

CONSTRUCTION PLANS FOR TRAFFIC SIGNAL IMPROVEMENTS RALPH HALL PARKWAY AT MIMS ROAD CITY OF ROCKWALL, TEXAS

CITY OF ROCKWALL

MAYOR:

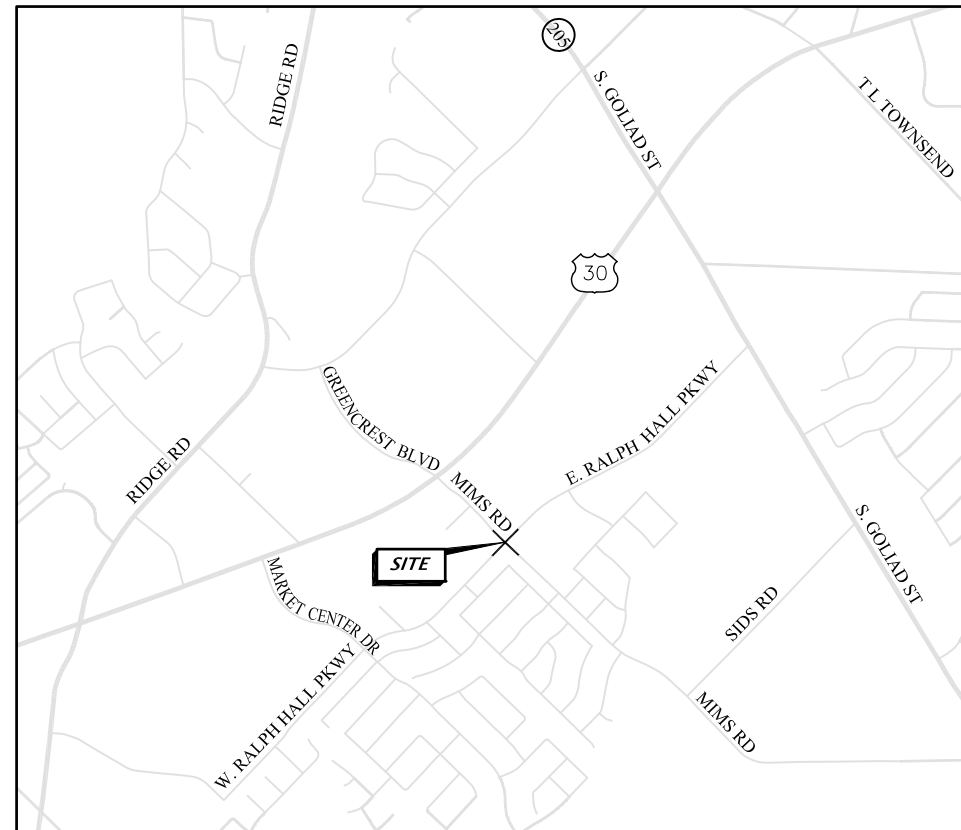
Jim Pruitt

CITY COUNCIL:

David White
John Hohenshelt
Bennie Daniels
Dennis Lewis, Mayor Pro-Tem
Scott Milder
Mike Townsend

CITY MANAGER:

Rick Crowley



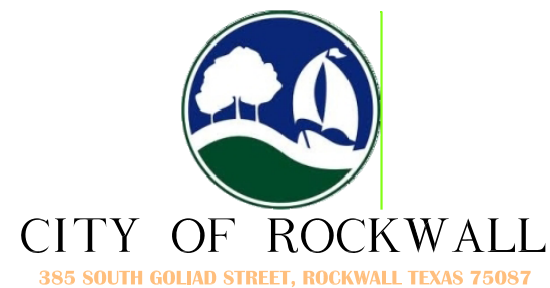
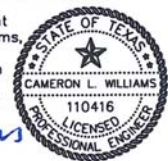
LOCATION MAP

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Cameron Williams
3-10-15



1801 Gateway Blvd, Suite 101 Richardson Texas 75080 www.bbcpl.com
Firm Registration #F-3185

MARCH 2015

GENERAL NOTES

GENERAL

1. THE CONTRACTOR SHALL NOTIFY THE CITY ENGINEER/INSPECTOR AT LEAST ONE WEEK PRIOR TO THE STARTING OF THIS PROJECT.
2. THE CONTRACTOR WILL ONLY BE ALLOWED TO WORK ON THIS PROJECT DURING DAYLIGHT HOURS (8 A.M. – 5 P.M. MONDAY – FRIDAY)
3. THE CONTRACTOR SHALL CLEAN UP AND REMOVE FROM THE WORK AREA ALL LOOSE MATERIAL RESULTING FROM THE CONTRACT OPERATIONS EACH DAY BEFORE WORK IS SUSPENDED.
4. ANY OBSTRUCTIONS TO EXISTING DRAINAGE DUE TO THE CONTRACTOR'S OPERATIONS WILL BE REMOVED BY THE CONTRACTOR AS REQUIRED BY THE CITY AT THE CONTRACTOR'S ENTIRE EXPENSE.

TEST PERIOD FOR SIGNALS

1. ONCE THE PERMANENT SIGNALS HAVE BEEN INSTALLED AND PLACED IN OPERATION, THEY SHALL OPERATE CONTINUOUSLY FOR A MINIMUM OF 30 CALENDAR DAYS IN A SATISFACTORY MANNER. EQUIPMENT FAILURES DURING THIS 30 DAYS WILL CAUSE THE TEST PERIOD TO START OVER.

EXISTING UTILITIES

1. THE EXACT LOCATION OF THE UNDERGROUND UTILITIES IS NOT CERTAIN. THE CONTRACTOR SHALL CONTACT THE CITY OF ROCKWALL AND UTILITY COMPANIES IN THE AREA FOR EXACT LOCATION PRIOR TO DRILLING FOR FOUNDATIONS AND ANY OTHER WORK THAT MIGHT INTERFERE WITH OR DAMAGE PRESENT UTILITIES. NO ADDITIONAL PAYMENT WILL BE MADE FOR THE RELOCATION OF ANY FOUNDATIONS DUE TO UTILITIES.
2. TEXAS STATE LAW, ARTICLE 1436C, MAKES UNLAWFUL THE OPERATION OF EQUIPMENT OR MACHINES WITHIN 10 FEET OF ANY OVERHEAD ELECTRICAL LINE UNLESS DANGER AGAINST CONTACT WITH HIGH VOLTAGE LINES HAD BEEN EFFECTIVELY GUARDED AGAINST PURSUANT TO THE PROVISION OF THE ARTICLE. WHEN CONSTRUCTION OPERATIONS REQUIRES WORKING NEAR AN OVERHEAD ELECTRICAL LINE, THE CONTRACTOR SHALL CONTACT THE OWNER/OPERATOR OF THE OVERHEAD ELECTRICAL LINE TO MAKE ADEQUATE ARRANGEMENTS AND TO TAKE NECESSARY SAFETY PRECAUTIONS TO ENSURE THAT ALL LAWS, ELECTRICAL LINE OWNER/OPERATOR REQUIREMENTS AND STANDARD INDUSTRY SAFETY PRACTICES ARE MET.

ITEM 416 – POLE FOUNDATIONS

1. NO MAST ARM POLE SHALL BE PLACED ON THE FOUNDATIONS PRIOR TO SEVEN (7) DAYS FOLLOWING PLACEMENT OF CONCRETE.
2. STAKE FOUNDATIONS LOCATIONS AND HAVE THEM APPROVED BY THE INSPECTOR BEFORE INSTALLATION. THIS WILL ENSURE THAT ALL LUMINAIRES AND MAST ARMS ARE CLEAR OF ALL OVERHEAD LINES AND UNDERGROUND UTILITIES BEFORE DRILLING BEGINS. THE SIGNAL INSPECTOR TOGETHER WITH THE CONTRACTOR WILL CALCULATE THE VERTICAL SIGNAL HEAD CLEARANCE BEFORE PLACING ANY TRAFFIC SIGNAL POLE.
3. THE DIMENSIONS SHOWN ON THE PLANS FOR LOCATION OF SIGNAL FOUNDATIONS, CONDUIT, AND OTHER ITEMS MAY BE VARIED TO MEET LOCAL CONDITIONS, SUBJECT TO APPROVAL BY THE CITY.
4. THE CONTRACTOR SHALL NOTIFY THE CITY AT LEAST 48 HOURS BEFORE PLACING CONCRETE.
5. ALL EXPOSED SIGNAL POLE AND CONTROLLER FOUNDATIONS SHALL RECEIVE A CLASS C FINISH PER TXDOT ITEM 427.

ITEM 618 – CONDUIT

1. UNDERGROUND CONDUIT FOR CABLE SHALL BE SCHEDULE 40 PVC. ALL COUPLINGS AND CONNECTIONS SHALL BE TIGHT AND WATER PROOF.
2. DO NOT USE EXPANDABLE FOAM TO SEAL ENDS OF CONDUIT, WHETHER USED OR UNUSED. CAP AND PLUG METHOD SHALL BE USED.

ITEM 620 – ELECTRICAL CONDUCTORS

1. ALL ELECTRICAL CONNECTORS FOR BREAKAWAY POLES SHALL BE BREAKAWAY IN ACCORDANCE WITH TXDOT RID(2). ALL ELECTRICAL CONNECTIONS FOR NEUTRALS SHALL BE BREAKAWAY, SHALL HAVE A WHITE COLOR IN MARKING AND SHALL HAVE PERMANENTLY INSTALLED SOLID NEUTRAL.

ITEM 628 – ELECTRICAL SERVICE

1. CONTRACTOR SHALL COORDINATE WITH THE ELECTRIC SERVICE PROVIDER AT LEAST 30 DAYS IN ADVANCE OF THE NEED FOR A SERVICE CONNECTION.

ITEM 680 – TRAFFIC SIGNAL INSTALLATION

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING AND INSTALLING ALL EQUIPMENT TO MAKE THE SIGNAL OPERATIONAL. THIS INCLUDES, BUT IS NOT LIMITED TO, FURNISHING AND INSTALLING CABINET, CONTROLLER, DIGITAL DETECTORS, AND CARD RACK ASSEMBLIES, AS REQUIRED. CARD RACK ASSEMBLIES SHALL BE FAIL-SAFE. ALL EQUIPMENT SHALL BE COMPATIBLE WITH EXISTING CITY SYSTEMS. ALL TRAFFIC SIGNAL EQUIPMENT SHALL BE APPROVED BY THE CITY PRIOR TO PURCHASE. UNLESS SPECIFICALLY CALLED OUT IN PLANS OR SPECIFICATIONS FURNISHING AND INSTALLATION OF THESE ITEMS SHALL BE SUBSIDIARY TO INSTALLATION OF HIGHWAY TRAFFIC SIGNAL BID ITEM. TRAFFIC SIGNAL EQUIPMENT SPECIFICS INCLUDE THE FOLLOWING:
 - A. THE TRAFFIC SIGNAL CONTROLLER SHALL BE AN ASC3-2100 ECONOLITE.
 - B. THE TRAFFIC SIGNAL CABINET SHALL BE A PTSI TRAFFIC SIGNAL CABINET, OR APPROVED EQUAL, MEETING THE FOLLOWING SPECIFICATIONS: NEMA TS/2, TYPE 1, SIZE 6, BASE MOUNT, WITH 16 POSITIONS.
 - C. THE BATTERY BACK-UP SHALL BE AN ALPHA BBU SYSTEM, OR APPROVED EQUAL, WHICH INCLUDES THE FOLLOWING: FXM2000, UNIVERSAL AUTOMATIC TRANSFER SWITCH, FOUR (4) ALPHAGEL BATTERIES, A BATTERY HARNESS, ALPHA GUARD, AND A S6 SIDE MOUNT CABINET.
 - D. OPTICOM DETECTORS, MOUNTING EQUIPMENT, AND PHASE SELECTION EQUIPMENT SHALL BE MANUFACTURED BY 3M OR AN APPROVED EQUAL. PROVIDE A 3M 380 CARD RACK OR APPROVED EQUAL AS REQUIRED TO MAKE SYSTEM OPERATIONAL.

- E. PROVIDE TWO (2) RACKVISION PRO 2 CARDS AND FOUR (4) AUTOSCOPE IMAGE SENSOR IV VIDEO DETECTION CAMERAS. THE CONTRACTOR SHALL INSTALL THE VIDEO DETECTION EQUIPMENT AND MAKE OPERATIONAL.

- F. PROVIDE FOUR (4) RED LIGHT CONFIRMATION SIGNALS AND WIRING AS IDENTIFIED IN THE PLANS.
2. FURNISH AND INSTALL MAST ARMS, SIGNAL POLES, LUMINAIRES, SIGNAL HEADS, ILLUMINATED STREET NAME SIGNS, AND SIGNAL CABLE.
3. FURNISH AND INSTALL CONDUIT AND GROUND BOXES.
4. FURNISH AND PLACE ALL CONCRETE AND REINFORCING STEEL FOR THE SIGNAL POLE FOUNDATIONS AND CONTROLLER FOUNDATIONS.
5. THE CONTRACTOR SHALL ALSO FURNISH AND INSTALL ALL OTHER ITEMS NOT LISTED ABOVE WHICH ARE NEEDED TO PROVIDE THE COMPLETE TRAFFIC SIGNAL INSTALLATION AS CALLED FOR IN THE PLANS AND SPECIFICATIONS.
6. UNLESS DIRECTED BY THE CITY, THE SIGNAL SHALL BE PLACED IN FULL OPERATION BETWEEN 9:00 AM – 12:00 P.M. (NOON) ON MONDAY, TUESDAY, OR WEDNESDAY ONLY.
7. CITY STAFF OR CITY REPRESENTATIVE SHALL BE PRESENT WHEN THE SIGNAL ARE PLACED IN OPERATION. THE CONTRACTOR SHALL NOTIFY THE CITY 48 HOURS IN ADVANCE OF THE TURN ON.
8. LIMINAIRE MAST ARMS, FIXTURES, AND LAMPS ARE CONSIDERED SUBSIDIARY TO ITEM 680. LUMINARE MAST ARMS SHALL BE POSITIONED DIRECTLY ABOVE AND IN LINE WITH THE ASSOCIATED MAST ARM.

ITEM 682 – SIGNAL HEADS

1. UNLESS OTHERWISE SHOWN IN THE PLANS, ALL SIGNAL HEADS SHALL BE MOUNTED HORIZONTALLY.
2. ALL SIGNAL HEADS SHALL BE COVERED WITH BURLAP OR OTHER APPROVED MATERIAL FROM THE TIME OF INSTALLATION UNTIL THE SIGNAL IS PLACED IN OPERATION.
3. LED SIGNAL LAMPS SHALL BE USED FOR ALL SIGNAL INDICATIONS AND FURNISHED BY THE CONTRACTOR.
4. PROVIDE ALL SIGNAL HEADS FROM THE SAME MANUFACTURER.
5. ALL NEW VEHICLE AND COUNTDOWN PEDESTRIAN SIGNAL HEADS FOR THE PERMANENT SIGNAL SHALL BE ALUMINUM WITH ALUMINUM VENTED BACK PLATES. THESE ITEMS SHALL BE PRIMED PRIOR TO AND PAINTED WITH PERMANENT BLACK PAINT.

ITEM 684 – TRAFFIC SIGNAL CABLES

1. IDENTIFY EACH CABLE AS SHOWN ON THE PLANS (CABLE 1, ETC.) WITH PRE-NUMBERED IDENTIFICATION TAGS OF PLASTIC, TAPE OR MARKING LABELS AT EACH SIGNAL HEAD, GROUND BOX, TERMINAL BLOCK, POLE BASE AND CONTROLLER.
2. ALL CABLES SHALL BE CONTINUOUS WITHOUT SPLICES FROM TERMINAL POINT TO TERMINAL POINT OR AS DIRECTED OR APPROVED. ALL PROPOSED SIGNAL CABLE AND NUMBER OF CONDUCTORS REQUIRED SHALL BE AS SHOWN ON THE PLANS. TERMINATE ALL ELECTRICAL CONDUCTORS FROM THE CONTROLLER AT THE TERMINATION BLOCK IN THE SIGNAL POLE HAND HOLE WHETHER IN USE OR NOT. PROVIDE THE NUMBER OF CONDUCTORS AS SHOWN ON THE PLANS.

ITEM 686 – POLE ASSEMBLIES

1. CRITICAL POLE ASSEMBLY FEATURES AND DIMENSIONS REQUIRED FOR THIS PROJECT ARE SHOWN ON THE PLAN DETAIL SHEETS. POLE SHAFT/MAST ARM IDENTIFICATION NUMBERS SHALL BE STENCILED ON POLE SHAFTS AND MAST ARMS BEFORE SHIPMENT TO ENSURE MATCHING OF POLES AN MAST ARMS DURING FIELD ASSEMBLY.
2. ALL SIGNAL POLES AND MAST ARMS SHALL BE GALVANIZED STEEL.
3. ALL SIGNAL POLES SHALL BE ROUND TYPE.
4. PROVIDE ALL SIGNAL POLES FROM THE SAME MANUFACTURER.

SIGNING AND PAVEMENT MARKINGS

1. EXISTING STOP SIGNS SHALL REMAIN IN OPERATION UNTIL THE NEW SIGNAL OPERATION HAS BEEN TURNED ON.
2. CONTRACTOR IS TO PROVIDE ALL NEW TRAFFIC SIGNS.
3. EXISTING SIGNS WHICH ARE TO BE REMOVED ARE TO BE SALVAGE AND RETURNED TO THE CITY.
4. ALL PAVEMENT MARKINGS SHALL BE THERMOPLASTIC AND FURNISHED AND INSTALLED BY THE CONTRACTOR.


ILLUMINATED STREET NAME SIGNS

1. CONTRACTOR SHALL FURNISH AND INSTALL ILLUMINATED STREET NAME SIGNS.
2. SIGNS ARE TO BE TEMPLE EDGE-LIT INTERNALLY ILLUMINATED LED SIGNS OR APPROVED EQUAL.
3. CONTRACTOR TO PROVIDE SHOP DRAWINGS OF PROPOSED SIGNS TO THE CITY FOR APPROVAL BEFORE ORDERING SIGNS.
4. ILLUMINATED STREET NAME SIGNS ARE TO BE MOUNTED TO THE SIGNAL MAST ARM BY AN APPROVED MOUNTING METHOD. THE SIGNS SHALL NOT BE FREE SWINGING BELOW THE MAST ARM OR ON A SEPARATE ARM DESIGNATED FOR THE ILLUMINATED STREET NAME SIGN.

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Cameron L. Williams
3-10-15



Rev.	Description	Date

GENERAL NOTES
RALPH HALL PARKWAY AT MIMS ROAD
CITY OF ROCKWALL, TEXAS

3 Binkley & Barfield C&P
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QUANTITIES


ITEM	TXDOT ITEM	DESCRIPTION	UNIT	QUANTITY
1	104	REMOVING CONCRETE (SIDEWALKS)	SY	476
2	416	DRILL SHAFT (TRF SIG POLE) (24 IN)	LF	20
3	416	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	30
4	416	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF	44
5	500	MOBILIZATION	LS	1
6	502	BARRICADS, SIGNS, AND TRAFFIC HANDLING	MO	3
7	529	CONCRETE CURB AND GUTTER	LF	82
8	531	CONCRETE SIDEWALKS	SY	112
9	618	CONDUIT (PVC) (SCHD 40) (2")	LF	180
10	618	CONDUIT (PVC) (SCHD 40) (3")	LF	20
11	618	CONDUIT (PVC) (SCHD 40) (4")	LF	40
12	618	CONDUIT (PVC) (SCHD 40) (4") (BORED)	LF	475
13	620	ELEC CONDR (NO. 6) INSULATED	LF	120
14	620	ELEC CONDR (NO. 6) GROUND	LF	720
15	621	TRAY CABLE (3 CONDR) (12 AWG)	LF	1600
16	621	TRAY CABLE (3 CONDR) (14 AWG)	LF	1260
17	624	GROUND BOX (TYPE D) (162922) W/APRON	EA	4
18	628	ELECTRICAL METER PEDESTAL	EA	1
19	644	INSTALL SMALL ROAD SIGN SUPPORT AND ASSEMBLY TYS80 (1) SA (P)	EA	1
20	666	REFLECTIVE PAVEMENT MARKING TYPE I (W) 8" (SLD) (100 MIL)	LF	675
21	666	REFLECTIVE PAVEMENT MARKING TYPE I (W) 12" (SLD) (100 MIL)	LF	112
22	666	REFLECTIVE PAVEMENT MARKING TYPE I (W) 24" (SLD) (100 MIL)	LF	408
23	666	REFLECTIVE PAVEMENT MARKING TYPE I (W) (ARROW) (100 MIL)	EA	5
24	666	REFLECTIVE PAVEMENT MARKING TYPE I (W) (DOUBLE ARROW) (100 MIL)	EA	1
25	666	REFLECTIVE PAVEMENT MARKING TYPE I (W) (WORD) (100 MIL)	EA	6
26	666	REFLECTIVE PAVEMENT MARKING TYPE I (Y) 4" (SLD) (100 MIL)	LF	450
27	677	ELIMINATE EXISTING PAVEMENT MARKING AND MARKS (4")	LF	400
28	677	ELIMINATE EXISTING PAVEMENT MARKING AND MARKS (8")	LF	822
29	677	ELIMINATE EXISTING PAVEMENT MARKING AND MARKS (12")	LF	221
30	677	ELIMINATE EXISTING PAVEMENT MARKING AND MARKS (24")	LF	148
31	677	ELIMINATE EXISTING PAVEMENT MARKING AND MARKS (ARROW)	EA	7
32	677	ELIMINATE EXISTING PAVEMENT MARKING AND MARKS (WORD)	EA	4
33	678	PAVEMENT SURFACE PREPARATION FOR MARKINGS (4")	LF	450
34	678	PAVEMENT SURFACE PREPARATION FOR MARKINGS (8")	LF	675
35	678	PAVEMENT SURFACE PREPARATION FOR MARKINGS (12")	LF	112
36	678	PAVEMENT SURFACE PREPARATION FOR MARKINGS (24")	LF	408
37	678	PAVEMENT SURFACE PREPARATION FOR MARKINGS (ARROW)	EA	5
38	678	PAVEMENT SURFACE PREPARATION FOR MARKINGS (DOUBLE ARROW)	EA	1
39	678	PAVEMENT SURFACE PREPARATION FOR MARKINGS (WORD)	EA	6
40	680	INSTALLATION OF HIGHWAY TRAFFIC SIGNAL	EA	1
41	682	BACKPLATE (12 IN) (3 SEC)	EA	8
42	682	BACKPLATE (12 IN) (4 SEC)	EA	4
43	682	VEHICLE SIGNAL SECTION (12 IN) LED (RED ARROW)	EA	4
44	682	VEHICLE SIGNAL SECTION (12 IN) LED (RED)	EA	8
45	682	VEHICLE SIGNAL SECTION (12 IN) LED (GREEN ARROW)	EA	4
46	682	VEHICLE SIGNAL SECTION (12 IN) LED (GREEN)	EA	8
47	682	VEHICLE SIGNAL SECTION (12 IN) LED (YELLOW ARROW)	EA	8
48	682	VEHICLE SIGNAL SECTION (12 IN) LED (YELLOW)	EA	8
49	682	PEDESTRIAN SIGNAL SECTION LED (COUNTDOWN)	EA	8
50	684	TRAFFIC SIGNAL CABLE (TY A) (14 AWG) (5 CONDR)	LF	368
51	684	TRAFFIC SIGNAL CABLE (TY A) (14 AWG) (7 CONDR)	LF	1818
52	684	TRAFFIC SIGNAL CABLE (TY A) (14 AWG) (16 CONDR)	LF	780
53	686	PEDESTRIAN POLE ASSEMBLY	EA	4
54	686	PEDESTRIAN POLE ASSEMBLY (PUSH BUTTON ONLY)	EA	8
55	686	INSTALL TRAFFIC SIGNAL POLE ASSEMBLY (S) 1 ARM (36') LUM & ILS	EA	1
56	686	INSTALL TRAFFIC SIGNAL POLE ASSEMBLY (S) 1 ARM (40') LUM & ILS	EA	1
57	686	INSTALL TRAFFIC SIGNAL POLE ASSEMBLY (S) 1 ARM (55') LUM & ILS	EA	1
58	686	INSTALL TRAFFIC SIGNAL POLE ASSEMBLY (S) 1 ARM (60') LUM & ILS	EA	1
59	688	ACCESSIBLE PEDESTRIAN PUSHBUTTONS	EA	8
60	6006	COAXIAL CABLE	LF	1004
61	-	VIDEO DETECTOR SYSTEM (MULTI-CHANNEL SYSTEM)	EA	1
62	-	VIDEO DETECTOR SYSTEM (CAMERA)	EA	4
63	-	VIDEO POWER CABLE	LF	1004
64	-	EMERGENCY PRE-EMPTION - 1 CHANNEL DETECTOR UNIT (OPTICOM DETECTOR 711)	EA	4
65	-	EMERGENCY PRE-EMPTION - 4 CHANNEL DESCRIMNATOR UNIT	EA	1
66	-	3M 138 OPTICOM CABLE	LF	1020
67	-	ILLUMINATED STREET NAME SIGN	EA	4
68	636*	ALUMINUM SIGNS	EA	6
69	656*	TRAFFIC SIGNAL CONTROLLER CABINET FOUNDATION	EA	1
70	690*	LUMINAIRE	EA	4
71	*	CONTROLLER AND CABINET	EA	1
72	*	BATTERY BACKUP SYSTEM	EA	1

* SUBSIDIARY TO ITEM 680 INSTALLATION OF HIGHWAY TRAFFIC SIGNAL

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Cameron L. Williams
3-10-15



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Rev.	Description	Date

QUANTITY SUMMARY
RALPH HALL PARKWAY AT MIMS ROAD
CITY OF ROCKWALL, TEXAS



1801 Gateway Blvd. Suite 101 Richardson, Texas 75080
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 Texas Registration Number F-3185 www.bbcpie.com

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PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN TEXT	DIMENSIONS	ALUMINUM TYPE A	ALUMINUM TYPE G	Post Type FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	Anchor Type UA=Univer-Conc UB=Univer-Bolt SA=Slip-Conc SB=Slip-Bolt WS=Wedge Steel WP=Wedge Plastic	Mounting Designation P = Prefab. "EXT" or "2EXT" = # of Ext. Beam = Extruded Wind Beam T = Prefab. "1" WC = 1.12 #/ft Wing Chan. U = Prefab. "U" EXAL= Extruded Aluminum	SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)
5	S1	R10-17T		30" x 30"	✓					MOUNT ON MAST ARM ON POLE T100.
5	S2	R3-8LK		36" x 30"	✓					MOUNT ON MAST ARM ON POLE T100.
5	S3	ILSN	xxxx RALPH HALL PKWY BLVD xxxx	TBD	✓					MOUNT ON MAST ARM ON POLE T100.
5	S4	R10-17T		30" x 30"	✓					MOUNT ON MAST ARM ON POLE T200.
5	S5	ILSN	xxxx MIMS RD BLVD xxxx	TBD	✓					MOUNT ON MAST ARM ON POLE T200.
5	S6	R10-17T		30" x 30"	✓					MOUNT ON MAST ARM ON POLE T300.
5	S7	R3-8LK		36" x 30"	✓					MOUNT ON MAST ARM ON POLE T300.
5	S8	R3-5R		30" x 36"	✓					MOUNT ON MAST ARM ON POLE T300.
5	S9	ILSN	xxxx RALPH HALL PKWY BLVD xxxx	TBD	✓					MOUNT ON MAST ARM ON POLE T300.
5	S10	R10-17T		30" x 30"	✓					MOUNT ON MAST ARM ON POLE T400.
5	S11	ILSN	xxxx MIMS RD BLVD xxxx	TBD	✓					MOUNT ON MAST ARM ON POLE T400.
5	S12	R3-7R		30" x 30"	✓		S80	1	SA	P

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ALUMINUM SIGN BLANKS (TYPE A)

Square Ft. Min. Thickness

Less than 7.5 0.080"
7.5 to 15 0.100"
Greater than 15 0.125"

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.

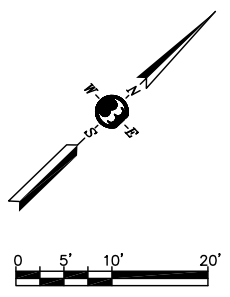
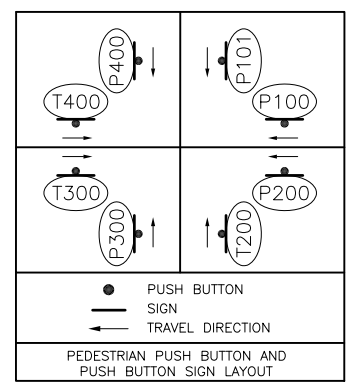
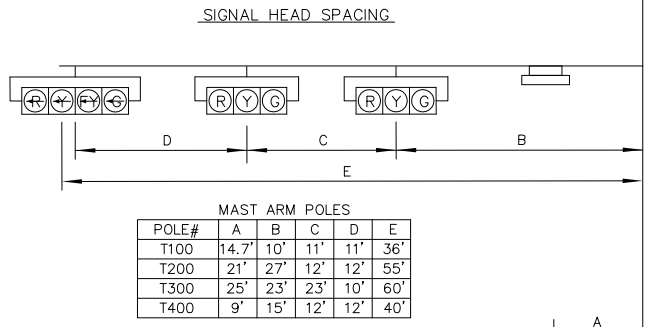
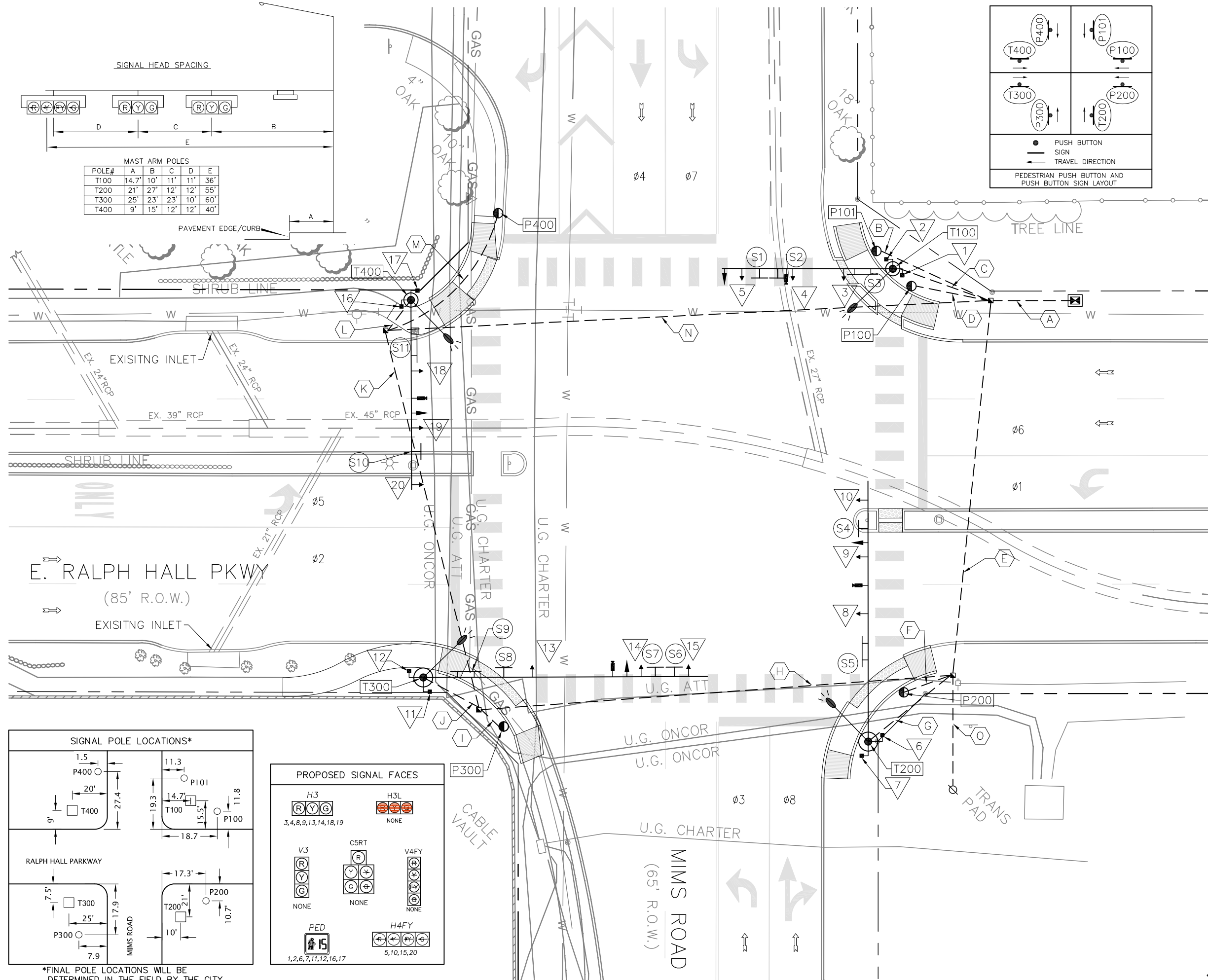
SUMMARY OF SMALL SIGNS

SOSS

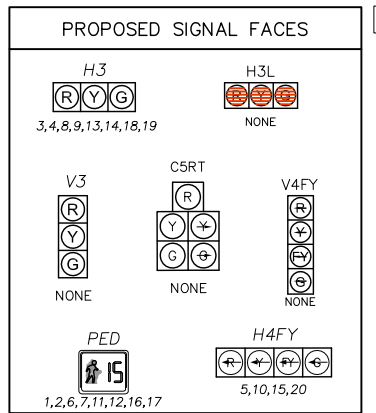
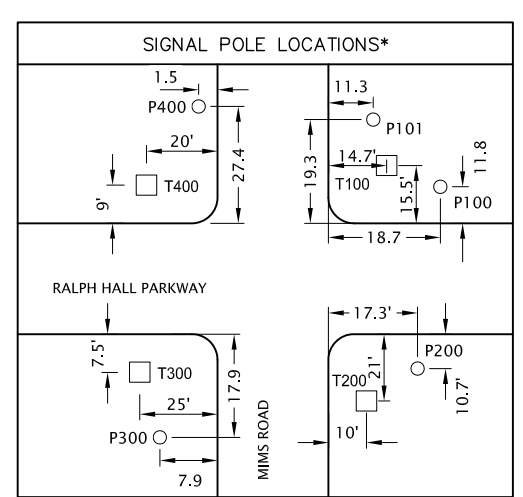
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DN.: -TxDOT	11-93	REVISIONS	
CK.: -TxDOT	8-95	7-02	
DW.: -TxDOT	1-02	2-07	
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CONT	SECT	JOB	HIGHWAY
DIST	COUNTY		SHEET NO.
			4

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- LEGEND**
- VEHICLE SIGNAL POLE
 - PUSHBUTTON POLE
 - VEHICLE SIGNAL HEAD
 - PEDESTRIAN SIGNAL INDICATION
 - GROUND BOX (TYPE D)
 - CONDUIT
 - METER PEDESTAL
 - PAD MOUNTED CONTROLLER AND CABINET
 - ⊥ TRAFFIC CONTROL SIGN
 - ⊥ STREET NAME SIGN (ILLUMINATED)
 - ▽ SIGNAL HEAD NUMBER
 - SIGN NUMBER
 - POLE NUMBER
 - CONDUIT RUN NUMBER
 - ▶ EMERGENCY VEHICLE DETECTOR (OPTICOM)
 - LUMINAIRE
 - VIVIDS
 - ⊥ POST MOUNTED SIGN & POST
 - TRAFFIC FLOW ARROWS



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110416
LICENSED PROFESSIONAL ENGINEER

Rev.	Description	Date

**TRAFFIC SIGNAL LAYOUT
RALPH HALL PARKWAY AT MIMS ROAD
CITY OF ROCKWALL, TEXAS**

Binkley & Barfield | C&P
consulting engineers

1801 Gateway Blvd. Suite 101 Richardson, Texas 75080
972.644.2800 Fax 972.644.2817
Texas Registration Number F-3185 www.bbcp.com

DRAWN BY: BBCPI DATE: 3/15 SCALE: 1" = 20' JOB NUMBER: BC14074 SHEET: 5

*FINAL POLE LOCATIONS WILL BE DETERMINED IN THE FIELD BY THE CITY.

MAST ARM SIGNAL HEAD AND POLE SUMMARY

SIGNAL HEAD AND POLE SUMMARY																																																		
POLE NUMBER	T100					P100/P101					T200					P200					T300					P300					T400					P400														
MAST ARM LENGTH	36'					-					55'					-					60'					-					40'					-														
FOUNDATION TYPE	36-A					24-A					24-A					48-A					24-A					48-A					24-A					36-B					24-A									
WITH LUMINAIRES	YES					-					-					YES					-					YES					-					YES					-									
ILSN	YES					-					-					YES					-					YES					-					YES					-									
SIZE OF LENS	12"					-					12"					-					12"					-					12"					-														
SIGNAL TYPE	PED	PED	H3	H3	H4FY	-	-	-	-	-	PED	PED	H3	H3	H4FY	-	-	-	-	-	PED	PED	H3	H3	H4FY	-	-	-	-	-	PED	PED	H3	H3	H4FY	-	-	-	-	-	PED	PED	H3	H3	H4FY	-	-	-	-	-
SIGNAL FACE NO.	1	2	3	4	5	-	-	-	-	-	6	7	8	9	10	-	-	-	-	-	11	12	13	14	15	-	-	-	-	-	16	17	18	18	20	-	-	-	-	-	21	22	23	24	25	-	-	-	-	-
	DW	DW	R	R	RA	-	-	-	-	-	DW	DW	R	R	RA	-	-	-	-	-	DW	DW	R	R	RA	-	-	-	-	-	DW	DW	R	R	RA	-	-	-	-	-	DW	DW	R	R	RA	-	-	-	-	-
	W	W	Y	Y	YA	-	-	-	-	-	W	W	Y	Y	YA	-	-	-	-	-	W	W	Y	Y	YA	-	-	-	-	-	W	W	Y	Y	YA	-	-	-	-	-	W	W	Y	Y	YA	-	-	-	-	-
	-	-	G	G	FYA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
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POLE WIRING TABLE AND SUMMARY

POLE NO.	3C #14 AWG (LUM)	3C #14 AWG (ILSN)	3C #14 AWG (RLCS)	3C#12 (PB)	3M 128 OPTICOM CABLE	COAXIAL (VIDEO)	POWER (VIDEO)	5C#14 (SIGNAL)	7C#14 (SIGNAL)
T100	30	30	25	5	56	52	52	71	52
P100	-	-	-	5	-	-	-	-	-
P101	-	-	-	5	-	-	-	-	-
T200	30	30	25	5	71	59	59	106	71
P200	-	-	-	5	-	-	-	-	-
T300	30	30	25	5	66	66	66	109	76
P300	-	-	-	5	-	-	-	-	-
T400	30	30	25	5	47	47	47	82	59
P400	-	-	-	5	-	-	-	-	-
TOTAL	120	120	100	40	240	224	224	368	258

NOTE: RLCS - RED LIGHT CONFIRMATION SIGNAL, PB - PUSH BUTTON

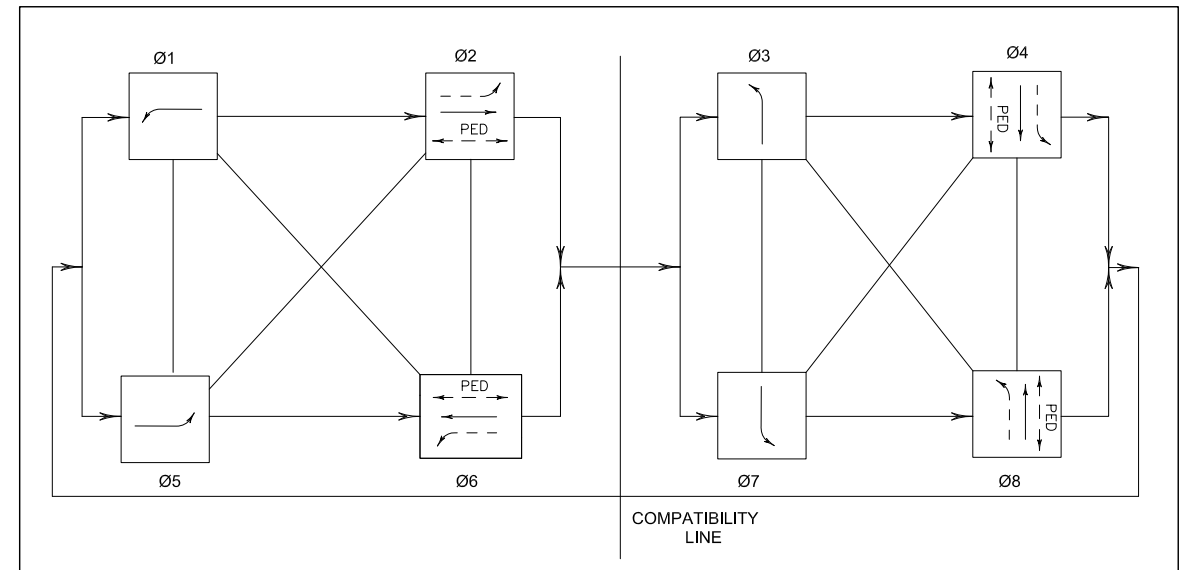
16C CABLE TERMINATION CHART

CABLE CONDUCTOR	T100	T200	T300	T400
	S.H. NO.	S.H. NO.	S.H. NO.	S.H. NO.
1 WHITE	SIG. COMMON	SIG. COMMON	SIG. COMMON	SIG. COMMON
2 RED	SH 3,4 R	SH 8,9 R	SH 13,14 R	SH 18,19 R
3 ORANGE	SH 3,4 Y	SH 8,9 Y	SH 13,14 Y	SH 18,19 Y
4 GREEN	SH 3,4 G	SH 8,9 G	SH 13,14 G	SH 18,19 G
5 BLACK	SPARE	SPARE	SPARE	SPARE
6 BLUE	SH 5 RA	SH 10 RA	SH 15 RA	SH 20 RA
7 RED/WHITE	SH 5 YA	SH 10 YA	SH 15 YA	SH 20 YA
8 GREEN/WHITE	SH 5 FYA	SH 10 FYA	SH 15 FYA	SH 20 FYA
9 RED/BLACK	SH 5 GA	SH 10 GA	SH 15 GA	SH 20 GA
10 GREEN/BLACK	Ø6 DW (SH 1)	Ø6 DW (SH 6)	Ø2 DW (SH 11)	Ø4 DW (SH 16)
11 BLUE/WHITE	Ø6 W (SH 1)	Ø6 W (SH 6)	Ø2 W (SH 11)	Ø4 W (SH 16)
12 BLUE/BLACK	Ø6 DW (SH 2)	Ø2 DW (SH 7)	Ø4 DW (SH 12)	Ø6 DW (SH 17)
13 WHITE/BLACK	Ø6 W (SH 2)	Ø2 W (SH 7)	Ø4 W (SH 12)	Ø6 W (SH 17)
14 BLACK/RED	SPARE	SPARE	SPARE	SPARE
15 ORANGE/BLACK	SPARE	SPARE	SPARE	SPARE
16 BLACK/WHITE	SPARE	SPARE	SPARE	SPARE

LED TRAFFIC SIGNAL LAMPS

LED TRAFFIC SIGNAL LAMP 12 INCH (EA)						PED SIGNAL LAMP
RED	GREEN	YELLOW	RED ARROW	YELLOW ARROW	GREEN ARROW	COUNTDOWN
8	8	8	4	8	4	8

PHASING DIAGRAM



FOUNDATION SUMMARY

POLE NO.	TYPE			
	24-A	36-A	36-B	48-A
T100		14		
P100	4			
P101	4			
T200				22
P200	4			
T300				22
P300	4			
T400			16	
P400	4			
TOTAL	20	14	16	44

GROUND BOX SUMMARY

GROUND BOX TYPE	TOTAL (EA.)
TYPE C	-
TYPE D	4
TYPE E	-

CONDUIT AND CABLE SUMMARY

CONDUIT RUN	CONDUIT						WIRE AND CABLE										LENGTH OF CONDUIT RUN C-C	CONDUIT RUN
	2" PVC TRENCHED	2" PVC BORED	3" PVC TRENCHED	3" PVC BORED	4" PVC TRENCHED	4" PVC BORED	1C #6 AWG (POWER)	1C #6 AWG (BARE)	3C #14 AWG (LUM)	3C #14 AWG (ILSN)	3M 128 OPTICOM CABLE	COAXIAL (VIDEO)	POWER (VIDEO)	16C #14 AWG (SIGNALS)	3C #12 AWG (PB)			
A					1			1		2		2	2	2	4	20	A	
B	1							1							1	25	B	
C	1							1	1	1		1	1	1	20	C		
D	1							1						1	15	D		
E					1			1		2		2	2	2	80	E		
F	1		1					1						1	10	F		
G	1							1	1	1		1	1	1	25	G		
H						1		1	1	1		1	1	2	100	H		
I	1							1						1	5	I		
J	1							1	1	1		1	1	1	15	J		
K						1		1							85	K		
L	1							1	1	1		1	1	1	10	L		
M	1							1						1	35	M		
N						1		1	1	1		1	1	2	130	N		
O			1				2	1	4	4					20	O		
SLACK							8	18	16	16	16	16	16	16	32	5	SLACK	
TOTAL	180	0	20	0	40	475	120	720	460	460	780	780	780	780	1560	-	TOTAL	

SIGNAL HEAD SUMMARY

NO.	TYPE	BACKPLATE			12" VEH SEC	16"X18" COUNTDOWN PED
		3 SECT.	4 SECT.	5 SECT.		
1	PED				0	1
2	PED				0	1
3	H3	1			3	
4	H3	1			3	
5	H4FY		1		4	
6	PED				0	1
7	PED				0	1
8	H3	1			3	
9	H3	1			3	
10	H4FY		1		4	
11	PED				0	1
12	PED				0	1
13	H3	1			3	
14	H3	1			3	
15	H4FY		1		4	
16	PED				0	1
17	PED				0	1
18	H3	1			3	
19	H3	1			3	
20	H4FY		1		4	
TOTALS		8	4	0	40	8

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Cameron L. Williams
3-10-15

STATE OF TEXAS
CAMERON L. WILLIAMS
110416
LICENSED PROFESSIONAL ENGINEER

TRAFFIC SIGNAL DETAILS
RALPH HALL PARKWAY AT MIMS ROAD
CITY OF ROCKWALL, TEXAS

Binkley & Barfield | C&P
consulting engineers

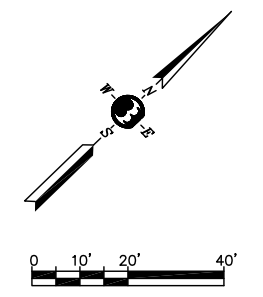
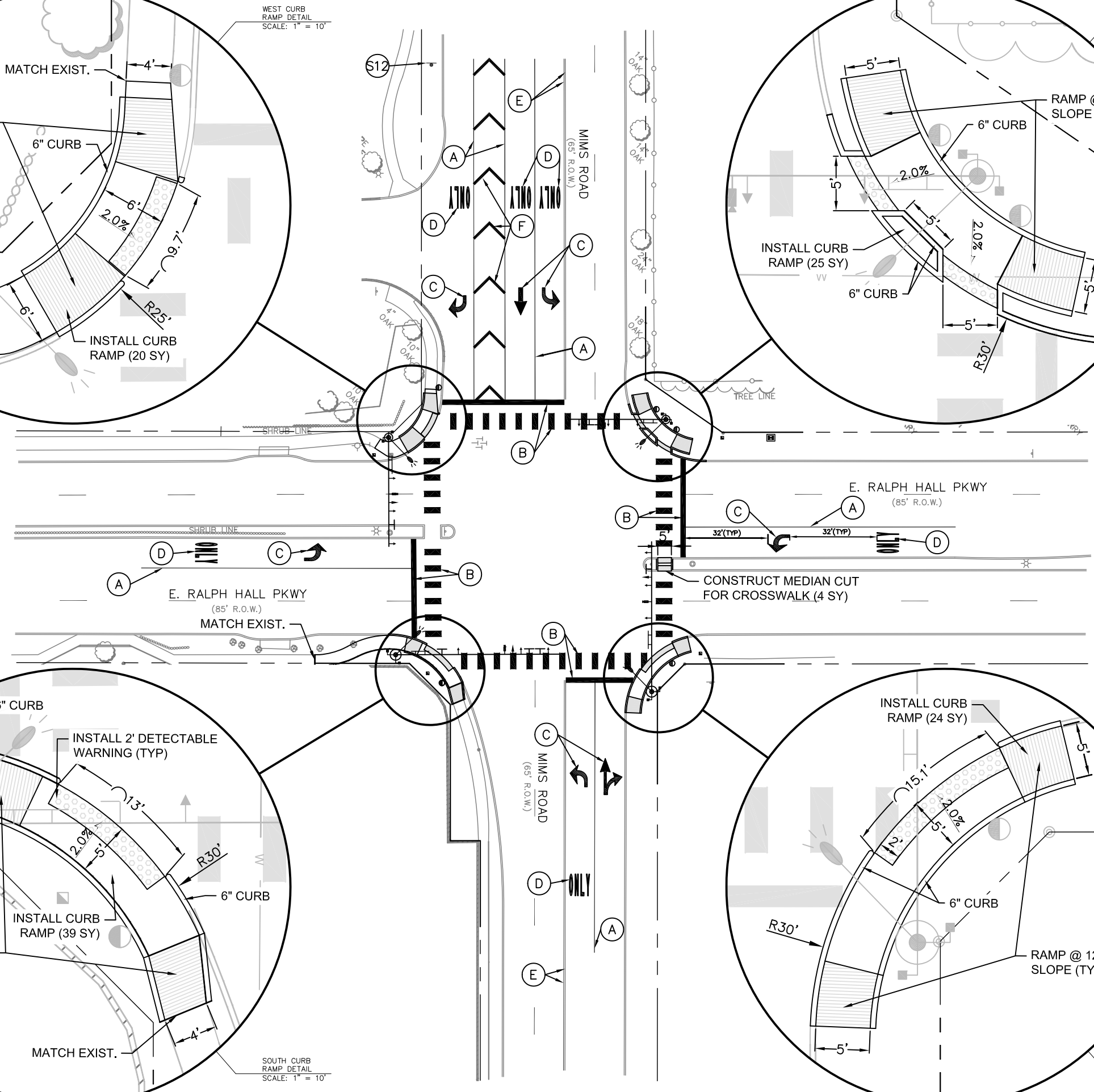
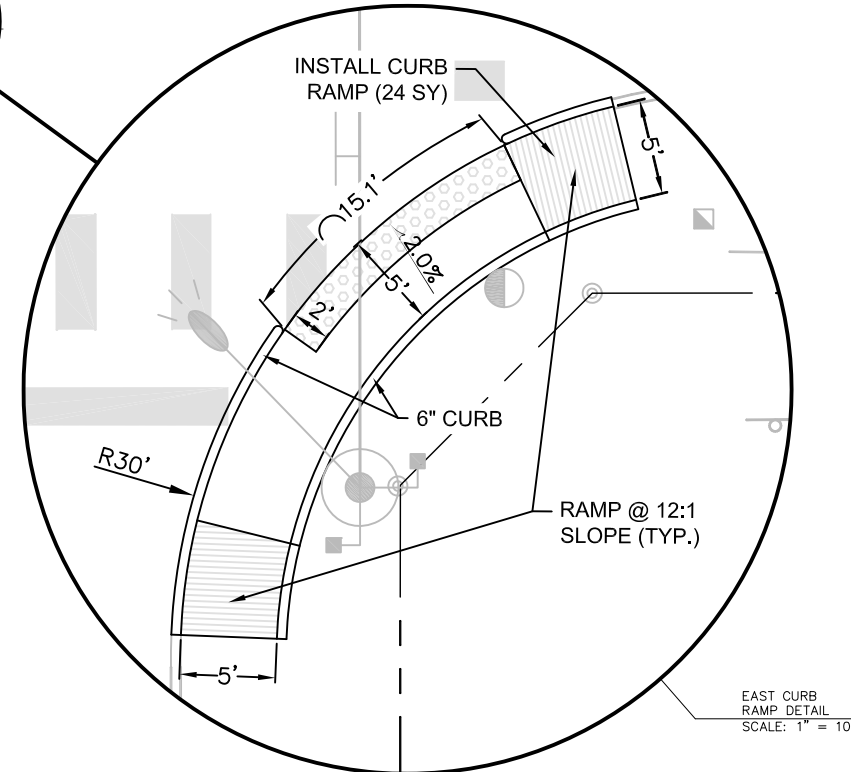
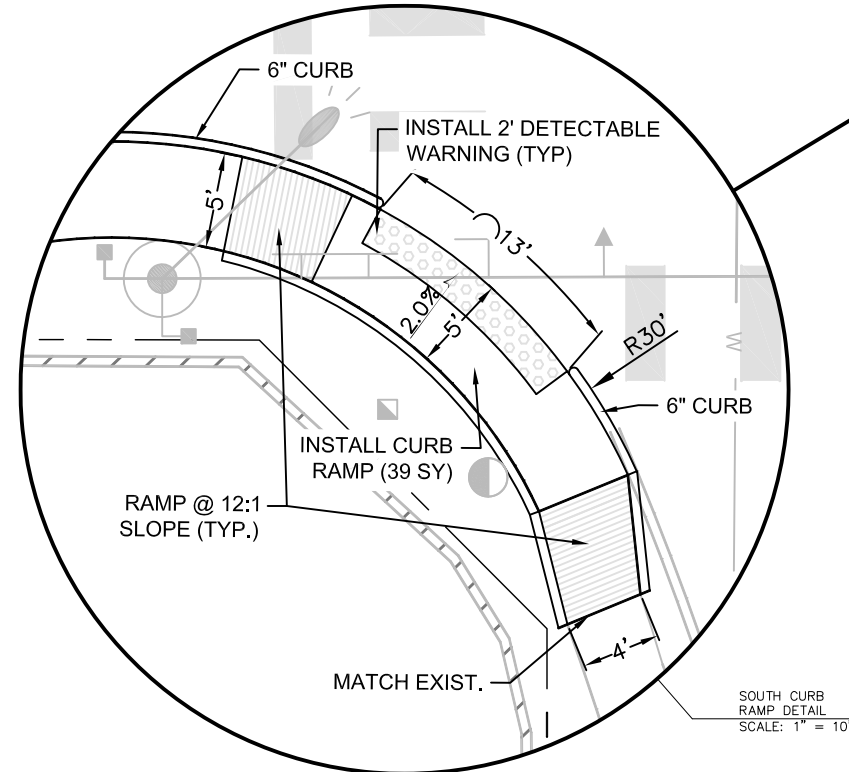
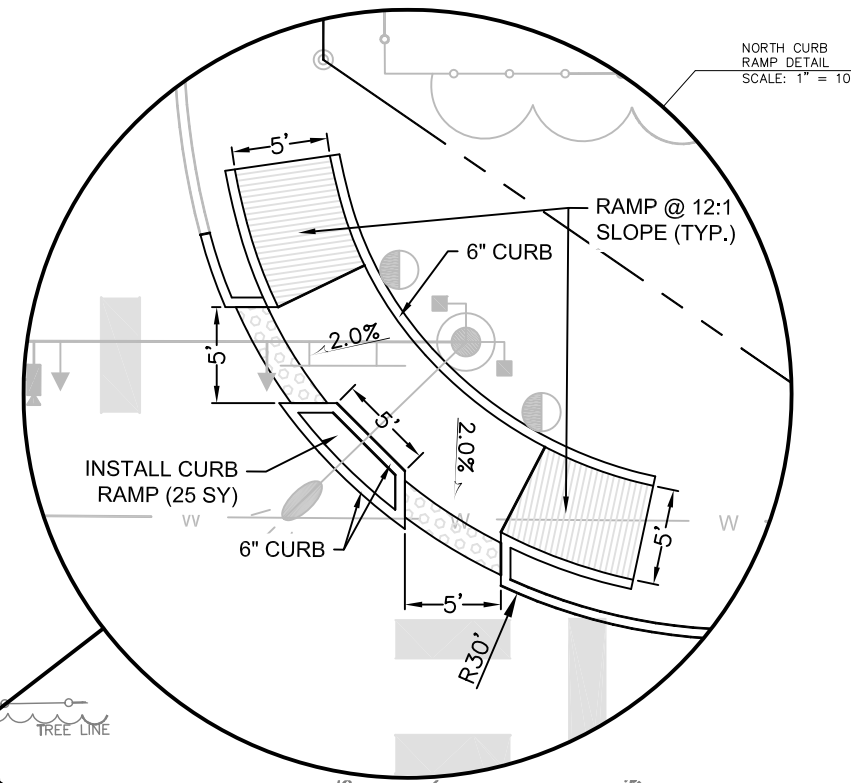
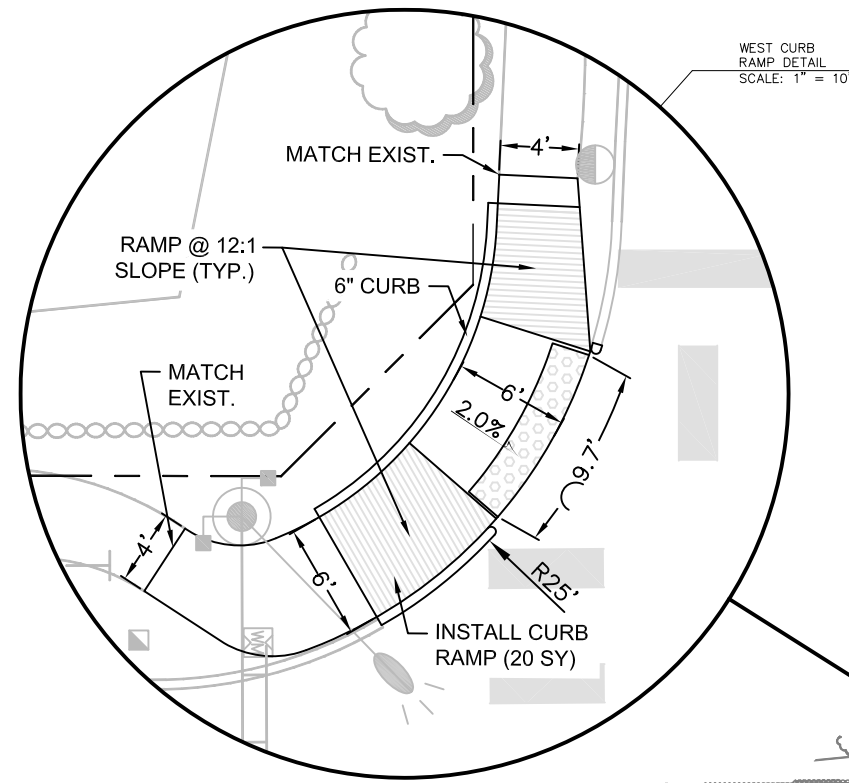
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- LEGEND**
- EXISTING MARKINGS
 - PROPOSED MARKINGS
 - (A) REFL PAV MRK TY I (W) 8" (SLD)
 - (B) REFL PAV MRK TY I (W) 24" (SLD)
 - (C) REFL PAV MRK TY I (W) (ARROW)
 - (D) REFL PAV MRK TY I (W) (WORD)
 - (E) REFL PAV MRK TY I (Y) (DBL) 4" (SLD)
 - (F) REFL PAV MRK TY I (W) 12" (SLD)

- NOTES:**
1. ALL PAVEMENT MARKINGS ARE TO BE INSTALLED BY CONTRACTOR.
 2. CROSSWALK MARKINGS SHOULD BE 2' WIDE, 6' LONG, WITH 4' GAPS BETWEEN MARKINGS AND PARALLEL TO THE FLOW OF TRAFFIC. MARKINGS SHOULD BE ALIGNED IN THE MIDDLE OF LANES AND ON LANE LINES TO AVOID VEHICLE WHEEL PATHS.
 3. ALL MARKINGS AND SIGNS SHALL BE INSTALLED PER THE LATEST EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
 4. DETECTABLE WARNING SHALL BE TRUNCATED DOME PLATES AND COLONIAL RED IN COLOR.

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Cameron L. Williams
3-10-15

STATE OF TEXAS
CAMERON L. WILLIAMS
110416
LICENSED PROFESSIONAL ENGINEER

Rev.	Description	Date

SIGNS & PAVEMENT MARKINGS
RALPH HALL PARKWAY AT MIMS ROAD
CITY OF ROCKWALL, TEXAS

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consulting engineers

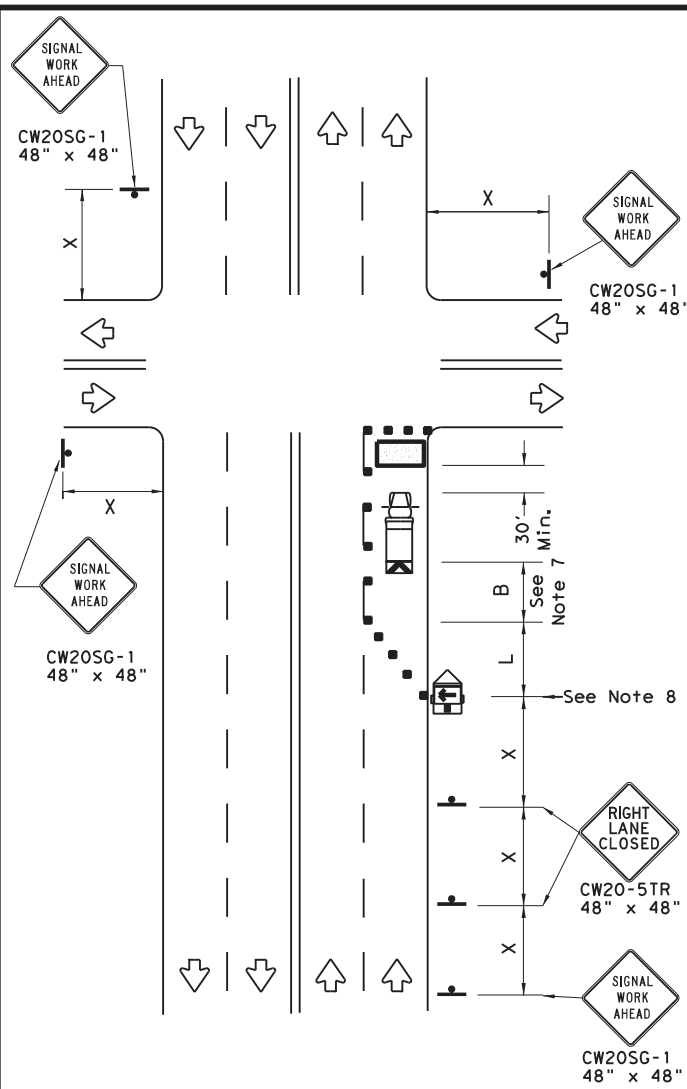
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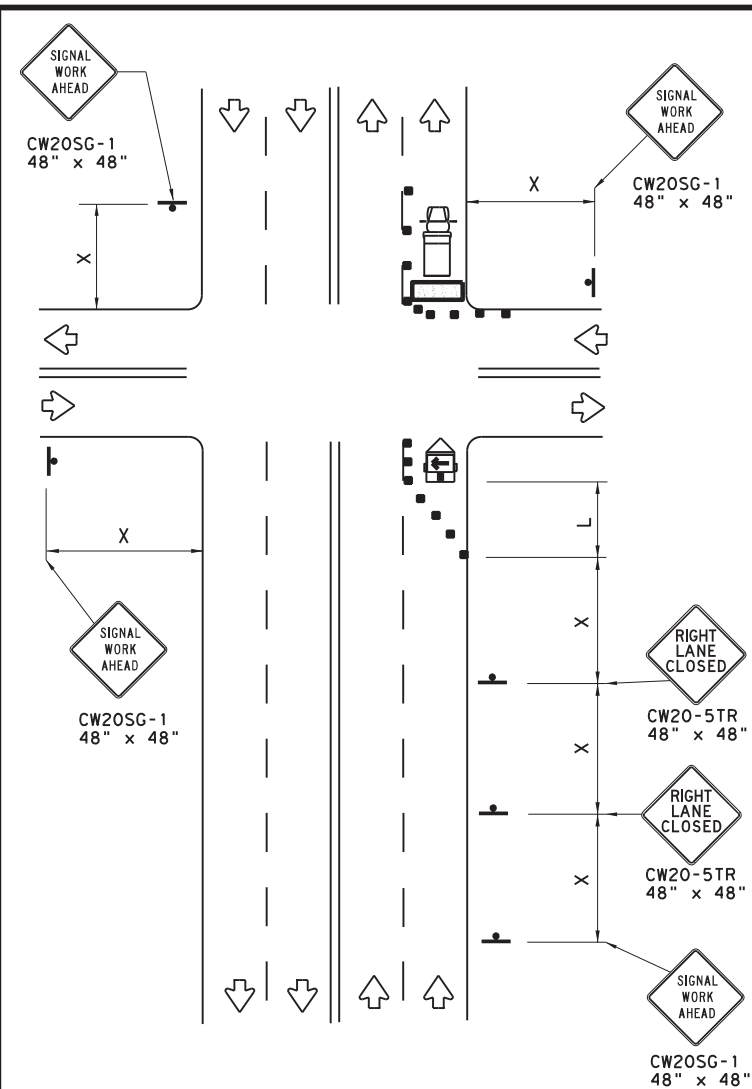
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BBCPI	3/15	1" = 40'	BC14074	7

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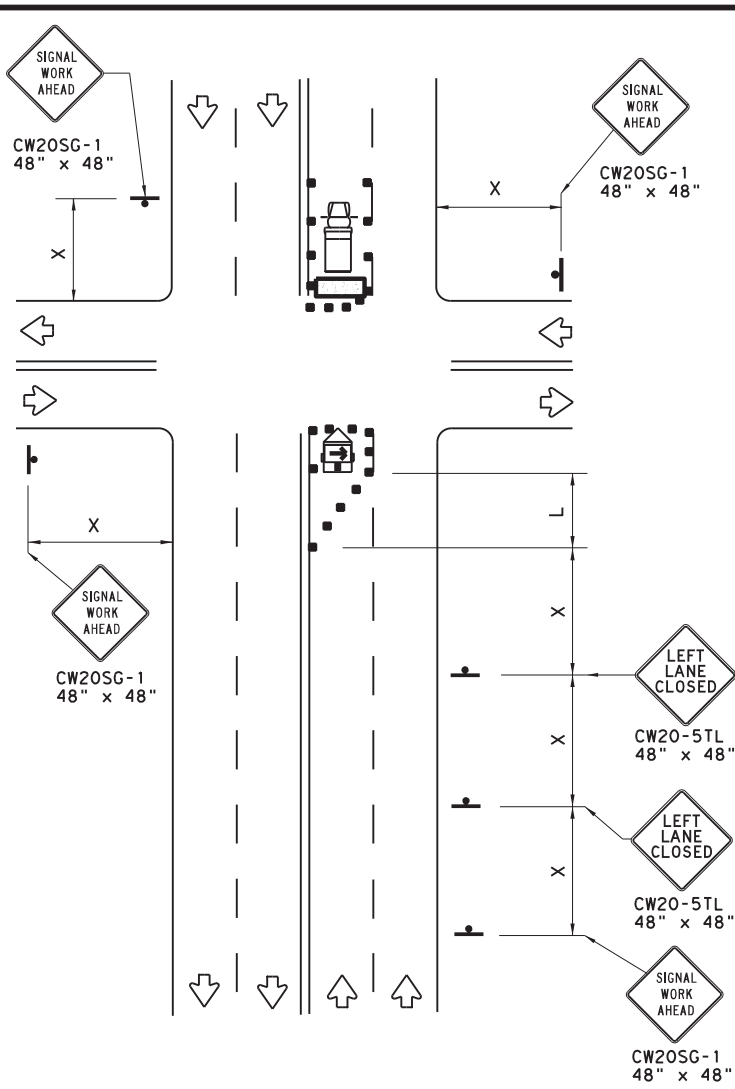
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NEAR SIDE LANE CLOSURE
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE
SHORT DURATION OR SHORT TERM STATIONARY



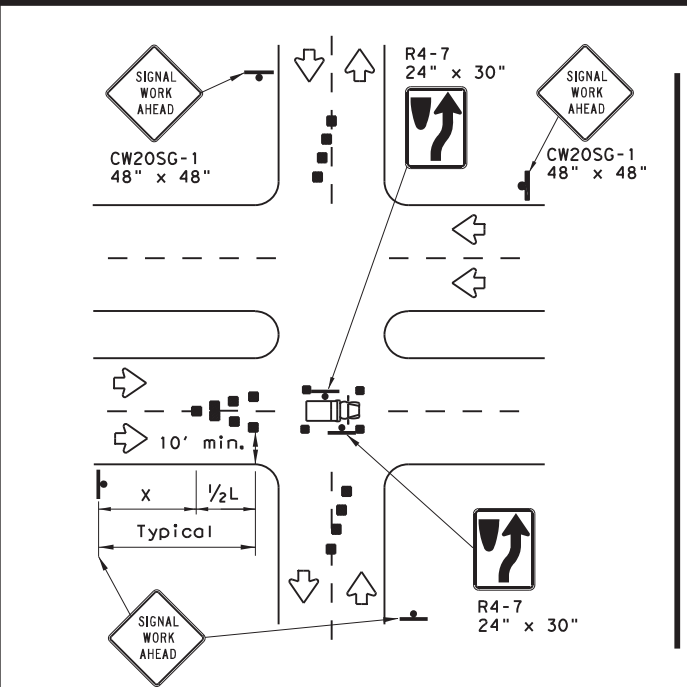
FAR SIDE LEFT LANE CLOSURE
SHORT DURATION OR SHORT TERM STATIONARY

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

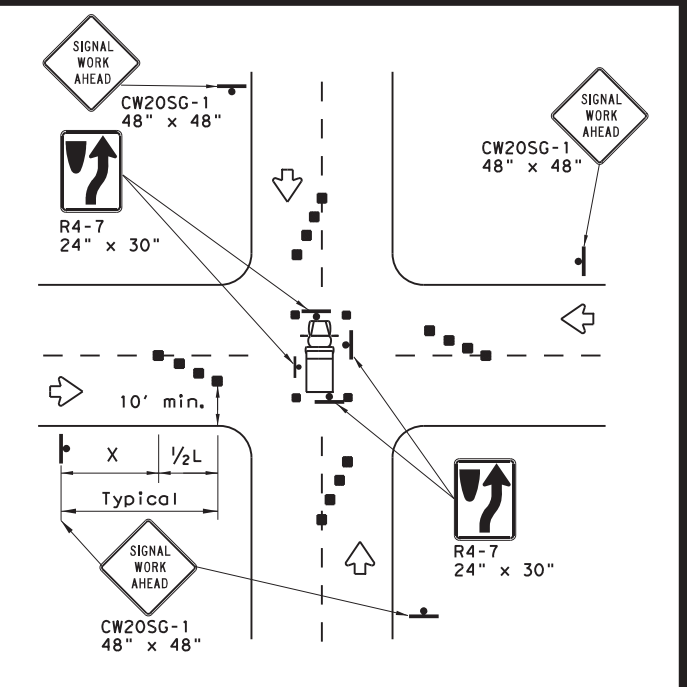
Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'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



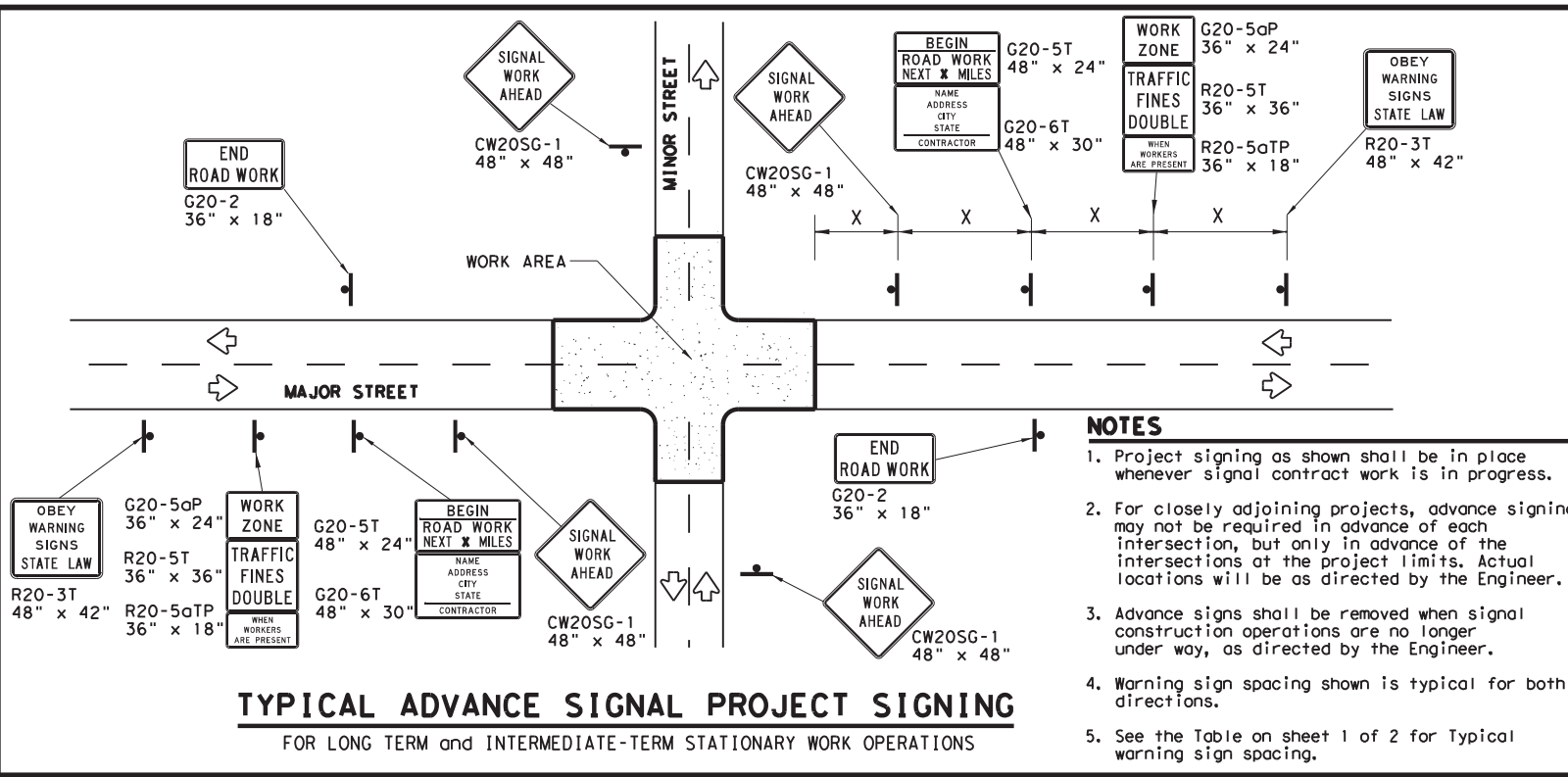
TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

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© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
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- 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 66.02 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.

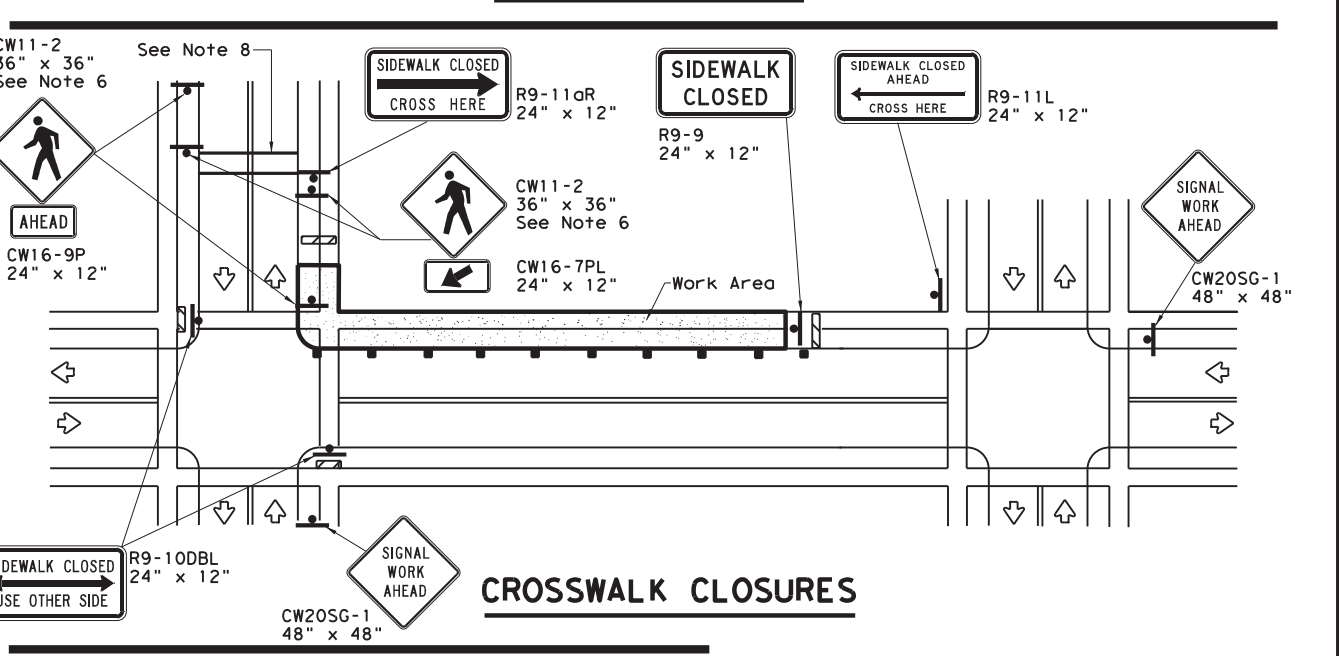
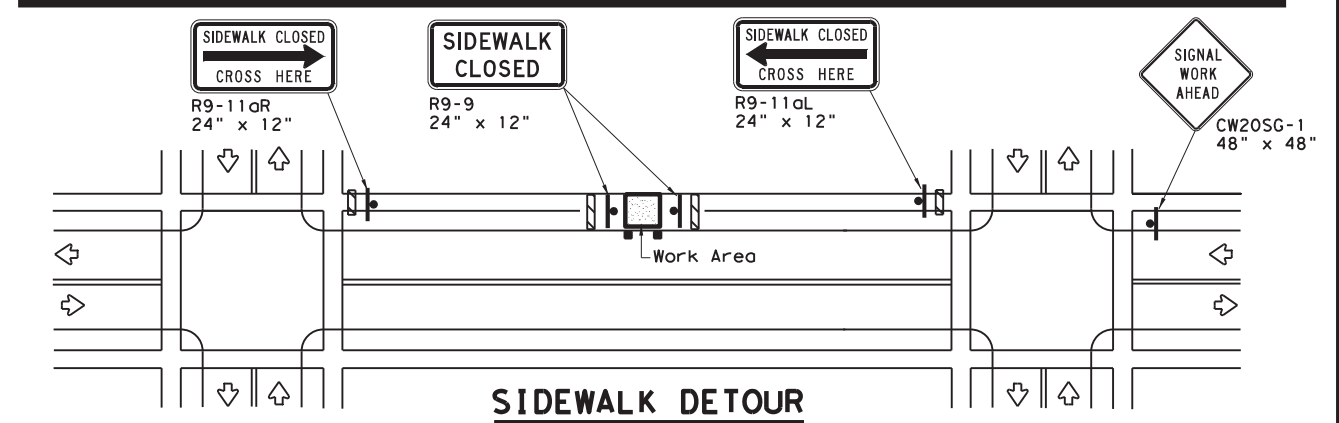
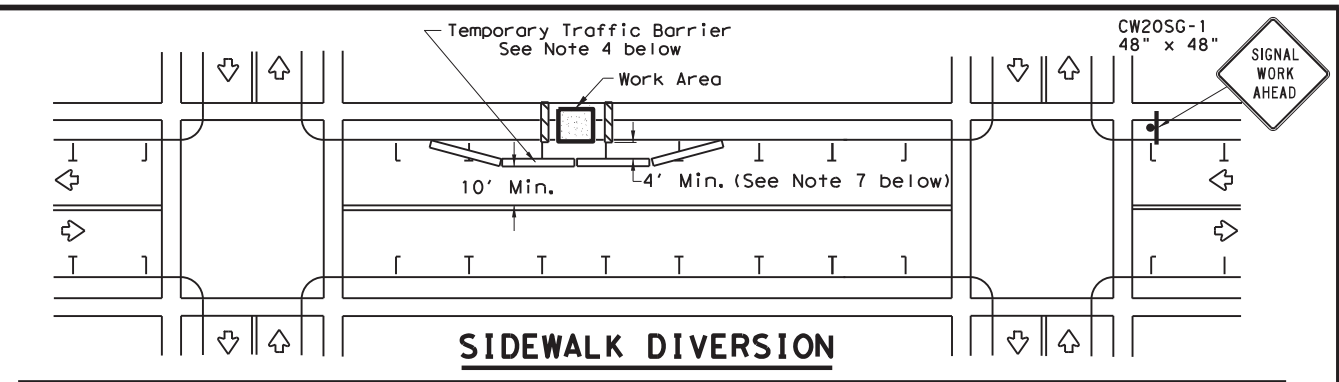
LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

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.

Texas Department of Transportation
 Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ (BTS-2) - 13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
4-98 3-03			9	

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I. GENERAL REQUIREMENTS FOR ALL ELECTRICAL WORK

The location of all conductors, conduits, junction boxes, ground boxes, and electrical services is diagrammatic only and may be shifted by the Engineer to accommodate local conditions.

Materials shall be new and unused. Materials and installation shall comply with the applicable provisions of the National Electrical Code (NEC), National Electrical Manufacturers Association (NEMA) standards, and shall be Underwriters Laboratories (UL) Listed unless otherwise shown on the plans or specifications or approved by the Engineer in writing. Faulty fabrication or poor workmanship in any material, equipment, or installation shall be justification for rejection. When reference is made to UL, it can be considered to mean a Nationally Recognized Independent Testing Lab (NRTL). Comparable standards of Canadian Standard Association, Electrical Testing Laboratories or Factory Mutual can be equal to the referenced UL standard. Where reference is made to NEMA listed devices, IEC listed devices shall not be considered to be an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing.

With the exception of high strength bolts, miscellaneous nuts, bolts and hardware may be stainless steel when plans specify galvanized, provided that bolts are 1/2 inch or less in diameter. The Contractor shall provide the following electrical test instruments as required by the Engineer to confirm compliance with the contract and the NEC. Those test instruments are voltmeter, amp probe, megger (1000 volt DC) and torque wrenches. All meters shall have been properly calibrated within one year. Calibration certification shall be provided to the Engineer upon request. Calibration certification tag shall also be applied to the meter. The Contractor shall operate meters during inspection as requested by the Engineer. Grounding shall be as shown on the plans and in accordance with the NEC. Metallic conduit, light poles, luminaires on bridge structures, and all metal enclosures shall be bonded to the system-grounding conductor. The ground rod in each ground box or junction box at the bridge ends, and in each ground box installed for underpass lighting will also be bonded to the system grounding conductor. The grounding conductor shall be bare or, if insulated, shall be green. Ground rods, connectors, and bonding jumpers will not be paid for separately, but will be subsidiary to the various bid items.

SUBMITTALS:

The contractor shall submit for approval six (6) copies of catalog cut sheets for each of the following three (3) categories.
 Category 1. Electrical services including photocell.
 Category 2. Breakaway disconnects, heat shrink tubing, heat shrink filler tape, GelCaps and ground boxes which will include loading capacity certification.
 Category 3. Highmast assembly kits, when applicable. See Item 614 "Highmast Illumination Assemblies". Submittals shall be legible and shall be marked to indicate which product on a cut sheet is to be supplied. Where manufacturers provide warranties and guarantees as a customary trade practice, the Contractor shall furnish to the State such warranties and guarantees. Any deviation from plans or specifications, including deviations due to plan error shall be prominently displayed on the submittal. Any changes not prominently noted in submittal and incorporated into the work without proper authorization will constitute grounds for rejection of that portion of the work.

II. CONDUIT

A. MATERIALS

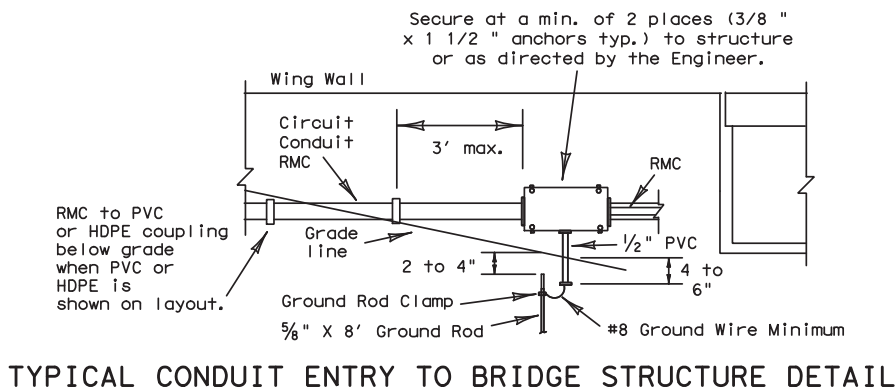
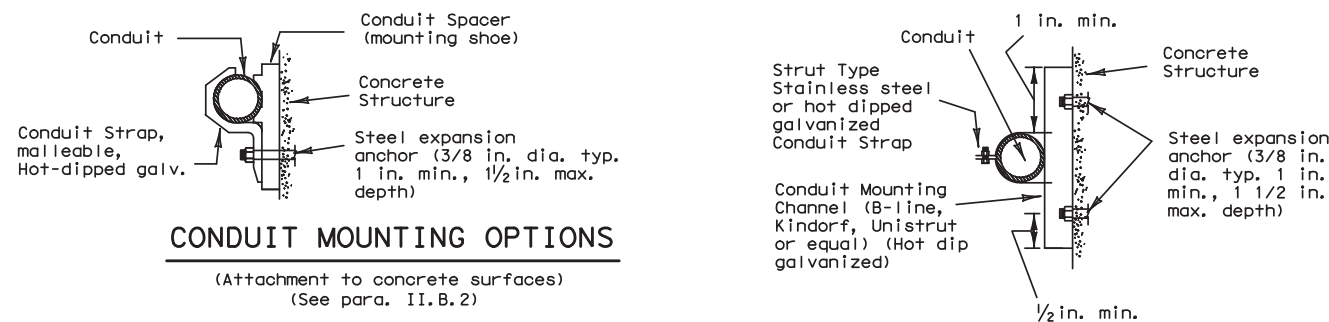
- Conduit and fittings shall be UL Listed for the intended use shown on plan sheets.
- Conduit shall be the type shown by descriptive code or shown elsewhere on the plans. Substitution of the various types of conduits will not be permitted. All flexible conduit in rigid metallic conduit (RMC) systems shall be Liquidtight Flexible Metal (LFMC) conduit. All flexible conduit in PVC systems shall be Liquidtight Flexible Non-metallic conduit (LFNC).
- All exposed conduits shall be RMC, unless otherwise specifically shown on the plans. All metal conduit shall be properly grounded.
- Couplings, connectors, conduit bodies, grounding bushings, and offset nipples for RMC shall be electro-zinc plated steel or hot dipped galvanized malleable iron, threaded or threadless compression type, rain-tight and shall be UL listed for the intended use.
- Expansion joints for metal conduit shall be provided with an internal or external bonding jumper and shall be UL listed.
- Unless otherwise shown on the plans, junction box minimum sizes shall be in accordance with 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 are present, the conductors shall be counted as if all are of the larger size. Situations not applicable to the table shall be sized in accordance with NEC 370-28.

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"

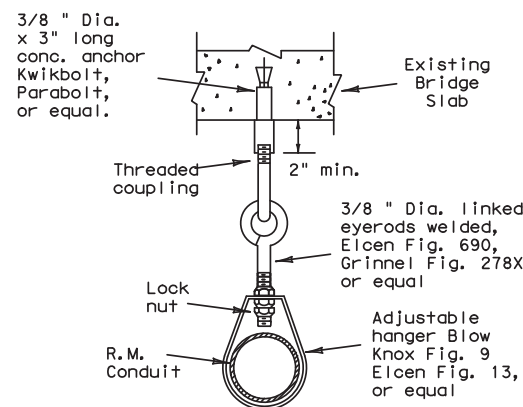
- RMC system junction boxes equal to or smaller, in any dimension, than 12 x 12 x 6 (HxWxD), surface mounted and containing conductors #8 or larger, shall be hot dipped galvanized cast iron with minimum wall thickness of 3/16 inch, shall have external mounting lugs, and shall be UL listed Crouse-Hinds Type WAB, OZ/Gedney Type YS or approved equal. Unless otherwise shown elsewhere on the plans, RMC system junction boxes larger than the aforementioned boxes but equal to or smaller, in any dimension, than 18 x 18 x 6 (HxWxD) shall be 14-ga. stainless steel; RMC system junction boxes larger than 18 x 18 x 6 (HxWxD) shall be 12-ga. stainless steel. All metal junction boxes shall be equipped with a threaded hole or lug for grounding. Stainless steel boxes 12 x 12 x 6 and larger need not be UL listed but shall meet the other requirements of the NEC and shall have ribs, stiffeners, or thicker metal and shall have external mounting feet. Junction boxes with an internal volume of more than 100 cu. in. may be supported by connection of two or more rigid metal conduits, where specifically shown on the plans or where approved by the Engineer.
- Junction boxes containing only #10 or #12 AWG conductors shall be Crouse Hinds Type GRFX, Appleton Type JBOX, two-gang FD, or similar approved cast iron box. Boxes shall be sized according to NEC Table 370-16(a).
- IMC and EMT conduit shall not be used unless specifically required by the plan layout sheets. Junction boxes in EMT conduit systems shall be made from galvanized sheeting and shall be UL listed and approved for outdoor use, unless otherwise noted on the plans. Sheet metal junction boxes shall be sized in accordance with the NEC. Junction boxes for IMC conduit systems shall meet the requirements of boxes used with RMC systems.
- Junction boxes in PVC conduit systems shall be PVC, intended for outdoor use, unless otherwise noted on the plans.
- Elbows in PVC conduit systems one inch and larger shall be rigid metal, with the exception of traffic signal systems which may have PVC elbows instead of rigid. If any part of the rigid metal elbow is buried less than 18 inches underground the elbow and rigid metal extension shall be grounded. Grounding shall be accomplished by means of a grounding bushing installed on the extension. Unless specifically shown on the plans, rigid metal elbows containing, or entering ground boxes containing only communications conductors, loop detectors, or other low voltage power limited circuits need not be grounded unless a ground wire is present in the conduit or ground box. The rigid metal elbows located in concrete foundations may be extended with PVC conduit and need not be grounded provided that the end of the elbow nearest the end of the conduit run exiting the foundation is at least 2 inches below the concrete. RMC elbows will not be eliminated. RMC elbows will not be paid for directly, but will be subsidiary to various bid items.
- High-Density Polyethylene (HDPE) conduit shall meet the requirements of Item 622, Duct Cable, except that the HDPE conduit, when bid under Item 618, Conduit, shall not contain factory installed conductors. Fittings for HDPE conduit shall be UL listed as an electrical conduit connector or shall be thermally fused using an electrically heated wound wire resistance welding method. HDPE conduit may be substituted for bored schedule 40 or schedule 80 PVC conduit. When such substitution is made, bored HDPE shall be schedule 40 of the size PVC being replaced. The HDPE conduit shall transition to PVC (or RMC elbow when required) at the bore pit. Size and schedule shall be as shown on the plans. Substituted conduit may not be extended to ground boxes or foundations; RMC elbows shall be installed at ground boxes and foundations. RMC elbows will not be eliminated.
- All conduit support hardware including straps, nuts, bolts, screws, retaining anchors and washers shall be hot dipped galvanized or stainless steel. Strut type conduit straps shall be stainless steel or hot dipped galvanized. Strut type straps need not be made of malleable type material. Stamped-cadmium plated straps will not be allowed. Straps having only one mounting hole shall not be allowed for use on conduits 2 inches and larger with the exception of electrical service poles where stainless steel standoff straps will be allowed. Two piece conduit straps designed to be used with a mounting shoe shall be installed only with the correctly sized shoe.

B. CONSTRUCTION METHODS

- Conduit in structures shall have expansion fittings at structure expansion joints. All straight runs of RMC conduit exposed on structures such as bridges shall have expansion joints installed at maximum intervals of 150 feet. Expansion joints shall be installed so they allow for movement of the conduit. Installation of the joint in such a manner that will not allow for movement shall be repaired at no expense to the state. The method of determining the final setting length of the expansion joint shall be provided to the Engineer upon request.
- Conduit supports shall be spaced at maximum intervals of 5 feet. Conduit spacers shall be used with metal conduit placed on surfaces of concrete structures (See conduit mounting options).
- Conduit supports shall not be attached directly to prestressed concrete beams except as shown specifically in the plans and approved by the Engineer.
- Unless otherwise shown on the plans, conduit placed beneath existing roadways, driveways, or sidewalks, or after the base or surfacing operation has begun, shall be accomplished by jacking or boring. The Contractor shall back fill and compact the bore pits to the bottom of the conduit prior to installing connecting conduit or duct cable to prevent bending of the connection.
- Conduit trenched in the subgrade of new roadways shall be backfilled with excavated material, unless otherwise noted on the plans. Conduit trenched in the sub-base of new roadways shall be backfilled with cement-stabilized base.
- Open ends of all conduit and raceways shall be fitted with temporary caps or plugs to prevent entry of dirt, debris and rodents during construction. The temporary cap may be constructed of duct tape, but in all cases shall be tightly fixed to the conduit and shall be durable. The contractor shall clean out the conduit and prove it clear in accordance with Standard Specifications Item 618.3 prior to installing any conductors.
- Conduit entry into the top of enclosures such as safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes shall be made weatherproof using conduit sealing hubs, or threaded bosses.
- A bonding jumper shall be installed from each grounding bushing to the nearest grounding rod, grounding lug, and/or equipment grounding conductor. All jumpers shall be the same size as equipment grounding conductor. Conduit used as casing under roadways for duct cable need not be grounded if duct extends full length through the casing. At electrical services, grounding electrode conductor shall be a solid Copper #6 AWG.
- Metal junction boxes shall be bonded to the grounding conductor in accordance with the NEC.
- Conduits entering ground boxes shall be placed so that the conduit ends shall be not less than 3 inches nor more than 6 inches from bottom of box (See ground box detail on sheet ED(3)).
- Conduit ends shall be sealed with heat shrink boots with waterproof sealant, urethane foam, or by other methods approved by the Engineer. Sealing shall be done after completion of any required pull tests. Duct tape shall not be used as a permanent conduit sealant. Silicone caulking shall not be used as a sealant.
- All strut mounting material and hardware shall be hot-dip galvanized or shall be stainless steel. The cut ends of strut and non-galvanized rigid metal conduit threads shall be coated with a zinc rich paint (90% or more zinc content). Zinc rich paint may only be used to touch up galvanized material as allowed under item 445.6 galvanizing. The painting of non-galvanized material with a zinc rich paint shall not be considered as an approved alternative for galvanized materials.
- All PVC conduit terminations shall be fitted with bushings or bell ends. All metal conduit terminations shall be fitted with a grounding type bushing.



- NOTES**
- Ground rod clamp to be UL listed for direct burial.
 - For conduit placed in structure, use flush-mounted box.
 - Bond junction box and metal conduits to equipment grounding conductor and grounding electrode conductor using listed connector.
 - Seal all conduits entering the junction box from underground.
 - Install bell end or bushing on 1/2" PVC conduit both ends.
 - Ground rod to be driven within 8 inches of 1/2 inch PVC conduit end.



5/03 Revision
 Revised notes.

Texas Department of Transportation
 Traffic Operations Division

ELECTRICAL DETAILS- CONDUIT

ED(1)-03

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4-98	12-00	3-03	5-03		

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SHEET NO. **10**

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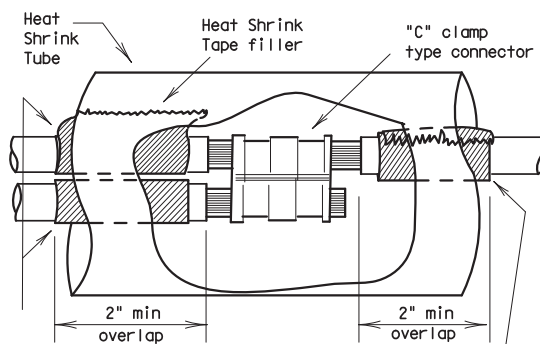
I. ELECTRICAL CONDUCTORS

A. MATERIALS

- Insulated conductors shall be NEC Type XHHW. Insulated conductors shall be color coded in accordance with the NEC, articles 200, 250, and 310; i.e. Insulation of grounded conductors (neutrals) shall be white. Grounding conductors (ground wires) shall be bare or insulation shall be green. Insulation of ungrounded conductors (hots) shall be any color except green, white, or gray. Identification of conductors #6 American Wire Gauge (AWG) and smaller shall be by continuous jacket color. Color coding of electrical conductors #4 AWG and larger shall be either by continuous color jacket or by colored tape. Colored tape marker shall consist of a half-lap of tape covering a 6-inch length of conductor.
- Where two or more circuits are present in one conduit or enclosure, the conductors of each circuit shall be identified by a permanent non-metallic tag at each accessible location. The tag shall be fastened to the conductors by two plastic straps. Each tag shall indicate circuit number, letter, or other identification shown in the plans.
- Grounding electrode conductor #6 AWG for bonding to ground rod at electrical service, shall be solid. Connection of conductor to ground rod shall be made using UL Listed connectors designed for such purposes.
- Heat Shrink Tape filler shall be used to seal the ends of heat shrink tubing around two or more conductors that are insulated with heat shrink tubing. Tape material shall have a minimum dielectric strength of 225 volts per mil and shall be cross-linked butyl rubber. Tape shall be supplied in rolls and shall have a backing (release paper) to prevent the tape from sticking to itself.
- Heat shrink tubing shall be heavy wall, UL listed for 600 volts or greater and shall have factory applied internal sealant.
- GelCaps shall be UL listed for 600-volt applications. GelCap shall have see-through elastomer molded cover. Cover shall be filled with high dielectric insulating gel silicone sealant to provide waterseal. Cover shall be held in place by snap-lock, molded clamp made of UV stable polypropylene.
- Splicing materials, insulating materials, breakaway disconnects, GelCaps and fuse holders will not be paid for directly but shall be subsidiary to various bid items.

B. CONSTRUCTION METHODS

- After conductors have been installed in conduit, a pull test shall be made on conductors. When any length of conductor cannot be freely pulled, the Contractor shall make any needed alterations or repairs at no expense to the State.
- The Contractor shall perform insulation resistance tests in accordance with Item 620, "Electrical Conductors." The Contractor shall coordinate with the Engineer to witness the tests.
- A sufficient length of conductor for making up connections shall be left in ground boxes (2 feet minimum, 3 feet maximum, to point of splice, 3 feet minimum, 4 feet maximum, when conductor is pulled through with no splice), enclosures, weatherheads and pole bases (1 foot minimum, 1.5 feet maximum).
- Splices shall be made only in junction boxes, ground boxes, pole bases, or electrical enclosures and shall be made with listed compression or screw type pressure connectors, terminal blocks, bolted lugs, or split bolt connectors. Splices shall be insulated with heavy wall heat shrink tubing or GelCaps and shall be made so as to provide a watertight splice. Heat shrink sleeve shall overlap conductor insulation a minimum of 2 inches on 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, the Contractor shall increase the diameter of the conductors insulation using heat shrink filler tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Tape shall be visible after completion of all splices. Where filler tape is used but not visible, the Engineer shall approve each individual splice by conducting a physical inspection of each splice. When it appears the tubing has been burned, or overheated the tubing shall be considered to be defective and shall be replaced.
- GelCaps when used in place of heat shrink method of splicing, shall be sized and installed according to manufacturer's specifications. (Raychem GelCap and GelCap SL or equal.)
- Wire nuts may be used for #8 AWG or smaller conductors in above-ground junction boxes, but not in pole bases or ground boxes. Wire nuts shall be positioned upright to prevent the accumulation of water. Wire nuts used at these locations shall have factory applied waterproof sealant.
- Conductors in illumination poles shall be supported by a J-hook in the top of the pole.
- All conductors bid under Item 620 "Electrical Conductors" shall have breakaway electrical disconnects installed anytime conductors pass through a break-away support device.
- For terminating the conductors, insulation-jacketing material shall be removed in such a manner as to not nick any of the individual strands of the conductor. When individual conductor strands are removed, the conductor shall be considered to be damaged.
- When a conductor or cable has been damaged, or fails to pass an insulation resistance test, the conductor shall be replaced.
- Duct tape, black electrical tape, or wire nuts shall not be used in the repair of a damaged conductor.
- For terminations, no more than one wire may be installed under a single pressure connector, unless the device is listed for more than one wire.
- Conductors connected to break-away in line fuse holders must be installed in accordance with the specific manufacturer's installation instructions. Where threaded connections are made, they shall be properly torqued. Where crimp type connections are made, crimps shall be made using properly sized crimping pliers. Proper conductor terminations are critical to the safe operation of break-away devices.
- Waterproofing boots shall be properly trimmed to fit snugly around the conductor so as to provide a water proof connection. No more than one wire may enter a single opening in any one boot. Water proofing boots must provide the correct number of openings. Where only one wire is to be connected to a boot, the boot may not be a two wire type.

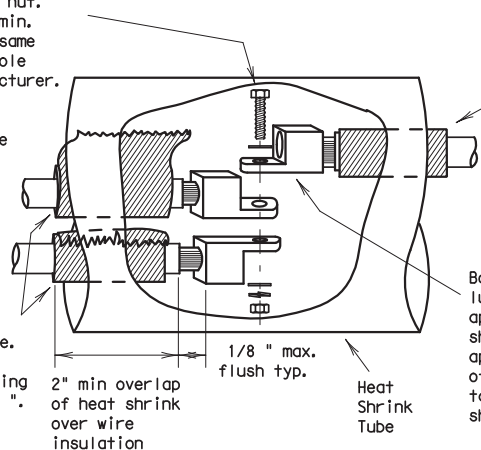


Seal between conductors with heat shrink tape. Tape to extend past end of tubing by 1/8" to 1/4".

Increase insulation diameter with heat shrink tape if necessary. Tape to extend past end of tubing by 1/8" to 1/4".

SPLICE OPTION 1
C-CLAMP

Stainless steel or brass machine screw, nut, 2 flat washers, lock washer or self locking nut. Machine screw to be a min. of 10-24, 3/16 or the same size as the mounting hole provided by the manufacturer. Secure wrench tight. Movement of lugs after final assembly shall be considered to be a defective connection.



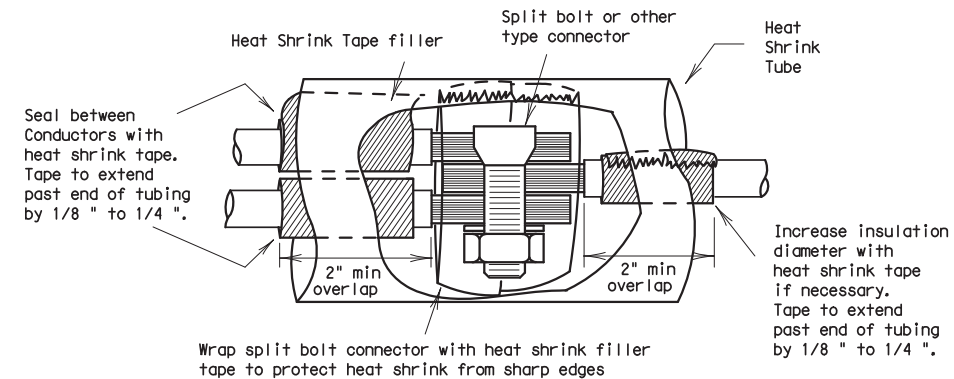
Seal between conductors with heat shrink tape. Tape to extend past end of tubing by 1/8" to 1/4".

Increase insulation diameter with heat shrink tape if necessary. Tape to extend past end of tubing by 1/8" to 1/4".

Bolt together lugs and prior to applying heat shrink tubing, apply two layers of heat shrink tape to cover sharp edges.

SPLICE OPTION 2
BOLTED WIRE LUGS

SPLICE OPTION 3
SPLIT BOLT



Seal between conductors with heat shrink tape. Tape to extend past end of tubing by 1/8" to 1/4".

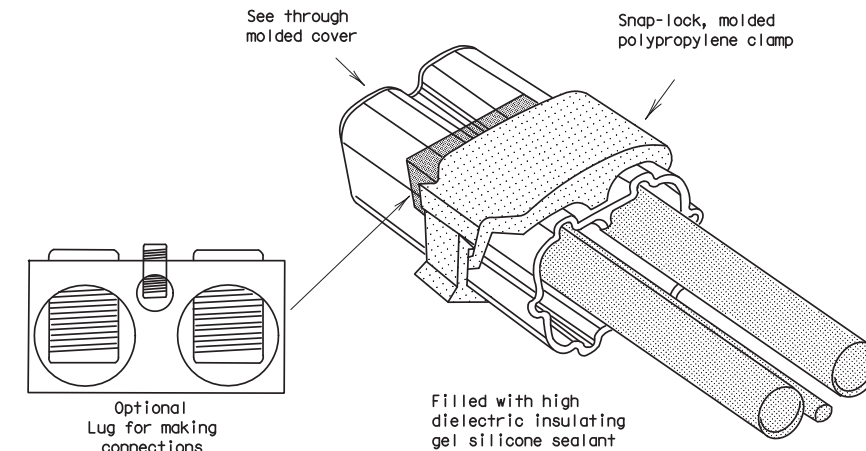
Increase insulation diameter with heat shrink tape if necessary. Tape to extend past end of tubing by 1/8" to 1/4".

Wrap split bolt connector with heat shrink filler tape to protect heat shrink from sharp edges

SPLICE OPTION 4

GELCAP

GelCap shall be sized and installed according to manufacturers specifications



Optional Lug for making connections

Filled with high dielectric insulating gel silicone sealant

- All conduits that contain circuit wiring of 50 volts or more shall contain an equipment grounding conductor (EGC). Conduit for traffic signals shall have an EGC, with a minimum size of #8 AWG stranded. Unless otherwise shown on the plans, the EGC for all other conduits shall be the same AWG size as the largest current carrying conductor contained in that conduit. The EGC shall be paid for item 620-Electrical Conductors.

C. TEMPORARY WIRING

- Temporary conductors and electrical equipment to provide power for utilization equipment, shall be installed in accordance with the NEC article 305. All temporary wiring materials and methods shall comply with the standard sheets. All power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade, supplied from a utility power source, shall be provided with a ground fault circuit interrupter.
- Residual current protective devices (GFCI) may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
- Where wire nuts are approved for temporary wiring, they shall be of the self-sealing type.
- All conductor splices must be contained within a listed enclosure, ground box or the splices will be more than ten feet above grade vertically and more than five feet horizontally from any metal structure. Where temporary conductors are installed in any area that is likely to be subjected to vehicle traffic, or mobile construction equipment, the vertical clearance to ground shall be at least 18 feet when measured at the lowest point. Where power conductors are to be supported by a span wire, the span wire shall be properly grounded.
- Existing conduit containing service conductors uncovered during the construction process shall be repaired in a timely manner in accordance with the NEC. Existing non-metallic conduit exposed during construction shall not be left exposed above grade, or with less than eighteen inches of cover, without protective methods approved by the Engineer.

**ELECTRICAL DETAILS-
CONDUCTORS**

ED(2)-03

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II. GROUND RODS

A. MATERIALS

- All ground rods installed at electrical services, including supplemental lightning protection ground rods specified by the plans in other locations such as pole bases, shall be copper clad and UL listed. Rods shall be a minimum diameter of 5/8 inch. The length shall be a minimum of 8 feet. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets.
- Ground rod clamps shall be listed to be in direct contact with the soil. Where concrete encasement is required, the clamp shall be listed for concrete encasement.

B. CONSTRUCTION METHODS

- Ground rods installed in locations such as pole bases, to provide supplemental lightning protection need not be totally in contact with the soil. Where called for in the plans, rods may be encased in soil or concrete or any combination of soil and concrete. When concrete encased, the connection of the conductor to the rod shall be readily accessible for inspection or repairs. When driven into the soil the upper end shall be between 2 to 4 inches below finished grade. Ground rods shall not be placed in the same drilled hole as a timber pole.
- Ground rods shall be installed such that the end imprinted with the rod's part number is installed as being the upper end.
- Non-conductive coatings such as concrete splatter shall be removed from the rod at the clamp location.
- Routing of lightning protection ground rod wires shall be run as short and straight as possible. Where bends are required they shall have a minimum radius of four inches.
- Unless specifically called for by the plans, conduits used for ground rod wires shall be non-metallic. Where metal conduits are specified, a grounding bushing and properly sized bonding jumper shall be provided and properly installed on each end.
- Where rocky soil or a solid rock bottom is encountered when driving a ground rod and the horizontal trench placement method is the only viable solution, written authorization from the Engineer must be obtained.

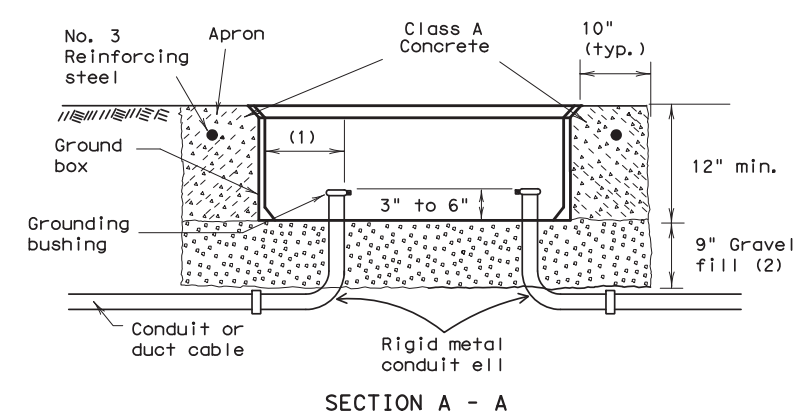
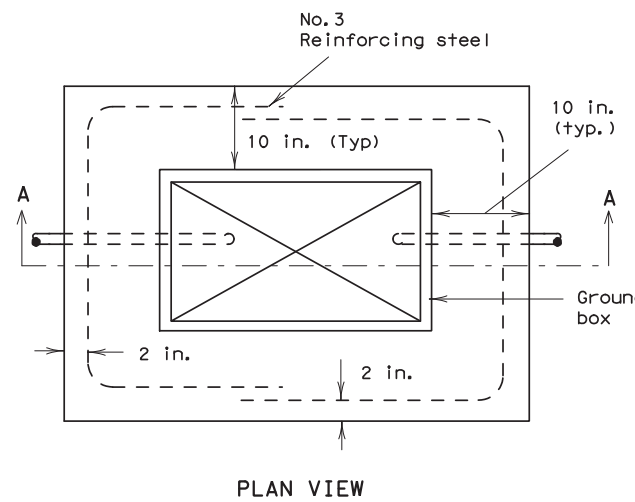
III. GROUND BOX

A. MATERIALS

- Ground boxes 16x30x24 inches (WxLxD) or smaller shall be polymer concrete of the type required by the descriptive code shown elsewhere. Larger ground boxes shall be as shown elsewhere in the plans.
- All ground boxes and covers shall be permanently marked either by impress or by permanent ink, with manufacturer's model number and manufacturer's name or logo.
- Covers shall be bolted down, and bolt holes in the box shall be arranged to drain dirt.
- Ground box Types A, B, C, D & E shall meet the following requirements:
 - Ground boxes and covers be manufactured from polymer concrete reinforced with continuous strands of woven or stitched borosilicate fiberglass cloth. The polymer concrete shall be made from catalyzed polyester resin, sand and aggregate, and shall have a minimum compressive strength of 11,000 psi. Polymer concrete containing chopped fiberglass or fiberglass reinforced plastic is not acceptable.
 - Minimum inside dimensions shall be as follows (width x length x depth):
 - Type A shall be 11.5 inches x 21 inches x 10 inches, (122311)
 - Type B shall be 11.5 inches x 21 inches x 20 inches, (122322)
 - Type C shall be 15.25 inches x 28.25 inches x 10 inches, (162911)
 - Type D shall be 15.25 inches x 28.25 inches x 20 inches, (162922)
 - Type E shall be 11.5 inches x 21 inches x 16 inches, (122317)
 - Bottom edge of box or extension shall be footed with a minimum 1 1/4 inch flange.
 - Ground boxes shall withstand 600 lbs. per sq. ft. applied over the entire sidewall with less than 1/4 inch deflection per foot length of box. Ground boxes and covers shall withstand a test loading of 20,000 lbs. over a 10 inch by 10 inch area centered on the cover with less than 1/2 inch deflection. Ground boxes and covers shall meet Western Underground Standards 3.6. Manufacturer shall supply certification by an independent laboratory or sealed by a Texas-Licensed Professional Engineer.
 - Covers shall be 2 inch (nominal) thick polymer concrete. All hardware shall be stainless steel. Cover shall be secured with two 1/2 inch stainless steel bolts. Bolts shall be self-retaining and shall withstand a minimum of 70 ft-lbs. torque and shall have a minimum 750 lbs. straight pull out strength. Nuts shall be floating and shall provide a minimum of 1/2 inch movement from the center of the nut. Covers shall be skid resistant, minimum 0.5 coefficient of friction. Covers shall be interchangeable between manufacturers and shall conform to the dimensions shown herein. Unless otherwise approved by the Engineer, cover shall be legibly imprinted with the following words in minimum 1 inch letters:
 - Ground Boxes containing wiring for traffic signals shall be labeled, Danger High Voltage Traffic Signal.
 - Ground boxes containing wiring for illumination systems shall be labeled, Danger High Voltage Illumination.
 - Ground boxes containing wiring for traffic management systems shall be labeled, Danger High Voltage Traffic Management.
 - Ground boxes containing wiring for sign illumination systems shall be labeled, Danger High Voltage Sign Illumination.
 - Ground boxes containing wiring for traffic signals that also contain illumination, powered by the signal electrical service, shall be labeled, Danger High Voltage Traffic Signal.

B. CONSTRUCTION METHODS

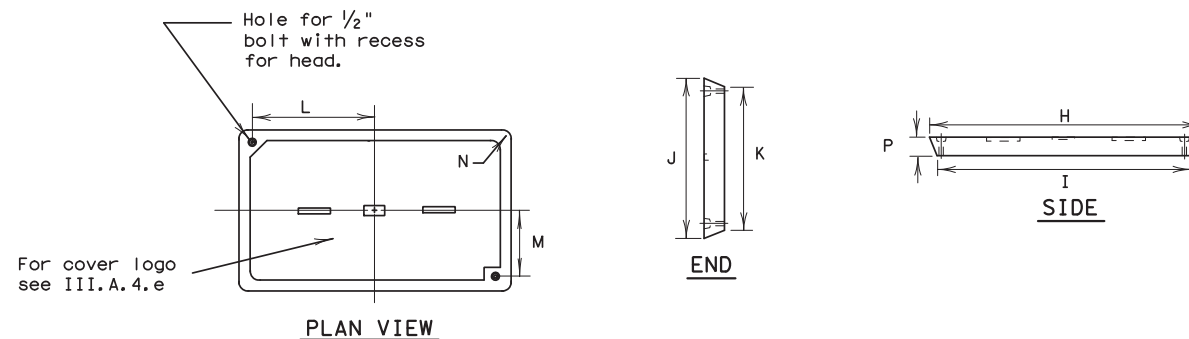
- Ground boxes shall be set on a 9 inch (minimum) bed of aggregate from 3/4 " up to 2" in size. Aggregate shall be in place prior to setting box and conduits shall be capped. Any gravel or dirt in conduit shall be removed.
- When required by Item descriptive code, construction of an apron encasing a ground box including concrete and reinforcing steel shall not be paid for directly but shall be subsidiary to the ground box. Reinforcing steel may be field bent. Concrete for aprons shall be considered miscellaneous concrete for testing purposes. Aprons shall be cast in place.
- Conduit holes may be cut in the walls of type B & D boxes at least 18 inches beneath the cover.
- If, within the limits of this project, the Contractor must utilize an existing ground box equipped with a metal cover, the Contractor shall bond the cover to the grounding conductor with a 3 foot long flexible stranded jumper the same size as the grounding conductor. Connection of bonding jumper to metal ground cover shall not be paid for directly but shall be subsidiary to various bid items. The box(es) must be clearly shown on the plans with plan notes fully describing the work required.
- If there are other ground boxes with metal covers within the project limits but not involved in the contract, the Engineer may direct the Contractor to ground the covers, designating and identifying the specific boxes in writing. This work will be paid for separately.
- Termination to metal ground box covers shall be made using a tank ground type lug.



APRON FOR GROUND BOXES

(Where required)

- Final position of end of conduit shall not exceed one-half the distance to the side of box opposite the conduit entry.
- Place gravel "under" the box, not "in" the box. Gravel should not encroach on the interior volume of the box.
- Install bushing on the upper end of all ells.
- Where a ground rod is present in the ground box, connect it to any and all equipment grounding conductors using a listed connector.
- Maintain sufficient space between all conduits so as to allow for proper installation of bushings.
- All conduits shall be installed in a neat and workmanlike manner.
- All conduits installed in the ground box shall be sealed after completion of conductor installation and any required pull tests. Silicone shall not be used as sealant.



GROUND BOX COVER

GROUND BOX COVER DIMENSIONS								
BOX	DIMENSIONS (INCHES)							
SIZE	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

Texas Department of Transportation
Traffic Operations Division

**ELECTRICAL DETAILS-
GROUND BOXES**

ED(3)-03

5/03 Revision

Revised notes.

© TxDOT January 1992		DATE	BY	CHKD	APP'D	CKD
REV	DESCRIPTION	DATE	BY	CHKD	APP'D	CKD
4-98						
12-00						
3-03						
5-03						

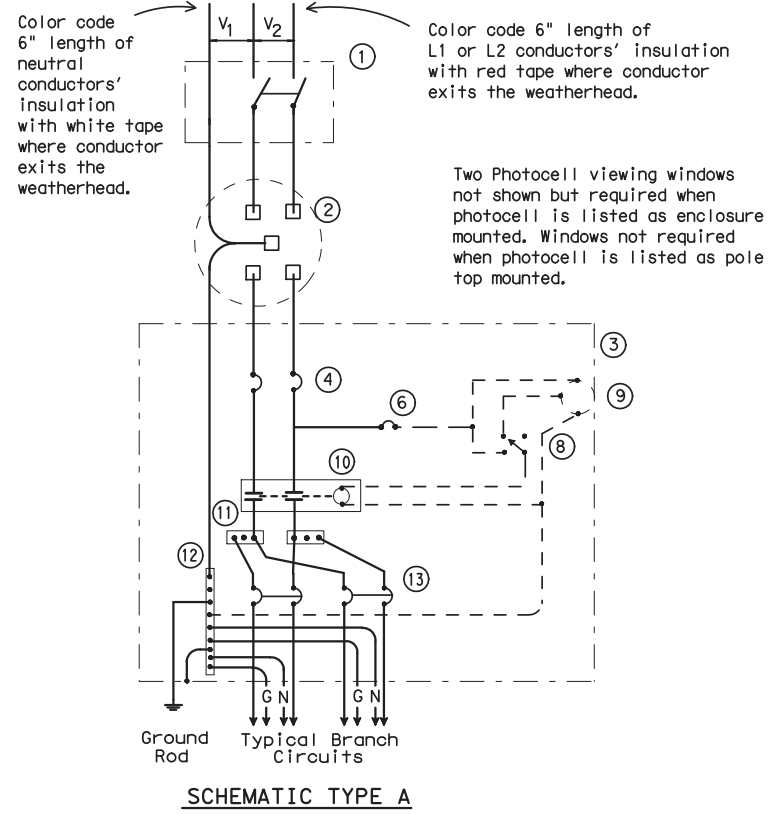
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SERVICE ENCLOSURE NOTES

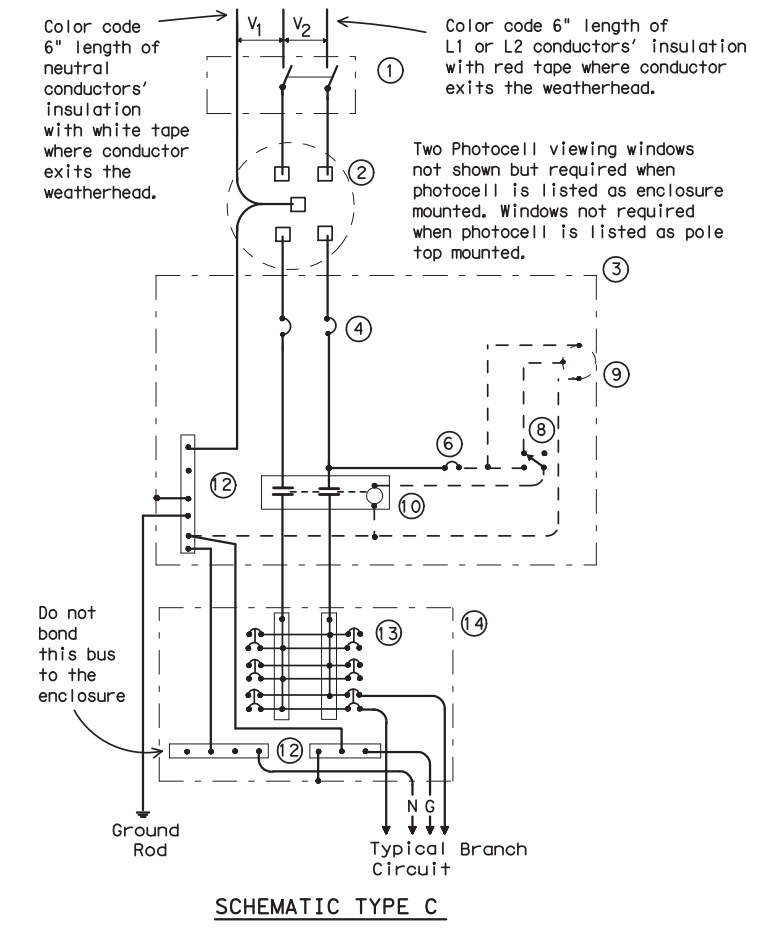
- VIII. Service Assembly Enclosures. All service assemblies and enclosures shall be UL Listed for the intended purpose.
- A. Shop built or shop assembled service assemblies (all types except Type T and Type D without lighting contactor or enclosure mounted photo cell) and all auxiliary equipment enclosures mounted with service equipment and paid for as part of Item 628, "Electrical Services", shall be built or assembled by a UL Listed Industrial Control Panel shop and shall have a unique serial numbered UL Label with the words "LISTED ENCLOSED INDUSTRIAL CONTROL PANEL". The same or an additional label shall have the name, location, and phone number of the shop, the UL file number of the shop, the shop order or drawing number, date of manufacture or assembly, and the line voltage. The service assembly enclosure shall also be labeled "SUITABLE ONLY FOR USE AS SERVICE EQUIPMENT".
 - B. Conduit entries into the top of enclosures shall have threaded hub. Conduit entries through the equipment mounting back plate will not be allowed.
 - C. All service enclosure front doors shall be permanently labeled "DANGER HIGH VOLTAGE". Label shall be a self sticking type, intended for outdoor installation. Lettering style, layout and colors of red, black and white shall be as required by OSHA. Label letters shall be 1 to 1 1/2 inches high or as high as the enclosure door width will permit for smaller services. Separate or auxiliary lighting enclosures need not be OSHA labeled when mounted in the same viewing plane as the service enclosure front door. Where only one type of load is served by the service, the service door shall be marked using duo-colored plastic labels or self adhesive vinyl weather resistant labels, minimum of 1 inch high; applied in a neat and workmanlike manner. On the label will be the service number shown on the plans as well as identifying the load served specifically (i.e. lighting, landscaping, signals, traffic management or other wording as directed by the Engineer). Safety switches need not be OSHA labeled unless specifically required by the serving utility.
 - D. Type GS enclosures will only be allowed for service Types D and T without an enclosure mounted photocell and/or lighting contactor and the Type C panelboard. This spec will allow an "off the shelf" product meeting these specifications to be used. Type GS enclosures shall be made from pre-galvanized steel sheeting, hot dipped galvanized steel, or powder coat painted steel unless shown differently on the plans. Steel enclosures shall be painted inside and outside; galvanized enclosures may be painted. Unless otherwise approved by the Engineer, painted enclosures shall be gray, beige, white or light green. Panelboard/loadcenter enclosures shall meet UL type 3R requirements, shall have a dead front trim, and an outer padlockable door preventing unauthorized persons from operating contained equipment. Galvanized steel is no longer allowed for Types A,C, or custom-built D or T enclosures. If GS is shown in the descriptive code for any of these, an AL shall be provided.
 - E. Type AL enclosures for service Types A and C shall meet UL type 3R requirements and shall also meet additional requirements of this paragraph. The enclosure shall have both a main disconnect remote operator handle and a door latch handle. Die-cast handles are not acceptable. The main disconnect remote operator shall be flange-mounted, shall interlock the door when in the "on" position, and shall be padlockable in both the "on" or "off" positions. Door latch shall latch at two or more points, operate by a handle separate from disconnect switch and be capable of being locked. Door closure clamps will not be allowed. Lock must be keyed to Master #2195. All the enclosures shall have either a continuous stainless steel piano hinge with stainless steel pin or enclosures less than 30 inches may have two heavy duty hinges, those over 30 inches must have three. Heavy duty two and three point hinges shall have a 0.185 inch minimum diameter electro-zinc plated steel pin or a stainless steel pin. Two point hinged doors shall be rated for 56 lbs of loading. Three point hinged doors shall be rated for 70 lbs of loading. The door shall have an attached data pocket constructed of either thermoplastic or metal. Pocket shall be 12" x 12", unless that size will not fit in enclosure. The pocket shall then be as large as possible, as approved by the Engineer, and mechanically attached with stainless steel nuts and bolts, or stainless steel or aluminum rivets. Enclosure shall include an equipment mounting panel installed inside the enclosure on collar studs or tapped bosses, and constructed of a minimum 12 gauge galvanized steel. Equipment mounting panels shall not be painted. Enclosure shall have factory installed external mounting feet. Enclosure door shall be capable of opening at least 130 degrees, with arm or other approved means to hold the door open. Only the enclosure exterior will be primed and painted. Paint color shall be beige or gray and shall be powder coat paint as shown below. Condensation drainage shall be provided in the bottom of the enclosure before leaving the factory. The Contractor shall prepare and submit a schematic drawing unique to an individual service. The approved drawing shall be laminated and placed in the document pocket of the service at the time of shipment to the job site. All applicable wiring diagrams and plan sheet layouts for all equipment and branch breaker circuits supplied by that service shall also be laminated and placed in the document pocket prior to shipping. Type AL enclosures for Type D and T services with enclosure mounted photocell and/or lighting contactor shall have the loadcenter interior mounted in an enclosure with properly adapted dead front trim. Types D and T shall not have a loadcenter exterior "can" mounted inside another enclosure meeting these specifications. (Do not put one enclosure inside another enclosure). Types D and T with enclosure mounted photocell and/or lighting contactor shall meet the additional requirements of this paragraph except that remote-operating handle will not be provided.
 - F. Type SS enclosures for Type A and C shall meet all the requirements above for their respective type AL. Type SS enclosures for D and T shall meet all the requirements above for their respective type AL. Stainless Steel shall not be painted.
 - G. PS enclosure shall be as detailed and specified on ED(8). Galvanized steel will not be allowed for any pedestal service. If GS is shown in the descriptive code an AL will be provided.
 - IX. Powder Coat Paint. Powder coating shall be either a polyester thermosetting resin, a zinc rich primer with a TGIC (triglycidyl isocyanurate) powder overcoating, or a zinc-rich epoxy powder, applied by either electrostatic spray or fluidized bed immersion, high temperature oven cured, high density, low gloss, 4 mil thick (minimum), coating. Adhesion shall meet the 5A or 5B classifications of ASTM D3359. Finish shall be uniform in appearance and free of scratches.
 - X. Main Disconnect. Main disconnect device shall be a circuit breaker, as specified in the Electrical Service Data, shall be two or three pole, and rated for the voltage and amperage specified. Circuit breaker shall be an UL Listed thermal-magnetic circuit breaker controlled by flange-mounted remote operator in the service assembly enclosure when required. Circuit breakers shall have a minimum interrupting rating of 10,000 Amps. When the utility company provides a transformer larger than 50 KVA, Contractor shall verify that the available fault current is less than the circuit breaker amps interrupting capacity (AIC) rating and shall provide documentation from the Utility to the Engineer. Documentation shall be submitted at the same time as other electrical submittals. Circuit breaker shall be UL Listed to UL489. No backfed breakers will be allowed for use as a main disconnect.
 - XI. Control Circuit. Control circuit protection shall be 15 amp circuit breaker.
 - XII. Control Station ("H-O-A" Switch). Control station shall be a maintained-contact, three position selector switch in an UL type enclosure. Switch shall be rated 600 volts and shall be fitted with "Hand-Off-Auto" legend.
 - XIII. Photo Electric Control. Photo electric control shall consist of a photocell, internal lightning arrester, and relay or bimetallic switch mounted inside a weatherproof enclosure with standard 3-prong twist lock photocell plug and receptacle. The enclosure shall be made of poly-acrylic with clear acrylic window. Enclosure chassis shall be molded thermosetting plastic. The photocell shall have a polyethylene gasket, and shall have a hermetically sealed cadmium sulfide cell. The arrester shall have an enclosed type expulsion arrester rated 2.0 kV sparkover with 5,000 amps follow-through. Relay or switch shall be time delay type with normally closed contacts. Photo electric control shall be rated a minimum of 1800 VA, voltage as required. Enclosure mounted photocells shall be the same as above except that the photocell shall be mounted inside the enclosure. The enclosure shall have two acrylic paneled windows, or other material approved by the Engineer, one on each side of the enclosure. Each window shall be rectangular approximately one inch by two inches, or round 2 inch diameter, or as otherwise approved by the Engineer. Bracket and photocell's receptacle will be mounted inside enclosure next to each window. Except for window side, 2" of clearance is required on all sides of photocell for ease of replacement. The photocell's receptacle is held in place by two mounting screws on bracket and located next to each window of the enclosure. The 3-prong twist lock photocell shall be mounted in a position to receive light from the window closest to the photocell. The photocell shall be mounted in a position to receive light from one window. Top of pole mounted photocells shall be mounted as shown on ED(4). The Contractor shall be responsible for proper operation of the photo-electric control. The Contractor shall move and/or adjust or shield the photocell from stray or ambient nighttime light or shall make any other adjustments required for proper operation. The photocell shall face North when practicable. Unless otherwise shown on the plans, the photocell shall turn on the illumination system at 1.0 (-) 0.5 footcandle and turn off the illumination system at two footcandles higher than turn on.
 - XIV. Lighting Contactor. Lighting contactor shall be a UL Listed NEMA rated lighting contactor, two-pole or multipole as required, electrically held type designed to control high pressure sodium lighting loads, with silver alloy double break contacts rated at 240 volts, 480 volts or 600 volts as required. Lighting contactor shall not be the DIN rail mounted type.
 - XV. Power Distribution Terminal Blocks. Power distribution terminal blocks shall be rated for 600 volts and shall be used for line side connections to branch circuit breakers where more than one circuit breaker is required. Lugs on blocks shall be properly sized for conductors being used. Only one conductor shall be placed under each lug.
 - XVI. Neutral/Ground Bus. Neutral/ground bus shall be a factory made bus permanently bonded to the enclosure with properly sized lugs for grounding and neutral conductors.

SCHMATIC LEGEND

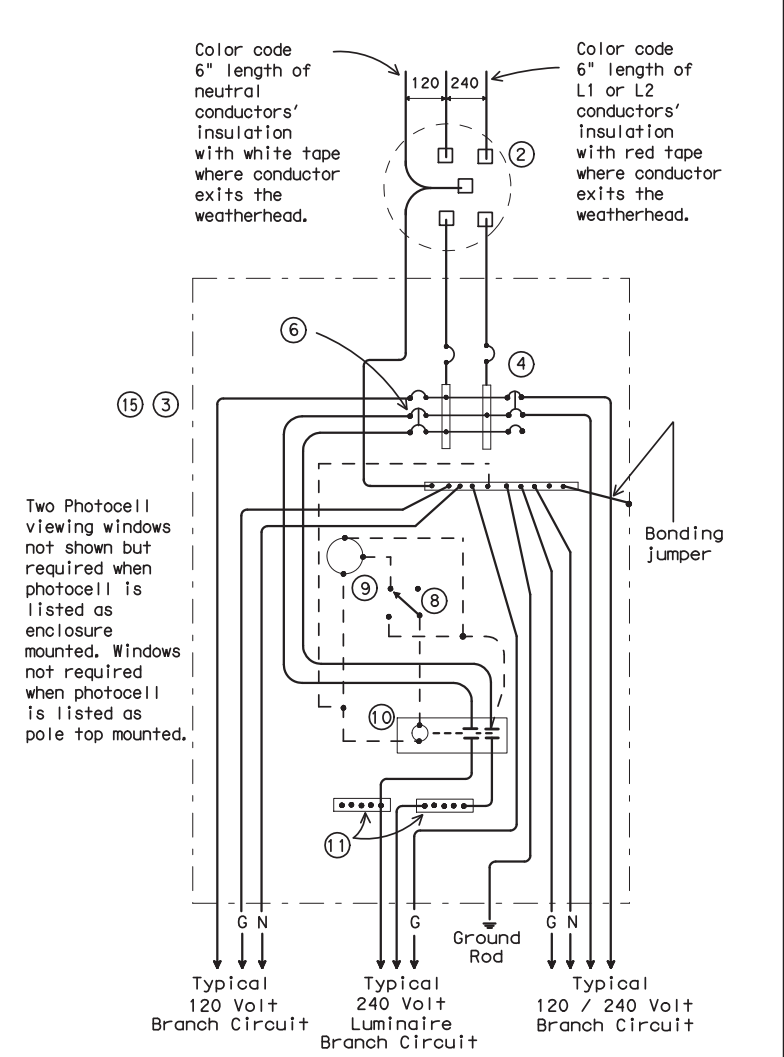
- | | |
|---|---|
| 1 - Safety Switch (when required) | 12 - Neutral/Ground Bus |
| 2 - Meter (when required) | 13 - Branch Circuit Breaker (See Electrical Service Data) |
| 3 - Service Assembly Enclosure | 14 - Circuit Breaker Panelboard (See Electrical Service Data) |
| 4 - Main Disconnect Breaker (See Electrical Service Data) | (If Type C is shown as AL or SS on descriptive code, this is the service assembly enclosure only. Panelboard enclosure is GS unless otherwise noted.) |
| 5 - Omit | 15 - Load Center |
| 6 - Circuit Breaker, 15Amp | |
| 7 - Auxiliary Enclosure | |
| 8 - Control Station ("H-O-A" Switch) | |
| 9 - Photo Electric Control (enclosure-mounted shown) | |
| 10 - Lighting Contactor | |
| 11 - Power Distribution Terminal Blocks | |
-
- | | |
|-----------|---|
| — — — — — | Power Wiring |
| — — — — — | Control Wiring |
| — N — — — | Neutral Conductor (when required) serve 120 v. loads only |
| — G — — — | Equipment grounding conductor-always required |



SCHEMATIC TYPE A
THREE WIRE
 Maximum feeder circuit size (High Mast Poles):
 100 amps for two pole 480V, 125 amps for one or two pole 120V or 240V. Maximum branch circuit size: 50 amps.



SCHEMATIC TYPE C
THREE WIRE
 Maximum feeder circuit size (High Mast Poles):
 100 amps for two pole 480V, 125 amps for one or two pole 120V or 240V. Maximum branch circuit size: 50 amps.



SCHEMATIC TYPE D
120/240 VOLTS - THREE WIRE
 Install photocell and lighting contactor when shown on Electrical Service Data. See Type D service notes.

TYPE D SERVICE NOTES

Photocell and lighting contactor shall be located either in the same UL type 3R enclosure with load center or, if approved by Engineer, in separate enclosure. There shall be a window on each side of enclosure to allow operation of photocell. Both photocell contactor and breaker area shall have dead front trim. Enclosure, except for RT and PS supports, shall not exceed 36 inches in height or 16 inches in width unless approved by the Engineer. Ty D load center with lighting controls or Ty D separate lighting control enclosure shall have power distribution blocks for a minimum of 4, #8 conductors per phase.



**ELECTRICAL DETAILS-
 SERVICE ENCLOSURE
 & NOTES**

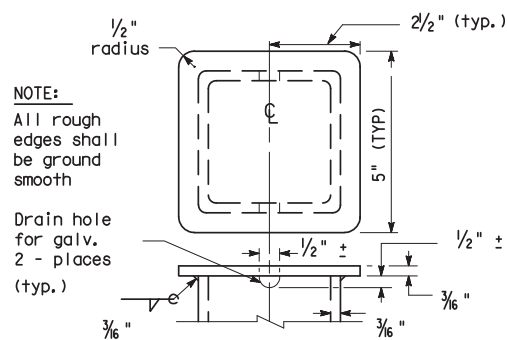
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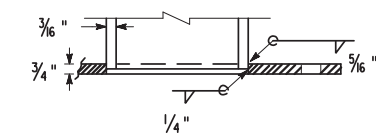
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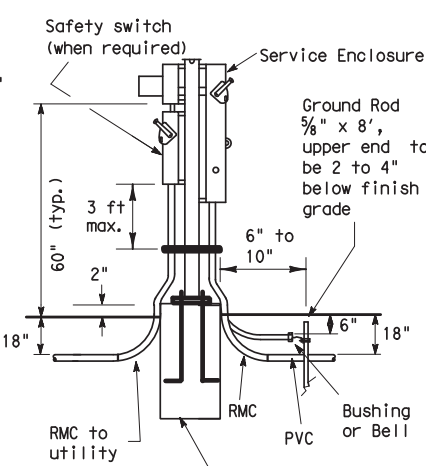
NOTE:
All rough edges shall be ground smooth
Drain hole for galv. 2 - places (typ.)

TOP OF POLE
TYPE SF & SP



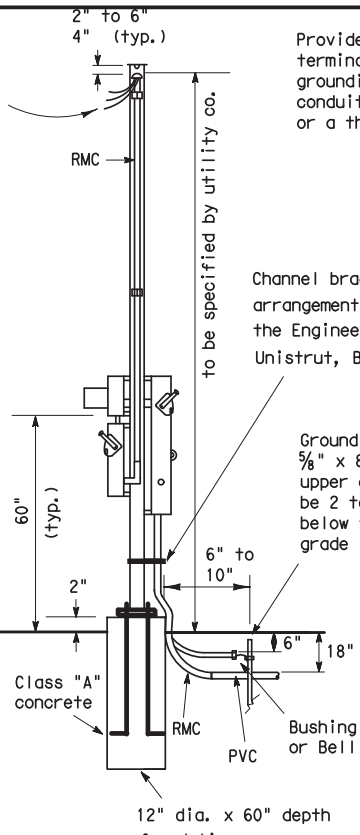
BOTTOM OF POLE
TYPE SF & SP

Color code 6" of grounded neutral conductors insulation with white tape where conductor exits the weatherhead. Color code 6" of L1 or L-2 Hot-ungrounded conductors insulation with red tape where conductor exits the weatherhead. Conductor free length, 12" min., 18" max.



SERVICE SUPPORT
TYPE SP (U)
UNDERGROUND SERVICE
WITH SAFETY SWITCH

12" dia. x 36" depth foundation
4-#4 reinforcing bars and #2 spiral (typ.)



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

Ground Rod 5/8" x 8', upper end to be 2 to 4" below finish grade

12" dia. x 60" depth foundation
4-#4 reinforcing bars and #2 spiral (typ.)

Provide grounding bushings on all metal conduits, terminate bonding jumpers (min. #6 AWG. Copper) to grounding bus. Grounding bushing not required when conduit end is fitted with a conduit sealing hub or a threaded type of boss such as a meter hub.

Channel bracket or other arrangement approved by the Engineer. (Kindorf, Unistrut, B-line or equal.)

Stand off type conduit support hardware shown. Provide when required by the utility.

RMC unless otherwise called for by the utility.

Conduit support spacing, 3' from the ends, max. and 5' in between unless otherwise called for by the utility.

UNDERGROUND RISER
AT UTILITY POLE
(for underground service)

Top of weatherhead to be 2" to 6", 4" typical below the top of pole.

As required by utility co. min. 20' max. 25' above grade

RMC size as shown elsewhere

Conduit support spacing, 3' from the ends, max. and 5' in between unless otherwise called for by the utility.

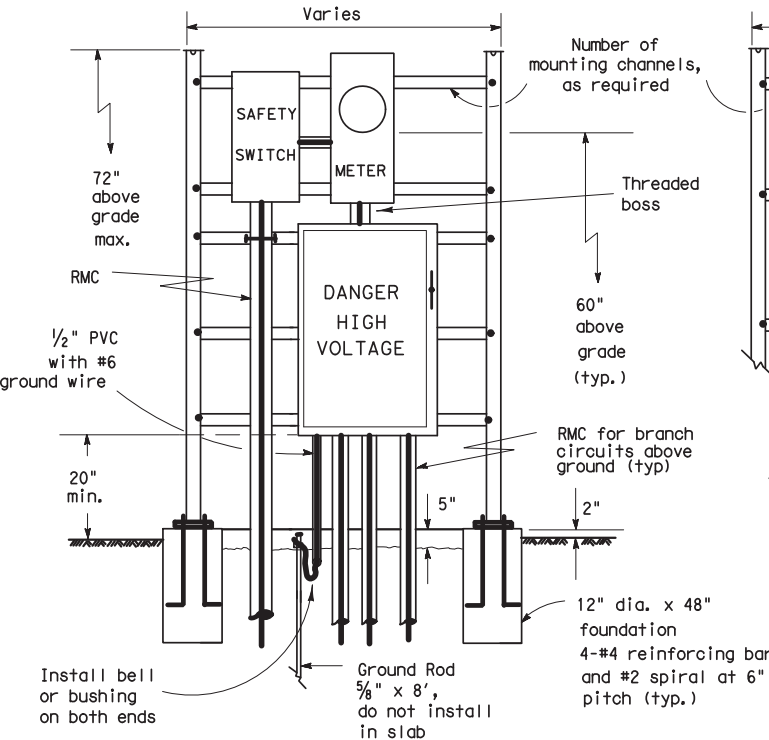
Color code 6" of grounded neutral conductors insulation with white tape where conductor exits the weatherhead. Color code 6" of L1 or L-2 Hot-ungrounded conductors insulation with red tape where conductor exits the weatherhead. Conductor free length, 12" min., 18" max.

12" dia. X 60" foundation
4-#4 reinforcing bars and #2 spiral at 6" pitch (typ.)

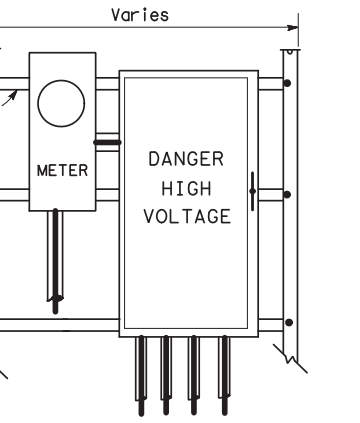
SERVICE SUPPORT TYPE SF (O)
OVERHEAD SERVICE

NOTES:

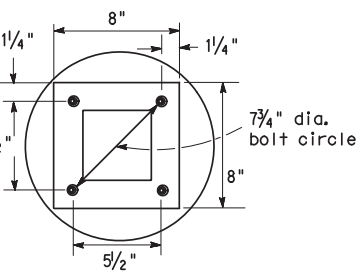
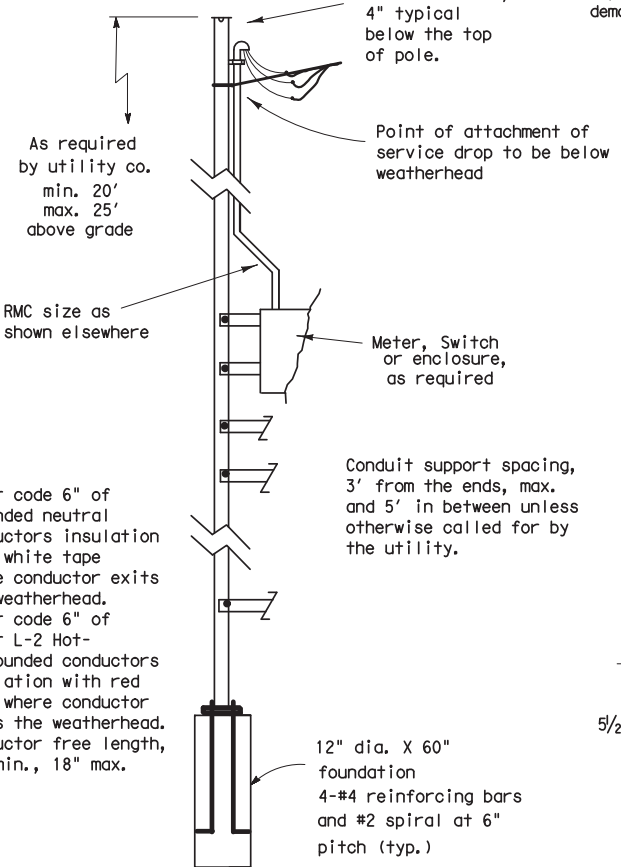
- Support Type SP and SF: Fabricated from 4" x 4" x 3/16" square structural tubing, ASTM A500 Grade A or G or equal. Base plate shall be 3/4" plate, ASTM A36 or equal. All equipment and conduit shall be mounted on galvanized channel strut, 1 1/2" x 1 5/8" x 12 gauge galvanized steel channel (Unistrut, Kindorf, B-line or equal) clamped with channel hardware, bolted or welded to vertical member as approved by the Engineer.
- Paint field cut ends of all channels with zinc-rich paint.
- All Steel Poles (SP and SF) shall be hot-dip galvanized after fabrication. Poles for overhead service shall be fitted with eyebolt or similar fitting, as approved by the utility company, for attachment of service drop to the pole.
- All conduit and conductors attached to the electrical service and within 12 inches of the electrical service will not be paid for directly, but shall be subsidiary to the electrical service. All conduit and conductors from the utility company pole to the point 12 inches from the electrical service, including conduit and conductors required for the utility pole riser when furnished by the Contractor, will be paid for separately.
- All mounting hardware and installation details of services shall be in accordance with utility company specifications.
- Anchor bolts for underground services shall be 3/4" x 18" x 4" (dia. x length x hook length). Anchor bolts for overhead services shall be 3/4" x 56" x 4". Anchor bolts shall be provided with leveling nuts.
- Conduit for grounding electrode conductor (ground rod wire) shall be 1/2" PVC. All other conduit on electrical services shall be rigid metal conduit. Service entrance conduit size shall be as shown elsewhere. Conduit for branch circuit entry to enclosure shall be the same size as that shown on the layout sheets for branch circuit conduit. Rigid metal conduit shall extend to the rigid metal elbow and then be coupled to the type conduit shown on the layout for that particular branch circuit. RMC shall have grounding bushings in enclosures.
- If pole is painted, each separate painted piece shall have a bonding jumper attached to a tapped hole.
- Sheet metal screws are not allowed for bonding. Provide 1/4-20 machine screws. Remove all non-conductive material at contact points. Terminate bonding jumper using listed device. Bonding jumper min. #6 AWG Copper. Make up all threaded bonding connections wrench tight.
- Conduits entering enclosure from underground shall be sealed at both ends. Silicone sealant will not be allowed.
- Ground rod clamp to be UL listed for direct burial.
- Service entrance conductors shall exit separately bushed non-metallic openings in weatherhead.
- Free conductor at weatherhead to be 12 in. min., 18 in. max., or as required by utility. Color code grounded-neutral conductor with white tape covering 6 in. of conductor. Color code L1 or L2 Hot un-grounded conductor with red tape covering 6 in. of conductor. Service drop and service entrance conductors must not contact metal pole in such a manner as to result in abrasion of insulated conductors.
- Conduit support spacing to be max. 3 ft. from ends, and max. 5 ft. in between.
- Shop drawings are not required for service support structure unless specifically stated elsewhere or as directed by the Engineer.
- Service enclosure to be labeled as specified on ED(5) VIII C.
- Liquidtight flexible metal conduit (LFMC) may be used between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. LFMC shall be the same size as service entrance conduit. LFMC shall not exceed 3 ft. and shall be securely supported within one foot of each end. LFMC shorter than 12" need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. A neutral conductor must be installed within the LFMC. Bend in LFMC shall not exceed 180 degrees. A pull test is required on all installed conductors, at least six inches of free conductor movement shall be demonstrated to the satisfaction of the Engineer.



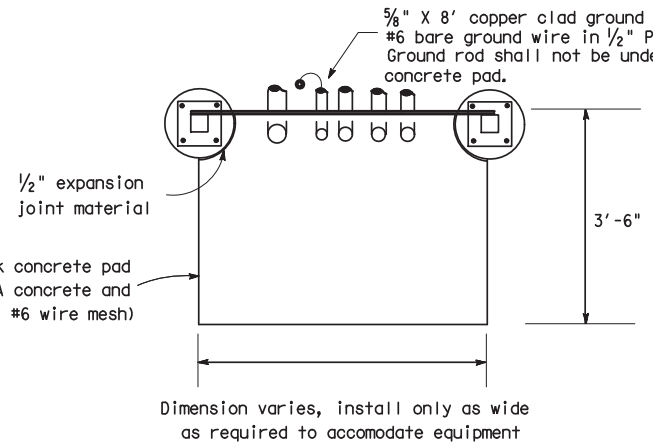
SERVICE SUPPORT TYPE SF (U)
UNDERGROUND SERVICE
WITH SAFETY SWITCH
(Typical Arrangement)



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



BASE PLATE DETAIL
TYPE SF & SP



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

Texas Department of Transportation
Traffic Operations Division

ELECTRICAL DETAILS-
SERVICE SUPPORT
TYPES SF & SP

ED(6)-03

5/03 Revision
Revised notes.

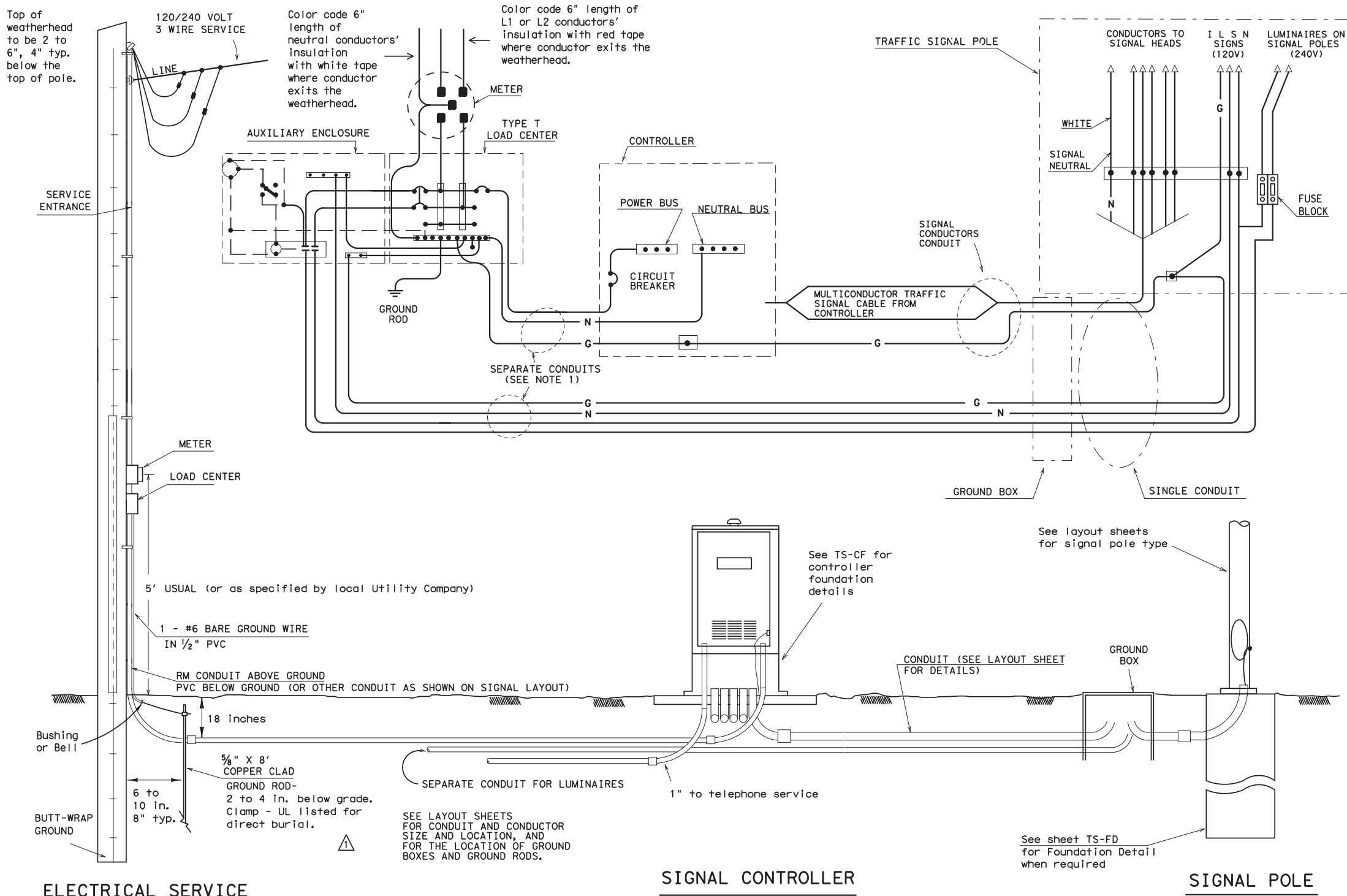
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NOTES:

- Luminaire conductors shall not be looped through controller cabinet.
- Electrical system to include an equipment grounding conductor noted here as "G". All exposed metal parts are to be bonded to grounding conductor.
- Photocell, when required, shall be mounted at top of pole or in enclosure as shown on ED(4) and ED(5) and as required by descriptive code.
- Roadway lighting fixtures, when required, shall be in accordance with the material and construction methods of the Item, "Roadway Illumination Assemblies" except for the test period for proper operation of the luminaires. Installed roadway lighting luminaires and internally lighted street name signs shall be tested for proper operation as a part of the associated traffic signal system.
- Internally lighted street name signs (ILSN), when required, shall be in accordance with the Item "Internally Lighted Street Name Signs". Because of the electrical isolation of ILSN hinges, a #12 green grounding conductor shall be run to the ILSN fixture.
- Install ground rod at alternate location when directed by the Engineer. Maintain a minimum of 8 ft in contact with the earth.
- Liquidtight flexible metal conduit (LFMC), may be used when meter and service enclosure are mounted 90 to 180 degrees to each other. LFMC shall be same size as service entrance conduit. LFMC shall not exceed 3 ft, and shall be securely supported within one foot of each end. No strap required for a LFMC shorter than 12". Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. A neutral conductor must be installed within the LFMC. Bend in liquidtight flexible metal conduit shall not exceed 180 degrees.
- Minimum embedment depth as per Item 627 Treated Timber Poles.
- Pole to be set plumb.
- Back fill thoroughly tamped in 6 in. lifts. Place 6 inches additional backfill above grade around pole base to allow for settling, as per Item 627.
- Excess pole length shall be trimmed from the top at a slope to aid water run off.
- Gain pole two places for each meter, service, separate or auxiliary enclosure. See ED(4) for details.
- All illumination and power conductors to be pull tested and megged. Do not meg traffic signal cable.
- Enclosures are to be locked, and ground box covers are to be bolted before power is applied to the circuit.
- Conduits entering top of enclosures to be fitted with conduit sealing hub or threaded boss, such as meter hub. Off-set nipple, when required, shall not be zinc-die-pressure cast. All metal conduits not connected to conduit sealing hub, or threaded boss must have a grounding bushing. Terminate bonding jumper to ground bus. All conduits entering enclosures shall be sealed. Silicone shall not be allowed.



ELECTRICAL SERVICE

(TYPE T TIMBER POLE SHOWN AS EXAMPLE, SEE ELECTRICAL DETAILS, LAYOUT SHEETS, AND ELECTRICAL SERVICE DATA SHEET FOR SERVICE REQUIRED AND FOR DETAILS.)

SIGNAL CONTROLLER

SIGNAL POLE

Unless shown elsewhere in the plans, electrical service data for Types D and T shall be as follows.

ELECTRICAL SERVICE DESCRIPTION (SEE ED(4))	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS ***	PANELBD./LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
TY D (120/240)070(NS)AL(E)**(*)	1/4	3/#4	N/A	2P/70	30	100	T.S. Lighting	1P/50 2P/15	<7.1
TY T (120/240)000(NS)GS(E)**(*)	1/4	3/#4	N/A	None	30	70	T.S. Lighting	1P/50 2P/15	<7.1

- *** Eliminate photocell, contactor and separate enclosure if lighting, or internally lighted signs are not required by plans
- ** See descriptive code in estimate for service support type.
- * See descriptive code in estimate for overhead or underground service.

**ELECTRICAL DETAILS-
TYPICAL TRAFFIC SIGNAL
SYSTEM DETAILS**

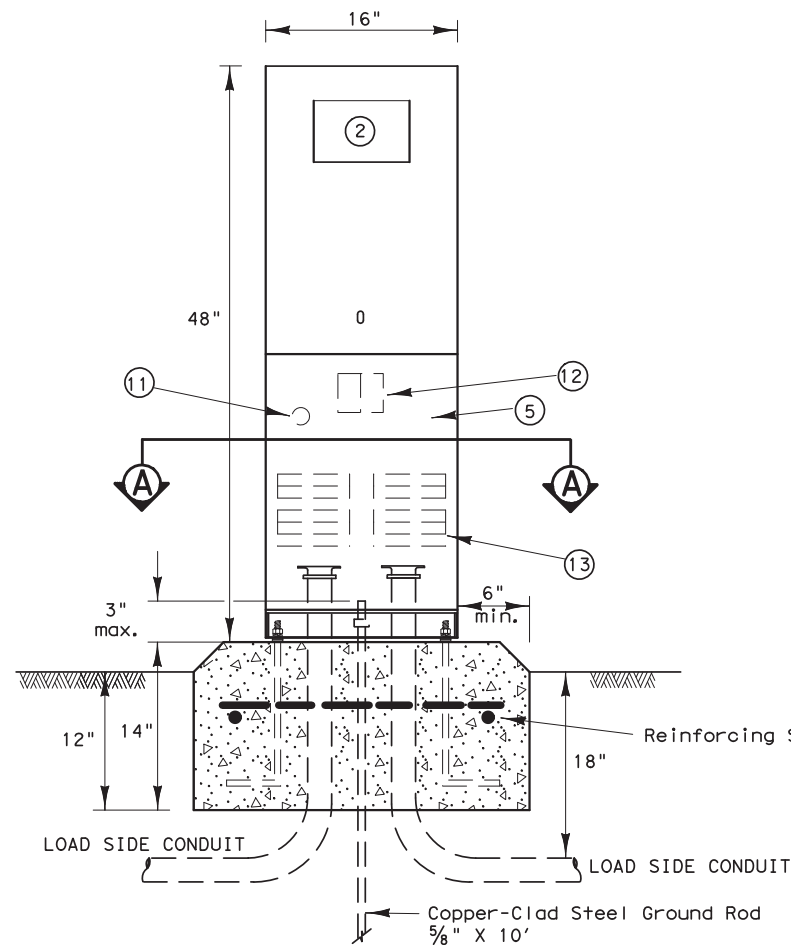
ED(7)-03

5/03 Revision

Revised notes.

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COUNT	SECT	JUR	HIGHWAY	
DIST	COUNTY		SHEET NO.	16

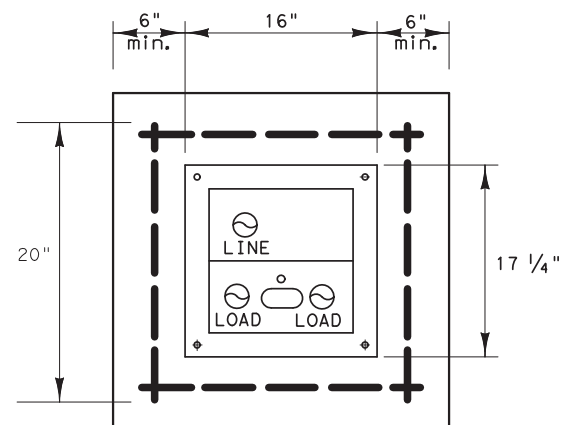
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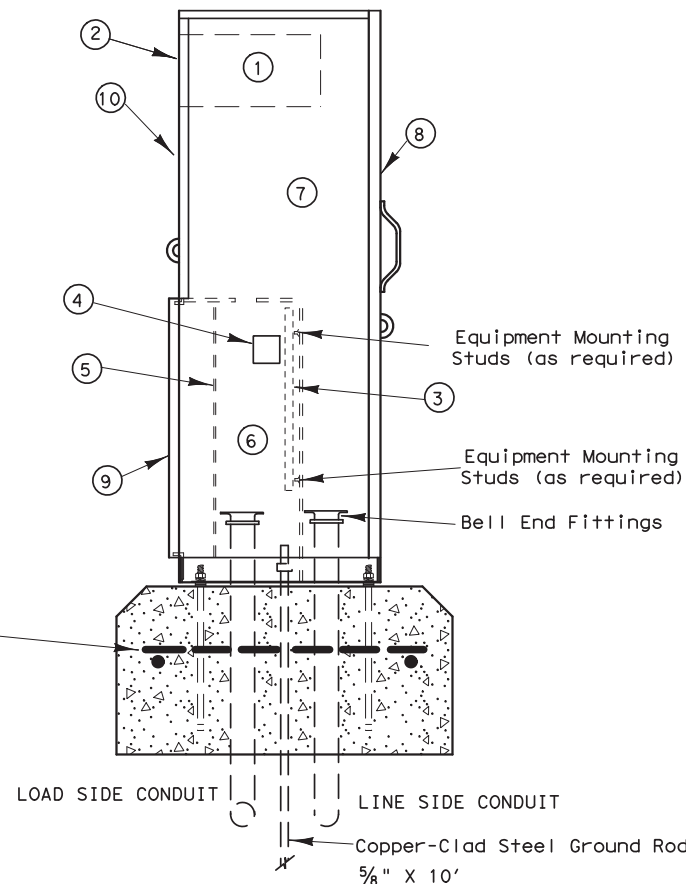
Note: Ells in foundation are rigid metal, size called for on the plans. Extension conduits from these ellis may be PVC, provided ends of rigid metal conduits are more than 2 in. below top of concrete foundation. Where extension conduits are metal, grounding bushing must be installed and a bonding jumper properly terminated.

FRONT VIEW

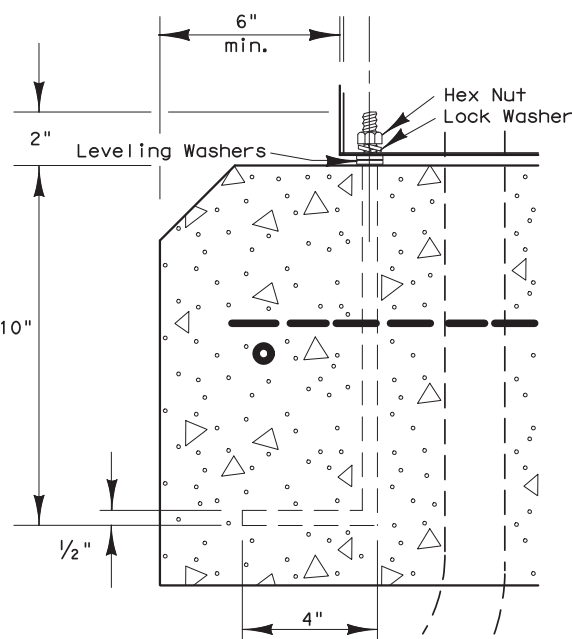
Ty C shown, Ty A similar except that Ty A shall have individual circuit breakers mounted on a equipment mounting panel. CB Handles shall protrude through hinged deadfront trim.



SECTION A-A



SIDE VIEW



ANCHOR BOLT DETAIL

GENERAL NOTES

- The pedestal service shall be UL type 3R, and shall be constructed of a minimum of 12 gauge stainless steel or aluminum as required by descriptive code. Stainless steel shall not be painted. For aluminum, the finish shall be an electrostatic applied polyurethane baked on powder, light green in color, or color as shown elsewhere and as approved by the Engineer. The front of the interior dead front trim shall be permanently labeled, "Danger High Voltage" with OSHA style label. The exterior of the pedestal service door shall be permanently labeled with a placard as to its use (i.e. Roadway Lighting, Traffic Signals, etc.). Placard shall be neat and professional in appearance. Lettering shall be 1" minimum height.
- Utility Access Door shall have stainless steel piano hinge and provisions for padlocking.
- Pedestal door shall have stainless steel piano hinge and stainless steel latch with provisions for padlocking.
- Meter Access shall be hinged and capable of padlocking.
- All mounting hardware and installation details of services shall be in accordance with utility company specifications. The Contractor is responsible for contacting the local utility company and obtaining their approval of pedestal details prior to making submittal to the Department and prior to constructing the electrical pedestal service. Any changes required by the utility company shall be noted on the submittals.
- Meter Socket shall be a minimum of 100 amp rating and shall comply with the local utility requirements.
- Photoelectric Control shall meet the requirements as shown on ED(5). Shield to control stray light is allowable. The Contractor shall be responsible for proper operation of the photo-electric control. The Contractor shall move and/or adjust or shield the photocell from stray or ambient nighttime light or shall make any other adjustments required for proper operation. The photocell shall face North when practicable. Unless otherwise shown on the plans, the photocell shall turn on the illumination system at 1.0 (+/-) 0.5 foot-candle and turn off the illumination system at two footcandles higher than turn on.
- The Control Station (H-O-A Switch) shall be as shown on ED(5) except that H-O-A Switch operating handle shall protrude through hinged deadfront trim and NEMA 1 enclosure will not be required.
- Concrete for pedestal service foundation shall be class A or C and shall be in accordance with Item 420, "CONCRETE STRUCTURES", except that concrete will not be paid for directly but shall be considered subsidiary to Item 628, "ELECTRICAL SERVICES".
- Reinforcing steel shall be #4 rebar in accordance with Item 440, "REINFORCING STEEL".
- Anchor bolts shall be A36M55 in accordance with Item 449, "ANCHOR BOLTS". Anchor bolts shall be 1/2 inch x 12 inches x 4 inches (dia. x length x hook length).
- All conduit and conductors attached to the pedestal service and within 12 inches of the pedestal service will not be paid for directly, but shall be subsidiary to the pedestal service. All service conduit and conductors from the utility company transformer to a point 12 inches from the pedestal service shall be paid for separately. Service conduit shall be the size and type as shown in the Electrical Service Data.
- Dimensions may vary to accommodate required equipment, utility company requirements, or manufacturer's standard equipment dimensions. The Contractor shall submit to the Engineer for approval, six (6) copies of brochures and/or drawings of the pedestal service to be supplied, including actual dimensions, and a paint color sample.
- A separate enclosure as shown on ED(4) or ED(5) for photocell shall not be used for pedestal services. Photocell shall be installed as shown here.
- The pedestal door shall have a mechanically attached data pocket on the inside. Pocket shall be either metal or thermoplastic and shall measure at least 12 inches by 12 inches. The Contractor shall prepare and submit a schematic drawing unique to an individual service. The approved drawing shall be laminated and placed in the document pocket of the service at the time of shipment to the job site. All applicable wiring diagrams and plan sheet layouts for all equipment and branch breaker circuits supplied by that service shall also be laminated and placed in the document pocket prior to shipping.
- Ground rod clamp to be UL listed for direct burial. All non-conductive coating to be removed from ground rod at clamp location. Ground rod wire to be #6 AWG solid copper. Metal conduit ellis to have grounding bushing and bonding jumpers correctly installed.
- All conduits entering enclosures from underground must be sealed. Silicone shall not be allowed.
- All conductors shall be megged and pull tested. Traffic signal cable not to be megged after connection, as electronics will be damaged.
- Top of concrete foundation to be finished in a neat and workman like manner. If leveling washers are used, no more than 1/4 in. height shall be used at any one corner. Maximum dip or rise in foundation is not to exceed 1/4 in per foot. When properly installed, top of service enclosure shall read level front to back and side to side within 1/4 in. Rocking or movement of the service enclosure shall be repaired by the contractor at no cost to the state.
- Liquidtight flexible metal conduit shall not be allowed on PS type services.

LEGEND

- METER SOCKET, (when required)
- METER SOCKET WINDOW, (when required)
- EQUIPMENT MOUNTING PANEL
- PHOTO ELECTRIC CONTROL WINDOW, (when required)
- HINGED DEADFRONT TRIM
- LOAD SIDE CONDUIT AREA
- LINE SIDE CONDUIT AREA
- UTILITY ACCESS DOOR, with handle
- PEDESTAL DOOR
- HINGED METER ACCESS
- CONTROL STATION (H-O-A Switch)
- MAIN DISCONNECT
- BRANCH CIRCUIT BREAKERS

5/03 Revision
 Revised notes.

Texas Department of Transportation
 Traffic Operations Division

ELECTRICAL DETAILS
ELECTRICAL SERVICE SUPPORT
PEDESTAL SERVICE TYPE PS

ED(8)-03

© TxDOT April 1998		DATE	BY	CHKD	DATE	BY	CHKD	DATE
12-00	3-03	REVISED						
3-03	5-03							
		PROJECT	COUNTY					SHEET NO.
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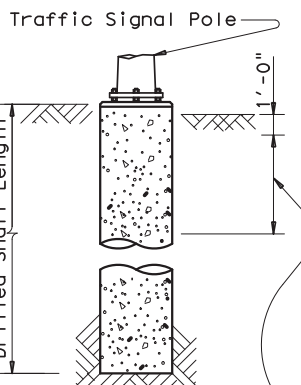
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FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft (4), (5), (6)			ANCHOR BOLT DESIGN (1)				FOUNDATION DESIGN LOAD (2)		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	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
		24' X 24'			
MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	28' X 28'				
	32' X 28'				
	36' X 36'				
	40' X 36'				
	44' X 28'				
		44' X 36'			
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
		24' X 24'			
MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	28' X 28'				
	32' X 24'				
	32' X 32'				
	36' X 36'				
	40' X 24'				
		40' X 36'			
		44' X 36'			

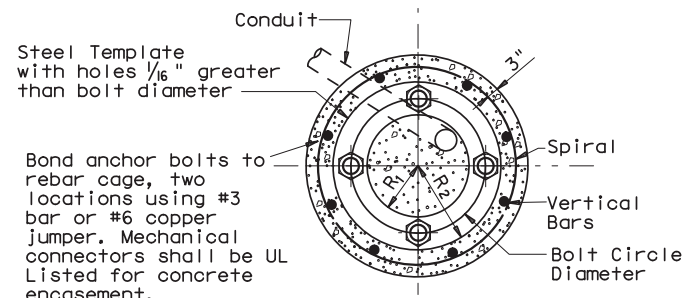


Use average N value over the top third of the embedded shaft. Ignore the top 1' of soil.

ANCHOR BOLT & TEMPLATE SIZES

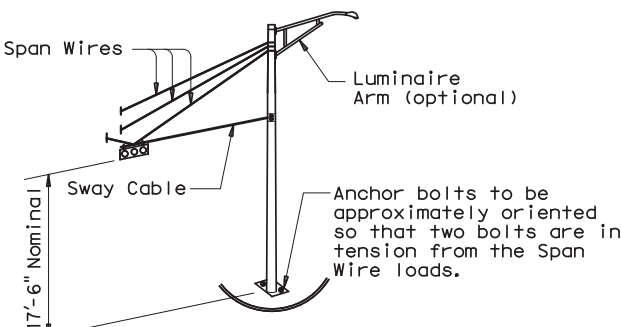
BOLT DIA IN.	(7) BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
3/4"	1'-6"	3"	—	12 3/4"	7 1/8"	5 5/8"
1 1/2"	3'-4"	6"	4"	17"	10"	7"
1 3/4"	3'-10"	7"	4 1/2"	19"	11 1/4"	7 3/4"
2"	4'-3"	8"	5"	21"	12 1/2"	8 1/2"
2 1/4"	4'-9"	9"	5 1/2"	23"	13 3/4"	9 1/4"

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

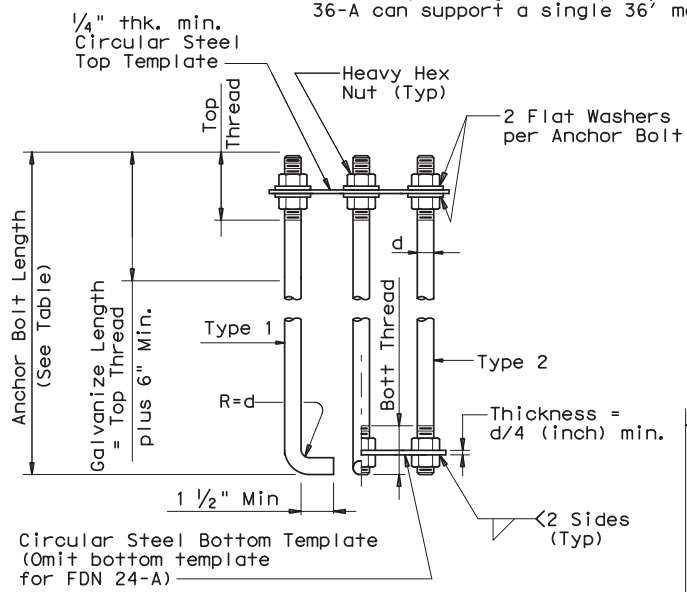


Bond anchor bolts to rebar cage, two locations using #3 bar or #6 copper jumper. Mechanical connectors shall be UL Listed for concrete encasement.

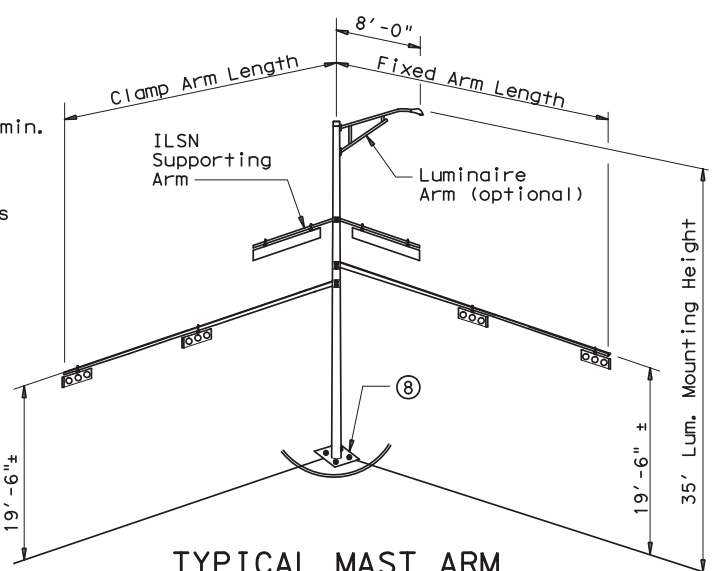
EXAMPLE:
 1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
 2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



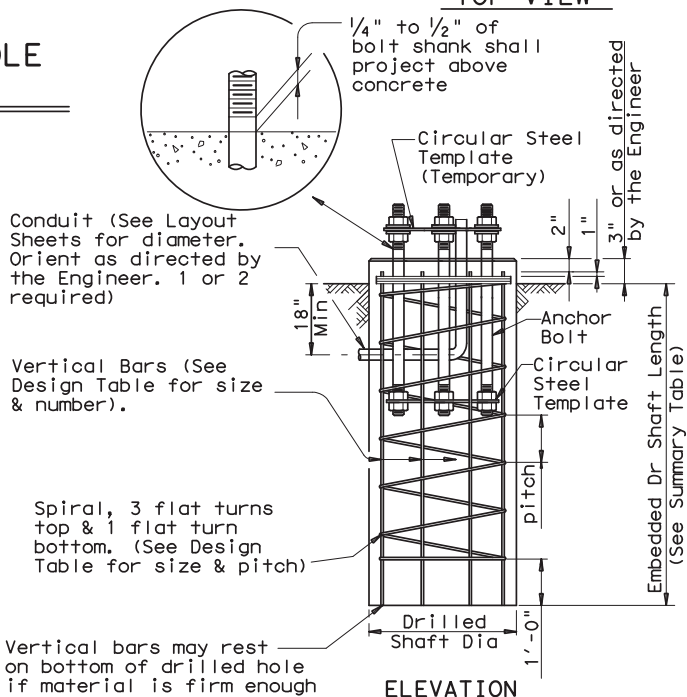
TYPICAL STRAIN POLE ASSEMBLY



ANCHOR BOLT ASSEMBLY



TYPICAL MAST ARM ASSEMBLY



FOUNDATION DETAILS

NOTES:

- Anchor bolt design develops the foundation capacity given under Foundation Design Loads.
- Foundation Design Loads are the allowable moments and shears at the base of the structure.
- Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.
- Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.
- If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.
- 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
T100	10	36-A	1			14		
P100	10	24-A	1	4				
P101	10	24-A	1	4				
P200	10	24-A	1	4				
P300	10	24-A	1	4				
T400	10	36-B	1				16	
P400	10	24-A	1	4				
TOTAL DRILLED SHAFT LENGTHS				20		14	16	

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 Cameron L. Williams
 3-10-15



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".



TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

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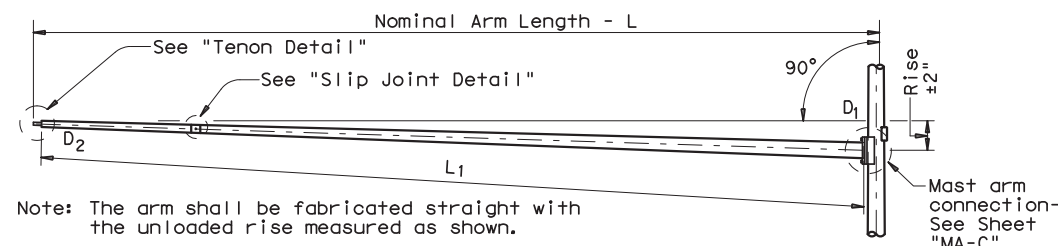
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Arm Length ft.	ROUND POLES					POLYGONAL POLES					Foundation Type
	D _B in.	D ₁₉ in.	D ₂₄ in.	D ₃₀ in.	① thk in.	D _B in.	D ₁₉ in.	D ₂₄ in.	D ₃₀ in.	① thk in.	
20	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
24	12.0	9.3	8.6	7.8	.239	13.0	10.0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

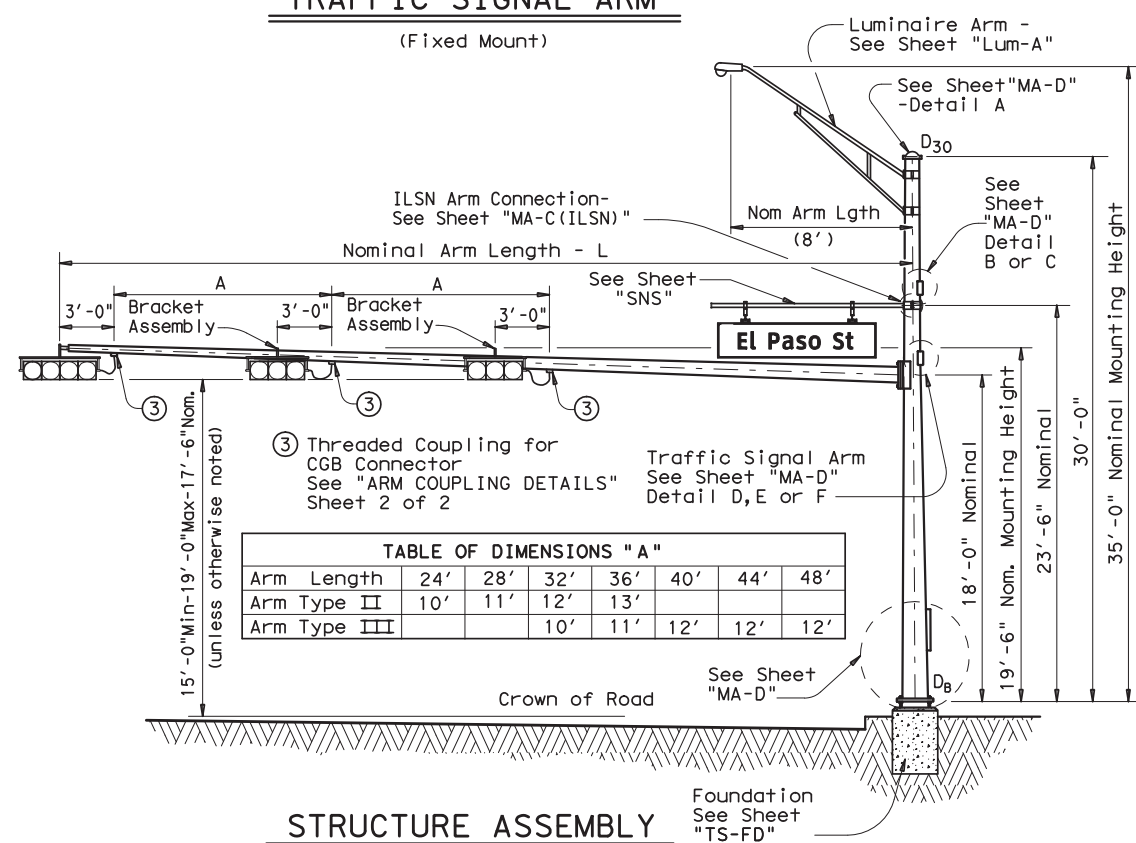
Arm Length ft.	ROUND ARMS					POLYGONAL ARMS				
	L ₁ ft.	D ₁ in.	D ₂ in.	① thk in.	Rise	L ₁ ft.	D ₁ in.	② D ₂ in.	① thk in.	Rise
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2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

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

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



TRAFFIC SIGNAL ARM
(Fixed Mount)



STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

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

Nominal Arm Length ft.	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-100		20S-100		20-100	
24	24L-100		24S-100		24-100	
28	28L-100		28S-100		28-100	
32	32L-100		32S-100		32-100	
36	36L-100	1	36S-100		36-100	
40	40L-100	1	40S-100		40-100	
44	44L-100		44S-100		44-100	

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

Nominal Arm Length ft.	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	1
40					40III-100	1
44					44III-100	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	2

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

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

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

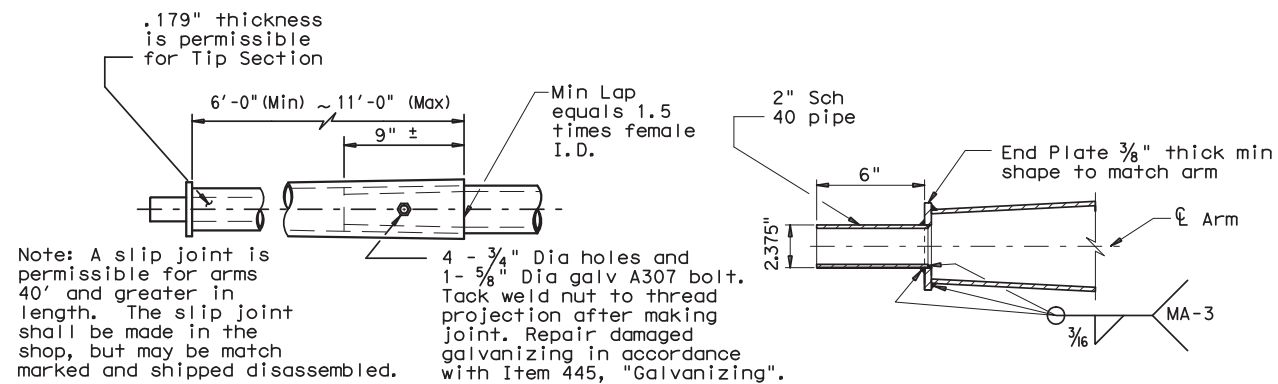
Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

Texas Department of Transportation
 Traffic Operations Division
TRAFFIC SIGNAL SUPPORT STRUCTURES
 SINGLE MAST ARM ASSEMBLY
 (100 MPH WIND ZONE)
SMA-100(1)-12

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1-12					
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SLIP JOINT DETAIL

TENON DETAIL

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

4 - 3/4" Dia holes and 1 - 5/8" Dia galv A307 bolt. Tack weld nut to thread projection after making joint. Repair damaged galvanizing in accordance with Item 445, "Galvanizing".

VIBRATION WARNING

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

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

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

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

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

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

BRACKET ASSEMBLY

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 100 mph plus a 1.3 gust factor.

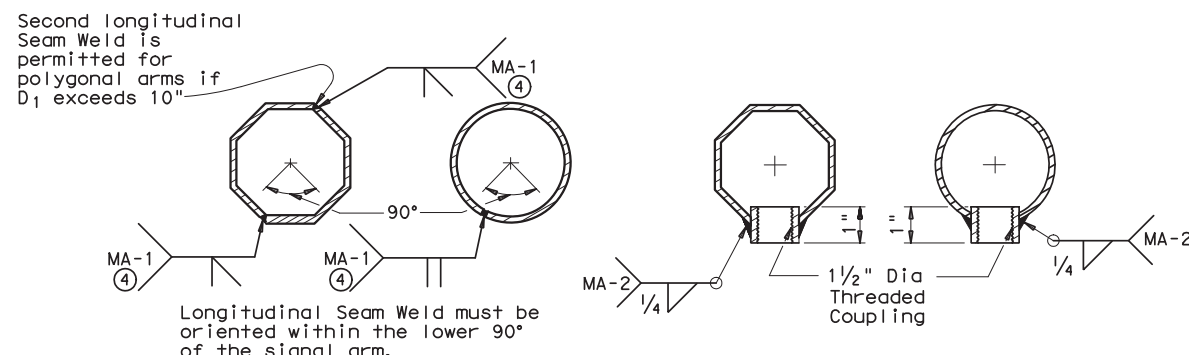
Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective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

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

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

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


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



ARM WELD DETAIL

ARM COUPLING DETAILS

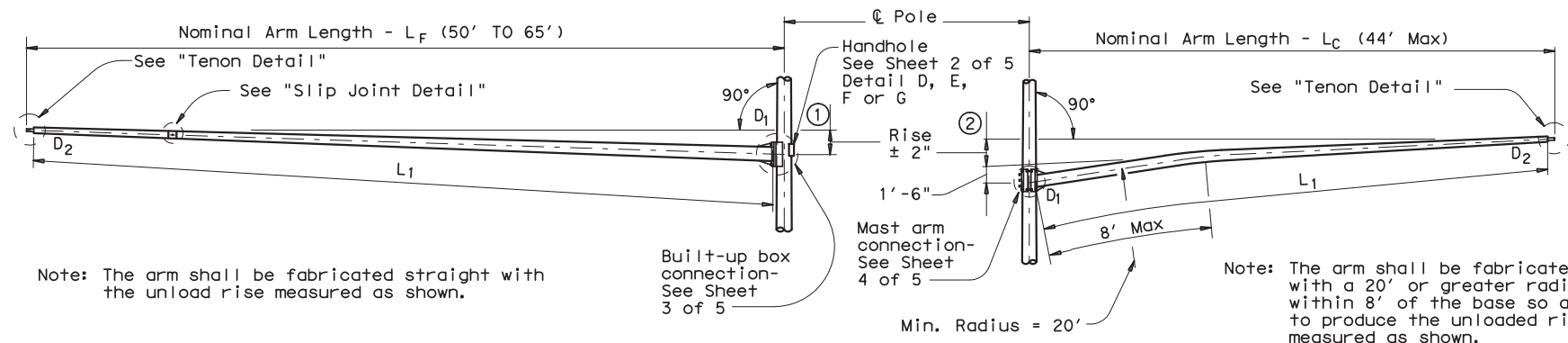
④ 60% Min. penetration
100% penetration within
6" of circumferential
base welds.


Texas Department of Transportation
 Traffic Operations Division
TRAFFIC SIGNAL SUPPORT STRUCTURES
SINGLE MAST ARM ASSEMBLY
 (100 MPH WIND ZONE)
SMA-100(2)-12

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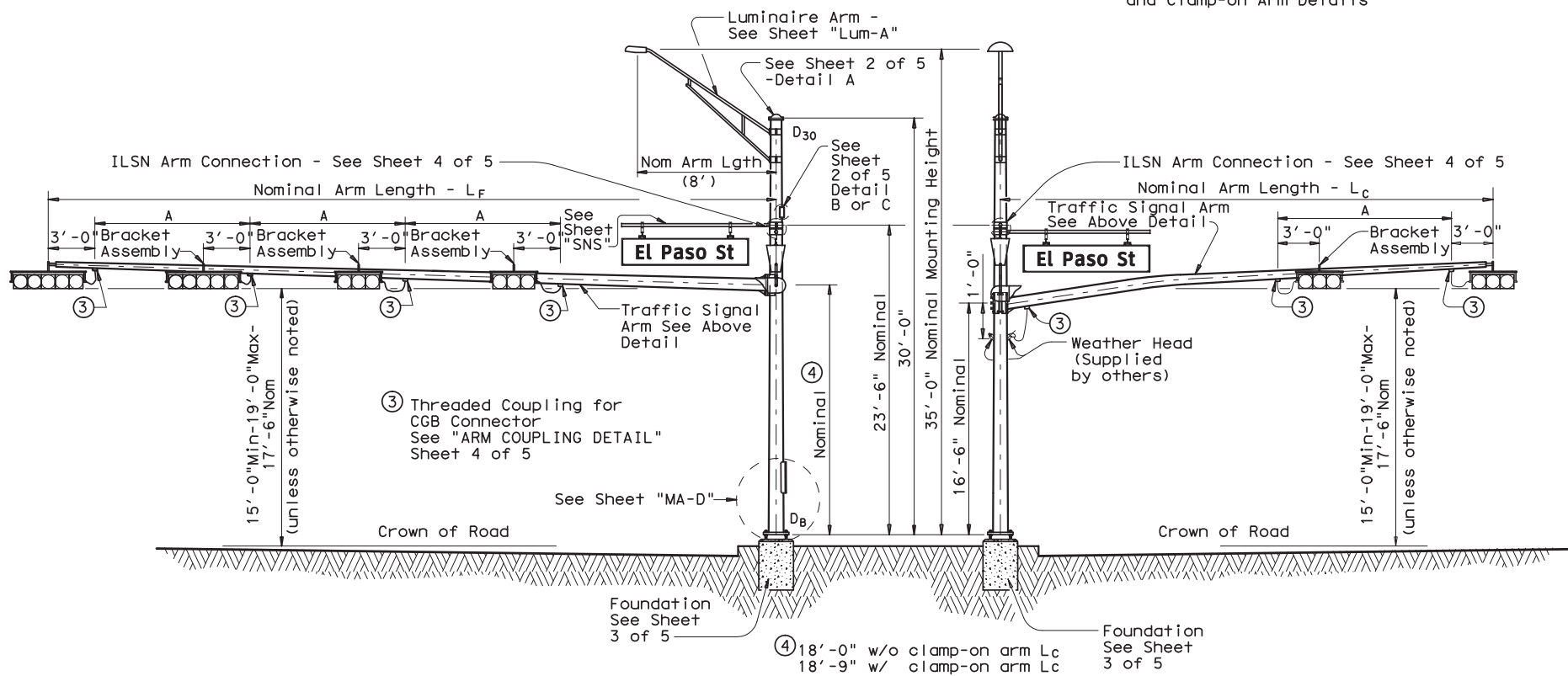


FIXED MOUNT TRAFFIC SIGNAL ARM

① See Sheet 3 of 5 for Arm Rise

CLAMP-ON TRAFFIC SIGNAL ARM (IF REQUIRED)

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



ELEVATION

(Showing fixed mount arm)

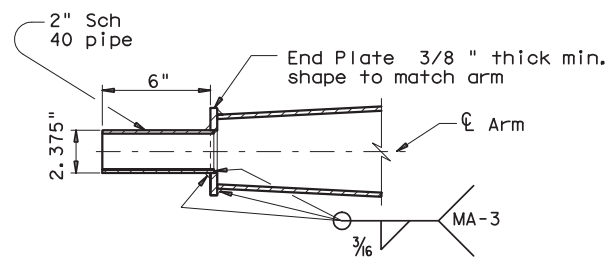
STRUCTURE ASSEMBLY

ELEVATION

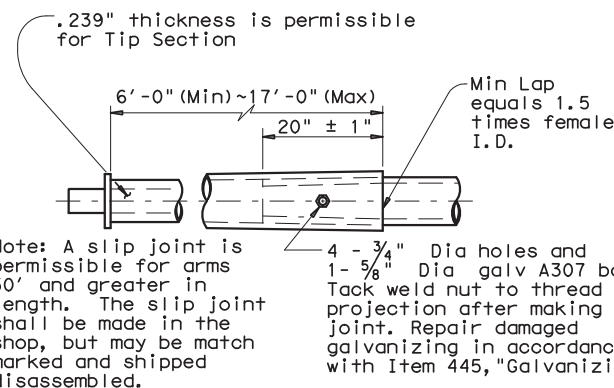
(Showing clamp-on arm)

TABLE OF DIMENSIONS "A"

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



TENON DETAIL



SLIP JOINT DETAIL (FIXED MOUNT ARM)

GENERAL NOTES:

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

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

Each arm with its related attachment is shown below

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

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

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

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

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

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

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

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

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

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

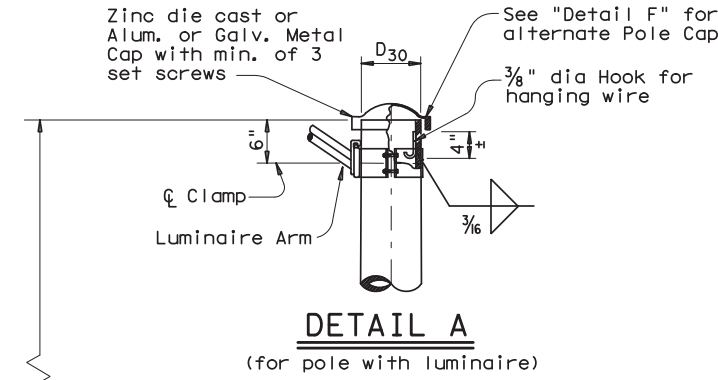
Texas Department of Transportation
Traffic Operations Division

**TRAFFIC SIGNAL
SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY
(50 TO 65 FT)
(80 AND 100 MPH WIND ZONE)
LMA(1)-12**

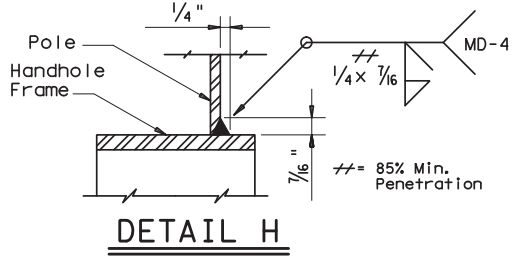
Sheet 1 of 5

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		DIST	COUNTY	SHEET NO.

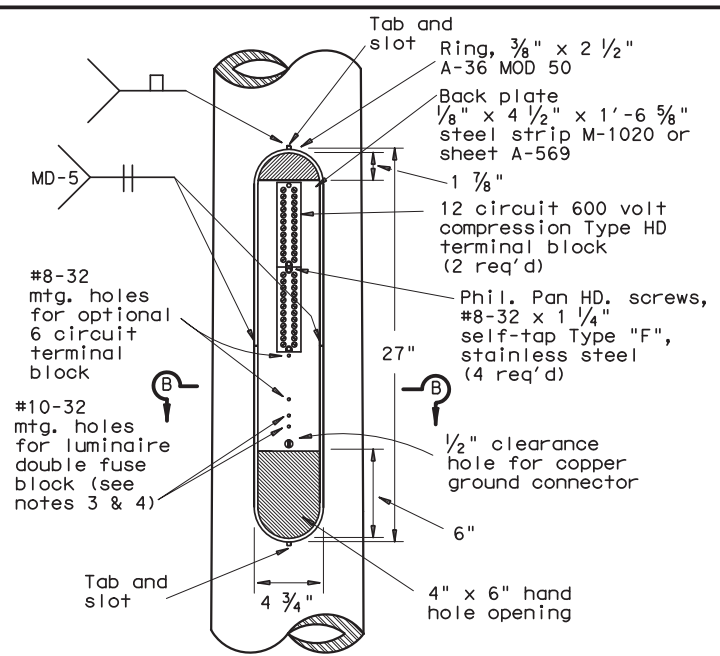
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DETAIL A
(for pole with luminaire)



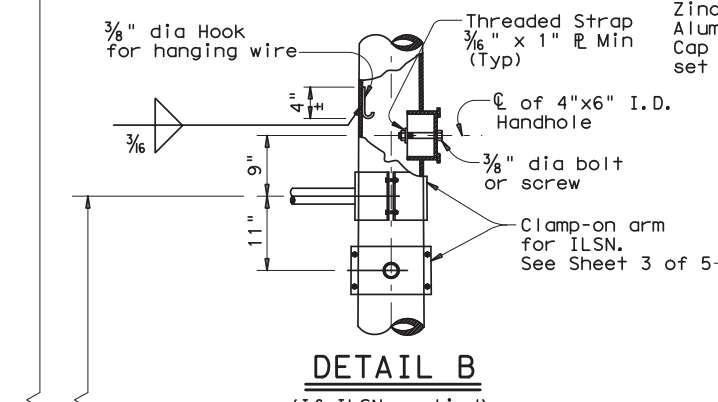
DETAIL H



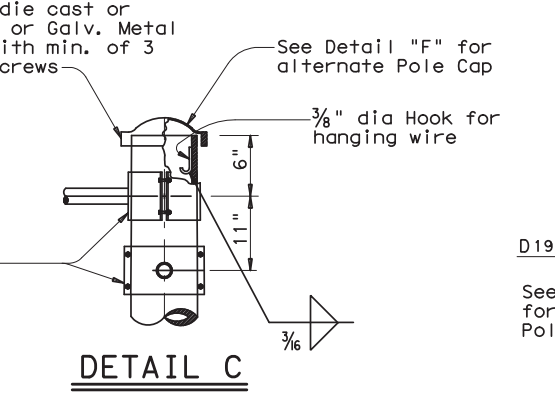
ACCESS COMPARTMENT

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

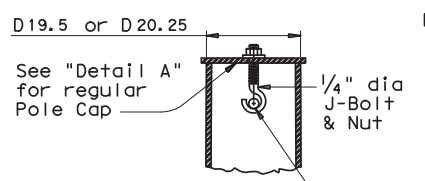
- ⁽⁷⁾ ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.
- ⁽⁸⁾ ASTM A1011 SS Gr. 50 shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.



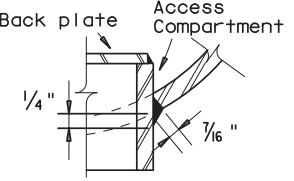
DETAIL B
(If ILSN applied)



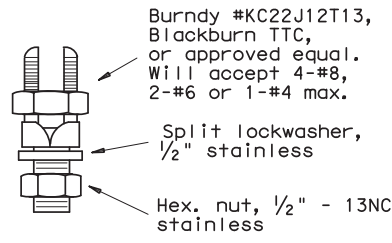
DETAIL C



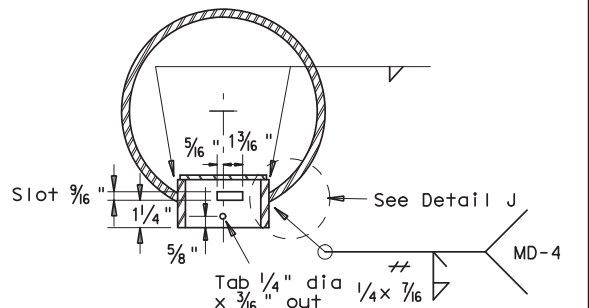
SECTION Y-Y



DETAIL J

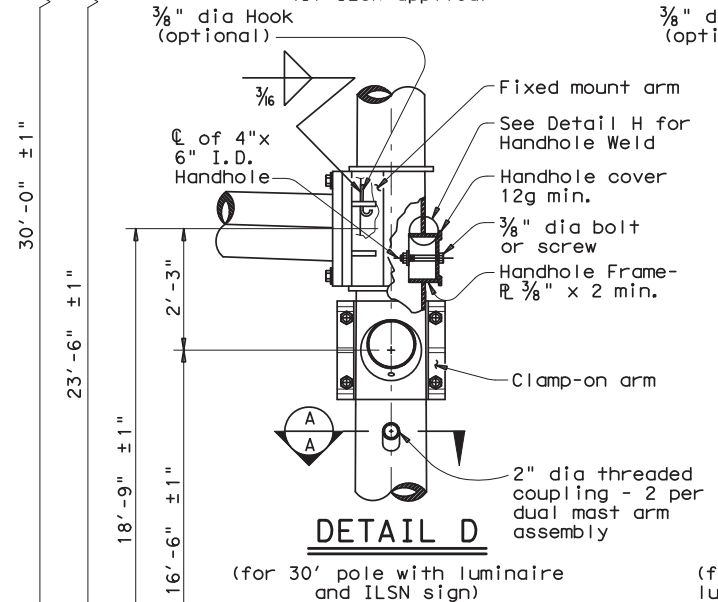


COPPER GROUND CONNECTOR

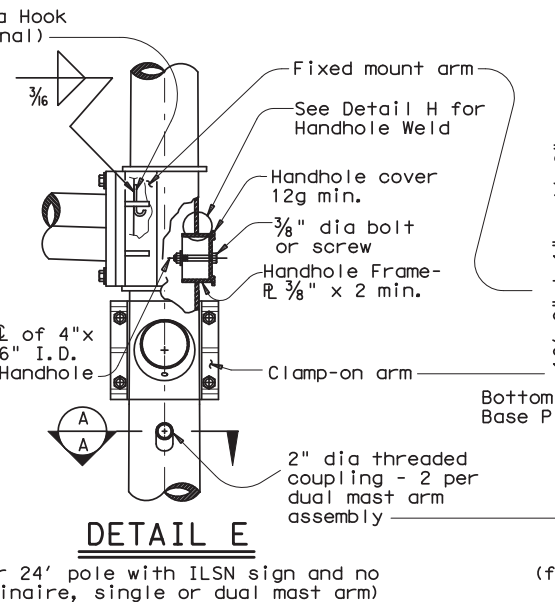


SECTION B-B

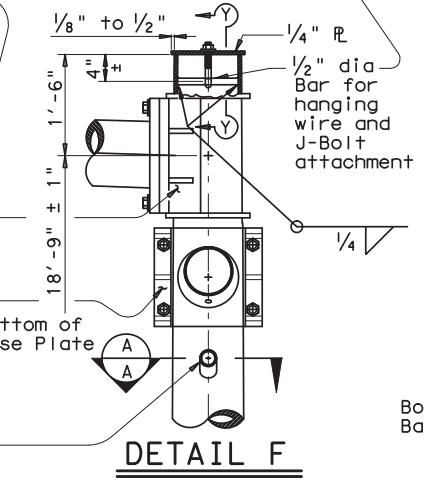
Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.



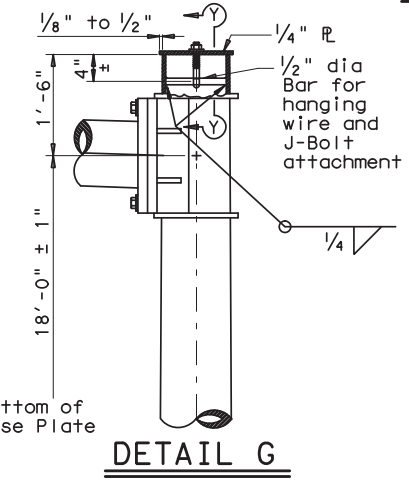
DETAIL D
(for 30' pole with luminaire and ILSN sign)



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



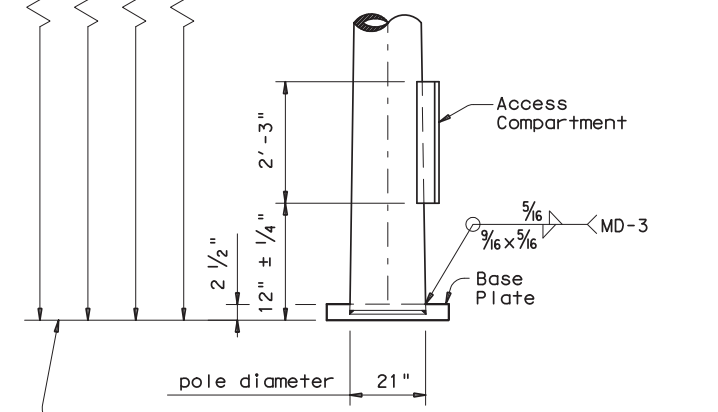
DETAIL F
(for 20.25' pole with no ILSN sign and no luminaire, dual mast arm)



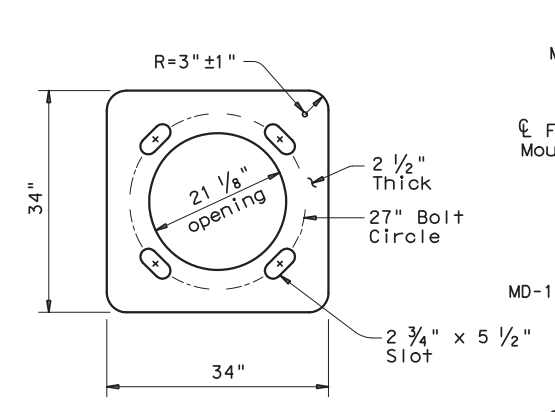
DETAIL G
(for 19.5' pole with no ILSN sign and no luminaire, single mast arm)

ACCESS COMPARTMENT NOTES:

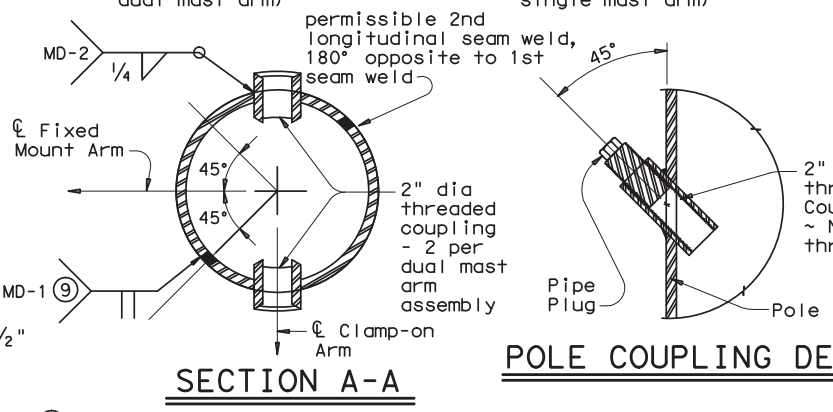
- The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20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



POLE ELEVATION



BASE PLATE



SECTION A-A

POLE COUPLING DETAIL

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

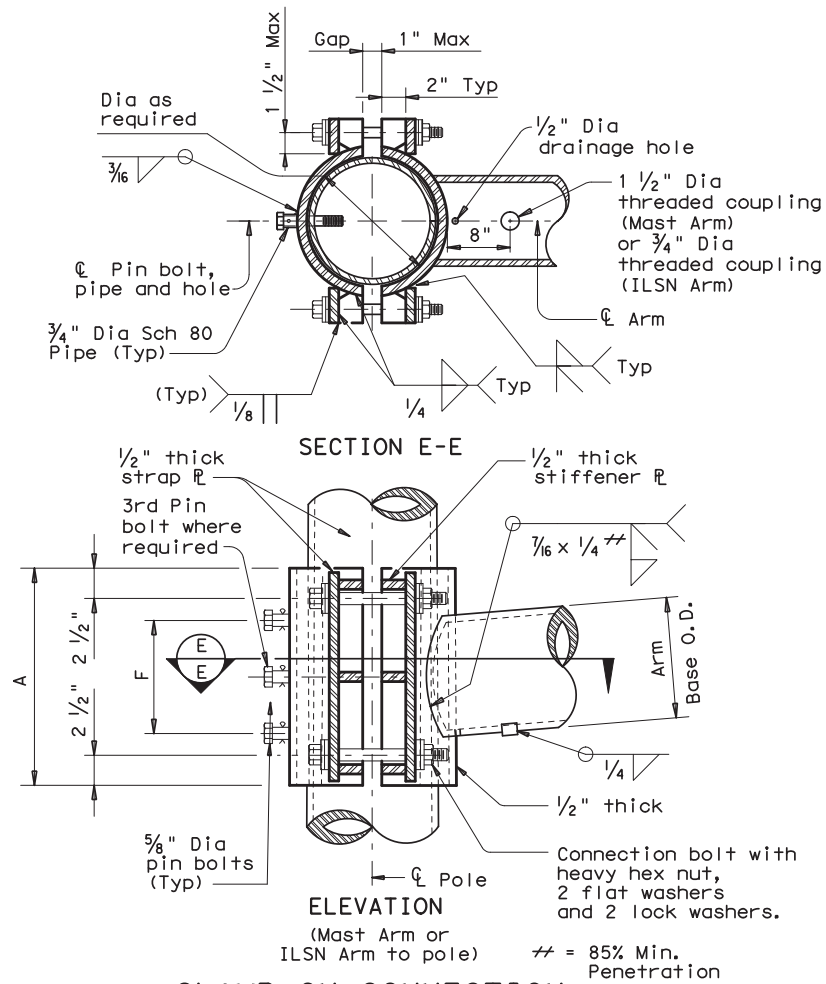
Texas Department of Transportation
Traffic Operations Division

**TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY
(50 TO 65 FT)
(80 AND 100 MPH WIND ZONE)
LMA (2) -12**

Sheet 2 of 5

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CLAMP-ON CONNECTION

80 MPH WIND										
Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L ₁	D ₁	D ₂	thk (12)	Rise	L ₁	D ₁	D ₂	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-0"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.239	2'-4"	35.0	10.0	3.5	.239	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"

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

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

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

CLAMP-ON ARM CONNECTION					
ILSN Arm Size		A	F	4 Conn. Bolts	5/8" Dia. Pin Bolts
Sch 40 pipe Dia	Thick				
in.	in.	in.	in.	in.	ea
3	.216	10	4	3/4	2

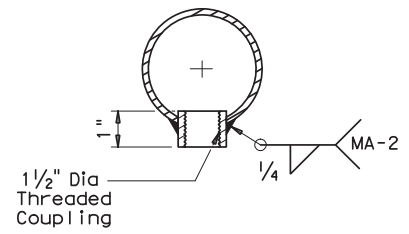
Mast Arm Size		A	F	4 Conn. Bolts	5/8" Dia. Pin Bolts
Base Dia	Thick				
in.	in.	in.	in.	in.	ea
6.5	.179	12	6	1	2
7.5	.179	14	8	1	2
8.0	.179	14	8	1	2
9.0	.179	16	10	1	2
9.5	.179	18	12	1 1/4	3
9.5	.239	18	12	1 1/4	3
10.0	.239	18	12	1 1/4	3
10.5	.239	18	12	1 1/4	3
11.0	.239	18	12	1 1/4	3
11.5	.239	18	12	1 1/4	3

GENERAL NOTES:

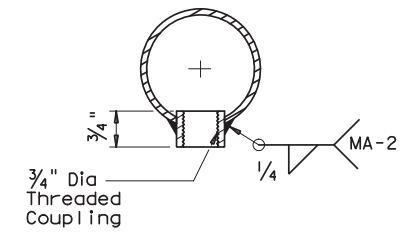
Clamp-on details are used for the second arm on dual mast arm assemblies or ILSN arm support. For a clamp-on mast arm, a maximum 1 1/2" wide vertical slotted hole may be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1". For an ILSN arm, a 1 1/2" diameter hole shall be cut in the front clamp plate for wire access. A matched hole shall be field drilled through the pole to provide wire access after arm is oriented. Deburr both holes.

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

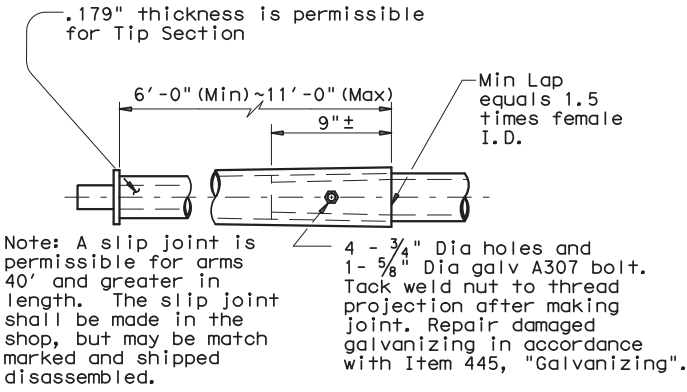
Pin bolts are required to prevent rotation of clamp-on arms under design wind forces. Pin bolts shall be ASTM A325 with threads excluded from the shear plane. Pin bolt and 3/4" diameter pipe shall have 3/16" diameter holes for a 1/8" diameter galvanized cotter pin. Back clamp plate shall be furnished with a 3/4" diameter hole for each pin bolt. An 1/16" diameter hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.



ARM COUPLING DETAIL



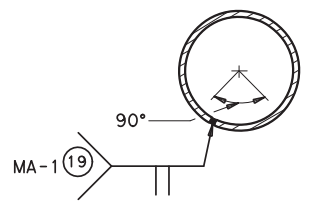
ILSN ARM COUPLING DETAIL



SLIP JOINT DETAIL (CLAMP-ON ARM)

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

BRACKET ASSEMBLY



ARM WELD DETAIL

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

Texas Department of Transportation
Traffic Operations Division

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

Sheet 4 of 5 **LMA (4) -12**

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Shipping Parts List							
Ship each pole with the following attached: enlarged hand hole, pole cap, fixed arm connection bolts and washers, and any additional hardware listed in the table.							
Nominal Arm Length	30' Poles with Luminaire		24' Poles with ILSN		19.50' (Single Mast Arm) 20.25' (Dual Mast Arm) Poles with no Luminaire and no ILSN See note above		
	See note above plus: one (or two if ILSN attached) small hand hole, clamp-on simplex		See note above plus one small hand hole				
Single Mast Arm							
Lf ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity	
50	50L		50S		50		
55	55L	1	55S		55		
60	60L	1	60S		60		
65	65L		65S		65		
Dual Mast Arm							
Lf ft.	Lc ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50	20	5020L		5020S		5020	
	24	5024L		5024S		5024	
	28	5028L		5028S		5028	
	32	5032L		5032S		5032	
	36	5036L		5036S		5036	
	40	5040L		5040S		5040	
55	20	5520L		5520S		5520	
	24	5524L		5524S		5524	
	28	5528L		5528S		5528	
	32	5532L		5532S		5532	
	36	5536L		5536S		5536	
	40	5540L		5540S		5540	
60	20	6020L		6020S		6020	
	24	6024L		6024S		6024	
	28	6028L		6028S		6028	
	32	6032L		6032S		6032	
	36	6036L		6036S		6036	
	40	6040L		6040S		6040	
65	20	6520L		6520S		6520	
	24	6524L		6524S		6524	
	28	6528L		6528S		6528	
	32	6532L		6532S		6532	
	36	6536L		6536S		6536	
	40	6540L		6540S		6540	
	44	6544L		6544S		6544	

Foundation Summary Table **

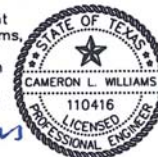
Location Ident.	Avg. N Blow/ft.	No. Each	Drill Shaft *** Length (feet)
			48-A
T200	10	1	22
T300	10	1	22
Total Drill Shaft Length			44

Notes

- ** Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.
- *** Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

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Cameron Williams
3-10-15



Abbreviations

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

Shipping Parts List						
Traffic Signal Arms (Fixed Mount) (1 per pole) Ship each arm with listed equipment attached						
Nominal Arm Length	Type IV Arm (4 Signals) 3 Bracket Assembly and 4 CGB Connectors		Luminaire Arms (1 per 30' pole)			
ft.	Designation	Quantity	Nominal Arm Length	Quantity		
50	50IV		8' Arm	2		
55	55IV	1	ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers			
60	60IV	1	Nominal Arm Length	Quantity		
65	65IV		7' Arm			
			9' Arm			
Traffic Signal Arms (80 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached						
Nominal Arm Length	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers	Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp w/bolts and washers	Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp w/bolts and washers			
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80			
32			32II-80		32III-80	
36			36II-80		36III-80	
40					40III-80	
44					44III-80	
Traffic Signal Arms (100 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached						
Nominal Arm Length	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers	Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp	Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp			
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	
40					40III-100	
44					44III-100	
Anchor Bolt Assemblies (1 per pole) Each anchor bolt assembly consists of the following: Top and bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers and 4 nut anchor devices (type 2) per Standard Drawing "TS-FD". Templates may be removed for shipment.						
Anchor Bolt Diameter	Anchor Bolt Length	Quantity				
2 1/2 "	5' - 3"	2				


Texas Department of Transportation
 Traffic Operations Division

**LONG MAST
ARM ASSEMBLY
PARTS LIST**

LMA (5) - 12

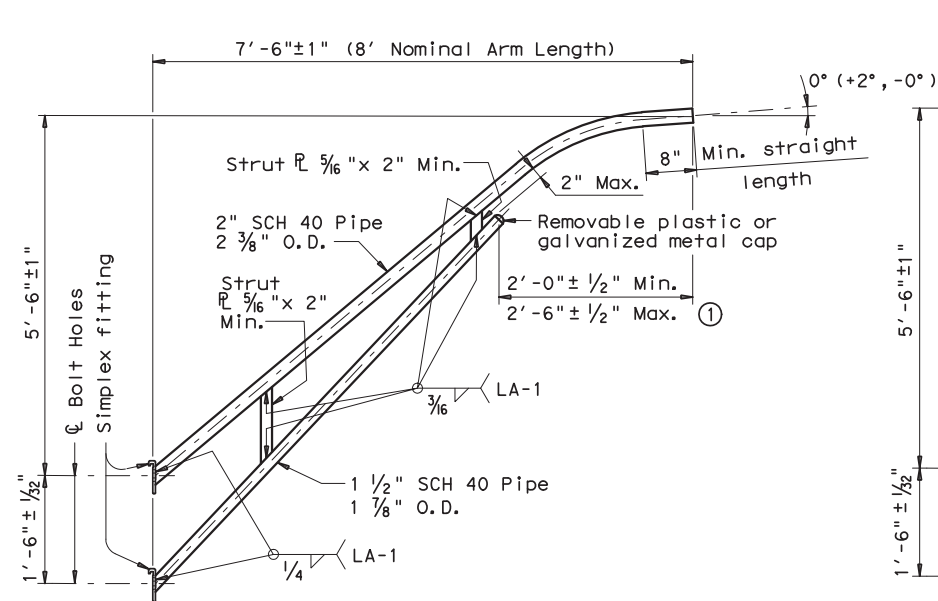
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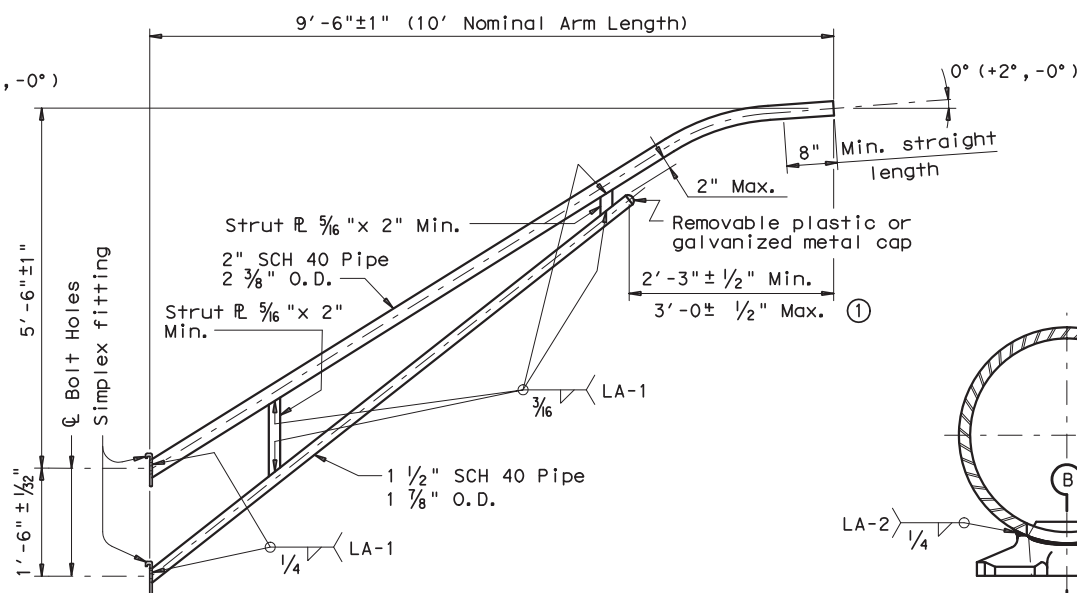
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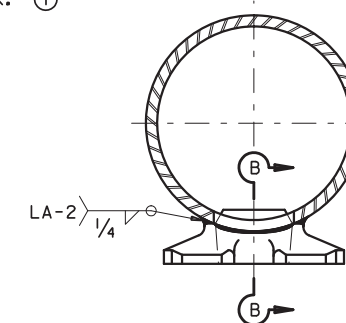
DATE: FILE:



8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

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

- 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.
- Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- 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.
- ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

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

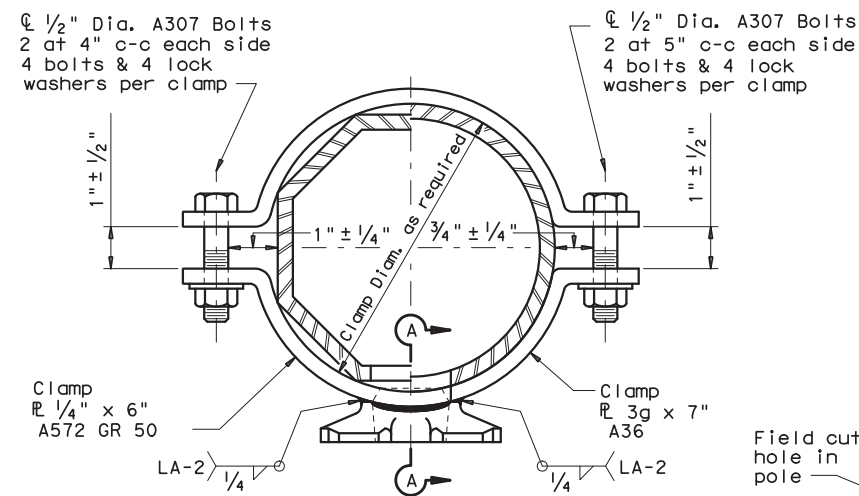
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified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

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

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

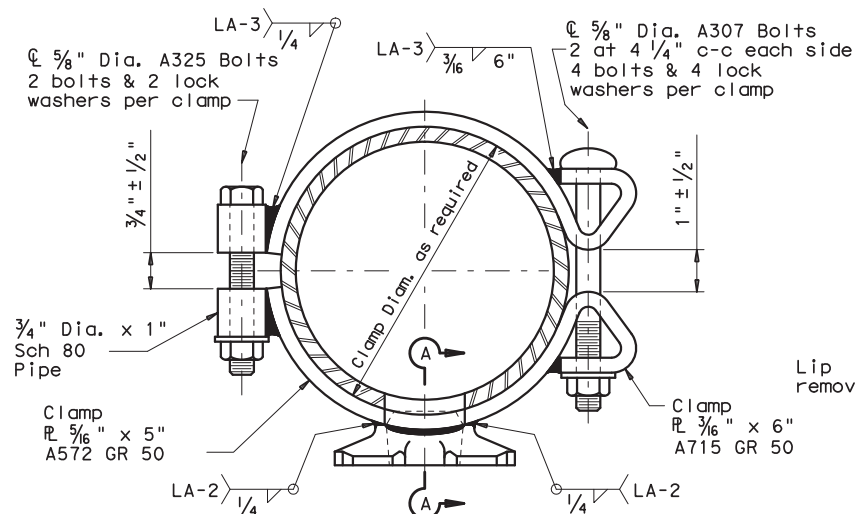
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly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

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



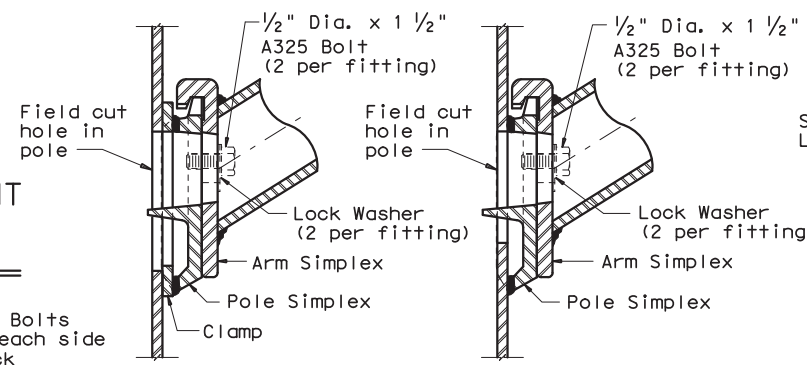
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



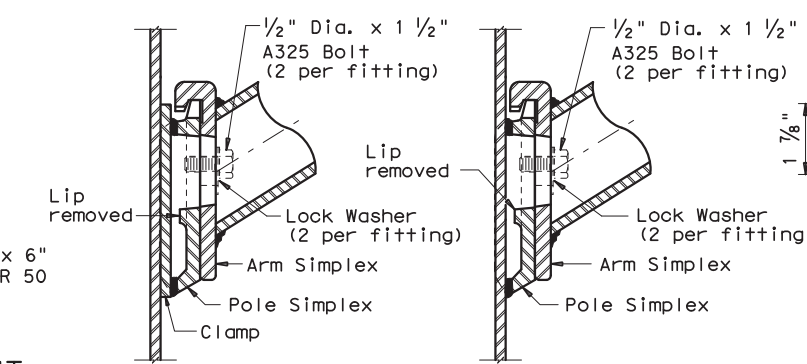
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)



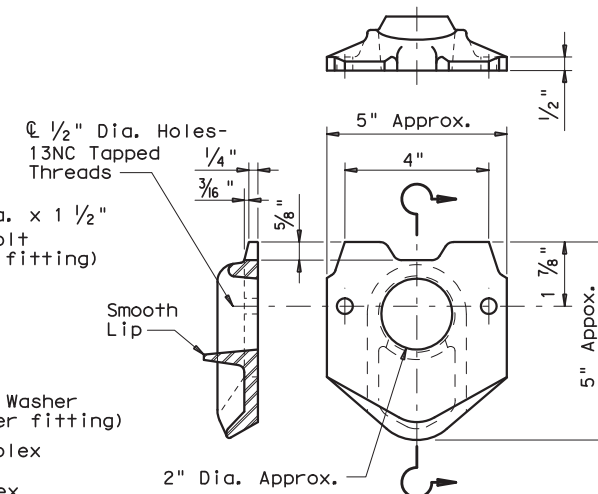
UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING

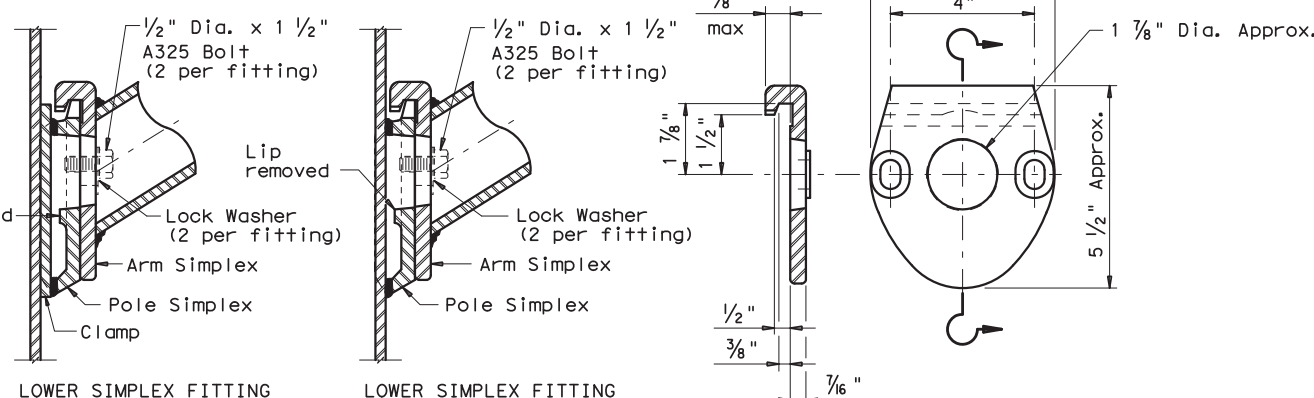


LOWER SIMPLEX FITTING

LOWER SIMPLEX FITTING



POLE SIMPLEX DETAIL



SECTION A-A

SECTION B-B

ARM SIMPLEX DETAIL

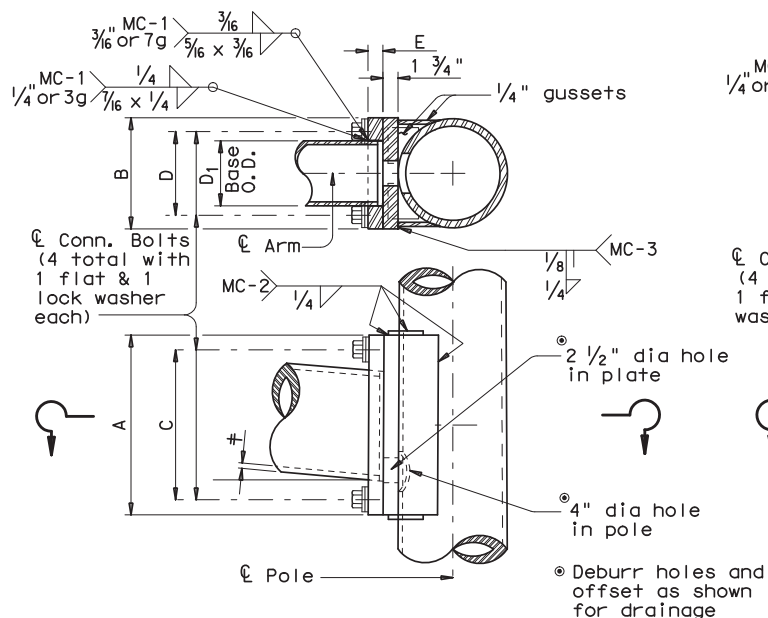
Texas Department of Transportation
Traffic Operations Division
STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES
ARM DETAILS
LUM-A-12

© TxDOT August 1995	DN: LEH	CK: JSY	DW: LTT	CK: TEB
5-96	REVISIONS	CONT	SECT	JOB
1-99				HIGHWAY
1-12				
	DIST	COUNTY		SHEET NO.
				27

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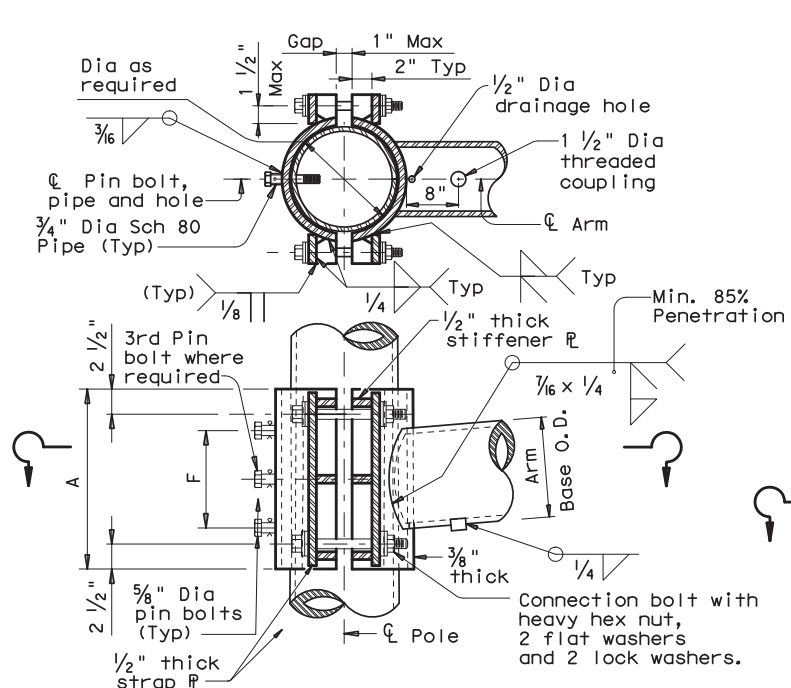
DATE:
FILE:

ARM SIZE		A	B	C	D	E	CONN BOLT DIA
D ₁	ϕ	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1 3/4	1
7.5	.179	13	9	10	6	1 3/4	1
8.0	.179	14	10	11	7	2	1 1/4
9.0	.179	16	11	13	8	2	1 1/4
9.5	.179	17	12	14	9	2	1 1/4
9.5	.239	18	12	15	9	2	1 1/4
10.0	.239	18	12	15	9	2	1 1/4
10.5	.239	18	13	15	10	3	1 1/2
11.0	.239	18	13	15	10	3	1 1/2



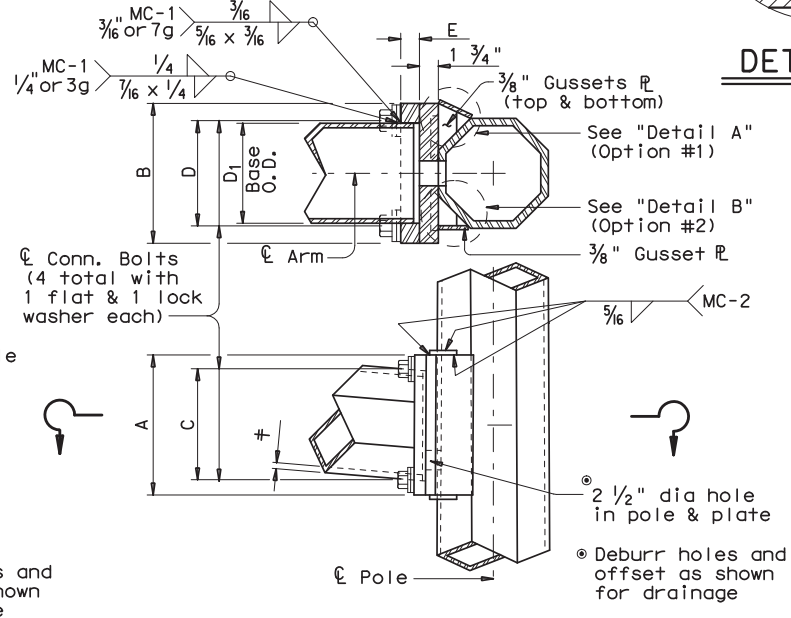
FIXED MOUNT DETAIL 1

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



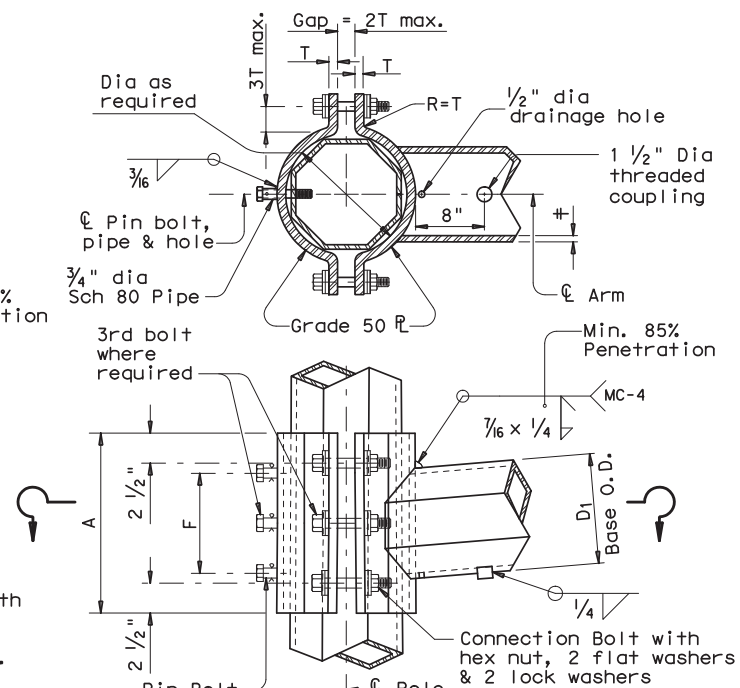
CLAMP-ON DETAIL 1

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

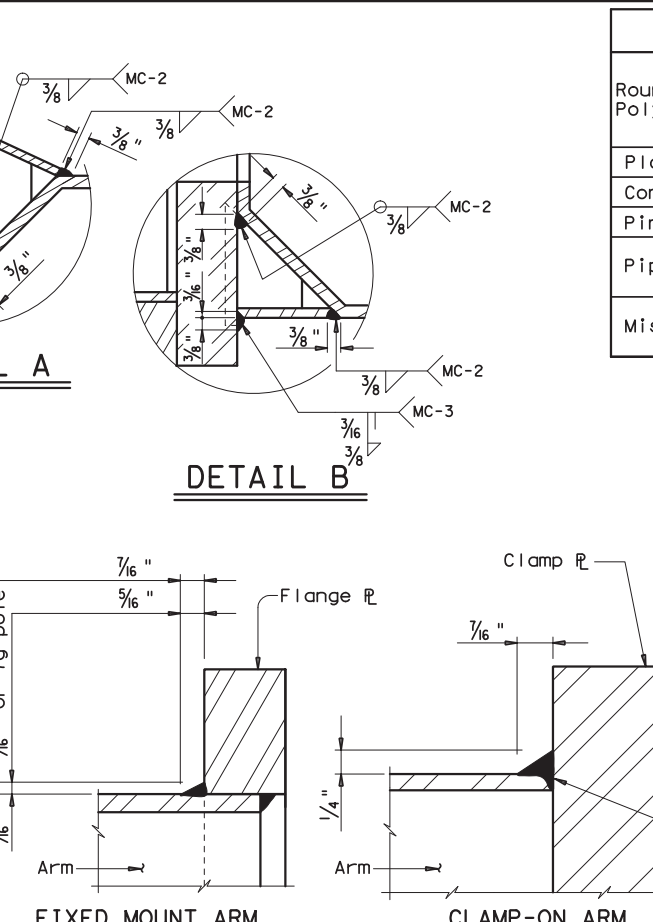


FIXED MOUNT DETAIL 2

ARM SIZE		A	F	T	CONN. BOLTS		PIN BOLTS	
D ₁	ϕ	in.	in.	in.	No.	Dia	No.	Dia
7.0	.179	12	6	3/4	4	3/4	2	5/8
7.5	.179	14	8	3/4	4	3/4	2	5/8
8.0	.179	14	8	3/4	4	3/4	2	5/8
9.0	.179	16	10	7/8	4	1	2	5/8
10.0	.179	18	10	7/8	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

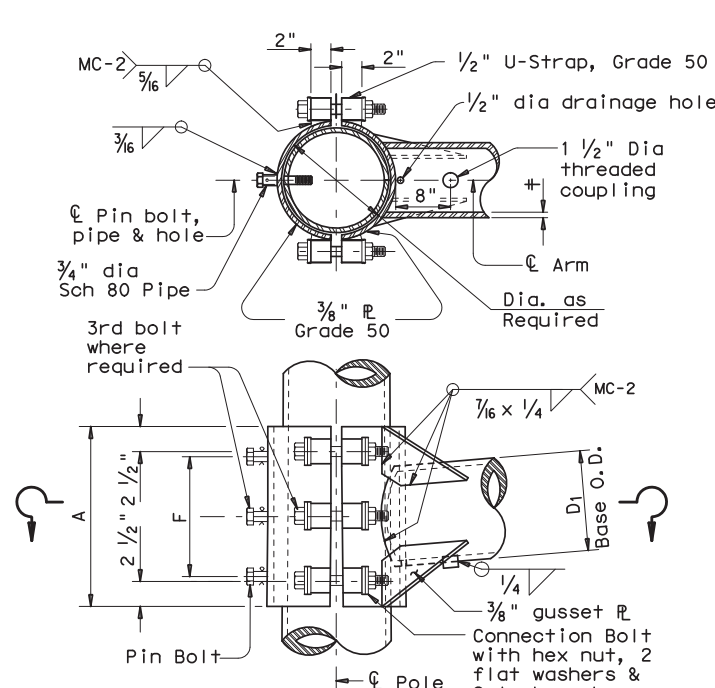


CLAMP-ON DETAIL 2



ARM BASE WELD DETAILS

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



CLAMP-ON DETAIL 3

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

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

GENERAL NOTES:

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

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

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

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

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and 3/4 inch dia pipe shall have 3/16 inch dia holes for a 1/8 inch dia galvanized cotter pin. Back clamp plate shall be furnished with a 3/4 inch dia hole for each pin bolt. An 1/16 inch dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST ARM CONNECTIONS

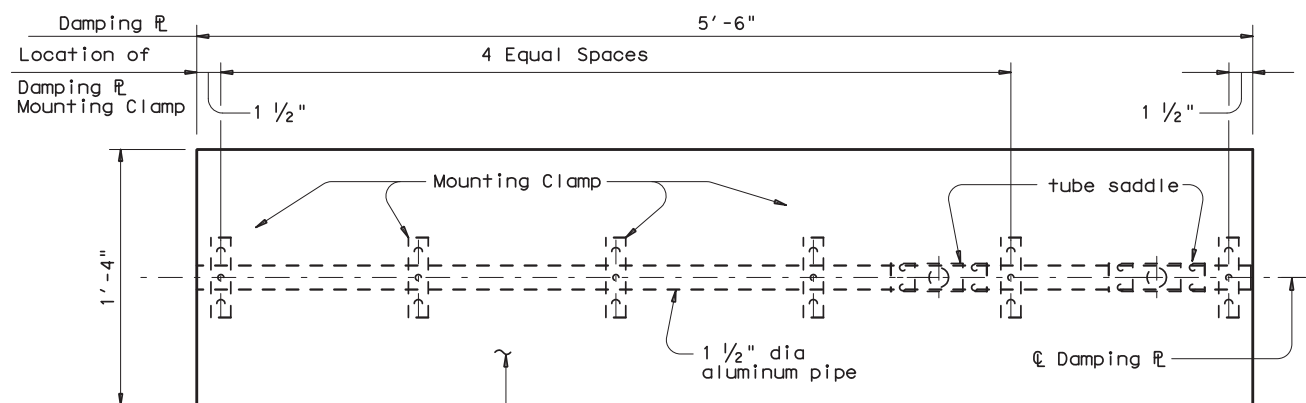
MA-C-12

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REVISIONS		CONT	SECT	JOB	HIGHWAY
5-96					
5-09					
1-12					
DIST		COUNTY		SHEET NO.	
				28	

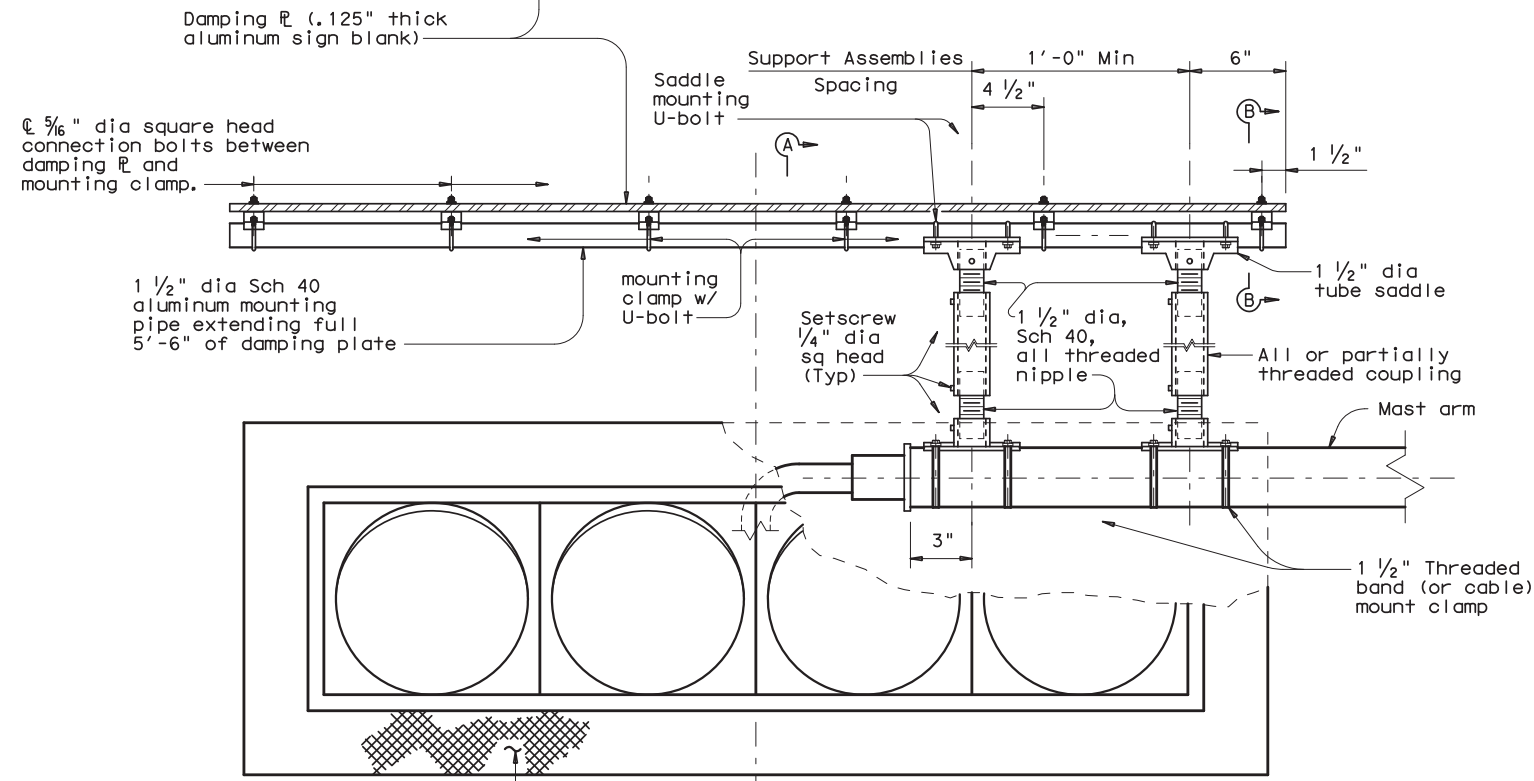
126A

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DATE:
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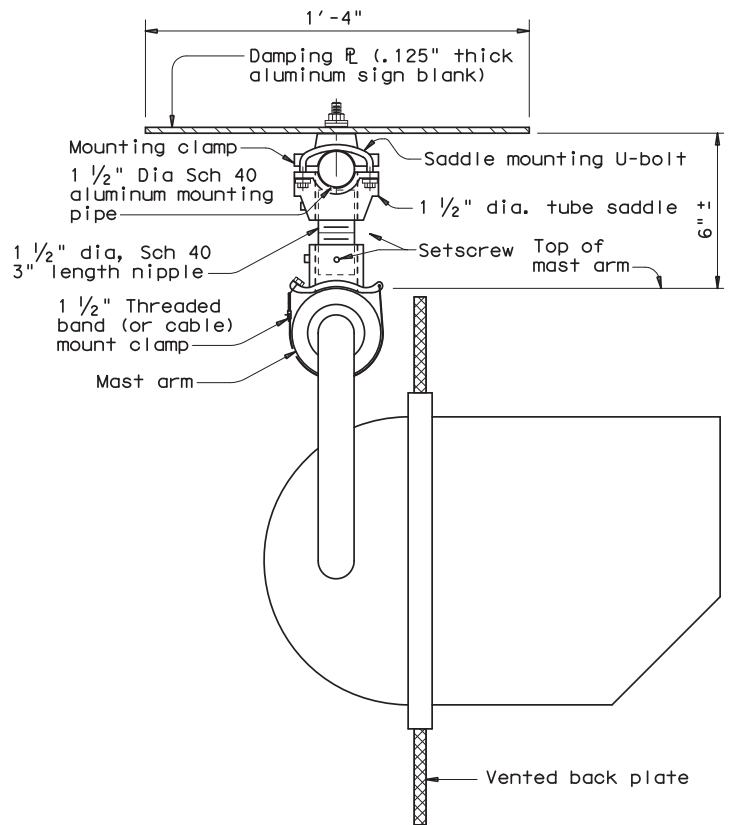
PLAN



ELEVATION

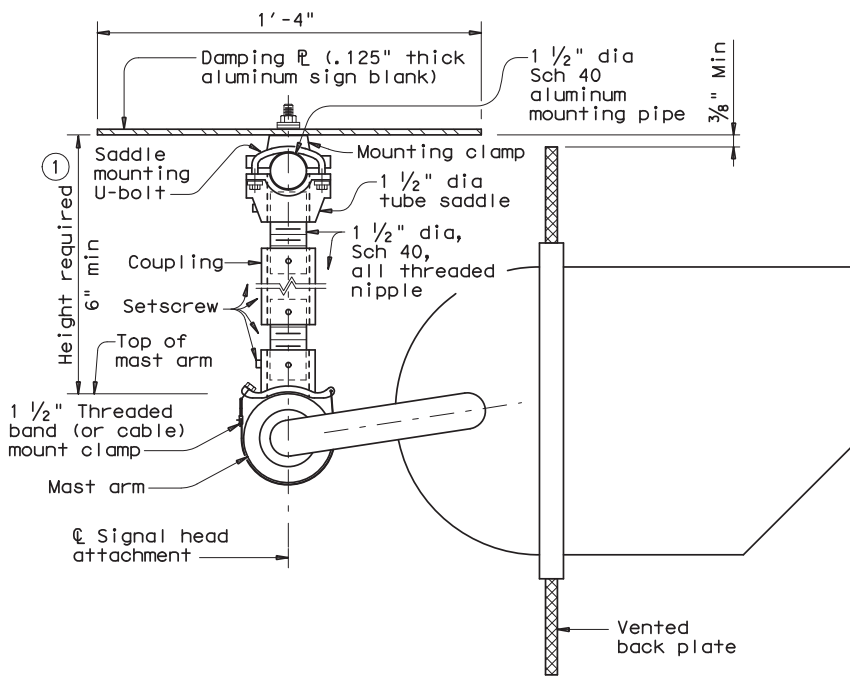
DAMPING PLATE MOUNTING DETAILS

(Showing alternate placement of signal head)



SECTION A-A

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



SECTION A-A

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

GENERAL NOTES:

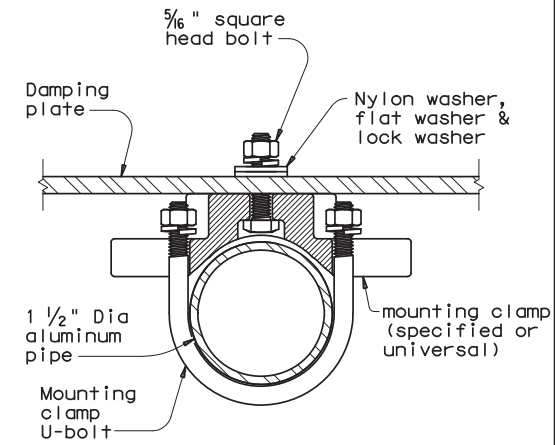
In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.

Aluminum sign blank for damping plate shall conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle shall be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling shall be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and U-bolt assemblies shall conform to Standard sheet SMD (GEN)-08. U-bolts for saddle mounting shall have a minimum yield strength of 36 ksi.

Damping plate shall be mounted horizontally. Position centerline of damping plate to align with centerline of signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate shall be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.

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

Contractor shall verify applicable field dimensions before the installation.



SECTION B-B

(Showing damping plate attachment)

① Recommended supporting assemblies to achieve required height

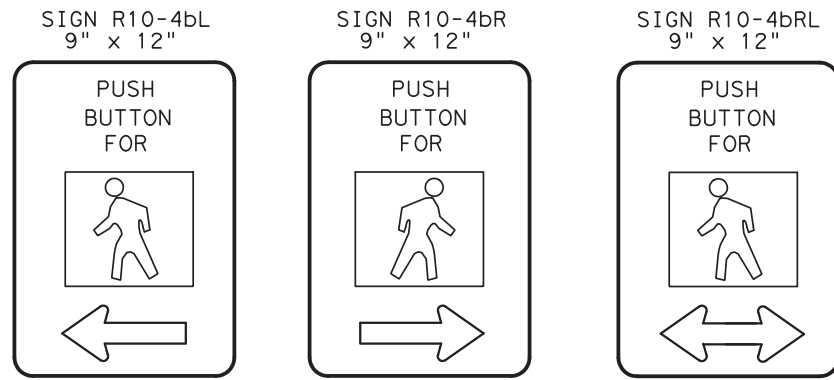
Height required	One nipple each length	Two nipples each length plus One coupling each length
6"-6 3/4"	3"	-
7"-8 1/2"	4"	-
9"-10 1/2"	6"	-
11"-15 1/2"	-	4" 5"
16"-24"	-	6" 10"



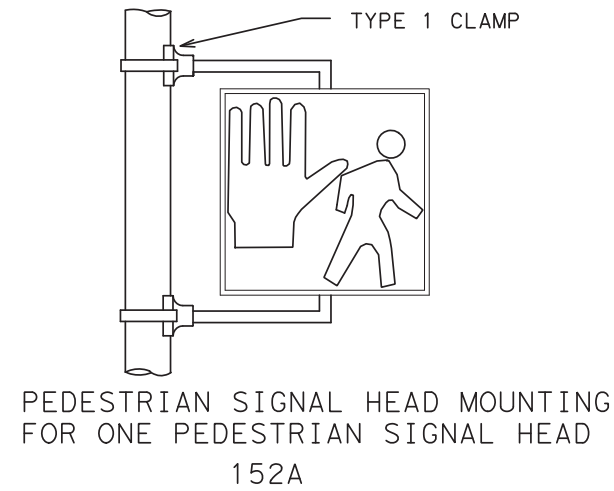
MAST ARM DAMPING PLATE DETAILS

MA-DPD-12

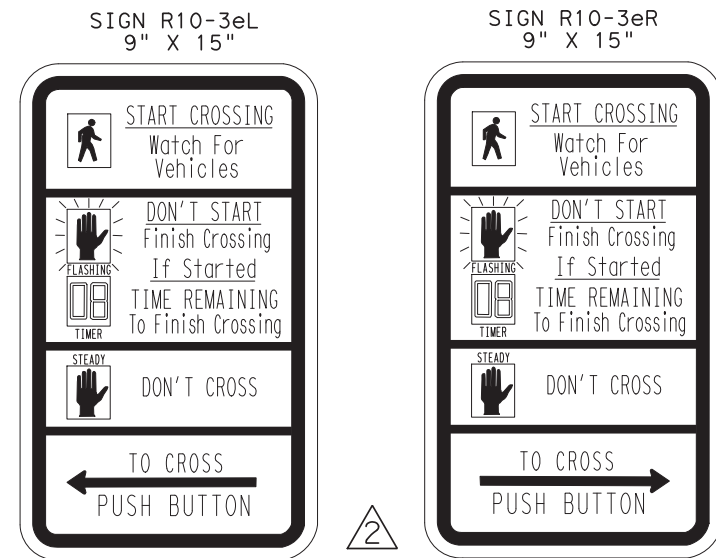
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REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.



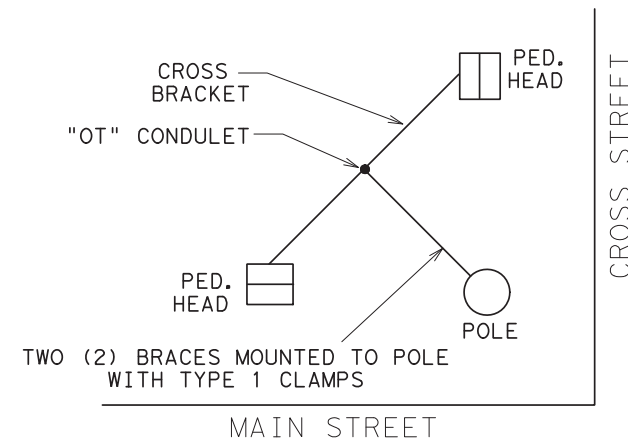
PEDESTRIAN PUSHBUTTON SIGN DETAILS



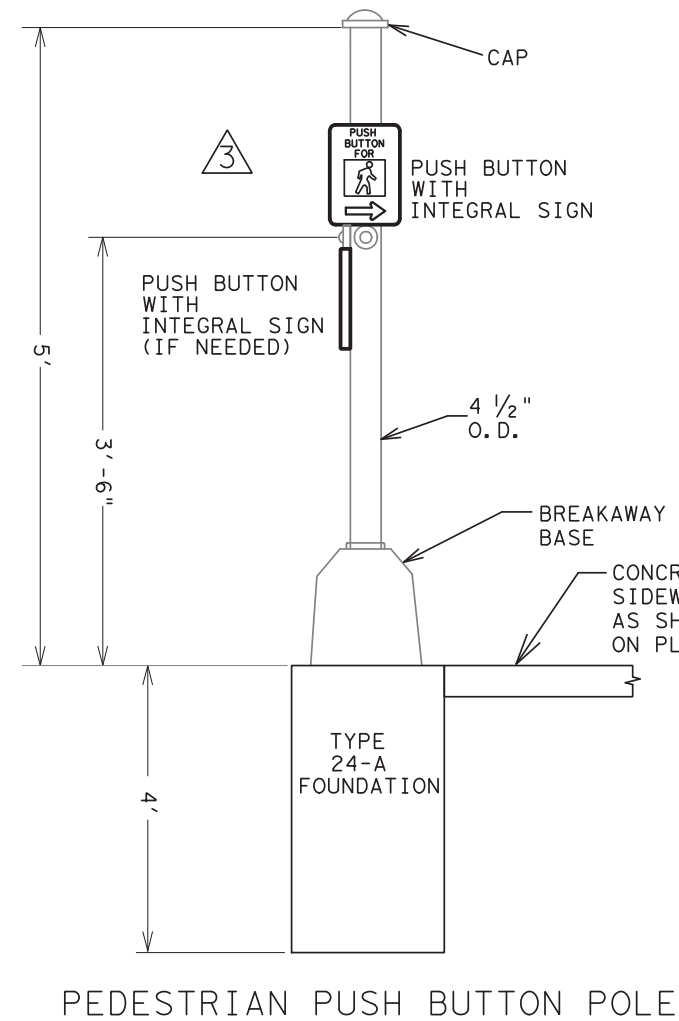
PEDESTRIAN SIGNAL HEAD MOUNTING FOR ONE PEDESTRIAN SIGNAL HEAD 152A




COUNTDOWN PEDESTRIAN PUSHBUTTON SIGN DETAILS

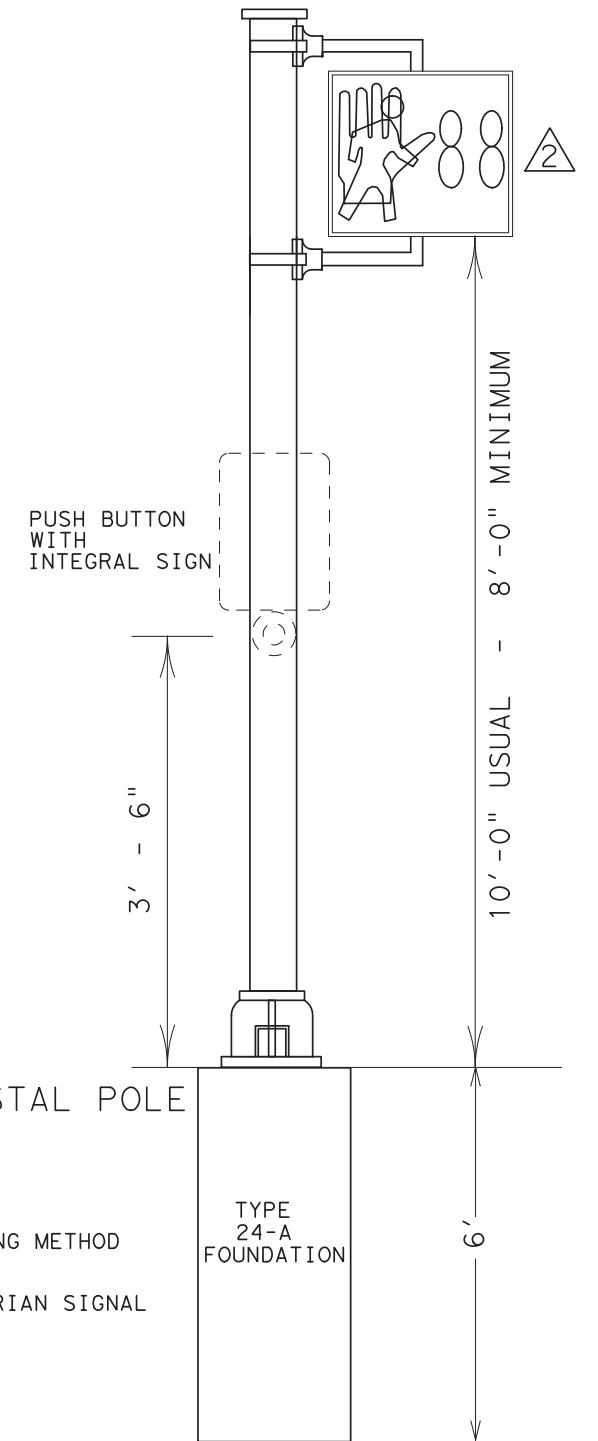


PEDESTRIAN SIGNAL HEAD MOUNTING FOR TWO PEDESTRIAN SIGNAL HEADS 143C




PEDESTRIAN PUSH BUTTON POLE

NOTE:  THE POLES ON THIS DRAWING ARE SHOWN AS AN EXAMPLE ONLY. POLES OF SIMILAR DESIGN FOR ANY CROSS SECTION WHICH MEET THE SPECIFICATIONS AND REQUIREMENTS SHOWN ON THESE DRAWINGS AND ARE APPROVED BY THE ENGINEER WILL BE DEEMED ACCEPTABLE.

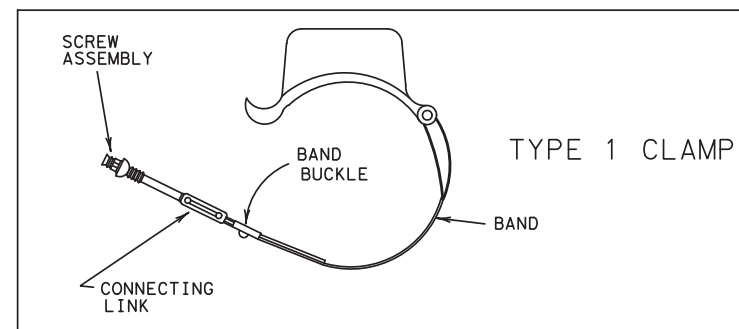





PEDESTAL POLE

 NOTE: CLAM SHELL MOUNTING HARDWARE MAY BE USED INSTEAD OF MOUNTING HARDWARE SHOWN ABOVE, AS APPROVED BY THE ENGINEER. ICC P/N 4805 OR MCCAIN QUICKMOUNT OR APPROVED EQUAL.

NOTES:

1. PEDESTRIAN SIGNAL HEADS SHALL BE MOUNTED WITH TYPE 1 CLAMPS AND APPROPRIATE TUBING.
2. ALL PEDESTRIAN SIGNAL HEADS SHALL BE INSTALLED ON THE AWAY-FROM-TRAFFIC SIDE OF THE PEDESTAL OR MAST ARM POLE.
3. ALL WIRING FOR PEDESTRIAN SIGNALS SHALL BE TOTALLY ENCLOSED WITHIN THE SIGNAL MOUNTING HARDWARE.
4. ALL PEDESTRIAN SIGNAL HEADS AND PUSH BUTTON SIGNS SHALL DISPLAY THE SYMBOLIZED MESSAGES SHOWN ABOVE.



-  ALTERNATIVE MOUNTING METHOD revised 12-92
-  ALTERNATIVE PEDESTRIAN SIGNAL HEAD AND SIGNING revised 10-08
-  PEDESTRIAN PUSH BUTTON POLE revised 01-11

PEDESTRIAN SIGNAL HEAD IDENTIFICATION

DALLAS DISTRICT STANDARD			
FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.	
6	(SEE TITLE SHEET)		
STATE	STATE DIST.	COUNTY	
TEXAS	18		
CONT.	SECT.	JOB	HIGHWAY NO.
			30