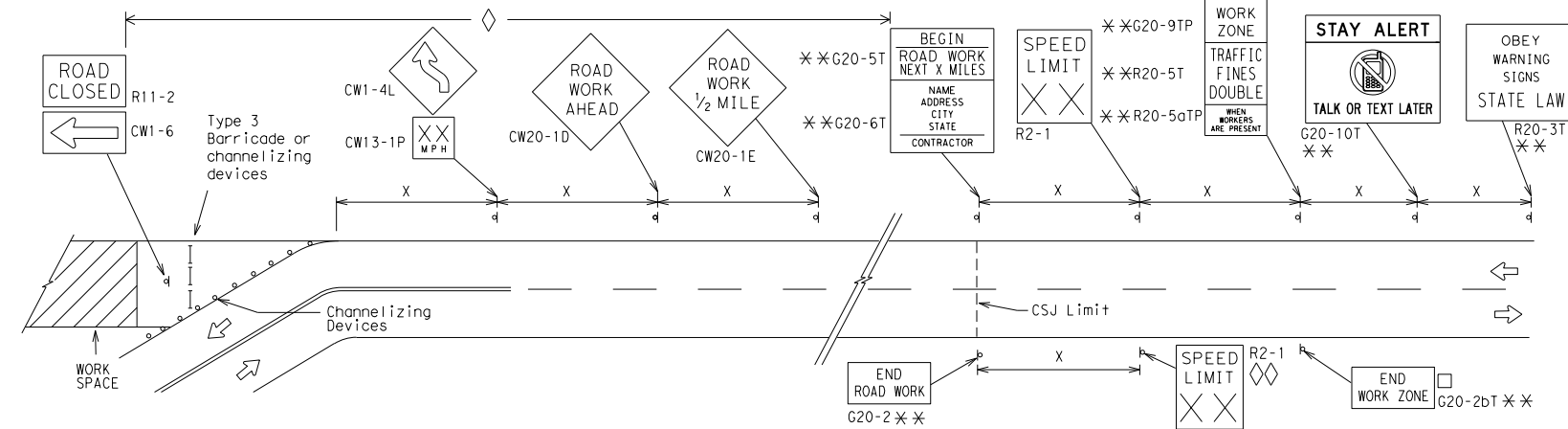
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

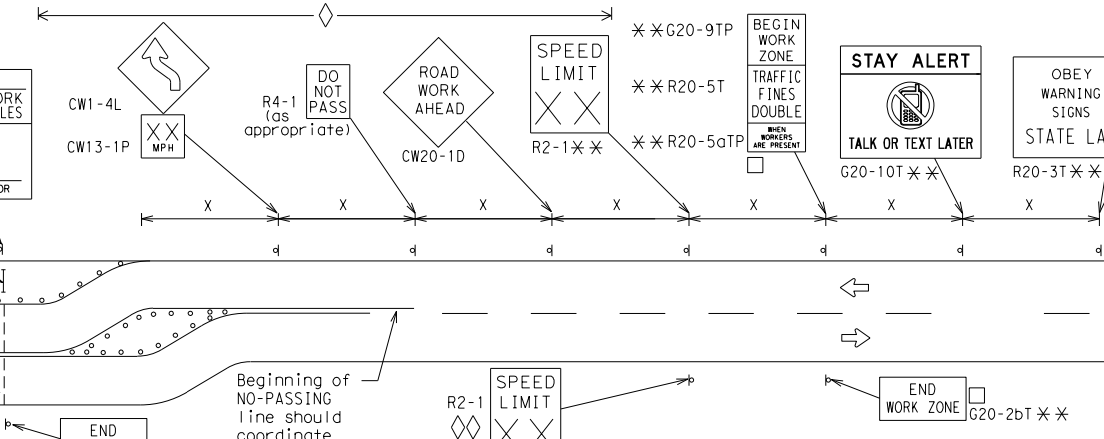


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



NOTES

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "x" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
- CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.
- Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
- Contractor will install a regulatory speed limit sign at the end of the work zone.

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

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

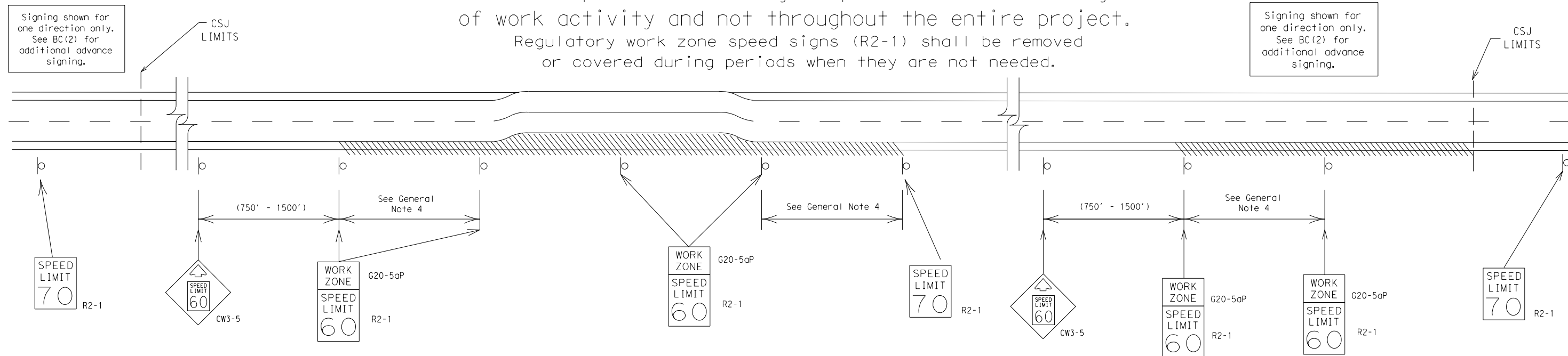
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	ODA	REEVES, Etc.	8	

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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- Frequency of work zone speed limit signs should be:

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

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SHEET 3 OF 12



BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

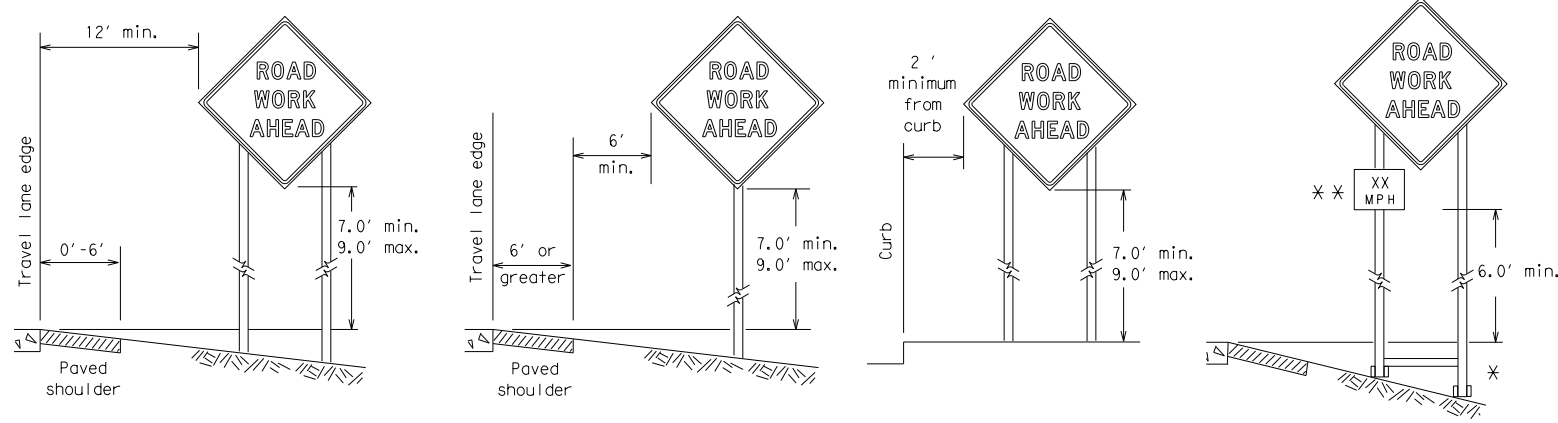
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9-07	8-14	DIST	COUNTY	SHEET NO.	
7-13	5-21	ODA	REEVES, Etc.	9	

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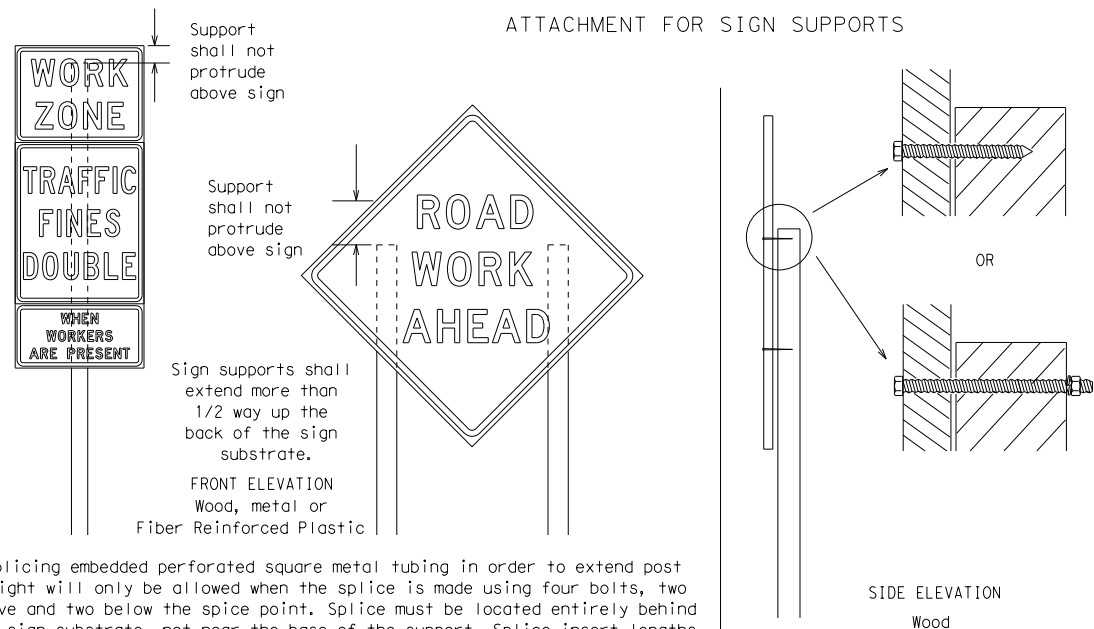
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

ATTACHMENT FOR SIGN SUPPORTS



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

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.

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

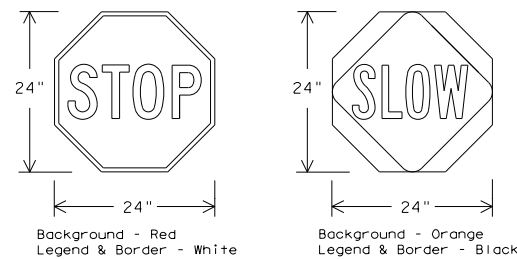
- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not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

FLAGS ON SIGNS

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

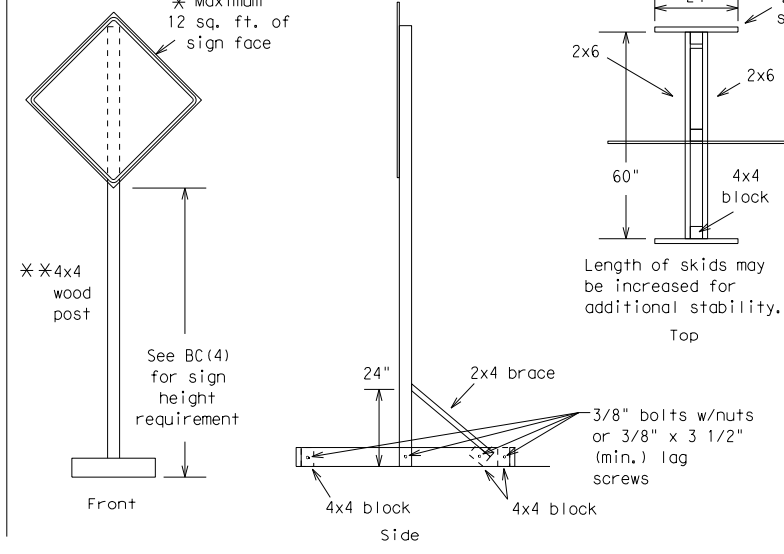
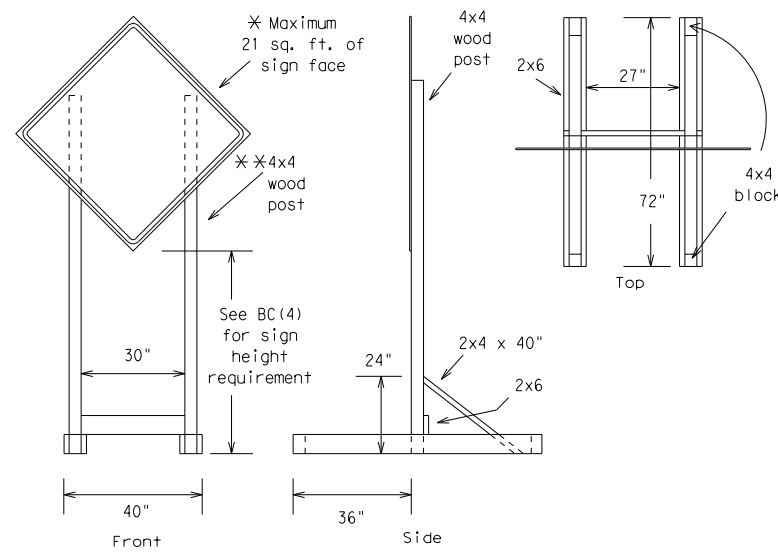
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

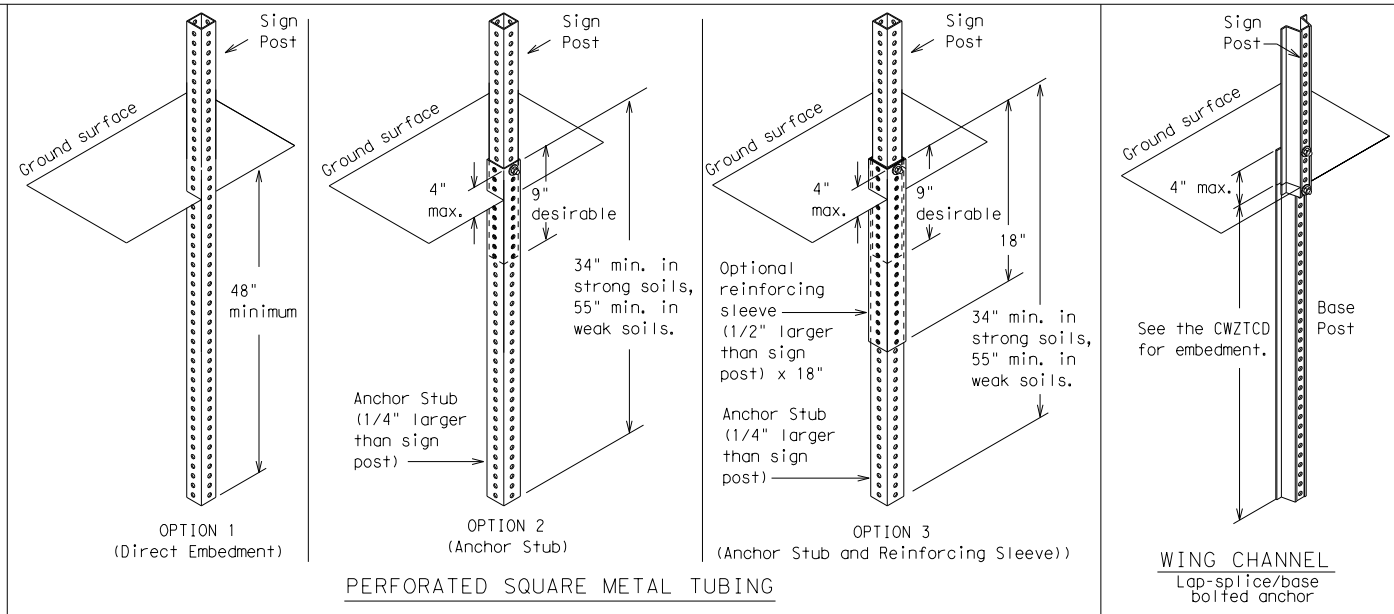
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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07	8-14	DIST	COUNTY	SHEET NO.
7-13	5-21	ODA	REEVES, Etc.	10

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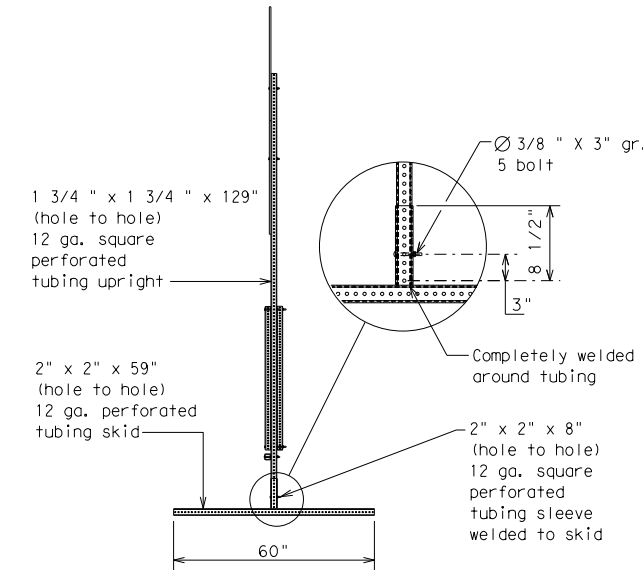
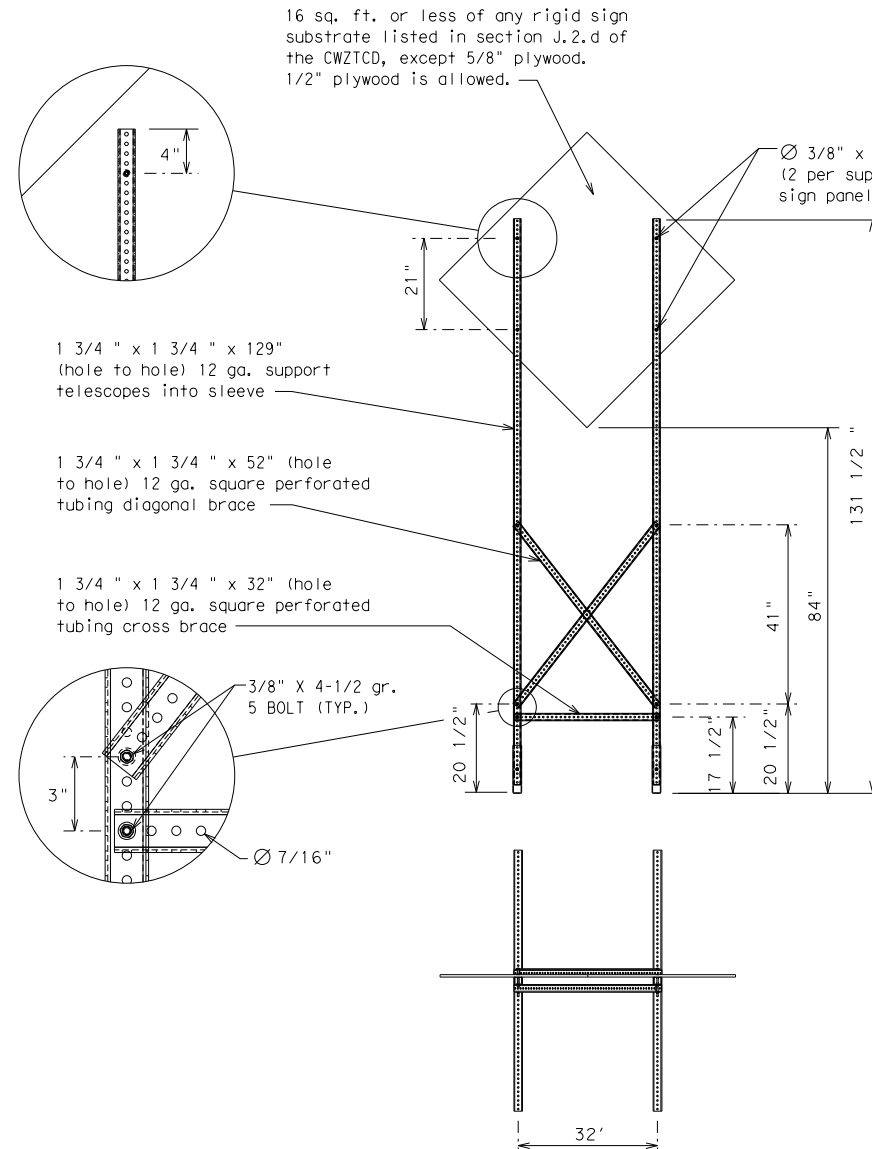
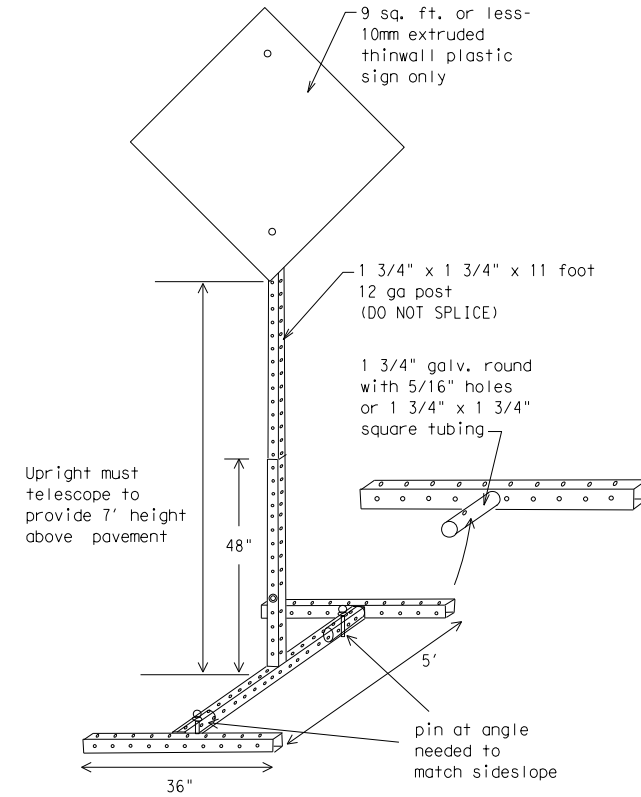
SKID MOUNTED WOOD SIGN SUPPORTS

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



GROUND MOUNTED SIGN SUPPORTS

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



SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

SHEET 5 OF 12



BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE
ROAD CLOSED AT SH XXX
ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED
CENTER LANE CLOSED
NIGHT LANE CLOSURES
VARIOUS LANES CLOSED
EXIT CLOSED
MALL DRIVEWAY CLOSED
XXXXXXXX BLVD CLOSED

Other Condition List

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT
RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN
DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED
EXIT XXX CLOSED X MILE
RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI
ROADWORK XXX FT
FLAGGER XXXX FT
RIGHT LN NARROWS XXXX FT
MERGING TRAFFIC XXXX FT
LOOSE GRAVEL XXXX FT
DETOUR X MILE
ROADWORK PAST SH XXXX
BUMP XXXX FT
TRAFFIC SIGNAL XXXX FT

ROAD REPAIRS XXXX FT
LANE NARROWS XXXX FT
TWO-WAY TRAFFIC XX MILE
CONST TRAFFIC XXX FT
UNEVEN LANES XXXX FT
ROUGH ROAD XXXX FT
ROADWORK NEXT FRI-SUN
US XXX EXIT X MILES
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
DETOUR NEXT X EXITS
USE EXIT XXX
STAY ON US XXX SOUTH
TRUCKS USE US XXX N
WATCH FOR TRUCKS
EXPECT DELAYS
REDUCE SPEED XXX FT
USE OTHER ROUTES
STAY IN LANE *

FORM X LINES RIGHT
USE XXXXX RD EXIT
USE EXIT I-XX NORTH
USE I-XX E TO I-XX N
WATCH FOR TRUCKS
EXPECT DELAYS
PREPARE TO STOP
END SHOULDER USE
WATCH FOR WORKERS

Location List

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

Warning List

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

** Advance Notice List

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

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

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

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Traffic Safety Division Standard

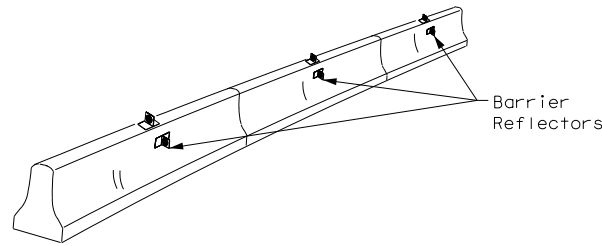
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

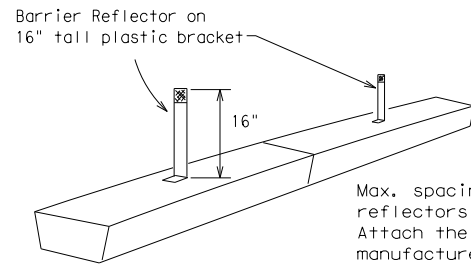
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



CONCRETE TRAFFIC BARRIER (CTB)



LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

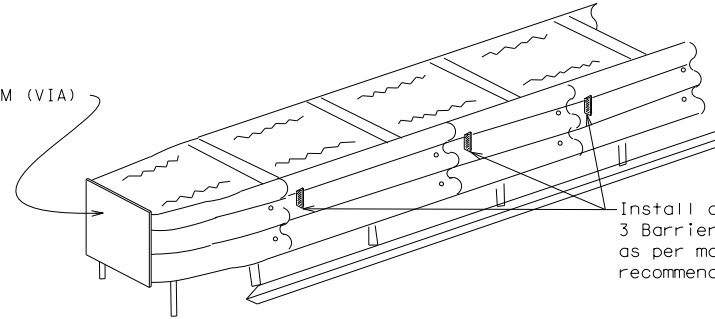
LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

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

LOW PROFILE CONCRETE BARRIER (LPCB)

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

See D & OM (VIA)



Install a minimum of 3 Barrier Reflectors as per manufacturer's recommendations.

DELINEATION OF END TREATMENTS

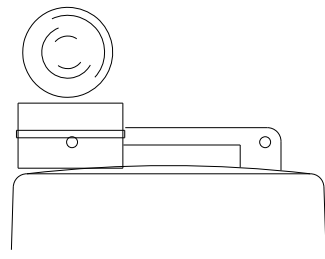
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

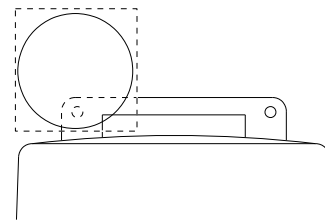
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet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



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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

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



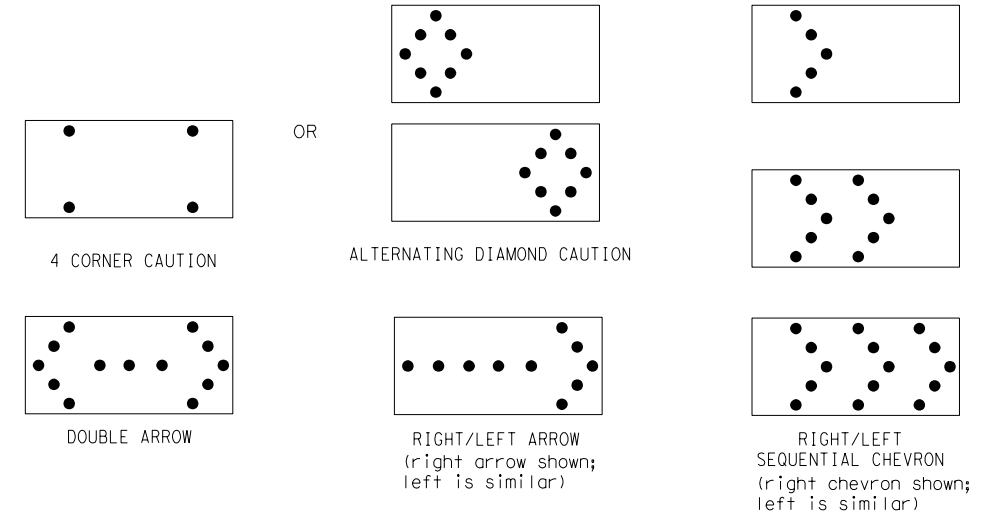
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

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

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

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

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



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

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

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

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

FLASHING ARROW BOARDS

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

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



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

BC(7)-21

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

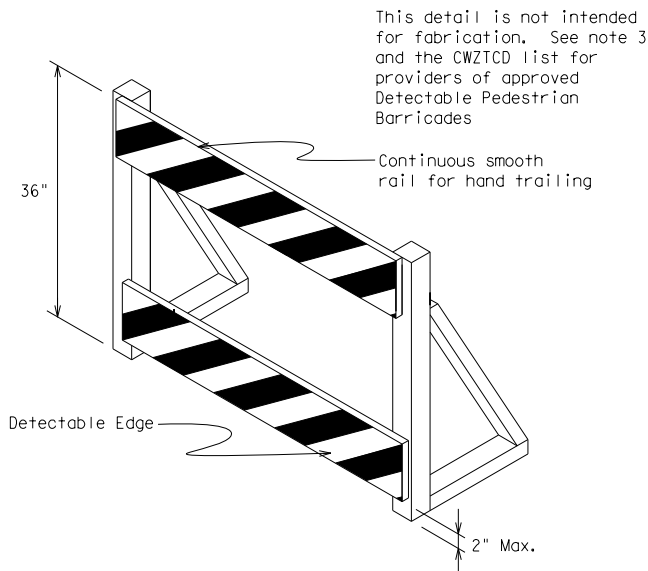
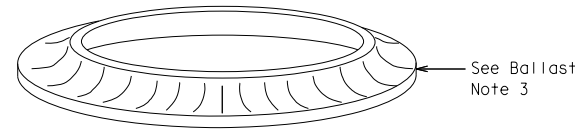
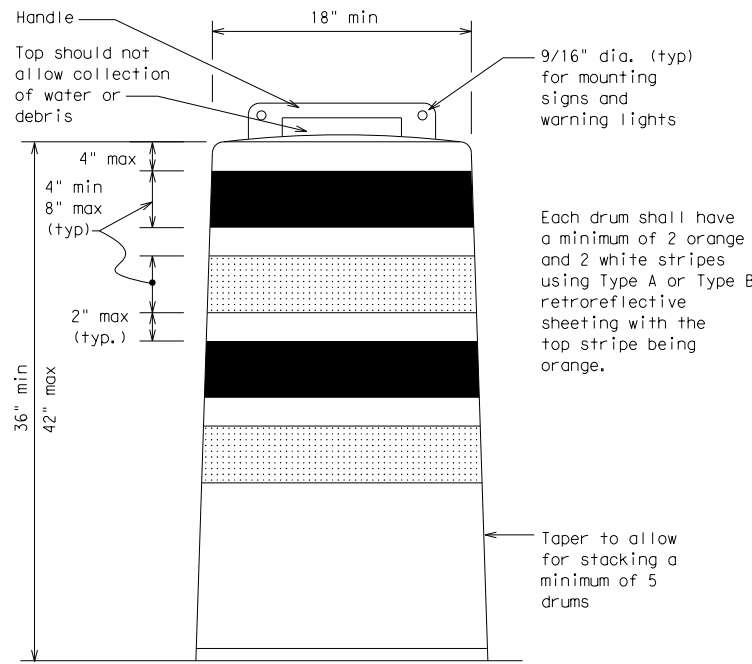
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

RETROREFLECTIVE SHEETING

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

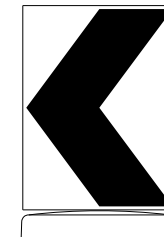
BALLAST

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

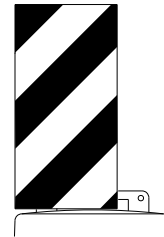


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

SHEET 8 OF 12



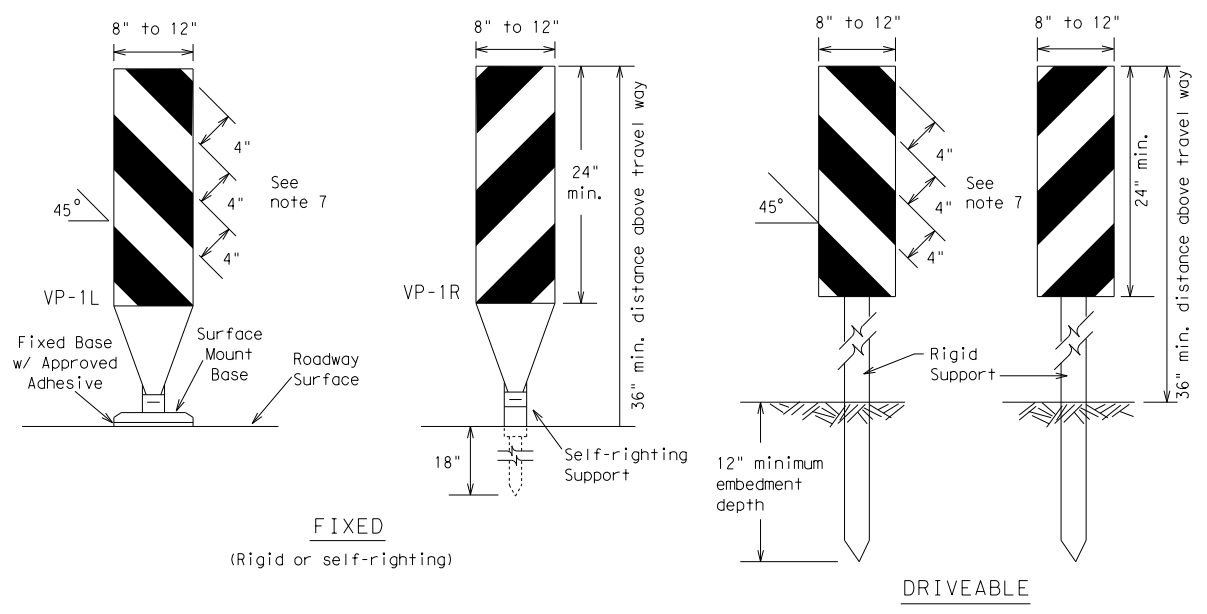
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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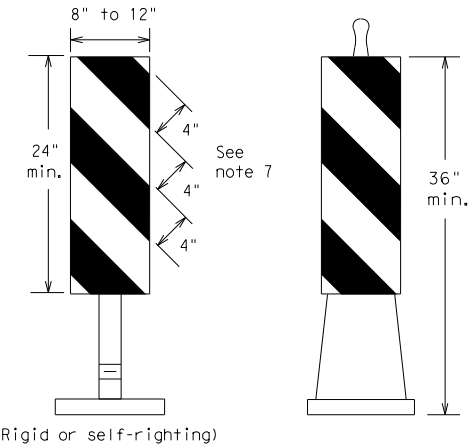
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FIXED
(Rigid or self-righting)

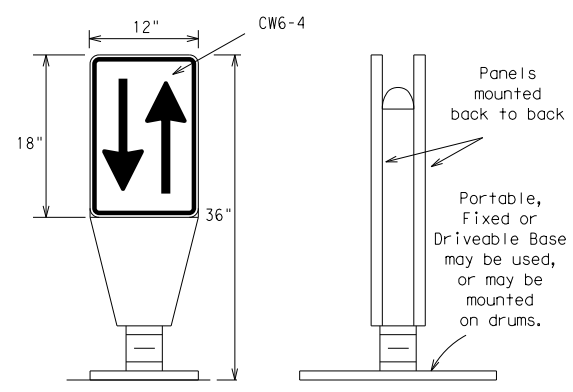
DRIVEABLE



PORTABLE

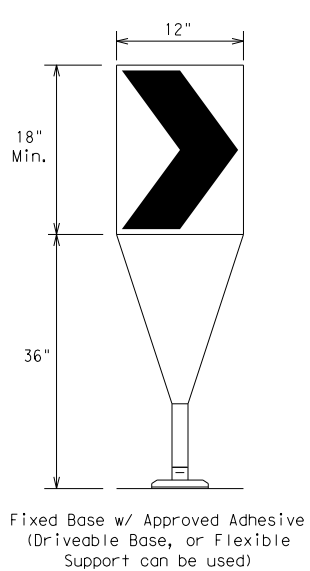
VERTICAL PANELS (VPs)

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



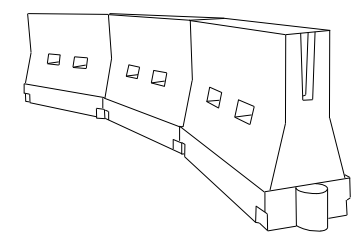
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

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



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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

GENERAL NOTES

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

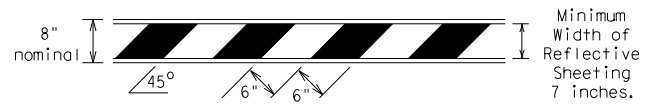
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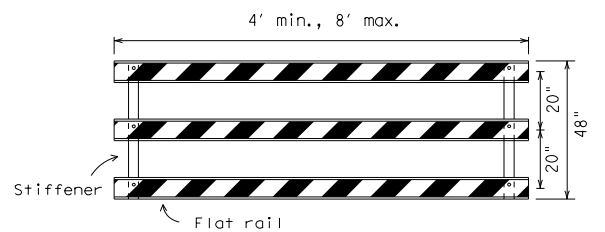
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



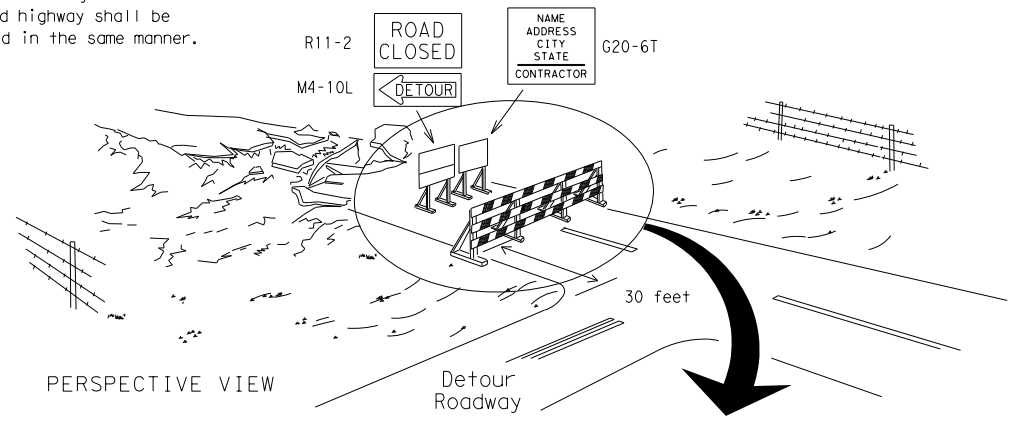
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

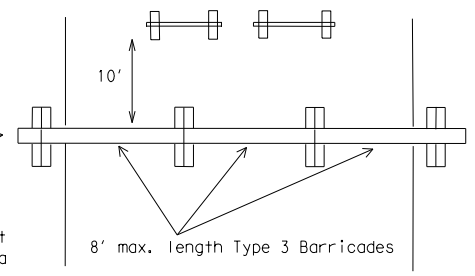
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

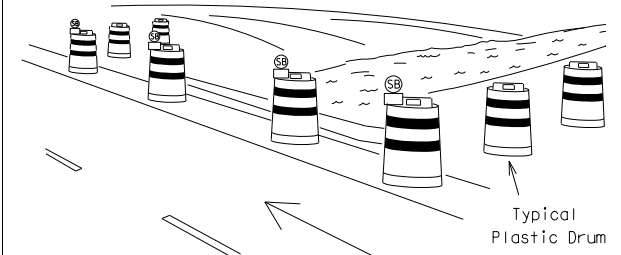
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



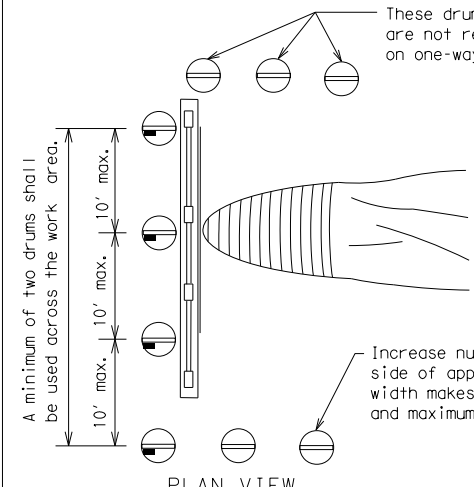
PLAN VIEW

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

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

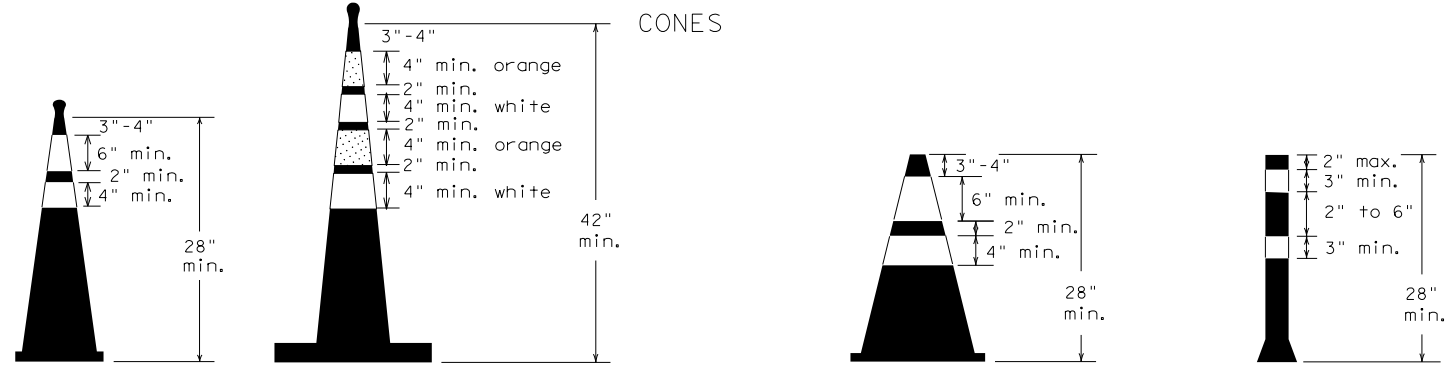


PLAN VIEW

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

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

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



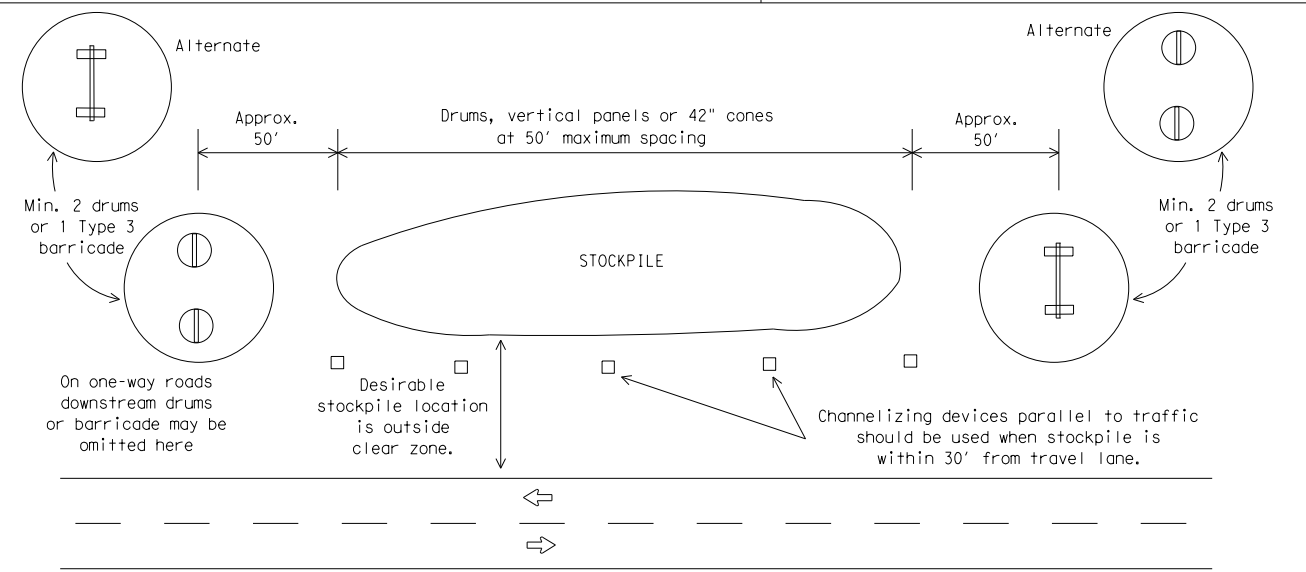
Two-Piece cones

One-Piece cones

Tubular Marker

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	ODA	REEVES, Etc.	16	

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

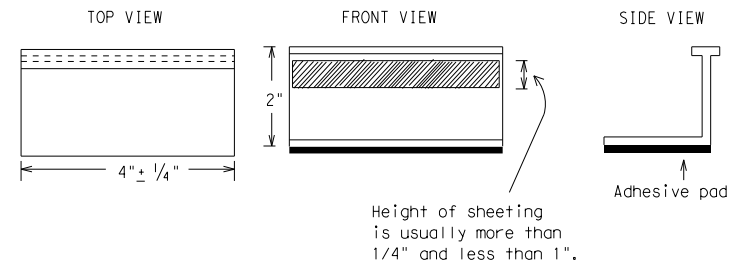
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

SHEET 11 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

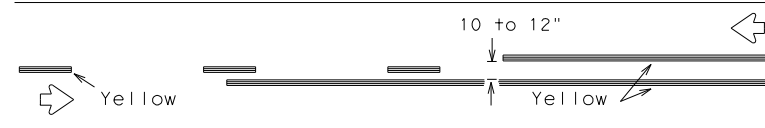
BC(11) - 21

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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS		0003	08	064, ETC.
2-98	9-07	5-21		
1-02	7-13			
11-02	8-14			
	DIST	COUNTY	SHEET NO.	
	ODA	REEVES, Etc.	17	

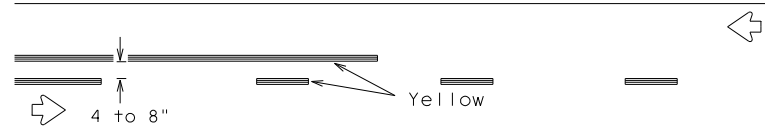
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PAVEMENT MARKING PATTERNS

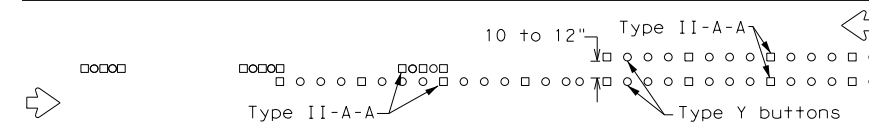


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

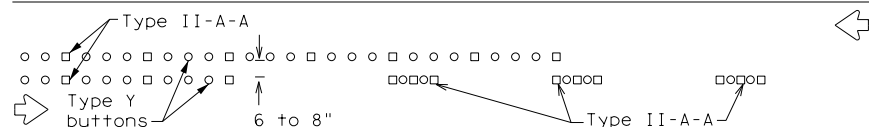


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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

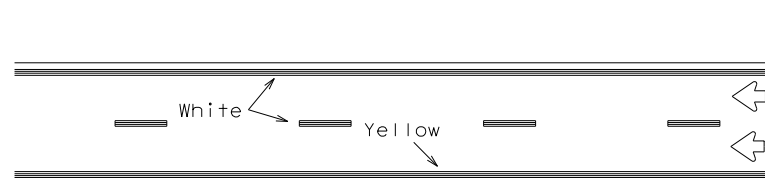


RAISED PAVEMENT MARKERS - PATTERN A



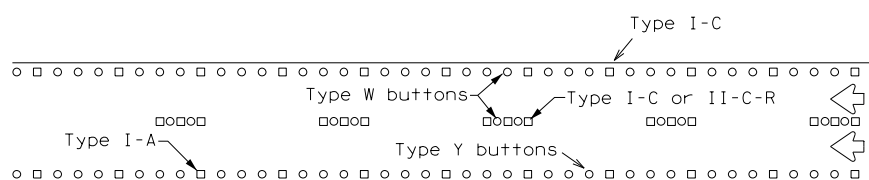
RAISED PAVEMENT MARKERS - PATTERN B

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



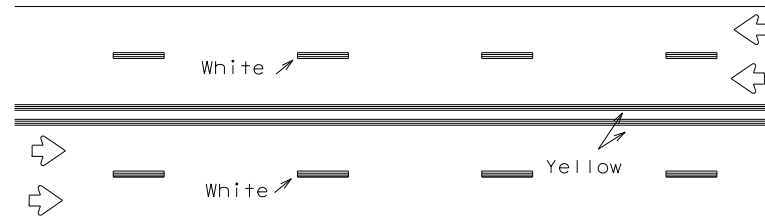
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



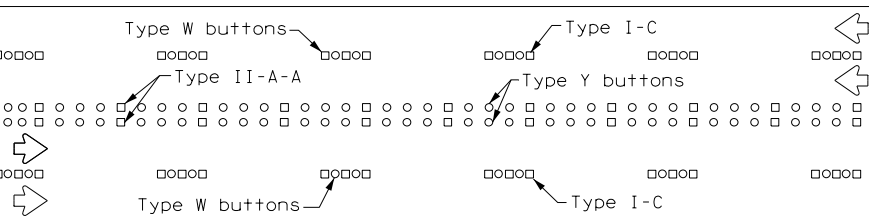
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



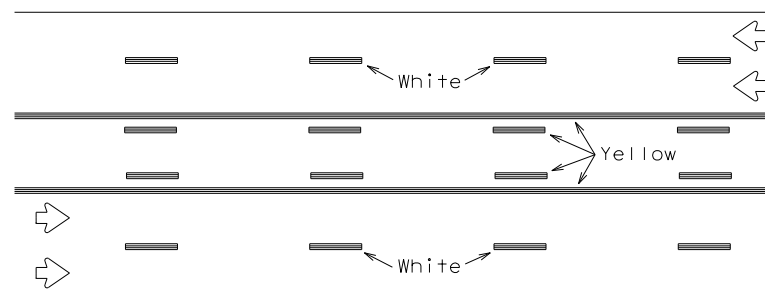
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



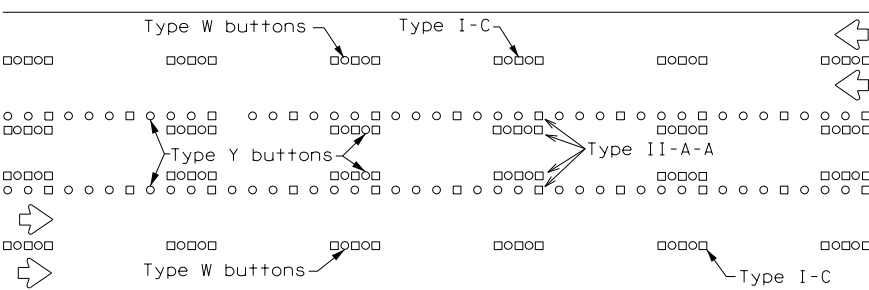
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

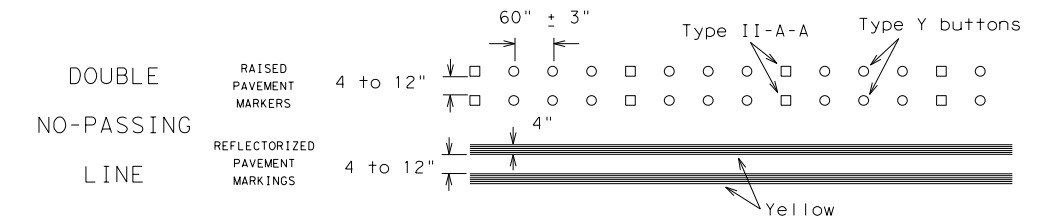
Prefabricated markings may be substituted for reflectORIZED pavement markings.



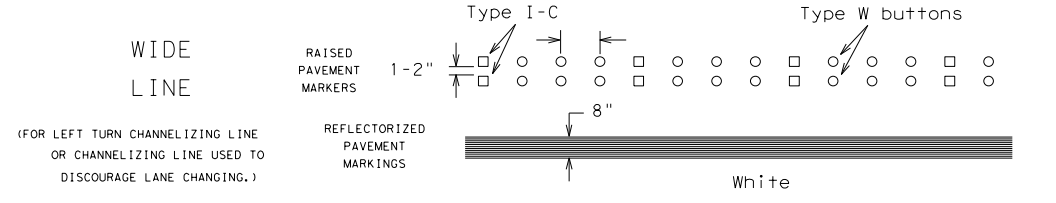
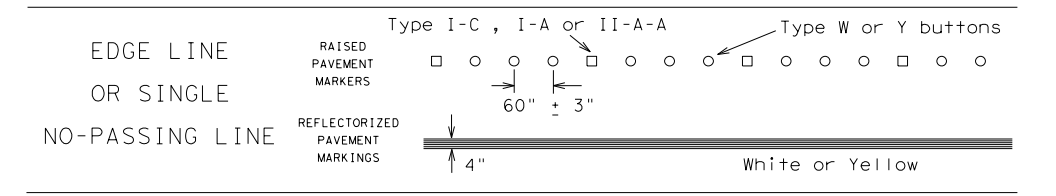
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

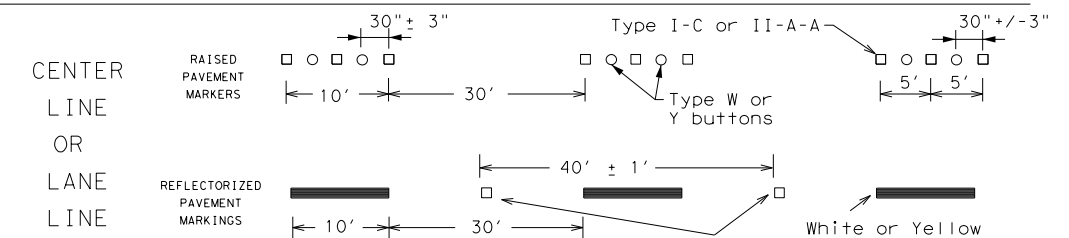
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



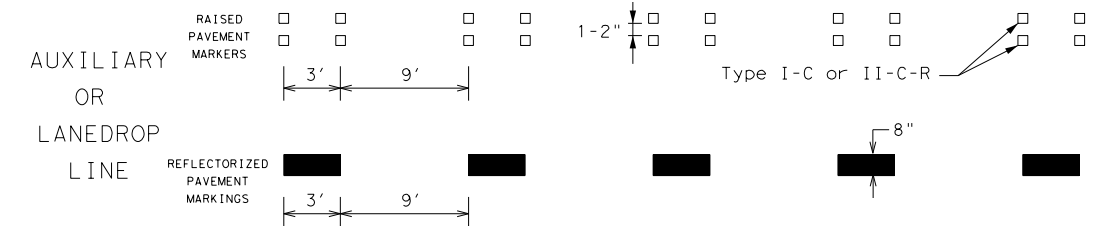
SOLID LINES



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

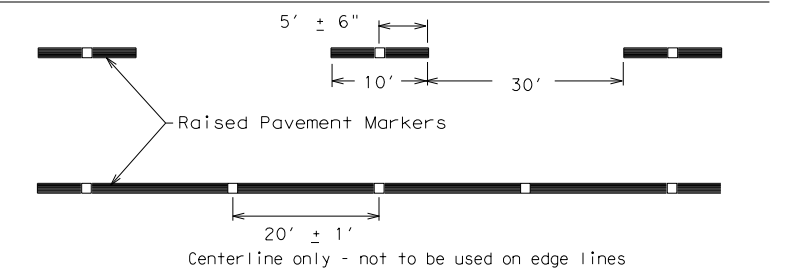


BROKEN LINES



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



SHEET 12 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

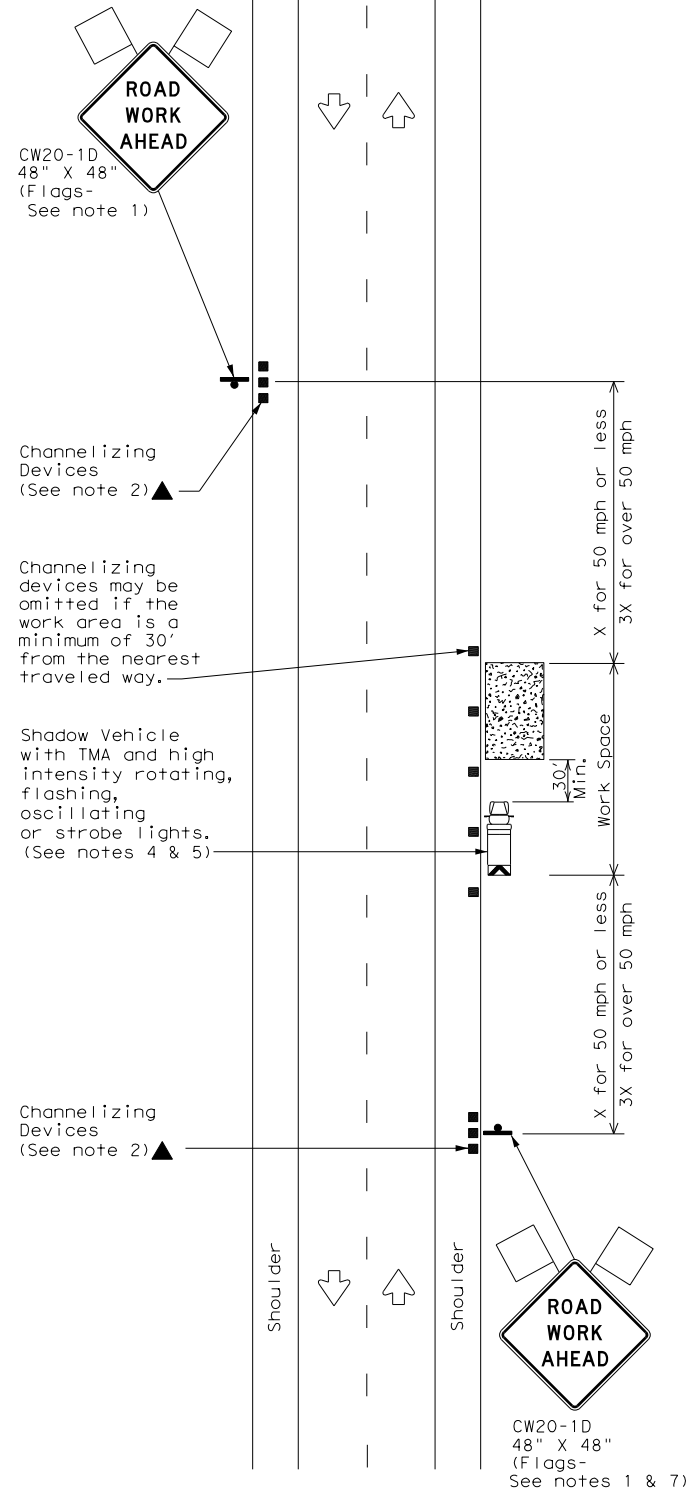
BC(12)-21

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REVISIONS	0003	08	064, ETC.	BI 20B, ETC.
1-97 9-07 5-21				
2-98 7-13	DIST	COUNTY	SHEET NO.	
11-02 8-14	ODA	REEVES, Etc.	18	
106				

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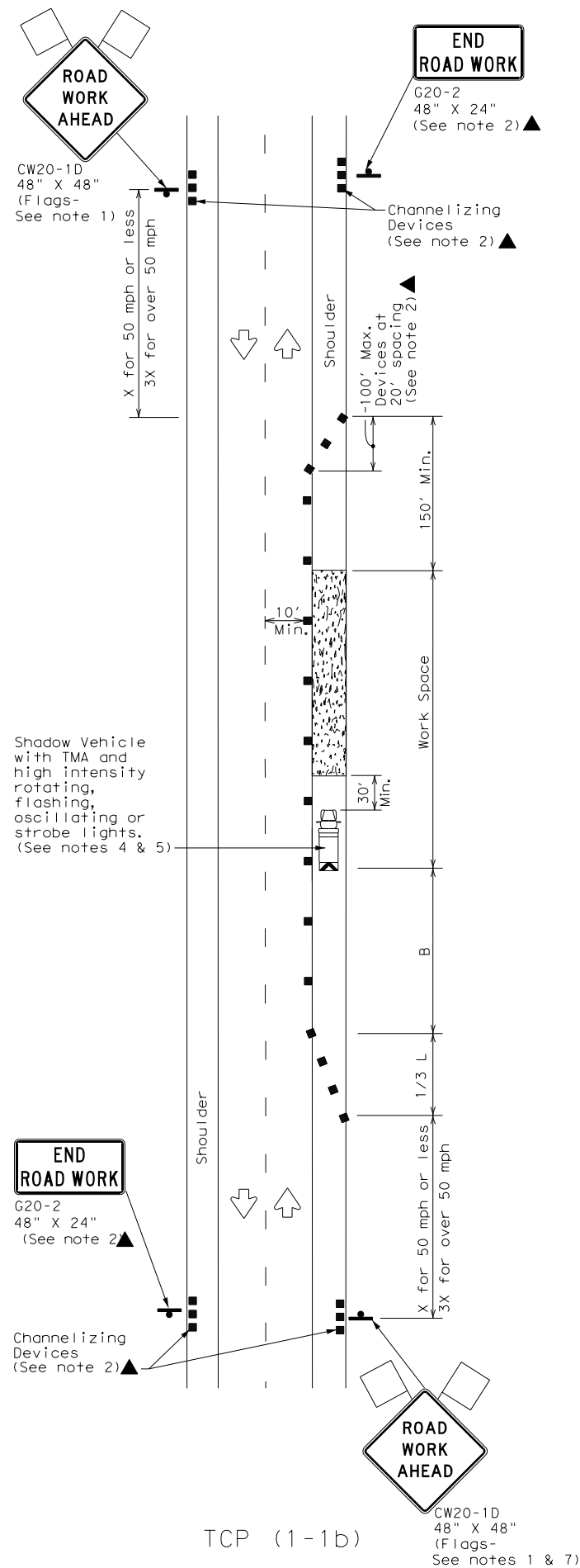
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DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for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



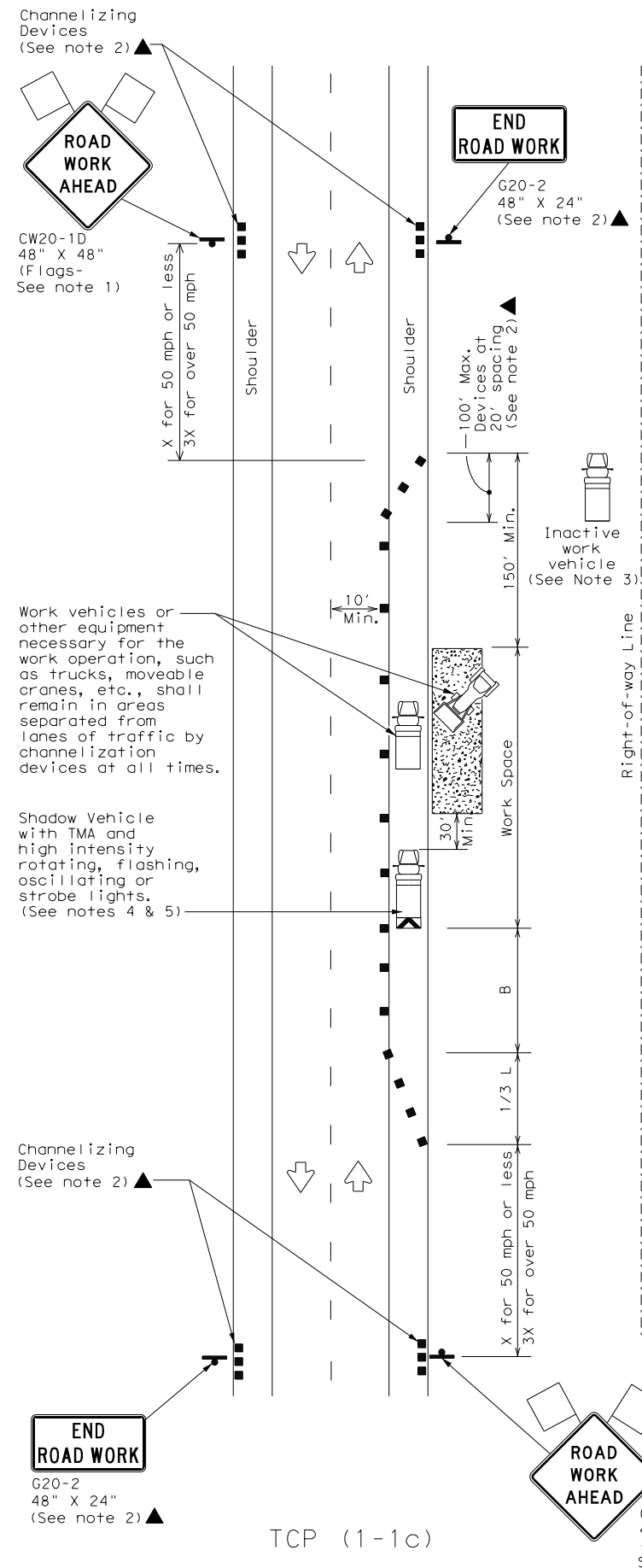
TCP (1-1a)

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

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

* Conventional Roads Only

** Taper lengths have been rounded off.

L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

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

GENERAL NOTES

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



Traffic Operations Division Standard

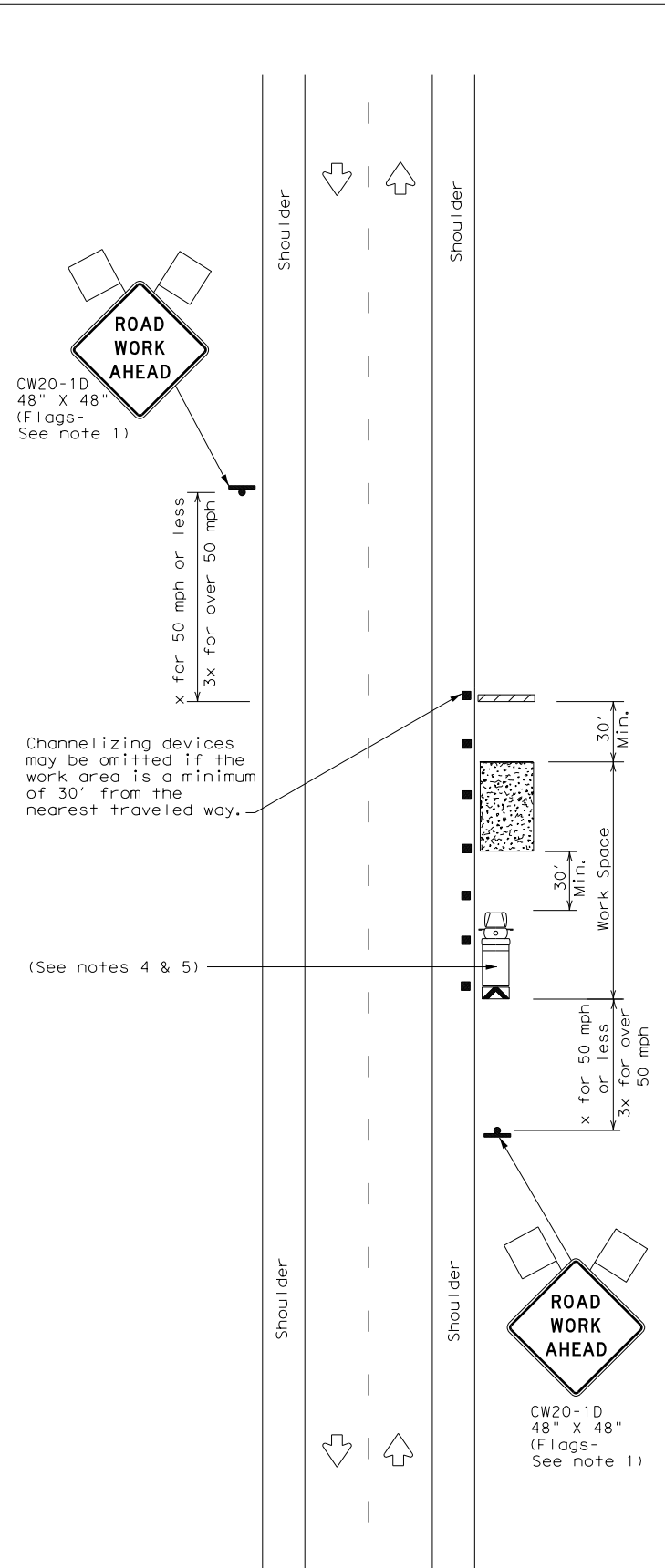
TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

TCP (1-1) - 18

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© TxDOT December 1985	CON: 0003	SECT: 08	JOB: 064, ETC.	HIGHWAY: BI 20B, ETC.
REVISIONS	DIST: COUNTY		SHEET NO.	
2-94 4-98	ODA		REEVES, ETC.	
8-95 2-12				
1-97 2-18				

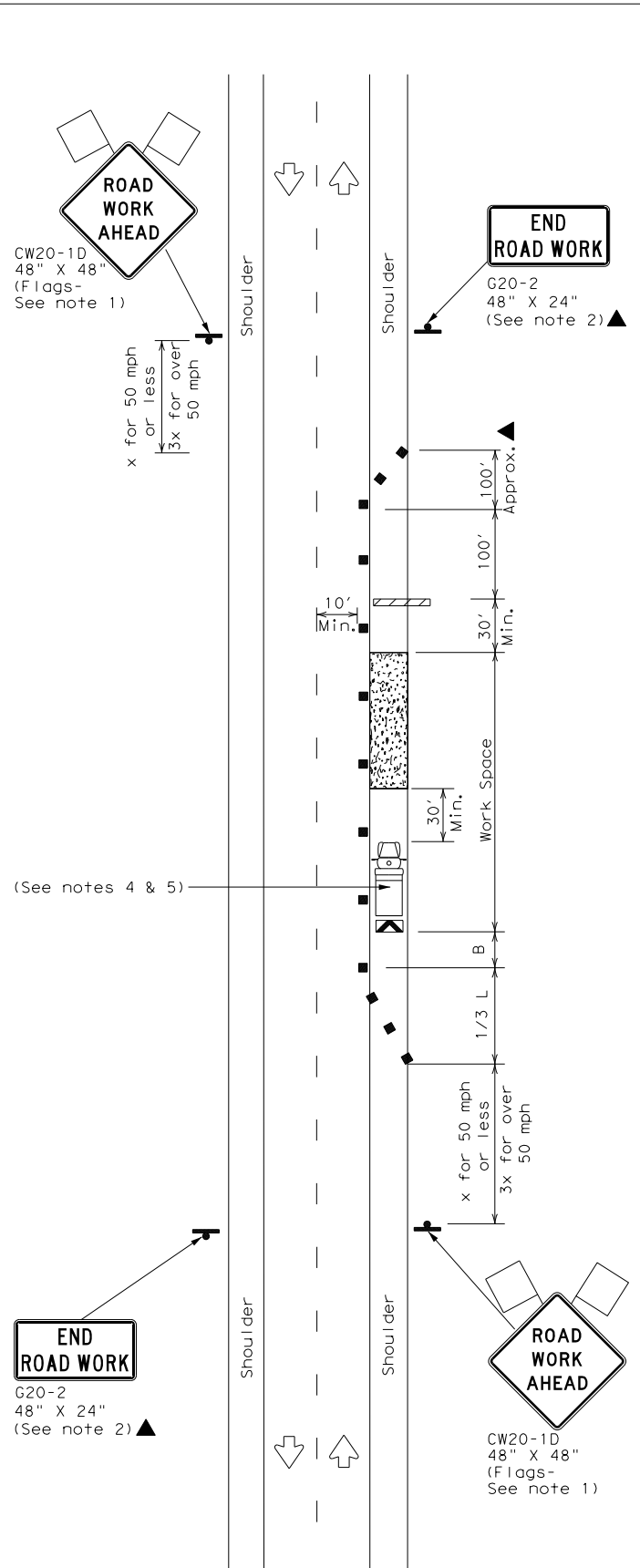
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DATE: FILE:



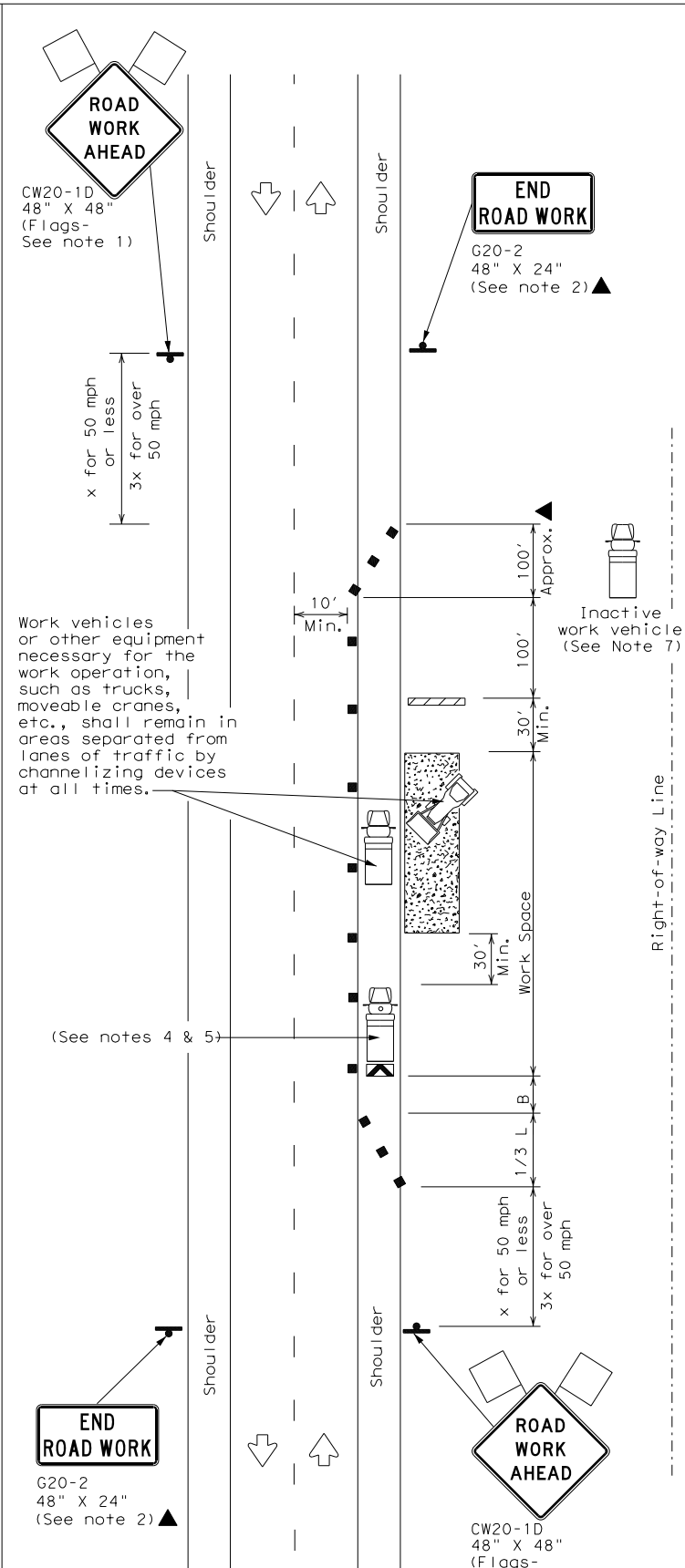
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

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

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

GENERAL NOTES

- Flags attached to signs where shown, are REQUIRED.
- All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
- Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
- Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
- Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
- See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
- Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
- CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.



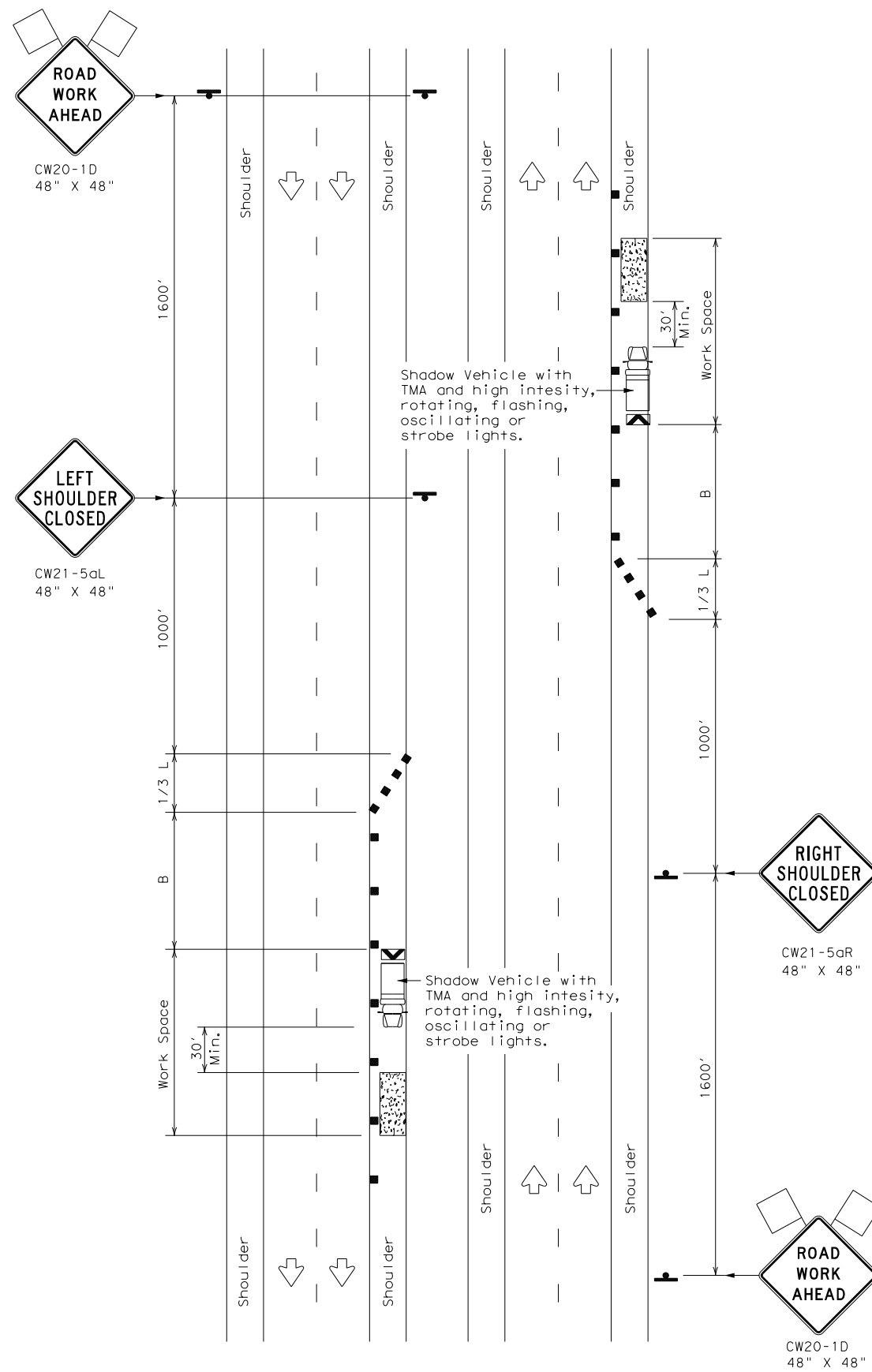
TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

TCP (2-1) - 18

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© TxDOT December 1985	CON:	SECT:	JOB:	HIGHWAY:
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1-97 2-18				

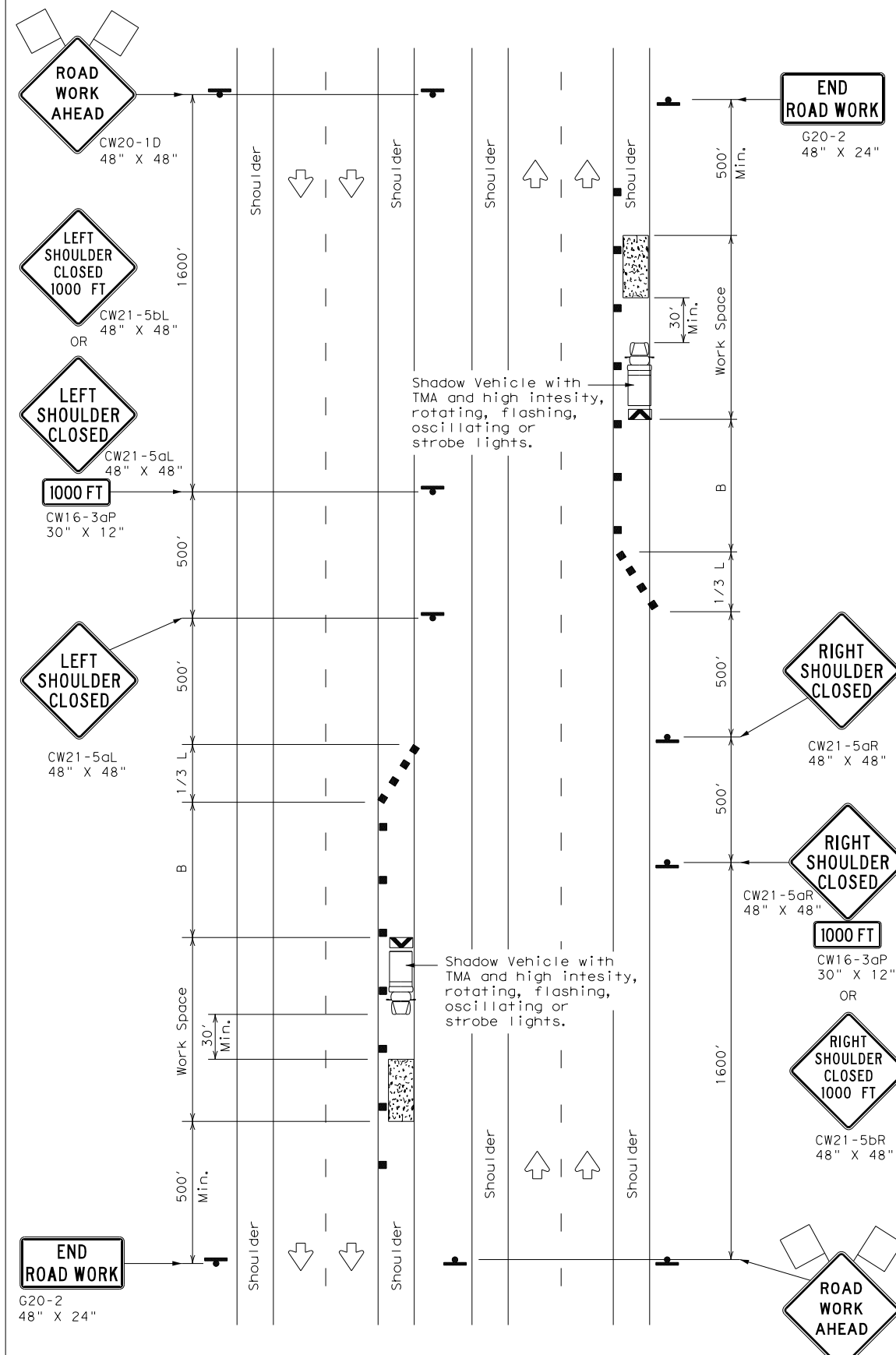
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DATE:
FILE:



TCP (5-1a)

WORK AREA ON SHOULDER



TCP (5-1b)

WORK AREA ON SHOULDER

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

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

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

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

GENERAL NOTES

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



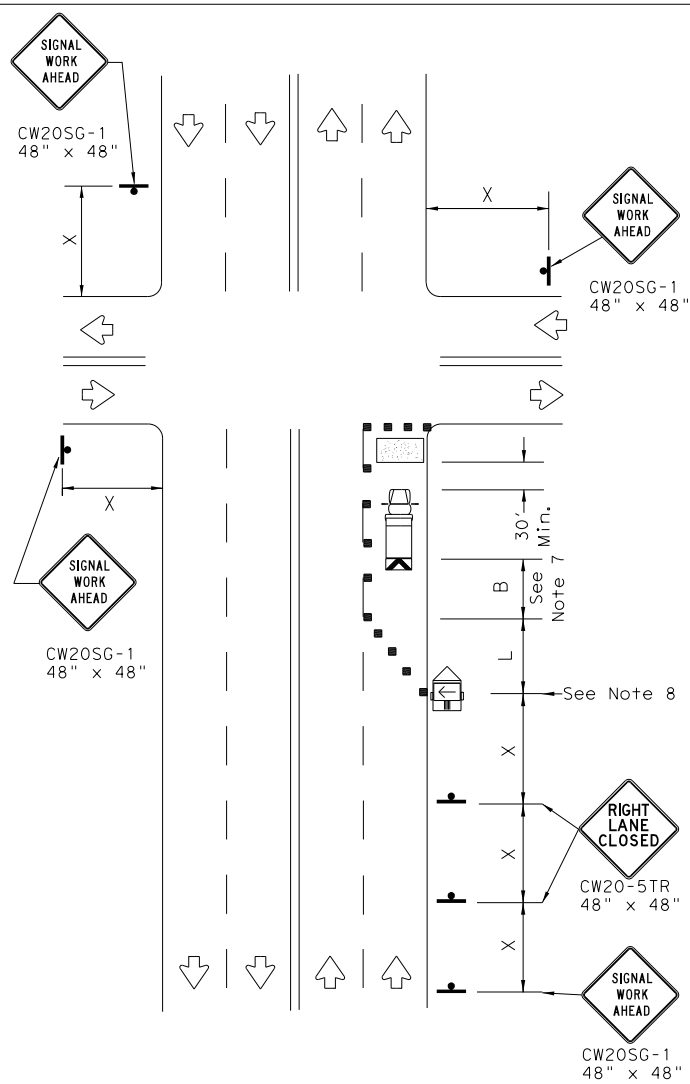
TRAFFIC CONTROL PLAN
 SHOULDER WORK FOR
 FREEWAYS / EXPRESSWAYS

TCP (5-1) - 18

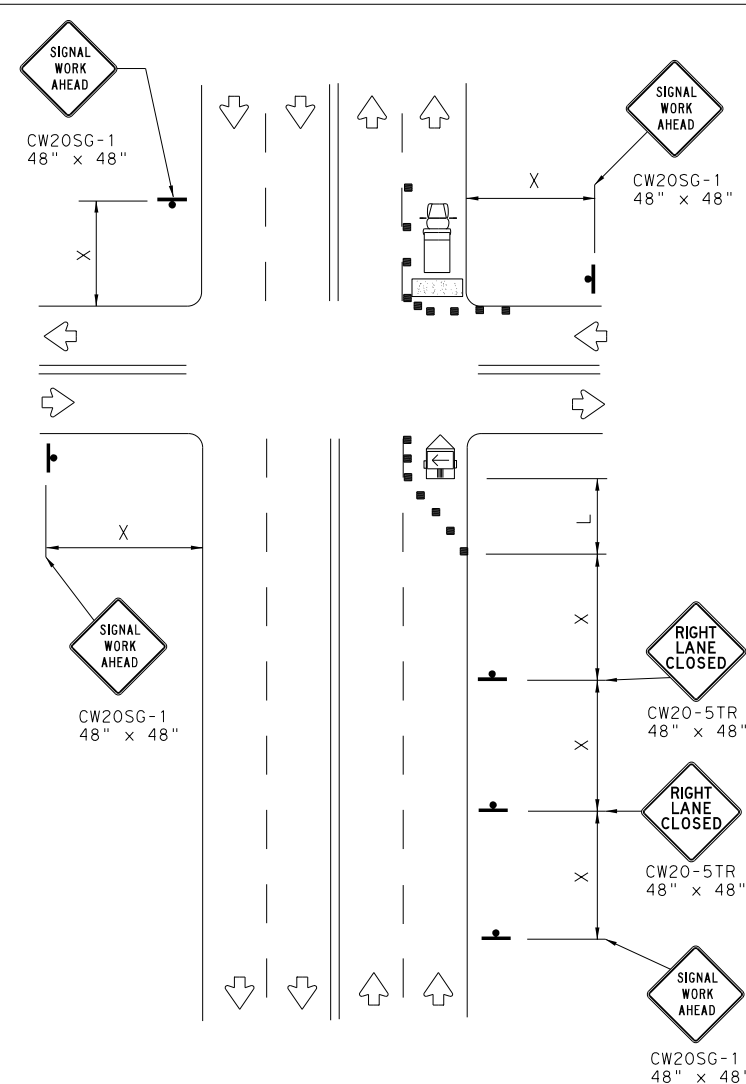
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	DIST:	COUNTY:	SHEET NO.:	
	ODA:	REEVES, ETC.	21	

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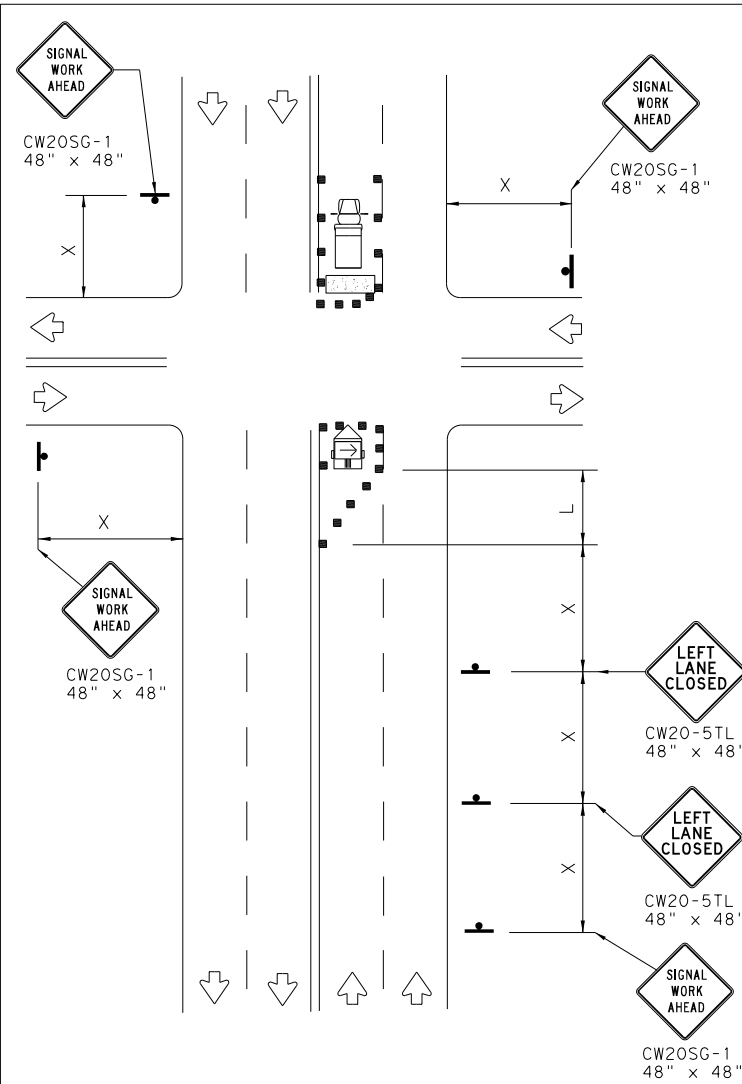
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NEAR SIDE LANE CLOSURE
 SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE
 SHORT DURATION OR SHORT TERM STATIONARY



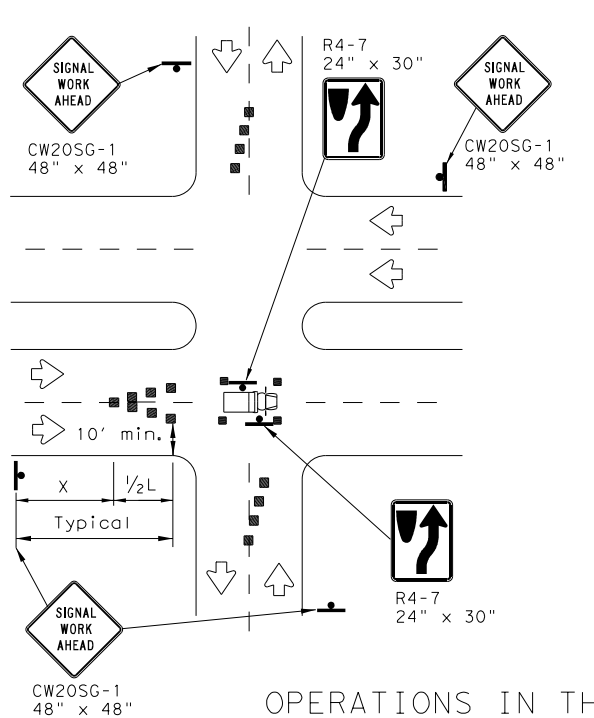
FAR SIDE LEFT LANE CLOSURE
 SHORT DURATION OR SHORT TERM STATIONARY

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

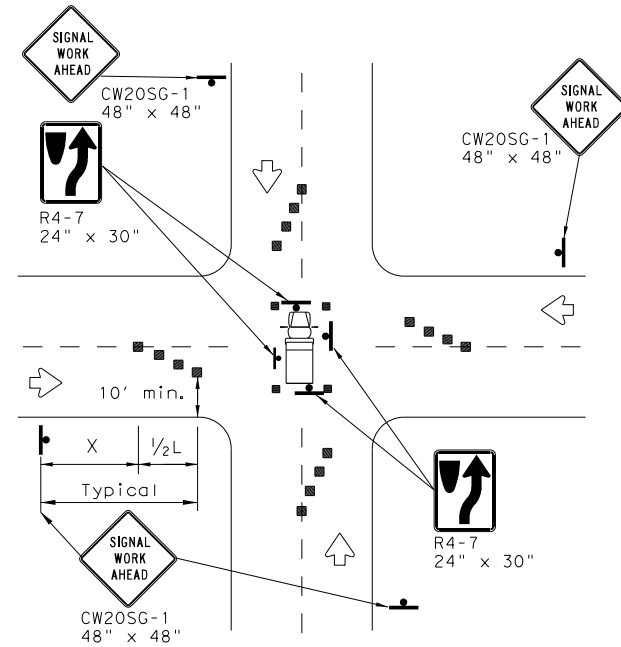
Posted Speed *	Formula	Minimum Desirable Taper Lengths * X			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
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.



OPERATIONS IN THE INTERSECTION
 SHORT DURATION



GENERAL NOTES

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

SHEET 1 OF 2



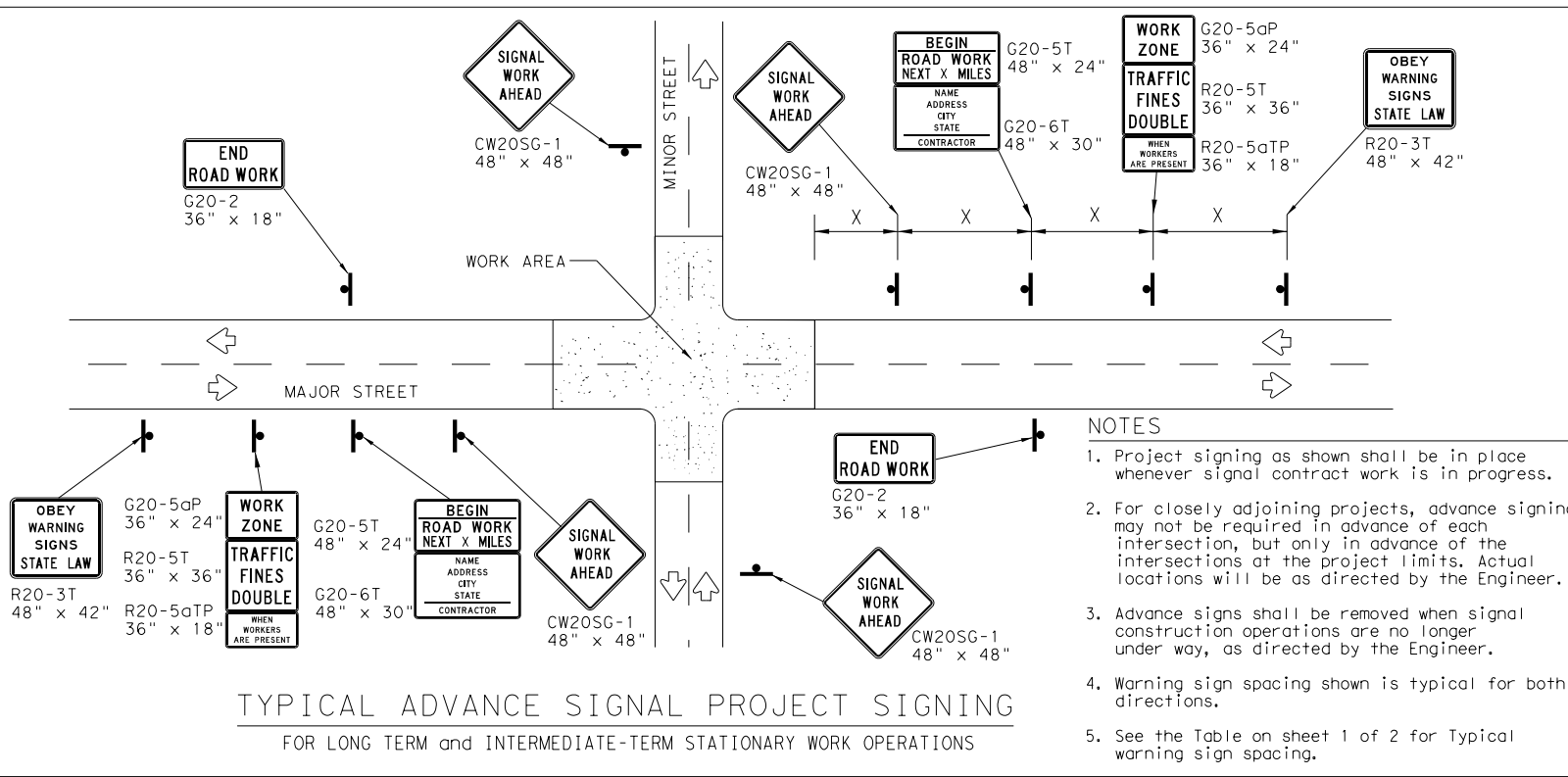
TRAFFIC SIGNAL WORK
 TYPICAL DETAILS

WZ(BTS-1)-13

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© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	08	064, ETC.	BI 20B, Etc.
2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
4-98 3-03	ODA	REEVES, Etc.	22	

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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 60.02 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

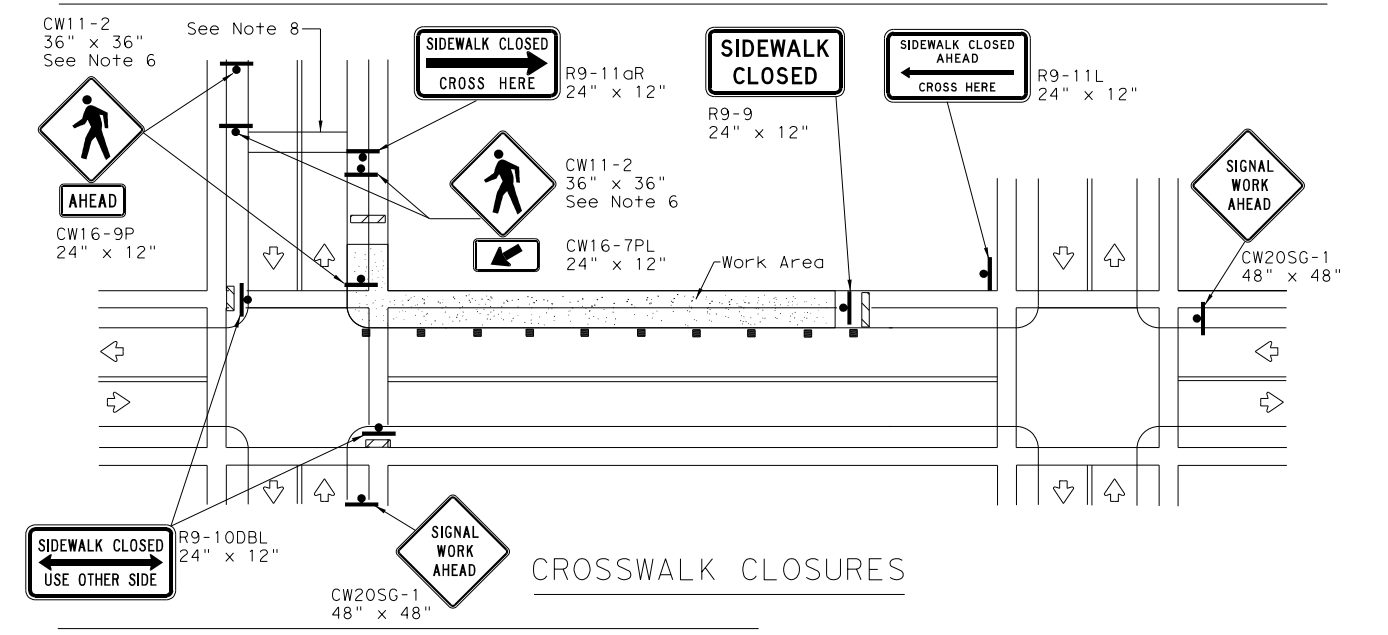
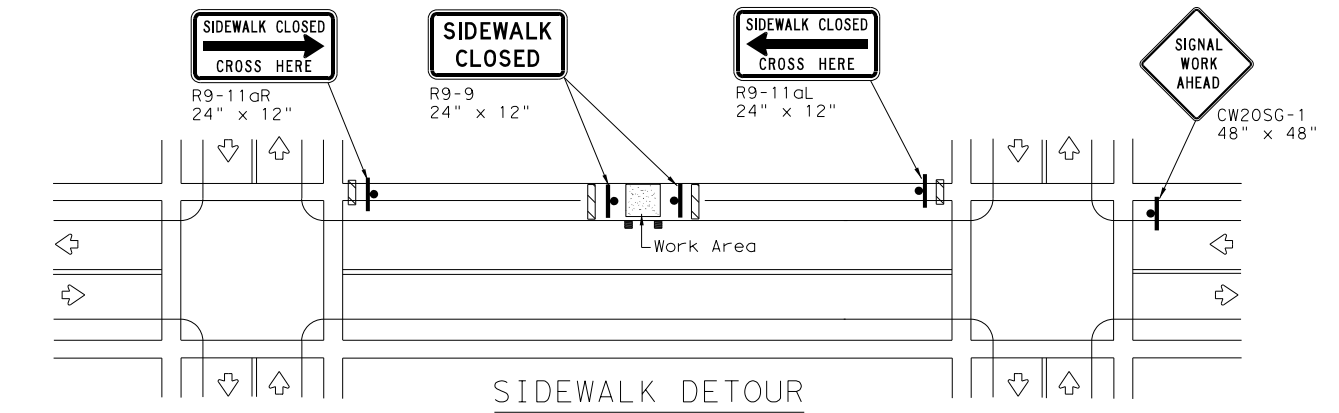
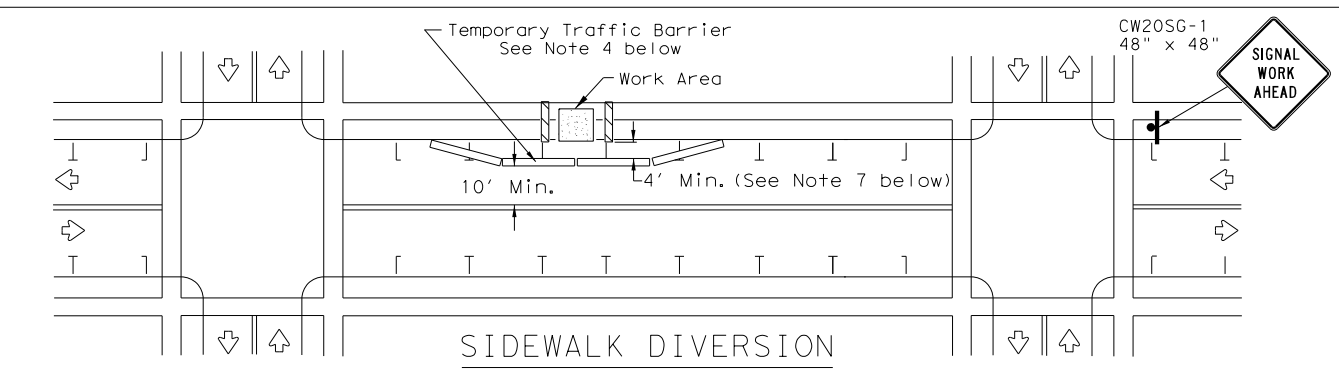
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

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



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.

SHEET 2 OF 2



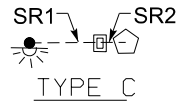
TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

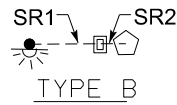
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2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
4-98 3-03	ODA	REEVES, Etc.	23	



STOP SIGN - R1-1 48"X48"
CROSS TRAFFIC DOES NOT STOP - W4-4P 36"X18"



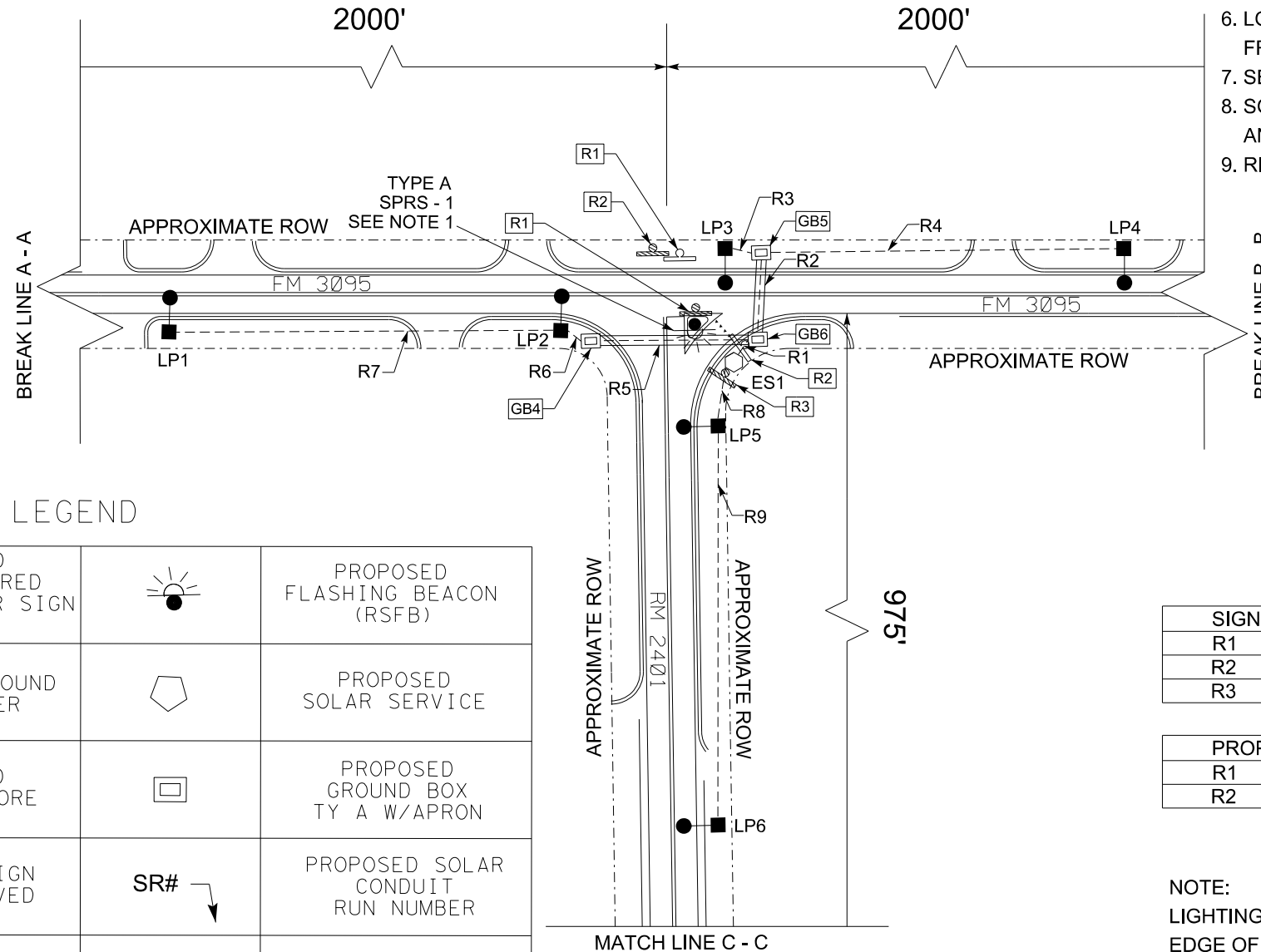
SR1 - CONDUIT RUN FROM GROUND BOX TO RSFB.
SR2 - CONDUIT RUN FROM SOLAR SERVICE TO GROUND BOX.
ADVANCED TRAFFIC CONTROL - W3-1 48"X48"



SR1 - CONDUIT RUN FROM GROUND BOX TO RSFB.
SR2 - CONDUIT RUN FROM SOLAR SERVICE TO GROUND BOX.
HWY INTERSECTION AHEAD - W2-1aT 48"X48"

NOTES:

1. SEE ROADSIDE FLASHING BEACON SIGN DETAIL.
2. USE TRF SIG CABLE (TY A)(12 AWG)(4 CONDR) IN ROADSIDE FLASHING BEACON (RSFB) POLES.
3. SIGNAL CABLE IN THE POLE AND TO THE CABINET IS INCLUDED IN THE RUN TOTALS.
4. TRAFFIC SIGNAL CABLE INSIDE SIGNAL HEADS, CONTROLLERS, AND COILS IN GROUND BOXES AND SIGNAL BASES IS NOT PAID FOR DIRECTLY, BUT IS SUBSIDIARY TO VARIOUS BID ITEMS. THIS IS IN ACCORDANCE WITH ITEM 684: TRAFFIC SIGNAL CABLES, SECTION 684.5 PAYMENT.
5. STAKE THE RSFB POLE AND SOLAR POLE LOCATIONS IN THE FIELD. LOCATIONS TO BE APPROVED BY THE ENGINEER BEFORE INSTALLATION BEGINS. IF RELOCATION IS NEEDED, LOCATION TO BE APPROVED BY ENGINEER.
6. LOCATION OF PROPOSED ADVANCE WARNING RSFB IS SHOWN BY DIMENSION FROM THE EDGE OF THE TRAVEL LANE OF THE INTERSECTING ROADWAY.
7. SEE PM (1)-12 FOR STOP BAR PLACEMENT.
8. SOLAR SERVICE POLE SHALL BE PLACED AS CLOSE TO THE R.O.W. AS POSSIBLE AND NOT IN LINE WITH FLASHING BEACON.
9. RIPRAP IS REQUIRED WHEN SHOWN ELSEWHERE IN PLANS.



LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED FLASHING BEACON (RSFB)
	PROPOSED GROUND BOX NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN TO BE REMOVED		PROPOSED SOLAR CONDUIT RUN NUMBER
	PROPOSED LUMINAIRE 50T-10 LED		PROPOSED CONDUIT TRENCH
	PROPOSED CONDUIT RUN NUMBER		PROPOSED ELECTRICAL SERVICE
	PROPOSED CURB AND GUTTER		PROPOSED SIGN

SIGN REMOVAL	
R1	STOP
R2	W1-7T
R3	YIELD

PROPOSED SIGN	
R1	W1-7T
R2	YIELD

NOTE:
LIGHTING 15' - 20' FROM EDGE OF ROADWAY.

NOTE:
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04/20/2022

SCALE: 1" = 100'

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FIRM #533

Texas Department of Transportation

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RM 2401

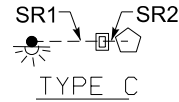
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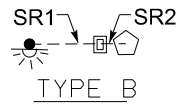
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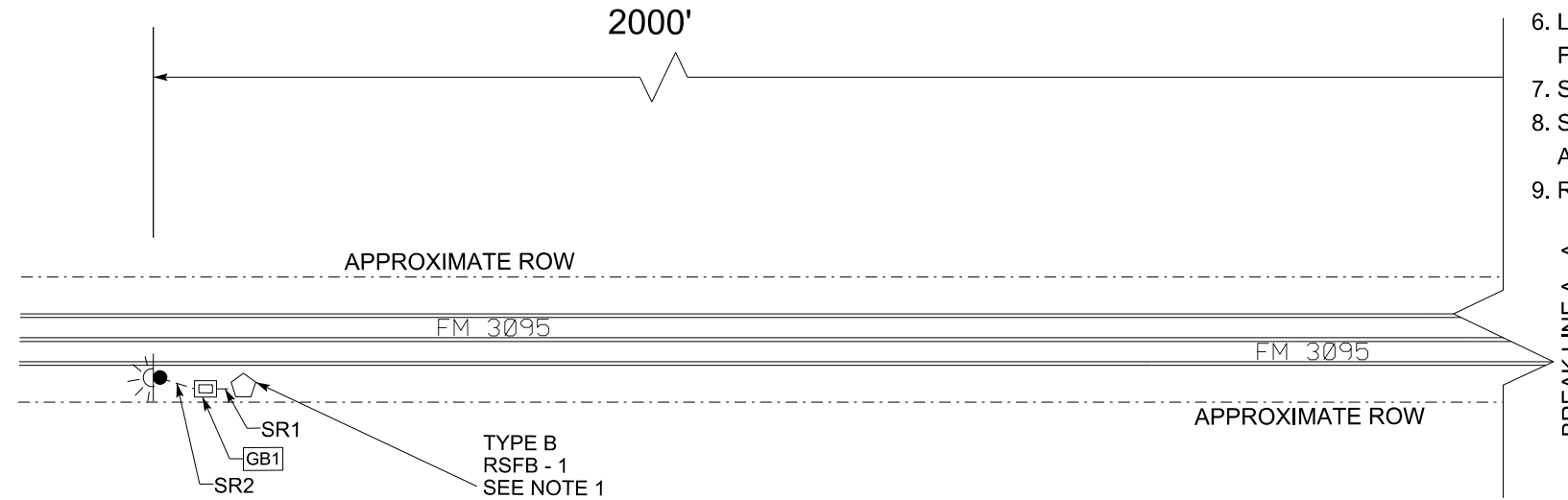
STOP SIGN - R1-1 48"X48"
CROSS TRAFFIC DOES NOT STOP - W4-4P 36"X18"



SR1 - CONDUIT RUN FROM GROUND BOX TO RSFB.
SR2 - CONDUIT RUN FROM SOLAR SERVICE TO GROUND BOX.
ADVANCED TRAFFIC CONTROL - W3-1 48"X48"



SR1 - CONDUIT RUN FROM GROUND BOX TO RSFB.
SR2 - CONDUIT RUN FROM SOLAR SERVICE TO GROUND BOX.
HWY INTERSECTION AHEAD - W2-1aT 48"X48"



LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED FLASHING BEACON (RSFB)
	PROPOSED GROUND BOX NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN TO BE REMOVED		PROPOSED SOLAR CONDUIT RUN NUMBER
	PROPOSED LUMINAIRE 50T-10 LED		PROPOSED CONDUIT TRENCH
	PROPOSED CONDUIT RUN NUMBER		PROPOSED ELECTRICAL SERVICE
	PROPOSED CURB AND GUTTER		PROPOSED SIGN

NOTES:

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8. SOLAR SERVICE POLE SHALL BE PLACED AS CLOSE TO THE R.O.W. AS POSSIBLE AND NOT IN LINE WITH FLASHING BEACON.
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BREAK LINE A - A

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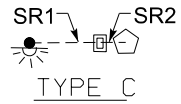
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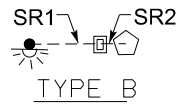
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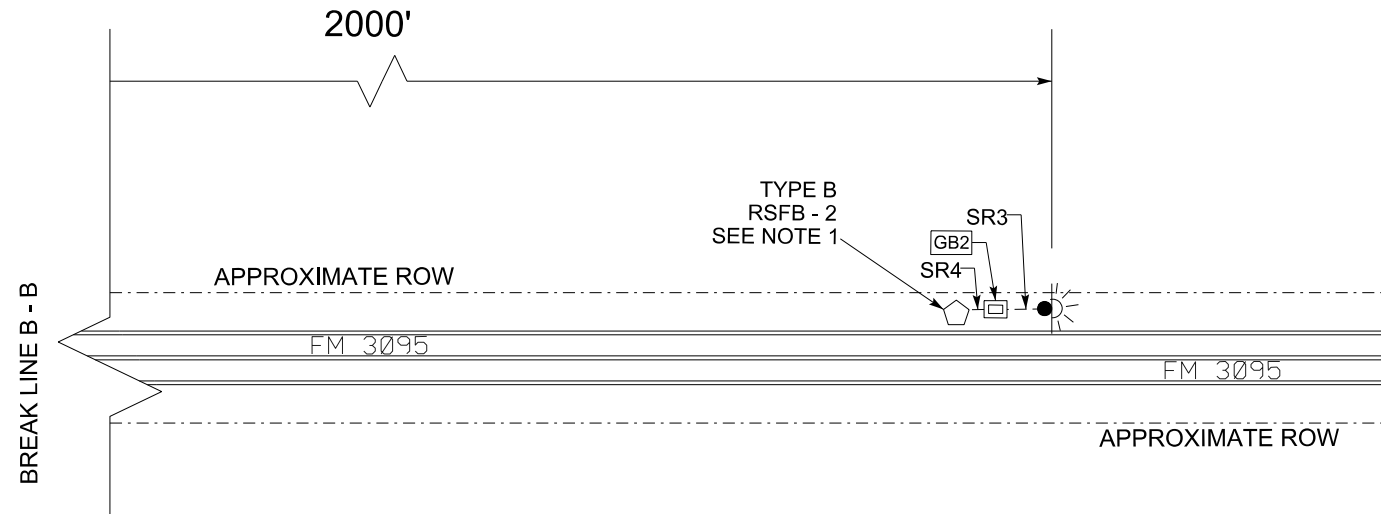
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 SR2 - CONDUIT RUN FROM SOLAR SERVICE TO GROUND BOX.
 ADVANCED TRAFFIC CONTROL - W3-1 48"X48"



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 SR2 - CONDUIT RUN FROM SOLAR SERVICE TO GROUND BOX.
 HWY INTERSECTION AHEAD - W2-1aT 48"X48"



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	PROPOSED CONDUIT BORE		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN TO BE REMOVED		PROPOSED SOLAR CONDUIT RUN NUMBER
	PROPOSED LUMINAIRE 50T-10 LED		PROPOSED CONDUIT TRENCH
	PROPOSED CONDUIT RUN NUMBER		PROPOSED ELECTRICAL SERVICE
	PROPOSED CURB AND GUTTER		PROPOSED SIGN

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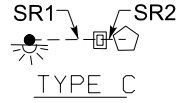
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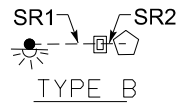
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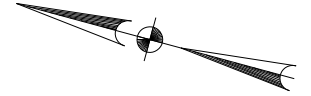
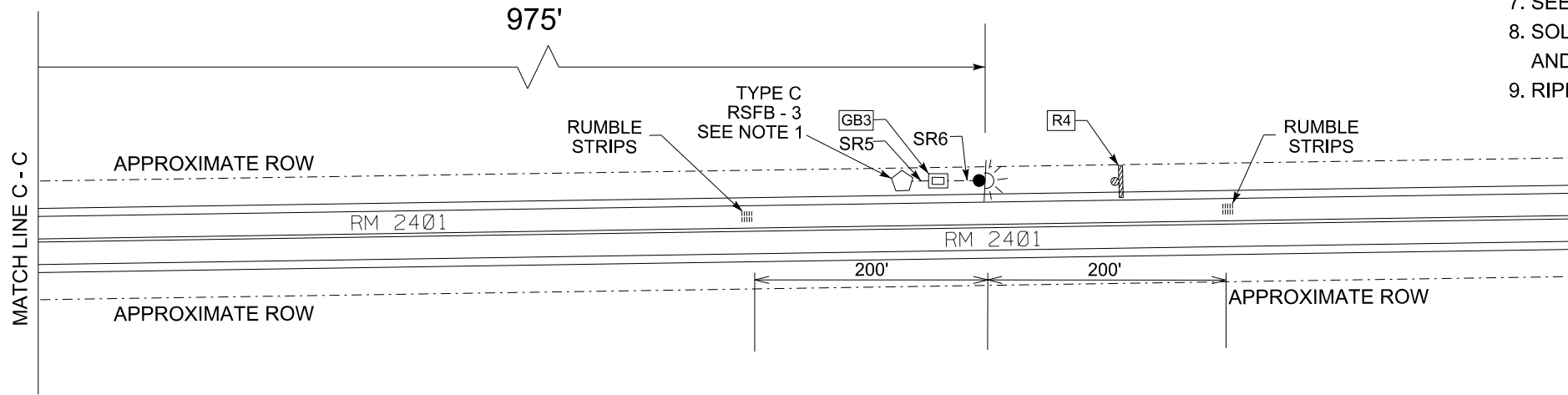
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ADVANCED TRAFFIC CONTROL - W3-1 48"X48"



SR1 - CONDUIT RUN FROM GROUND BOX TO RSFB.
SR2 - CONDUIT RUN FROM SOLAR SERVICE TO GROUND BOX.
HWY INTERSECTION AHEAD - W2-1aT 48"X48"

NOTES:

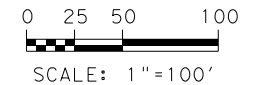
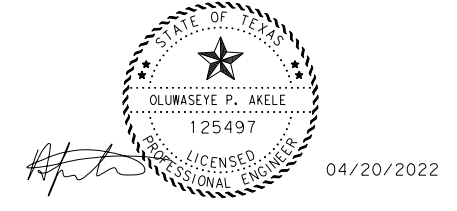
1. SEE ROADSIDE FLASHING BEACON SIGN DETAIL.
2. USE TRF SIG CABLE (TY A)(12 AWG)(4 CONDR) IN ROADSIDE FLASHING BEACON (RSFB) POLES.
3. SIGNAL CABLE IN THE POLE AND TO THE CABINET IS INCLUDED IN THE RUN TOTALS.
4. TRAFFIC SIGNAL CABLE INSIDE SIGNAL HEADS, CONTROLLERS, AND COILS IN GROUND BOXES AND SIGNAL BASES IS NOT PAID FOR DIRECTLY, BUT IS SUBSIDIARY TO VARIOUS BID ITEMS. THIS IS IN ACCORDANCE WITH ITEM 684: TRAFFIC SIGNAL CABLES, SECTION 684.5 PAYMENT.
5. STAKE THE RSFB POLE AND SOLAR POLE LOCATIONS IN THE FIELD. LOCATIONS TO BE APPROVED BY THE ENGINEER BEFORE INSTALLATION BEGINS. IF RELOCATION IS NEEDED, LOCATION TO BE APPROVED BY ENGINEER.
6. LOCATION OF PROPOSED ADVANCE WARNING RSFB IS SHOWN BY DIMENSION FROM THE EDGE OF THE TRAVEL LANE OF THE INTERSECTING ROADWAY.
7. SEE PM (1)-12 FOR STOP BAR PLACEMENT.
8. SOLAR SERVICE POLE SHALL BE PLACED AS CLOSE TO THE R.O.W. AS POSSIBLE AND NOT IN LINE WITH FLASHING BEACON.
9. RIPRAP IS REQUIRED WHEN SHOWN ELSEWHERE IN PLANS.



LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED FLASHING BEACON (RSFB)
	PROPOSED GROUND BOX NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN TO BE REMOVED		PROPOSED SOLAR CONDUIT RUN NUMBER
	PROPOSED LUMINAIRE 50T-10 LED		PROPOSED CONDUIT TRENCH
	PROPOSED CONDUIT RUN NUMBER		PROPOSED ELECTRICAL SERVICE
	PROPOSED CURB AND GUTTER		PROPOSED SIGN

SIGN REMOVAL	
R4	W3-1



NOTE:
EXISTING CONDITIONS LAYOUT IS FIELD VERIFIED AND ONLY SHOWS INFORMATION AND/OR INTERSECTION DETAILS THAT ARE NEEDED TO ANALYZE DATA FOR AN INSTALLATION OF FLASHING BEACONS, CURB/GUTTER. CONTRACTOR SHALL FIELD VERIFY AND MARK LOCATIONS IN FIELD. FLASHING BEACONS OR GROUND BOX LOCATIONS SHALL NOT IMPEDE DRAINAGE, SIGHT DISTANCE AND BE 4 FEET HORIZONTAL AND 2 FEET VERTICAL UNDERGROUND FROM ALL EXISTING UTILITIES

REV. NO.	DATE	DESCRIPTION	BY	
Design & Consultancy for natural and built assets FIRM #533				
FM 3095 AT RM 2401 PAGE 4 OF 6				
DSN#	FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK#	6	TEXAS	F 2022 (736)	RM 2401
DRN#	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.
CK#	ODA	REEVES, ETC.	0003	08 064, ETC.
				JOB NO.
				27
				SHEET NO.

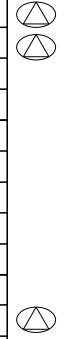
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26 - RM_Sheet_4.dgn

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RM 2401 AT FM 3095																			
BID ITEM	DESCRIPTION	UNIT	ES1									RSFB-1		RSFB-2		RSFB-3		SPRS-1	
			R1	R2	R3	R4	R5	R6	R7	R8	R9	SR1	SR2	SR3	SR4	SR5	SR6	-	-
	RUN LENGTH		12	46	13	250	93	11	250	33	250	10	10	10	10	10	10	-	-
	POINT:POINT		SP1:GB6	GB6:GB5	GB5:LP3	GB5:LP4	GB6:GB4	GB4:LP2	LP2:LP1	SP1:LP5	LP5:LP6	SS:GB1	GB1:FB	SS:GB2	GB2:FB	SS:GB3	GB3:FB	-	-
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF			8	8		8	8	8								
432	6001	RIPRAP	CY			0.5	0.5		0.5	0.5	0.5								
610	6304	IN RD IL (TY AL) 50T-10(400W EQ) LED	EA			1	1		1	1	1								
618	6023	CONDT (PVC) (SCH 40) (2")	LF	12		13	250		11	250	33	250	10	10	10	10	10	10	
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF		46			93											
620	6009	ELEC CONDR (NO. 6) BARE	LF	15	52	26	263	99	24	270	43	270							
620	6010	ELEC CONDR (NO. 6) INSULATED	LF	30	104	52	526	198	48	540	86	540	13	26	13	26	13	26	
624	6002	GROUND BOX TY A (122311) W/APRON	EA		1	1		1					1		1		1		
628	6045	ELC SRV TY A 240/480 060 (NS)SS(E)SP(O)	EA	1															
636	6001	ALUMINIUM SIGNS (TY A)	SF										16		16		16	4.5	23.5
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA															1	2
644	6076	REMOVE SM RD SN SUP&AM	EA														1	1	2
666	6102	REF PAV MRK TY I(W)36"(YLD TRI)(100MIL)	EA																4
682	6003	VEH SIG SEC (12") LED (YEL)	EA										2		2		2		
682	6033	BACK PLATE (12") (1 SEC)(VENTED) ALUM	EA										2		2		2		
684	6009	TRF SIG CBL (TYA) (12 AWG) (4 CONDR)	LF										26		26		26		
685	6004	INSTL RDS D FLSH BCN ASSM (SOLAR PWRD)	EA										1		1		1		
6227	6001	SOLAR POWERED LED WARNING SIGN	EA															1	



BASIS OF CALCULATIONS

SP:GB = (length of run) + SP(0') + GB(3')

GB:GB = (length of run) + GB(3') + GB(3')

GB:LP = (length of run) + GB(3') + LP(10')

SS:GB = (length of run) + SP(0') + GB(3')

GB:FB = (length of run) + GB(3') + FB(13')

SP = SERVICE POLE
 SS = SOLAR SERVICE
 GB = GROUND BOX
 LP = 50' LUMINAIRE POLE
 FB = ROADSIDE FLASHING BEACON

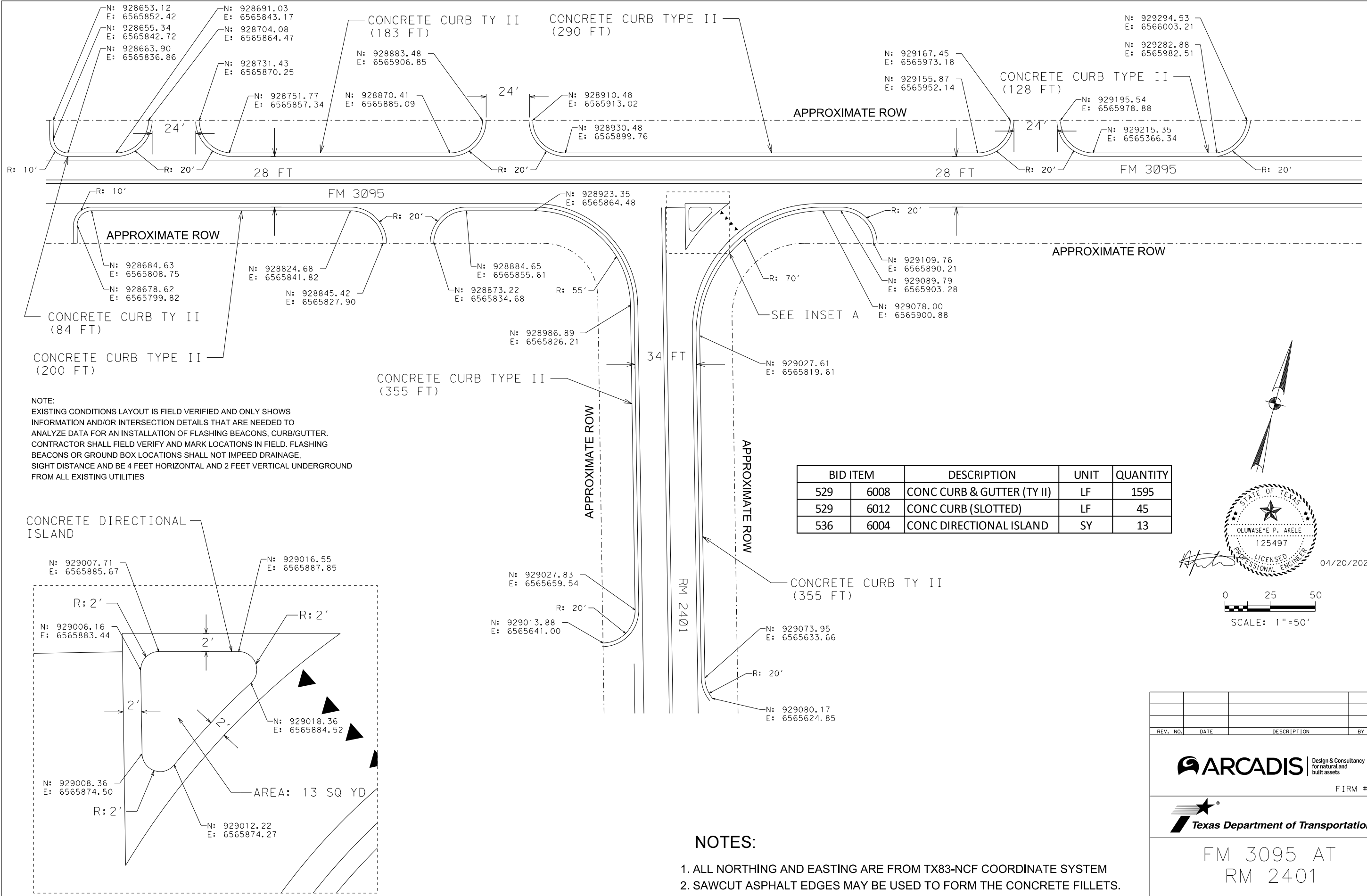
A. Akele
 OLUWASEYE P. AKELE
 125497
 LICENSED PROFESSIONAL ENGINEER
 04/20/2022

REV. NO.	DATE	DESCRIPTION	BY
Design & Consultancy for natural and built assets			
FIRM #533			
FM 3095 AT RM 2401			
PAGE 5 OF 6			
DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.
CK:	6	TEXAS	F 2022 (736)
DRN:	STATE DISTRICT	COUNTY	CONTROL NO.
CK:	ODA	REEVES, ETC.	0003
			SECTION NO.
			08
			JOB NO.
			064, ETC.
			SHEET NO.
			28

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NOTE:
 EXISTING CONDITIONS LAYOUT IS FIELD VERIFIED AND ONLY SHOWS INFORMATION AND/OR INTERSECTION DETAILS THAT ARE NEEDED TO ANALYZE DATA FOR AN INSTALLATION OF FLASHING BEACONS, CURB/GUTTER. CONTRACTOR SHALL FIELD VERIFY AND MARK LOCATIONS IN FIELD. FLASHING BEACONS OR GROUND BOX LOCATIONS SHALL NOT IMPEED DRAINAGE, SIGHT DISTANCE AND BE 4 FEET HORIZONTAL AND 2 FEET VERTICAL UNDERGROUND FROM ALL EXISTING UTILITIES

BID ITEM	DESCRIPTION	UNIT	QUANTITY
529 6008	CONC CURB & GUTTER (TY II)	LF	1595
529 6012	CONC CURB (SLOTTED)	LF	45
536 6004	CONC DIRECTIONAL ISLAND	SY	13

04/20/2022

SCALE: 1"=50'

- NOTES:**
1. ALL NORTHING AND EASTING ARE FROM TX83-NCF COORDINATE SYSTEM
 2. SAWCUT ASPHALT EDGES MAY BE USED TO FORM THE CONCRETE FILLETS.
 3. GRADE FILLETS TO ACCOMODATE DRAINAGE.

REV. NO.	DATE	DESCRIPTION	BY

ARCADIS Design & Consultancy for natural and built assets
 FIRM #533

Texas Department of Transportation

FM 3095 AT
 RM 2401

PAGE 6 OF 6

DSN#	FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.		
CK:	6	TEXAS	F 2022 (736)	RM 2401		
DRN#	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
ck:	ODA	REEVES, ETC.	0003	08	064, ETC.	29

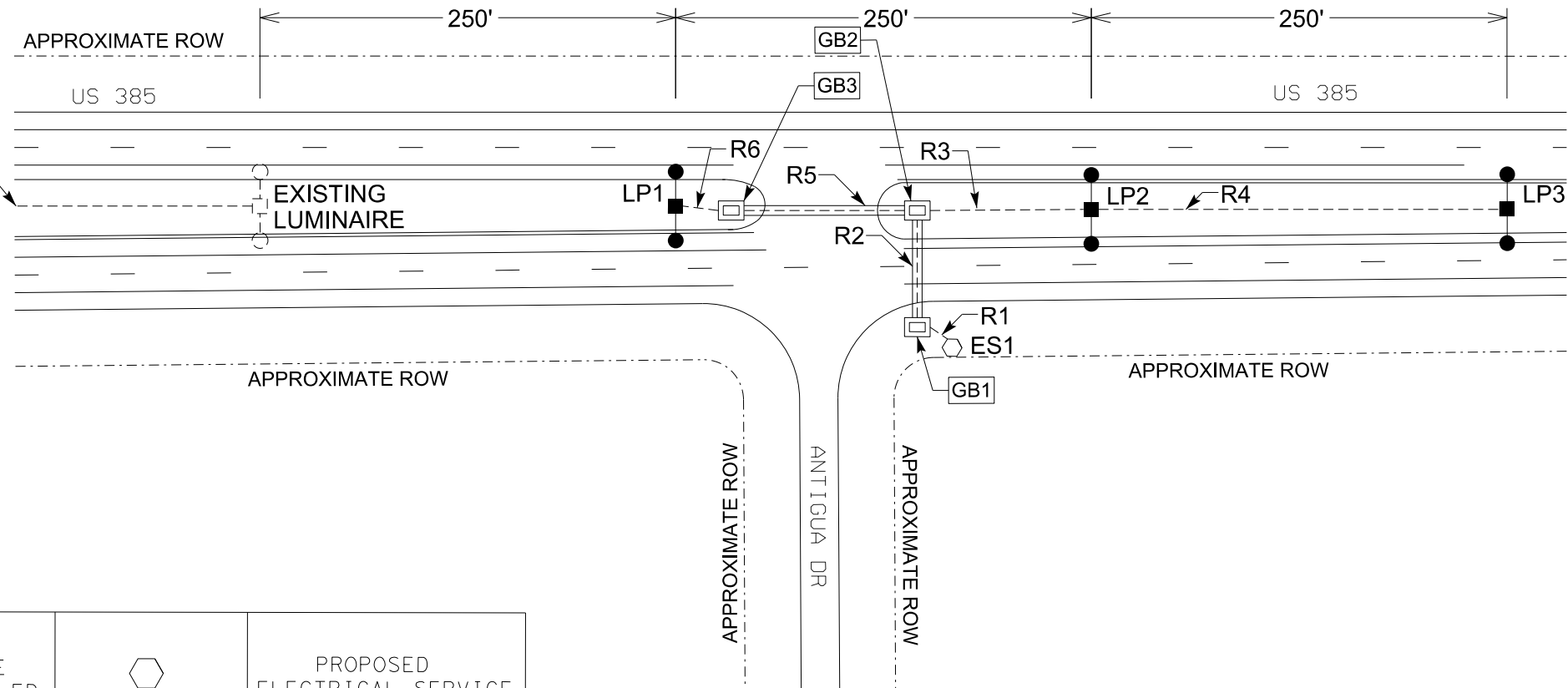
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US 385 AT ANTIGUA DR				ES1					
BID ITEM	DESCRIPTION	UNIT	R1	R2	R3	R4	R5	R6	
	RUN LENGTH		14	61	96	250	101	23	
	POINT:POINT		SP1:GB1	GB1:GB2	GB2:LP2	LP2:LP3	GB2:GB3	GB3:LP1	
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF			8	8	8	
432	6001	RIPRAP	CY			0.5	0.5	0.5	
610	6305	IN RD IL (TY AL) 50T-10-10(400W EQ) LED	EA			1	1	1	
618	6023	CONDT (PVC) (SCH 40) (2")	LF	14		96	250		
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF		61			101	
620	6009	ELEC CONDR (NO. 6) BARE	LF	17	67	109	270	107	
620	6010	ELEC CONDR (NO. 6) INSULATED	LF	34	134	218	540	214	
624	6002	GROUND BOX TY A (122311) W/APRON	EA			1	1	1	
628	6045	ELC SRV TY A 240/480 060 (NS)SS(E)SP(O)	EA	1					

NOTES:

- LUMINAIRE POLES SHOULD BE 15'-20' FROM THE EDGE OF TRAVEL LANE IF POSSIBLE.
- PHOTOCELL SHOULD BE ENCLOSED AND FACING NORTH WHEN PRACTICAL.
- A GROUNDING ROD WILL BE REQUIRED ON ALL ELECTRICAL SERVICES FOR ALL SUPPORT TYPES. SEE ED(10)-14 FOR GROUNDING ROD DETAILS.

SEE CSJ: 0229-01-038 FOR DETAILS



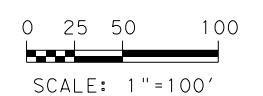
LEGEND

	EXISTING LUMINAIRE 50T-10-10 LED		PROPOSED ELECTRICAL SERVICE
	PROPOSED LUMINAIRE 50T-10-10 LED		PROPOSED GROUND BOX TY A W/APRON
	PROPOSED CONDUIT BORE		PROPOSED CONDUIT RUN NUMBER
	PROPOSED CONDUIT TRENCH		PROPOSED GROUND BOX NUMBER

BASIS OF CALCULATIONS	
SP:GB	= (length of run) + SP (0') + GB (3')
GB:GB	= (length of run) + GB (3') + GB (3')
GB:LP	= (length of run) + GB (3') + LP (10')
SP	= SERVICE POLE
GB	= GROUND BOX
LP	= 50' LUMINAIRE POLE



04/20/2022



REV. NO.	DATE	DESCRIPTION	BY

ARCADIS Design & Consultancy for natural and built assets
FIRM #533

Texas Department of Transportation

US 385 AT ANTIGUA DR

PAGE 1 OF 1

DSN#	FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.		
CK:	6	TEXAS	F 2022 (736)	US 385		
DRN#	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK:	ODA	REEVES, ETC.	0003	08	064, ETC.	30

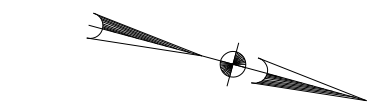
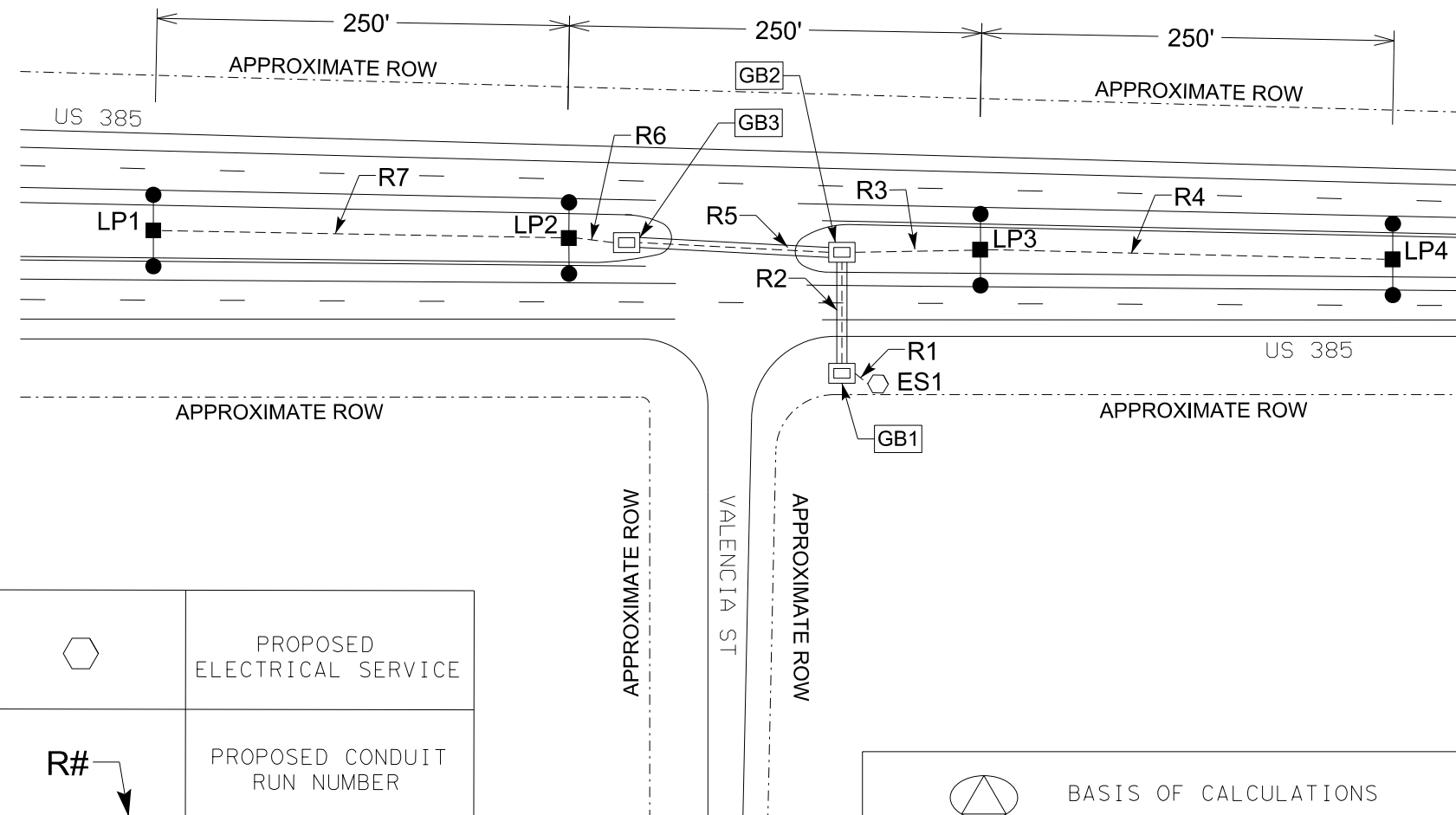
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27. Antigua_Sheet 1.dgn

US 385 AT VALENCIA ST				ES1						
BID ITEM	DESCRIPTION	UNIT	R1	R2	R3	R4	R5	R6	R7	
	RUN LENGTH		10	61	71	250	114	23	250	
	POINT:POINT		SP1:GB1	GB1:GB2	GB2:LP3	LP3:LP4	GB2:GB3	GB3:LP2	LP2:LP1	
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF		8	8		8	8	
432	6001	RIPRAP	CY		0.5	0.5		0.5	0.5	
610	6305	IN RD IL (TY AL) 50T-10-10(400W EQ) LED	EA		1	1		1	1	
618	6023	CONDT (PVC) (SCH 40) (2")	LF	10		71	250		250	
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF		61			114	23	
620	6009	ELEC CONDR (NO. 6) BARE	LF	13	67	84	270	120	36	270
620	6010	ELEC CONDR (NO. 6) INSULATED	LF	26	134	168	540	240	72	540
624	6002	GROUND BOX TY A (122311) W/APRON	EA		1	1		1		
628	6045	ELC SRV TY A 240/480 060 (NS)SS(E)SP(O)	EA	1						

NOTES:

- LUMINAIRE POLES SHOULD BE 15'-20' FROM THE EDGE OF TRAVEL LANE IF POSSIBLE.
- PHOTOCELL SHOULD BE ENCLOSED AND FACING NORTH WHEN PRACTICAL.
- A GROUNDING ROD WILL BE REQUIRED ON ALL ELECTRICAL SERVICES FOR ALL SUPPORT TYPES. SEE ED(10)-14 FOR GROUNDING ROD DETAILS.



Professional Engineer Seal for Oluwaseye P. Akelle, License No. 125497, State of Texas. The seal is dated 04/20/2022. Below the seal is a graphic scale bar showing 0, 25, 50, and 100 feet, with the text 'SCALE: 1"=100\''.

LEGEND

	PROPOSED LUMINAIRE 50T-10-10 LED		PROPOSED ELECTRICAL SERVICE
	PROPOSED CONDUIT BORE		PROPOSED CONDUIT RUN NUMBER
	PROPOSED CONDUIT TRENCH		PROPOSED GROUND BOX NUMBER
	PROPOSED GROUND BOX TY A W/APRON		

BASIS OF CALCULATIONS

$SP:GB = (\text{length of run}) + SP(0') + GB(3')$
 $GB:GB = (\text{length of run}) + GB(3') + GB(3')$
 $GB:LP = (\text{length of run}) + GB(3') + LP(10')$

SP = SERVICE POLE
 GB = GROUND BOX
 LP = 50' LUMINAIRE POLE

Revision table with columns: REV. NO., DATE, DESCRIPTION, BY.

ARCADIS Design & Consultancy for natural and built assets. FIRM #533

Texas Department of Transportation

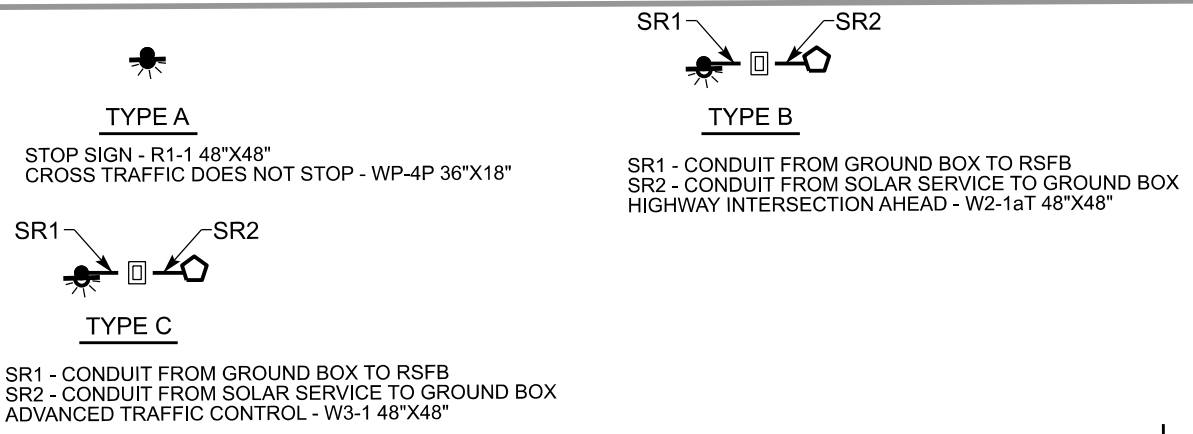
US 385 AT VALENCIA ST

PAGE 1 OF 1

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK:	6	TEXAS	F 2022 (736)	US 385
DRN:	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.
CK:	ODA	REEVES, ETC.	0003	08 064, ETC.
				SHEET NO.
				31

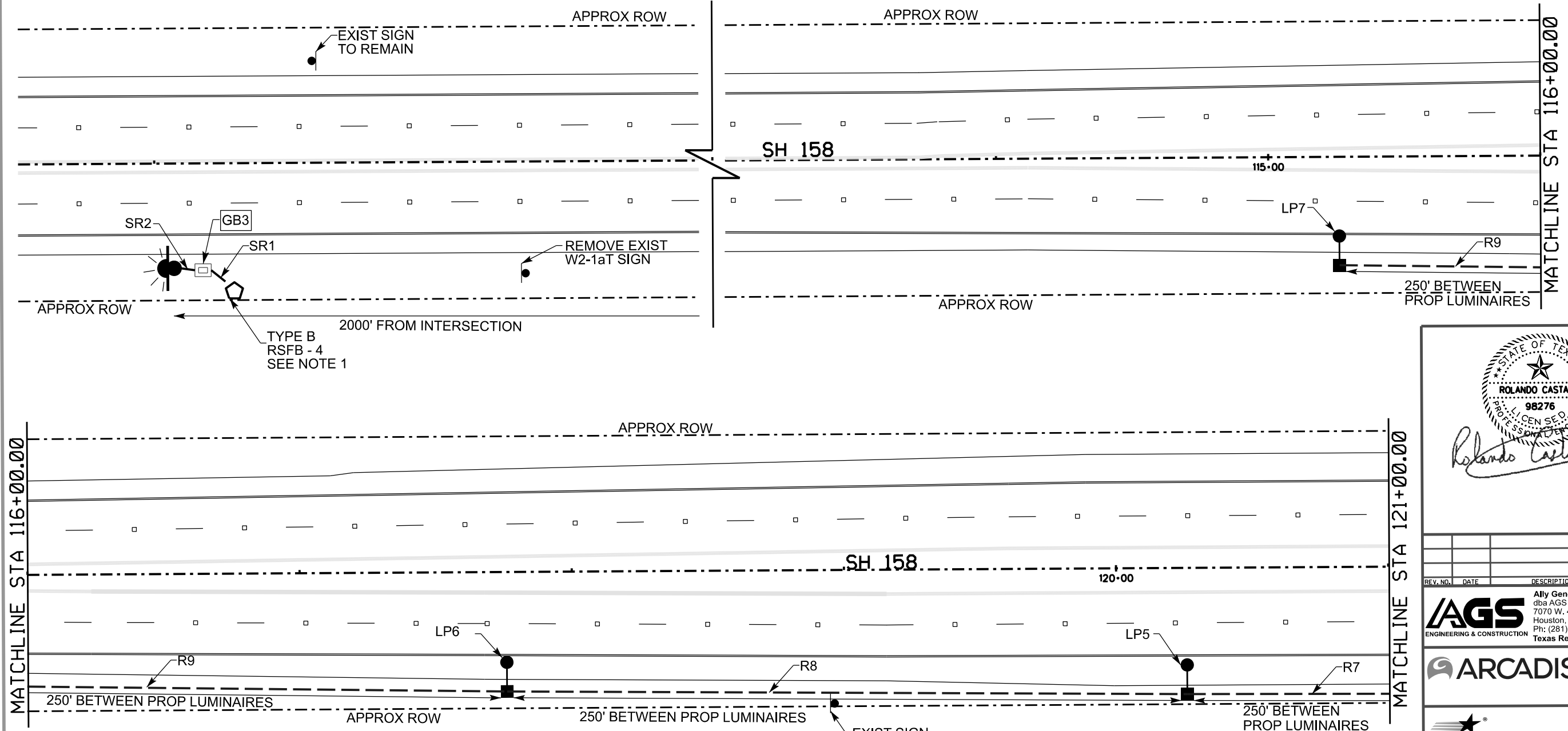
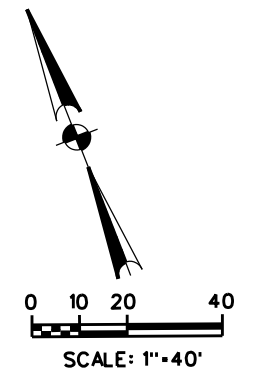
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NOTE:
LUMINAIRE POLES SHOULD BE
15'-20' FROM THE SHOULDER
WHERE POSSIBLE.

LEGEND					
	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE
	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN		PROPOSED CONDUIT RUN NUMBER		EXIST POWER POLE
	PROPOSED CONDUIT TRENCH		PROPOSED ELECTRICAL SERVICE		TRANSVERSE RUMBLE STRIPS



- NOTES:
1. SEE ROADSIDE FLASHING BEACON SIGN DETAIL.
 2. USE TRF SIG CABLE (TY A)(12 AWG)(4 CONDR) IN ROADSIDE FLASHING BEACON (RSFB) POLES.
 3. SIGNAL CABLE IN THE POLE AND TO THE CABINET IS INCLUDED IN THE RUN TOTALS.
 4. TRAFFIC SIGNAL CABLE INSIDE SIGNAL HEADS, CONTROLLERS, AND COILS IN GROUND BOXES AND SIGNAL BASES IS NOT PAID FOR DIRECTLY, BUT IS SUBSIDIARY TO VARIOUS BID ITEMS. THIS IS IN ACCORDANCE WITH ITEM 684: TRAFFIC SIGNAL CABLES, SECTION 684.5 PAYMENT.

5. STAKE THE RSFB POLE AND SOLAR POLE LOCATIONS IN THE FIELD. LOCATIONS TO BE APPROVED BY THE ENGINEER BEFORE INSTALLATION BEGINS. IF RELOCATION IS NEEDED, LOCATION TO BE APPROVED BY ENGINEER.
6. LOCATION OF PROPOSED ADVANCE WARNING RSFB IS SHOWN BY DIMENSION FROM THE EDGE OF THE TRAVEL LANE OF THE INTERSECTING ROADWAY.
7. SEE PM (1)-12 FOR STOP BAR PLACEMENT.
8. SOLAR SERVICE POLE SHOULD BE PLACED AS CLOSE TO THE ROW AS POSSIBLE AND NOT IN LINE WITH THE FLASHING BEACON.

NOTE:
EXISTING CONDITIONS LAYOUT IS FIELD VERIFIED AND ONLY SHOWS INFORMATION AND/OR INTERSECTION DETAILS THAT ARE NEEDED TO ANALYZE DATA FOR AN INSTALLATION OF LUMINAIRE POLES. CONTRACTOR SHALL FIELD VERIFY AND MARK LOCATIONS IN FIELD. LUMINAIRE OR GROUND BOX LOCATIONS SHALL NOT IMPEDE DRAINAGE, SIGHT DISTANCE AND BE 4 FEET HORIZONTAL AND 2 FEET VERTICAL UNDERGROUND FROM ALL EXISTING UTILITIES.

REV. NO.	DATE	DESCRIPTION	BY

AGS
ENGINEERING & CONSTRUCTION

Ally General Solutions, LLC
dba AGS Engineering & Construction
7070 W. 43rd St., Ste 203
Houston, TX 77092
Ph: (281) 888-7682
Texas Registration No. F-13574

ARCADIS Design & Consultancy for natural and built assets

FIRM #533

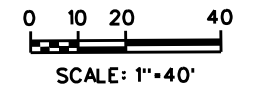
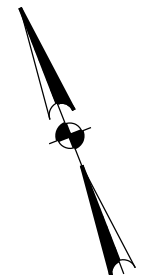
SH 158 AT FM 1379 (SOUTH)
PROPOSED LIGHTING LAYOUT

FED. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.
6	TEXAS	F 2022(736)	SH0158
COUNTY	CONTROL NO.	SECTION NO.	JOB NO.
MIDLAND	0003	08	064
SHEET NO.	SHEET NO.		
32	32		

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#TIMES
#FILES/REVIEWS

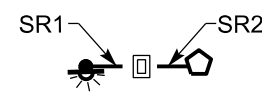
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ELECTRICAL SERVICE DATA												
Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
ES1	N/A	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	2"	3/#6	60	2P/60	60	N/A	LIGHTING WEST	1P/20	7	4.9
LAT & LONG		31° 55' 21.69" N, 101° 49' 33.15" W							LIGHTING EAST	1P/20	7	
									LIGHTING SOUTH	1P/20	5	



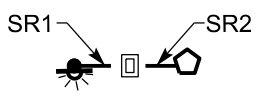
TYPE A

STOP SIGN - R1-1 48"x48"
CROSS TRAFFIC DOES NOT STOP - WP-4P 36"x18"



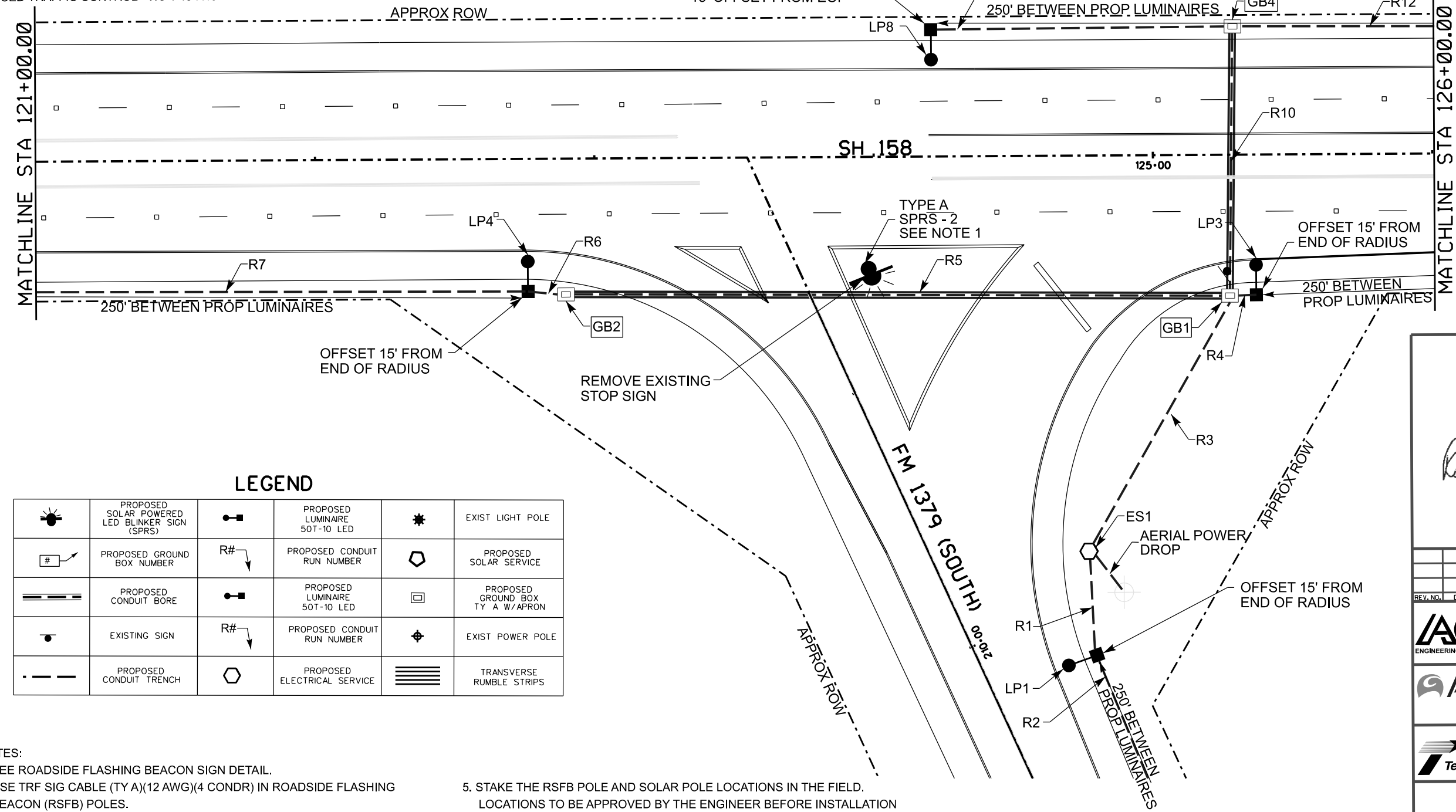
TYPE B

SR1 - CONDUIT FROM GROUND BOX TO RSFB
SR2 - CONDUIT FROM SOLAR SERVICE TO GROUND BOX
HIGHWAY INTERSECTION AHEAD - W2-1aT 48"x48"



TYPE C

SR1 - CONDUIT FROM GROUND BOX TO RSFB
SR2 - CONDUIT FROM SOLAR SERVICE TO GROUND BOX
ADVANCED TRAFFIC CONTROL - W3-1 48"x48"



NOTE:
LUMINAIRE POLES SHOULD BE 15'-20' FROM THE SHOULDER WHERE POSSIBLE.

LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE
	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN		PROPOSED CONDUIT RUN NUMBER		EXIST POWER POLE
	PROPOSED CONDUIT TRENCH		PROPOSED ELECTRICAL SERVICE		TRANSVERSE RUMBLE STRIPS

NOTES:

- SEE ROADSIDE FLASHING BEACON SIGN DETAIL.
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REV. NO. DATE DESCRIPTION BY

AGS
ENGINEERING & CONSTRUCTION

Ally General Solutions, LLC
dba AGS Engineering & Construction
7070 W. 43rd St., Ste 203
Houston, TX 77092
Ph: (281) 888-7682
Texas Registration No. F-13574

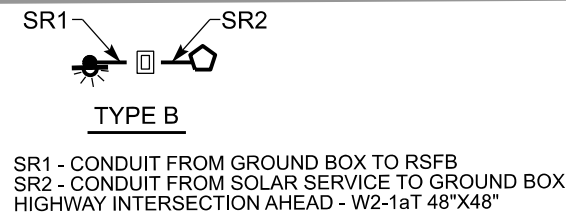
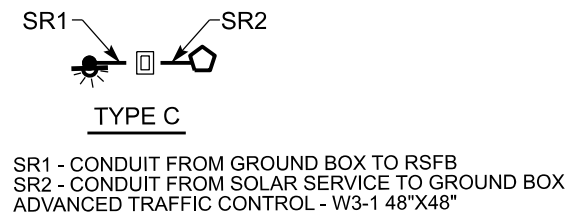
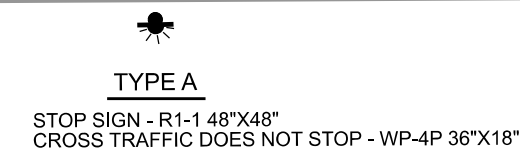
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FIRM #533

Texas Department of Transportation

SH 158 AT FM 1379 (SOUTH)
PROPOSED LIGHTING LAYOUT

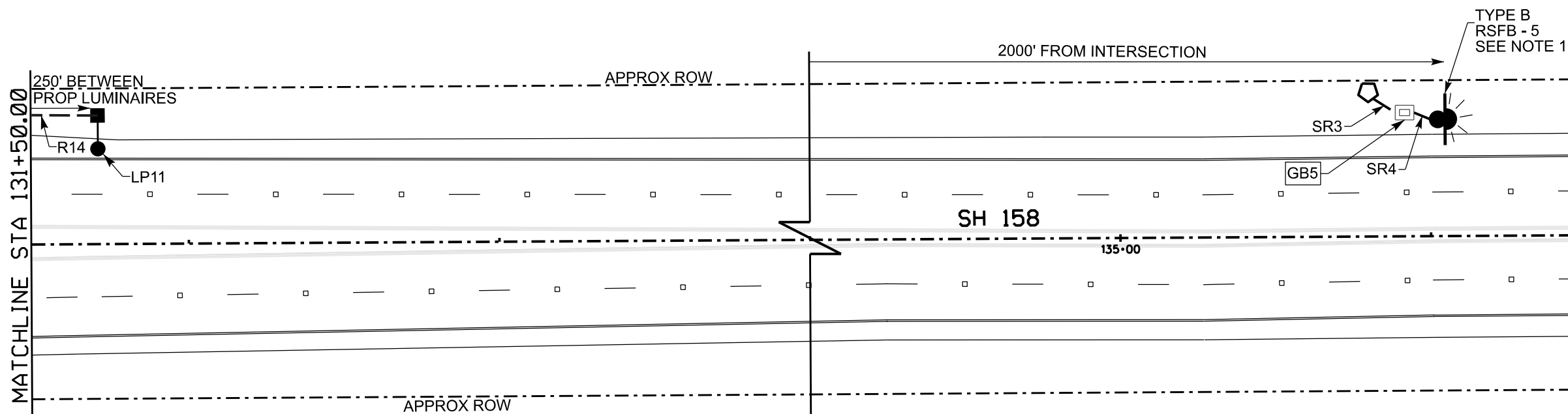
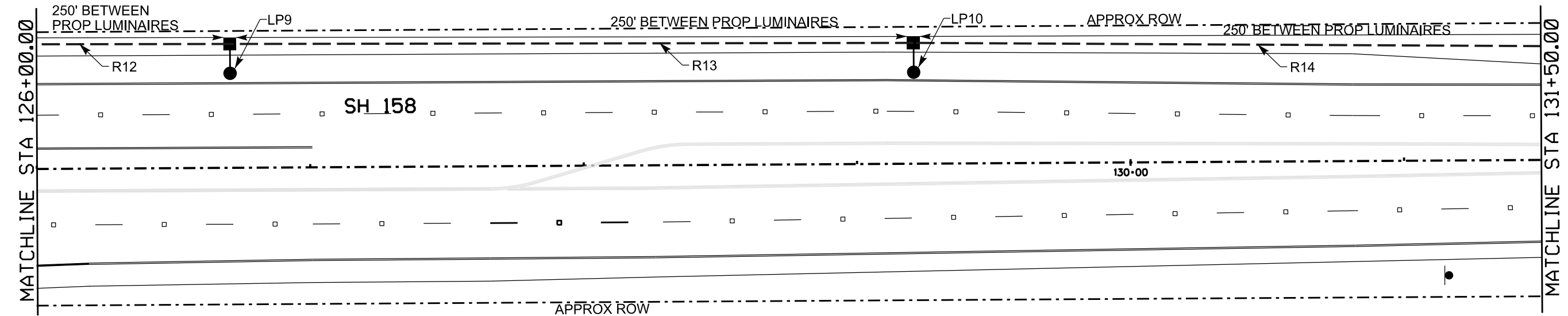
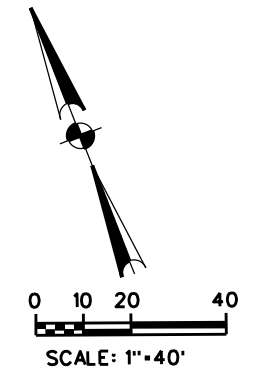
FED. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.		
6	TEXAS	F 2022(736)	SH0158		
CDISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	MIDLAND	0003	08	064	33



NOTE:
LUMINAIRE POLES SHOULD BE
15'-20' FROM THE SHOULDER
WHERE POSSIBLE.

LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE
	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN		PROPOSED CONDUIT RUN NUMBER		EXIST POWER POLE
	PROPOSED CONDUIT TRENCH		PROPOSED ELECTRICAL SERVICE		TRANSVERSE RUMBLE STRIPS



NOTES:

- SEE ROADSIDE FLASHING BEACON SIGN DETAIL.
- USE TRF SIG CABLE (TY A)(12 AWG)(4 CONDR) IN ROADSIDE FLASHING BEACON (RSFB) POLES.
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FIRM #533

**SH 158 AT FM 1379 (SOUTH)
PROPOSED LIGHTING LAYOUT**

SHEET 3 OF 5

FED. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.
6	TEXAS	F 2022(736)	SH0158
COUNTY	SECTION NO.	JOB NO.	SHEET NO.
6	MIDLAND	0003 08	064 34

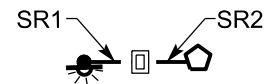


TYPE A
STOP SIGN - R1-1 48"x48"
CROSS TRAFFIC DOES NOT STOP - WP-4P 36"x18"



TYPE B

SR1 - CONDUIT FROM GROUND BOX TO RSFB
SR2 - CONDUIT FROM SOLAR SERVICE TO GROUND BOX
HIGHWAY INTERSECTION AHEAD - W2-1aT 48"x48"

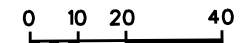
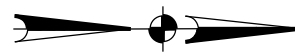


TYPE C

SR1 - CONDUIT FROM GROUND BOX TO RSFB
SR2 - CONDUIT FROM SOLAR SERVICE TO GROUND BOX
ADVANCED TRAFFIC CONTROL - W3-1 48"x48"

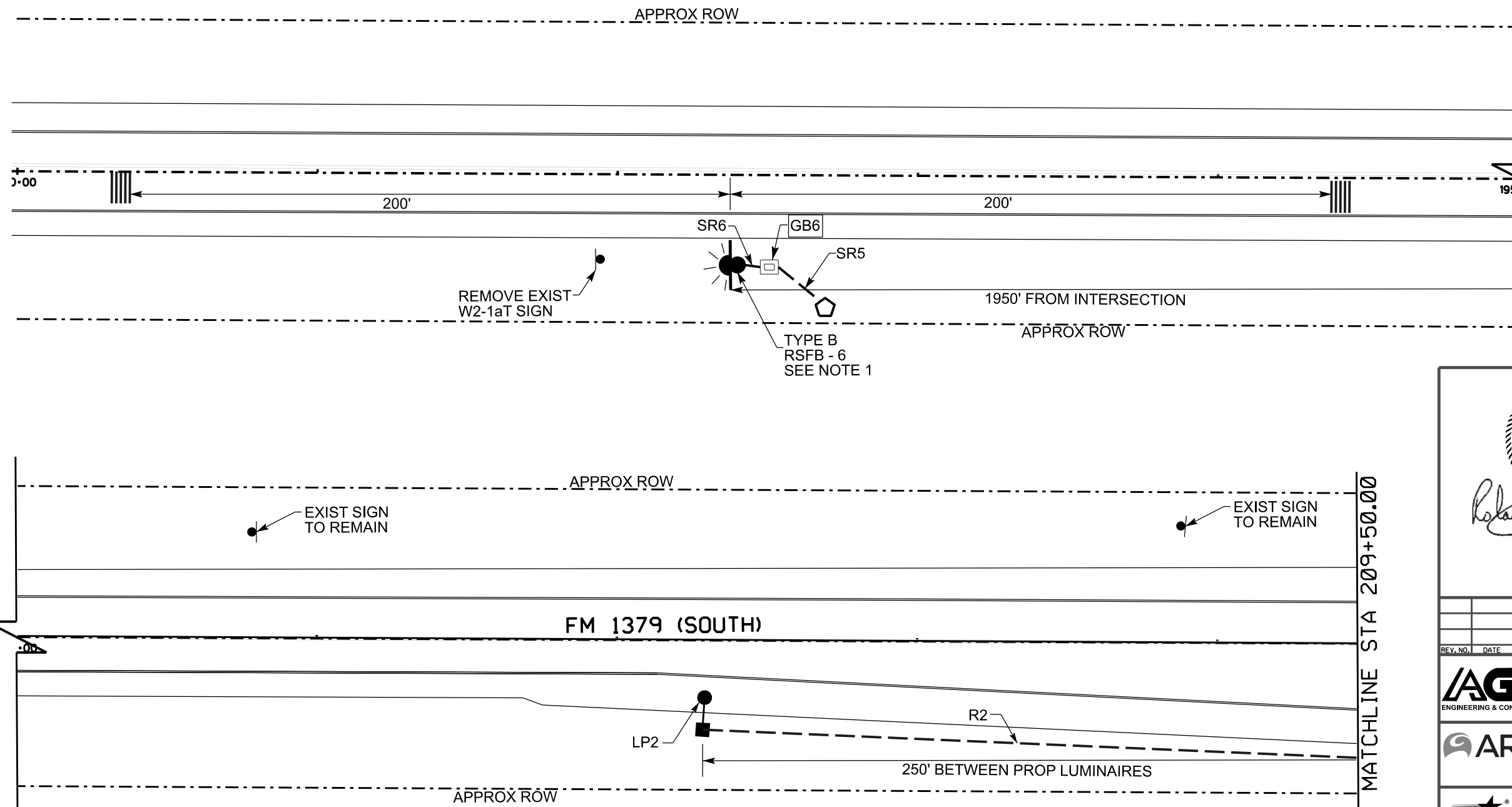
LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE		PROPOSED CONDUIT TRENCH
	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE		PROPOSED ELECTRICAL SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/APRON		TRANSVERSE RUMBLE STRIPS
	EXISTING SIGN		PROPOSED CONDUIT RUN NUMBER		EXIST POWER POLE		



SCALE: 1"=40'

NOTE:
LUMINAIRE POLES SHOULD BE 15'-20' FROM THE SHOULDER WHERE POSSIBLE.



NOTES:

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Texas Department of Transportation

SH 158 AT FM 1379 (SOUTH)
PROPOSED LIGHTING LAYOUT

SHEET 4 OF 5

FED. RD. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK: 6	TEXAS	F 2022(736)	SH0158
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.
CK: 6	MIDLAND	0003	08
		JOB NO.	SHEET NO.
		064	35

USER#

TIME#

DATE#
FILE#

FILE#



TYPE A

STOP SIGN - R1-1 48"x48"
CROSS TRAFFIC DOES NOT STOP - WP-4P 36"x18"



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SR1 - CONDUIT FROM GROUND BOX TO RSFB
SR2 - CONDUIT FROM SOLAR SERVICE TO GROUND BOX
HIGHWAY INTERSECTION AHEAD - W2-1aT 48"x48"



TYPE C

SR1 - CONDUIT FROM GROUND BOX TO RSFB
SR2 - CONDUIT FROM SOLAR SERVICE TO GROUND BOX
ADVANCED TRAFFIC CONTROL - W3-1 48"x48"

LEGEND

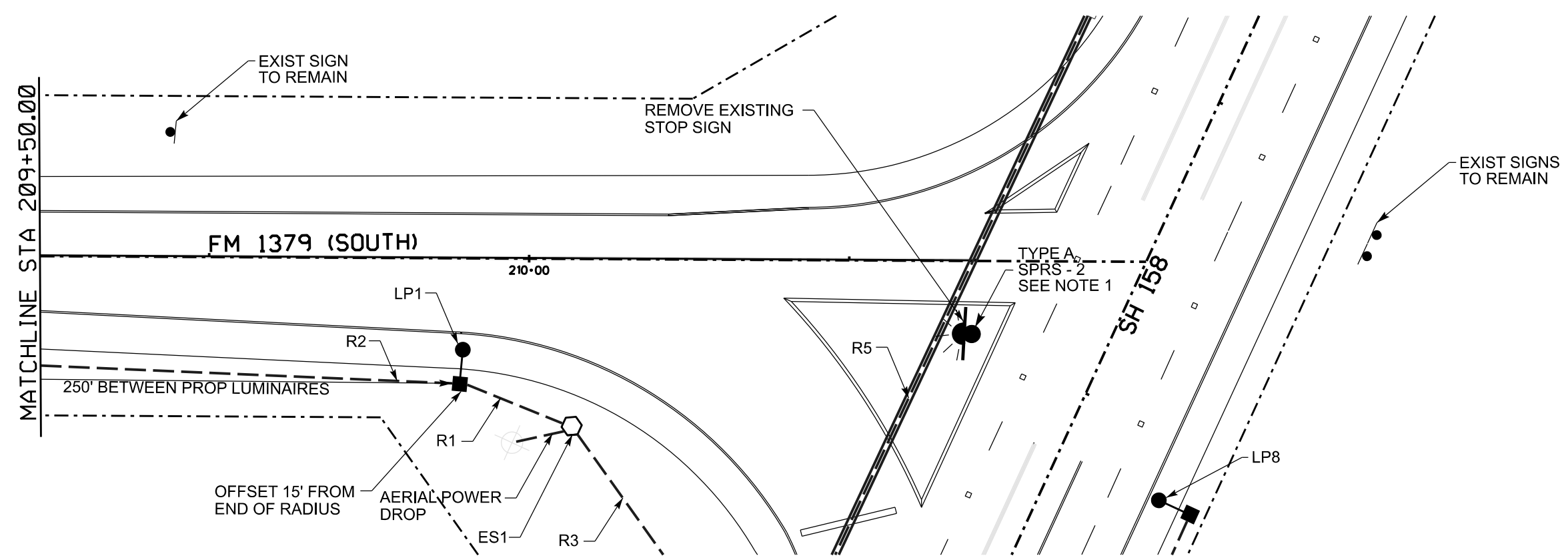
	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED CONDUIT RUN NUMBER		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE		PROPOSED CONDUIT TRENCH
	PROPOSED GROUND BOX NUMBER		R#		PROPOSED SOLAR SERVICE		PROPOSED GROUND BOX TY A W/APRON		PROPOSED ELECTRICAL SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED CONDUIT RUN NUMBER		EXIST POWER POLE		TRANSVERSE RUMBLE STRIPS
	EXISTING SIGN		R#		PROPOSED LUMINAIRE 50T-10 LED				



0 10 20 40

SCALE: 1"=40'

NOTE:
LUMINAIRE POLES SHOULD BE 15'-20' FROM THE SHOULDER WHERE POSSIBLE.



BASIS OF CALCULATIONS

SP:GB = (length of run) + SP(0') + GB(3')

GB:GB = (length of run) + GB(3') + GB(3')

GB:LP = (length of run) + GB(3') + LP(10')

SS:GB = (length of run) + SP(0') + GB(3')

GB:FB = (length of run) + GB(3') + FB(13')

SP = SERVICE POLE
SS = SOLAR SERVICE
GB = GROUND BOX
LP = 50' LUMINAIRE POLE
FB = ROADSIDE FLASHING BEACON

STATE OF TEXAS
ROLANDO CASTANEDA
98276
LICENSED PROFESSIONAL ENGINEER
Rolando Castaneda
4/18/2022

SH 158 AT FM 1379 (SOUTH)		ES1														RSFB-4		RSFB-5		RSFB-6		SPRS-2		UOM	TOTAL
BID ITEM	DESCRIPTION	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	SR1	SR2	SR3	SR4	SR5	SR6	-	-		
	RUN LENGTH	32	250	100	7	235	7	250	250	250	95	105	140	250	250	10	6	10	6	18	6	-	-		
	POINT:POINT	SP:LP1	LP1:LP2	SP:GB1	GB1:LP3	GB1:GB2	GB2:LP4	LP4:LP5	LP5:LP6	LP6:LP7	GB1:GB4	GB4:LP8	GB4:LP9	LP9:LP10	LP10:LP11	SS:GB3	GB3:FB	SS:GB5	GB5:FB	SS:GB6	GB6:FB	-	-		
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	8	8		8		8	8	8		8	8	8	8									LF	88
432	6001	RIPRAP	0.5	0.5		0.5		0.5	0.5	0.5		0.5	0.5	0.5	0.5									EA	5.5
610	6304	IN RD IL (TY AL) 50T-10(400W EQ) LED	1	1		1		1	1	1		1	1	1	1									EA	11
618	6023	CONDT (PVC) (SCH 40) (2")	32	250	100	7		7	250	250		105	140	250	250	10	6	10	6	18	6			LF	1947
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)						235				95												LF	330
620	6009	ELEC CONDR (NO. 6) BARE	45	270	103	13	241	20	270	270	270	101	118	153	270	270								LF	2414
620	6010	ELEC CONDR (NO. 6) INSULATED	90	540	206	26	482	40	540	540	540	202	236	306	540	540	23	19	23	19	31	19		LF	4962
624	6002	GROUND BOX TY A (122311) W/APRON				1		1				1						1		1	1			EA	6
628	6045	ELC SRV TY A 240/480 060 (NS)SS(E)SP(O)				1																		EA	1
636	6001	ALUMINIUM SIGNS (TY A)															16		16					SY	36.5
644	6076	REMOVE SM RD SN SUP&AM														1				1				EA	3
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)																						EA	1
682	6003	VEH SIG SEC (12") LED (YEL)															2		2					EA	4
682	6033	BACK PLATE (12") (1 SEC)(VENTED) ALUM															2		2					EA	4
684	6009	TRF SIG CBL (TYA) (12 AWG) (4 CONDR)															19		19					LF	38
685	6004	INSTL RDS D FLSH BCN ASSM (SOLAR PWRD)															1		1					EA	2
6227	6001	SOLAR POWERED LED WARNING SIGN																						EA	1

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Texas Department of Transportation

SH 158 AT FM 1379 (SOUTH)
PROPOSED LIGHTING LAYOUT
SHEET 5 OF 5

FED. RD. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.		
6	TEXAS	F 2022(736)	SH0158		
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	MIDLAND	0003	08	064	36

8:USER*

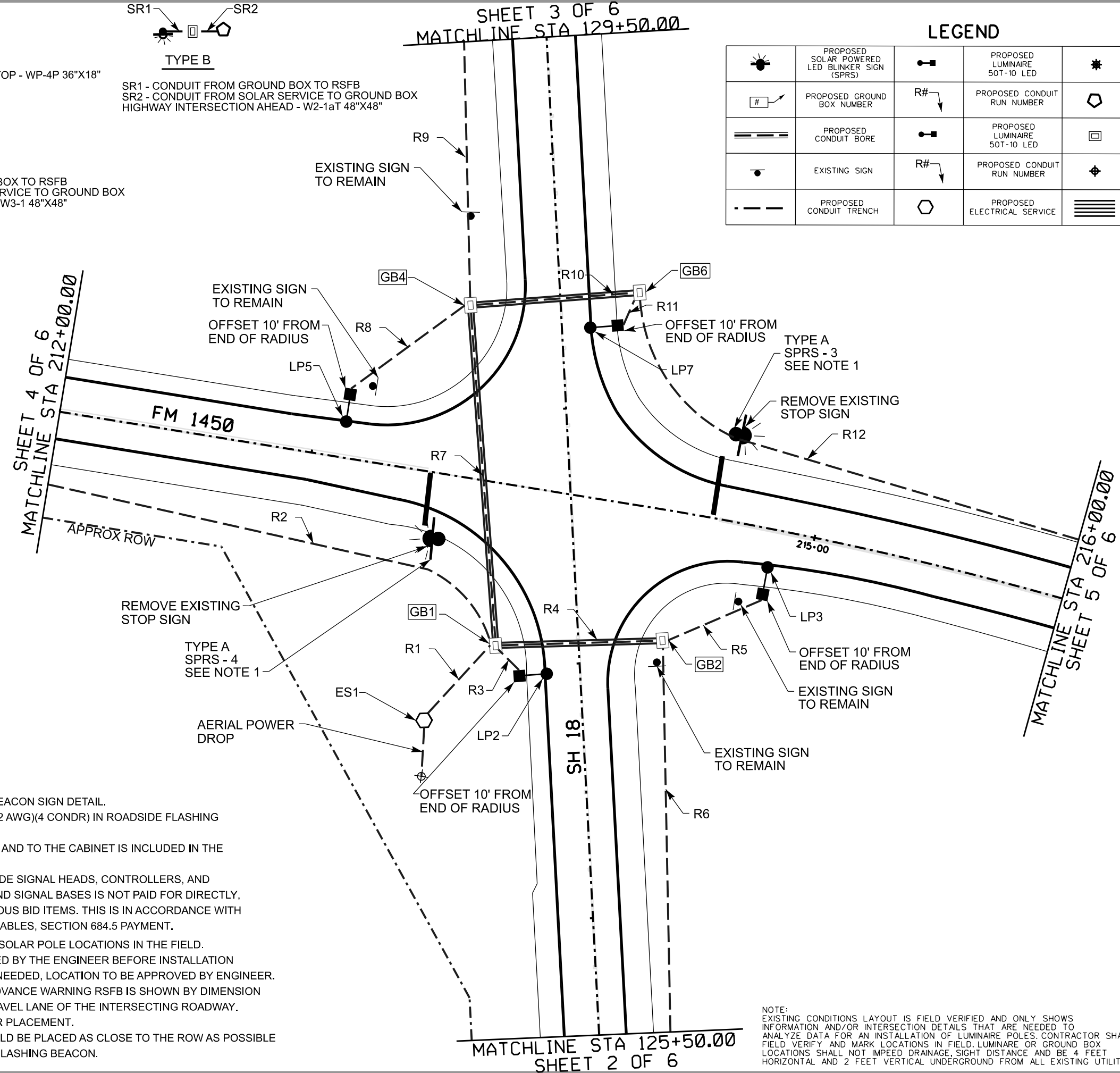
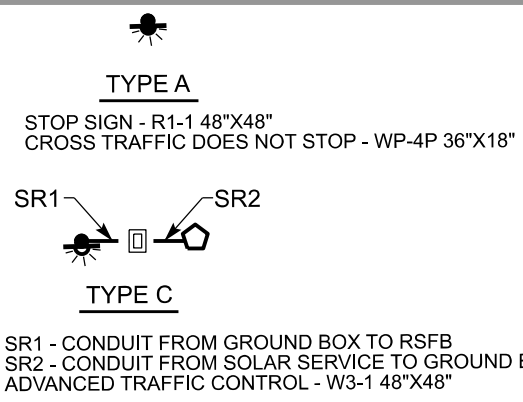
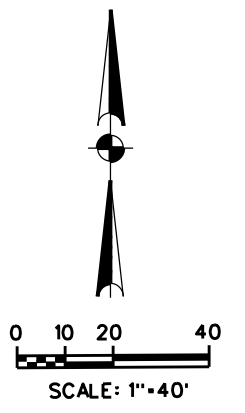
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8:DATE*
8:FILE/ABBREV*

8:FILES*

LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE
	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN		PROPOSED CONDUIT RUN NUMBER		EXIST POWER POLE
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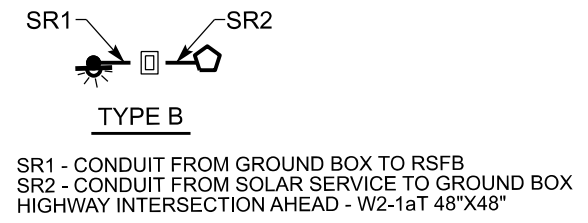
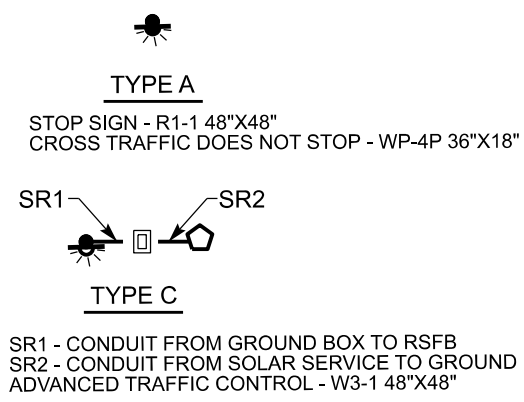
Texas Department of Transportation

SH 18 AT FM 1450
PROPOSED LIGHTING LAYOUT

FED. RD. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK: 6	TEXAS	F 2022 (736)	SH18
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.
CK: 6	MIDLAND	0003	08
		JOB NO.	SHEET NO.
		064	37

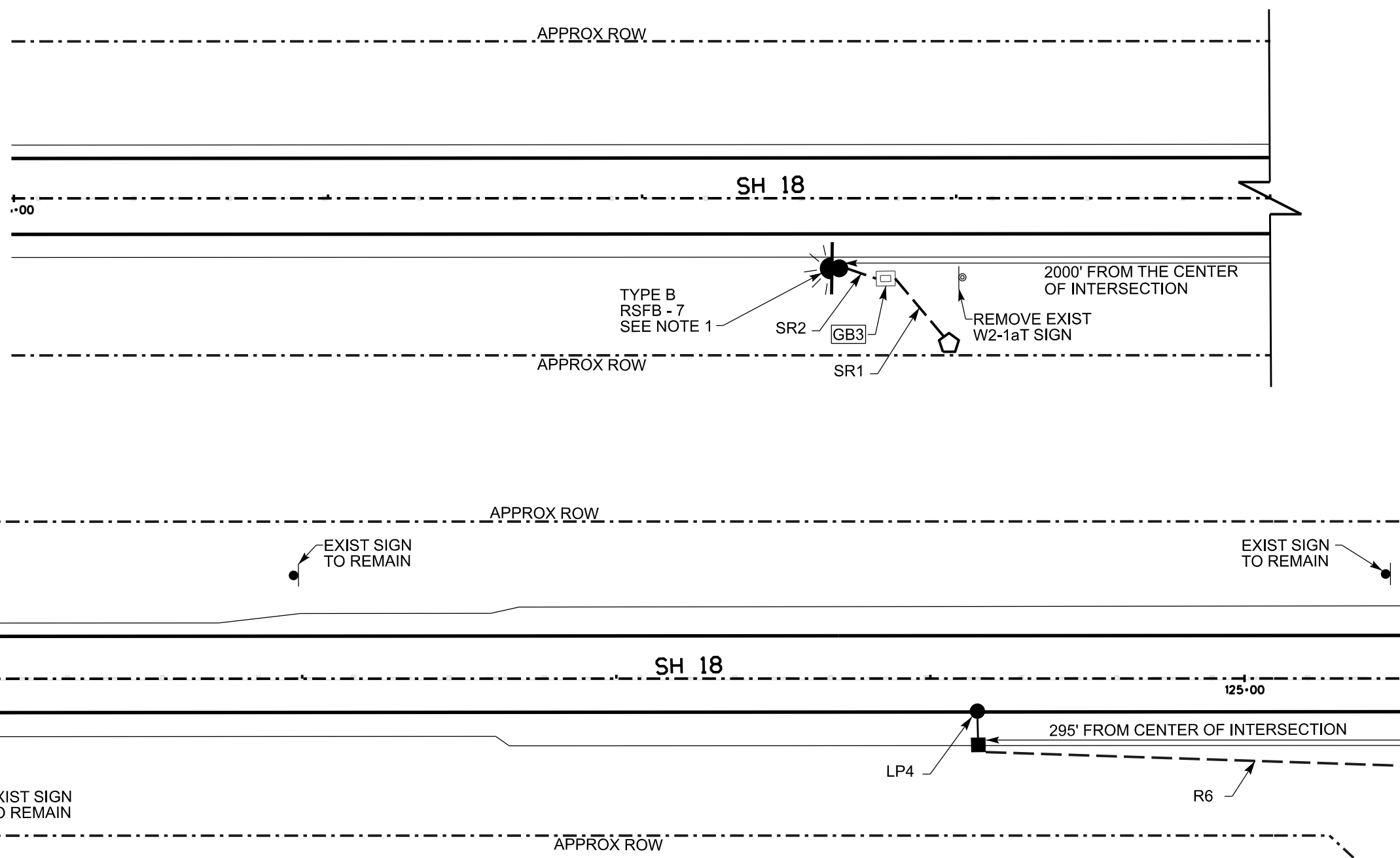
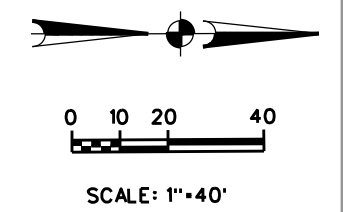
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 #TIME#
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 #FILE#
 #ABBREV#



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LEGEND					
	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE
	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/ APRON
	EXISTING SIGN		PROPOSED CONDUIT RUN NUMBER		EXIST POWER POLE
	PROPOSED CONDUIT TRENCH		PROPOSED ELECTRICAL SERVICE		TRANSVERSE RUMBLE STRIPS



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**SH 18 AT FM 1450
PROPOSED LIGHTING LAYOUT**

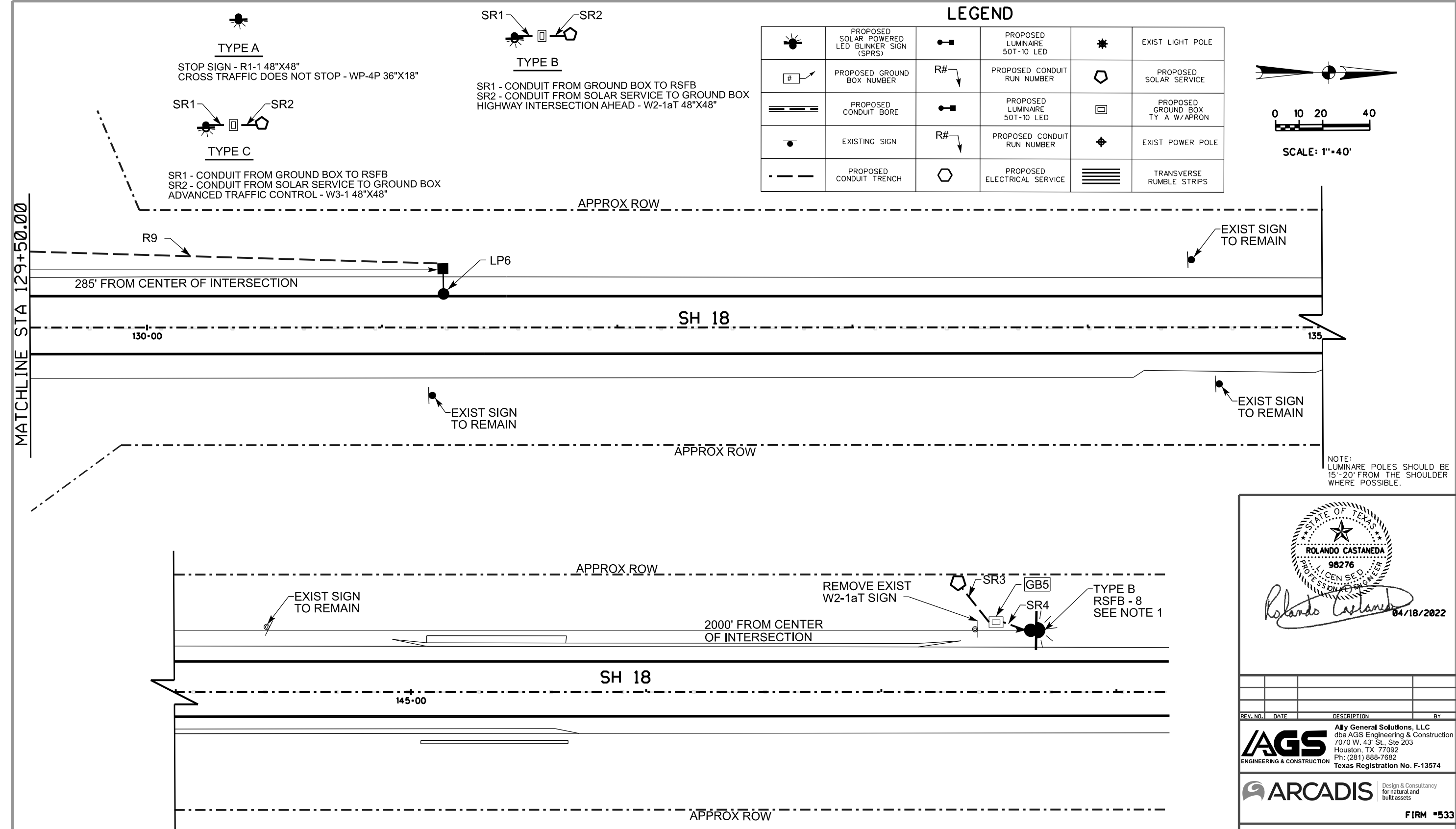
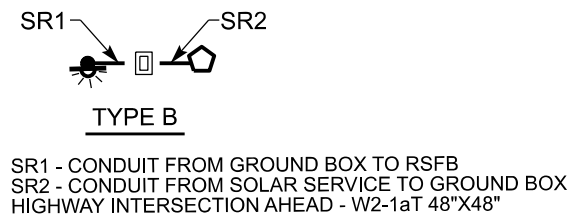
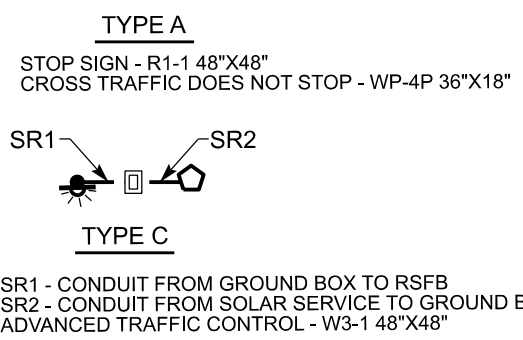
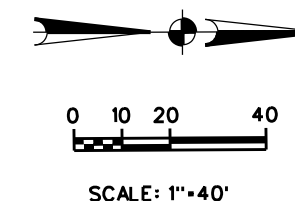
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6	TEXAS	F 2022 (736)	SH18		
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	MIDLAND	0003	08	064	38

#USER#
 #TIME#
 #DATE#
 #FILE#ABBREV#

#FILES#

LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE
	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN		PROPOSED CONDUIT RUN NUMBER		EXIST POWER POLE
	PROPOSED CONDUIT TRENCH		PROPOSED ELECTRICAL SERVICE		TRANSVERSE RUMBLE STRIPS



NOTE:
LUMINAIRE POLES SHOULD BE 15'-20' FROM THE SHOULDER WHERE POSSIBLE.

REV. NO.	DATE	DESCRIPTION	BY

AGS Ally General Solutions, LLC
dba AGS Engineering & Construction
7070 W. 43rd St., Ste 203
Houston, TX 77092
Ph: (281) 888-7682
Texas Registration No. F-13574

ARCADIS Design & Consultancy for natural and built assets
FIRM #533

Texas Department of Transportation

SH 18 AT FM 1450
PROPOSED LIGHTING LAYOUT

SHEET 3 OF 6

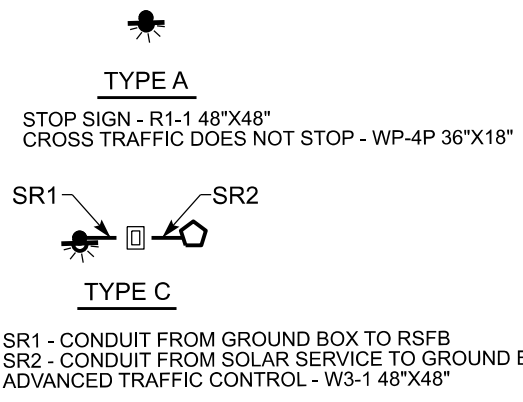
FED. RD. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK: 6	TEXAS	F 2022 (736)	SH18
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.
CK: 6	MIDLAND	0003	08
		JOB NO.	SHEET NO.
		064	39

- NOTES:
- SEE ROADSIDE FLASHING BEACON SIGN DETAIL.
 - USE TRF SIG CABLE (TY A)(12 AWG)(4 CONDR) IN ROADSIDE FLASHING BEACON (RSFB) POLES.
 - SIGNAL CABLE IN THE POLE AND TO THE CABINET IS INCLUDED IN THE RUN TOTALS.
 - TRAFFIC SIGNAL CABLE INSIDE SIGNAL HEADS, CONTROLLERS, AND COILS IN GROUND BOXES AND SIGNAL BASES IS NOT PAID FOR DIRECTLY, BUT IS SUBSIDIARY TO VARIOUS BID ITEMS. THIS IS IN ACCORDANCE WITH ITEM 684: TRAFFIC SIGNAL CABLES, SECTION 684.5 PAYMENT.

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- LOCATION OF PROPOSED ADVANCE WARNING RSFB IS SHOWN BY DIMENSION FROM THE EDGE OF THE TRAVEL LANE OF THE INTERSECTING ROADWAY.
- SEE PM (1)-12 FOR STOP BAR PLACEMENT.
- SOLAR SERVICE POLE SHOULD BE PLACED AS CLOSE TO THE ROW AS POSSIBLE AND NOT IN LINE WITH THE FLASHING BEACON.

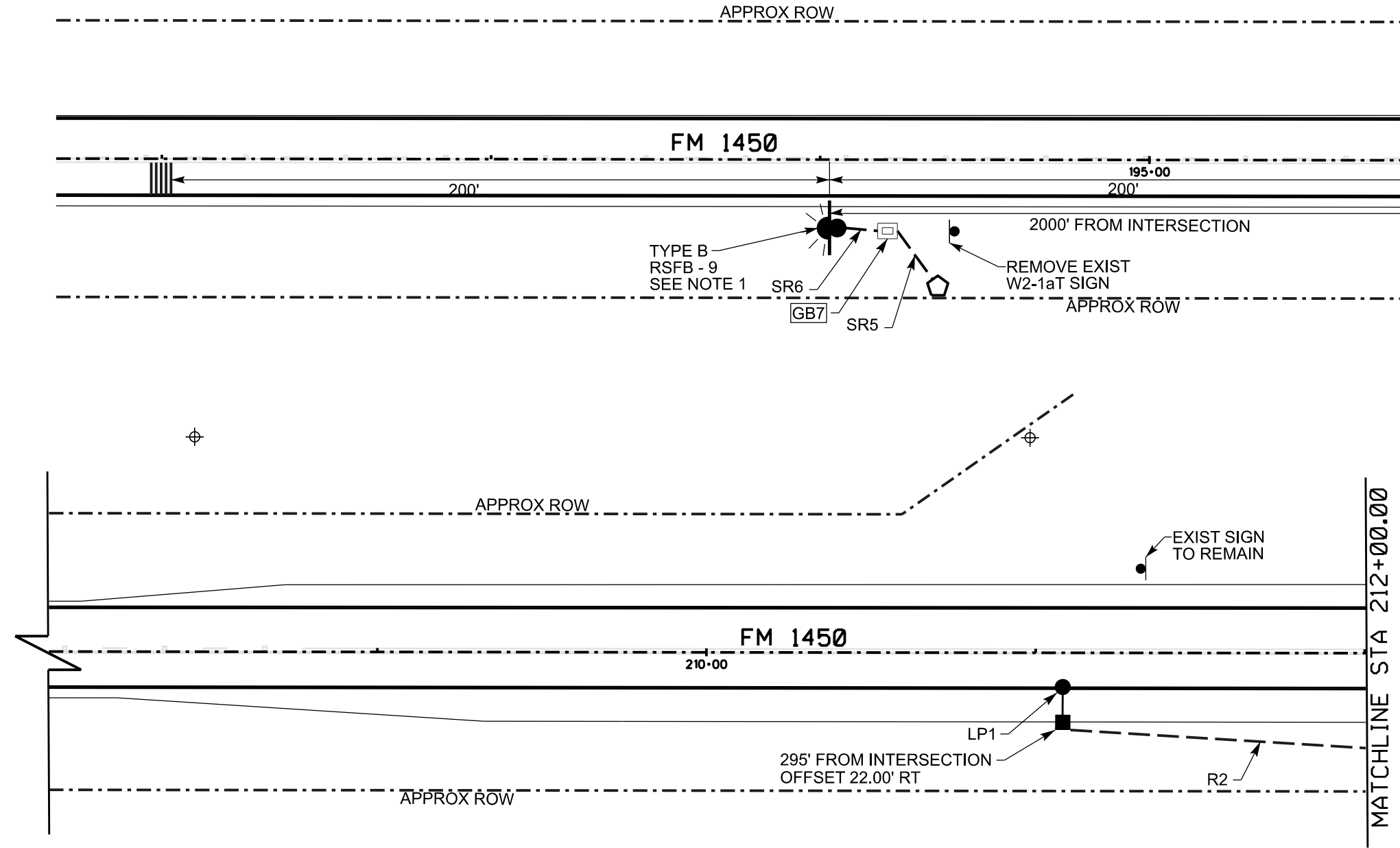
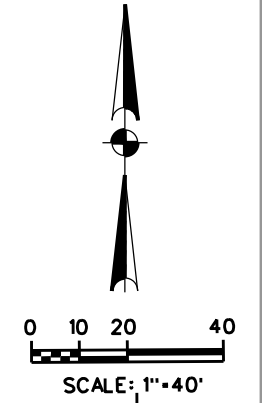
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#USER#
 #TIME#
 #DATE#
 #FILE#
 #ABBREV#



LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE
	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN		PROPOSED CONDUIT RUN NUMBER		EXIST POWER POLE
	PROPOSED CONDUIT TRENCH		PROPOSED ELECTRICAL SERVICE		TRANSVERSE RUMBLE STRIPS



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AGS
ENGINEERING & CONSTRUCTION

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ARCADIS
Design & Consultancy
for natural and built assets

FIRM #533

SH 18 AT FM 1450
PROPOSED LIGHTING LAYOUT

SHEET 4 OF 6

FED. RD. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK: 6	TEXAS	F 2022 (736)	SH18
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.
CK: 6	MIDLAND	0003	08
		JOB NO.	SHEET NO.
		064	40

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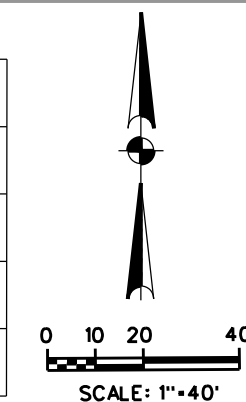
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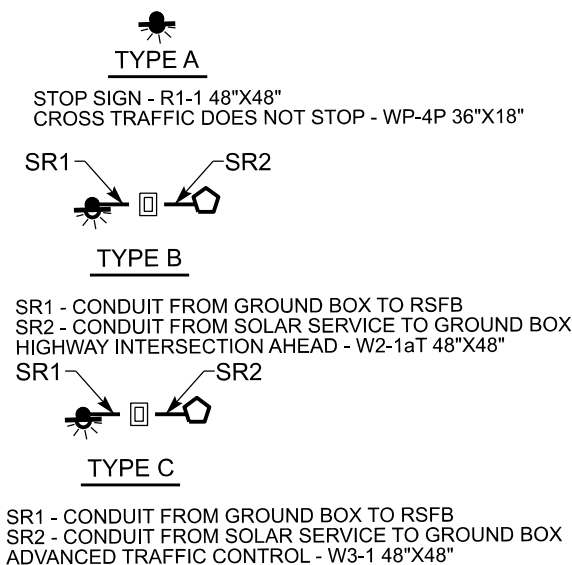
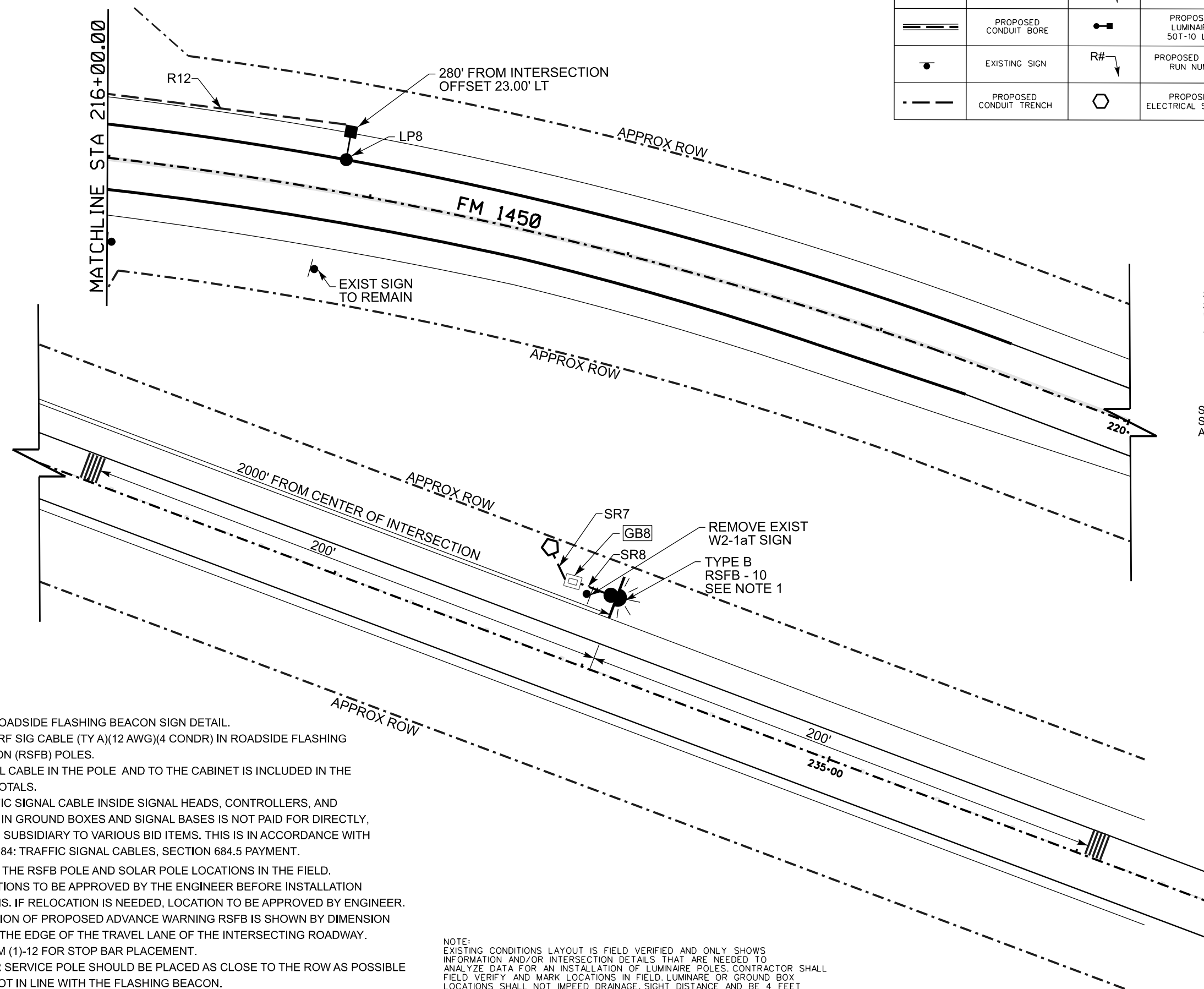
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LEGEND

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	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/APRON
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	PROPOSED CONDUIT TRENCH		PROPOSED ELECTRICAL SERVICE		TRANSVERSE RUMBLE STRIPS



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REV. NO.	DATE	DESCRIPTION	BY

AGS Ally General Solutions, LLC
dba AGS Engineering & Construction
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Houston, TX 77092
Ph: (281) 888-7682
Texas Registration No. F-13574

ARCADIS Design & Consultancy
for natural and built assets
FIRM #533

Texas Department of Transportation

SH 18 AT FM 1450
PROPOSED LIGHTING LAYOUT

SHEET 5 OF 6

FED. RD. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK: 6	TEXAS	F 2022 (736)	SH18
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.
CK: 6	MIDLAND	0003	08
		JOB NO.	SHEET NO.
		064	41

8 USER*


8 TIME*

8 DATE*
8 FILE ABBREV*

8 FILE*

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
ES1	N/A	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	2"	3/*6	60	2P/60	60	N/A	LIGHTING NB	1P/20	3	3.6
LAT & LONG		31° 14' 58.14", 102° 53' 29.42"							LIGHTING SB	1P/20	3	
									LIGHTING WB	1P/20	3	
									LIGHTING EB	1P/20	3	

TX 18 AT FM 1450																											
BID ITEM	DESCRIPTION	ES1												RSFB-7		RSFB-8		RSFB-9		RSFB-10		SPRS-3	SPRS-4	UOM	TOTAL		
		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	SR1	SR2	SR3	SR4	SR5	SR6	SR7	SR8	-	-				
	RUN LENGTH	36	265	12	62	40	280	130	55	290	62	12	297	25	10	20	10	20	10	12	10	-	-				
	POINT:POINT	SP:GB1	GB1:LP1	GB1:LP2	GB1:GB2	GB2:LP3	GB2:LP4	GB1:GB4	GB4:LP5	GB4:LP5	GB4:G6	GB6:LP7	GB6:LP8	SS:GB3	GB3:FB	SS:GB5	GB5:FB	SS:GB7	GB7:FB	SS:GB8	GB8:FB	-	-				
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	8	8		8	8		8	8		8	8											LF	64		
432	6001	RIPRAP	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5											LF	4		
610	6304	IN RD IL (TY AL) 50T-10(400W EQ) LED	1	1		1	1		1	1		1	1											EA	8		
618	6023	CONDT (PVC) (SCH 40) (2")	36	265	12		40	280		55	290		12	297	25	10	20	10	20	10	12	10			LF	1404	
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)				62						62													LF	254	
620	6009	ELEC CONDR (NO. 6) BARE	39	278	25	6	53	293	136	68	303	68	25	310											LF	1604	
620	6010	ELEC CONDR (NO. 6) INSULATED	78	556	50	12	106	586	272	136	606	136	50	620	38	23	33	23	33	23	25	23			LF	3429	
624	6002	GROUND BOX TY A (122311) W/APRON	1			1						1			1		1		1		1				EA	8	
628	6045	ELC SRV TY A 240/480 060 (NS)SS(E)SP(O)	1																						EA	1	
636	6001	ALUMINIUM SIGNS (TY A)													16		16		16		16		4.5	4.5	SY	73	
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)																				1	1		EA	2	
644	6076	REMOVE SM RD SN SUP&AM													1		1		1		1		1	1		EA	6
682	6003	VEH SIG SEC (12") LED (YEL)													2		2		2		2					EA	8
682	6033	BACK PLATE (12") (1 SEC)(VENTED) ALUM													2		2		2		2					EA	8
684	6009	TRF SIG CBL (TYA) (12 AWG) (4 CONDR)													23		23		23		23					LF	92
685	6004	INSTL RDS D FLSH BCN ASSM (SOLAR PWRD)													1		1		1		1					EA	4
6227	6001	SOLAR POWERED LED WARNING SIGN																				1	1			EA	2

 BASIS OF CALCULATIONS

SP:GB = (length of run) + SP(0') + GB(3')

GB:GB = (length of run) + GB(3') + GB(3')


GB:LP = (length of run) + GB(3') + LP(10')

SS:GB = (length of run) + SP(0') + GB(3')

GB:FB = (length of run) + GB(3') + FB(13')

SP = SERVICE POLE
 SS = SOLAR SERVICE
 GB = GROUND BOX
 LP = 50' LUMINAIRE POLE
 FB = ROADSIDE FLASHING BEACON




 Rolando Castaneda
 04/18/2022

REV. NO.	DATE	DESCRIPTION	BY

AGS Ally General Solutions, LLC
 dba AGS Engineering & Construction
 7070 W. 43rd St., Ste 203
 Houston, TX 77092
 Ph: (281) 888-7692
 Texas Registration No. F-13574

ARCADIS Design & Consultancy
 for natural and built assets
 FIRM #533



SH 18 AT FM 1450
 ELECTRICAL SERVICE DATA & CALCULATIONS
 SHEET 6 OF 6

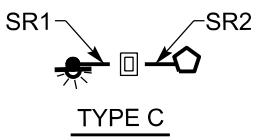
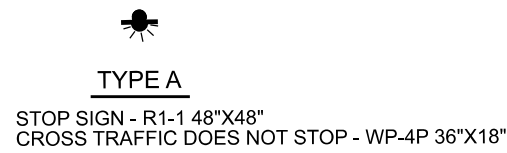
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6	TEXAS	F 2022 (736)	SH18		
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
6	MIDLAND	0003	08	064	42

8 USER*

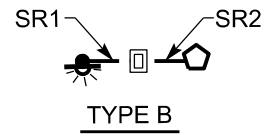
8 TIME*

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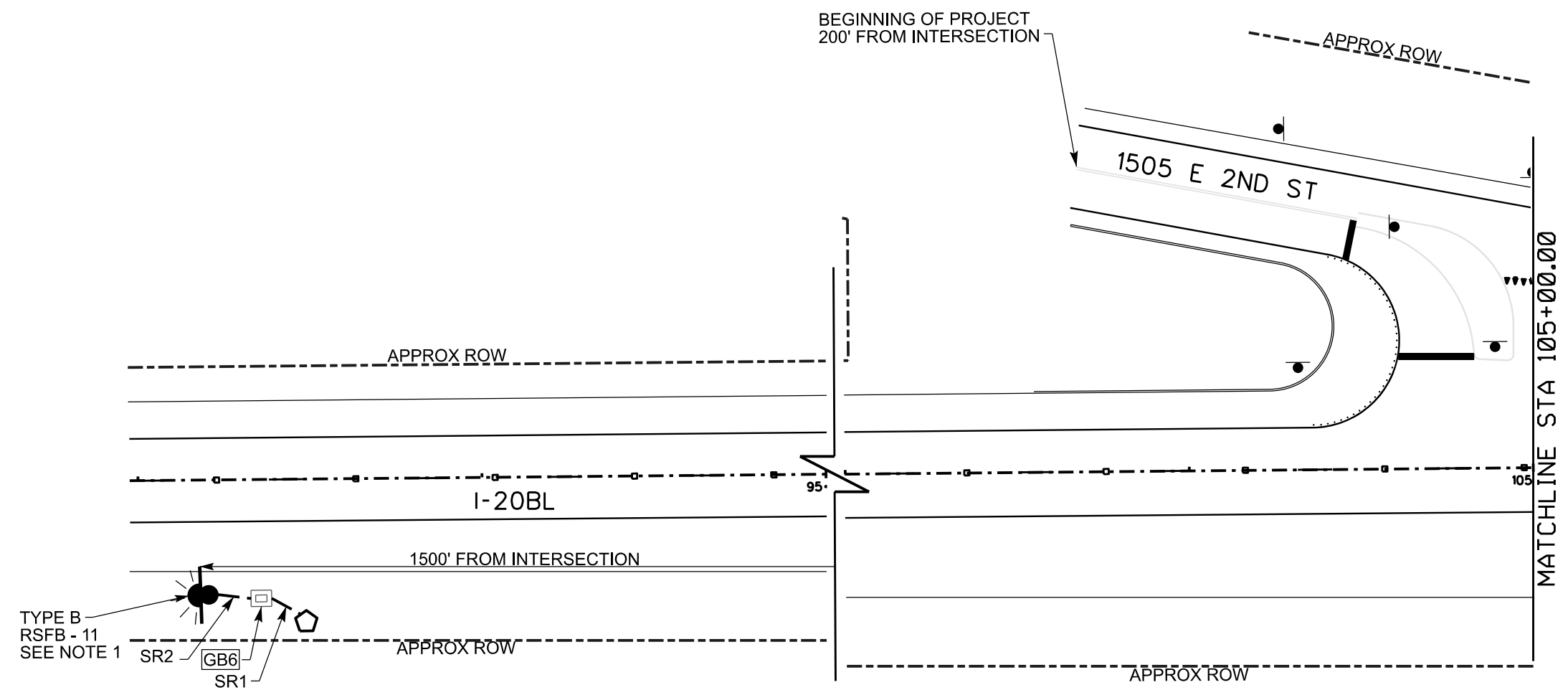
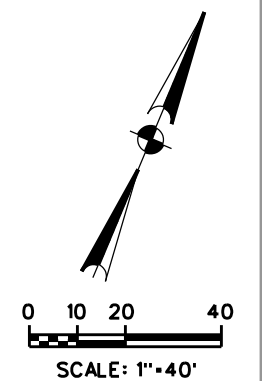
SR1 - CONDUIT FROM GROUND BOX TO RSFB
SR2 - CONDUIT FROM SOLAR SERVICE TO GROUND BOX
ADVANCED TRAFFIC CONTROL - W3-1 48"X48"



SR1 - CONDUIT FROM GROUND BOX TO RSFB
SR2 - CONDUIT FROM SOLAR SERVICE TO GROUND BOX
HIGHWAY INTERSECTION AHEAD - W2-1at 48"X48"

LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE
	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/APRON
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NOTE:
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STATE OF TEXAS
ROLANDO CASTANEDA
98276
LICENSED PROFESSIONAL ENGINEER
Rolando Castaneda
04/18/2022

REV. NO.	DATE	DESCRIPTION	BY

AGS Ally General Solutions, LLC
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7070 W. 43rd St., Ste 203
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ARCADIS Design & Consultancy for natural and built assets
FIRM #533

Texas Department of Transportation

B100208 AT CR117
PROPOSED LIGHTING PLAN

SHEET 1 OF 3

FED. RD. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.
CK: 6	TEXAS	F 2022(736)	B100208
STATE DISTRICT	COUNTY	SECTION NO.	JOB NO.
CK: 6	MIDLAND	0003	08 064
			SHEET NO.
			43

8 USER*

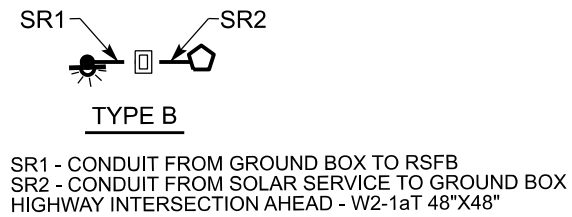
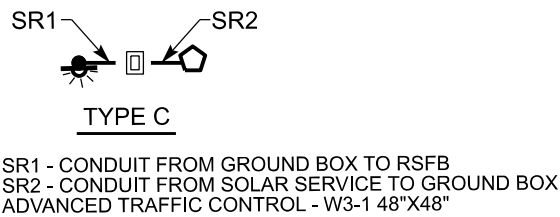
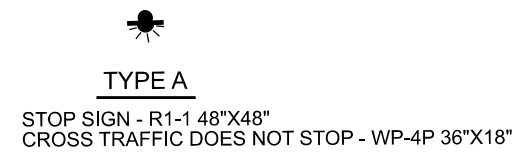
8 TIME*

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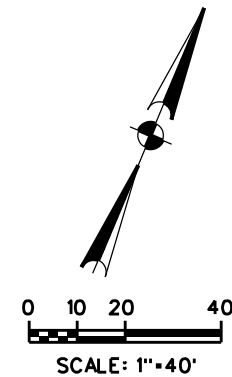
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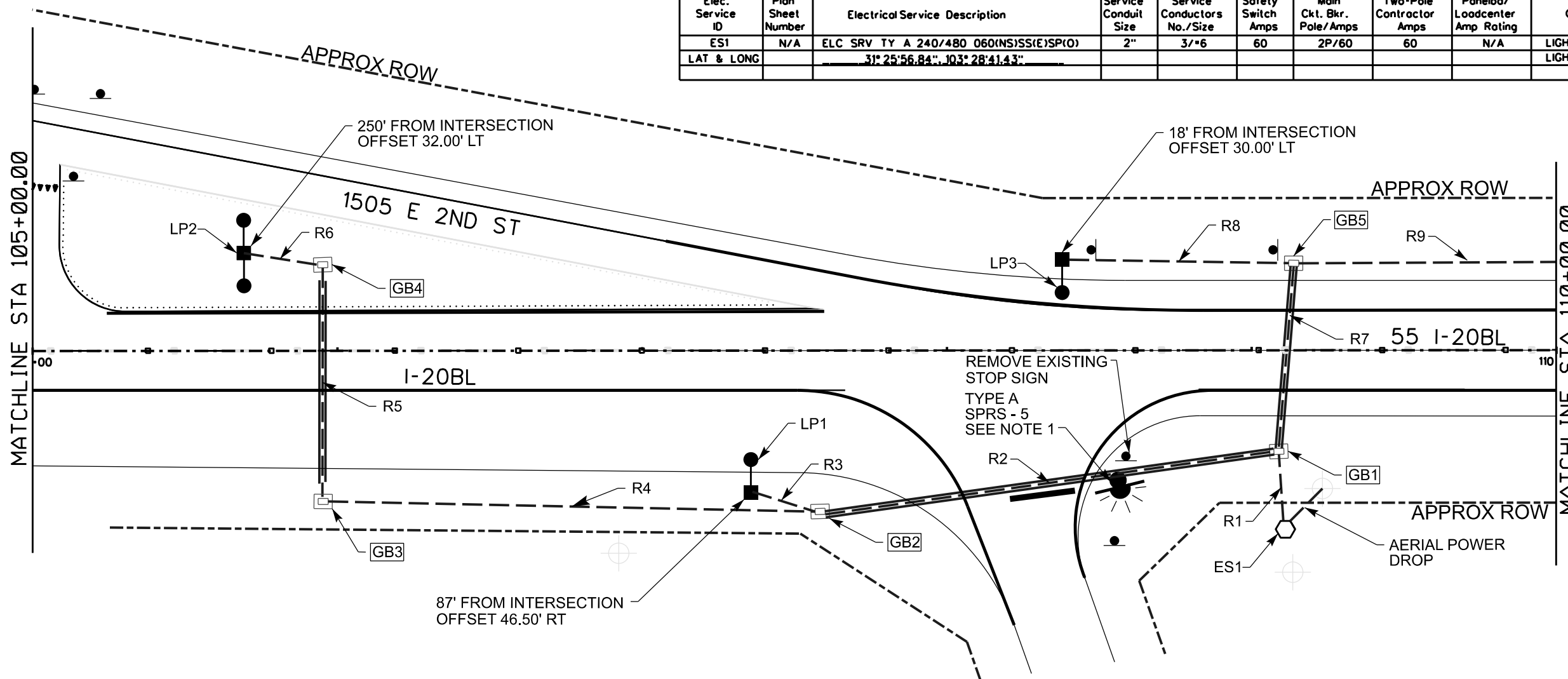


LEGEND

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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
ES1	N/A	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	2"	3/•6	60	2P/60	60	N/A	LIGHTING WB	1P/20	3	1.8
LAT & LONG		31° 25' 56.84" N 103° 28' 41.43" W							LIGHTING EB	1P/20	3	



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- LOCATION OF PROPOSED ADVANCE WARNING RSFB IS SHOWN BY DIMENSION FROM THE EDGE OF THE TRAVEL LANE OF THE INTERSECTING ROADWAY.
- SEE PM (1)-12 FOR STOP BAR PLACEMENT.
- SOLAR SERVICE POLE SHOULD BE PLACED AS CLOSE TO THE ROW AS POSSIBLE AND NOT IN LINE WITH THE FLASHING BEACON.

NOTE: EXISTING CONDITIONS LAYOUT IS FIELD VERIFIED AND ONLY SHOWS INFORMATION AND/OR INTERSECTION DETAILS THAT ARE NEEDED TO ANALYZE DATA FOR AN INSTALLATION OF LUMINAIRE POLES. CONTRACTOR SHALL FIELD VERIFY AND MARK LOCATIONS IN FIELD. LUMINAIRE OR GROUND BOX LOCATIONS SHALL NOT IMPEDE DRAINAGE, SIGHT DISTANCE AND BE 4 FEET HORIZONTAL AND 2 FEET VERTICAL UNDERGROUND FROM ALL EXISTING UTILITIES.

NOTE: LUMINAIRE POLES SHOULD BE 15'-20' FROM THE SHOULDER WHERE POSSIBLE.



AGS Allly General Solutions, LLC
dba AGS Engineering & Construction
7070 W. 43rd St., Ste 203
Houston, TX 77092
Ph: (281) 888-7682
Texas Registration No. F-13574

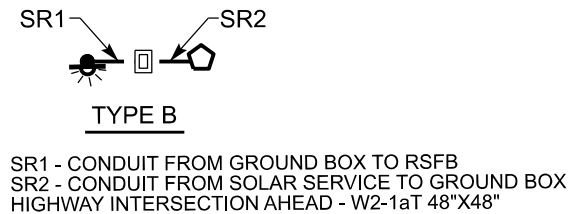
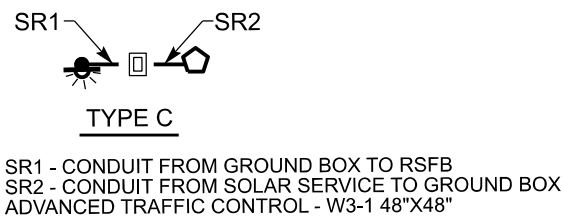
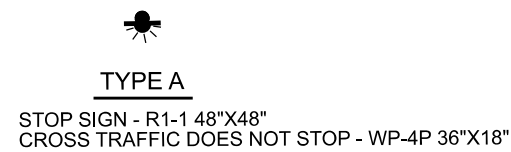
ARCADIS Design & Consultancy for natural and built assets
FIRM #533

Texas Department of Transportation

B100208 AT CR117
PROPOSED LIGHTING PLAN

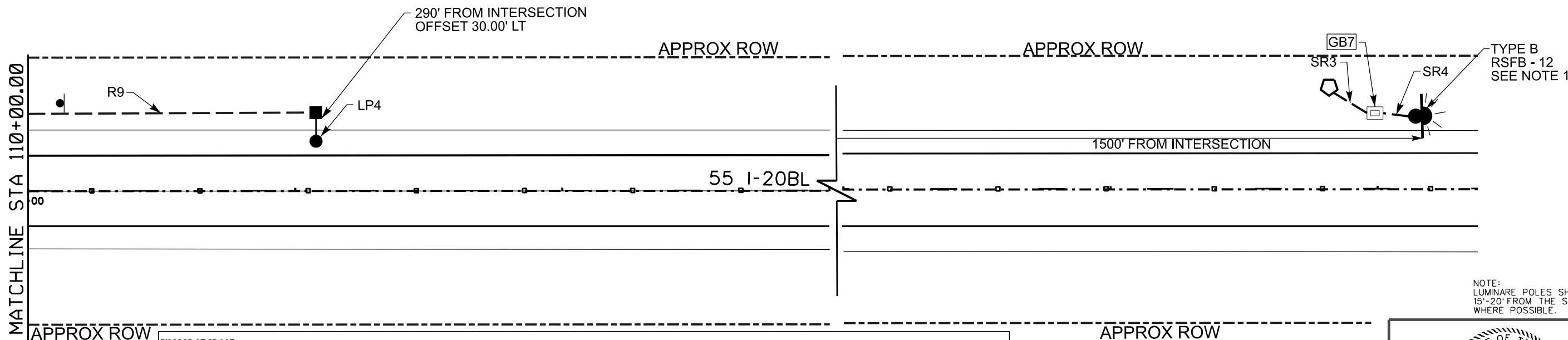
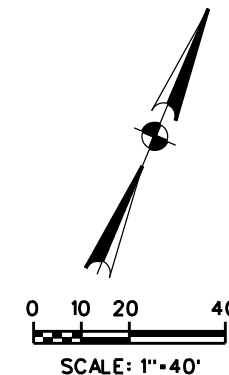
SHEET 2 OF 3

FED. RD. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.
6	TEXAS	F 2022(736)	B100208
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.
6	MIDLAND	0003	08
CK:	JOB NO.	SHEET NO.	
	064	44	



LEGEND

	PROPOSED SOLAR POWERED LED BLINKER SIGN (SPRS)		PROPOSED LUMINAIRE 50T-10 LED		EXIST LIGHT POLE
	PROPOSED GROUND BOX NUMBER		PROPOSED CONDUIT RUN NUMBER		PROPOSED SOLAR SERVICE
	PROPOSED CONDUIT BORE		PROPOSED LUMINAIRE 50T-10 LED		PROPOSED GROUND BOX TY A W/APRON
	EXISTING SIGN		PROPOSED CONDUIT RUN NUMBER		EXIST POWER POLE
	PROPOSED CONDUIT TRENCH		PROPOSED ELECTRICAL SERVICE		TRANSVERSE RUMBLE STRIPS



NOTE: LUMINAIRE POLES SHOULD BE 15'-20' FROM THE SHOULDER WHERE POSSIBLE.

BID ITEM		DESCRIPTION	ES1									RSFB-11		RSFB-12		SPRS-5	UOM	TOTAL
RUN LENGTH			R1	R2	R3	R4	R5	R6	R7	R8	R9	SR1	SR2	SR3	SR4	-		
POINT:POINT		SP:GB1	GB1:GB2	GB2:LP1	GB2:GB3	GB3:GB4	GB4:LP2	GB4:GB5	GB5:LP3	GB5:LP4	SS:GB6	GB6:FB	SS:GB7	GB7:FB	-			
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)			8			8		8	8						LF	32
432	6001	RIPRAP			0.5			0.5		0.5	0.5						LF	2
610	6304	IN RD IL (TY AL) 50T-10(400W EQ) LED			1					1	1						EA	3
610	6305	IN RD IL (TY AL) 50T-10(400W EQ) LED						1									EA	1
618	6023	CONDT (PVC) (SCH 40) (2")	22		22			25		72	190	10	10	15	10		LF	376
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)		150		160	75		60								LF	445
620	6009	ELEC CONDR (NO. 6) BARE	25	156	35	166	81	38	66	85	203						LF	855
620	6010	ELEC CONDR (NO. 6) INSULATED	50	312	70	332	162	76	132	170	406	23	23	28	23		LF	1807
624	6002	GROUND BOX TY A (122311) W/APRON	1	1		1	1			1			1	1			EA	7
628	6045	ELC SRV TY A 240/480 060 (NS)SS(E)SP(O)	1														EA	1
636	6001	ALUMINIUM SIGNS (TY A)										16	16	4.5			SY	36.5
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)														1	EA	1
644	6076	REMOVE SM RD SN SUP&AM														1	EA	1
682	6003	VEH SIG SEC (12") LED (YEL)											2	2			EA	4
682	6033	BACK PLATE (12") (1 SEC)(VENTED) ALUM											2	2			EA	4
684	6009	TRF SIG CBL (TYA) (12 AWG) (4 CONDR)											23	23			LF	46
685	6004	INSTL RDS FL SH BCN ASSM (SOLAR PWRD)											1	1			EA	2
6227	6001	SOLAR POWERED LED WARNING SIGN														1	EA	1

NOTES:

- SEE ROADSIDE FLASHING BEACON SIGN DETAIL.
- USE TRF SIG CABLE (TY A)(12 AWG)(4 CONDR) IN ROADSIDE FLASHING BEACON (RSFB) POLES.
- SIGNAL CABLE IN THE POLE AND TO THE CABINET IS INCLUDED IN THE RUN TOTALS.
- TRAFFIC SIGNAL CABLE INSIDE SIGNAL HEADS, CONTROLLERS, AND COILS IN GROUND BOXES AND SIGNAL BASES IS NOT PAID FOR DIRECTLY, BUT IS SUBSIDIARY TO VARIOUS BID ITEMS. THIS IS IN ACCORDANCE WITH ITEM 684: TRAFFIC SIGNAL CABLES, SECTION 684.5 PAYMENT.
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- LOCATION OF PROPOSED ADVANCE WARNING RSFB IS SHOWN BY DIMENSION FROM THE EDGE OF THE TRAVEL LANE OF THE INTERSECTING ROADWAY.
- SEE PM (1)-12 FOR STOP BAR PLACEMENT.
- SOLAR SERVICE POLE SHOULD BE PLACED AS CLOSE TO THE ROW AS POSSIBLE AND NOT IN LINE WITH THE FLASHING BEACON.

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BASIS OF CALCULATIONS

SP:GB = (length of run) + SP(0') + GB(3')

GB:GB = (length of run) + GB(3') + GB(3')

GB:LP = (length of run) + GB(3') + LP(10')

SS:GB = (length of run) + SP(0') + GB(3')

GB:FB = (length of run) + GB(3') + FB(13')

SP = SERVICE POLE
SS = SOLAR SERVICE
GB = GROUND BOX
LP = 50' LUMINAIRE POLE
FB = ROADSIDE FLASHING BEACON

STATE OF TEXAS
ROLANDO CASTANEDA
98276
LICENSED PROFESSIONAL ENGINEER
04/18/2022

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Ally General Solutions, LLC
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Houston, TX 77092
Ph: (281) 888-7682
Texas Registration No. F-13574

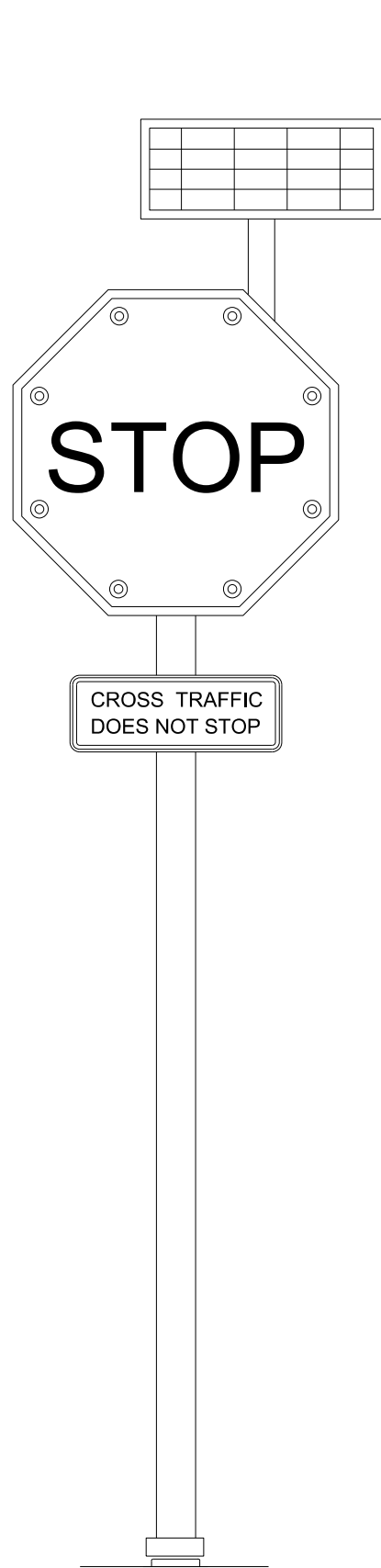
ARCADIS
Design & Consultancy
for natural and built assets
FIRM #533

Texas Department of Transportation

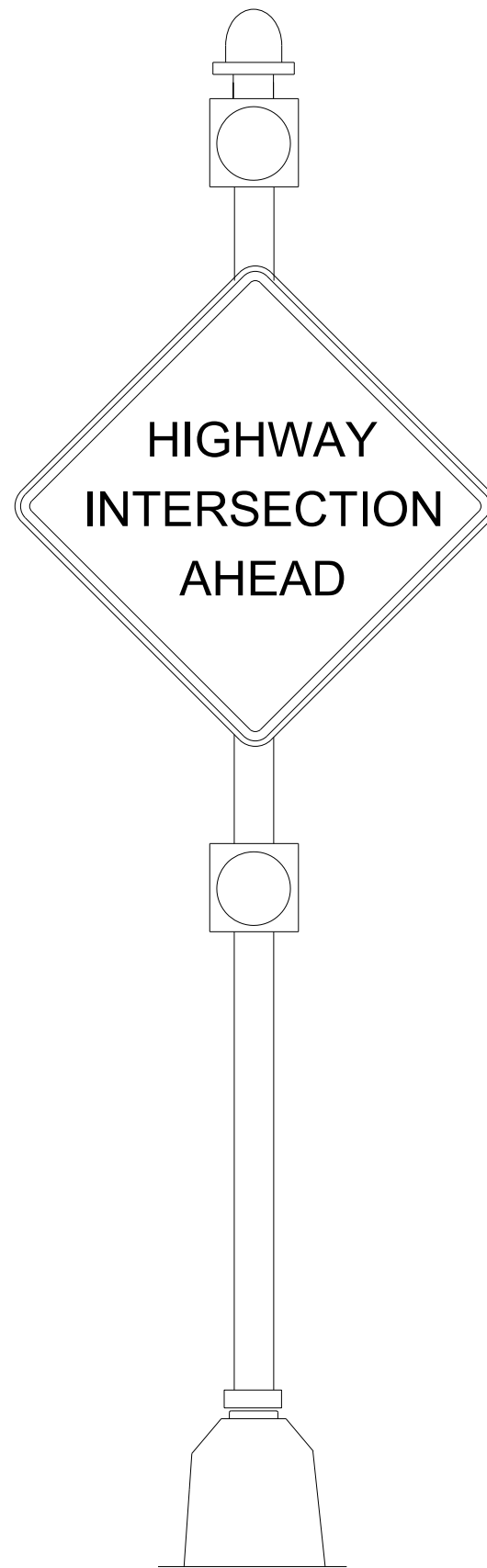
B100208 AT CR117
PROPOSED LIGHTING PLAN

SHEET 3 OF 3

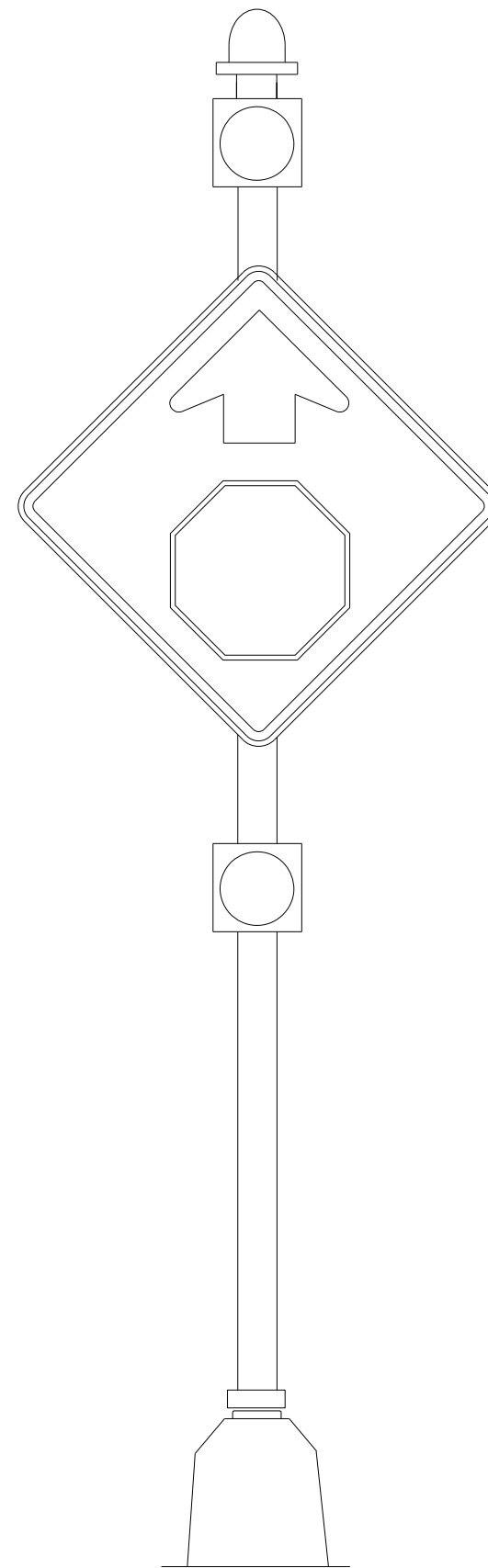
FED. RD. DIST. NO.	STATE	PROJECT NO.	HIGHWAY NO.
6	TEXAS	F 2022(736)	B100208
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.
6	MIDLAND	0003	08
		JOB NO.	SHEET NO.
		064	45



TYPE A



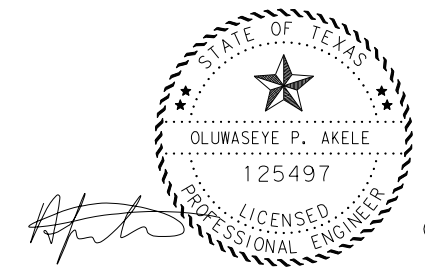
TYPE B



TYPE C

NOTES:

1. SEE RFBA-13 (MOD) FOR MORE DETAILS.
2. SEE SPECIAL SPECIFICATION 6227 FOR MORE DETAILS.
3. SEE SMALL SIGN SUMMARY FOR SIGN SIZES.
4. SPACING BETWEEN SIGNS IS SHOWN ON SMD STANDARDS.
5. USE ASTRO-BRAC SIGN MOUNT PELCO #AB-3009 OR APPROVED EQUAL TO MOUNT ALL SIGNS TO RSFB ASSEMBLIES.



04/20/2022



ROADSIDE FLASHING
BEACON SIGN DETAIL

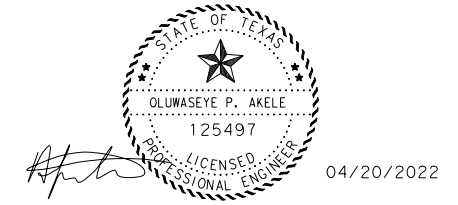
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© TxDOT January 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	08	064, ETC.	BI 20B, Etc.
5-93 12-04	DIST	COUNTY	SHEET NO.	
10-93 3-13	ODA	REEVES, E+c.	46	
4-98				

SUMMARY OF SMALL SIGNS

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

DATE: 04/20/2022 4:35:10 PM
 FILE: ...28.2_Summary of Small Signs.dgn

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)				BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION	
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	PREFABRICATED P = "Plain" T = "T" U = "U"	
24	SPRS-1	R1-1 W4-4P	STOP SIGN CROSS TRAFFIC DOES NOT STOP	48 X 48 36 X 18			10BWG	1	SA	T	
24	R-1	W1-7T	TWO DIRECTION LARGE ARROW W/ OBJECT MARKER	96 X 30			10BWG	1	SA	T	
24	R-2	R1-2	YIELD SIGN	48 X 48 X 48			10BWG	1	SA	T	
25	RSFB-1	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							ROADSIDE FLASHING BEACON
26	RSFB-2	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							ROADSIDE FLASHING BEACON
27	RSFB-3	W3-1	STOP AHEAD	48 X 48							ROADSIDE FLASHING BEACON
32	RSFB-4	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							SOLAR POWERED LED ROADSIDE SIGN
33	SPRS-2	R1-1 W4-4P	STOP SIGN CROSS TRAFFIC DOES NOT STOP	48 X 48 36 X 18			10BWG	1	SA	T	
34	RSFB-5	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							SOLAR POWERED LED ROADSIDE SIGN
35	RSFB-6	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							SOLAR POWERED LED ROADSIDE SIGN
37	SPRS-3	R1-1 W4-4P	STOP SIGN CROSS TRAFFIC DOES NOT STOP	48 X 48 36 X 18			10BWG	1	SA	T	
37	SPRS-4	R1-1 W4-4P	STOP SIGN CROSS TRAFFIC DOES NOT STOP	48 X 48 36 X 18			10BWG	1	SA	T	
38	RSFB-7	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							SOLAR POWERED LED ROADSIDE SIGN
39	RSFB-8	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							SOLAR POWERED LED ROADSIDE SIGN
40	RSFB-9	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							SOLAR POWERED LED ROADSIDE SIGN
41	RSFB-10	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							SOLAR POWERED LED ROADSIDE SIGN
43	RSFB-11	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							SOLAR POWERED LED ROADSIDE SIGN
44	SPRS-5	R1-1 W4-4P	STOP SIGN CROSS TRAFFIC DOES NOT STOP	48 X 48 36 X 18			10BWG	1	SA	T	
45	RSFB-12	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 X 48							SOLAR POWERED LED ROADSIDE SIGN



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

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.
<http://www.txdot.gov/>

- NOTE:**
- Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
 - For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS) Standard Sheet.
 - For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).



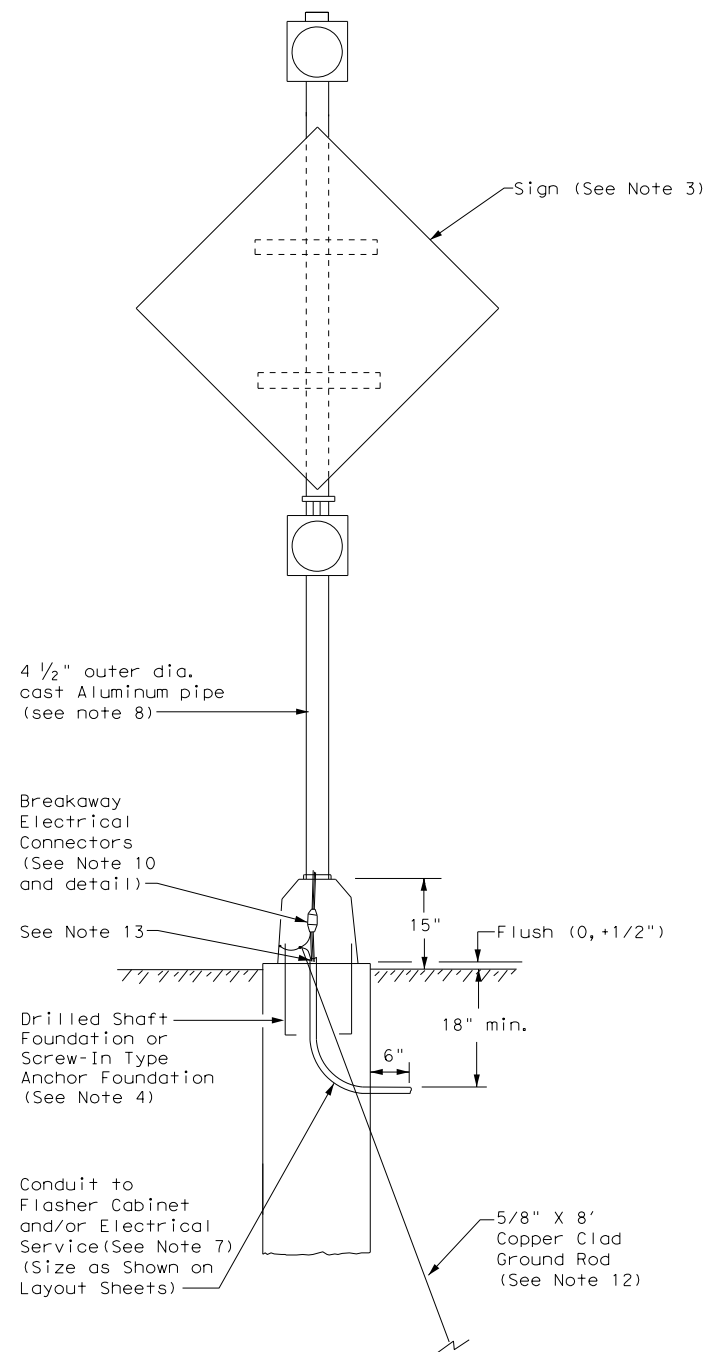
SUMMARY OF SMALL SIGNS

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© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
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4-16	DIST	COUNTY	SHEET NO.	
8-16	ODA	REEVES, Etc.	47	

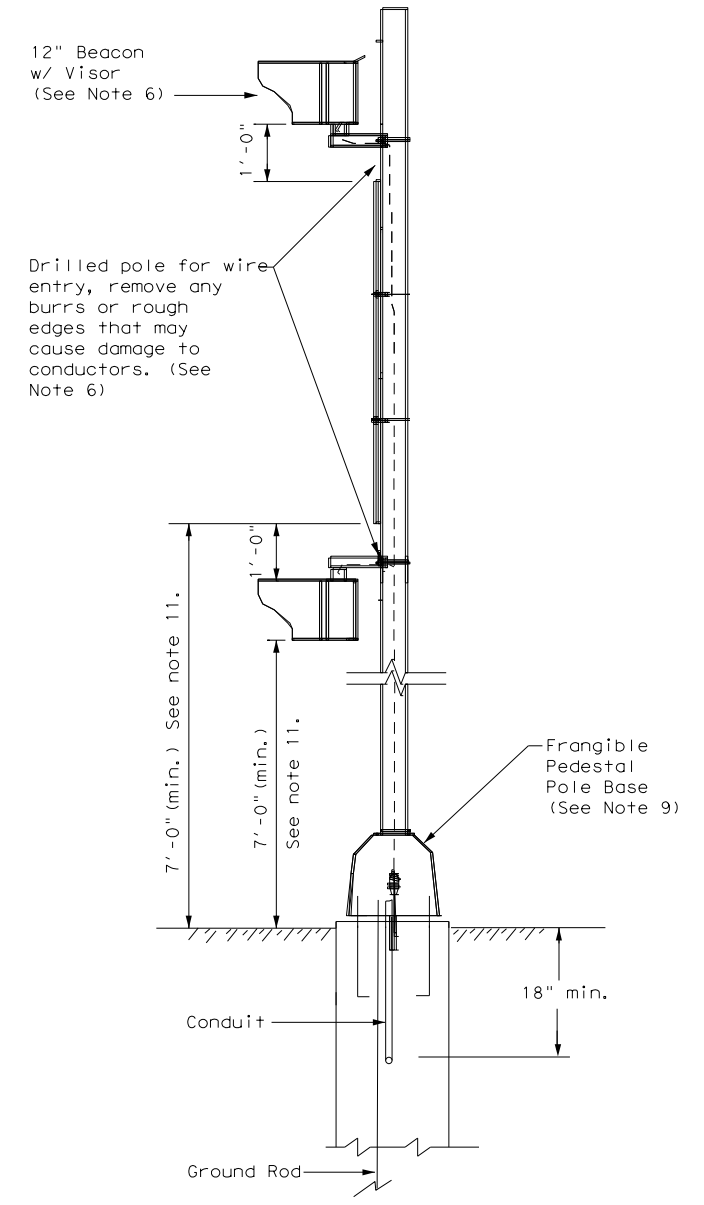
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

GENERAL NOTES:

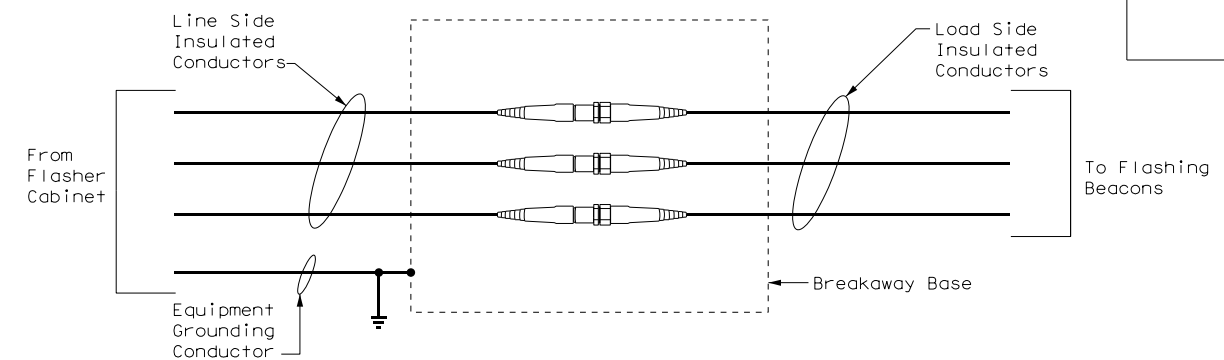
- Details show a typical warning sign with two flashing beacon heads, other arrangements are possible. When only one beacon is required, install the upper beacon.
- See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.
- See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.
- Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.
- When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".
- Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.
- Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."
- Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.
- Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening of connection.
- Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies." Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse slug. For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).
- Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.
- Make connections to ground rods according to NEC. Ground rod clamps shall be listed for their intended purpose.
- Ensure height of conduit and ground rod is below top of anchor bolts.



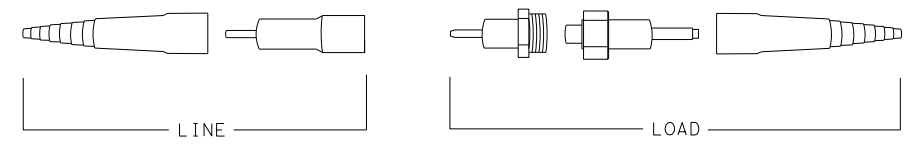
FRONT



SIDE



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS
EXPLODED VIEW



ROADSIDE FLASHING
BEACON ASSEMBLY

RFBA-13

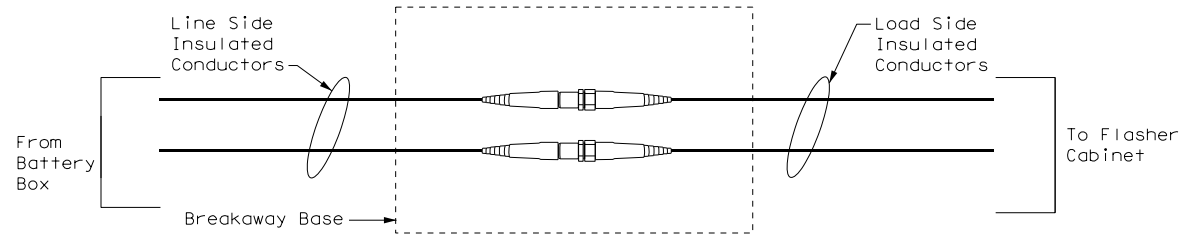
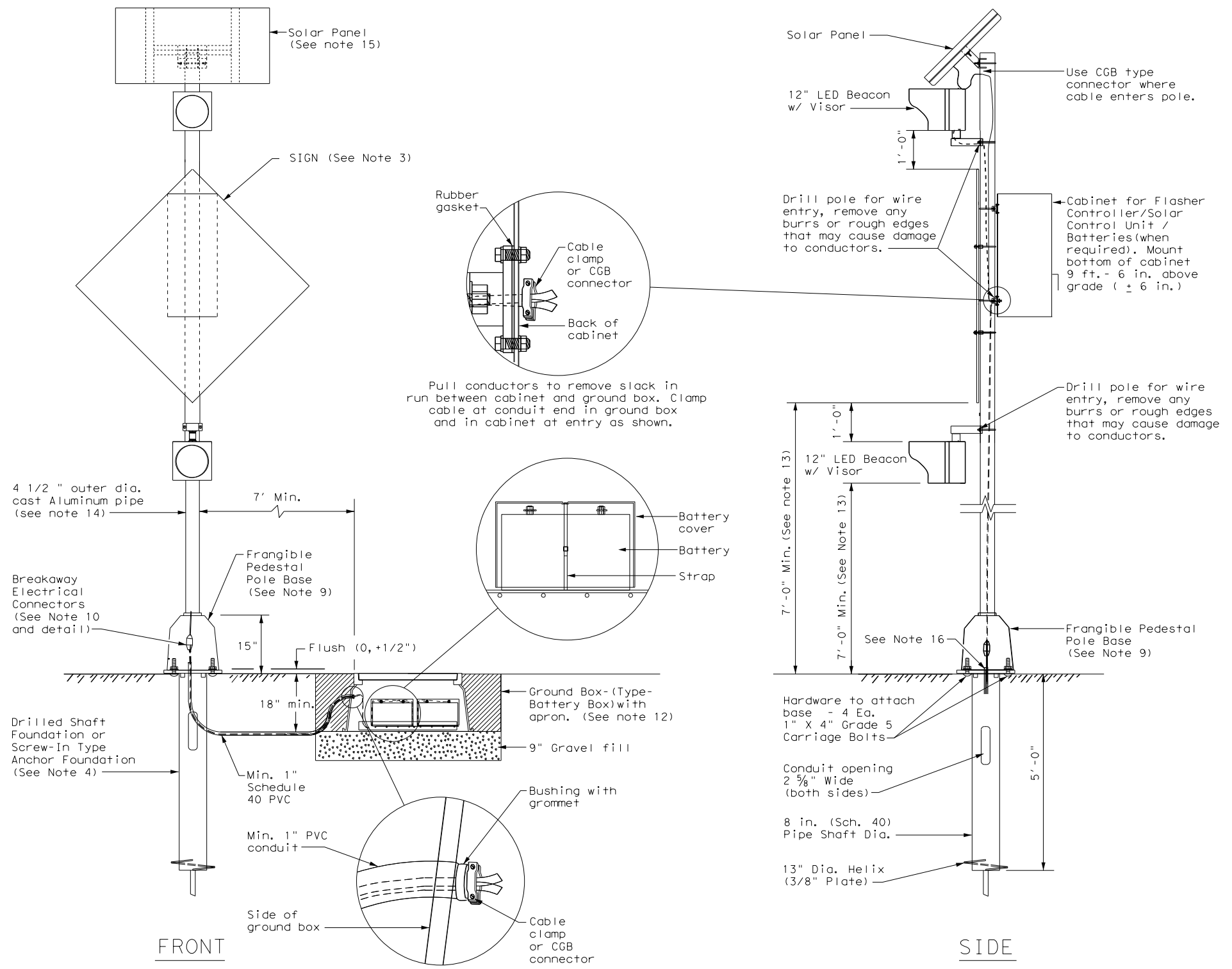
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© TxDOT January 1992	CONT	SECT	JOB	HIGHWAY
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10-93 3-13	DIST	COUNTY	SHEET NO.	
4-98	ODA	REEVES, Etc.	48	

DATE:
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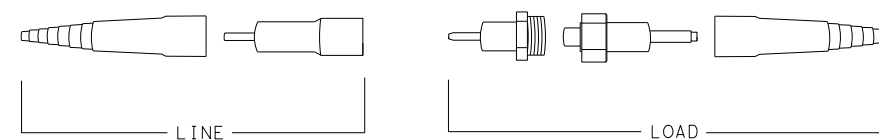
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GENERAL NOTES:

1. Details show a typical warning sign with two flashing beacon heads, other arrangements are possible. When only one beacon is required, install the upper beacon.
2. See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.
3. See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.
4. Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.
5. When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".
6. Use materials specifically designed for attaching cabinets, beacon heads, solar panels, etc., to poles.
7. Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.
8. Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."
9. Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening on connection.
10. Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies." Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse slug. For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).
11. Install the batteries in a battery box. Place the batteries on a 3/16" thick plastic sheet and connect together. Place a plastic cover (battery bell jar) over the top of each battery and secure the battery bell jar to the battery with a strap. The batteries, bell jars, straps and 3/16" plastic sheet are subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies." When required, install batteries in the flasher cabinet. Wire batteries according to manufacturer's recommendations. Provide the number of batteries as required by the manufacturer.
12. See standard sheet Electrical Details (ED) for additional requirements regarding the installation of ground boxes/battery boxes, conduit, and cabinets.
13. Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.
14. Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.
15. Orient solar panel for optimum exposure to sunlight (face to the south). Prior to installation, check the location to ensure there is no overhead obstruction that would block the solar panel from receiving full sunlight. Unless specified elsewhere, mount a minimum of 14' above grade.
16. Ensure height of conduit is below top of anchor bolts.



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS
EXPLODED VIEW



SOLAR POWERED ROADSIDE FLASHING BEACON ASSEMBLY DETAILS
SPRFBA (1) - 13

FILE: spb1-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	08	064, ETC.	BI 20B, ETC.
12-04	DIST	COUNTY	SHEET NO.	
3-13	ODA	REEVES, ETC.	49	

DATE:
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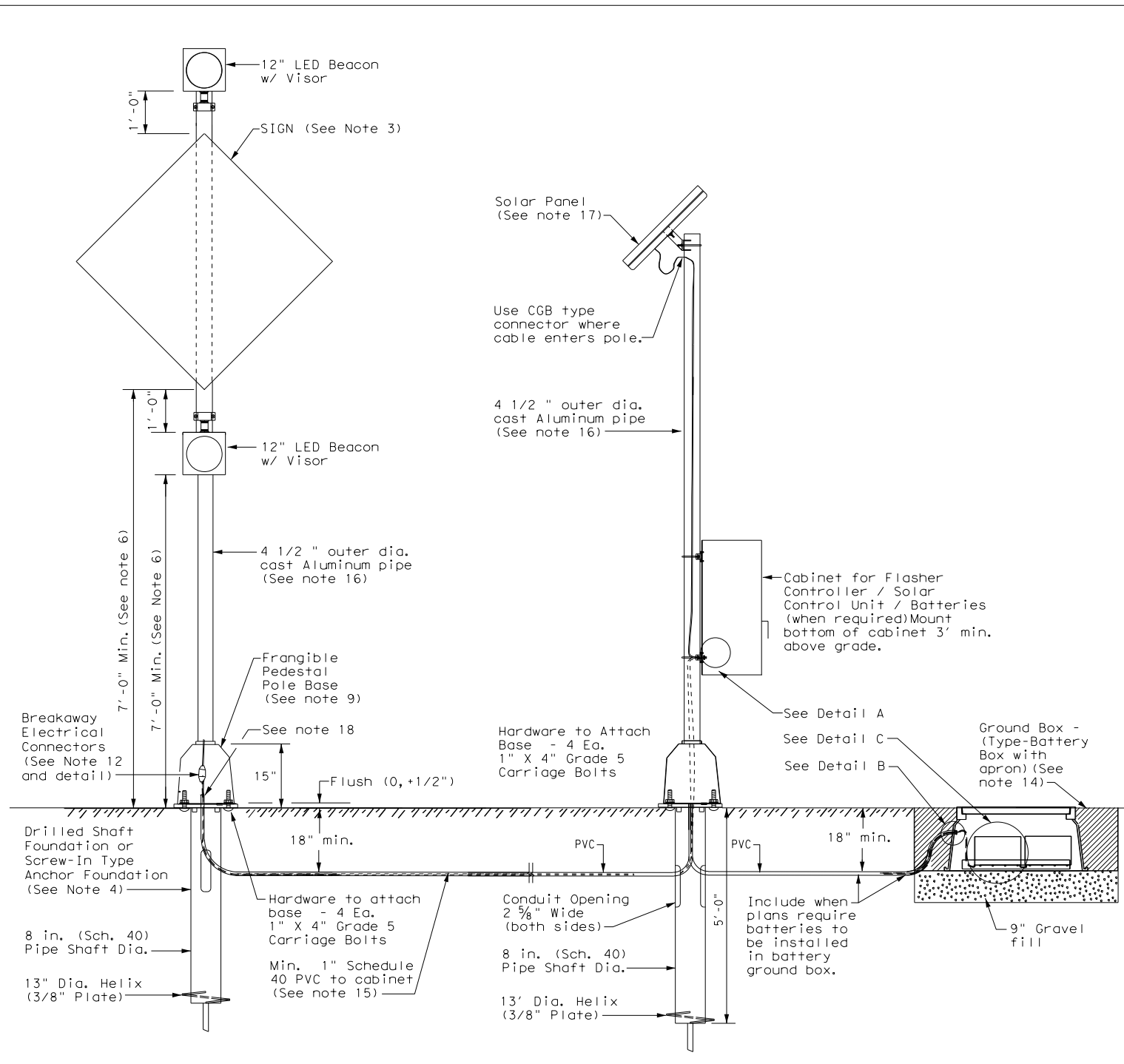
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GENERAL NOTES:

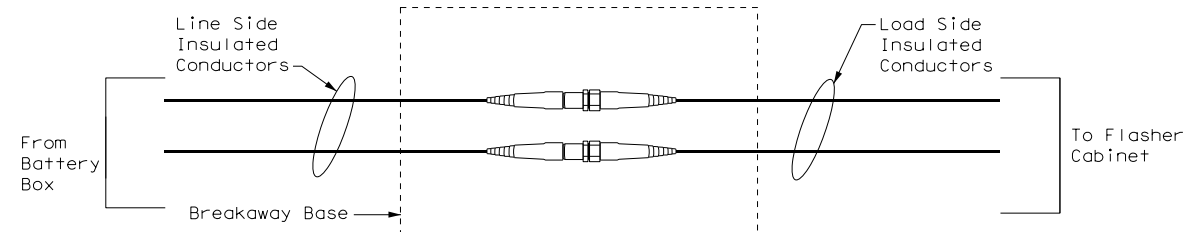
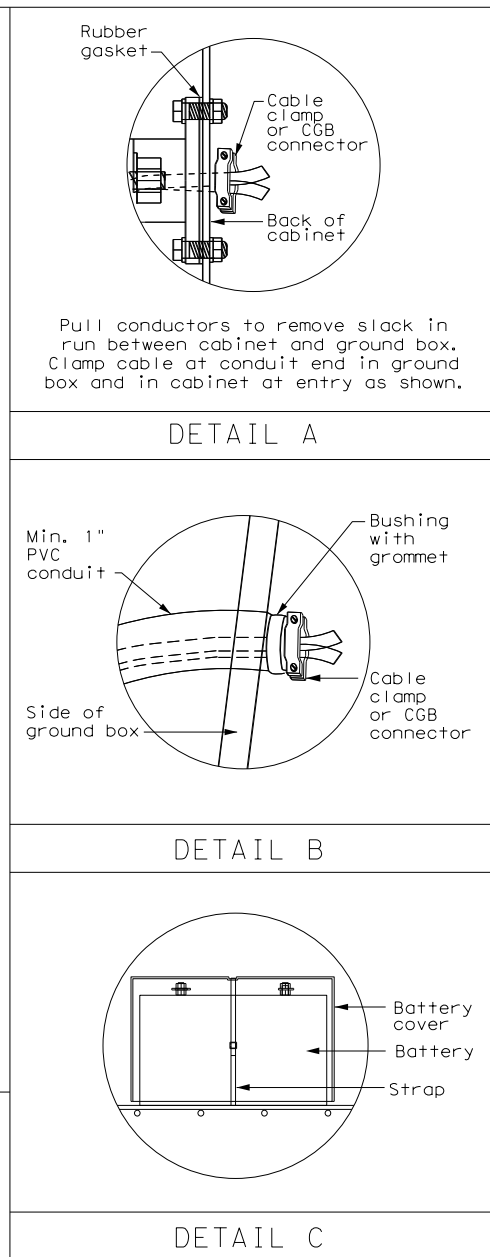
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- See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.
- See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.
- Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet T5-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.
- When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".
- Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.
- Use materials specifically designed for attaching cabinets, beacon heads, solar panels, etc., to poles.
- Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."
- Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening on connection.
- Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.
- Install the cable clamp in the bottom third of the back of the cabinet. See Detail A.
- Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies". Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse (slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).
- Install the batteries in a battery box. Place the batteries on a 3/16" thick plastic sheet and connect together. Place a plastic cover (battery bell jar) over the top of each battery and secure the battery bell jar to the battery with a strap. The batteries, bell jars, straps and 3/16" plastic sheet are subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies." When required, install batteries in the flasher cabinet. Wire batteries according to manufacturer's recommendations. Provide the number of batteries as required by the manufacturer.
- See standard sheet Electrical Details (ED) for additional requirements regarding the installation of ground boxes/battery boxes, conduit, and cabinets.
- Unless otherwise shown on the plans or recommended by the manufacturer, use the following table to determine the wire size from cabinet to beacons.

Distance from Cabinet to Beacons (ft.)	Minimum Required Wire Size (AWG)
0 - 35	#14
35 - 60	#12
60 - 100	#10
> 100	#8

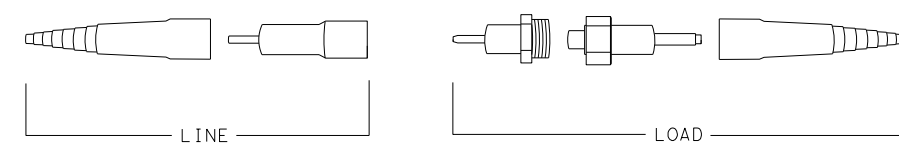
- Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.
- Orient solar panel for optimum exposure to sunlight (face to the south). Prior to installation, check the location to ensure there is no overhead obstruction that would block the solar panel from receiving full sunlight. Unless specified elsewhere, mount a minimum of 14' above grade.
- Ensure height of conduit is below top of anchor bolts.



DETAIL FOR SOLAR PANEL, CABINET, AND BATTERIES LOCATED OUT OF CLEAR ZONE ON SEPARATE ALUMINUM POLE ASSEMBLY



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS EXPLODED VIEW



SOLAR POWERED ROADSIDE FLASHING BEACON ASSEMBLY DETAILS (ALUMINUM)
SPRFBA (3) - 13

FILE: spb3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 2003	CONT: 0003	SECT: 08	JOB: 064, ETC.	HIGHWAY: BI 20B, Etc.
12-04	DIST: ODA	COUNTY: REEVES, Etc.	SHEET NO. 50	

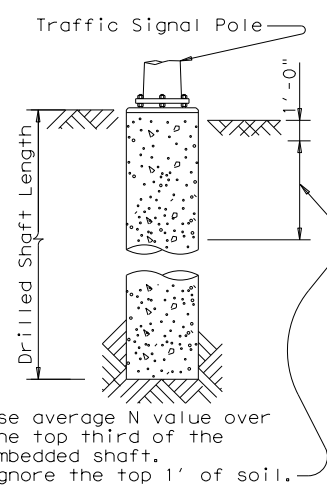
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FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft (4), (5), (6)			ANCHOR BOLT DESIGN (1)			FOUNDATION DESIGN LOAD (2)		TYPICAL APPLICATION	
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	F _y (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	3/4"	36	12 3/4"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 1/2"	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 3/4"	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 1/4"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

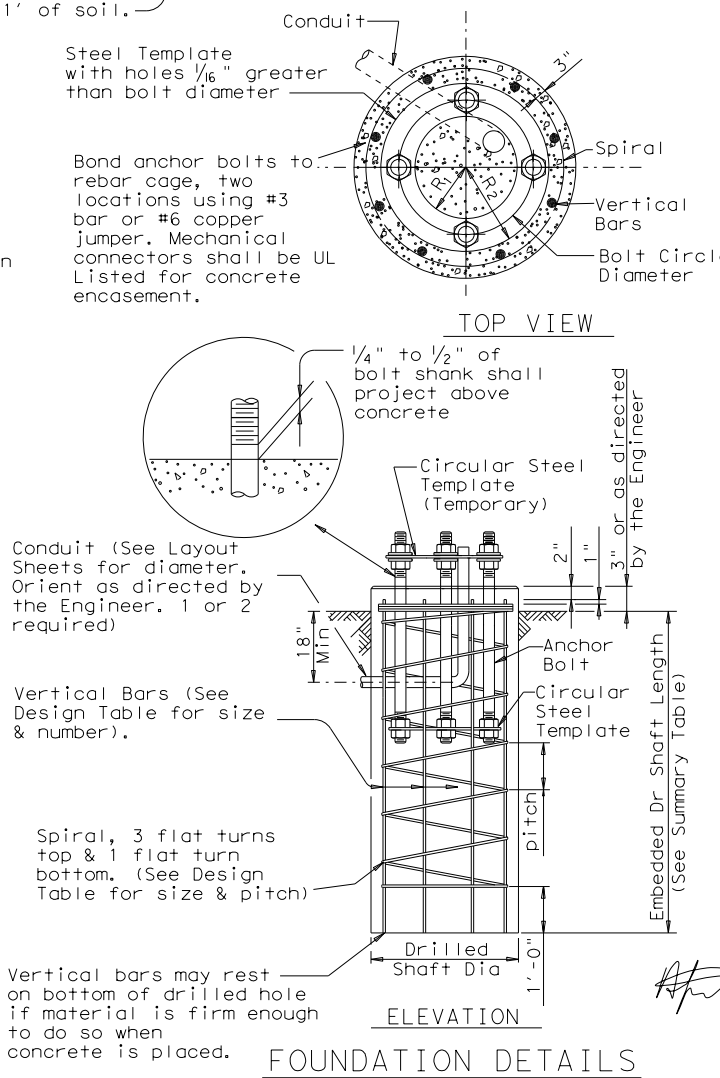
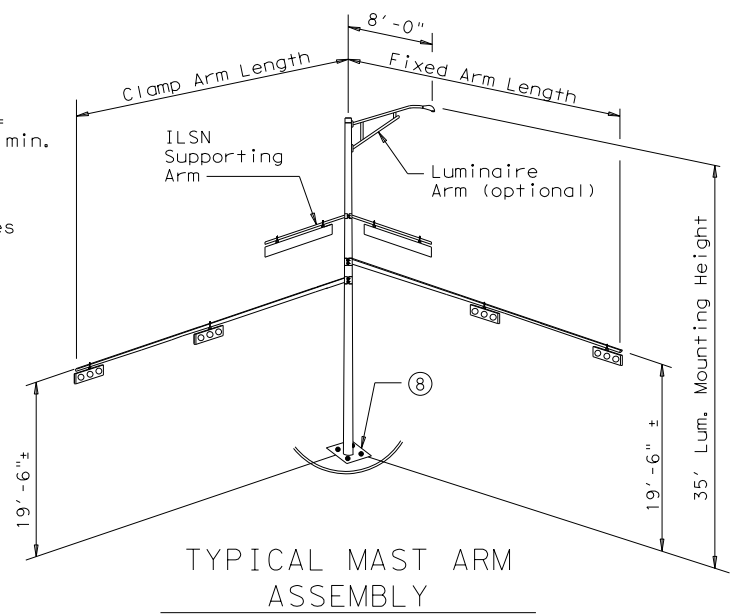
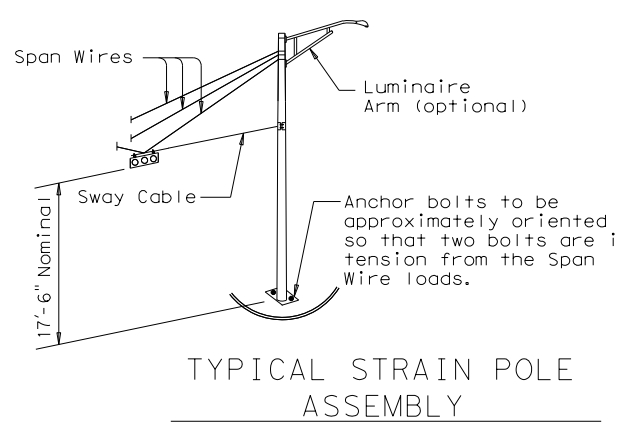
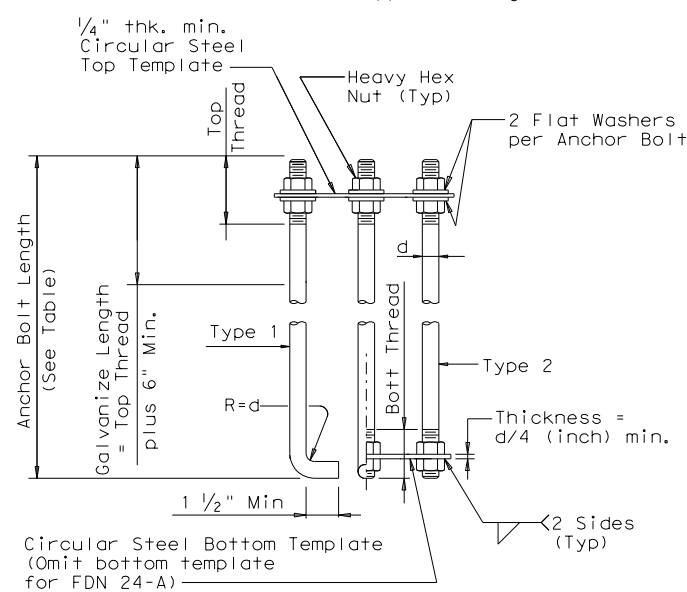
FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)					
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
28' X 28'					
32' X 28'					
36' X 36'					
40' X 36'					
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 24'			
		32' X 32'			



ANCHOR BOLT & TEMPLATE SIZES						
BOLT DIA IN.	(7) BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R ₂	R ₁
3/4"	1'-6"	3"	—	12 3/4"	7 1/8"	5 5/8"
1 1/2"	3'-4"	6"	4"	17"	10"	7"
1 3/4"	3'-10"	7"	4 1/2"	19"	11 1/4"	7 3/4"
2"	4'-3"	8"	5"	21"	12 1/2"	8 1/2"
2 1/4"	4'-9"	9"	5 1/2"	23"	13 3/4"	9 1/4"

(7) Min dimensions given, longer bolts are acceptable.

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.



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
SPRS-1	10	24-A	1	6				
R-1	10	24-A	1	6				
R-2	10	24-A	1	6				
RSFB-1	10	24-A	1	6				
RSFB-2	10	24-A	1	6				
RSFB-3	10	24-A	1	6				
RSFB-4	10	24-A	1	6				
SPRS-2	10	24-A	1	6				
RSFB-5	10	24-A	1	6				
RSFB-6	10	24-A	1	6				
SPRS-3	10	24-A	1	6				
SPRS-4	10	24-A	1	6				
RSFB-7	10	24-A	1	6				
RSFB-8	10	24-A	1	6				
RSFB-9	10	24-A	1	6				
RSFB-10	10	24-A	1	6				
RSFB-11	10	24-A	1	6				
SPRS-5	10	24-A	1	6				
RSFB-12	10	24-A	1	6				
TOTAL DRILLED SHAFT LENGTHS				114				

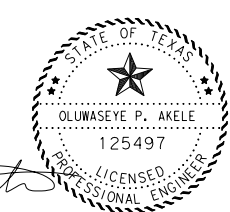
GENERAL NOTES:
 Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.
 Reinforcing steel shall conform to Item 440, "Reinforcing Steel".
 Concrete shall be Class "C".
 Threads for anchor bolts and 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".

Texas Department of Transportation
 Traffic Operations Division

TRAFFIC SIGNAL
 POLE FOUNDATION
 TS-FD-12 (MOD)

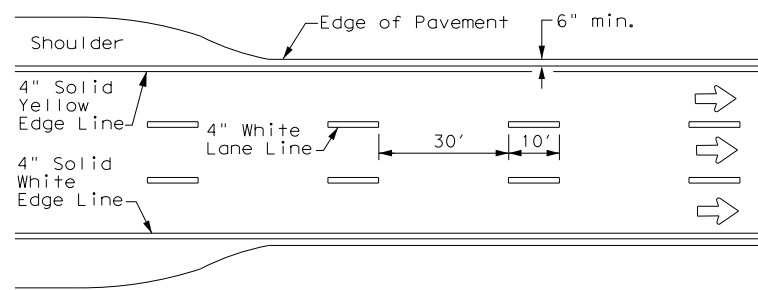
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© TxDOT August 1995		DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB
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0003		08	064, ETC.	BI 20B, ETC.	
DIST		COUNTY		SHEET NO.	
ODA		REEVES, Etc.		51	

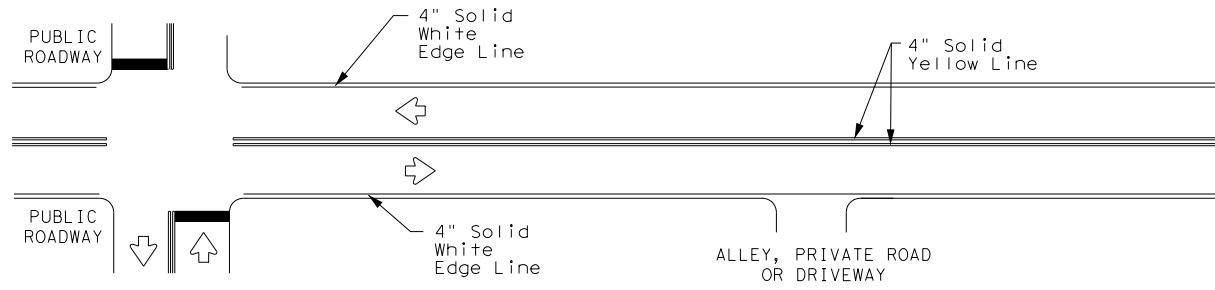


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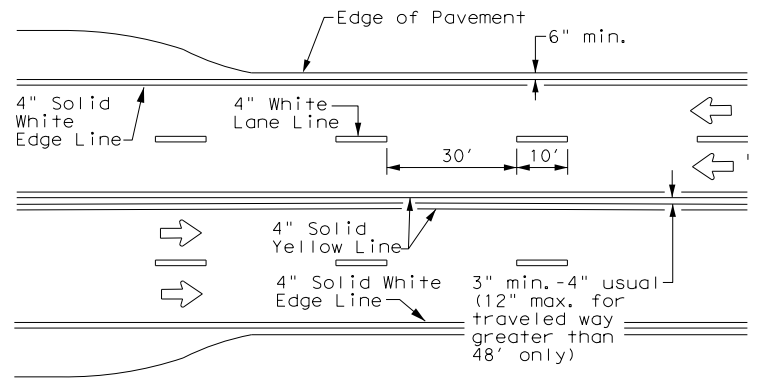
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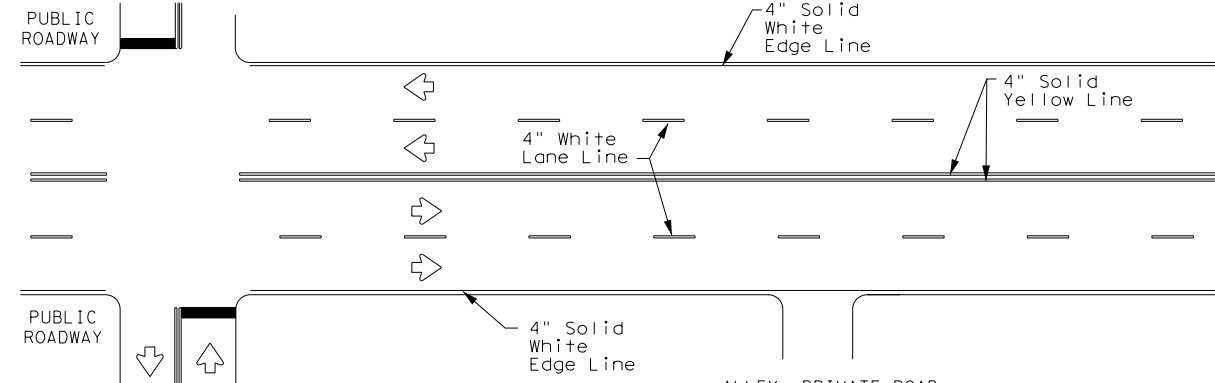
EDGE LINE AND LANE LINES
 ONE-WAY ROADWAY
 WITH OR WITHOUT SHOULDERS



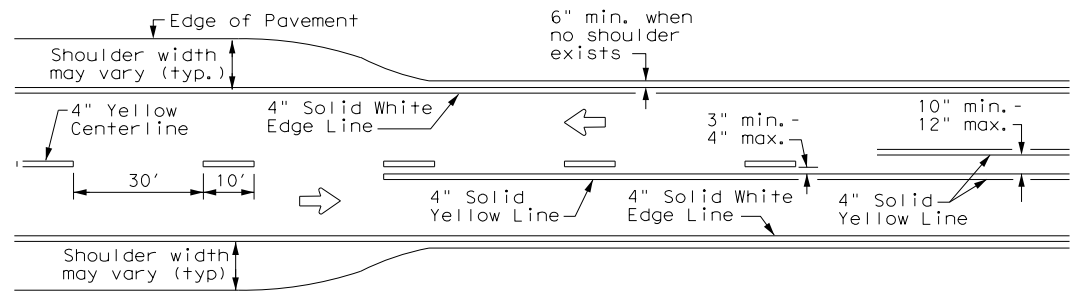
TYPICAL TWO-LANE, TWO-WAY PAVEMENT
 MARKINGS THROUGH INTERSECTIONS



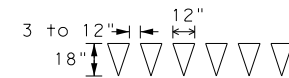
CENTERLINE AND LANE LINES
 FOUR LANE TWO-WAY ROADWAY
 WITH OR WITHOUT SHOULDERS



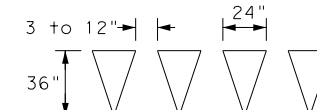
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
 MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY
 WITH OR WITHOUT SHOULDERS

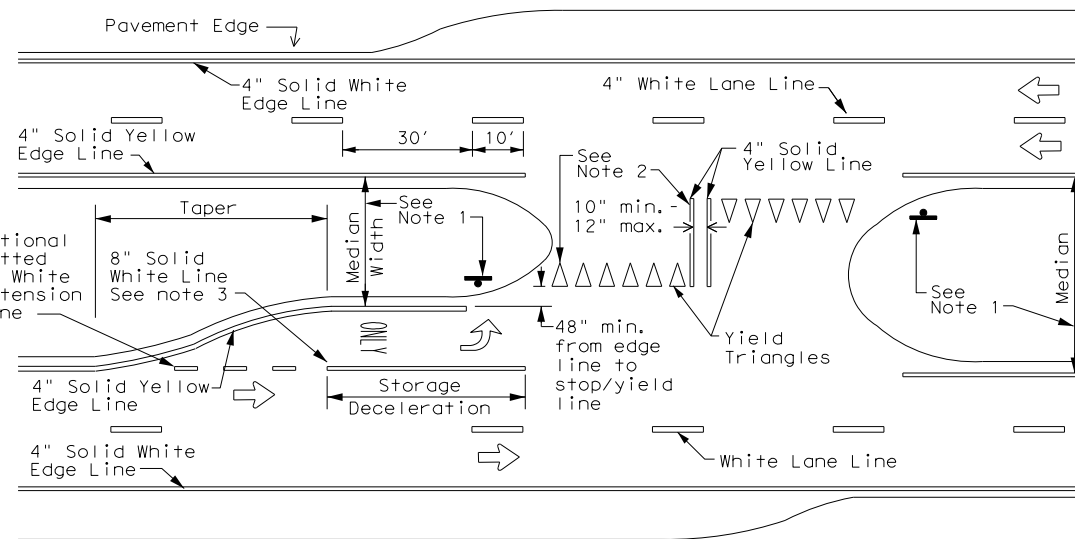


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

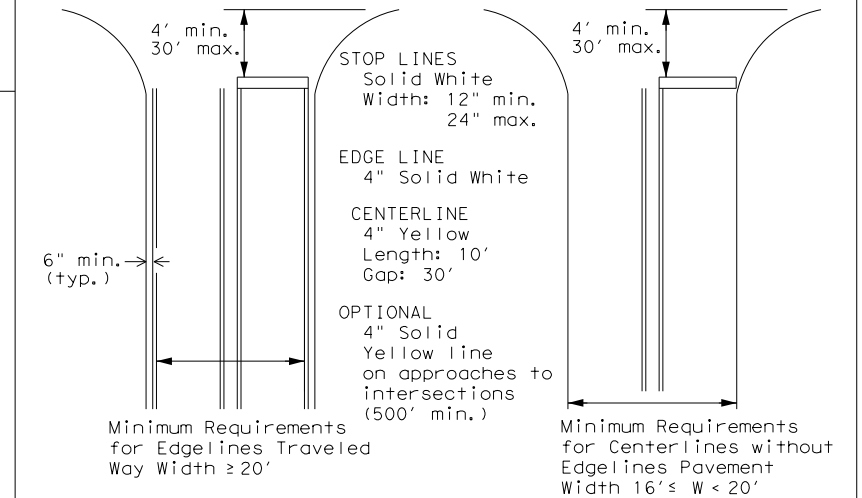
- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.
- 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 triangles shall only be used with yield signs.
- Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

- Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed 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.
- 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



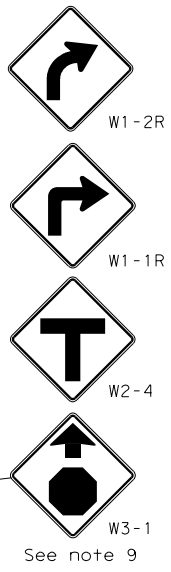
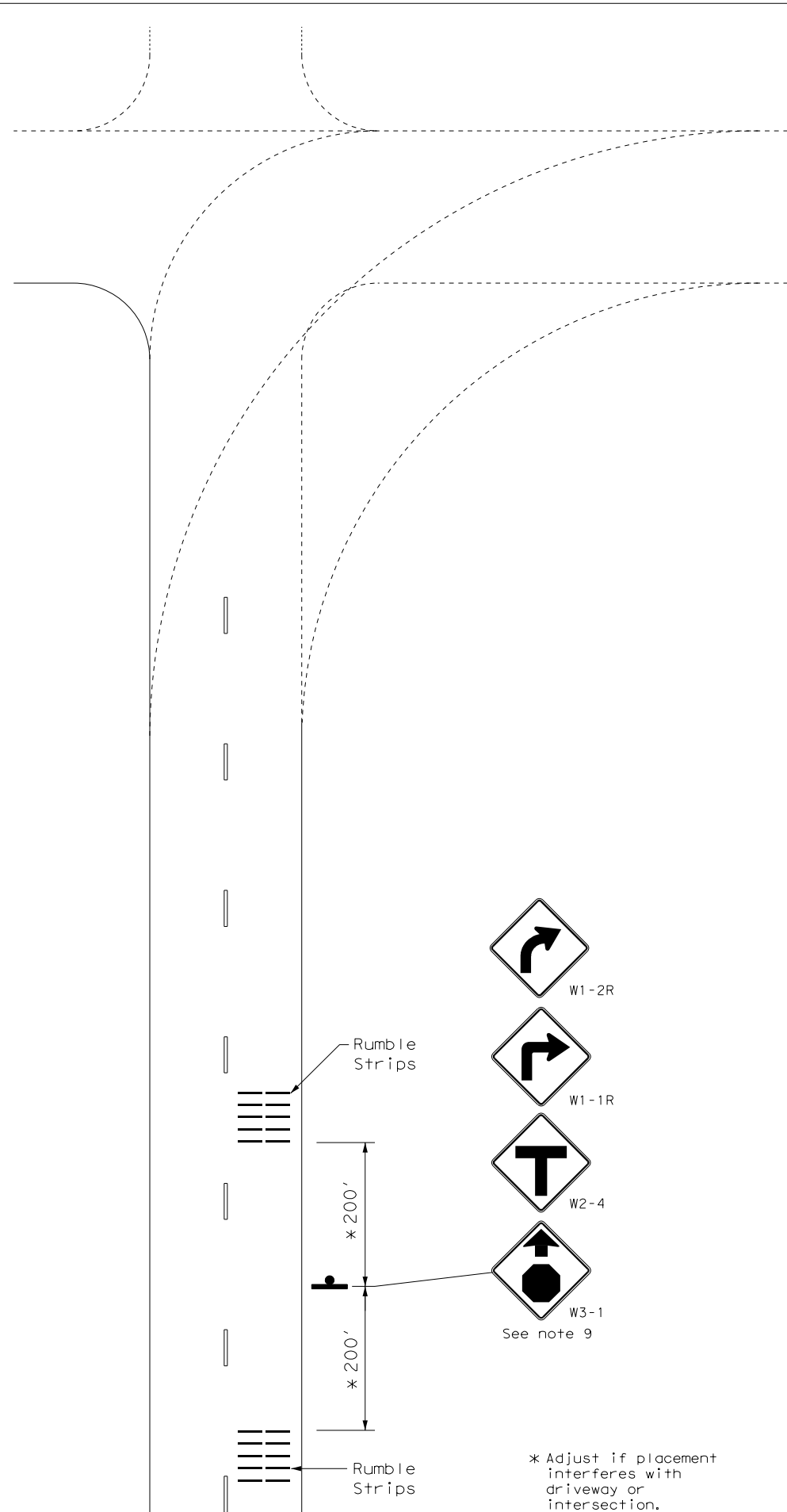
TYPICAL STANDARD
 PAVEMENT MARKINGS

PM(1) - 20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
8-95 3-03 REVISIONS	0003	08	064, ETC.	BI 20B, Etc.
5-00 2-12	DIST	COUNTY	SHEET NO.	
8-00 6-20	ODA	REEVES, Etc.	52	

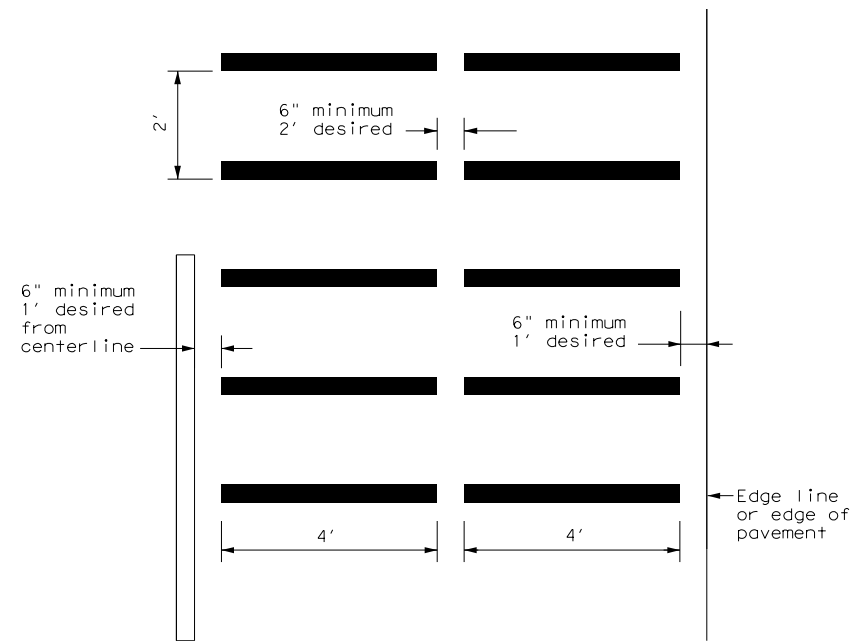
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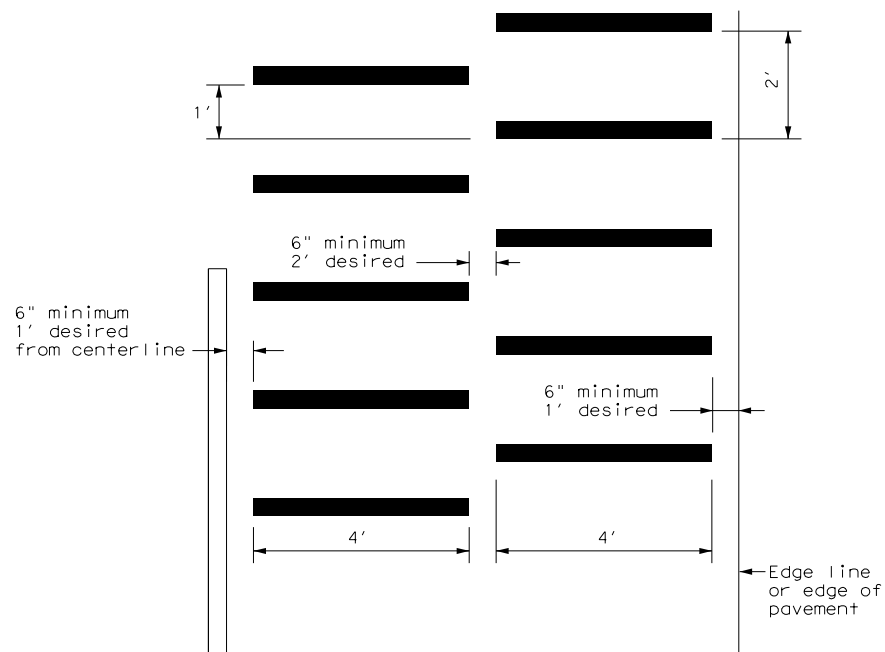


* Adjust if placement interferes with driveway or intersection.

STANDARD PATTERN



ALTERNATIVE PATTERN



GENERAL NOTES

1. Transverse or in-lane rumble strips should only be used at high incident and special geometric locations. These special geometric locations may include: approaches to rural, high speed signalized or Stop-controlled intersections with sight restrictions and/or high crash rates, approaches to unexpected urban intersections, approaches to newly installed Stop or signalized controlled intersections, approaches to toll plazas, approaches to hazardous horizontal curves, and approaches to railroad grade crossings.
2. When used, the rumble strips shall be placed 200 feet prior to and after the placement of the warning device.
3. The use of rumble strips should not be widespread or used indiscriminately.
4. Preformed black raised rumble strips should be used. They should be installed in accordance with the manufacturer's recommendations.
5. A list of approved, preformed raised rumble strips can be obtained from the Traffic Operations Division.
6. Consideration should be given to noise levels when in-lane or transverse rumble strips are installed near residential areas, schools, churches, etc.
7. The use of the "Rumble Strips Ahead" sign may be used in advance of in-lane or transverse rumble strips, based on engineering judgement. This sign is typically not necessary for rumble strip installations built to the guidelines on this standard sheet. When used, this sign should be spaced in advance of the rumble strips based on the guidelines for advance placement of warning sign included in the "Texas Manual on Uniform Traffic Control Devices".



W17-2T

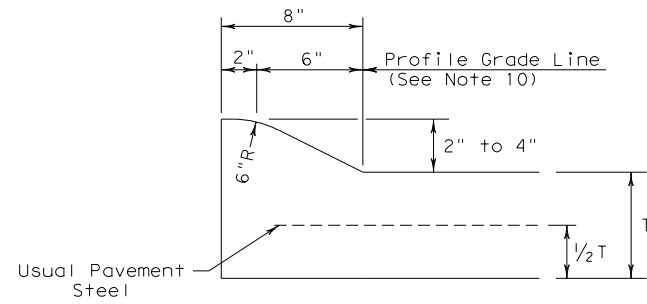
8. Consideration should be given to bicyclists. A 12 inch gap from the edge line may be used to accommodate bicyclists when a usable shoulder is not available. Additional gaps in the in-lane or transverse rumble strips are not recommended since they could cause motorists to swerve to avoid the rumble strips.

9. Other signs can be used as conditions warrant.

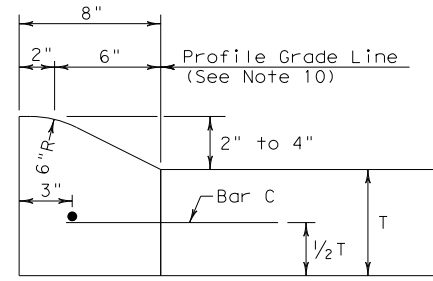
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<h2>TRANSVERSE OR IN-LANE RUMBLE STRIPS</h2> <h3>RS(5)-13</h3>			
FILE: r.s(5)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT April 2006	CONT	SECT	JOB
REVISIONS		0003	08
2-10	DIST	COUNTY	SHEET NO.
10-13	ODA	REEVES, Etc.	53

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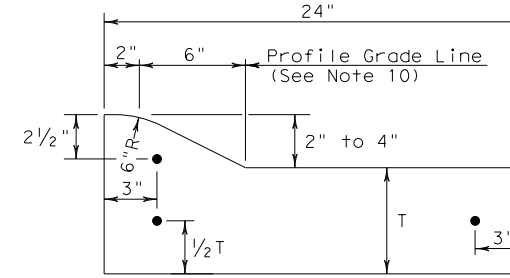
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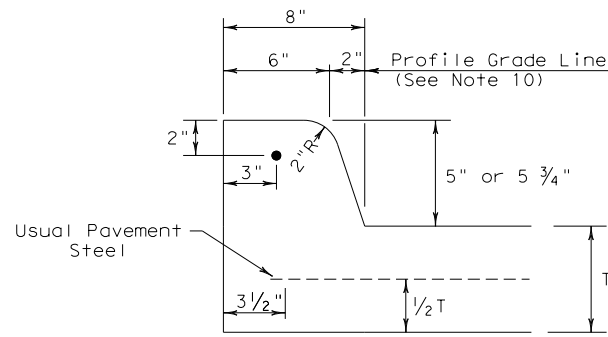
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2" - 4" HEIGHT



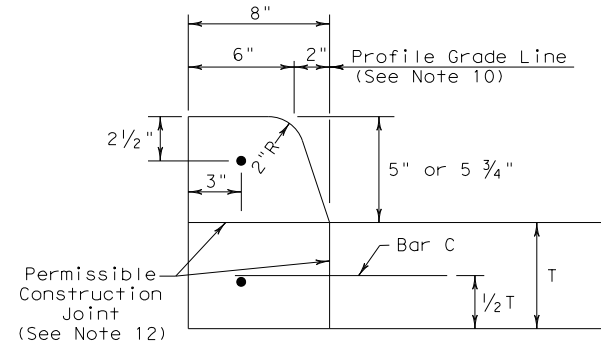
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2" - 4" HEIGHT



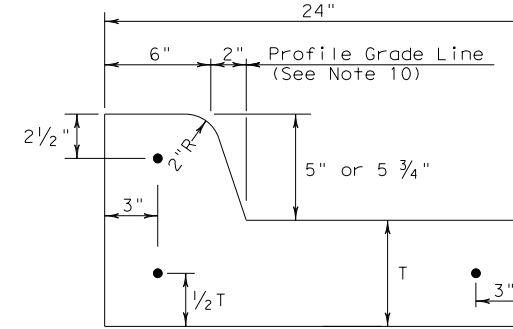
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



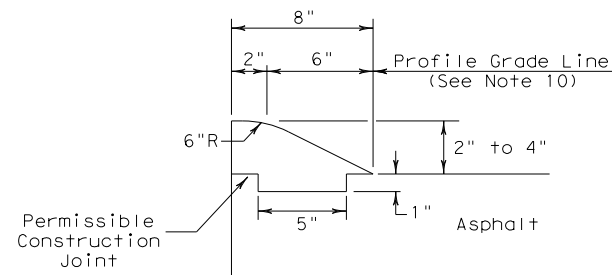
TYPE II CURB (MONOLITHIC)
5" - 5 3/4" HEIGHT



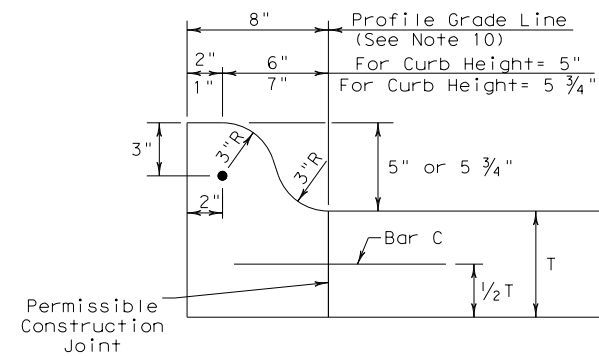
TYPE II CURB
5" - 5 3/4" HEIGHT



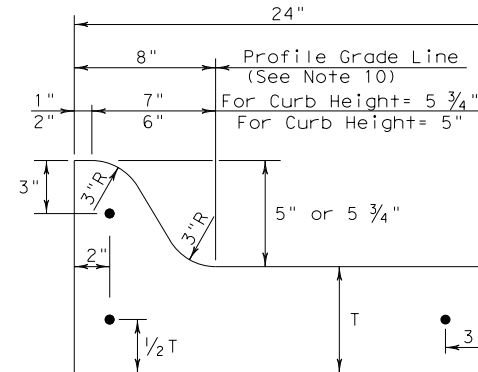
TYPE II CURB AND GUTTER
5" - 5 3/4" HEIGHT



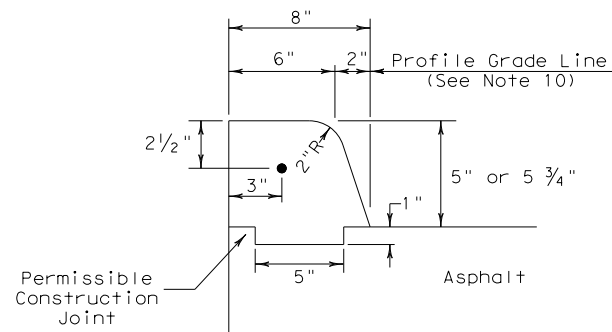
TYPE III CURB (KEYED)
2" - 4" HEIGHT



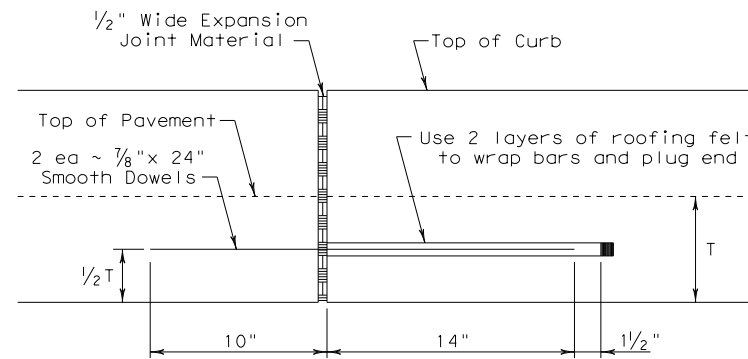
TYPE IIa CURB
5" - 5 3/4" HEIGHT



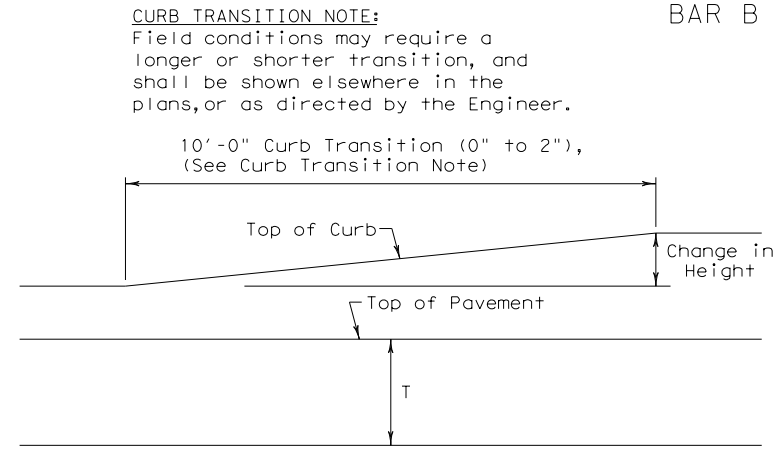
TYPE IIa CURB AND GUTTER
5" - 5 3/4" HEIGHT



TYPE IV CURB (KEYED)
5" - 5 3/4" HEIGHT



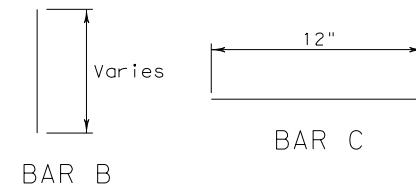
EXPANSION JOINT DETAIL



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
- Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
- All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
- Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and the grouted in place, or may be inserted into fresh concrete.
- 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.
- Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
- Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
- Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
- One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
- When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
- Bar B used as needed to support curb reinforcing steel during concrete placement.



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.

				Design Division Standard	
<p>CONCRETE CURB AND CURB AND GUTTER</p> <p>CCCG-21</p>					
FILE: cccg21.dgn	DN: TxDOT	CK: AN	DW: SS	CK: KM	
©TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY	
REVISTONS	0003	08	064, ETC.	BI 20B, Etc.	
	DIST	COUNTY		SHEET NO.	
	ODA	REEVES, Etc.		54	

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

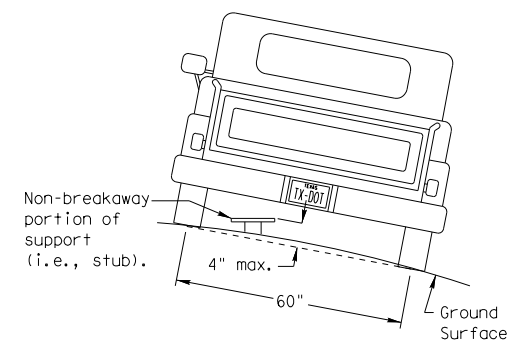
SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

Post Type _____
 FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
 TWT = Thin-Walled Tubing (see SMD(TWT))
 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
 S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2) _____
 Anchor Type _____
 UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
 UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
 WS = Wedge Anchor Steel - (see SMD(TWT))
 WP = Wedge Anchor Plastic (see SMD(TWT))
 SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
 SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

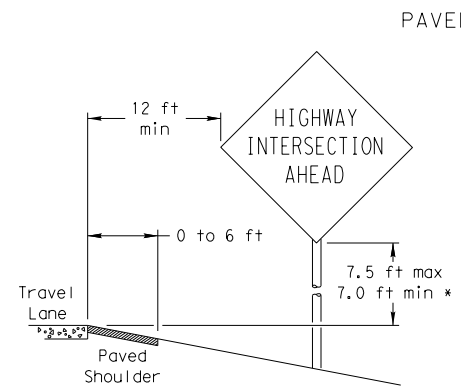
Sign Mounting Designation
 P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
 T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
 U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
 IF REQUIRED
 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
 BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
 WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
 EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT

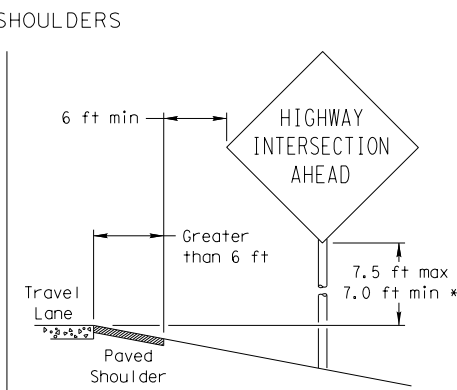


To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

SIGN LOCATION

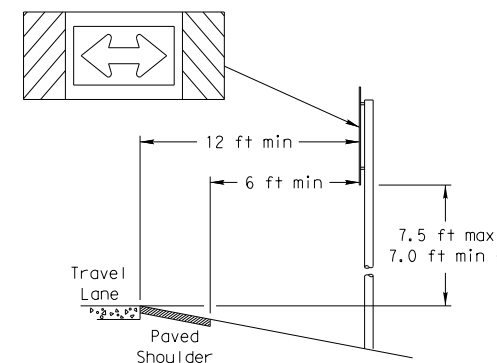


LESS THAN 6 FT. WIDE
 When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



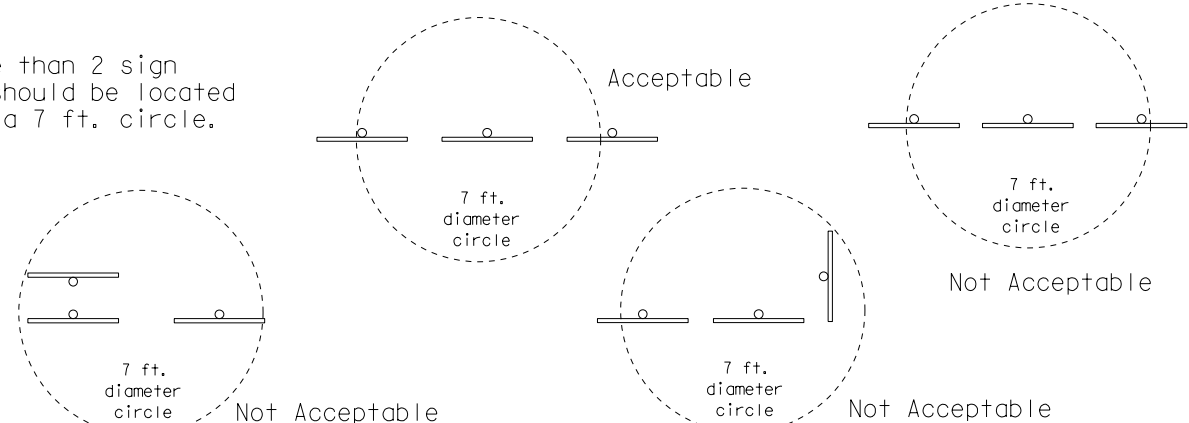
GREATER THAN 6 FT. WIDE
 When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

T-INTERSECTION

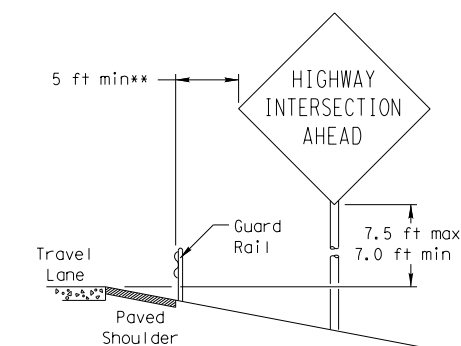


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

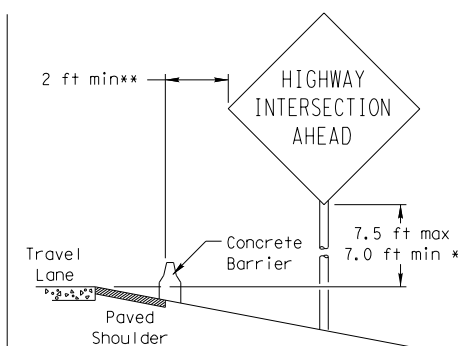
No more than 2 sign posts should be located within a 7 ft. circle.



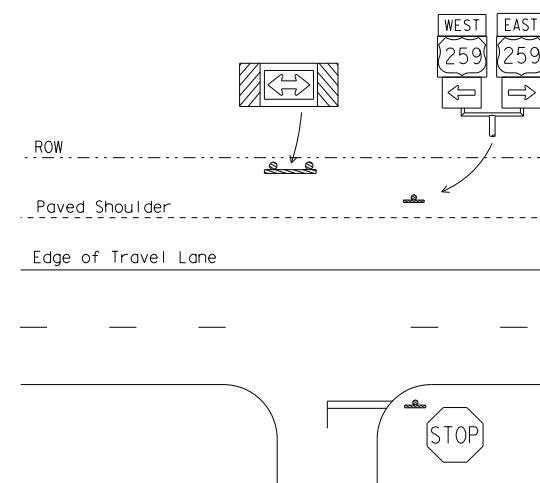
BEHIND BARRIER



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

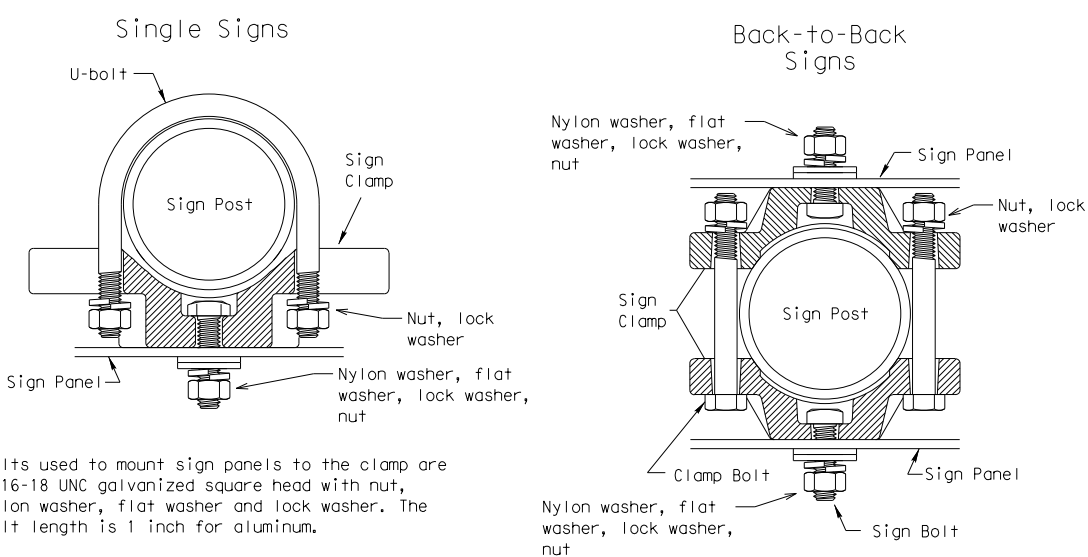


BEHIND CONCRETE BARRIER
 **Sign clearance based on distance required for proper guard rail or concrete barrier performance.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:
 (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
 (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.
 The maximum values may be increased when directed by the Engineer.
 See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.
 The website address is:
<http://www.txdot.gov/publications/traffic.htm>

TYPICAL SIGN ATTACHMENT DETAIL



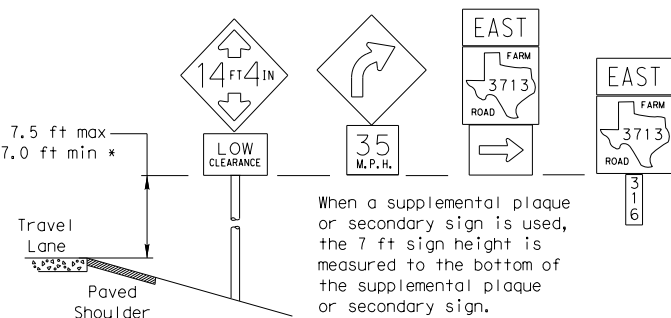
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

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

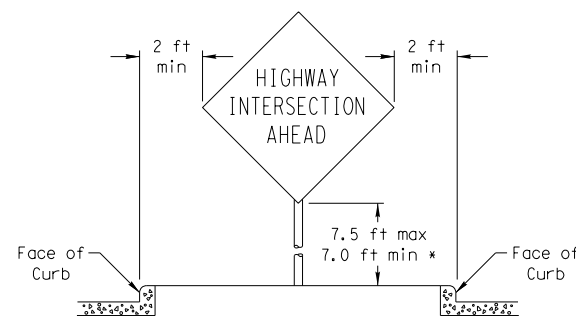
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES

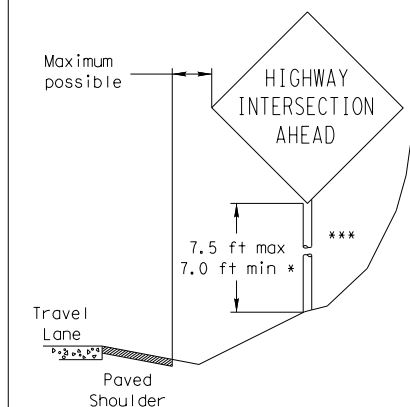


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY (When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.



SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS SMD(GEN)-08

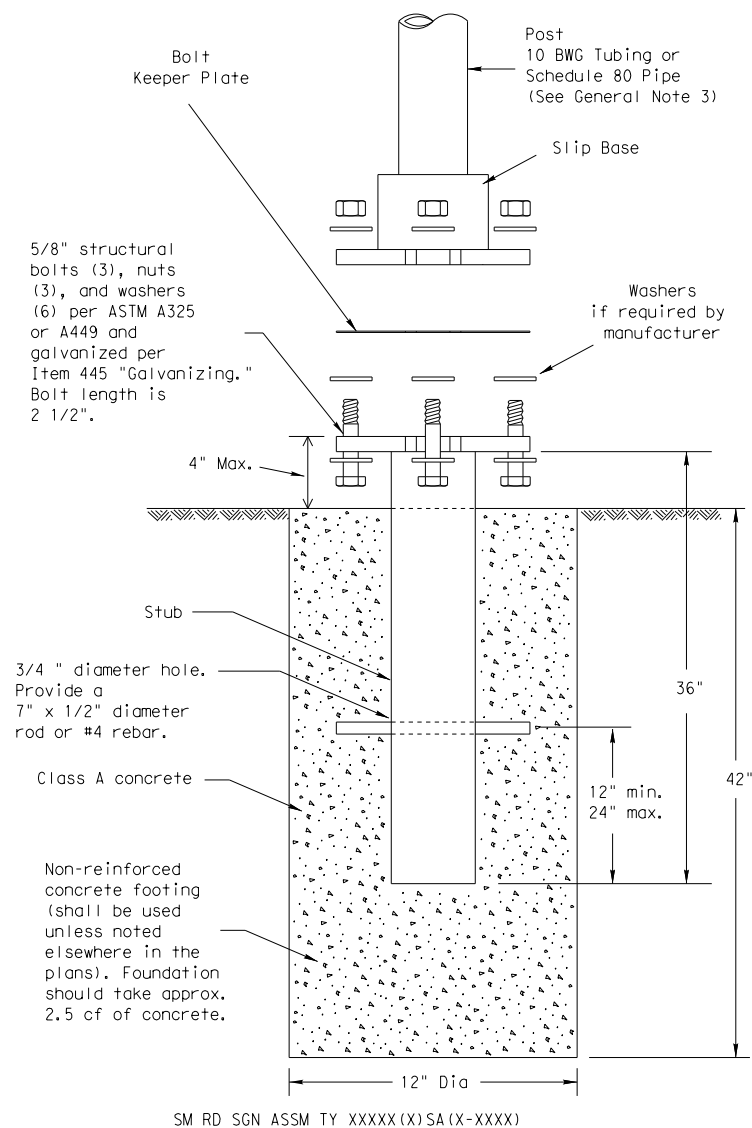
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9-08	REVISIONS	CONT	SECT	JOB
		0003	08	064, ETC.
		DIST	COUNTY	B.I. 20B, ETC.
		ODA	REEVES, ETC.	SHEET NO.
				55

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TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

- Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
- Material used as post with this system shall conform to the following specifications:
 - 10 BWG Tubing (2.875" outside diameter)
 - 0.134" nominal wall thickness
 - Seamless or electric-resistance welded steel tubing or pipe
 - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
 - Other steels may be used if they meet the following:
 - 55,000 PSI minimum yield strength
 - 70,000 PSI minimum tensile strength
 - 20% minimum elongation in 2"
 - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
 - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
 - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
 - Schedule 80 Pipe (2.875" outside diameter)
 - 0.276" nominal wall thickness
 - Steel tubing per ASTM A500 Gr C
 - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
 - 46,000 PSI minimum yield strength
 - 62,000 PSI minimum tensile strength
 - 21% minimum elongation in 2"
 - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
 - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
 - Galvanization per ASTM A123
- See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

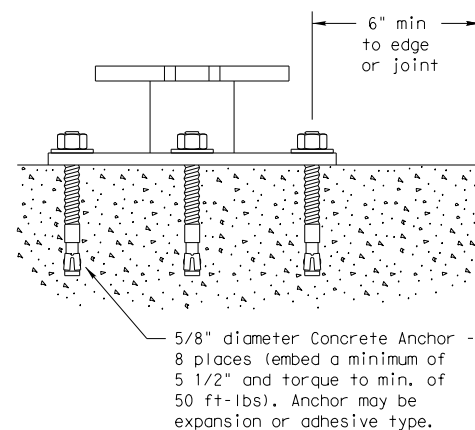
Foundation

- Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
- The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
- Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support

- Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
- Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

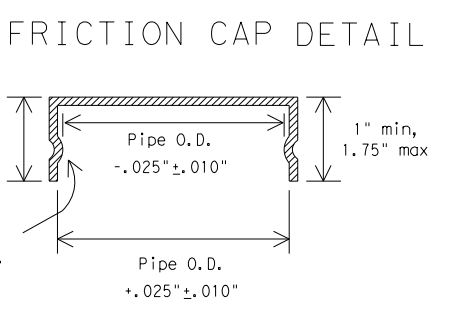
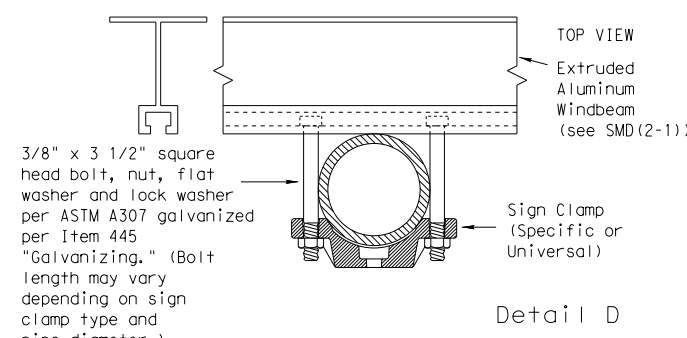
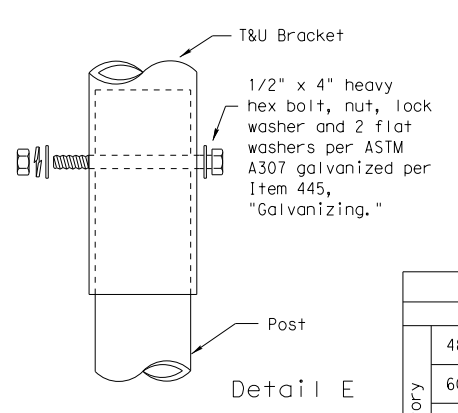
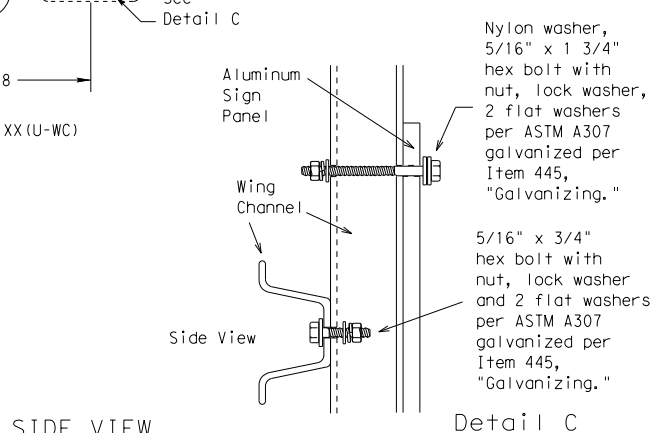
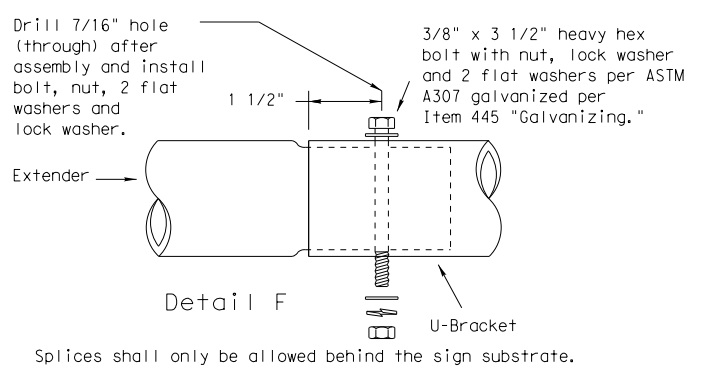
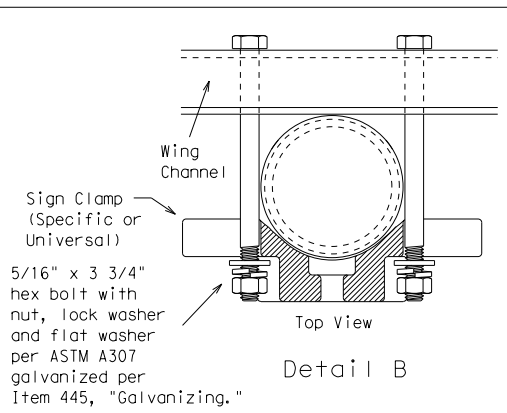
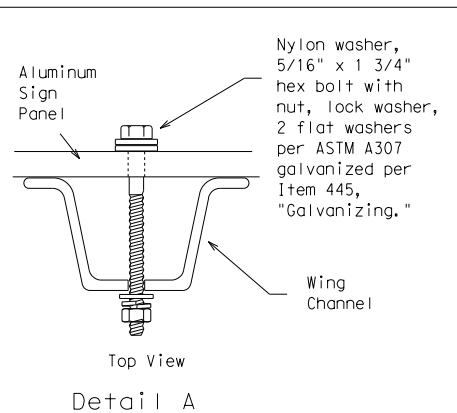
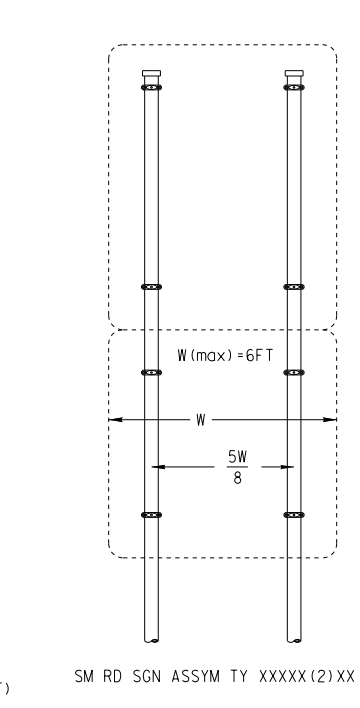
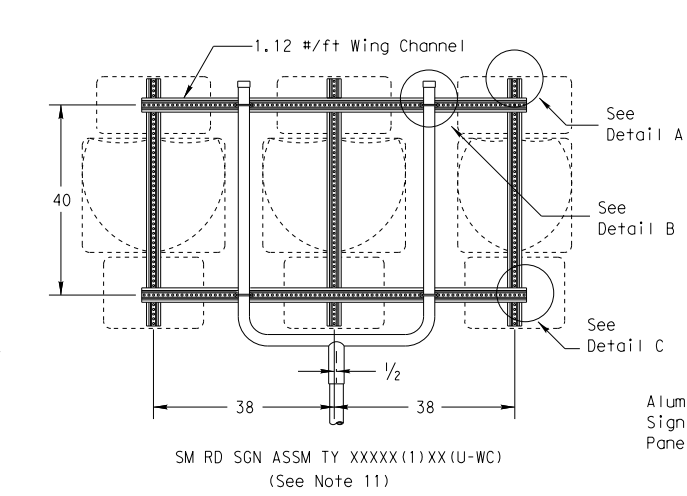
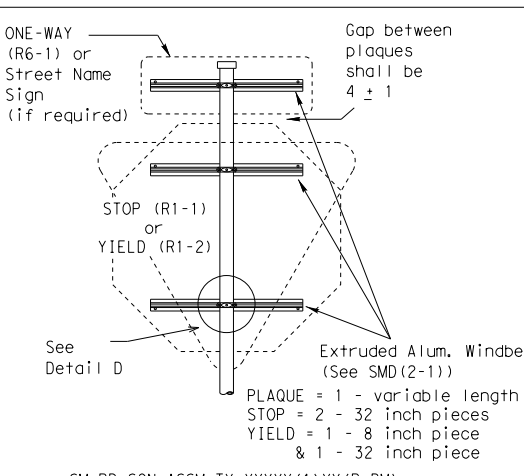
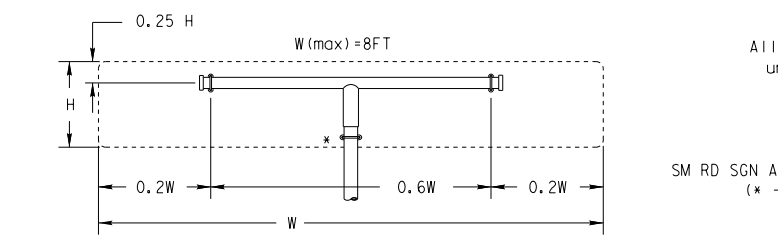
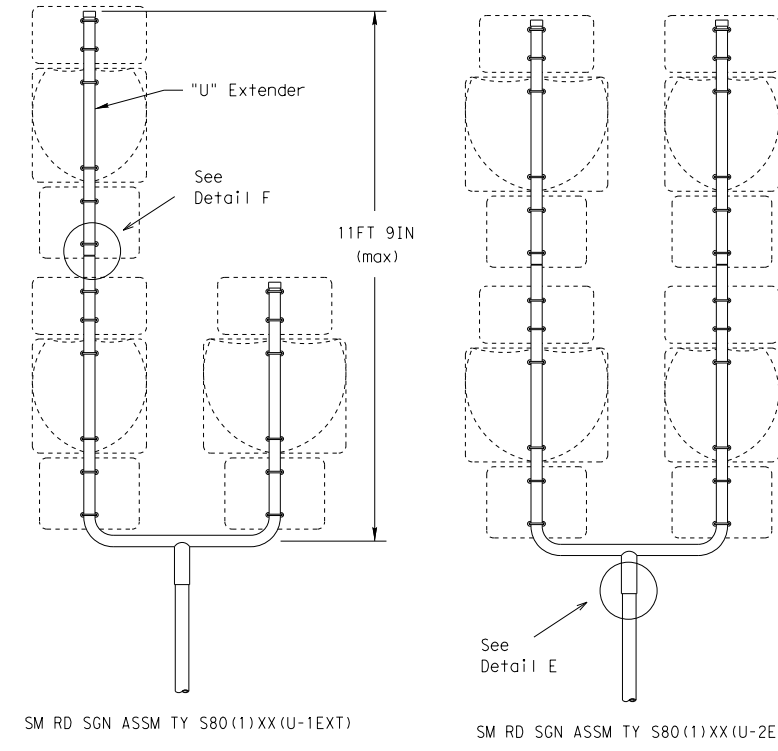
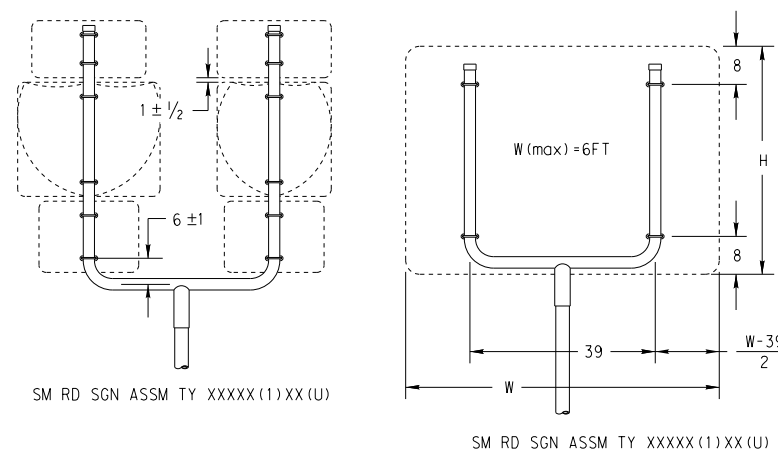
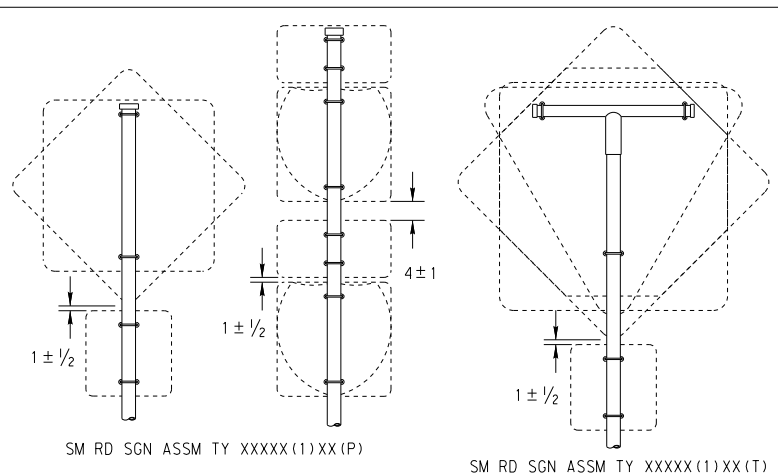
 Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
 SMALL ROADSIDE SIGNS
 TRIANGULAR SLIPBASE SYSTEM
 SMD(SLIP-1)-08

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9-08	CONT	SECT	JOB	HIGHWAY
	0003	08	064, ETC.	BI 20B, Etc.
	DIST	COUNTY		SHEET NO.
	ODA	REEVES, Etc.		56

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All dimensions are in english unless detailed otherwise.

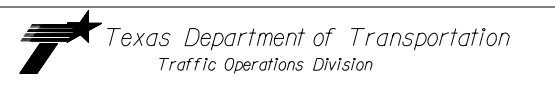
SM RD SGN ASSM TY XXXX(1)XX(T) (* - See Note 12)

GENERAL NOTES:

- | SIGN SUPPORT | # OF POSTS | MAX. SIGN AREA |
|--------------|------------|----------------|
| 10 BWG | 1 | 16 SF |
| 10 BWG | 2 | 32 SF |
| Sch 80 | 1 | 32 SF |
| Sch 80 | 2 | 64 SF |
- The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
- When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
- Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
- 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.
- Post open ends shall be fitted with Friction Caps.
- Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT		
SIGN DESCRIPTION	SUPPORT	
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	48x60-inch signs	TY S80(1)XX(T)
	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)	

Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes. The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture. Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

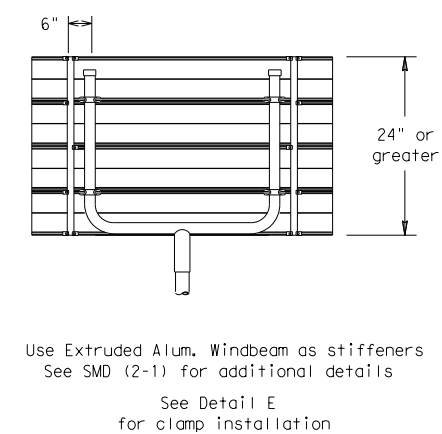
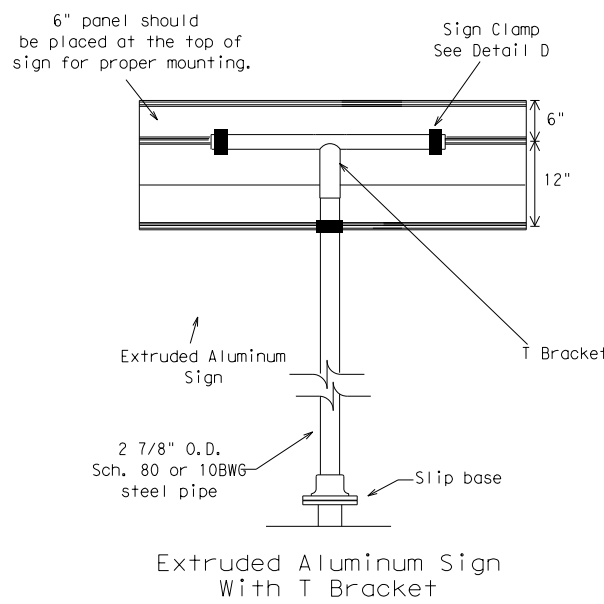
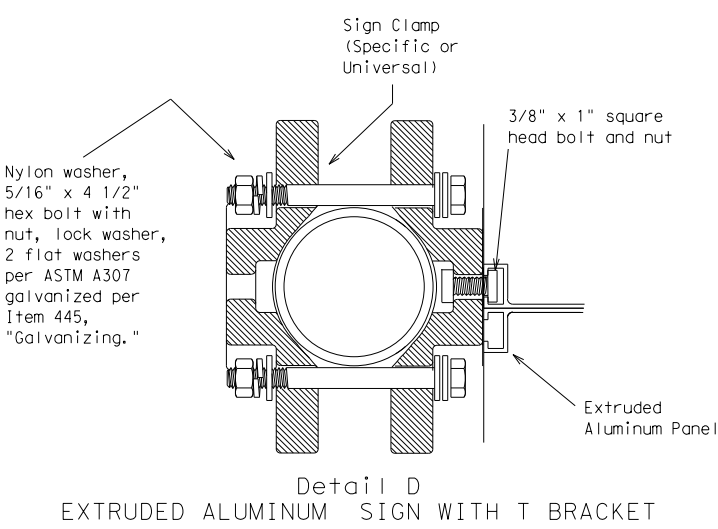
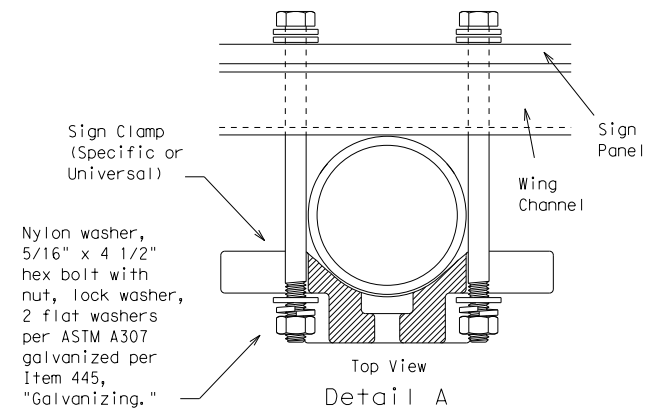
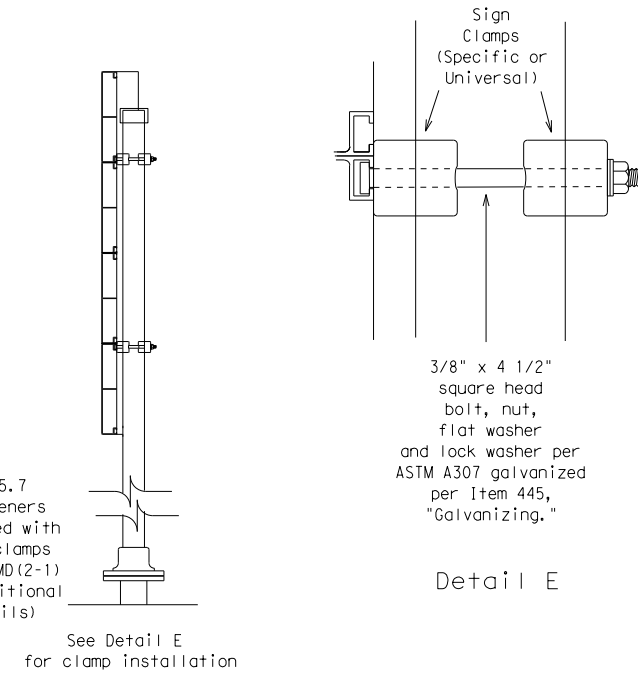
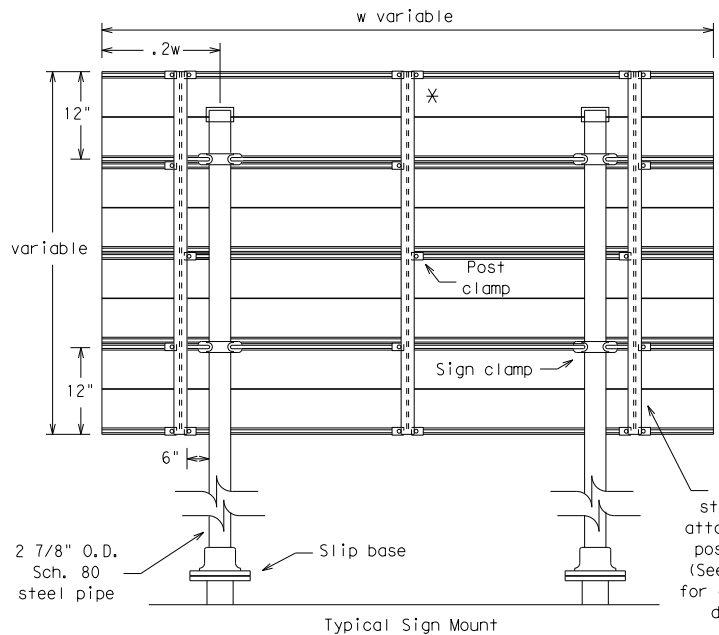
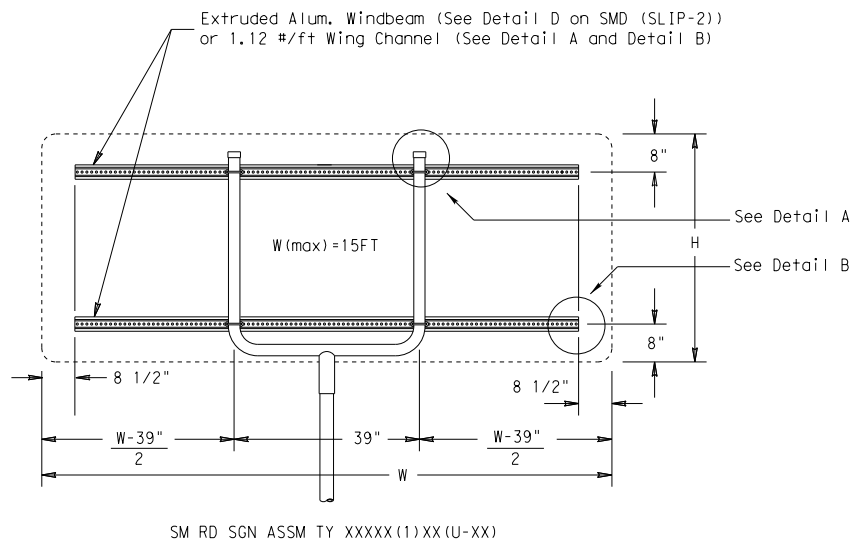
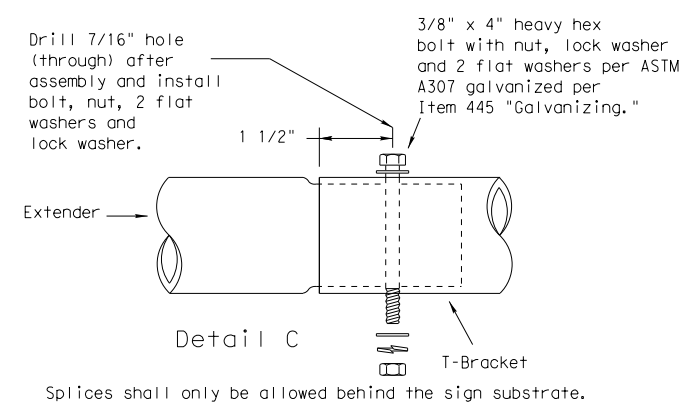
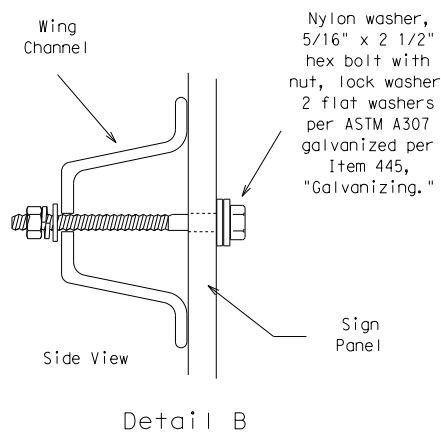
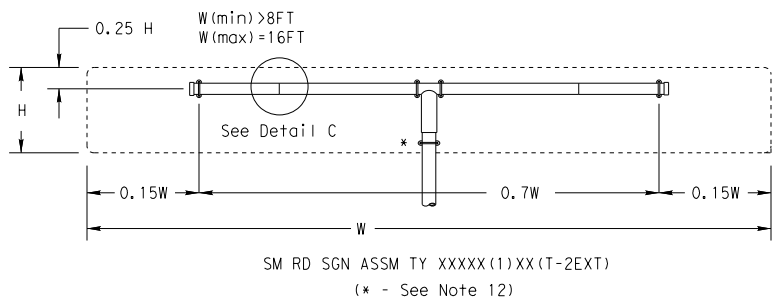


SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM
SMD(SLIP-2)-08

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9-08	REVISONS	CON: 0003	SECT: 08	JOB: 064, ETC.
		DIST: ODA	COUNTY: REEVES, Etc.	HIGHWAY: BI 20B, Etc.
				SHEET NO. 57

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GENERAL NOTES:

- | SIGN SUPPORT | # OF POSTS | MAX. SIGN AREA |
|--------------|------------|----------------|
| 10 BWG | 1 | 16 SF |
| 10 BWG | 2 | 32 SF |
| Sch 80 | 1 | 32 SF |
| Sch 80 | 2 | 64 SF |
- The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
- When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
- Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	48x60-inch signs	TY S80(1)XX(T)
	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

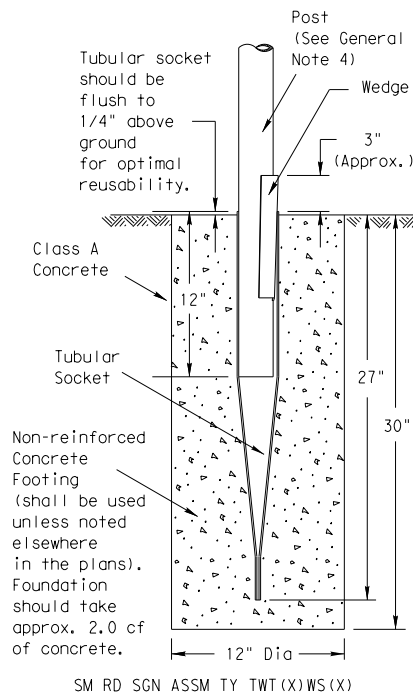


SIGN MOUNTING DETAILS
 SMALL ROADSIDE SIGNS
 TRIANGULAR SLIPBASE SYSTEM
 SMD(SLIP-3) -08

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		DIST	COUNTY		SHEET NO.
		ODA	REEVES, ETC.		58

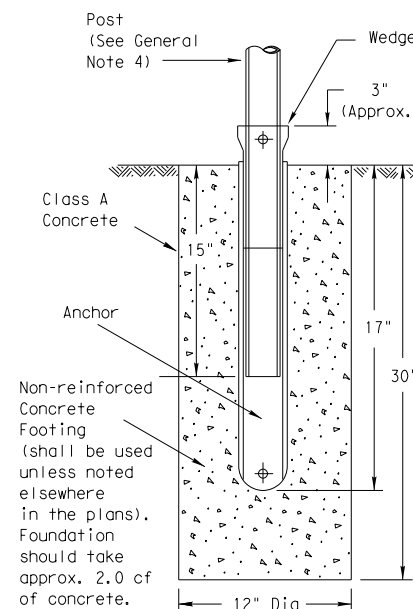
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Wedge Anchor Steel System



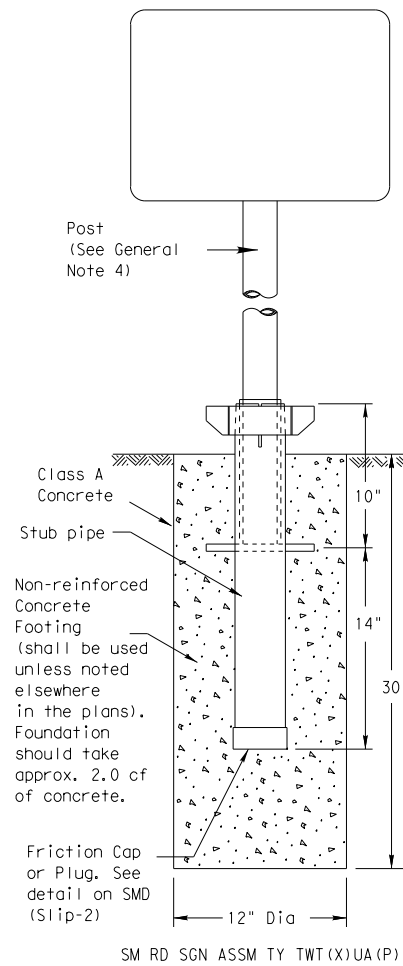
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

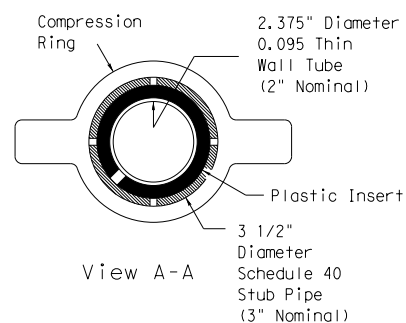
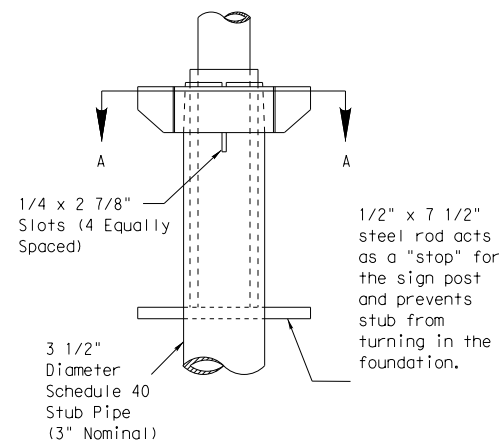


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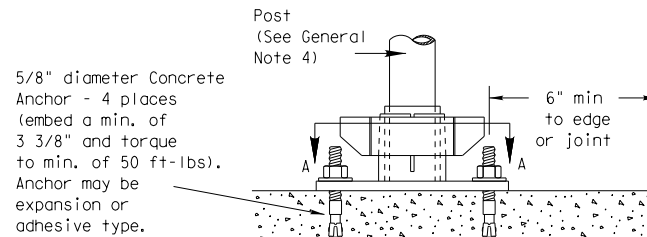
Universal Anchor System with Thin-Walled Tubing Post



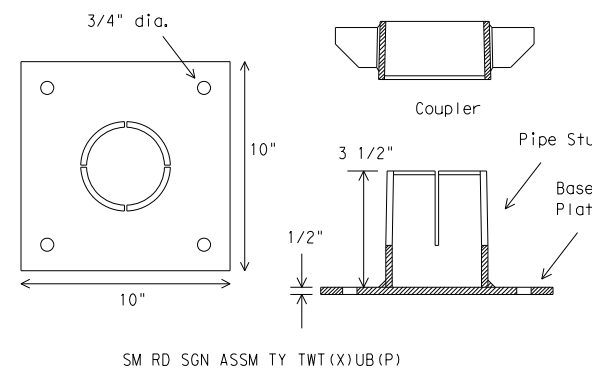
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Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

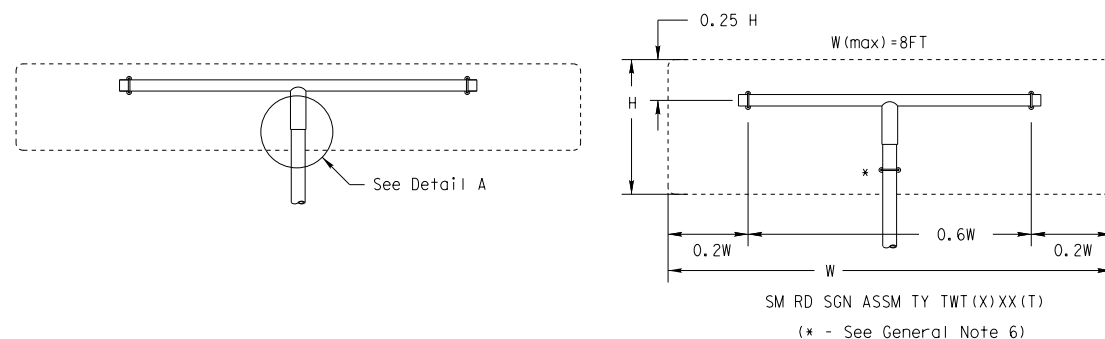


Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxy and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.

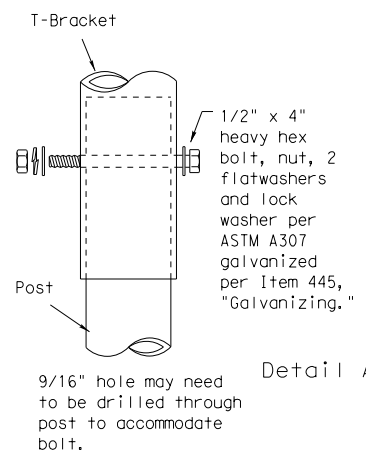


SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post



SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

NOTE

The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

- The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
- The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
- Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer_list.htm
- Material used as post with this system shall conform to the following specifications:
 - 13 BWG Tubing (2.375" outside diameter) (TWT)
 - 0.095" nominal wall thickness
 - Seamless or electric-resistance welded steel tubing
 - 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
 - 18% minimum elongation in 2"
 - Wall thickness (uncoated) shall be within the range of .083" to .099"
 - Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
 - Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- 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. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
- Insert tubular socket into concrete until top of socket is approximately 1/4" above the concrete footing.
- Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer.
- Attach the sign to the sign post.
- Insert the sign post into socket and align sign face with roadway.
- Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

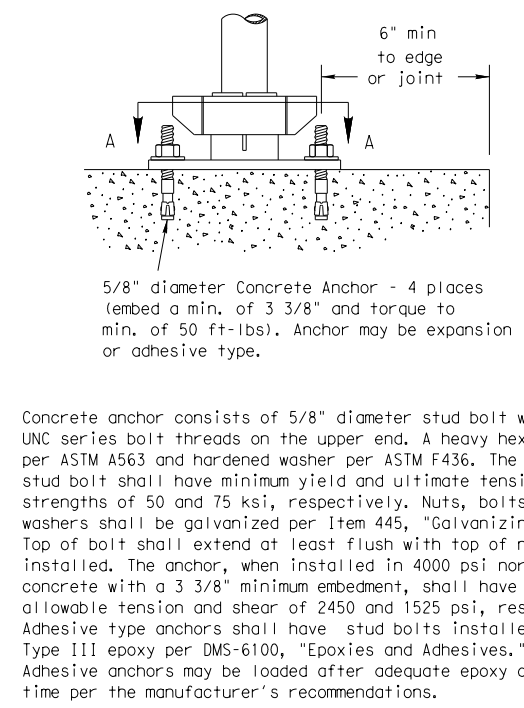
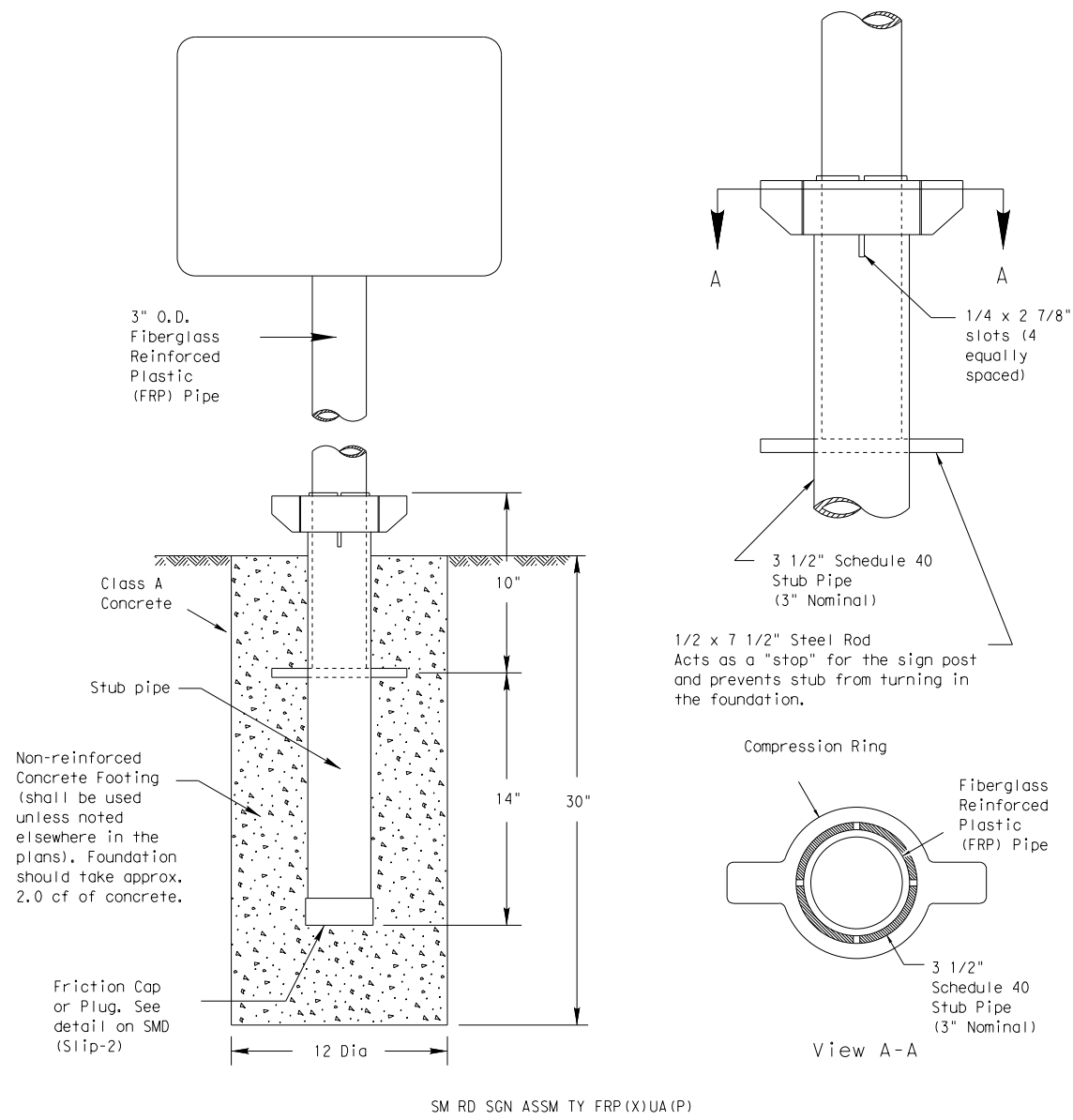
- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- Insert base post in hole to depths shown and backfill hole with concrete.
- Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
- Attach the sign to the sign post.
- Install plastic insert around bottom of post.
- Insert sign post into base post. Lower until the post comes to rest on steel rod.
- Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
- Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.



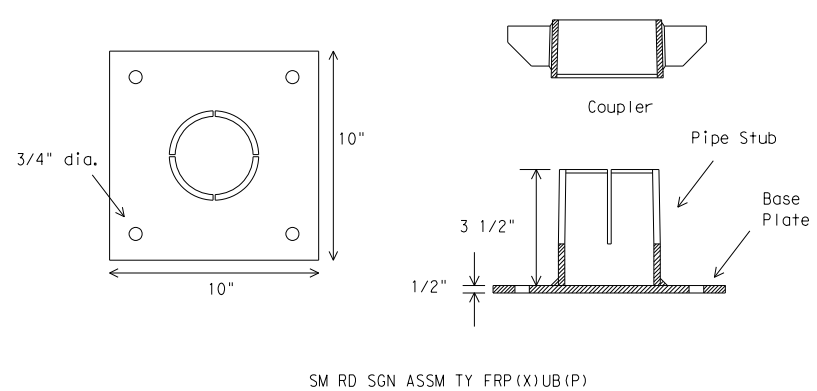
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST SMD(TWT) - 08

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Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post



BOLT-DOWN DETAILS



GENERAL NOTES:

- FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet.
- All nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing."
- See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: <http://www.txdot.gov/publications/traffic.htm>

FRP POST REQUIREMENTS

- Materials shall conform to the requirements of Departmental Material Specification DMS-4410 and will be furnished in a yellow or gray color as specified elsewhere in the plans.
- Thickness of FRP sign support is 0.125" + 0.031", - 0.0".
- FRP sign supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing: Texas Department of Transportation Traffic Operations Division 125 East 11th Street Austin, Texas 78701-2483

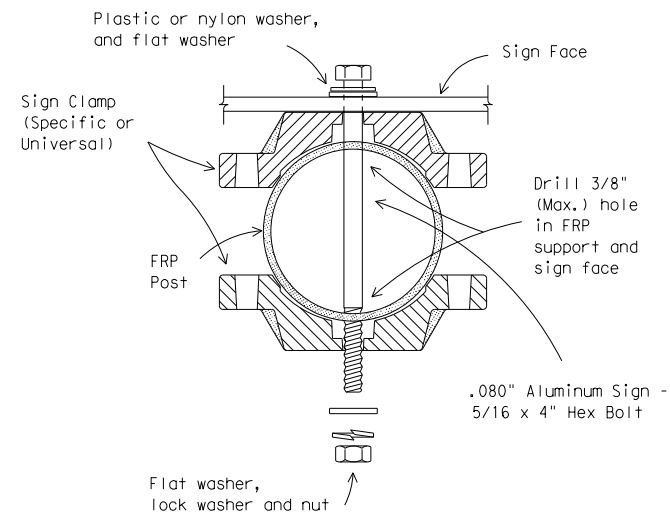
UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD (GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- 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.
- Insert base post in foundation hole to depths shown and fill hole with concrete. Cut base post from bottom and ensure a minimum of 18" embedment if installed in solid rock.
- Level and plumb the base post with coupler using a torpedo level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer. Bottom of base post slots shall be above the concrete footing.
- Attach sign to FRP post.
- Insert sign post into base post. Lower until the post comes to rest on the steel rod.
- Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
- Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

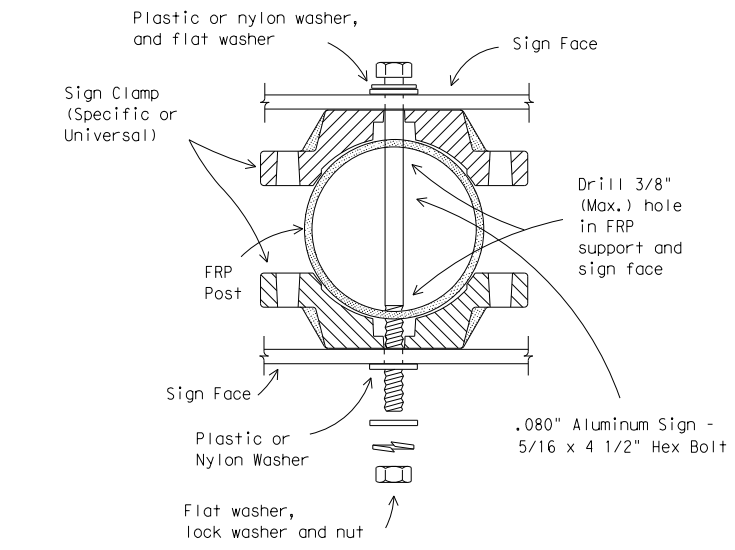
BOLT DOWN SIGN SUPPORT

- Position base plate with coupler on existing concrete.
- Drill holes into concrete and insert the 5/8" diameter bolts with wedge anchors, and tighten nuts.
- Attach sign to FRP post.
- Insert bottom of sign post into pipe stub.
- Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
- Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

Typical Sign Mounting Detail for FRP Support with Single Sign




Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs



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Texas Department of Transportation
Traffic Operations Division

**SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
UNIVERSAL ANCHOR SYSTEM
WITH FRP POST**

SMD (FRP) -08

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		DIST	COUNTY		SHEET NO.
		ODA	REEVES, Etc.		60

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GENERAL NOTES FOR ALL ELECTRICAL WORK

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

CONDUIT

A. MATERIALS

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

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

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

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

B. CONSTRUCTION METHODS

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

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ELECTRICAL DETAILS
CONDUITS & NOTES

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		ODA	REEVES, Etc.		61

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.

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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.

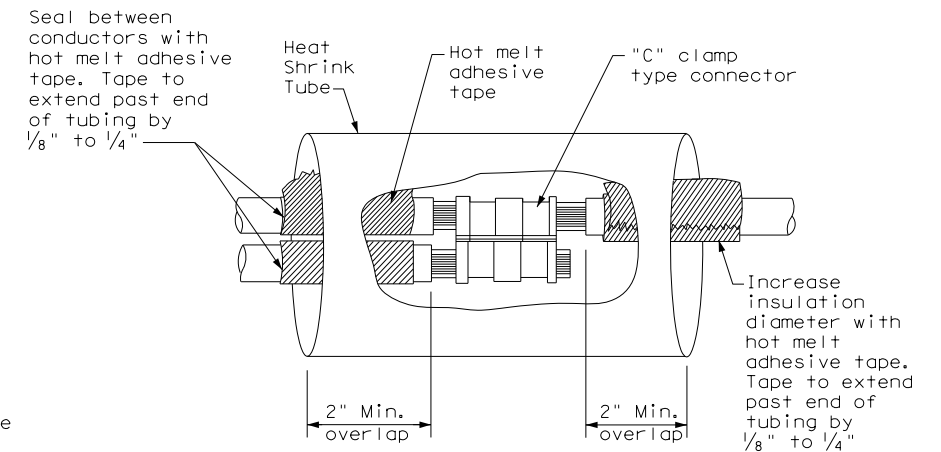
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

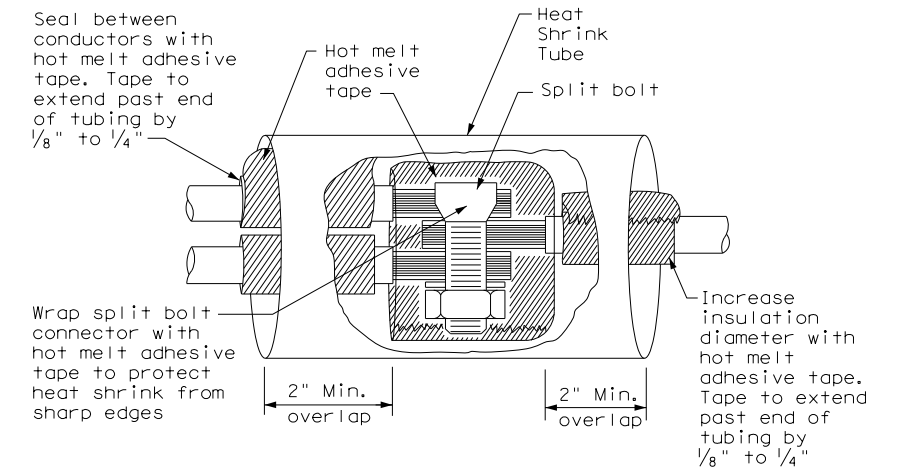
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in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

B. CONSTRUCTION METHODS

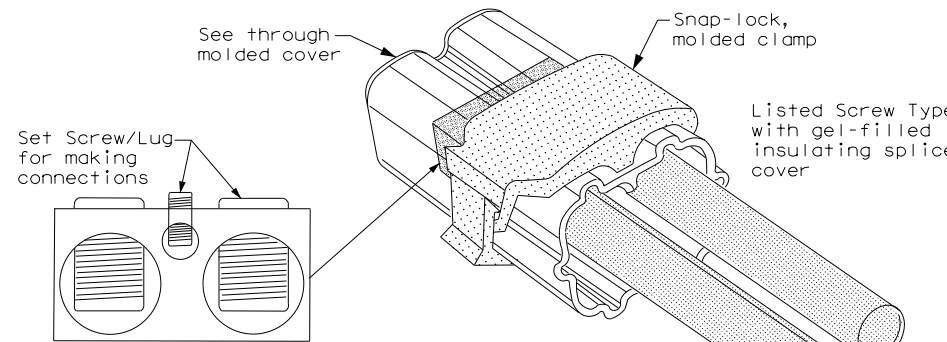
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil,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

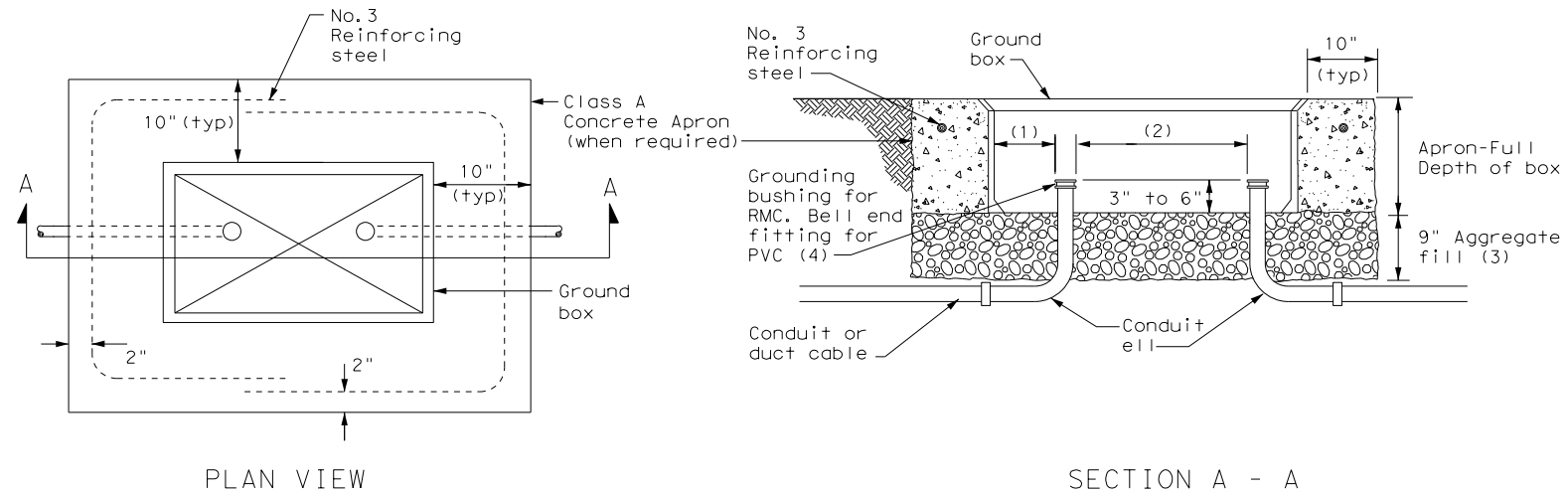


SPLICE OPTION 3
Listed Screw Type

		Texas Department of Transportation		Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS CONDUCTORS</h2>					
<h3>ED(3) - 14</h3>					
FILE:	ed3-14.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2014	CONT:	0003	SECT:	08
REVISIONS		JOB		HIGHWAY	
		064, ETC.		BI 20B, Etc.	
		COUNTY		SHEET NO.	
		ODA		REEVES, Etc.	
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APRON FOR GROUND BOX

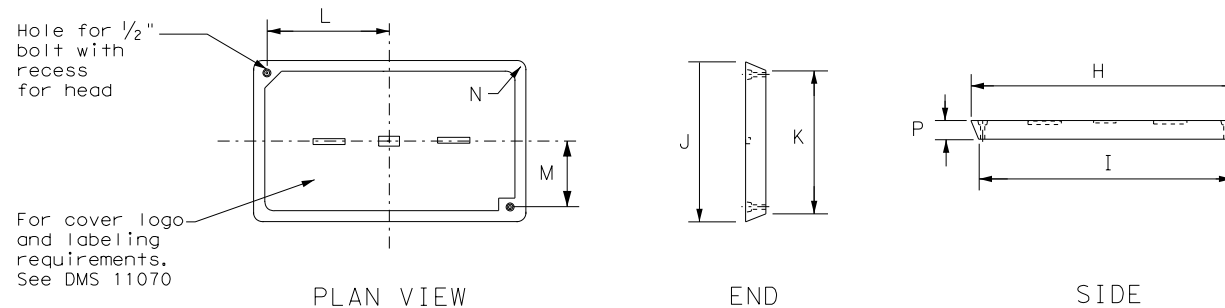
- (1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.
- (2) Maintain sufficient space between conduits to allow for proper installation of bushing.
- (3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.
- (4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS

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

GROUND BOX COVER DIMENSIONS

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



GROUND BOX COVER

GROUND BOXES

A. MATERIALS

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.

DATE:
FILE:



Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4) - 14

FILE: ed4-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT: 0003	SECT: 08	JOB: 064, ETC.	HIGHWAY: BI 20B, ETC.
REVISIONS		DIST: ODA	COUNTY: REEVES, ETC.	SHEET NO: 63

ELECTRICAL SERVICES NOTES

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

SERVICE ASSEMBLY ENCLOSURE

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

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

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

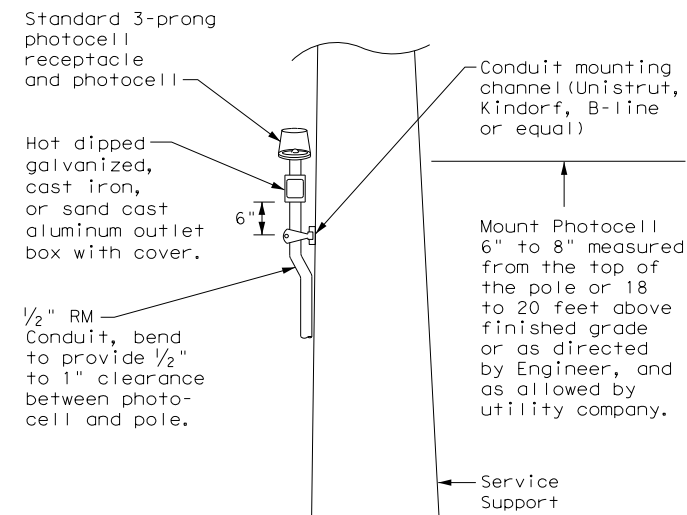
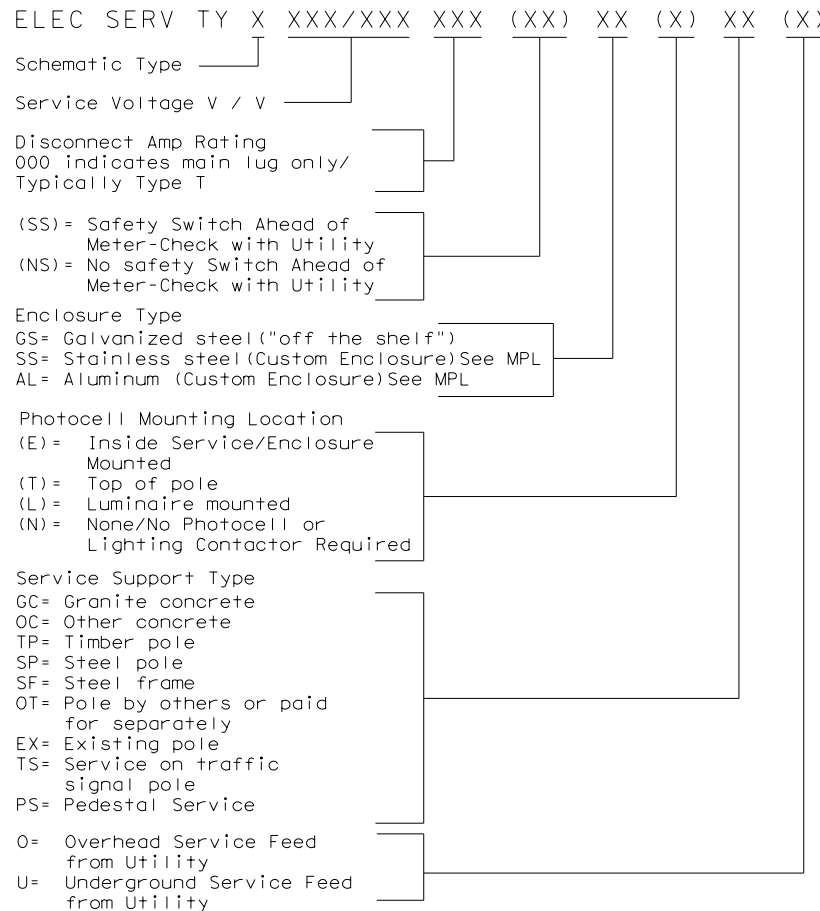
PHOTOELECTRIC CONTROL

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

* ELECTRICAL SERVICE DATA												
Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
RM 2401	24	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	2"	3/#6	60	2P/60	60	N/A	Lighting EB	1P/20	5	2.7
									Lighting WB	1P/20	5	
									Lighting SB	1P/20	5	
ANTIGUA DR	30	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	2"	3/#6	60	2P/60	60	N/A	Lighting NB	1P/20	5	1.3
									Lighting SB	1P/20	3	
VALENCIA ST	31	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	2"	3/#6	60	2P/60	60	N/A	Lighting NB	1P/20	5	1.3
									Lighting SB	1P/20	3	
FM 1379	33	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	2"	3/#6	60	2P/60	60	N/A	Lighting EB,WB & SB	1P/20	7,7,5	4.9
FM 1450	42	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	2"	3/#6	60	2P/60	60	N/A	Lighting EB,WB,NB & SB	1P/20	3,3,3,3	3.6
BI 20	44	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	2"	3/#6	60	2P/60	60	N/A	Lighting EB & WB	1P/20	3,3	1.8

* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.
 ** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National Electrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.



ELECTRICAL DETAILS SERVICE NOTES & DATA

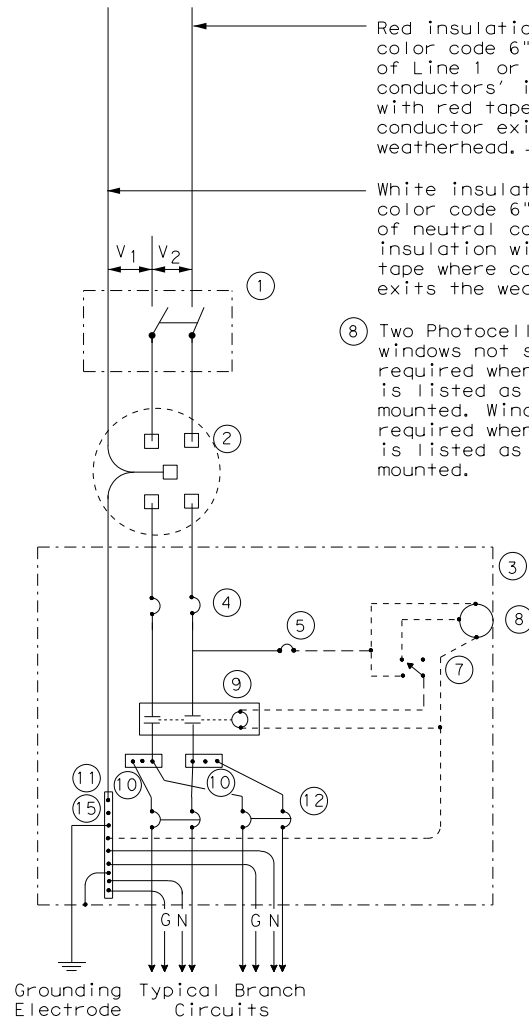
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FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	08	064, ETC.	BI 20B, ETC.
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	ODA	REEVES, ETC.	64	

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SCHEMATIC TYPE A
THREE WIRE

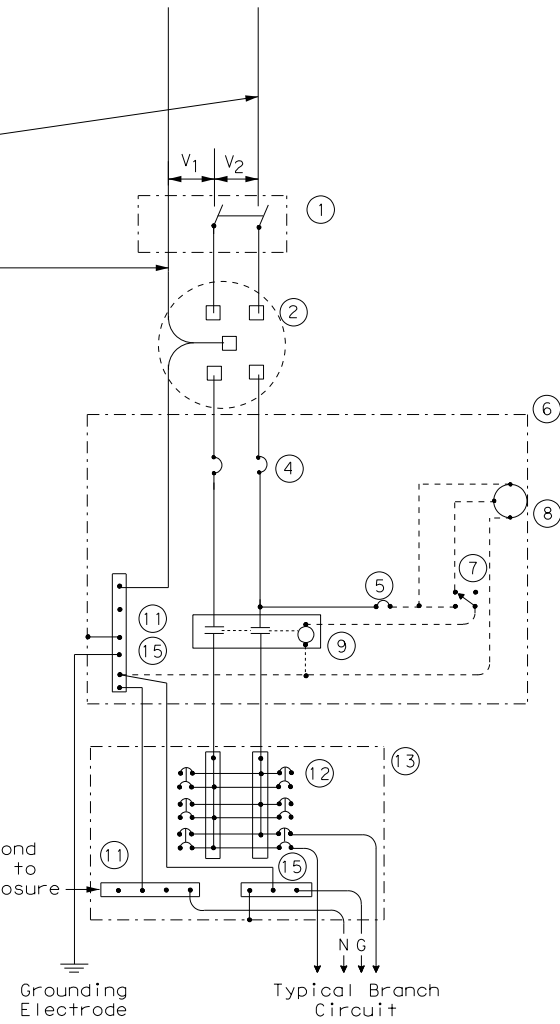
Red insulation or color code 6" length of Line 1 or Line 2 conductors' insulation with red tape where conductor exits the weatherhead.

White insulation or color code 6" length of neutral conductors' insulation with white tape where conductor exits the weatherhead.

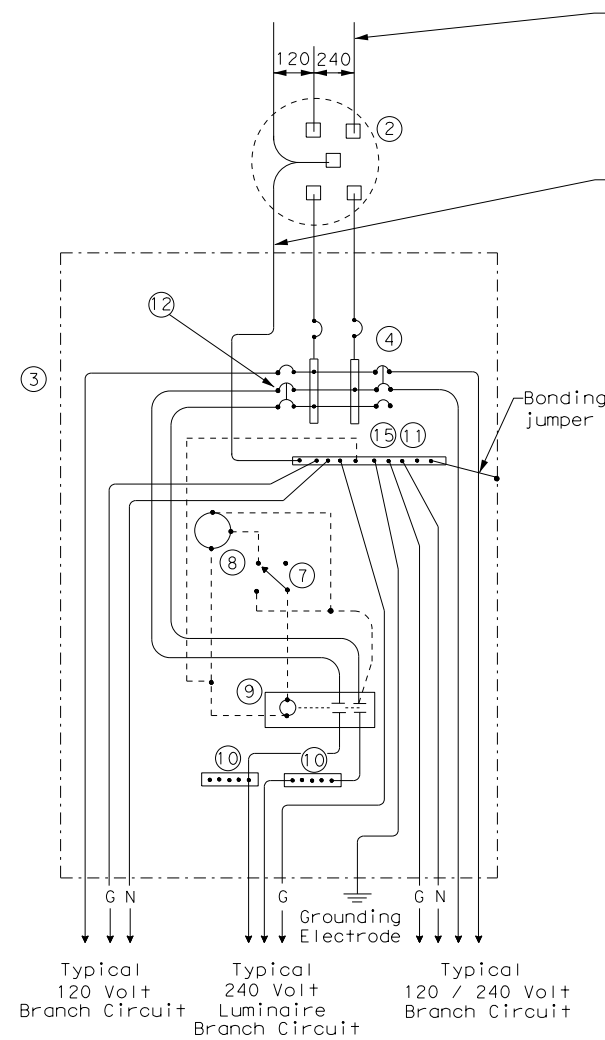
⑧ Two Photocell viewing windows not shown but required when photocell is listed as enclosure mounted. Windows not required when photocell is listed as pole top mounted.

Do not bond this bus to the enclosure

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



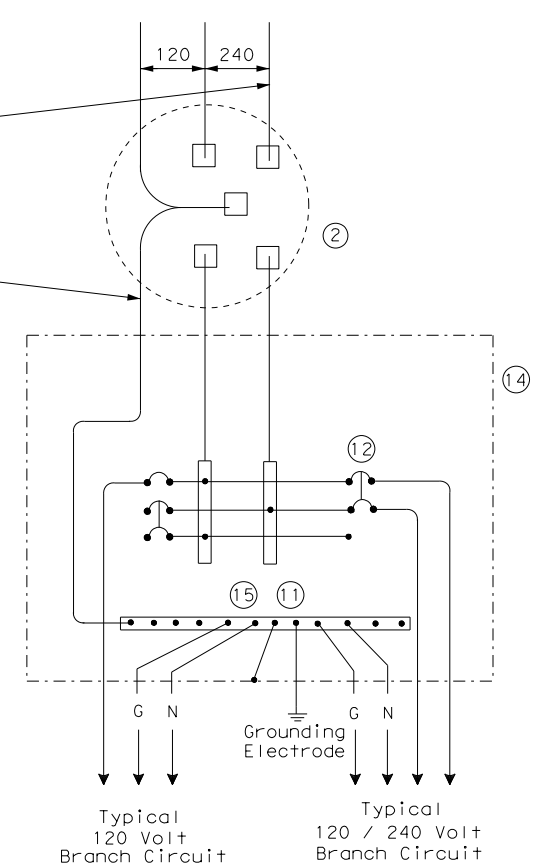
SCHEMATIC TYPE C
THREE WIRE



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

Red insulation or color code 6" length of Line 1 or Line 2 conductors' insulation with red tape where conductor exits the weatherhead.

White insulation or color code 6" length of neutral conductors' insulation with white tape where conductor exits the weatherhead.



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

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

				Traffic Operations Division Standard	
ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES					
ED(6) - 14					
FILE:	ed6-14.dgn	DN:	TxDOT	CK:	TxDOT
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REVISIONS		JOB:	064, ETC.		BI 20B, Etc.
		DIST:	COUNTY:	SHEET NO.	
		ODA:	REEVES, Etc.	65	

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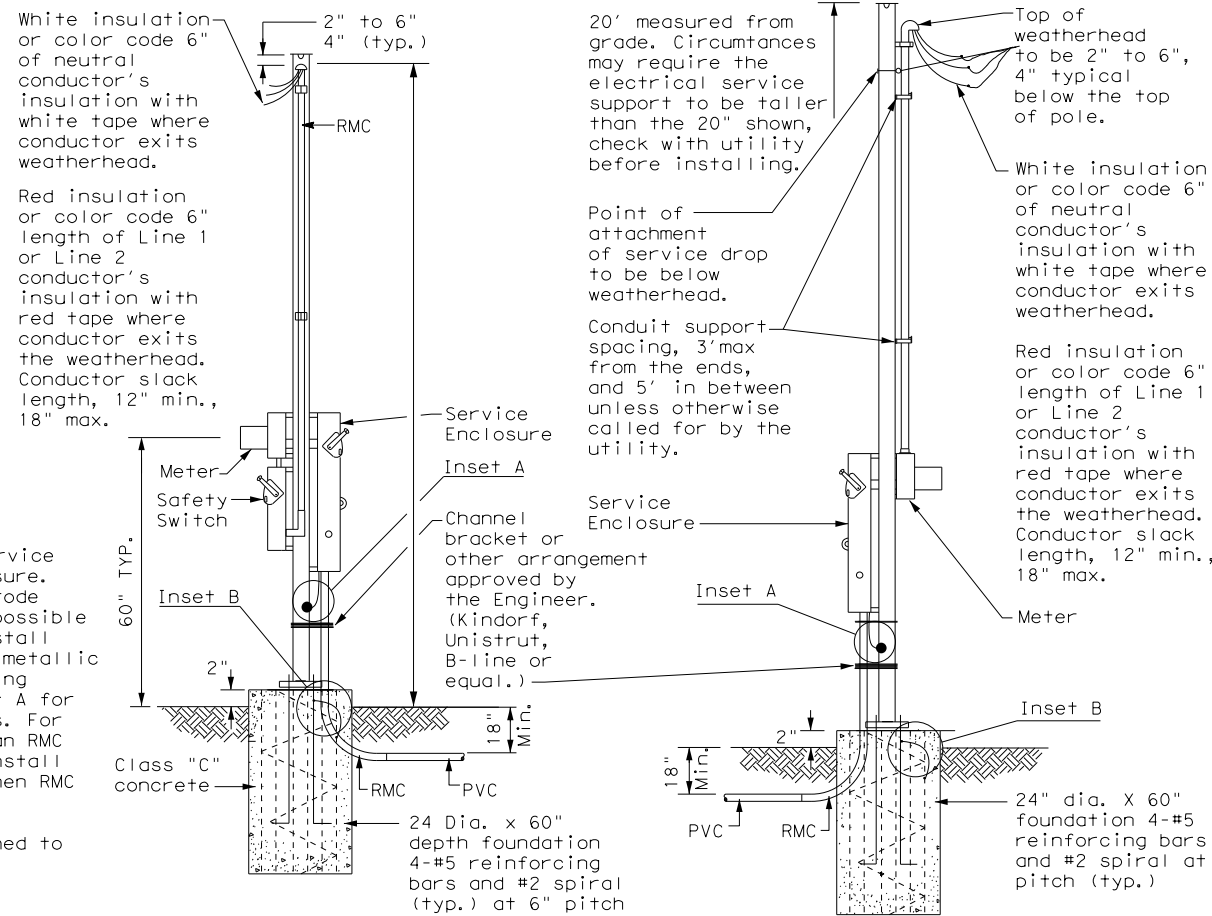
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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

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 1/2 in. or 1 3/8 in. wide by 1 in. up to 3 3/4 in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not 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 3/4 in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized 3/4 in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 1/4 in. to 3 1/2 in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.
4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.
5. Furnish and install rigid metallic 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 1/2 in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.
8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.
9. Provide 1/4" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.
10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.
11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

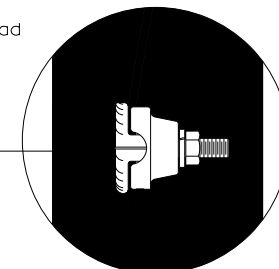
White insulation or color code 6" of neutral conductor's insulation with white tape where conductor exits weatherhead.

Red insulation or color code 6" length of Line 1 or Line 2 conductor's insulation with red tape where conductor exits the weatherhead. Conductor slack length, 12" min., 18" max.

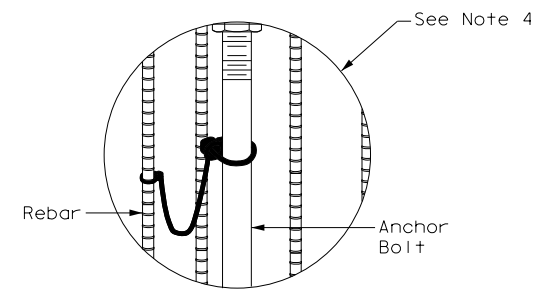


WITH SAFETY SWITCH
WITHOUT SAFETY SWITCH
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE

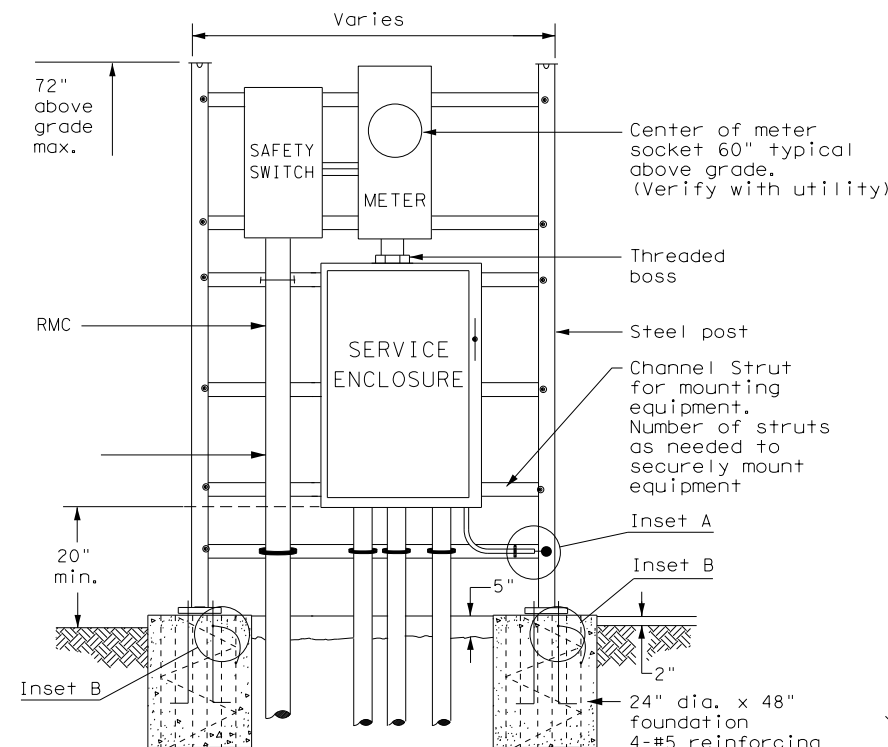
Drill, tap, and thread 1/2" X 13 UNC. Install tank ground fitting, connect electrical service grounding electrode conductor. See Note 7.



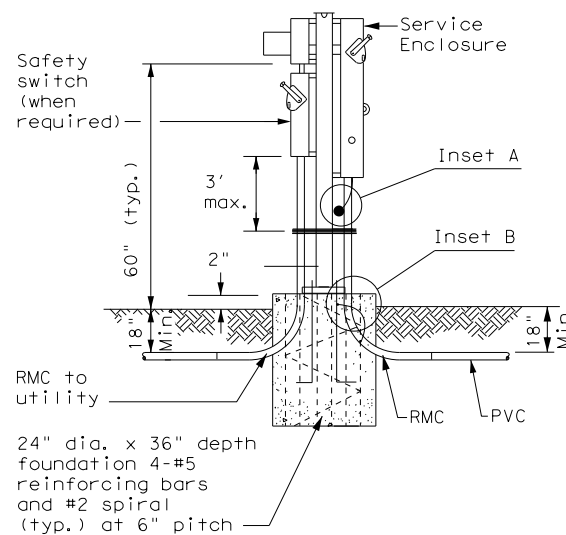
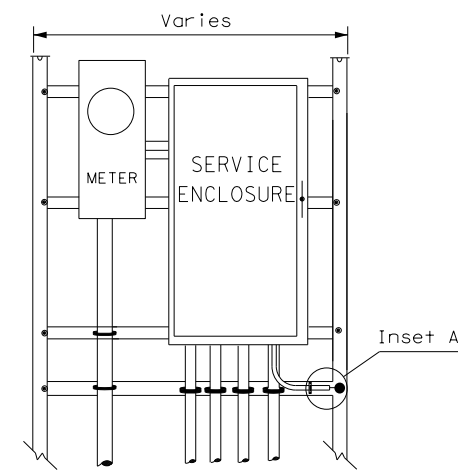
FRONT VIEW
INSET A



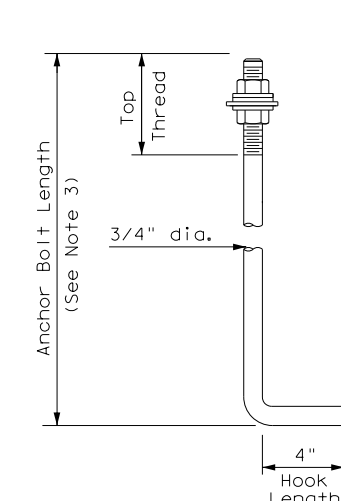
INSET B



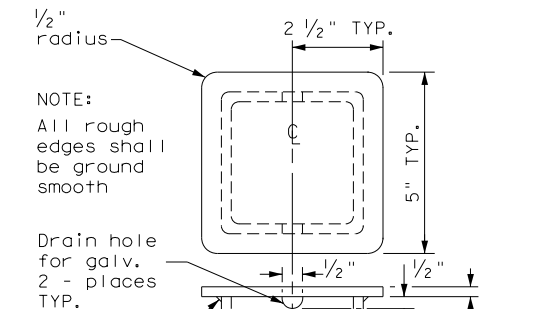
WITH SAFETY SWITCH
WITHOUT SAFETY SWITCH
SERVICE SUPPORT TYPE SF (U) - UNDERGROUND SERVICE



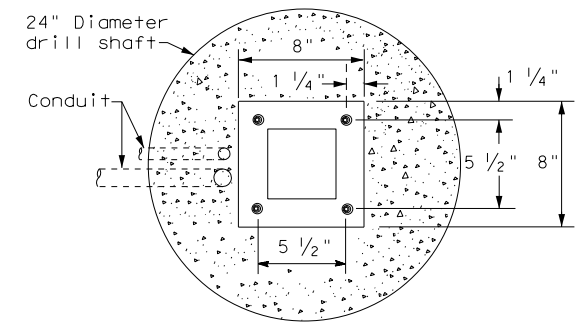
WITH SAFETY SWITCH
WITHOUT SAFETY SWITCH
SERVICE SUPPORT TYPE SP (U) - UNDERGROUND SERVICE



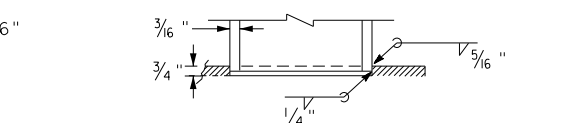
HOOKED ANCHOR DETAIL



POLE TOP PLATE

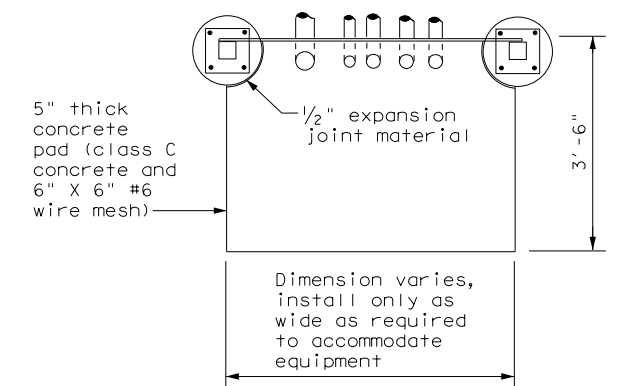


BASE PLATE DETAIL



BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



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



ELECTRICAL DETAILS
SERVICE SUPPORT
TYPES SF & SP
ED(7) - 14

FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	DIST: ODA	COUNTY: REEVES, ETC.	SHEET NO. 66	

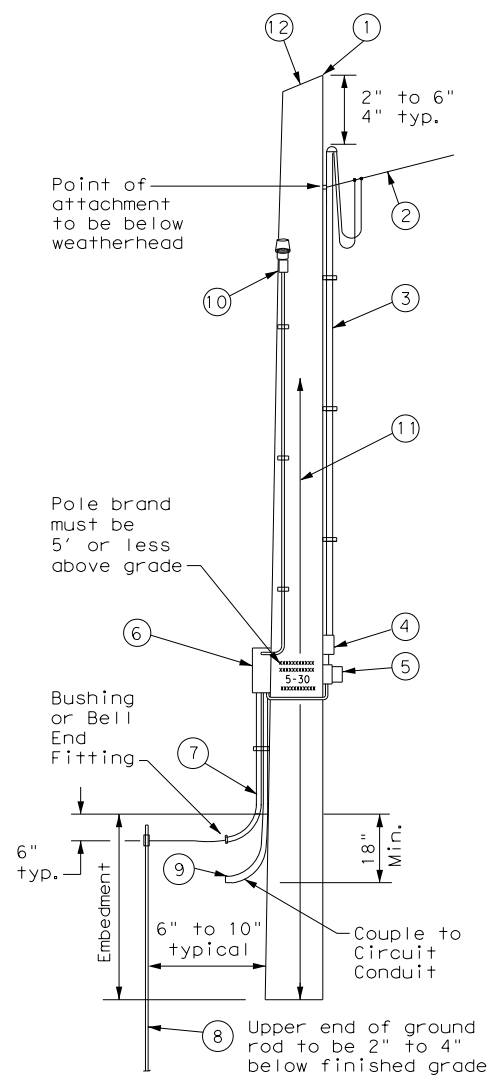
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TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrical service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to $\frac{3}{8}$ in. max. depth and $1\frac{1}{8}$ in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to $3\frac{3}{4}$ in. maximum depth, and $1\frac{1}{2}$ in. to $1\frac{5}{8}$ in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, $\frac{1}{4}$ in. minimum diameter by $1\frac{1}{2}$ in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

- 1 Class 5 pole, height as required
- 2 Service drop from utility company (attached below weatherhead)
- 3 Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)
- 4 Safety switch (when required)
- 5 Meter (when required)
- 6 Service enclosure
- 7 6 AWG bare grounding electrode conductor in $\frac{1}{2}$ in. PVC to ground rod - extend $\frac{1}{2}$ in. PVC 6 in. underground.
- 8 $\frac{5}{8}$ in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.
- 9 RMC same size as branch circuit conduit.
- 10 See pole-top mounted photocell detail on ED(5).
- 11 When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.
- 12 When required by utility, cut top of pole at an angle to enhance rain run off.

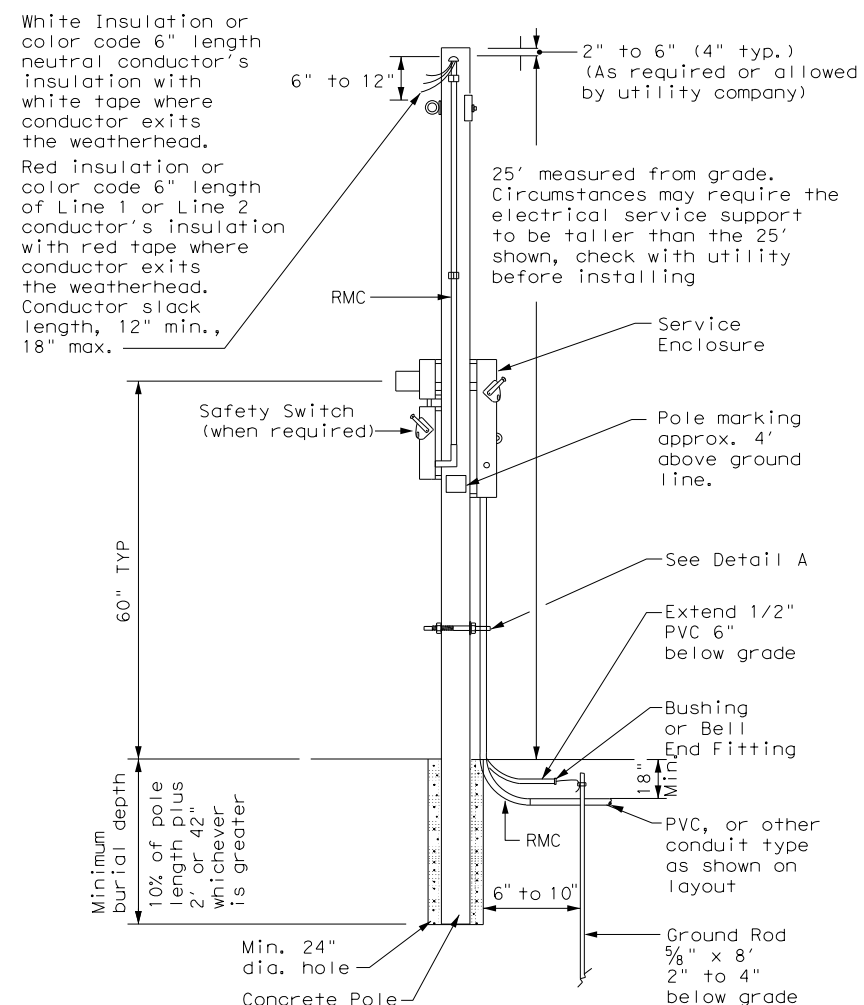


SERVICE SUPPORT TYPE TP (O)

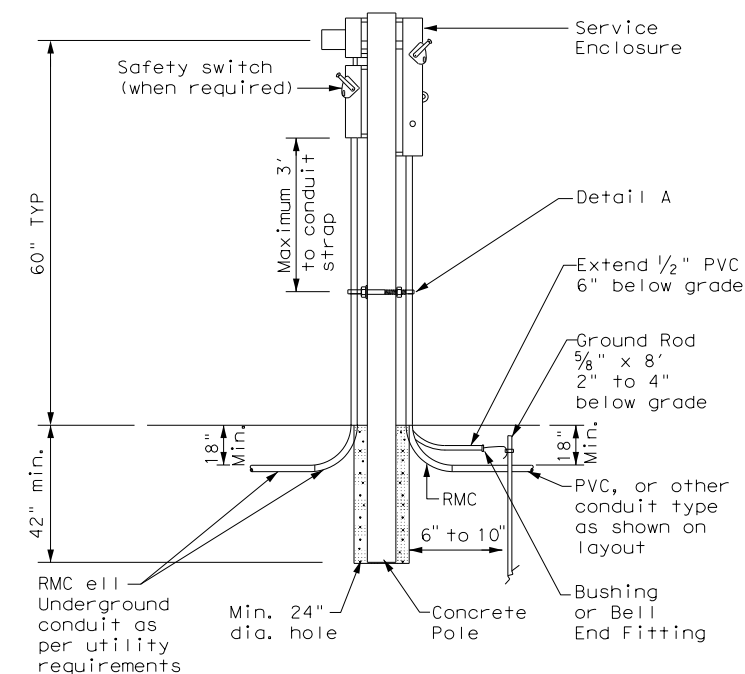
GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

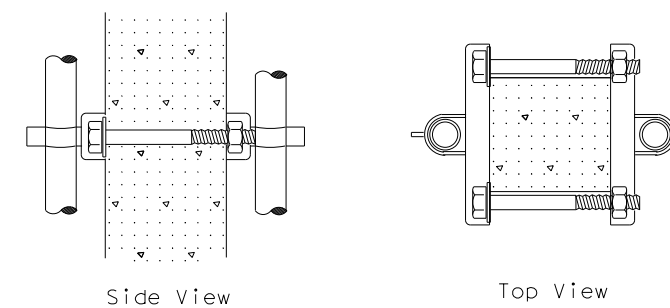
1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized or stainless steel channel strut $1\frac{1}{2}$ in. or $1\frac{5}{8}$ in. wide by 1 in. up to $3\frac{3}{4}$ in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



CONCRETE SERVICE SUPPORT Overhead (O)



CONCRETE SERVICE SUPPORT Underground (U)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.



ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

FILE: ed10-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0003	08	064, ETC.	BI 20B, ETC.
	DIST	COUNTY	SHEET NO.	
	ODA	REEVES, ETC.	67	

SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

Nominal Mounting Ht. (ft)	Shoe Base				Quantity	T-Base				Quantity	CSB/SSCB Mounted				Quantity
	Designation					Designation					Designation				
	Pole	A1	A2	Luminaire		Pole	A1	A2	Luminaire		Pole	A1	A2	Luminaire	
20	(Type SA 20 S - 4)			(150W EQ) LED		(Type SA 20 T - 4)			(150W EQ) LED						
	(Type SA 20 S - 4 - 4)			(150W EQ) LED		(Type SA 20 T - 4 - 4)			(150W EQ) LED						
30	(Type SA 30 S - 4)			(250W EQ) LED		(Type SA 30 T - 4)			(250W EQ) LED		(Type SP 28 S - 4)		(250W EQ) LED		
	(Type SA 30 S - 4 - 4)			(250W EQ) LED		(Type SA 30 T - 4 - 4)			(250W EQ) LED		(Type SP 28 S - 4 - 4)		(250W EQ) LED		
40	(Type SA 30 S - 8)			(250W EQ) LED		(Type SA 30 T - 8)			(250W EQ) LED		(Type SP 28 S - 8)		(250W EQ) LED		
	(Type SA 30 S - 8 - 8)			(250W EQ) LED		(Type SA 30 T - 8 - 8)			(250W EQ) LED		(Type SP 28 S - 8 - 8)		(250W EQ) LED		
	(Type SA 40 S - 4)			(250W EQ) LED		(Type SA 40 T - 4)			(250W EQ) LED		(Type SP 38 S - 4)		(250W EQ) LED		
	(Type SA 40 S - 4 - 4)			(250W EQ) LED		(Type SA 40 T - 4 - 4)			(250W EQ) LED		(Type SP 38 S - 4 - 4)		(250W EQ) LED		
	(Type SA 40 S - 8)			(250W EQ) LED		(Type SA 40 T - 8)			(250W EQ) LED		(Type SP 38 S - 8)		(250W EQ) LED		
	(Type SA 40 S - 8 - 8)			(250W EQ) LED		(Type SA 40 T - 8 - 8)			(250W EQ) LED		(Type SP 38 S - 8 - 8)		(250W EQ) LED		
50	(Type SA 40 S - 10)			(250W EQ) LED		(Type SA 40 T - 10)			(250W EQ) LED		(Type SP 38 S - 10)		(250W EQ) LED		
	(Type SA 40 S - 10 - 10)			(250W EQ) LED		(Type SA 40 T - 10 - 10)			(250W EQ) LED		(Type SP 38 S - 10 - 10)		(250W EQ) LED		
	(Type SA 40 S - 12)			(250W EQ) LED		(Type SA 40 T - 12)			(250W EQ) LED		(Type SP 38 S - 12)		(250W EQ) LED		
	(Type SA 40 S - 12 - 12)			(250W EQ) LED		(Type SA 40 T - 12 - 12)			(250W EQ) LED		(Type SP 38 S - 12 - 12)		(250W EQ) LED		
	(Type SA 50 S - 4)			(400W EQ) LED		(Type SA 50 T - 4)			(400W EQ) LED		(Type SP 48 S - 4)		(400W EQ) LED		
	(Type SA 50 S - 4 - 4)			(400W EQ) LED		(Type SA 50 T - 4 - 4)			(400W EQ) LED		(Type SP 48 S - 4 - 4)		(400W EQ) LED		
	(Type SA 50 S - 8)			(400W EQ) LED		(Type SA 50 T - 8)			(400W EQ) LED		(Type SP 48 S - 8)		(400W EQ) LED		
	(Type SA 50 S - 8 - 8)			(400W EQ) LED		(Type SA 50 T - 8 - 8)			(400W EQ) LED		(Type SP 48 S - 8 - 8)		(400W EQ) LED		
	(Type SA 50 S - 10)			(400W EQ) LED		(Type SA 50 T - 10)			(400W EQ) LED		(Type SP 48 S - 10)		(400W EQ) LED		
	(Type SA 50 S - 10 - 10)			(400W EQ) LED		(Type SA 50 T - 10 - 10)			(400W EQ) LED		(Type SP 48 S - 10 - 10)		(400W EQ) LED		
(Type SA 50 S - 12)			(400W EQ) LED		(Type SA 50 T - 12)			(400W EQ) LED		(Type SP 48 S - 12)		(400W EQ) LED			
(Type SA 50 S - 12 - 12)			(400W EQ) LED		(Type SA 50 T - 12 - 12)			(400W EQ) LED		(Type SP 48 S - 12 - 12)		(400W EQ) LED			

OTHER				
Designation				Quantity
Pole	A1	A2	Luminaire	
(Type AL 50 T - 10)			(400W EQ) LED	29
(Type AL 50 T - 10 - 10)			(400W EQ) LED	8

GENERAL NOTES:

- All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.
- The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.
- Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.
- Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.
 - Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
 - Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
 - Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
 - Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.
- Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.
 - Meet all of the requirements stated above for optional steel pole designs and the following:
 - Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
 - Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
 - Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
 - Pole components shall be constructed using the following material:
 - Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
 - Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
 - Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
 - Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
 - Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
 - Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.
- Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.
- Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS

(TYPE SA 50 T - X - X) (400W EQ) LED

SA: Pole and mast arm may be steel or aluminum.
 ST: Pole and mast arm must be steel.
 AL: Pole and mast arm must be aluminum.
 SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.

Next letter denotes type of base, (S-Shoe Base, T-Transformer Base, or B-Bridge/Ret.Wall Mount)

First number denotes length of mast arm in feet.

Use of second mast arm is indicated by second dashed number which denotes length in feet.

Luminaire rating in watts (i.e. 400W). Equivalent wattage LED fixtures will include EQ (i.e. 400W EQ)

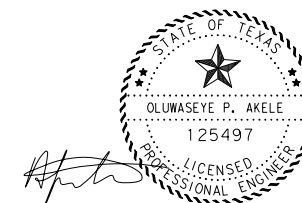
Last letters indicate light source (S - High Pressure Sodium; LED - LED luminaire)

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ROADWAY ILLUMINATION POLES
 RIP(1) - 19

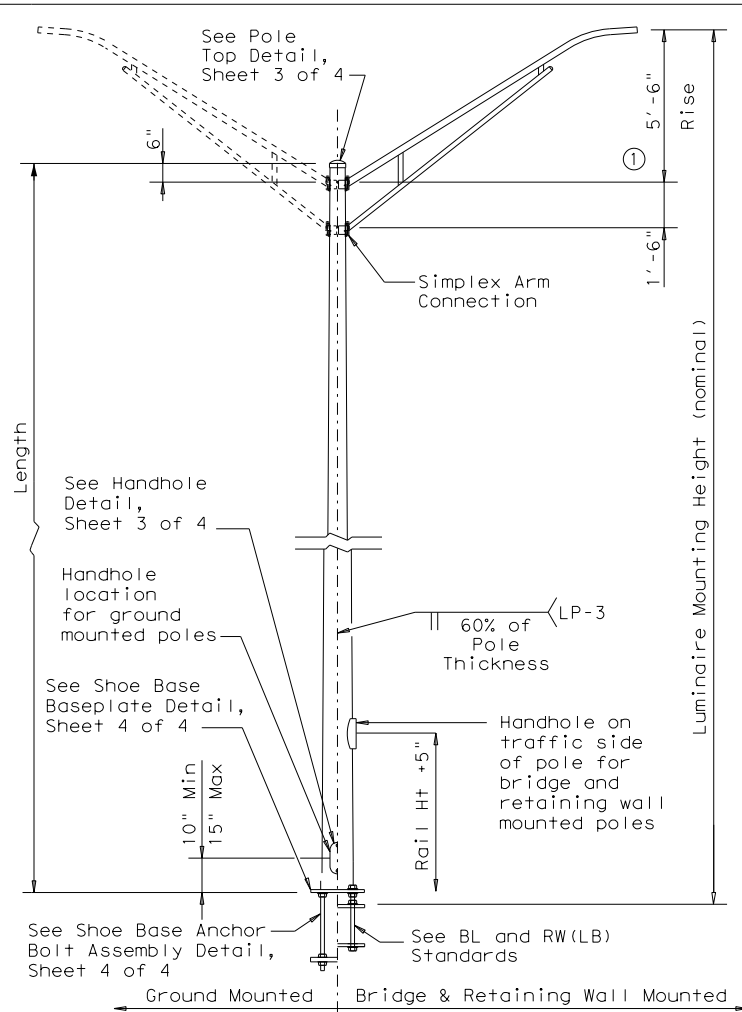


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12-19	DIST	COUNTY	SHEET NO.	
	ODA	REEVES, ETC.	68	

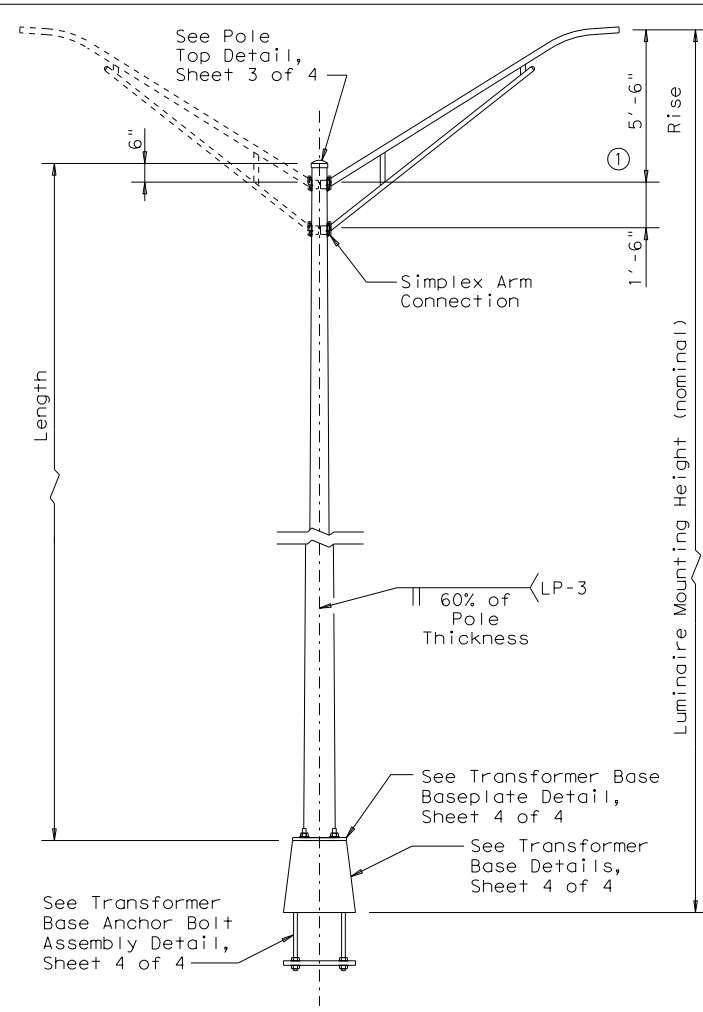
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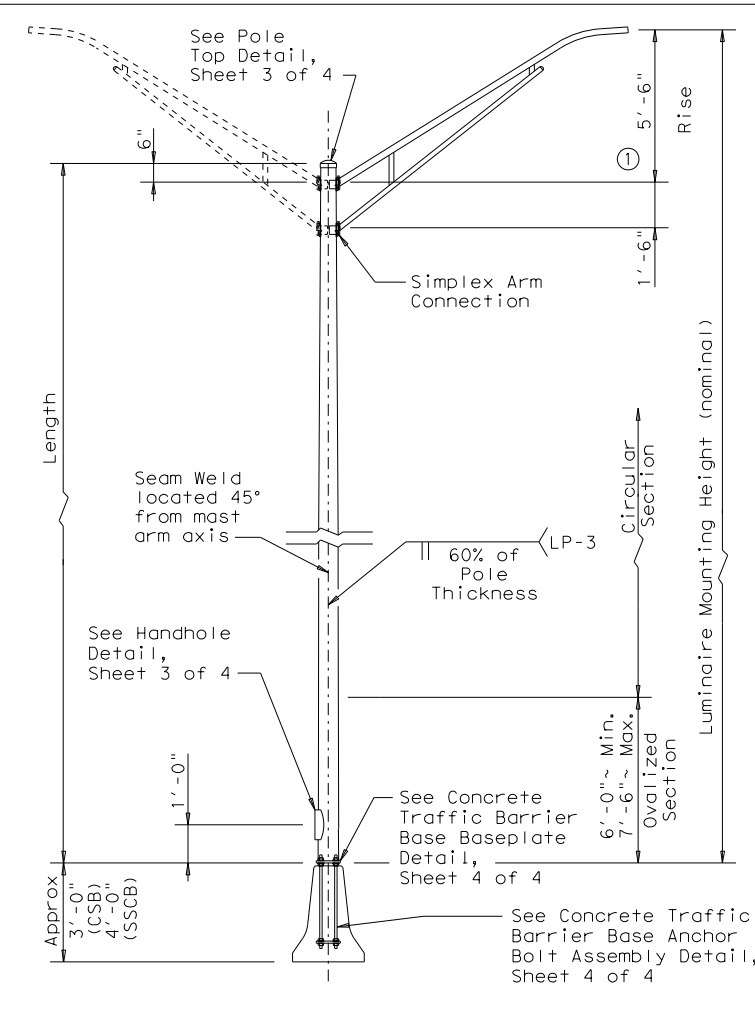
SHOE BASE POLE

SHOE BASE POLE					
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	4.90	15.00	0.1196	7.1
30.00	7.50	4.00	25.00	0.1196	13.2
31.00-39.00	8.00	4.36-3.24	26.00-34.00	0.1196	20.7
40.00	8.50	3.60	35.00	0.1196	20.7
50.00	10.50	4.20	45.00	0.1196	30.3



TRANSFORMER BASE POLE

TRANSFORMER BASE POLE					
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	5.11	13.50	0.1196	7.1
30.00	7.50	4.21	23.50	0.1196	13.2
31.00-39.00	8.00	4.57-3.45	24.50-32.50	0.1196	20.7
40.00	8.50	3.81	33.50	0.1196	20.7
50.00	10.00	3.91	43.50	0.1196	30.3



CONCRETE TRAFFIC BARRIER BASE POLE

CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB)						
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About C of Rail	Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

MATERIAL DATA

COMPONENT	ASTM DESIGNATION	MIN. YIELD (ksi)
Pole Shaft (0.14"/ft. Taper)	A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 ③, or A1008 HSLAS Gr 50 Cl 2	50
Base Plate and Handhole Frame	A572 Gr.50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts	F1554 Gr 55, A193-B7 or A321	55 105
Anchor Bolt Templates	A36	36
Heavy Hex (H.H.) Nuts	A194 Gr 2H, or A563 Gr DH	
Flat Washers	F436	

NOTES:

- ① 2'-6" rise for 4 ft. luminaire arms.
- ② Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.
- ③ A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

POLE ASSEMBLY FABRICATION TOLERANCES TABLE

DIMENSION	TOLERANCE
Shaft length	+1"
I.D. of outside piece of slip fitting pieces	+1/8", -1/16"
O.D. of inside piece of slip fitting pieces	+1/32", -1/8"
Shaft diameter: other	+3/16"
Out of "round"	1/4"
Straightness of shaft	±1/4" in 10 ft
Twist in multi-sided shaft	4° in 50 ft
Perpendicular to baseplate	1/8" in 24"
Pole centered on baseplate	±1/4"
Location of Attachments	±1/4"
Bolt hole spacing	±1/16"

GENERAL NOTES:

1. Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.
2. Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.
3. Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance 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 these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
4. For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.
5. Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."
6. Steel poles shall be fabricated in accordance with Item 441, "Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.
7. Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.
8. Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.
9. Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."
10. All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.
11. The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."
12. Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.
13. Erect transformer base poles in accordance with sheet RID(1).

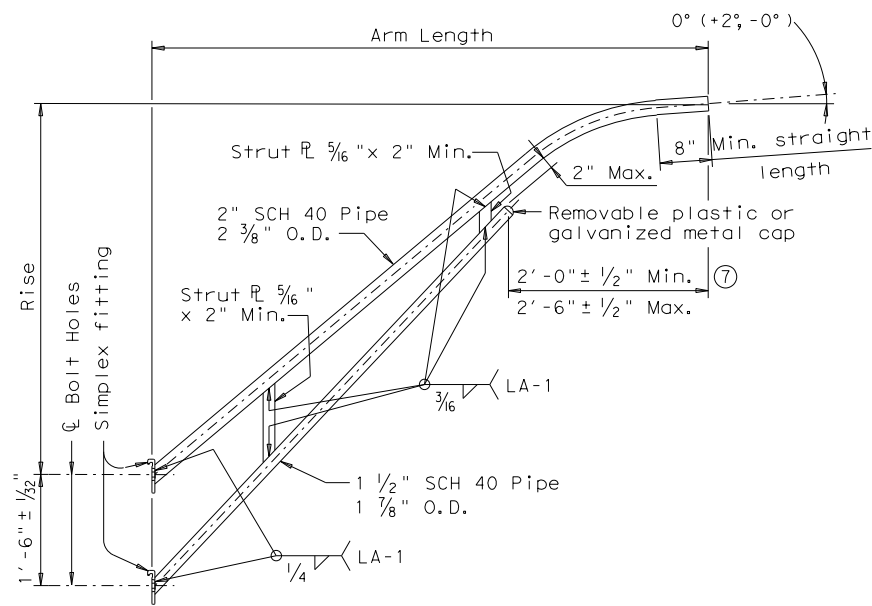


ROADWAY ILLUMINATION POLES
RIP(2)-19

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©TxDOT January 2007	CON: 0003	SECT: 08	JOB: 064, ETC.	HIGHWAY: BI 20B, ETC.
7-17 12-19	DIST: ODA	COUNTY: REEVES, ETC.	SHEET NO. 69	

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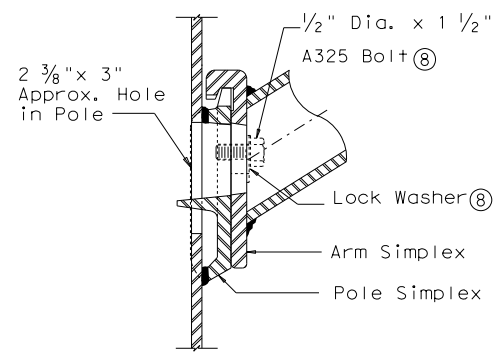
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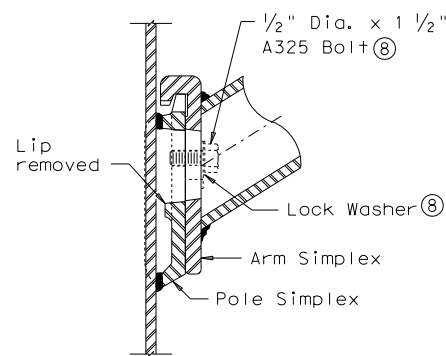
LUMINAIRE ARM

LUMINAIRE ARM DIMENSIONS		
Nominal Arm Length	Arm Length	Rise
4'-0"	3'-6"	2'-6"
6'-0"	5'-6"	5'-6"
8'-0"	7'-6"	5'-6"
10'-0"	9'-6"	5'-6"
12'-0"	11'-6"	5'-6"

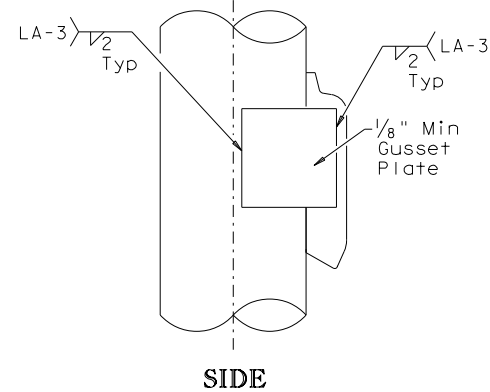
ARM ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"



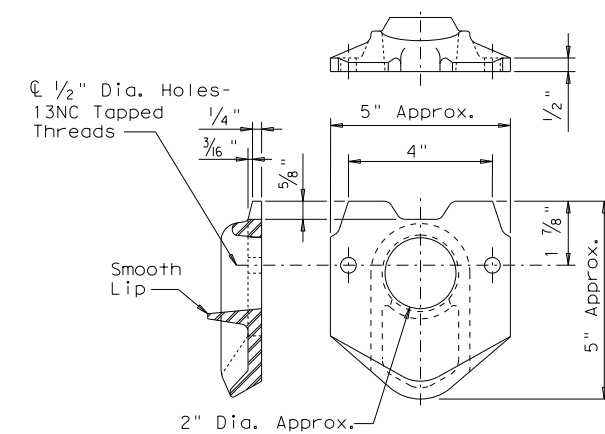
UPPER SIMPLEX FITTING
(Gusset not shown for clarity)



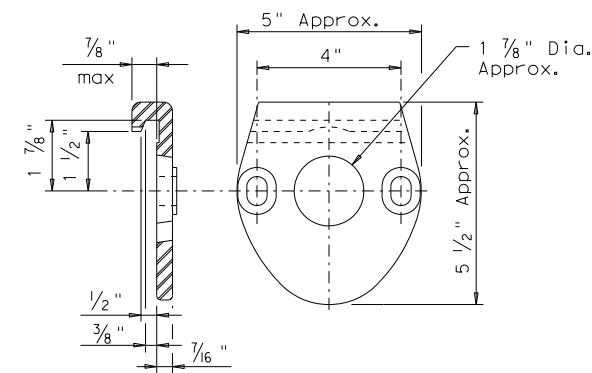
LOWER SIMPLEX FITTING
(Gusset not shown for clarity)



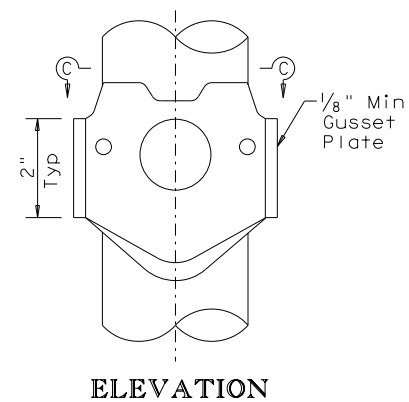
SECTION B-B



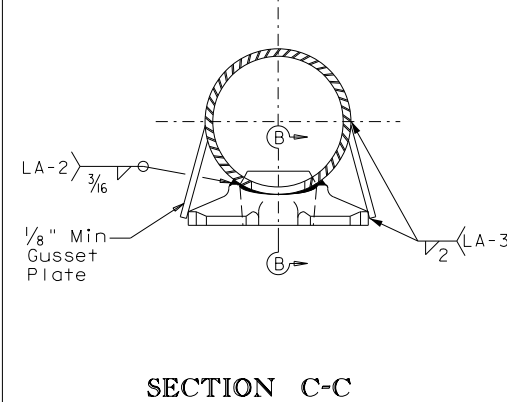
POLE SIMPLEX DETAIL



ARM SIMPLEX DETAIL

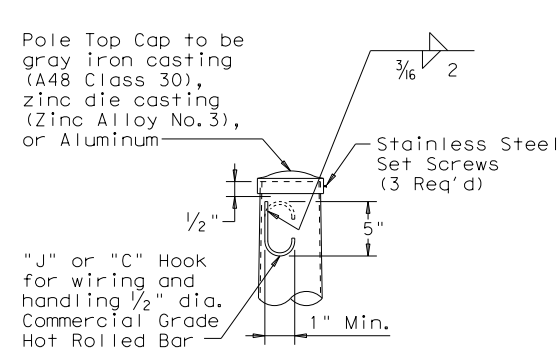


ELEVATION

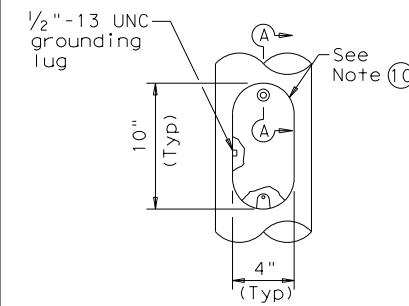


SECTION C-C

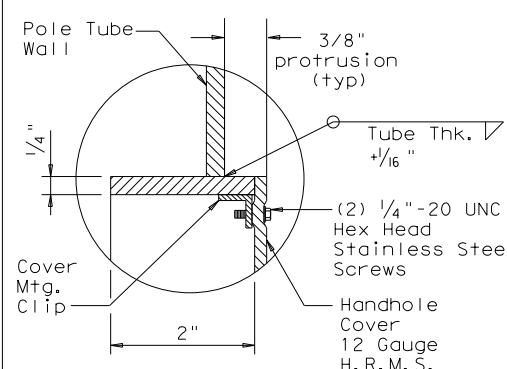
SIMPLEX ATTACHMENT DETAIL



POLE TOP



ELEVATION



SECTION A-A

HANDHOLE

NOTES:

- ④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- ⑤ 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.
- ⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.
- ⑦ 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.
- ⑧ Each pole simplex fitting shall be supplied with 2 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.
- ⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.
- ⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

MATERIALS

Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 ⑤, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 ⑥, or A1011 HSLAS-F Gr 50 ⑥
Arm Struts and Gusset Plates ④	ASTM A36, A572 Gr 50 ⑥, or A588
Misc.	ASTM designations as noted

SHEET 3 OF 4



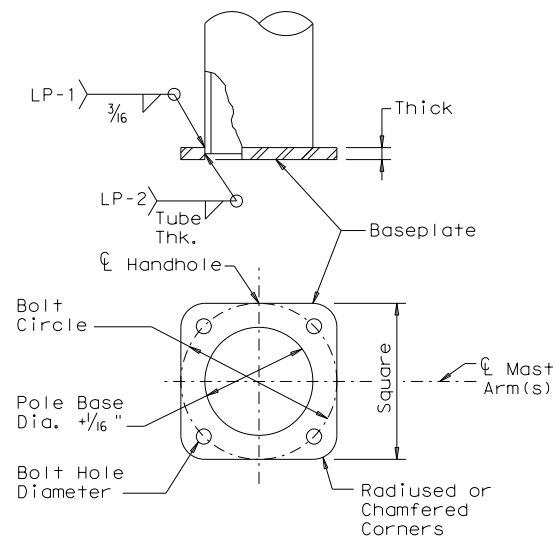
Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(3) - 19

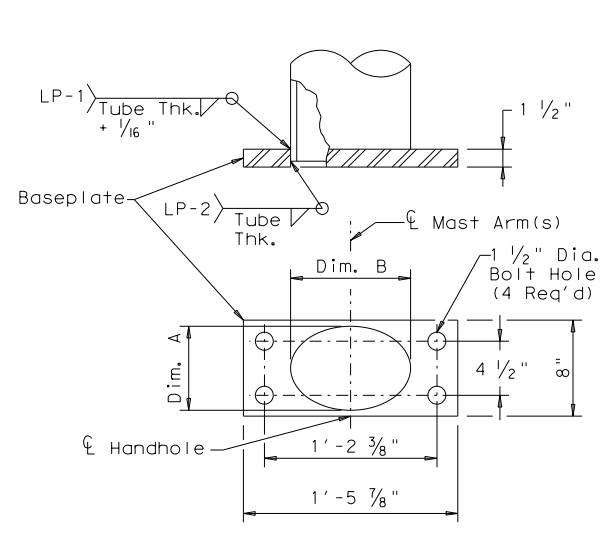
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© TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	08	064, ETC.	BI 20B, Etc.
7-17	DIST	COUNTY	SHEET NO.	
12-19	ODA	REEVES, Etc.	70	

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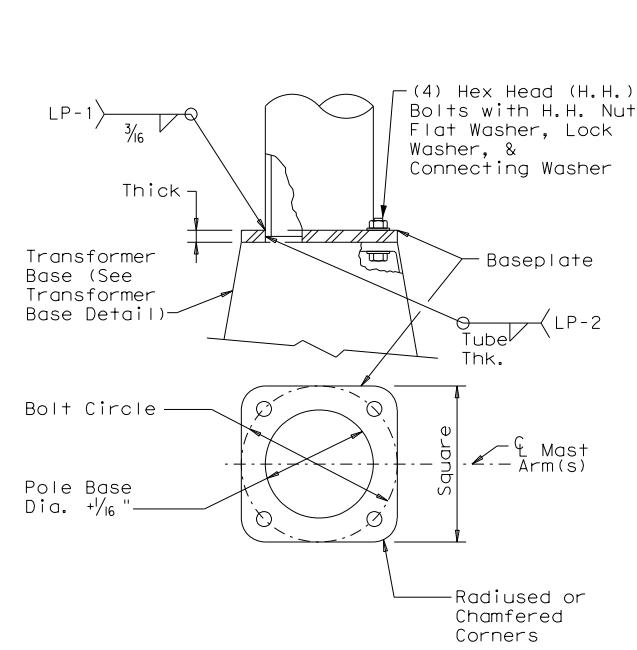
SHOE BASE BASEPLATE

MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	BOLT HOLE DIAMETER
20' - 39'	13"	13"	1 1/4"	1 1/4"
40'	15"	15"	1 1/4"	1 1/2"
50'	15"	15"	1 1/2"	1 1/2"



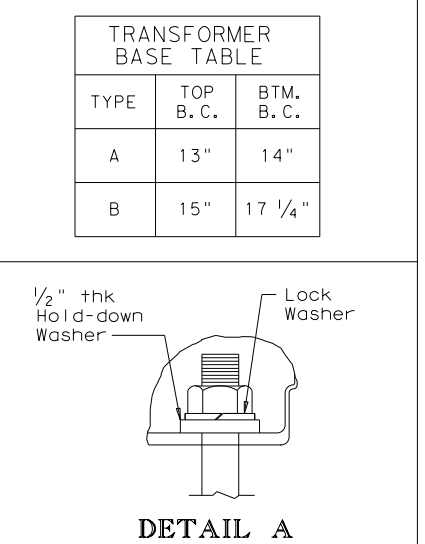
CONCRETE TRAFFIC BARRIER BASE BASEPLATE

MOUNTING HEIGHTS (nominal)	POLE DIA. (12)	DIM. A	DIM. B
28' - 38'	9"	7" ± 1/4"	10" ± 1/4"
48'	10 1/2"	7" ± 1/4"	13" ± 1/4"

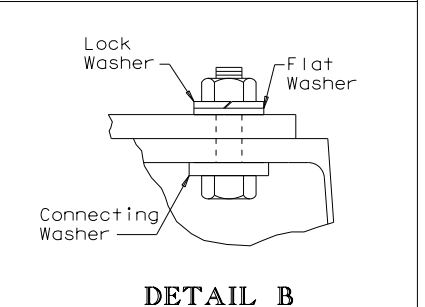


TRANSFORMER BASE BASEPLATE

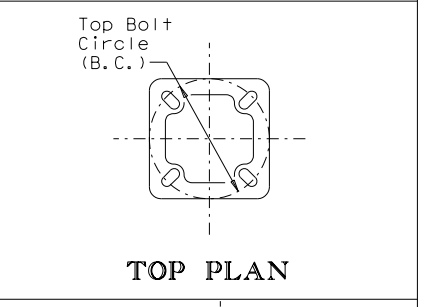
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFORMER BASE TYPE
20' - 39'	13"	13"	1 1/4"	1"	1 1/4"	A
40'	15"	15"	1 1/4"	1 1/4"	1 1/2"	B
50'	15"	15"	1 1/2"	1 1/4"	1 1/2"	B



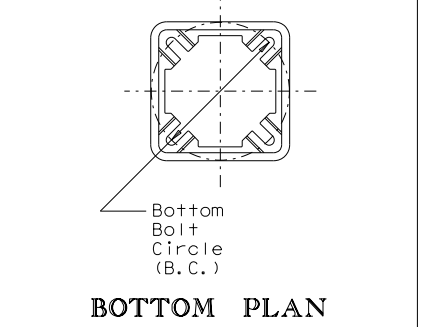
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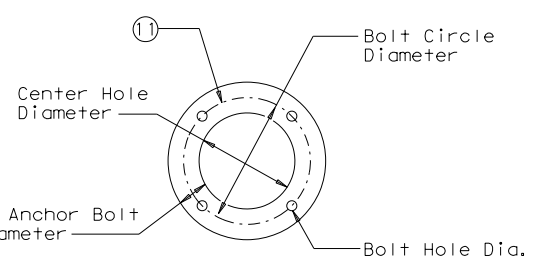
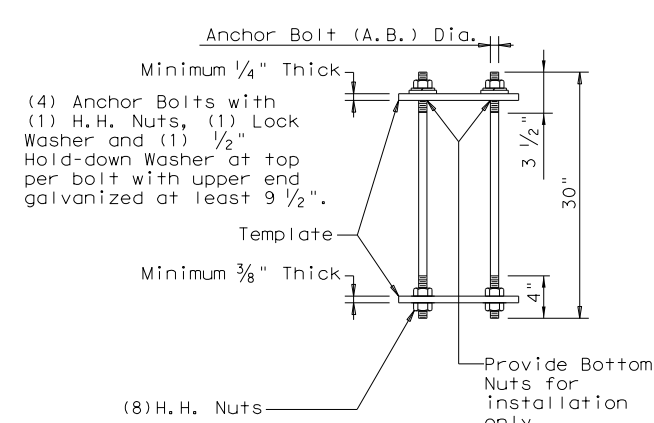
DETAIL B



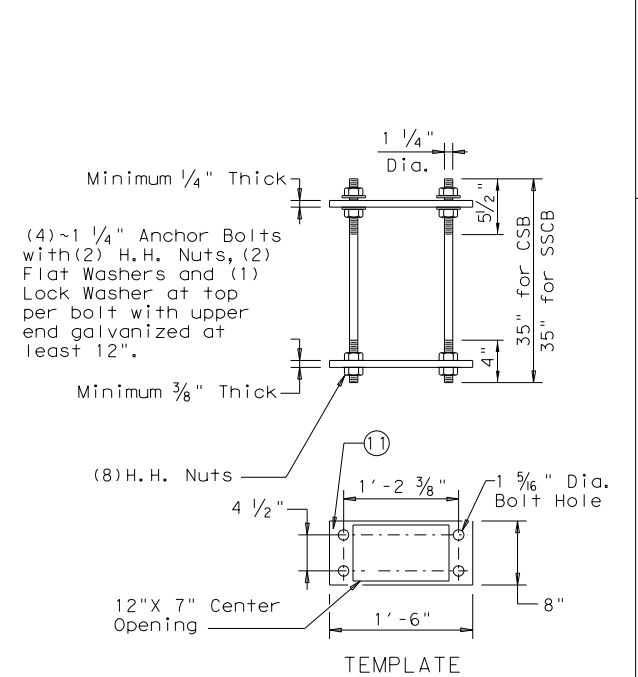
TOP PLAN



BOTTOM PLAN

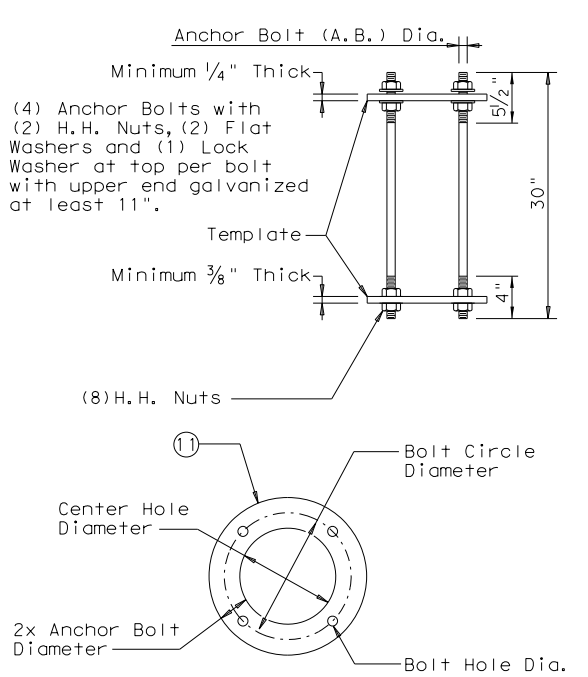


TRANSFORMER BASE ANCHOR BOLT ASSEMBLY



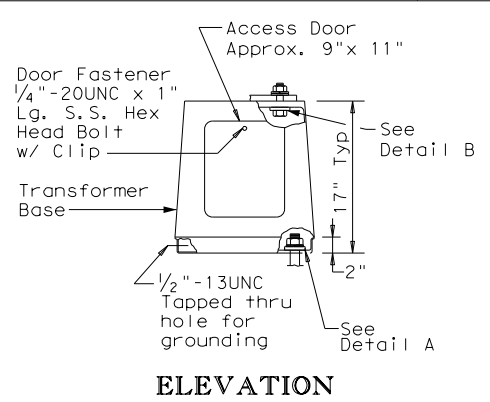
CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY

MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	14"	12"	1 1/16"
40' - 50'	1 1/4"	17 1/4"	14 3/4"	1 5/16"



SHOE BASE ANCHOR BOLT ASSEMBLY

MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	13"	11"	1 1/16"
40' - 50'	1 1/4"	15"	12 1/2"	1 5/16"



TRANSFORMER BASE DETAILS

GENERAL NOTES:

- For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
- All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto, and shall have been tested by FHWA-approved methods. All bases shall have been structurally tested to resist 150% of the design moment.
- Transformer bases shall be cast from aluminum, ASTM B108 or B26 Alloy 356.0-T6, or other material approved by the Engineer. Four Hex Head (H.H.) bolts with four H.H. nuts, four lock washers, four flat washers, and connecting and hold-down washers as recommended by the manufacturer, galvanized to ASTM A153 Class C or D, or B695 Class 50, shall be provided with each transformer base for connecting the pole. Bolts shall be ASTM A325 or approved equal. Nuts shall be ASTM A563 grade DH galvanized.
- Bases shall be stamped, incised or by other approved permanent means, marked to show fabricator's name or logo, and model number. Such information shall be placed in a readily seen location, inside or outside the base, but shall not be placed on the door.
- Doors for transformer bases shall be made of plastic, fiberglass or other non-metallic material approved by the Engineer and shall be attached with stainless steel screws or bolts. Transformer bases shall be cleaned by grit blast cleaning after heat treatment. Certification by the manufacturer of heat treatment shall be furnished with transformer bases. The certification shall show the metal alloy and temper and that the base meets those requirements, chemical and physical. The certification shall also show the material ASTM specification. Transformer bases shall be cast with a removable tab bar for material testing. Some bars may have been removed by the manufacturer for testing.

NOTES:

- Anchor Bolt Templates do not need to be galvanized.
- Pole diameter before ovalized.

DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"

SHEET 4 OF 4

Texas Department of Transportation
Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES
RIP(4) - 19

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REVISIONS	0003	08	064, ETC.	BI 20B, ETC.
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	ODA	REEVES, ETC.	71	

DATE: FILE:

ROADWAY ILLUMINATION ASSEMBLY NOTES

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1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.
2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.
3. 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, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.
4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.
5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.
 - a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.
 - b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25' above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25' above the surrounding terrain, provide poles meeting the following requirements:
 - i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).
 - ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.
6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.
7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.
8. Install T-Base with following procedure:
 - a. Anchor Bolt Tightening.
 - i. Coat the threads of the anchor bolts with electrically conductive lubricant.
 - ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.
 - iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.
 - iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.
 - v. Check top of T-base for level. If not level then foundation must be leveled.
 - b. Top Bolt Procedure
 - i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

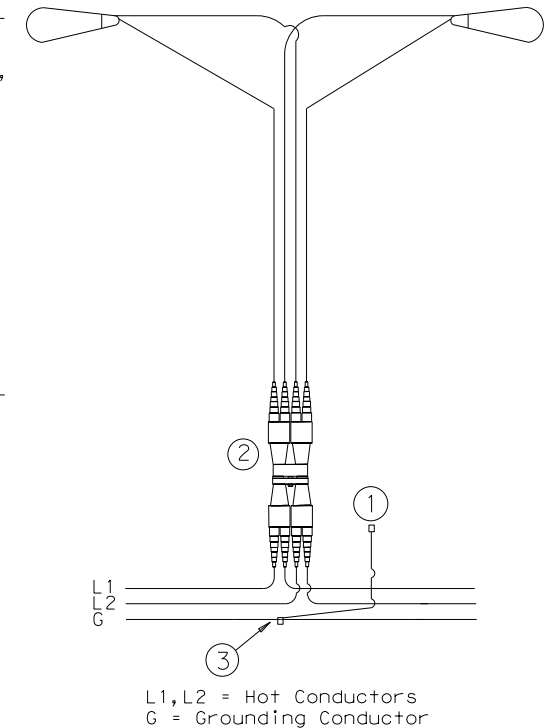
- ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."
- iii. Tighten each nut to 150 ft-lb. using a torque wrench.
- c. Level and Plumb
 - i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.
9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).
10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.
11. Mount luminaires on arms level as shown by the luminaire level indicator.
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

Wiring Diagram Notes:

- ① Use 1/2 in.-13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.
- ② Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.
- ③ Split Bolt or other connector.

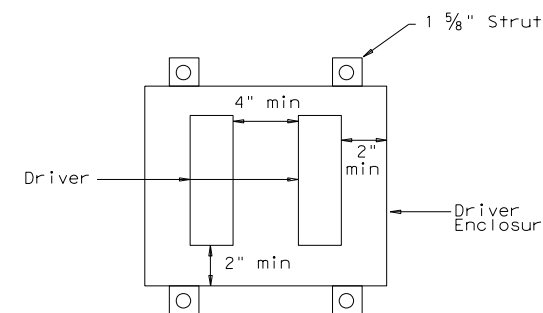
Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):
 - a. Provide NEMA 3R outdoor enclosure or as approved.
 - b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.
 - c. Install drivers with at least 2 inches of space from enclosure walls.
 - d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment
 - e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.
 - f. Provide remote drivers with a maximum of 100 watts
 - g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.

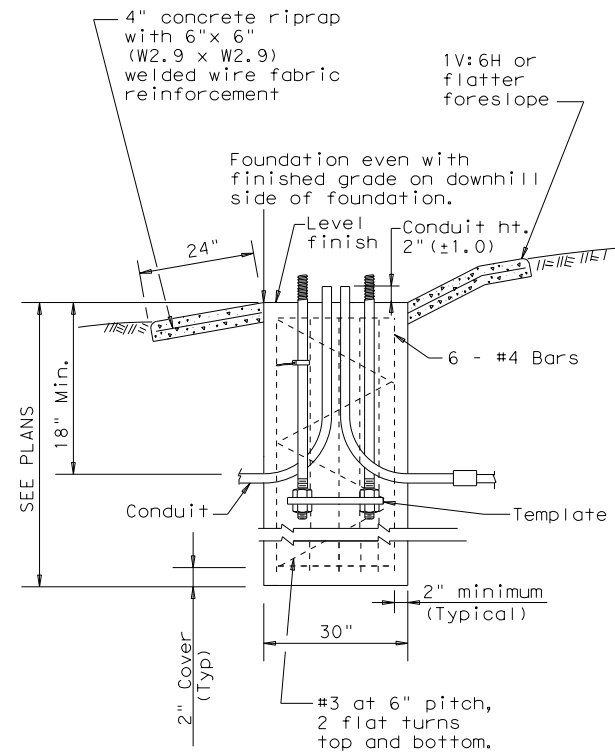


Driver Spacing In Remote Enclosure

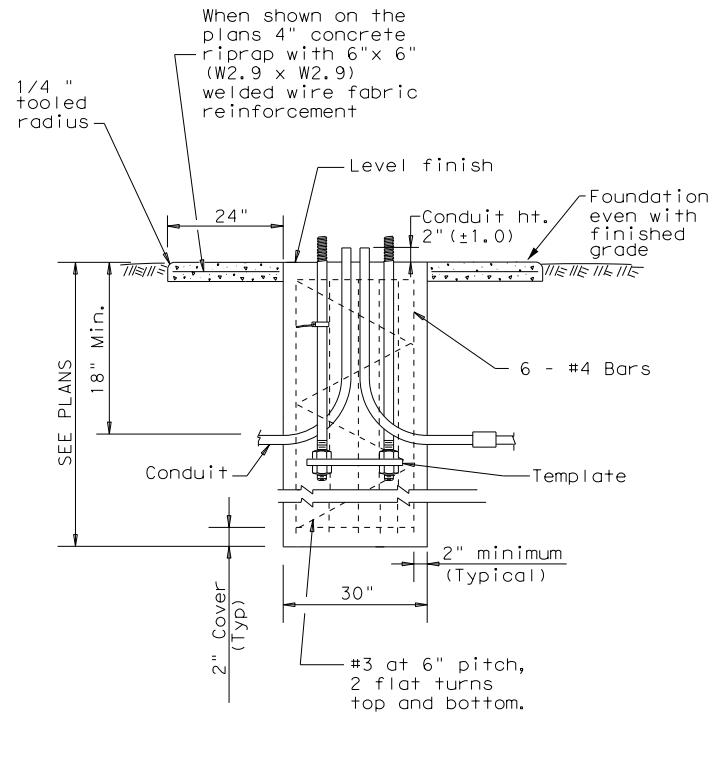
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© TxDOT January 2007		CONT	SECT	JOB	HIGHWAY
REVISIONS		0003	08	064, ETC.	BI 20B, Etc.
7-17		DIST	COUNTY		SHEET NO.
12-20		ODA	REEVES, Etc.		72
72A					

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SECTION A-A
 SHOWING SLOPED GRADE



SECTION A-A
 SHOWING CONSTANT GRADE

TABLE 1

ANCHOR BOLTS

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1 in. x 30 in.
40-50 ft.	15 in.	17 1/4 in.	1 1/4 in. x 30 in.

TABLE 2

RECOMMENDED FOUNDATION LENGTHS (See note 1)

MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6'	6'	6'
>20 ft. to 30 ft.	8'	6'	6'
>30 ft. to 40 ft.	8'	8'	6'
>40 ft. to 50 ft.	10'	8'	6'

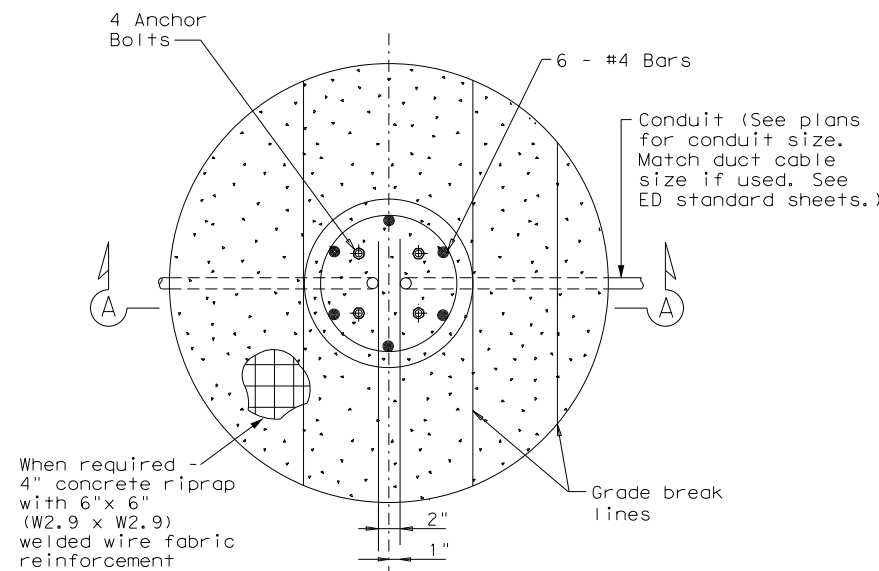
TABLE 3

PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)

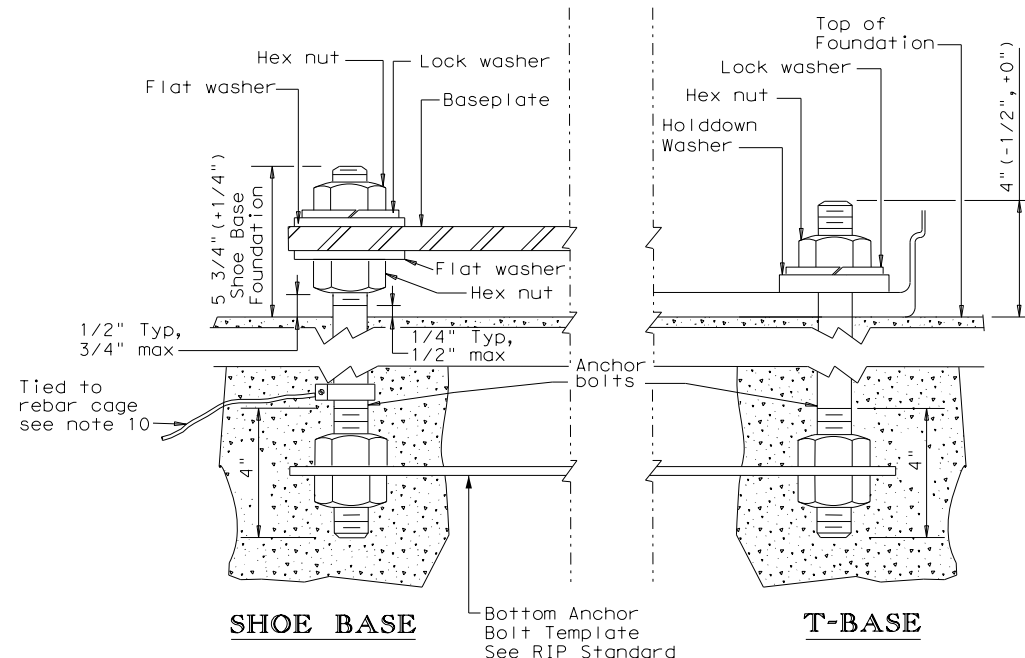
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

GENERAL NOTES:

- "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
- Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
- Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
- Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
- Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
- Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
- Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
- Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
- Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
- Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
- Grade earthwork around T-base foundations even with the finished grade as shown in Section A-A to ensure proper function of the breakaway device. Use riprap on T-base foundations that are located on sloped grades, and as shown on the plans for level grades.



FOUNDATION DETAIL



ANCHOR BOLT DETAIL

TABLE 4

BREAKAWAY POLE PLACEMENT (See note 6)

ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

* or as close to ROW line as is practical

** provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.

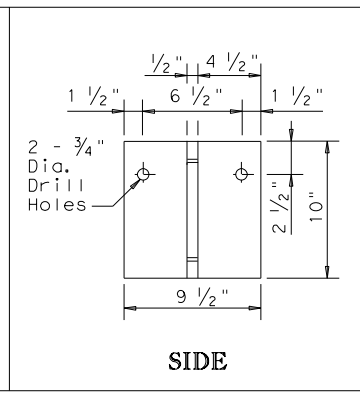
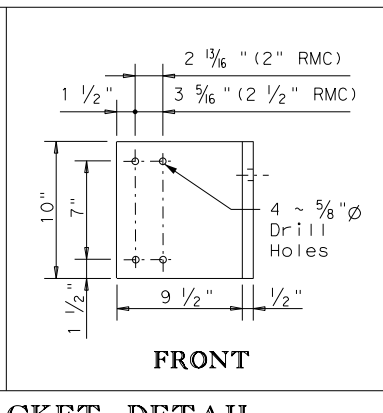
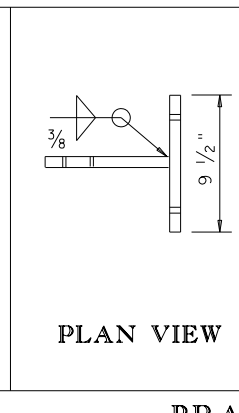
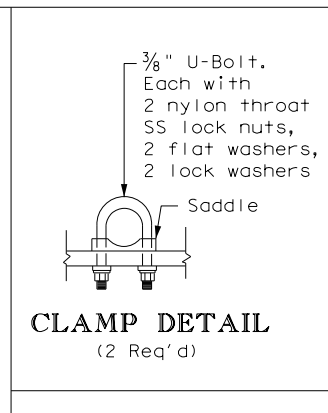
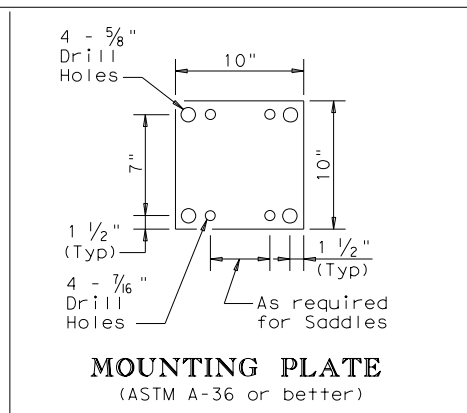
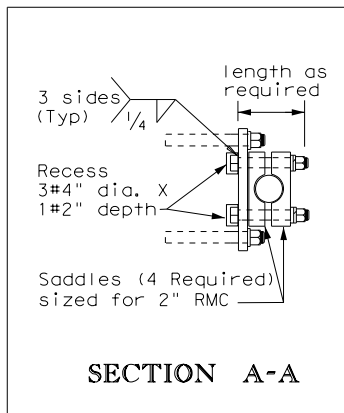


ROADWAY ILLUMINATION DETAILS (RDWY ILLUM FOUNDATIONS)
 RID(2)-20

FILE: r1d2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT January 2007	CON:	SECT:	JOB:	HIGHWAY:
REVISIONS	0003	08	064, ETC.	BI 20B, ETC.
1-11	DIST:	COUNTY:	SHEET NO.	
7-17	ODA	REEVES, ETC.	73	
12-20				
72B				

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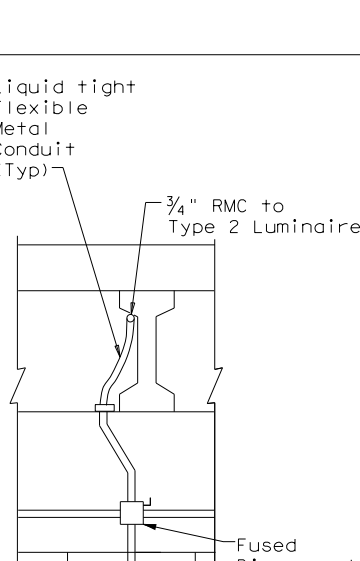
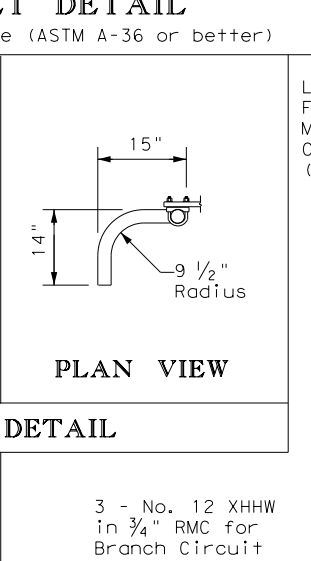
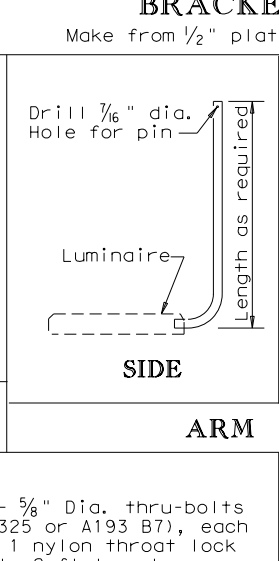
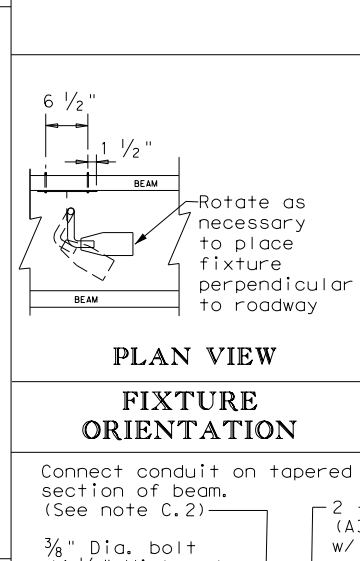
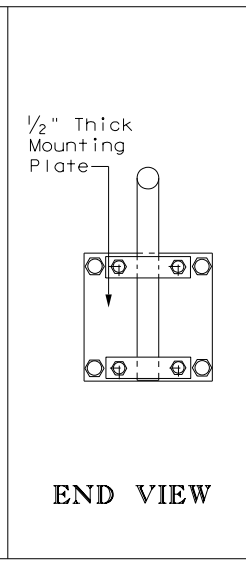
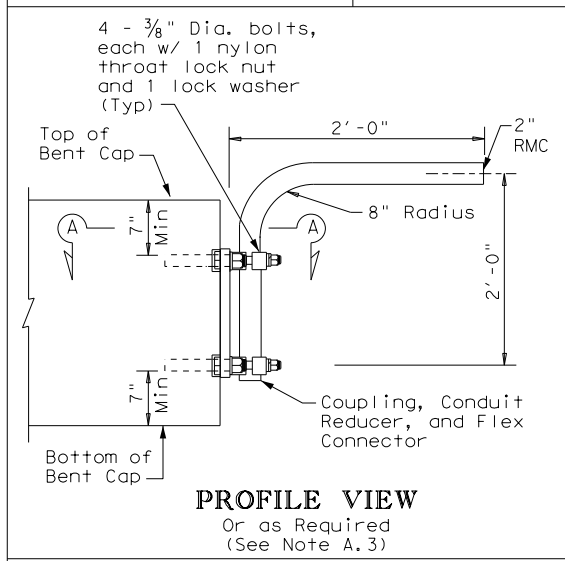
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GENERAL NOTES:

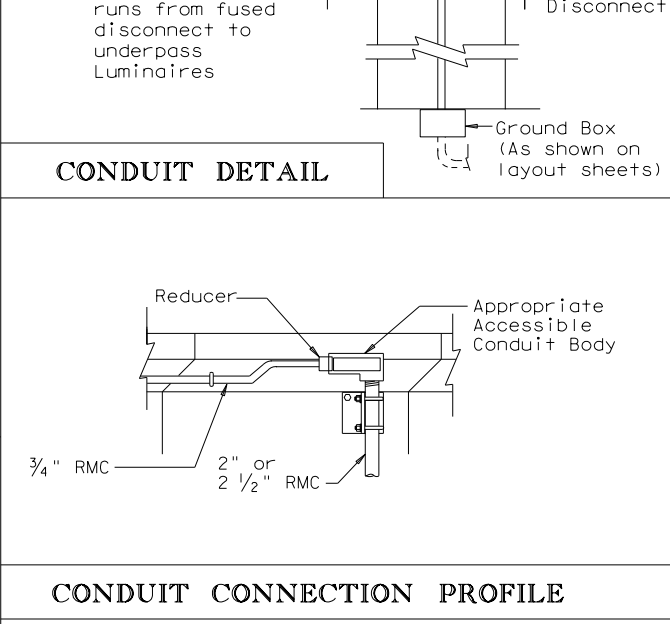
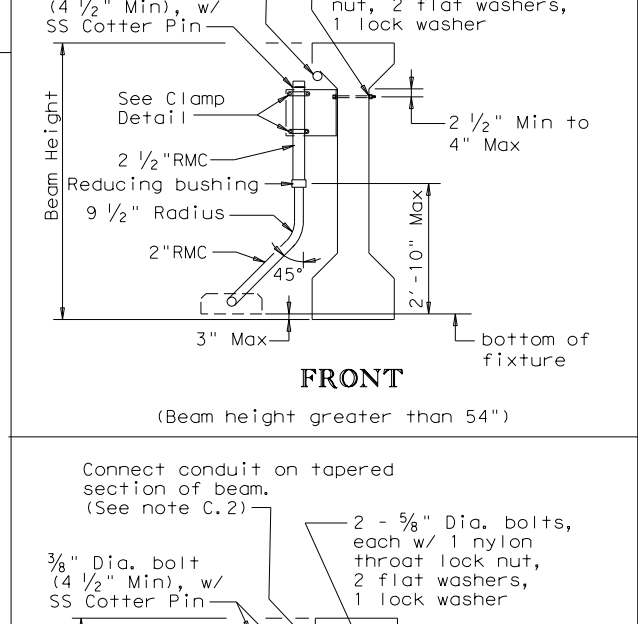
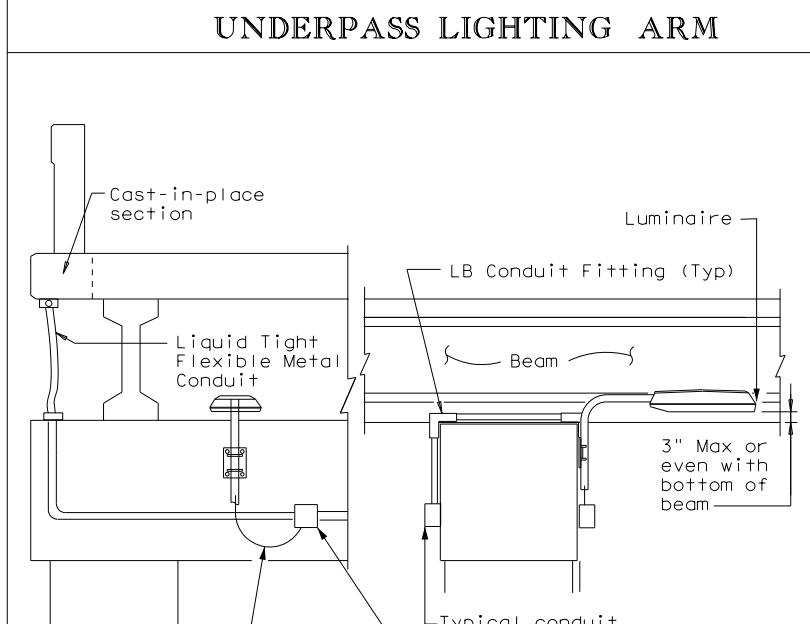
A. ALL 150 watt HPS and 150 watt equivalent LED Luminaires

- Luminaire locations, conduit and conductor sizes and routing are typical and diagrammatic only. See project layout sheets for specific details.
- Conduit will be paid for under Item 618, "Conduit" and conductors will be paid for under Item 620, "Electrical Conductors," unless otherwise shown on the plans.
- Adjust conduit in saddles to place fixture height and orientation as required. See fixture orientation detail and plans. Where practicable, place luminaires so the bottom of luminaire is above the bottom of the beam, maximum of 3 in. (See detail UNDERPASS LIGHTING ARM TYPE 2)
- Except as noted, galvanize all structural steel and exposed bolts, nuts, and washers in accordance with Item 445 "Galvanizing".
- Fabrication of brackets and support arms will not be paid for directly but is subsidiary to Item 610, "Roadway Illumination Assemblies."
- Install a heavy duty NEMA 3R fused disconnect or breaker enclosure rated at 30 amps and 480 volts to switch underpass luminaires as shown on plans, with at least one per bridge circuit. Install 20 amp time-delay fuses or inverse-time circuit breakers. Mount disconnect or breaker enclosure 10 ft. (min) above grade on columns or bent caps as approved by the Department. Modify disconnect to allow padlocking in the "ON" and "OFF" positions. Padlocks and disconnect switches or circuit breakers for underpass fixtures will not be paid for directly but are subsidiary to the various bid items of the contract.
- Conduit on columns, caps, and slab is shown surface mounted. For new columns and caps, embed PVC conduit in concrete. Bond and ground metal junction boxes and conduit.



B. TYPE 1

- Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) for Type 1 arm shaft.
- Use 3/8 in. stainless steel bolt or stud non-epoxy type expansion anchors for concrete for Type 1 mounting. Except as noted, provide an allowable 2650 lbs minimum pull-out force (after consideration of adjustment factors for edge distance and bolt spacing) for each anchor. Install each anchor to the embedment depth recommended by the manufacturer.
- Attach conduit to plate with 4 saddles, four - 3/8 in. diameter bolts, nylon throat lock nuts, and lock washers.



C. TYPE 2

- Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) or provide a combination of 2 1/2 in. (2.875" O.D., 0.193" wall) and 2 in. (2.375" O.D., 0.146" wall) rigid metal conduits with a reducing bushing as beam height stipulated for Type 2 arm shaft. Field cutting and threading will be permitted. Paint cut and threaded areas with zinc rich paint after conduit is connected to adjacent fitting.
- Connecting conduit may be strapped to tapered section only of precast beams as shown. Anchor as approved by the Engineer. Maximum anchor depth is 1 in.
- Indiscriminate drilling into precast concrete beams may result in reduced beam strength. Use drilling location and method as directed by the Engineer. See Location of Underpass Lighting Mounting Bracket detail. The locations shown in the table are such that reinforcing strands will not be damaged.

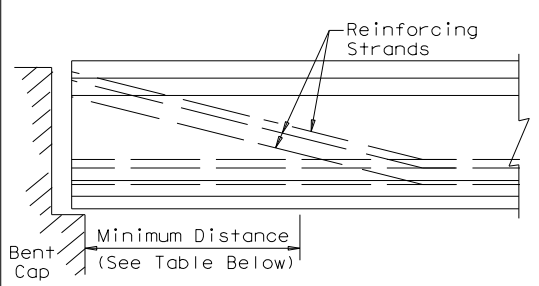
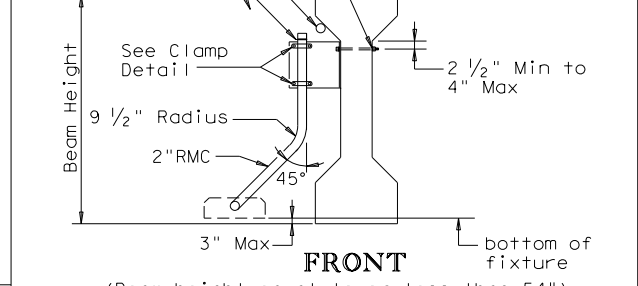
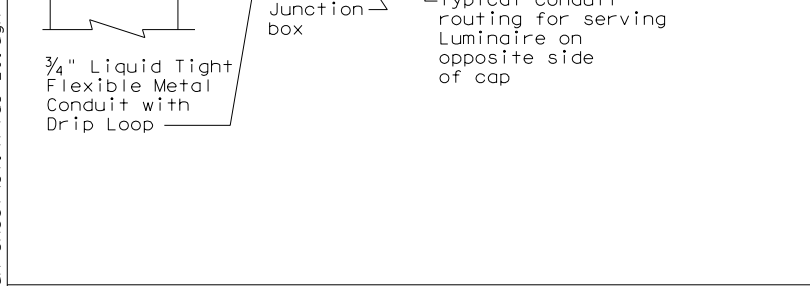


TABLE 5

LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET

SPAN LENGTH	MINIMUM DISTANCE
≤ 50'	10'-0"
50' - 70'	15'-0"
70' - 90'	20'-0"
> 90'	25'-0"

Texas Department of Transportation

ROADWAY ILLUMINATION DETAILS (UNDERPASS LIGHT FIXTURES)

RID(3) - 20

Traffic Safety Division Standard

IN RD IL AM (U/P) (TY 1)
 If bridge has pre-cast panels under deck, run circuit under deck edge.

UNDERPASS LIGHTING TYPE 1

IN RD IL AM (U/P) (TY 2)

LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET

UNDERPASS LIGHTING TYPE 2

FILE: rid3-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0003	08	064, ETC.BI 20B, Etc.	
2-14	DIST	COUNTY	SHEET NO.	
7-17	ODA	REEVES, Etc.	74	
12-20				
72C				

STORM WATER POLLUTION PREVENTION PLAN (SW3P):

This SW3P has been developed in accordance with TPDES General Permit TXR150000. The operator, The Texas Department of Transportation ensures that: Project specifications provide that adequate BMPs have been developed for this project. The contractor shall be the party responsible for implementing the BMPs described herein. The contractor shall implement changes approved by the Project Engineer to the SW3P within the times specified in the SW3P or the TPDES General Permit. Operators affected by modifications to specifications will be notified in a timely manner.

1. SITE OR PROJECT DESCRIPTION:

NATURE OF THE CONSTRUCTION ACTIVITY: SEE TITLE SHEET

POTENTIAL POLLUTANTS	AND SOURCES:
<i>Sediment laden storm water</i>	<i>Storm water conveyance over disturbed areas</i>
<i>Fuels, oils, and lubricants</i>	<i>Construction vehicles and storage areas</i>
<i>Construction debris and waste</i>	<i>Various construction activities</i>
<i>Trash</i>	<i>Construction site and Receptacles</i>

SEQUENCE OF ACTIVITIES THAT WILL DISTURB SOILS:

1. *Drilling operations to prepare for the erection of illumination poles.*
2. *Trenching operations while setting conduit and electrical equipment.*
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

AREAS:

TOTAL AREA OF PROJECT:	ACRES
TOTAL AREA OF SOIL DISTURBANCE:	ACRES
TOTAL AREA OFF-SITE:	

DATA DESCRIBING THE SOIL: *Soil consists of nearly level Faskin-Duoro association, and nearly level Kimbrough - Stegall association.*

GENERAL LOCATION MAP: SEE TITLE SHEET

DETAILED SITE MAP: SEE SW3P SITE MAP/S SHEET/S

THE LOCATION AND DESCRIPTION OF CONCRETE AND ASPHALT PLANTS:

Supporting Concrete Plant Facilities shall be located off site. See note DEDICATED CONCRETE PLANTS.

Supporting Concrete Plant Facilities shall be located off site. See note DEDICATED ASPHALT PLANTS.

NAME OF RECEIVING WATERS: *Storm Water from this project will flow to various tributaries then into the Upper Pecos River, which is segment number 2311 of the Rio Grande Basin.*

A COPY OF TPDES CGP TXR150000 IS INCLUDED IN THE SW3P FILE.

REMARKS: *None.*

401 WATER QUALITY CERTIFICATION: YES _____ NO X

2. BEST MANAGEMENT PRACTICES (BMPs):

EROSION AND SEDIMENT CONTROLS: Erosion and sediment controls have been designed to retain sediment on-site. Controls shall be utilized to reduce off site transport of suspended sediments and pollutants if it is necessary to pump water from the site. Control measures shall be installed per specifications or as directed. Sediment must be removed from controls per the plan requirements or manufacturers recommendations, but no later than the time that design capacity has been reduced by 50%. If sediment escapes the site, accumulations will be removed to minimize further negative effects. Controls will be developed to limit the off site transportation of litter, construction debris, and construction materials.

INTERIM (INT), PERMANENT (PER), AND 401 CERTIFICATION BMP'S:							
EROSION CONTROLS:	401	INT	PER	SEDIMENT CONTROLS:	401	INT	PER
<input type="checkbox"/> Blankets and Matting	—	—	—	<input type="checkbox"/> Silt Fence	—	—	—
<input type="checkbox"/> Sod	—	—	—	<input type="checkbox"/> Rock Berm	—	—	—
<input type="checkbox"/> Preserve Existing Vegetation	—	—	—	<input type="checkbox"/> Buffer Zones	—	—	—
<input type="checkbox"/> Soil Stabilization	—	—	—	<input type="checkbox"/> Vegetative Filter Strips	—	—	—
<input type="checkbox"/> Permanent Vegetation	—	—	—	<input type="checkbox"/> Ditch Block	—	—	—
<input type="checkbox"/> No Erosion Controls are Required.	—	—	—	<input type="checkbox"/> Erosion Control Logs	—	—	—
				<input type="checkbox"/> No Sediment Controls are Required.	—	—	—

POST CONSTRUCTION TSS CONTROL (401 CERTIFICATION ONLY):

<input type="checkbox"/> Vegetation Lined Drainage Ditch	<input type="checkbox"/> Grassy Swales
<input type="checkbox"/> Retention/Irrigation	<input type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> No Post Construction TSS Control Required.

SEQUENCE OR SCHEDULE OF IMPLEMENTATION:

1. *Complete drilling and trenching operations within the area.*
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

The dates of major grading activities, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization practices are initiated, are available in the project diary or SW3P. Stabilization measures must be initiated as soon as practicable in portions of the site where construction has temporarily or permanently ceased. The Odessa District is located in a semi-arid area and the 14 and 21 day requirements are not applicable except, as directed by the Engineer.

3. STRUCTURAL CONTROL PRACTICES: Structural control practices for this project are listed elsewhere herein.

4. PERMANENT STORM WATER CONTROLS: Structural control practices installed during construction will be maintained and inspected after construction has ceased on the site and until final stabilization is attained. Unless specified in the plans, after project acceptance TxDOT will assume maintenance responsibilities for the controls and measures. Other permanent controls include existing and proposed riprap at culvert inlets and outlets, diversion dikes, swales, retaining walls, and other similar devices.

5. OTHER CONTROLS: OFF-SITE VEHICLE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST: The off site vehicle tracking of sediments shall be minimized by removal of excess dirt from the road and at entrances to the work site. Stabilized Construction Entrances and Exits shall be constructed per the plans or as directed by the Project Engineer. The generation of dust will be minimized as directed by the Project Engineer by dampening haul roads and covering haul trucks with a tarpaulin.

CONSTRUCTION AND WASTE MATERIALS: The contractor will maintain a clean, orderly construction site. Construction waste including trash, rubble, scrap and vegetation shall be disposed of in lidded dumpsters or in a manner approved by the Project Engineer. Disposal methods must meet Federal, State, and Local waste management guidelines. No construction waste will be buried or burned on site. Spoils disposal, material storage, and materials resulting from the destruction of existing roads and structures shall be stored in areas designated by the Project Engineer and protected from run-off. All waterways shall be cleared of temporary embankment, temporary bridges, matting, false work, piling, debris, or other obstructions placed during construction operations, that are not part of the finished work, as soon as practicable. All excess soil generated by the construction will be collected and disposed of by the contractor. Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, water body, or stream bed.

POLLUTANT SOURCES FROM AREAS OTHER THAN CONSTRUCTION: Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants. If potential pollutant sources are identified after the start of construction, controls and measures shall be implemented as directed by the Project Engineer.

5. OTHER CONTROLS (CONT):

DEDICATED ASPHALT PLANTS: Asphalt or asphaltic material for this project will be produced off site. If the project requires a dedicated asphalt plant and the plant within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer.

DEDICATED CONCRETE PLANTS: Cement or Concrete material for this project will be produced off site. If the project requires a dedicated concrete plant and the plant is within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer. Concrete trucks shall be washed or washed out in locations designated by the Project Engineer. The locations shall be protected by a berm sufficient to contain all waste and wash water. Wash water shall not be allowed to enter any storm drainage system or waterway. The residual material and contaminated soil shall be collected and disposed of in accordance with Federal, State, and Local guidelines. Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants.

HAZARDOUS MATERIALS AND SPILL REPORTING: The contractor shall take appropriate measures to prevent, minimize, and control the spillage or leakage of hazardous materials and any associated wastes on site and in maintenance and staging areas. Hazardous materials shall include but are not limited to paints, acids, solvents, asphalt products, chemical additives, curing compounds, oils, fuels, and lubricants. Hazardous materials shall not be stored, accumulated, or transported in open containers subject to precipitation or spillage, but shall be stored, accumulated, or transported in closed containers of the type recommended by the manufacturer. In the event of a spill the Project Engineer should be contacted immediately. All spills shall be immediately cleaned and any contaminated soil removed and disposed of in accordance with Local, State, and Federal laws. Fuel tanks shall be protected by a secondary containment, such as a lined berm, capable of containing 1.5 times the capacity of the tank, or as approved by the Project Engineer.

OFF SITE PSLs: All off site project specific locations including dedicated asphalt plants, concrete plants, or utility installations, required by the contractor, are the contractor's responsibility. The contractor shall secure all permits required by local, state, or federal laws for off site PSLs. The contractor shall provide diagrams and areas of disturbance for all PSL's within 1 mile of the project.

SANITARY FACILITIES: All sanitary or septic wastes that are generated onsite shall be treated and disposed of in accordance with state and local regulations. Raw sewage or septage shall not be discharged or buried on site. Precaution shall be taken to prevent illicit discharges to storm water. Licensed waste management contractors shall be required to dispose of sanitary waste. Porta johns will be required for the laboratory and construction site or as directed by the Project Engineer.

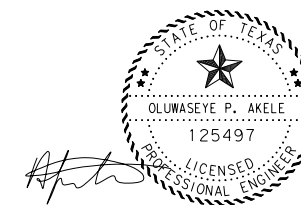
VELOCITY DISSIPATION DEVICES: Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as shown in the plans or as directed by the Project Engineer to provide a non-erosive flow velocity from the structure to a watercourse so that the natural physical and biological characteristics and functions are maintained and protected.

6. APPROVED STATE AND LOCAL PLANS: This SW3P is consistent with requirements specified in applicable sediment and erosion site plans or site permits, or storm water management site plans or permits approved by federal, state, or local officials.

7. MAINTENANCE: Control measures shall be properly installed according to specifications. If inspections or other information indicates a control has been installed, used, or is performing inadequately, the contractor must replace or modify the control as soon as practicable after discovery. Control measures shall be maintained in effective operating condition. If inspections determine that BMPs are not operating effectively maintenance will be performed as necessary to continue the effectiveness of the controls. Maintenance must be accomplished as soon as practicable. Controls adjacent to creeks, culverts, bridges, and water crossings shall have priority. Controls that have been disabled, run over, removed, or otherwise rendered ineffective must be corrected immediately upon discovery.

8. INSPECTION OF CONTROLS: A TxDOT inspector will inspect disturbed areas of the site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, and structural controls for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion controls measures identified in the SW3P will be inspected to ensure that they are operating correctly. Locations where vehicles enter or exit the site will be inspected for evidence of off-site vehicle tracking. Inspections will be conducted every month and within 24 hours after the end of a storm event of 0.5 inches or greater. The SW3P will be modified based on the result of these inspections. Revisions will be completed within 7 Calendar days following the inspection. Revised implementation schedules will be described in the SW3P and implemented as soon as practicable. Rain gages will be maintained on site for the duration of the project. Reports summarizing the scope of the inspections are included in the SW3P file.

9. NON-STORM WATER COMPONENTS: The contractor shall be required to implement appropriate pollution prevention controls and measures for all eligible non-storm water components of the discharge as approved and directed by the Project Engineer.



04/20/2022

SW3P NOTES
Texas Department of Transportation
SW3P NOTES
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REV: 10-25-16

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	F 2022 (736)		75
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	REEVES, E+C.	
CONT.	SECT.	JOB	HIGHWAY NO.
0003	08	064, ETC.	BI 20B, ETC.

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DATE: FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.
2.
 No Action Required Required Action

Action No.

- Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
- Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
- Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
- When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

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

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

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

- No Permit Required
 Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
 Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
 Individual 404 Permit Required
 Other Nationwide Permit Required: NWP# _____

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

1.
2.
3.
4.

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

Best Management Practices:

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

III. CULTURAL RESOURCES

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

- No Action Required Required Action

Action No.

1.
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4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

- No Action Required Required Action

Action No.

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V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

- No Action Required Required Action

Action No.

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If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

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

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

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

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

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

Contact the Engineer if any of the following are detected:

- * Dead or distressed vegetation (not identified as normal)
- * Trash piles, drums, canister, barrels, etc.
- * Undesirable smells or odors
- * Evidence of leaching or seepage of substances

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

- Yes No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

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

- Yes No

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

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

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

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

- No Action Required Required Action

Action No.

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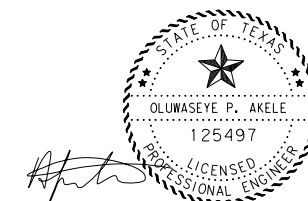
VII. OTHER ENVIRONMENTAL ISSUES

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

- No Action Required Required Action

Action No.

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3.



		Design Division Standard	
ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS			
EPIC			
FILE: epic.dgn	DN: TxDOT	CK: RG	DN: VP
©TxDOT: February 2015	CONT	SECT	JOB
12-12-2011 (DS) REVISIONS	0003	08	064, ETC.
05-07-14 ADDED NOTE SECTION IV. TO ITEM 506, ADDED GRASSY SWALES.	DIST	COUNTY	SHEET NO.
	ODA	REEVES, E+C.	76