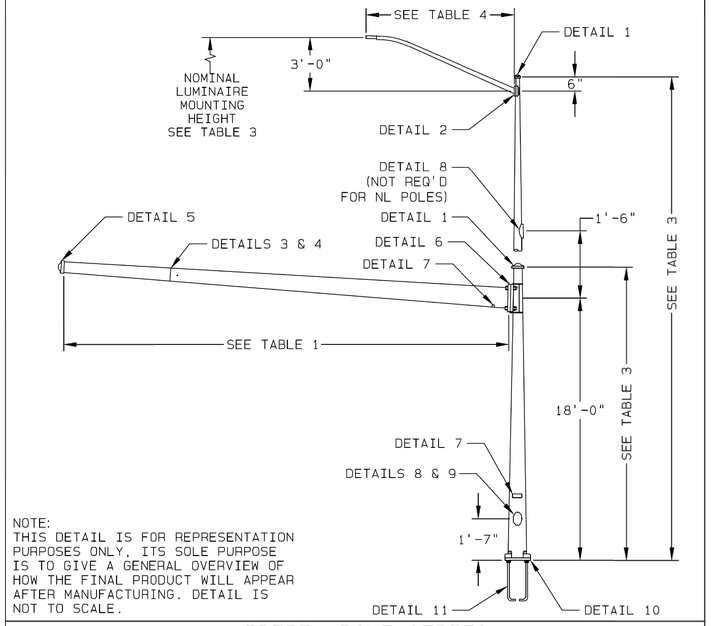


NOTE:
THIS DETAIL IS FOR REPRESENTATION PURPOSES ONLY. ITS SOLE PURPOSE IS TO GIVE A GENERAL OVERVIEW OF HOW THE FINAL PRODUCT WILL APPEAR AFTER MANUFACTURING. DETAIL IS NOT TO SCALE.

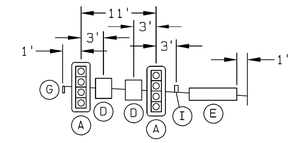
LIBERTY POLE SERIES

THE MAST ARM TRAFFIC STRUCTURES SHOWN ON THIS DRAWING HAVE BEEN DESIGNED IN ACCORDANCE WITH THE LOADING AND THE ALLOWABLE STRESS REQUIREMENTS OF THE 2013 AASHTO "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS", SIXTH EDITION, LTS-6. THE WIND LOADS WERE CALCULATED FROM A BASIC WIND VELOCITY OF 90 MPH WITH A RECURRENCE INTERVAL OF 50 YEARS, AND A FATIGUE CATEGORY OF 2. THE FATIGUE LOADS WERE CALCULATED ON THE REQUIREMENTS OF SECTION 11 OF THE CODE, AND THE FOLLOWING DESIGN CONDITIONS:

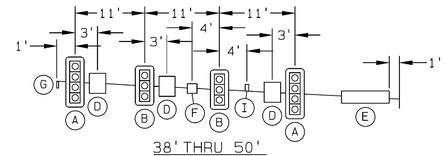
- STRUCTURES ARE DESIGNED TO RESIST NATURAL WIND GUSTS BASED ON THE YEARLY MEAN WIND VELOCITY OF 11.2 MPH.
- STRUCTURES ARE NOT DESIGNED TO RESIST GALLOPING-INDUCED CYCLIC LOADS. IF GALLOPING OCCURS, THE CUSTOMER SHALL USE A VIBRATION MITIGATION DEVICE.
- TRUCK-INDUCED GUST LOADS ARE EXCLUDED PER THE REQUIREMENTS OF THE CODE.

**NOTE:
UPON INITIAL FIELD ASSEMBLY OF THE MAST-ARM'S FIRST SECTION'S BUTT PLATE TO THE MAST-ARM VERTICAL POLE'S BUTT PLATE, IF THE END USER DETERMINES THAT THERE IS A SUFFICIENT GAP AT A BOLT HOLE SUCH THAT THERE WILL NOT BE FACE-TO-FACE CONTACT BETWEEN THE TWO BUTT PLATES, THEN A WASHER SHALL BE INSERTED TO PROVIDE FACE-TO-FACE CONTACT BETWEEN THE TWO BUTT PLATES IN ACCORDANCE WITH SECTION 5.16 "BOLTED CONNECTIONS" OF THE 2013 EDITION OF AASHTO.

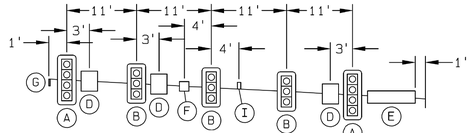
AASHTO 2013 SPECIFICATIONS



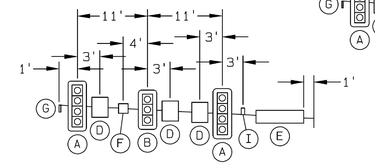
14' THRU 26' SIGNAL ARMS



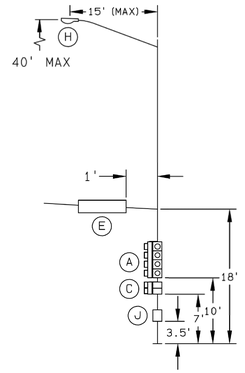
38' THRU 50' SIGNAL ARMS



52' THRU 55' SIGNAL ARMS



28' THRU 36' SIGNAL ARMS



DEVICE	DESCRIPTION	PROJ. AREA (FT^2)	WEIGHT (LBS)
Ⓐ	12"-4 SEC. SIGNAL HEAD W/ BACK PLATES	11.00	40
Ⓑ	12"-3 SEC. SIGNAL HEAD W/ BACK PLATES	8.67	30
Ⓒ	16"x18"-1 SEC. PEDESTRIAN SIGNAL HEAD	3.00	20
Ⓓ	36"x36" FLATSHEET ALUMINUM SIGN (MAX)	9.00	20
Ⓔ	24"X120" FLATSHEET ALUMINUM SIGN (MAX)	20.00	60
Ⓕ	ADVANCE RADAR DETECTOR	1.00	15
Ⓖ	PRESENCE RADAR DETECTOR	1.00	15
Ⓗ	LED LUMINAIRE	1.00	30
Ⓘ	EMERGENCY VEHICLE PRE-EMPTION DETECTOR	0.50	5
Ⓙ	APS PUSHBUTTON AND 9"X15" SIGN	1.50	15

MAXIMUM LOADING INFORMATION

TABLE 1: POLE AND SIGNAL ARM DATA

DESIGNATION KEY					POLE TUBE			POLE BASE					ANCHOR BOLT				SIGNAL ARM TUBE			
POLE SERIES	POLE TYPE	SIGNAL ARM SPAN (FT)	LUMINAIRE ARM TYPE	LUMINAIRE ARM SPAN (FT)	BASE DIA. (IN)	LENGTH (FT)	GAUGE OR THK. (IN)	SQUARE "S" (IN)	BOLT CIRCLE "Y" (IN)	THICKNESS "M" (IN)	CENTER HOLE "P" (IN)	HOLE "Z" (IN)	DIAMETER (IN) "K"	LENGTH (IN) "J"	HOOK (IN) "H"	THREAD LENGTH (IN) "U"	FIXED END DIA. (IN)	FREE END DIA. (IN)	GAUGE OR THK. (IN)	LENGTH (FT)
LIBERTY	1	14	NL,LR,MR	6 10 15	13.00	SEE TABLE 3	5	18.00	17.50	2.00	8.50	1.75	1.50	54.00	6.00	8.00	9.00	7.04	7	14.00
		16															9.00	6.76	7	16.00
		18															9.00	6.48	7	18.00
		20															9.00	6.20	7	20.00
		22															9.00	5.92	7	22.00
		24															9.00	5.64	7	24.00
		26															9.00	5.36	7	26.00
		28															9.00	5.08	7	28.00
		30															9.00	4.80	7	30.00
		32															10.00	5.52	7	32.00
		34															10.00	5.24	7	34.00
		36															11.00	5.96	7	36.00
LIBERTY	2	38	NL,LR, MR	6 10 15	15.00		0.250	20.00	20.00	2.00	12.00	2.00	1.75	84.00	6.00	8.00	11.00	5.68	7	38.00
		40															11.00	5.40	7	40.00
		42															12.00	6.12	7	42.00
		44															12.00	5.84	7	44.00
		46															12.50	6.06	5	46.00
		48															12.50	5.78	5	48.00
		50															12.50	5.50	5	50.00
		52															13.00	6.08	SEE DET. 3	52.00
		55															13.00	5.66		55.00

TABLE 2: MATERIAL DATA

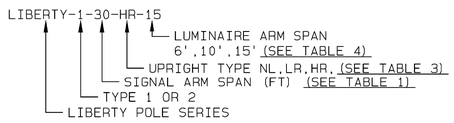
COMPONENT	ASTM DESIGNATION	MIN. YIELD (KSI)
ALL TAPERED TUBES	A595 GR.A OR A572	55
BASE PLATE	A36	36
SIMPLEX PLATES	A36	36
LUM ARM ATTACHMENT	A36	36
LUMINAIRE CONN. BOLTS	SAE GR.5	--
ANCHOR BOLTS	F1554 GR.55	55
GALVANIZING-HARDWARE	F2329	--

TABLE 3: ELEVATION DATA

ELEVATIONS	TYPE		
	NO LUMINAIRE (NL)	LOW RISE (LR)	*MEDIUM*RISE (MR)
LUM. MOUNTING HEIGHT	---	30'-0"	*35*'-0"
POLE LENGTH	20'-6"	27'-6"	*32*'-6"

TABLE 4: LUMINAIRE ARM DATA

SPAN	FIXED END DIA.	FREE END DIA.	GAUGE
6'	3.40"	2.38"	11
10'	3.89"	2.38"	11
15'	4.58"	2.38"	11

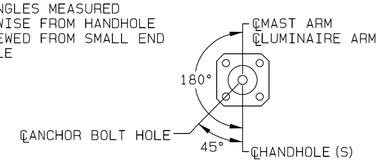


DESIGNATION KEY

FINISH DATA

SYSTEM: GALVANIZED (GV)
BASE COAT: HOT-DIP GALVANIZED TO ASTM A123
PRIME COAT: NONE
FINISH COAT: NONE
COLOR: NONE
SPEC: F-1

ALL ANGLES MEASURED CLOCKWISE FROM HANDHOLE AS VIEWED FROM SMALL END OF POLE



RADIAL INDEX

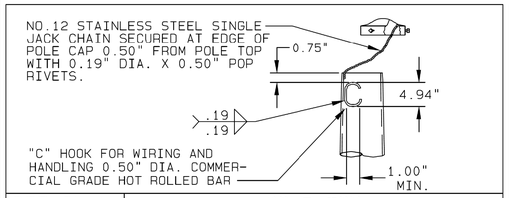
CITY OF LIBERTY, MO
DEPARTMENT OF PUBLIC WORKS

Liberty missouri

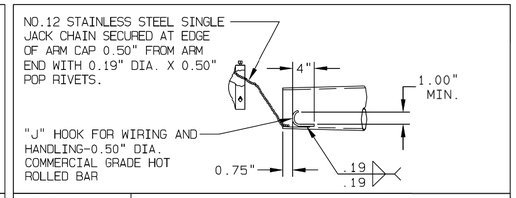
TRAFFIC SIGNAL
DETECTOR & SIGN MOUNTING

TS-1

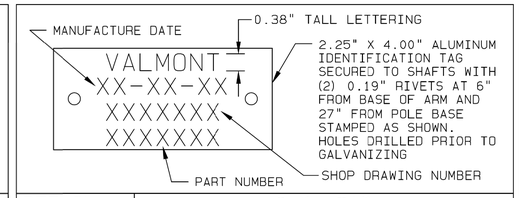
JKPIPES
9/27/2018 - 3:20:25 PM - pw:\\hq-pwint01.a-e.transyscorp.com:transyscorp-pw1\Documents\Projects\KC101 - Kansas City\P101170119\310.00\Standard Drawings\Liberty SG-10.dgn



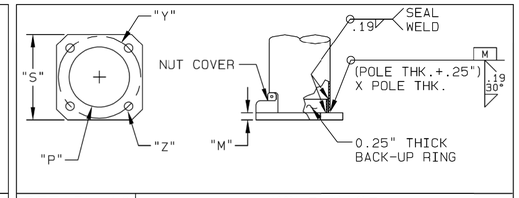
DETAIL 1 | POLE TOP



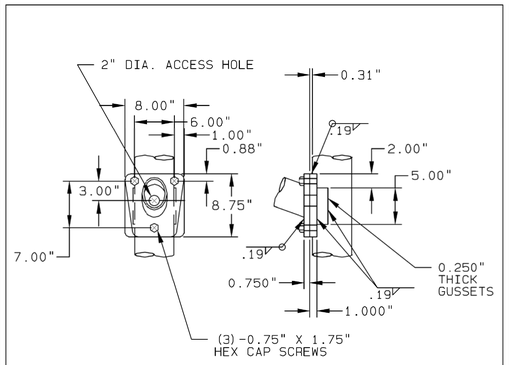
DETAIL 5 | ARM CAP



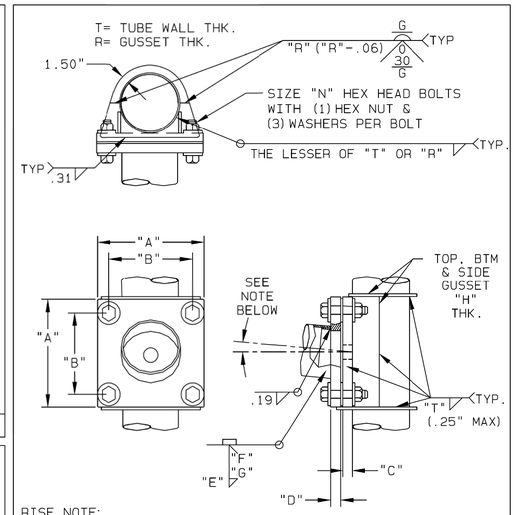
DETAIL 7 | I.D. TAG



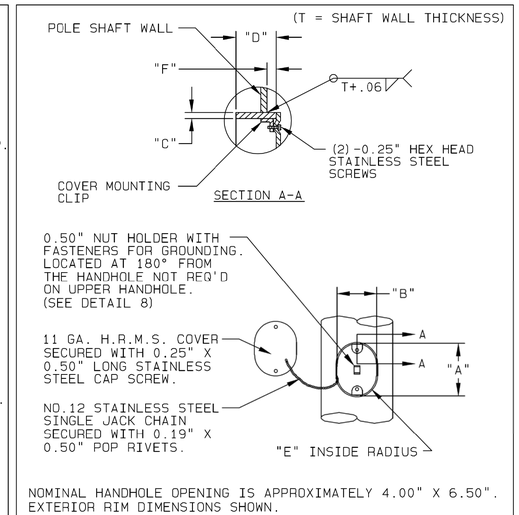
DETAIL 10 | POLE BASE



DETAIL 2 | LUMINAIRE ARM ATTACHMENT



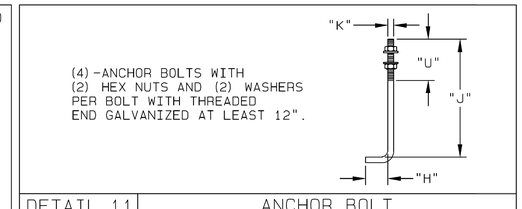
RISE NOTE:
RISE SHALL BE BUILT IN THE MOUNTING PLATE ATTACHED TO THE ARM. RISE IN MTG PLATES MAY VARY DEPENDING UPON POLE SIZE AND MAST ARM LOADING.



NOMINAL HANDHOLE OPENING IS APPROXIMATELY 4.00" X 6.50". EXTERIOR RIM DIMENSIONS SHOWN.

"A" I.D. (IN)	"B" I.D. (IN)	"C" THK. (IN)	"D" DEPTH (IN)	"E" RADIUS (IN)	"F" PROJECT (IN)
6.56	4.50	0.500	2.00	2.25	0.500

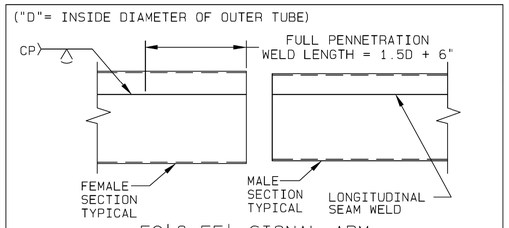
DETAIL 8 | HANDHOLE



DETAIL 11 | ANCHOR BOLT

SPAN (FT)	BASE SECTION		END SECTION		
	LENGTH (FT)	THK. (IN)	BASE DIA. (IN)	LENGTH (FT)	GAUGE (IN)
52.00	40.00	0.209	8.05	14.08	7
55.00	40.00	0.209	8.05	17.08	7

DETAIL 3 | 52'-55' SIGNAL ARM SLIP JOINT



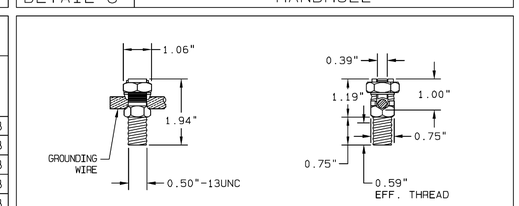
DETAIL 4 | SIGNAL ARM WELD REINFORCEMENT

ARM SHAFT WALL THK.	ARM-TO-PLATE WELD "E"	BEVEL "F"X"G"
ALL	(ARM THK.+.25") X ARM THK.	.19" X 30°

DETAIL 6 | SIGNAL ARM ATTACHMENT

SIGNAL ARM ATTACHMENT DATA

ARM BASE DIA. (IN)	POLE BASE DIA. (IN)	"A" (IN)	"B" (IN)	"C" (IN)	"D" (IN)	"N" (IN)	CENTER HOLE DIA. (IN)	"H" (IN)
9.00	13.00	18.25	15.00	2.00	2.00	1.25 X 6.25	5.00	0.38
10.00	13.00	18.25	15.00	2.00	2.00	1.25 X 6.25	5.50	0.38
11.00	13.00	18.25	15.00	2.00	2.00	1.25 X 6.25	6.00	0.38
11.00	15.00	21.25	17.50	2.00	2.25	1.50 X 6.50	6.00	0.38
12.00	15.00	21.25	17.50	2.00	2.25	1.50 X 6.50	6.00	0.38
12.50	15.00	21.25	17.50	2.00	2.25	1.50 X 6.50	5.50	0.38
13.00	15.00	21.25	17.50	2.00	2.25	1.50 X 6.50	5.50	0.38



DETAIL 9 | KC25 BURNDY GROUND LUG

CITY OF LIBERTY, MO
DEPARTMENT OF PUBLIC WORKS

TRAFFIC SIGNAL
DETECTOR & SIGN MOUNTING

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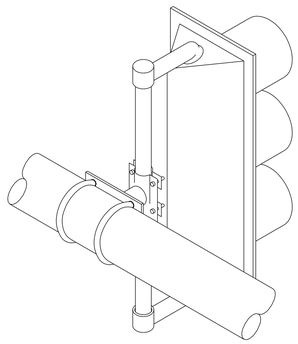
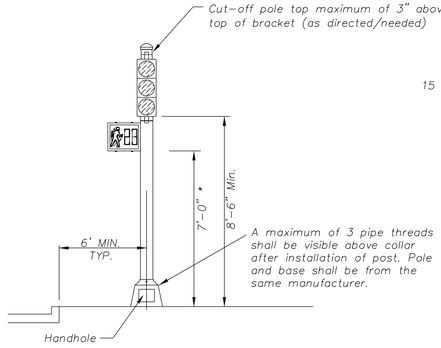
Notes:

1. Bolt covers, handhole cover, and mast arm & pole caps shall be shipped with the poles and be installed prior to final acceptance of the traffic signal system.
2. Install corresponding colors of signal heads at the same elevation – adjust for mast arm rake.
3. Each vehicular signal head (mast arm and/or pole mounted) shall be covered with a black or orange (unless otherwise noted) signal head cover during construction until the system is made operational.
4. The side of pole signal head mounting heights shown are to the bottom of the housing and not to the brackets.
5. All signs to be mounted on the traffic signal poles or mast arms shall be provided and installed by the contractor. All signs shall conform to the Manual on Uniform Traffic Control Devices, latest edition for color, size, letter and legend.
6. Contractor to provide and install overhead street name sign.
7. Radar detection devices shall be mounted as per manufacturer's recommendation.
8. Emergency Vehicle Pre-emption (EVP) detector shall be mounted near the center of the through traffic lane(s) to the right or left of the radar detection unit.
9. All hardware not specifically shown in the details shall be in accordance with manufacturer's recommendation. Any deviations shall be submitted for approval.
10. All traffic signal heads shall have two ¼"diameter drain holes drilled in the bottom housing



Mast Arm Signal Mounting Bracket

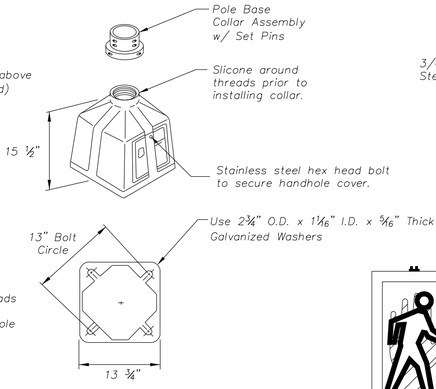
(Cable Mount Assembly)



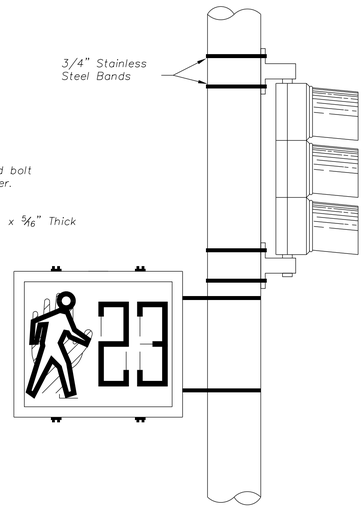
Aluminum Signal Pedestal Pole

*Notes:

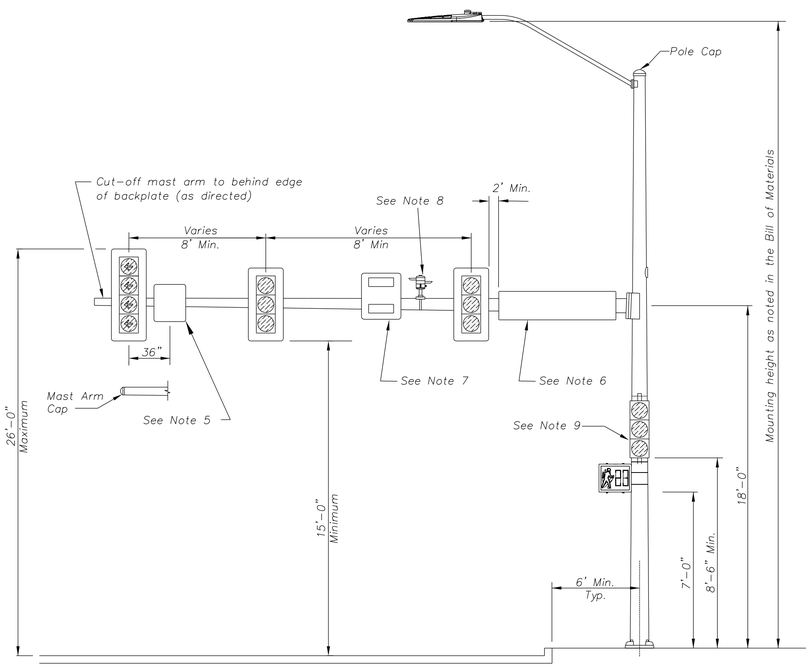
- Mount pedestrian head at 7'-4" if no vehicle heads. Otherwise maintain 7'-0" mounting as shown.
- Orient handhole toward the sidewalk opposite the direction of opposing traffic.



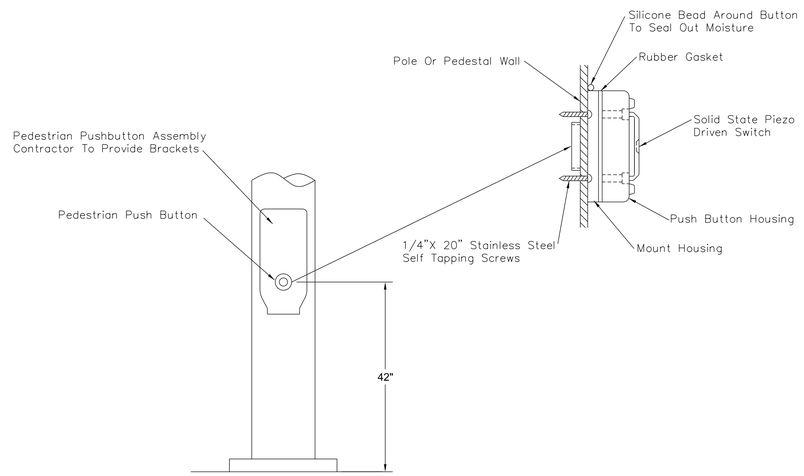
Pedestal Pole Base Detail



Pole Band and Bracket Mounting Detail



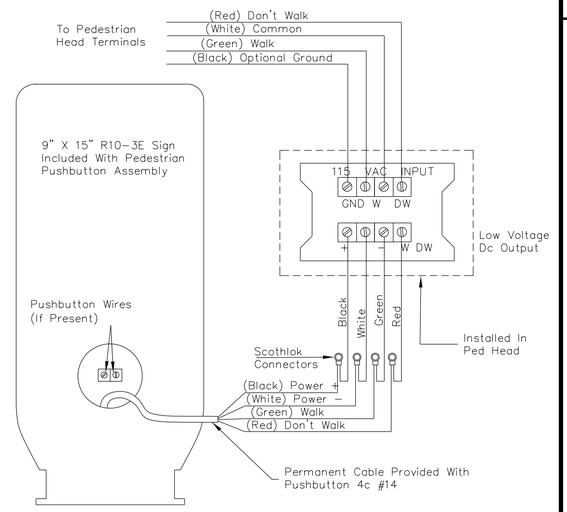
Steel Combination Streetlighting & Signal Pole



Pedestrian Pushbutton Mounting

Note:

Maintain 10" Maximum Reach From An Accessible Sidewalk To The Pedestrian Pushbutton.



CITY OF LIBERTY, MO
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TRAFFIC SIGNAL
POLE MOUNTING DETAILS

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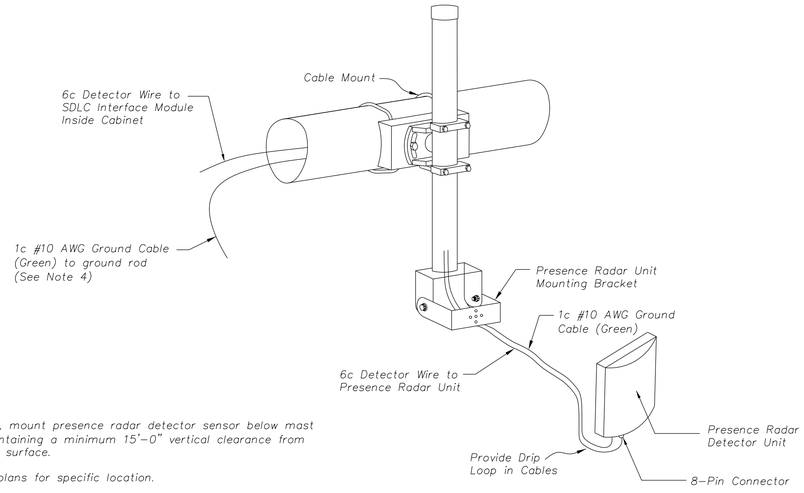
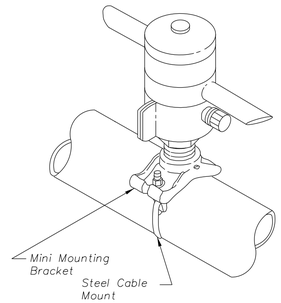


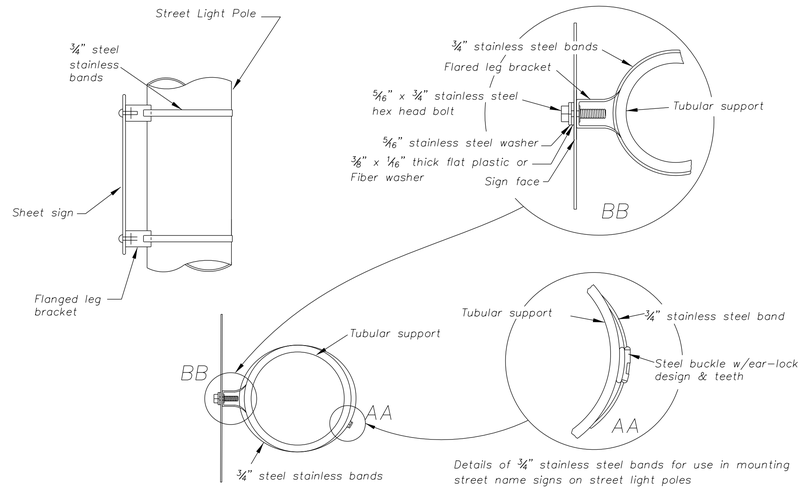
Notes:

1. Generally, mount presence radar detector sensor below mast arm maintaining a minimum 15'-0" vertical clearance from the road surface.
2. Consult plans for specific location.
3. Mounting bracket arm shall be vertical to road surface, and on the same side of the mast arm that the detector is aimed, unless otherwise directed.
4. Install the 1c#10 AWG ground cable from the sensor to the ground rod in the closest service box adjacent to the pole the sensor is mounted on. Use a separate ground rod clamp for each sensor.

Presence Radar Detection Mounting Detail
(Mast Arm Bracket Arm Mount)



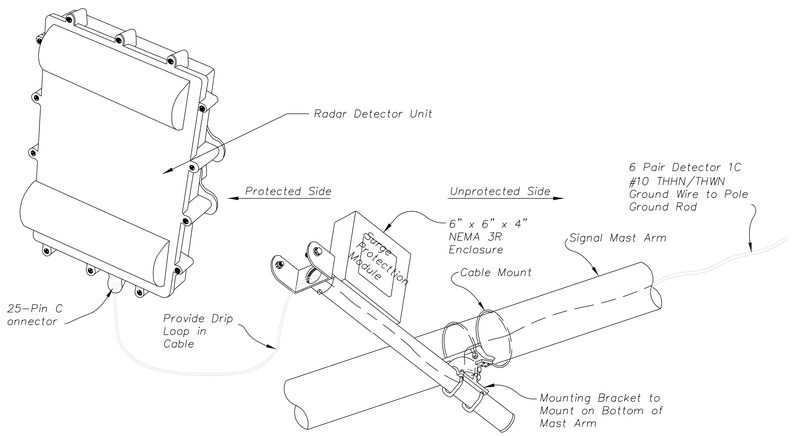
Bracket Attachment Detail



Sign Mounting Detail (Vertical Pole)

Notes:

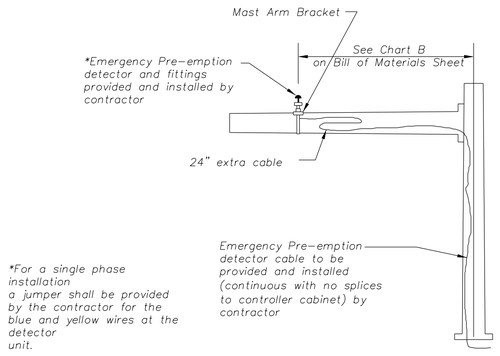
1. Signs on side of poles shall be attached with two (2) brackets and stainless steel bands.
2. Holes in sign for attachment to the mounting brackets shall be offset a minimum of 2" from the edge of sign.
3. Holes in sign shall be located such that the sign is plumb and level.
4. This detail is not intended for R10 series signs attached to signal mast arms.



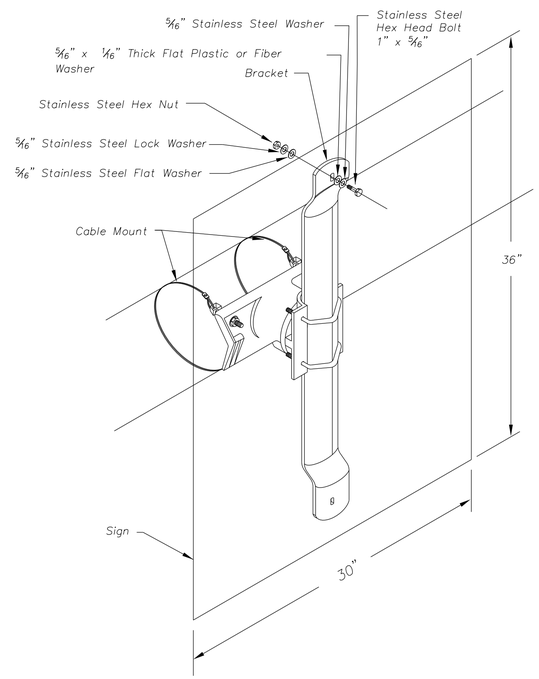
Notes:

1. Maintain offsets from center of the desired lane less than 24 feet.
2. Apply silicon dielectric compound into the connector at the base of the radar detector
3. Orient radar detector straight ahead with no downward tilt. Bracket arm should be parallel to the road surface.

Advance Radar Detection Mounting Detail
(Mast Arm Bracket Arm Mount)



Emergency Vehicle Pre-Emption System Detail



Sign Mounting Detail (Mast Arm)

Liberty missouri

CITY OF LIBERTY, MO
DEPARTMENT OF PUBLIC WORKS

TRAFFIC SIGNAL
DETECTOR & SIGN MOUNTING

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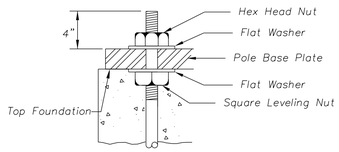
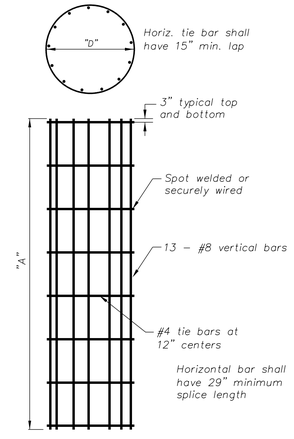
Table 1 – Rebar Schedule				
Pole Fnd. Dia.	Pole Fnd Depth	Rebar Cir. "D"	Vert. Rebar Length "A"	Hor. Rebar Spacing
24"	3'	No Rebar Required		
36"	9'	32"	8'–6"	12" MAX.
36"	10'	32"	9'–6"	12" MAX.
36"	11'	32"	10'–6"	12" MAX.



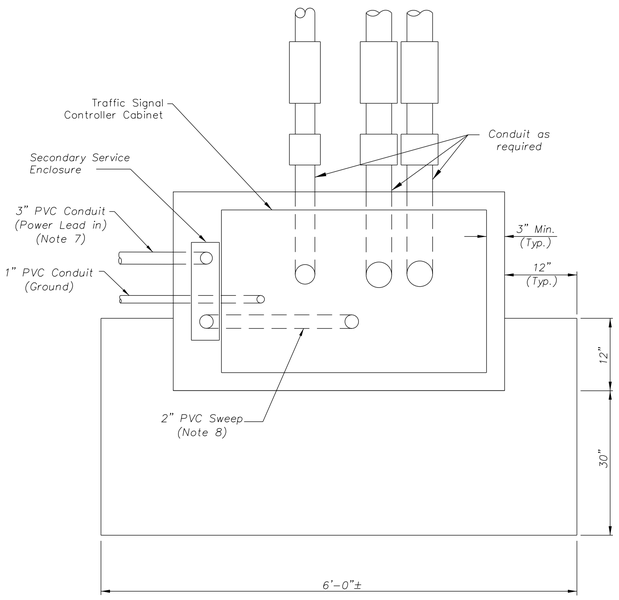
Anchor Bolt Detail



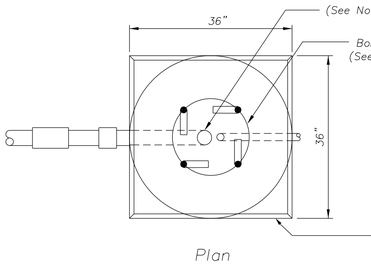
Rebar Cage Detail

Pole Foundation Notes:

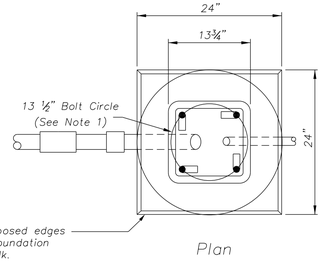
1. Final pole, anchor bolt size, anchor bolt projection, and bolt circle shall be as per manufacturer's recommended practices. Rotate anchor bolt to maintain minimum clearance from edge of hole.
2. All conduits and anchor bolts for all the new pole foundations shall be rigidly installed before concrete is placed. Anchor bolts shall be spaced by means of a factory certified template or drawing, the center of which shall coincide with the center of the foundation.
3. All concrete used in this work shall meet the requirements of the City of Liberty Technical Specifications Section 2000 and shall be KCMMB4K concrete (f'_c = 4,000 psi). Poles shall not be erected until concrete has reached 3,400 psi.
4. Reinforcing steel shall have 60 ksi yield strength: Maintain 2" minimum clearance from reinforcing steel to edge of hole or form for mast arm poles.
5. In the event excavation for the drilled shaft encounters sound limestone short of the required length shown in the table of dimensions, the shaft may be shortened to a minimum length of 8 feet with a minimum inclusive rock socket of 3 feet.
6. Shale foundation material will be considered as a stiff clay. Drilled shafts in shale must satisfy the dimensions on Table 2.
7. All concrete pole foundations shall be consolidated by an internal type vibrator.
8. Final 6" of concrete foundation (pole cap) shall be formed square. The cap shall be formed and poured after the mast arm is erected and the pole plumb. Pole cap for pedestal pole shall be required at inspector discretion. Final top elevation shall match ADA sidewalk ramp.
9. PVC conduit elbows in concrete foundations shall be connected to HDPE conduit with PVC pipe nipple and approved PVC to HDPE couplings. All PVC pipe nipples, elbows, and couplings shall be considered subsidiary to the traffic signal pole foundation.
10. Bare No. 6 solid copper ground conductor shall be connected from internal pole grounding nut with a ring terminal to the clamp on the ground rod.
11. All reinforcing steel shall be ASTM A615 GR60.
12. All concrete surfaces should be brushed and sealed with curing compound.



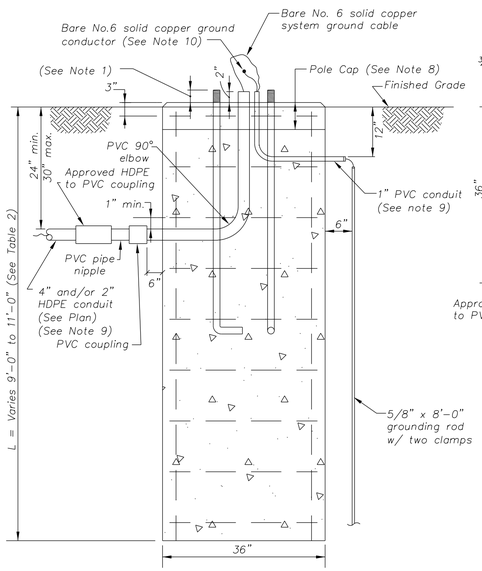
Plan



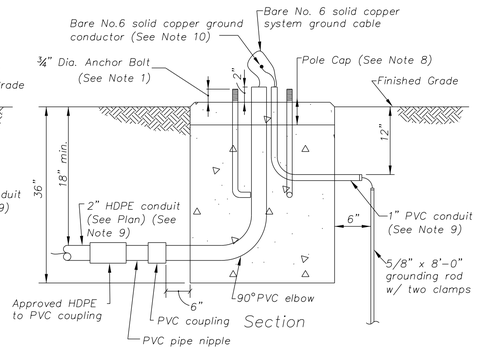
Plan



Plan



Section
Traffic Signal Pole Foundation



Section

Pedestal Pole Foundation

Table 2 Signal Pole Foundations Drilled Shaft Dimensions		
Length of Mast Arm	Diameter	"L" Length
< 25'	36"	9'
26' to 36'	36"	10'
38' to 55'	36"	11'
> 55'	Requires Special Design	

Signal Controller Pad Foundation:

1. All conduits and anchor bolts shall be rigidly installed before concrete is placed.
2. A bare #6 solid copper system ground cable shall be installed through one of the HDPE conduits between the controller and the closet service box.
3. Duct seal shall be applied at all conduit entrances after cable installation.
4. A watertight seal shall be applied along the inside and outside edges of the cabinet where it abuts to the concrete pad and around the secondary service enclosure where it abuts to the cabinet.
5. PVC conduit elbows in concrete foundations shall be connected to HDPE conduit with PVC pipe nipple and approved PVC to HDPE couplings. All PVC pipe nipples, elbows and couplings shall be considered subsidiary to the traffic signal controller foundation.
6. Contractor to install concrete anchors and bolts per manufacturer's recommendation to anchor secondary service enclosure to concrete foundation. Also anchor to signal cabinet with sheet metal screws.
7. Contractor shall install a 36" radius, large sweep 90° elbow at each end of power lead–in conduit. Material shall be Schedule 40 PVC.
8. Contractor shall install 180° PVC conduit sweeps from secondary service enclosure sweeping up into the controller cabinet.
9. Cabinet shall be oriented such that when the technician is facing the front of the cabinet, he can look over the top and see the intersection ahead of them.
10. All concrete surfaces shall be brushed and sealed with curing compound.

Controller Cabinet Pad Details

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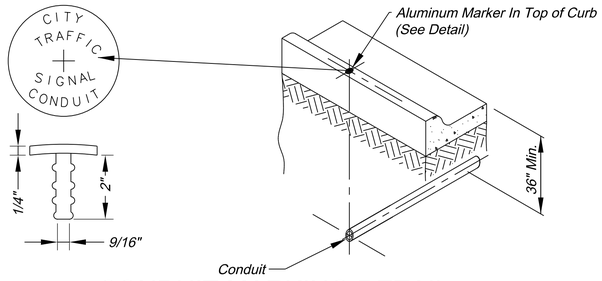
Liberty missouri

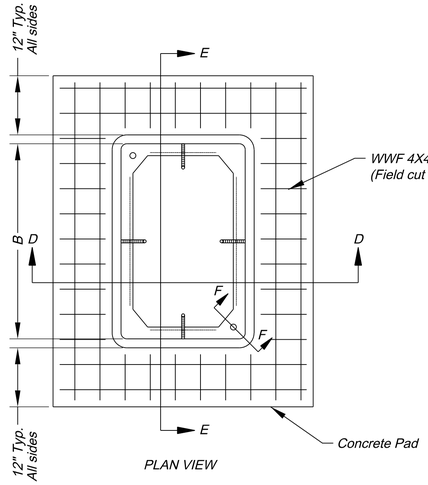
TRAFFIC SIGNAL
POLE & CABINET FOUNDATION

TS–5

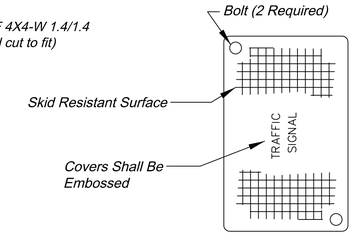


CONDUIT MARKING DETAIL

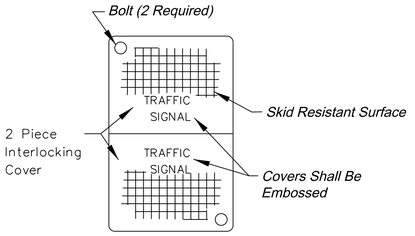
NOTES:
1. An aluminum marker shall be placed in the top of the curb directly over the conduit at each street crossing.
2. Markers shall be installed by drilling the curb and expoxying the marker in place. If installed in a sidewalk or curb ramp, the marker shall be embedded so that the top of the marker is flush with the concrete surface.
3. No direct payment shall be made for conduit markers; they are subsidary to the installation of conduit.



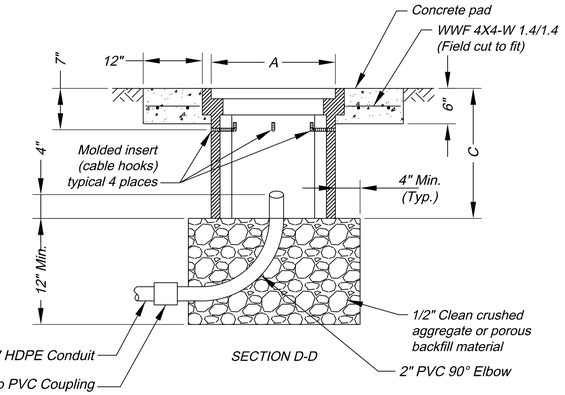
PLAN VIEW



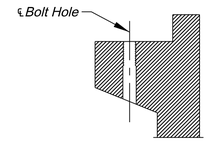
CLASS 1 OR 2
BOX COVER



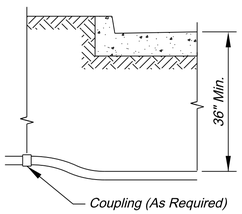
CLASS 3
BOX COVER



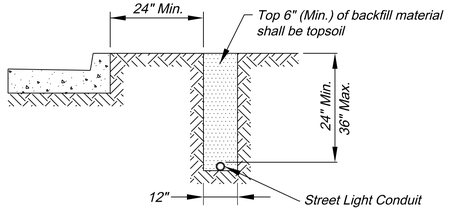
SECTION D-D



SECTION F-F



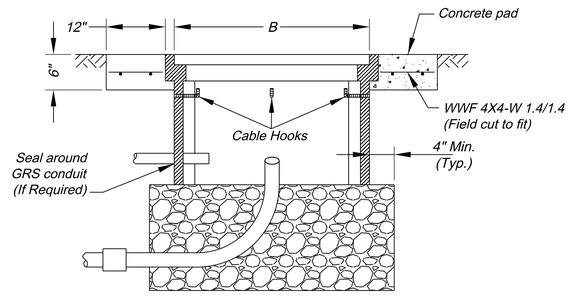
BORED CONDUIT



TRENCHED OR PLOWED CONDUIT

CONDUIT LOCATIONS

NOTES:
1. All trenches for conduit under proposed paved surfaces shall be backfilled with flowable fill.
2. Backfill in unpaved areas shall be free of rubble and rock.
3. If multiple conduits are installed within the same trench, they shall have a minimum of 12" horizontal and vertical clearance between them.



SECTION E-E

Number of Entering/Exiting Conduits	CLASS	Minimum Box Dimensions		
		A	B	C
<23	1	17"	30"	22"
23 -68	2	24"	36"	24"
>68	3	30"	48"	36"

All dimensions shown are nominal

NOTES:
1. Lift opening required on all covers.
2. Preformed box walls may be either flared or vertical. The bottom of boxes shall be open to below.
3. If an extension is used with a preformed box, the lip of the extension may be interior or exterior. The extension shall be compatible and from the same manufacturer.
4. A Class 3 Pull Box shall be installed adjacent to each controller.

PULL OR JUNCTION BOX DETAILS

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TRAFFIC SIGNAL
DETECTOR & SIGN MOUNTING
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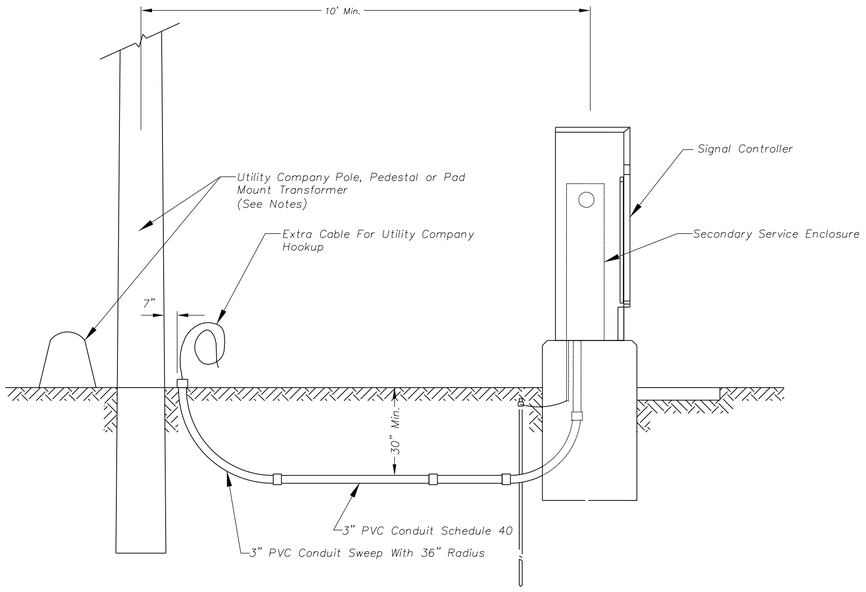
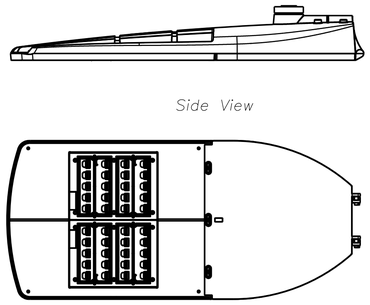
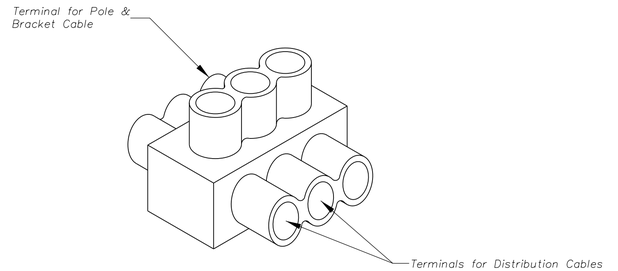


Secondary Service Connection Details

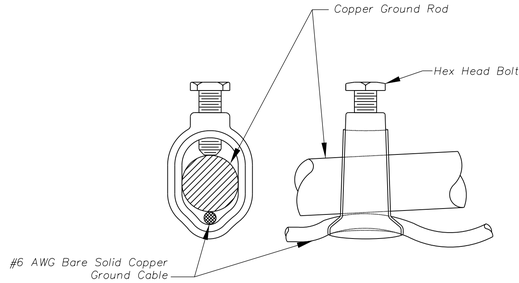
NOTES:
1. Contractor is responsible for coordinating the delivery of secondary service with the electrical utility company.
2. Contractor shall install a conduit stub 24" to 6" above ground at poles. Conduit shall be stubbed to the side of the pole that will allow a direct run up the pole to the transformer without crossing other utility lines or cables. The end of the conduit shall be capped.
3. Contractor shall install conduit with a pull string and trench to within 24" of pedistals or pad mount transformers, and leave a 36" x 36" x 36" access hole in the ground. Contractor shall keep open trench covered and promptly backfill when service is completed.



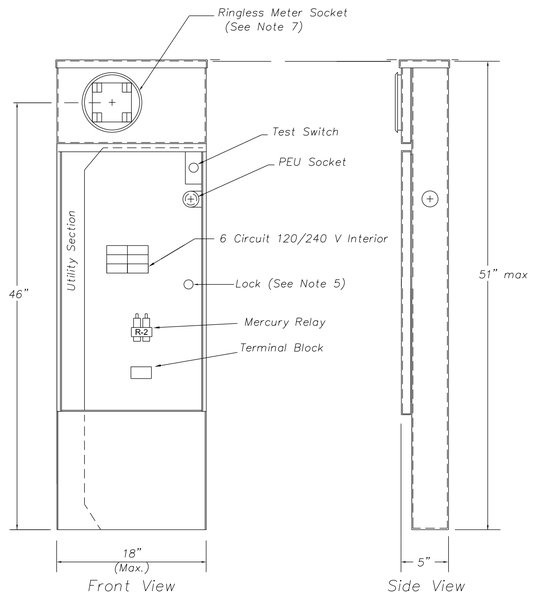
LED Luminaire



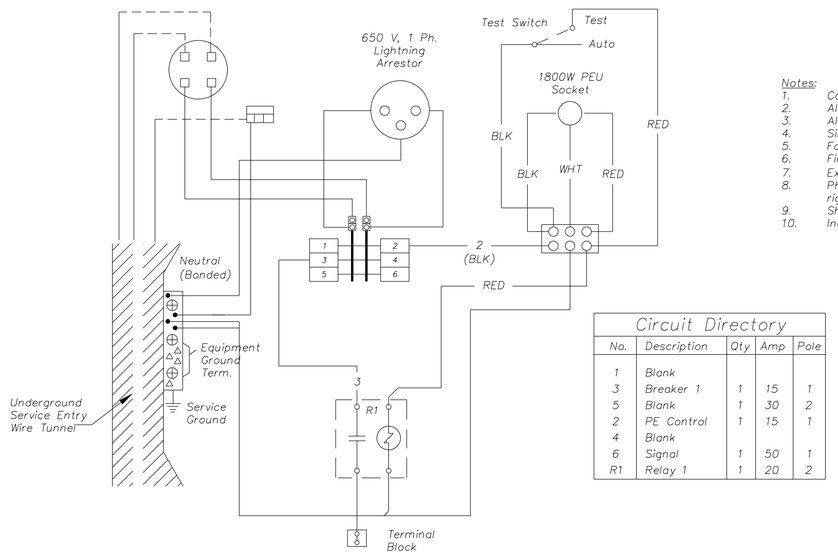
Multiple Tap Electrical Connector



Ground Rod Connection Details



Secondary Service Enclosure



Wiring Diagram

Circuit Directory				
No.	Description	Qty	Amp	Pole
1	Blank			
3	Breaker 1	1	15	1
5	Blank	1	30	2
2	PE Control	1	15	1
4	Blank			
6	Signal	1	50	1
R1	Relay 1	1	20	2

Notes:
1. Cabinet to be code 0.125 inch corrosion resistant aluminum NEMA 3R Enclosure.
2. All factory installed wire to be copper.
3. All terminals approved for copper or aluminum wire #6 to 350 MCM AWG.
4. Silver-plated copper bussed circuit breaker interior.
5. Factory installed Corbin lock assembly designed for standard No. 2 key with tapered latch.
6. Finish: Natural Aluminum unless otherwise specified.
7. Exposed 200A 240V 5 terminal meter socket w/horn bypass and ringless cover.
8. Photocell and pad shall be oriented to the north or east. Photocell is located on the right side of the cabinet.
9. Shall be UL listed for 5,000 amp short circuit current rating.
10. Include mounting collar with cabinet.

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TRAFFIC SIGNAL
ELECTRICAL DETAILS

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