

ELECTRICAL SECTION

GENERAL

All electrical equipment, materials, and workmanship shall be in accordance with the Standard Specifications, State of California, Department of Transportation, Caltrans (CSS), the National Electrical Manufacturers Association (NEMA), the Underwriters' Laboratories Inc. (UL), the Electrical Testing Laboratories (ETL), the National Electrical Testing Association (NETA), the Electronic Industries Association (EIA), the National Electric Code (NEC), the American Society for Testing and Materials (ASTM), where applicable and except as modified herein.

ELECTROLIERS

(a) Electroliers. Electroliers shall consist of a 30' single arm galvanized steel pole (standard) equivalent to a CALTRANS type 15, and an LED Streetlight Series E, Type II Medium or approved equal, furnished and installed in accordance with City of Morgan Hill Standard Details for Construction. For electrolier spacing and luminaire wattage requirement, see Detail E-17.

(b) Conduit. All conduit shall be 1 1/2" Schedule 40 Polyvinyl Chloride (PVC), and conform to ASTM D 2241. Rigid conduit may be required by the City Engineer.

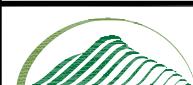
(c) Trenching for Conduits. Conduit trenches shall be dug to 24" min. depth. Conduit shall be placed directly behind the back of curb (6" Max., from back of curb to center of conduit). In cases where there will be an attached sidewalk, the backfill material shall be sand with the concrete sidewalk poured over the trench location. In cases where there will be a detached sidewalk, the conduit shall be covered by 3 inches of concrete. For electrolier conduit designed to occupy PG&E's joint trench, see paragraph h.

(d) Conductors. All conductors shall be #8 AWG type THW (#10 AWG allowed in pole only) unless otherwise specified, and be UL listed for 600V operation. All wire shall be stranded copper in accordance with ASTM B 3 and B 8. All conductor insulation shall be standard type THW in accordance with ASTM D 2219 and ASTM D 2220.

(e) Fuses. Fuses shall be standard midget ferrule type, with "Non-Time Delay" feature, and shall be 13/22" x 1 1/2". All lighting service conductors shall be fused at the service connection point (30 AMP Max) and at all electroliers with a 10 Amp fuse accessible from the hand hole opening on the standard.

(f) Service Connection Point. Pull boxes for streetlight service connection points shall be installed adjacent to P.G.&E. secondary box designated for service connection.

(g) Pull Boxes. Pull boxes shall be precast of reinforced portland cement concrete in accordance with CSS Section 86-2.06A. Any pull box made of non portland cement concrete material shall conform to ASTM D 635. All individual pull boxes for electroliers shall be placed directly in front of the standard and parallel to the face of curb.



City of Morgan Hill
Public Works Department

Jim Ashcraft
CITY ENGINEER

4/1/96
DATE

3/10/15
REVISED

GENERAL NOTES

DRAWING NO.
E-I

DEVELOPER INSTALL OPTION

(h) Electrolier Conduit Location. If developer elects to install the substructure for PG&E, Cable, and Telephone ("Private Utilities"), electrolier conduit may occupy the joint trench only upon approval the City Engineer. Otherwise, electrolier conduit shall be located and installed per the Electrical Section General Notes and standard details E-1 and E-2.

(i) Plan Submittal Developer shall submit to the Public Works Department two (2) sets of a substructure plan for review after PG&E review and approval. The Public Works Department shall only review the plan for possible conflicts with existing "Public Utilities" and approved subdivision improvements. Changes to the plans shall be directed as they relate to utility conflicts and all matters related to electroliers. It is developer's responsibility to ensure that the substructure plans meet PG&E's, GTE's and Charter Communication's standards. The plans shall contain, as a minimum, the following information:

(1) STREET LIGHTING PLAN— shows all proposed electroliers, boxes and conduit related to the subdivision's street lighting system as well as their location in respects to sidewalks, driveway approaches and handicap ramps.

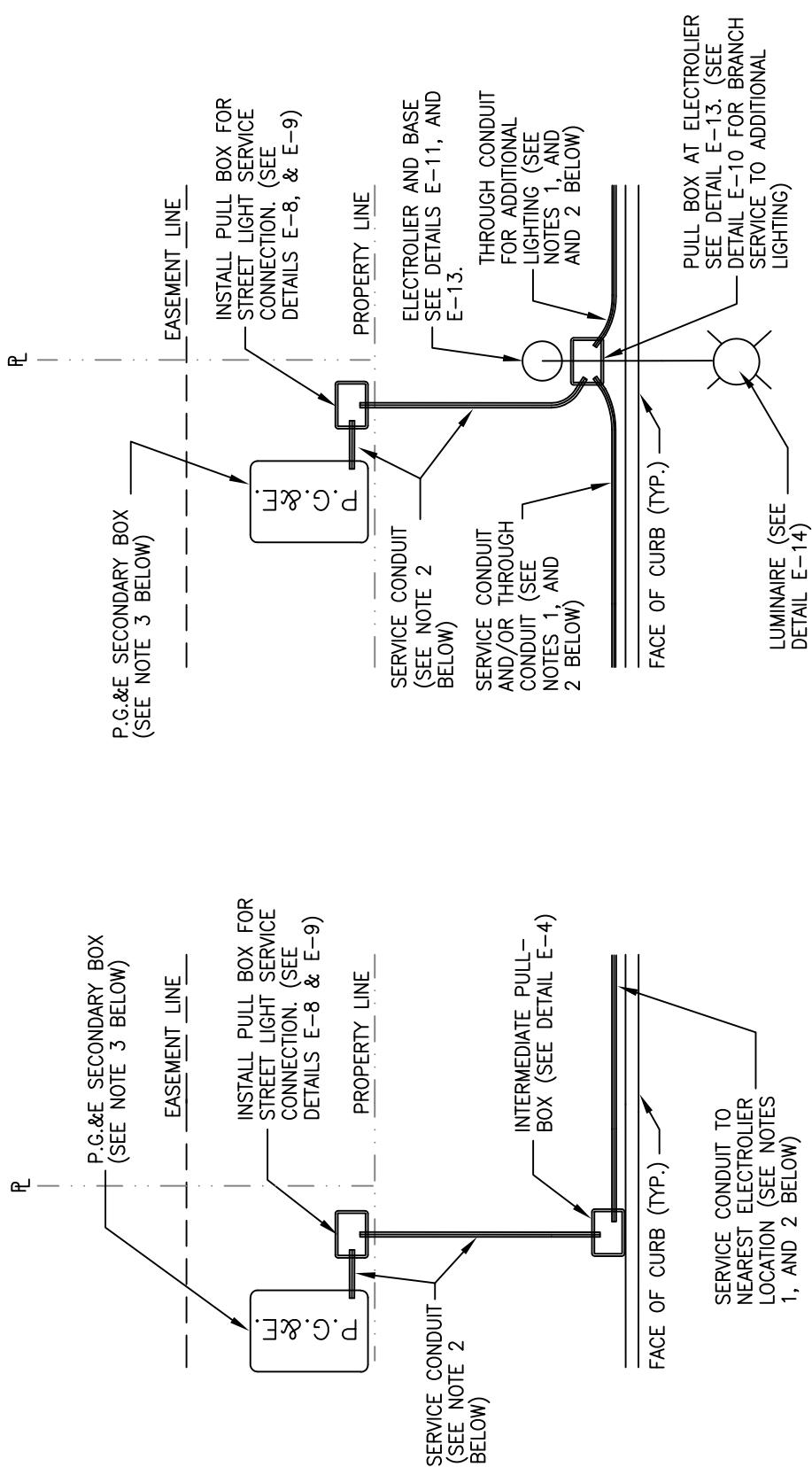
(2) JOINT TRENCH PLAN— using the "Overall Utility Plan" as the background, shows joint trench locations, electroliers, existing and proposed "Public" and "Private" utilites.

(3) DETAILS SHEET— shows all applicable City of Morgan Hill Standard Details, to include trench restoration and backfill details.

(4) PRIMARY ELECTRICAL, GAS, CABLE & TELEPHONE PLANS— information shown per respective utility's standards.

(j) Commencement of Work Developer's substructure contractor shall not commence work until the above plans have been reviewed by the Public Works Department and an encroachment permit issued specifically for such work.

 City of Morgan Hill Public Works Department	GENERAL NOTES	DRAWING NO. E-II
 CITY ENGINEER	4/1/96 3/15/07 DATE REVISED	



SERVICE FROM NEARBY CONNECTION POINT

NOTES:

1. ALL CONDUIT SHALL BE LOCATED 6" BEHIND BACK OF CURB, AND INSTALLED AT A MINIMUM OF 24" DEPTH. SEE "ELECTRICAL SECTION-GENERAL NOTES", SHEET E-1, PARAGRAPH C.
2. ALL CONDUIT SHALL BE 1 1/2" SCHEDULE 40 P.V.C. THE MAXIMUM DISTANCE BETWEEN PULL BOXES SHALL NOT EXCEED 200', AND SHALL NOT CONTAIN MORE THAN 3 (45° MAX.) BENDS.
3. STREET LIGHT SERVICE CONNECTIONS TO P.G.&E. SECONDARY SERVICE BOXES SHALL ONLY BE MADE TO P.G.&E. DESIGNATED STREET LIGHT CONNECTION POINTS. SERVICE CONDUIT FROM PULL BOX TO P.G.&E. SECONDARY BOX SHALL CONTAIN THE NECESSARY CONDUCTORS, AND AN ADDITIONAL 24" (MIN.) SLACK FOR P.G.&E..
4. THIS DETAIL IS DIAGRAMMATICAL, ACTUAL CONDITIONS MAY VARY.

SERVICE CONNECTION DIAGRAM



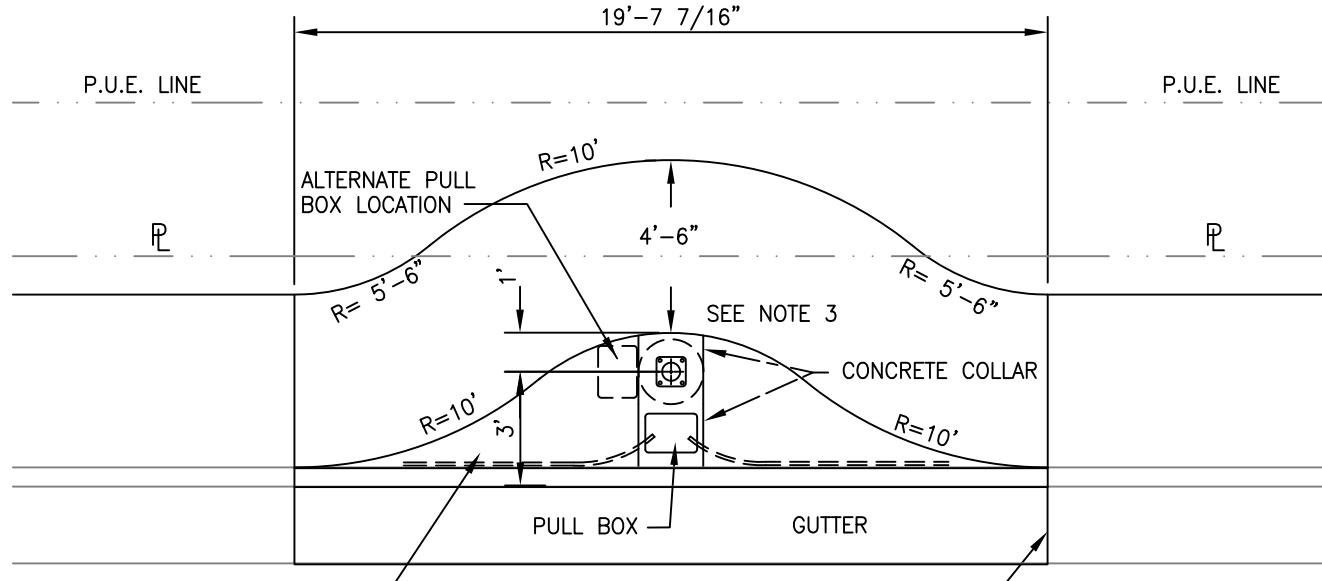
City of Morgan Hill
Public Works Department

Jim Ashcraft
CITY ENGINEER

4/1/96
DATE

REVISED

DRAWING NO.
E-1

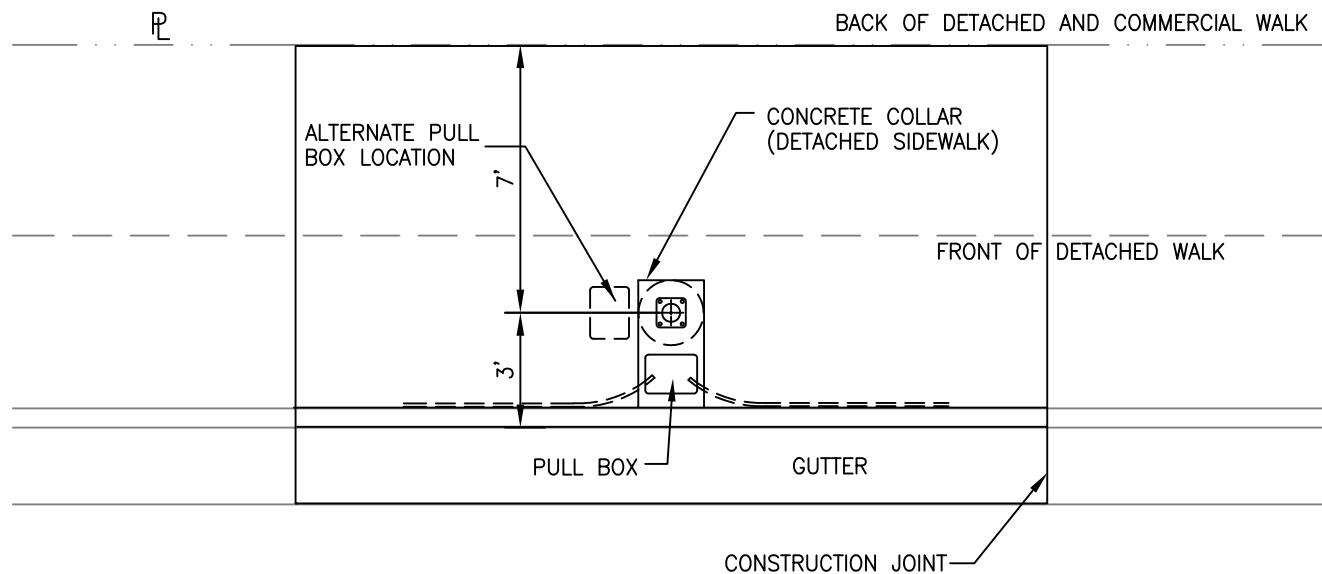


SIDEWALK SECTION WITH
EXPOSED AGGREGATE
(1/2" MARYSVILLE ROCK
OR APPROVED EQUAL)

ATTACHED SIDEWALK
(WITH SIDEWALK MEANDER)

NOTES:

1. JOINT TRENCHES LOCATED BEHIND SIDEWALK SHALL FOLLOW PATH OF MEANDER AROUND ELECTROLIER (ATTACHED SIDEWALK).
2. SEE DETAIL E-11 "ELECTROLIER & BASE", DETAIL E-13 "ELECTROLIER SERVICE CONNECTION", DETAIL E-4 "CONCRETE PULLBOX NON-TRAFFIC" AND DETAIL E-7 "CONCRETE PULLBOX NOTES".
3. SEE DETAIL E-3 FOR ELECTROLIER LOCATION WITHOUT SIDEWALK MEANDER.



DETACHED OR COMMERCIAL SIDEWALK



City of Morgan Hill
Public Works Department

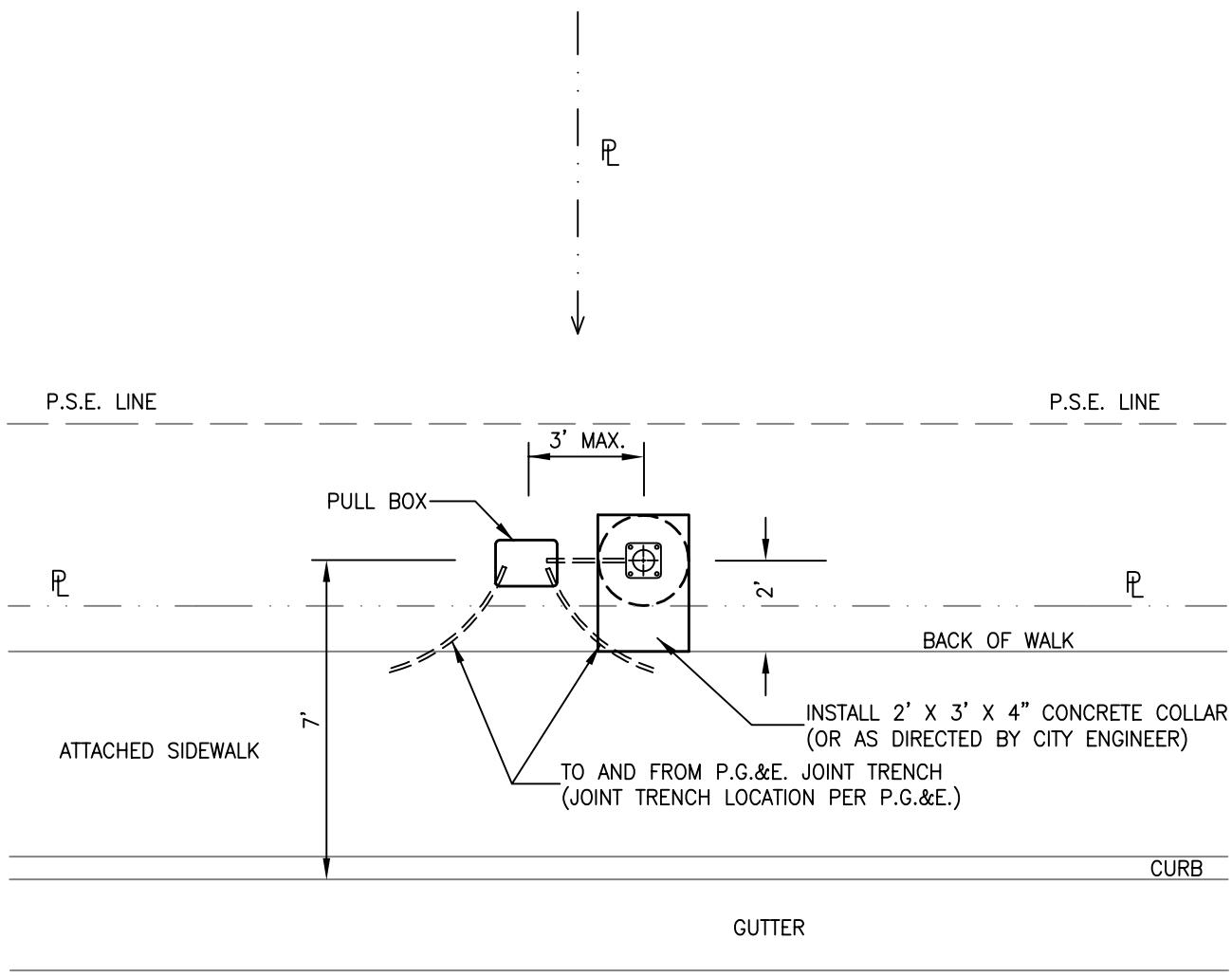
Jim Ashcraft
CITY ENGINEER

4/1/96
DATE

3/15/07
REVISED

**ELECTROLIER LOCATION
ATTACHED SIDEWALK (with)
SIDEWALK MEANDER, DETACHED,
& COMMERCIAL SIDEWALK**

DRAWING NO.
E-2

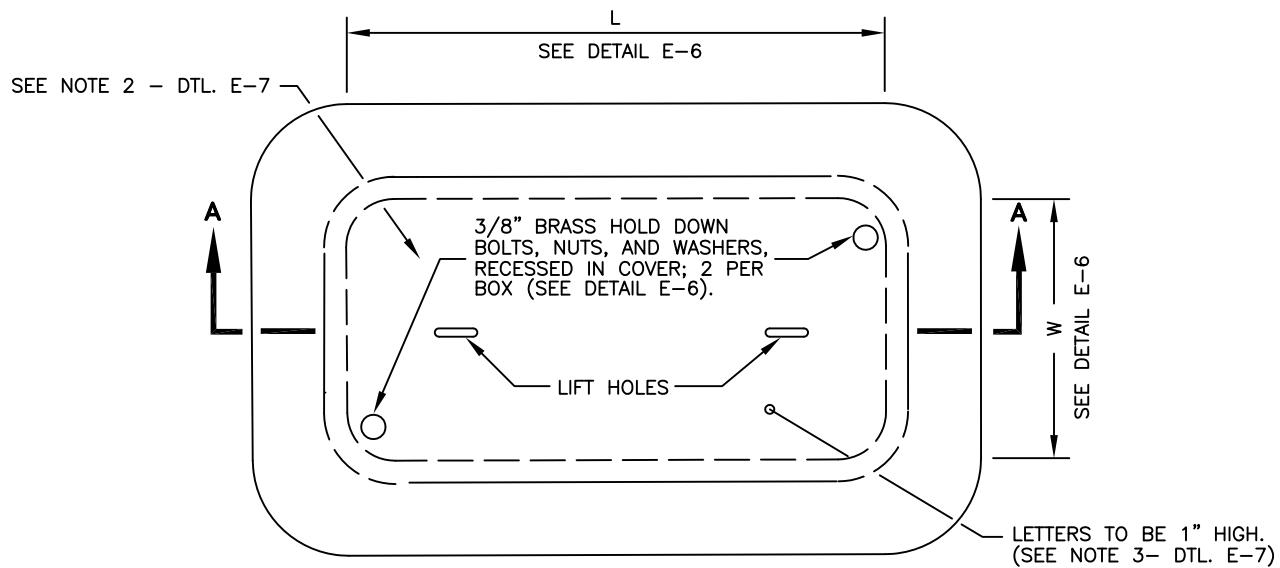


ATTACHED SIDEWALK
(WITHOUT SIDEWALK MEANDER)

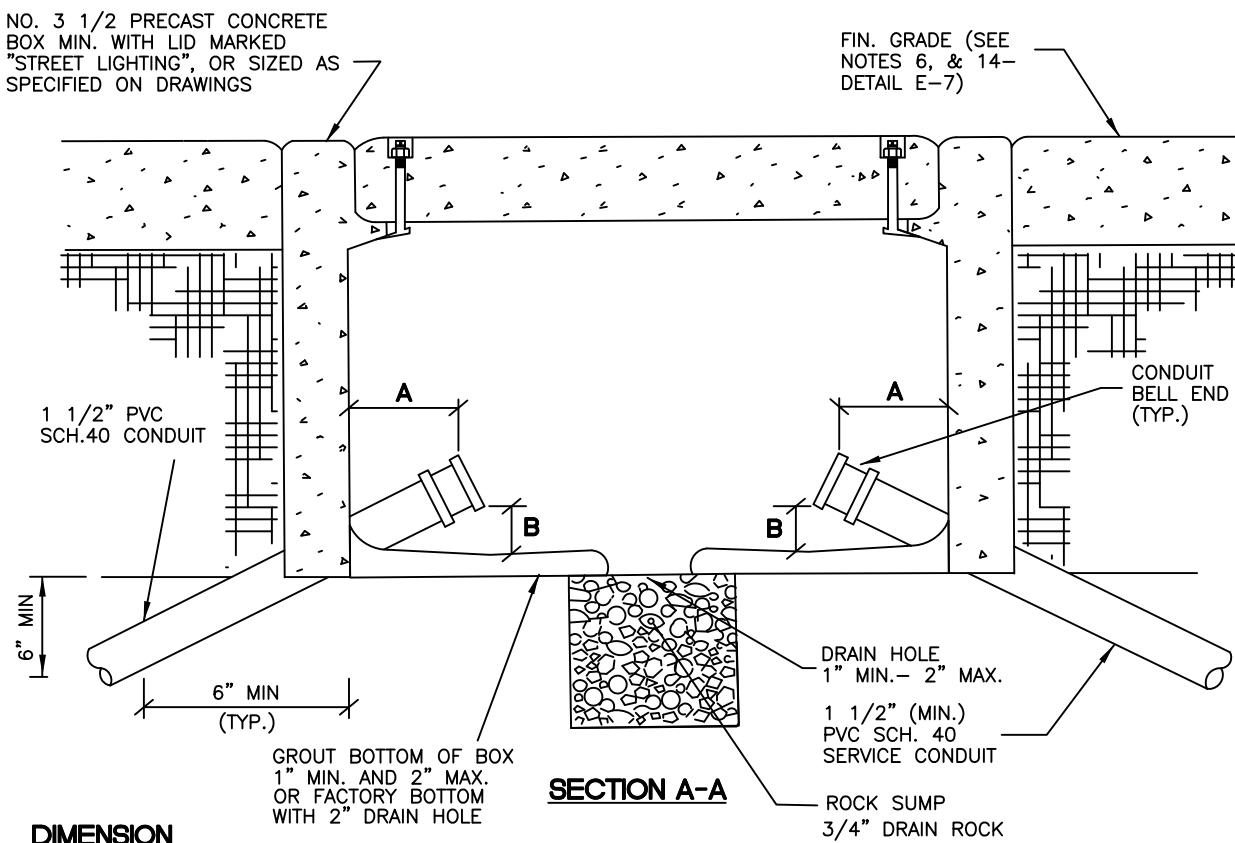
NOTES:

1. SEE DETAIL E-11 "ELECTROLIER & BASE", DETAIL E-13 "ELECTROLIER SERVICE CONNECTION", DETAIL E-4 "CONCRETE PULLBOX NON-TRAFFIC" AND DETAIL E-7 "CONCRETE PULLBOX NOTES".
2. POLE SHALL BE CALTRANS TYPE 15, OR APPROVED EQUAL, WITH 10' MAST ARM (SEE DETAIL E11).
3. IF JOINT TRENCH FACILITIES DO NOT EXIST, STREET LIGHTING SECONDARY SHALL BE LOCATED DIRECTLY BEHIND CURB (AS SHOWN THROUGHOUT THIS SECTION).
4. PULL BOX SHALL BE LOCATED TO THE LEFT OF THE ELECTROLIER (OR DIRECTLY IN FRONT OF HAND HOLE).

 City of Morgan Hill Public Works Department	ELECTROLIER LOCATION ATTACHED SIDEWALK (without) SIDEWALK MEANDER	DRAWING NO. E-3
 CITY ENGINEER	6/6/00 DATE	12/05/16 REVISED



TOP VIEW



DIMENSION

A: 1" MIN. 2" MAX. (TYP. - ALL CONDUITS)
 B: 1" MIN. 2" MAX. (TYP. - ALL CONDUITS)

NOTE:

APPLICATION: PLACED IN CONDUIT RUNS IN AREAS WHERE BOX IS NOT SUBJECT TO VEHICULAR TRAFFIC LOAD: SEE DETAILS E-6 AND E-7 FOR PULL BOX DETAILS AND NOTES.



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Public Works Department

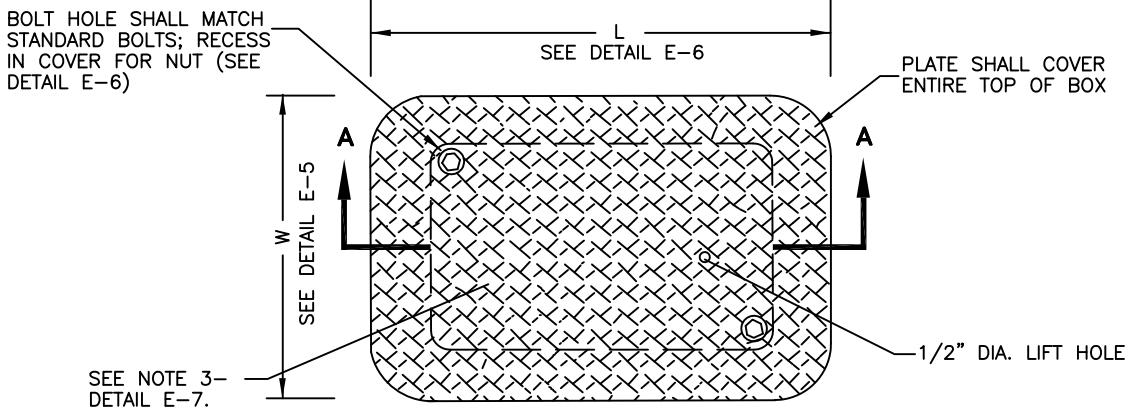
Jim Schaeft
CITY ENGINEER

4/1/96
DATE

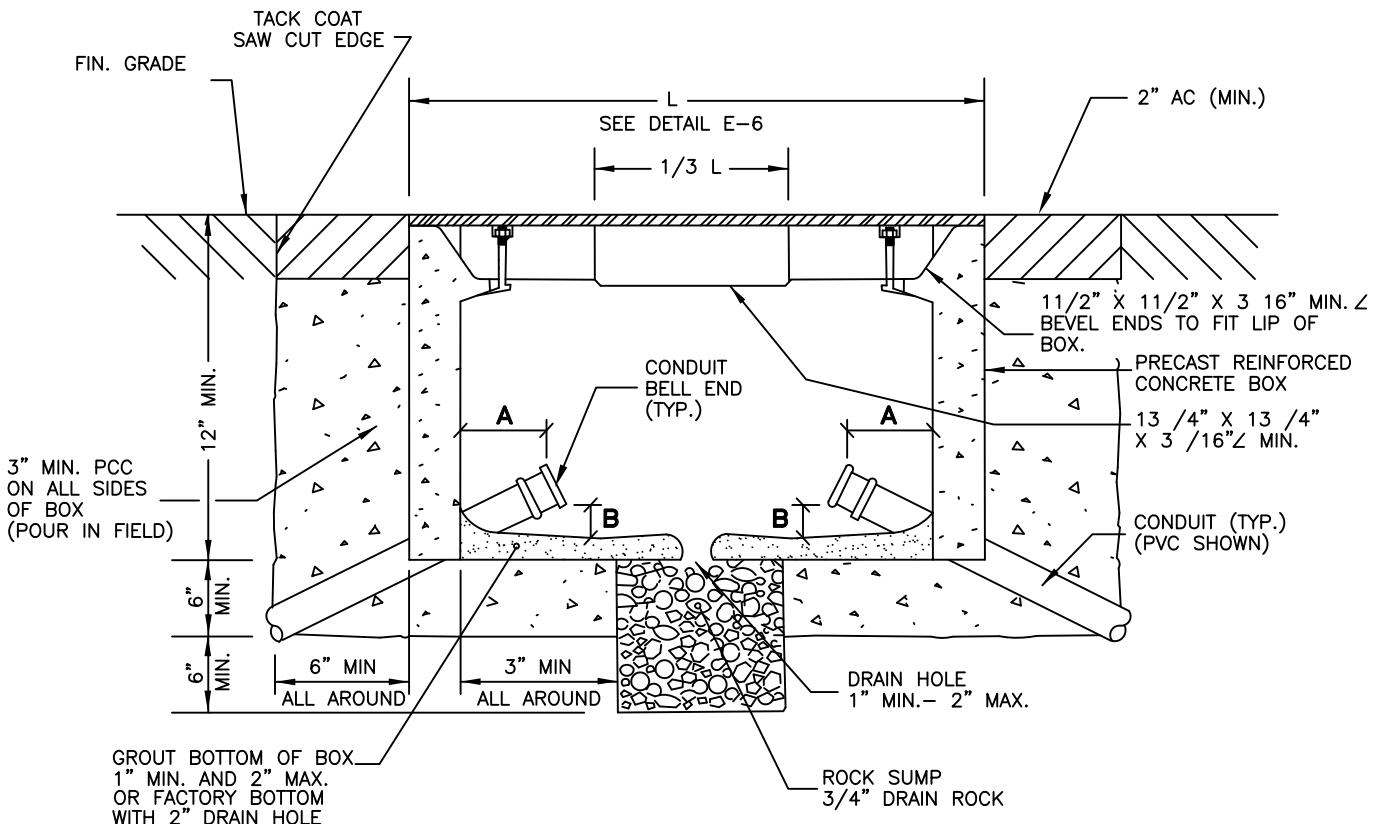
5/14/14
REVISED

CONCRETE PULLBOX
NON-TRAFFIC

DRAWING NO.
E-4



TOP VIEW



SECTION A - A

DIMENSION

A: 1" MIN. 2" MAX. (TYP. - ALL CONDUITS)
B: 1" MIN. 2" MAX. ABOVE GROUT (TYP. - ALL CONDUITS)

NOTES:

1. APPLICATION: PLACED IN CONDUIT RUNS IN AREAS WHERE BOX IS SUBJECT TO VEHICULAR TRAFFIC LOAD.
2. SEE DETAILS E-6, AND E-7 FOR PULL BOX DETAILS AND NOTES.



City of Morgan Hill

Public Works Department

Jin Ashcraft
CITY ENGINEER

4/1/96
DATE

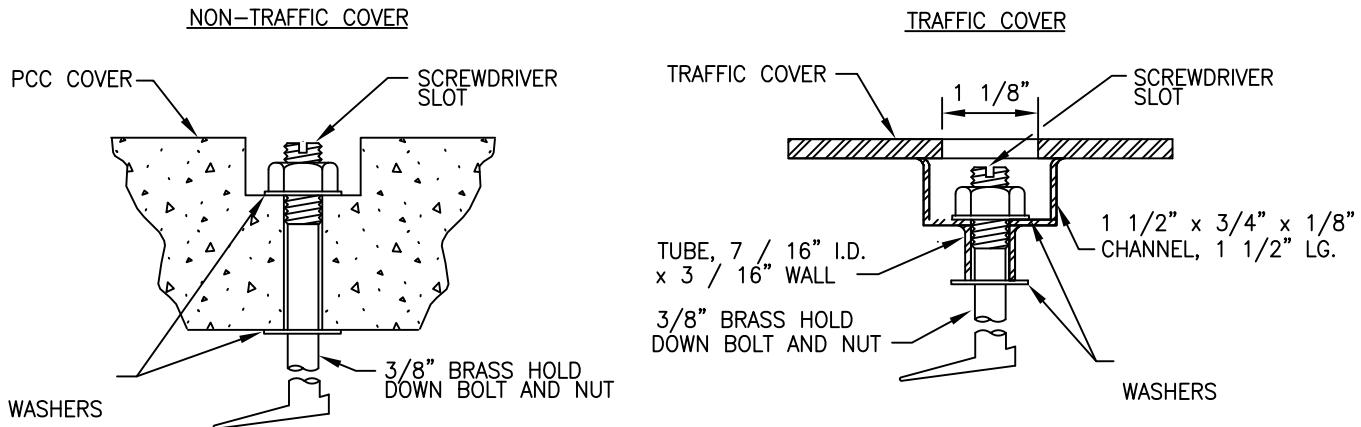
5/14/15
REVISED

CONCRETE PULLBOX TRAFFIC

DRAWING
NO.

E-5

HOLD DOWN BOLT DETAIL



DIMENSION TABLE

PULL BOX	CONCRETE BOX		CONCRETE COVER					TRAFFIC COVER			ROCK SUMP
	MIN. THICKNESS	MIN. DEPTH	L	W	R	EDGE THICKNESS	EDGE TAPER	L	W	PLATE THICKNESS	
NO. 3 1/2	1"	12"	15 3/8"	10 1/8"	1 1/8"	1 3/4"	1/8"	19 1/8"	14"	1/4"	1.8
NO. 5	1"	12"	23 1/4"	13 3/4"	1 1/4"	2"	1/8"	24 5/8"	15 1/8"	1/4"	2.6
NO. 6	1 1/2"	12"	30 5/8"	17 5/8"	1 1/4"	2"	1/8"	34 5/8"	21 7/8"	1/4"	5.3
NO. 7	1 1/2"	14"	35 3/4"	24"	1 1/4"	3"	1/8"	39 3/4"	28 1/8"	1/4"	7.7
NO. 8	1 1/2"	14"	47 3/4"	30 1/8"	1 1/4"	3"	1/8"	51 3/4"	33 5/8"	1/4"	12.2

△ = MINIMUM CUBIC FEET OF DRAIN ROCK FOR ROCK SUMP. DOES NOT APPLY TO TRAFFIC BOX. PROVIDE DRAIN ROCK FOR TRAFFIC BOX IN ACCORDANCE WITH STD. E-5

PULL BOX NOTES

1. Use steel cover and special concrete footing, as shown in Detail E-5, when box is approved by the City Engineer to be installed where subject to vehicular traffic loads. Steel cover shall have embossed non-skid pattern. (See detail E-5)
2. Steel reinforcing shall be as regularly used in the standard products of the respective manufacturer.
3. Pull boxes shall be marked as follows:
"TRAFFIC SIGNAL": For traffic signal systems with or without street lighting systems.
"STREETLIGHTING": For streetlighting systems only.
"SPRINKLER CONTROL": For sprinkler control systems only.
"ELECTRICAL": For miscellaneous electrical systems only.
4. All metal covers, metal Z-bar frame, metal rings, or any metallic component of a pull box shall be bonded to a #10 AWG or larger copper grounding conductor. Bonding jumpers shall be solid or braided copper equivalent to #10 AWG and shall be attached to a 1/4"-20 stainless steel screw (drill and tap as required) and approved grounding lug.
5. The pullbox cover opening shall be 1/8" greater in length and width.
6. The City Engineer shall approve installation of pullboxes in a sidewalk area except as shown in Dtl. E-2, Commercial Sidewalk. The depth of the pullbox shall be adjusted so that the top of the box is flush with the surrounding sidewalk.
7. Pull boxes shall not be installed within the boundary of new or existing wheelchair ramps or driveways.
8. All pull boxes shall be located within the City Right-Of-Way, or in an officially dedicated Public Utility Easement (upon the approval of the City Engineer).
9. Drain rock cushion shall extend a minimum of 6" beyond inside walls of non-traffic boxes.
10. Conduits shall terminate not more than 2" and not less than 1" inside the box, and shall be not less than 1" nor more than 2" clear from the bottom of the box.
11. Conduits shall enter the box with manufactured long radii type or standard 45° elbow.
12. Pull box shall be size No. 3 1/2 minimum unless approved otherwise.
13. Pull boxes shall be placed at intervals not exceeding 200' in conduit runs.
14. Install pull box extension(s) as required to set top of pull box flush with surrounding grade.



City of Morgan Hill
Public Works Department

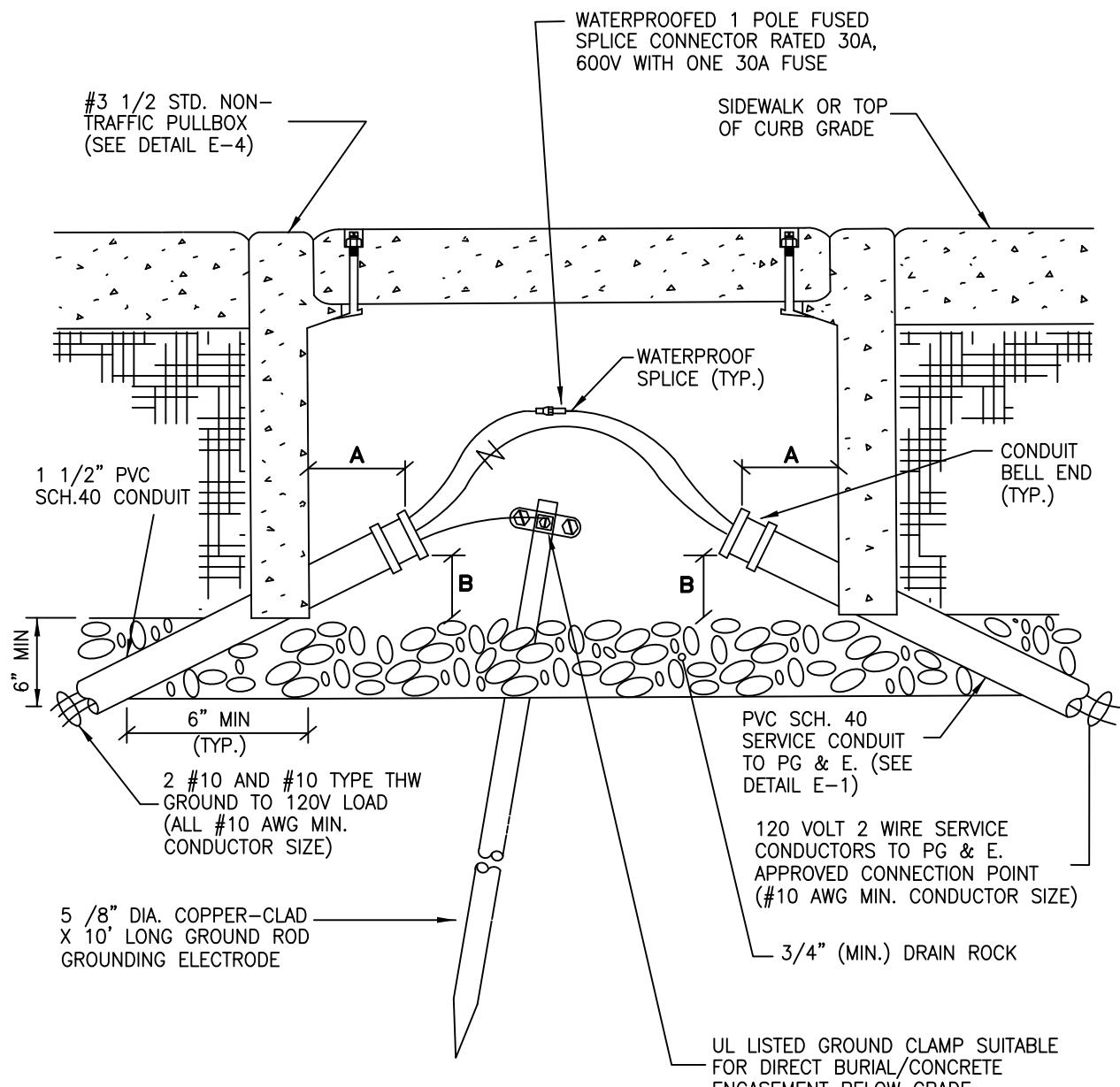
Jim Ashcraft
CITY ENGINEER

4/1/96
DATE

REVISED

CONCRETE PULLBOX NOTES

DRAWING NO.
E-7



NOTES:

1. SEE DETAILS E-6, AND E-7 NOTES.
2. PROVIDE 3' OF SLACK IN ALL CONDUCTORS IN ACCORDANCE WITH SPECIFICATIONS. (SLACK NOT SHOWN.)



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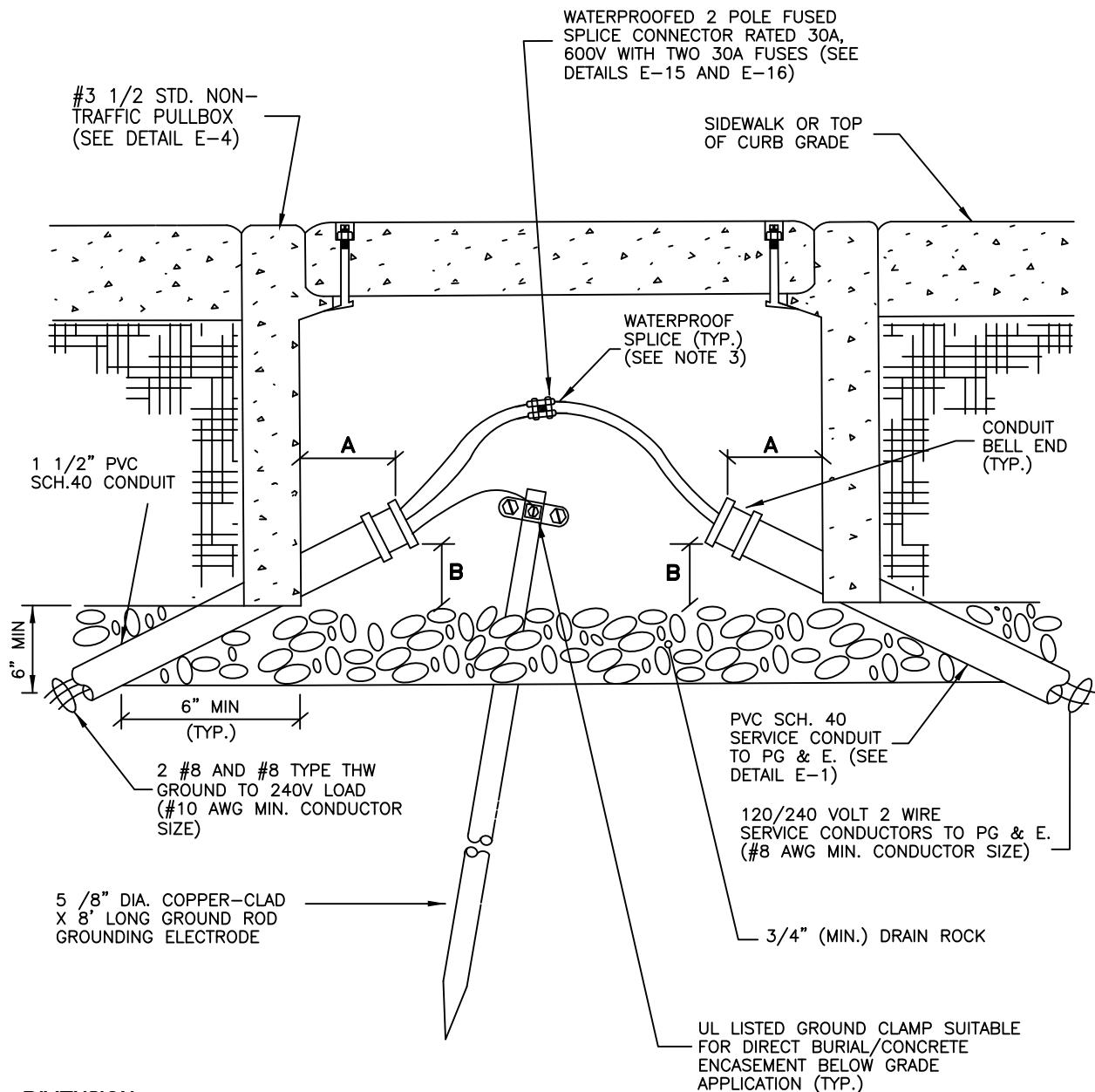
Jim Ashcraft
CITY ENGINEER

4/1/96
DATE

6/8/00
REVISED

**UNDERGROUND STREETLIGHT
120V SERVICE CONNECTION**

DRAWING NO.
E-8



NOTES:

1. SEE DETAILS E-6, AND E-07 NOTES.
2. PROVIDE 3' OF SLACK IN ALL CONDUCTORS IN ACCORDANCE WITH SPECIFICATIONS (SLACK NOT SHOWN).



City of Morgan Hill
Public Works Department

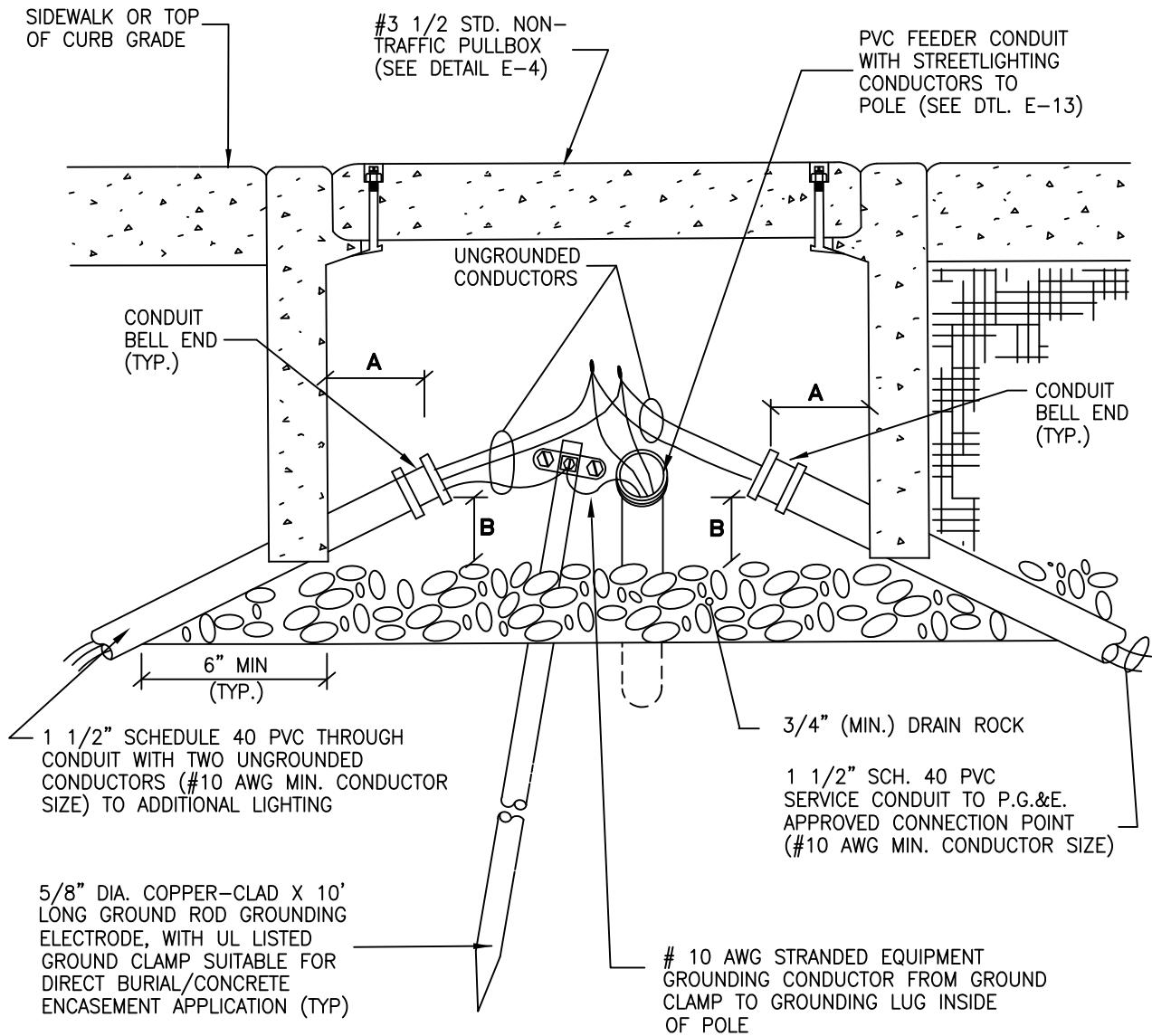
Jim Ashcraft
CITY ENGINEER

4/1/96
DATE

6/8/00
REVISED

**UNDERGROUND STREETLIGHT
240V SERVICE CONNECTION**

DRAWING NO.
E-9



DIMENSION

A: 1" MIN. 2" MAX. (TYP.- ALL CONDUITS)
 B: 1" MIN. 2" MAX. (TYP.- ALL CONDUITS)

NOTES:

1. SEE DETAILS E-6 AND E-7 NOTES.
2. PROVIDE 3' OF SLACK IN ALL CONDUCTORS IN ACCORDANCE WITH SPECIFICATIONS. (SLACK NOT SHOWN.)
3. 240V STREETLIGHTING CIRCUIT SHOWN. 120V STREETLIGHTING SIMILAR EXCEPT NEUTRAL CONDUCTOR IS PRESENT.



City of Morgan Hill
 Public Works Department

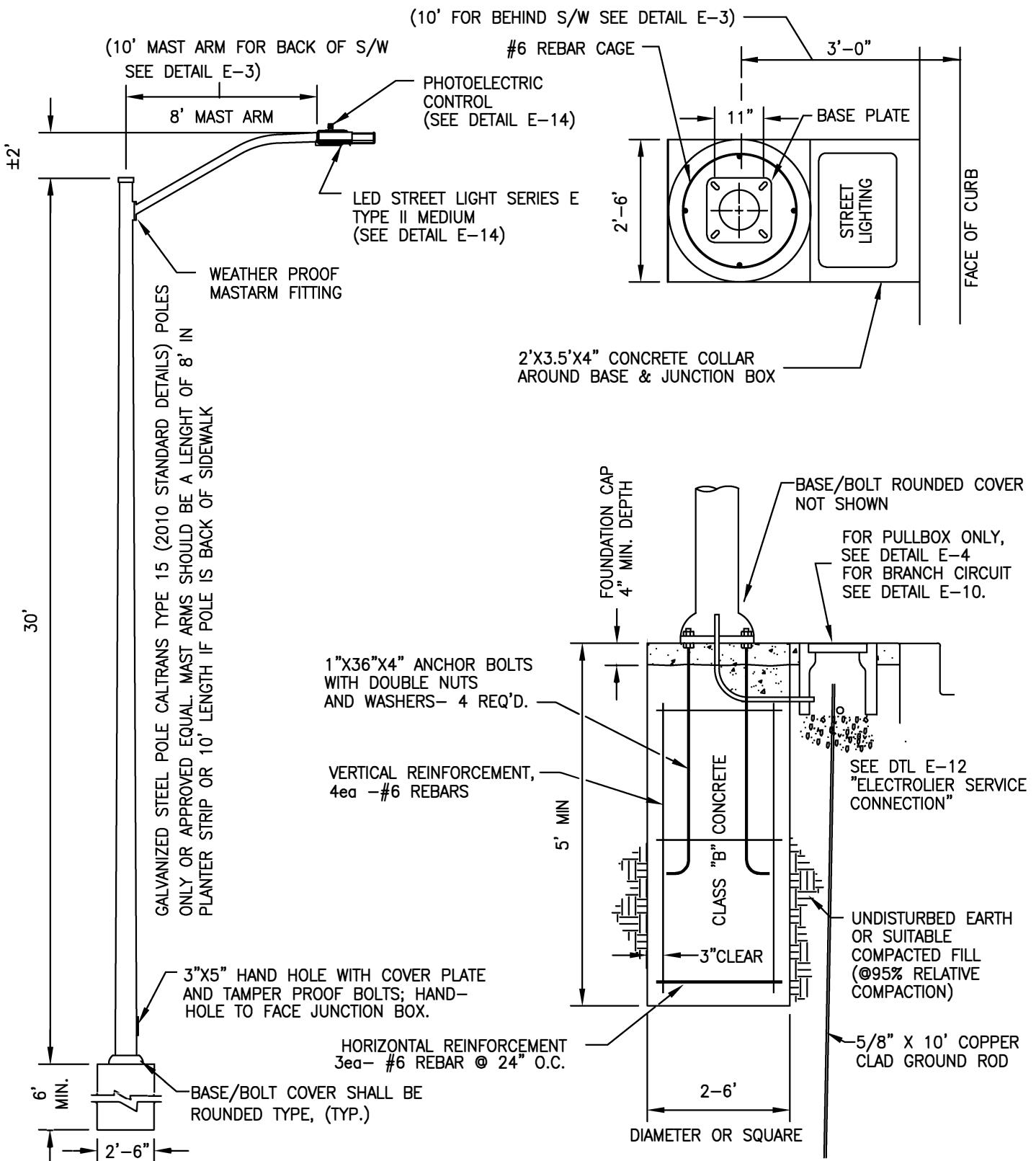
Jim Ashcraft
 CITY ENGINEER

4/1/96
 DATE

REVISED

STREETLIGHT-BRANCH CIRCUIT
 PULLBOX

DRAWING
 NO.
 E-10



NOTE: THE APPLICATION SHOWN REFERENCES ELECTROLIERS INSTALLED WITH A DETACHED SIDEWALK.
FOR ELECTROLIERS LOCATED BEHIND THE SIDEWALK USE DETAIL E-3 FOR LOCATION DIMENSIONS.



City of Morgan Hill
Public Works Department

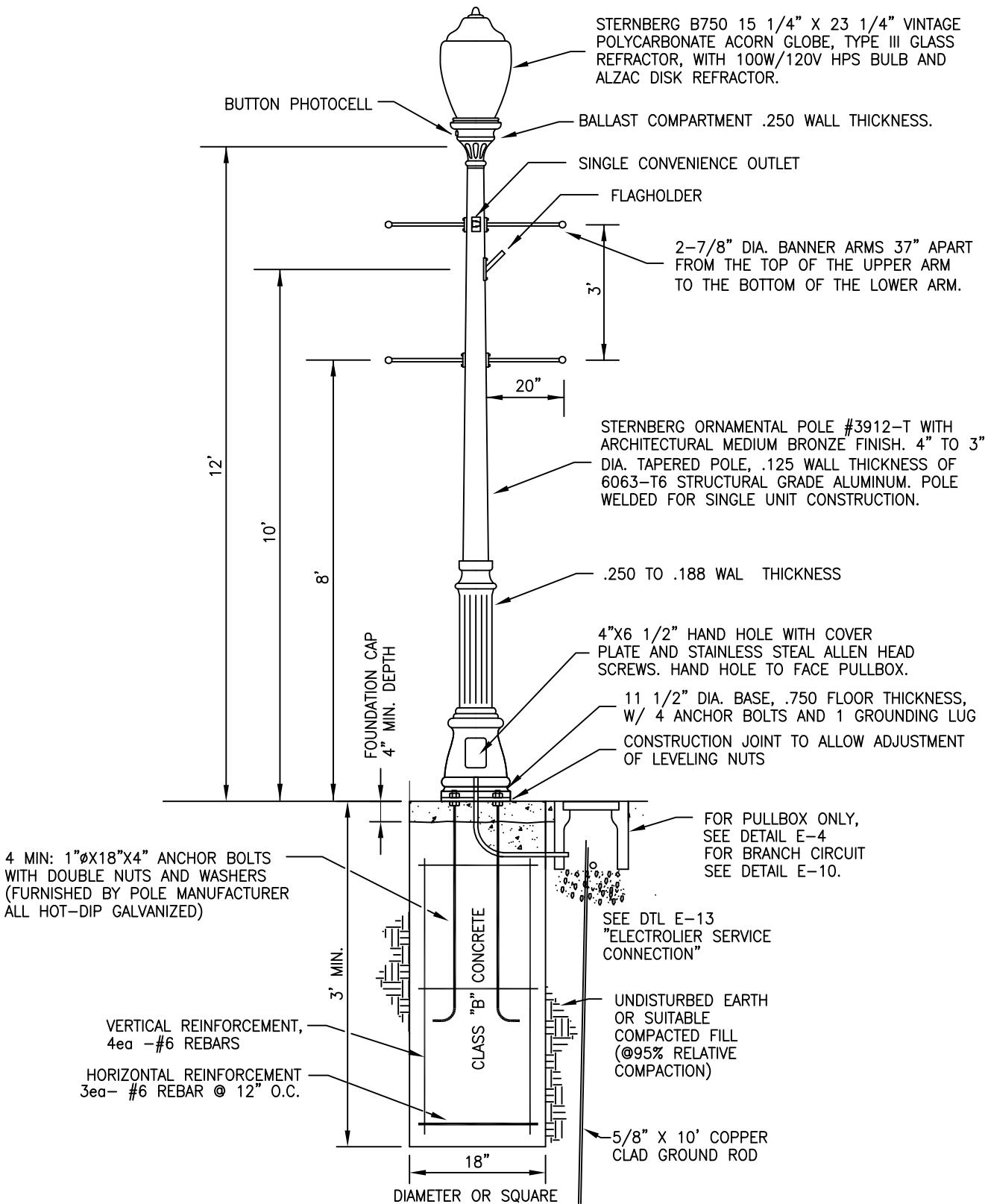
S. C.
CITY ENGINEER

1/22/24
DATE

REVISED

ELECTROLIER & BASE

DRAWING NO.
E-11



City of Morgan Hill
Public Works Department

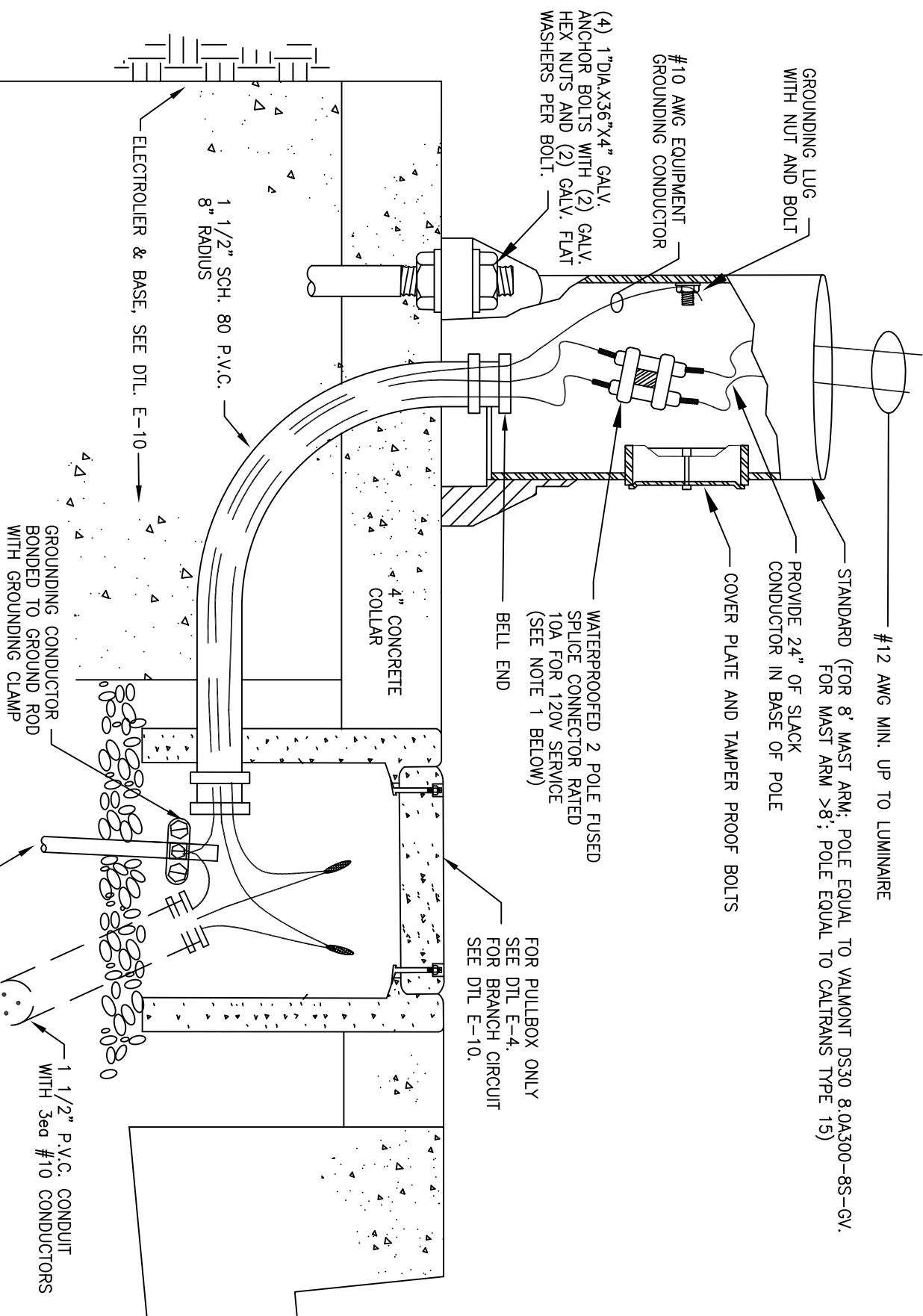
Jim Ashcraft
CITY ENGINEER

3/15/07
DATE

5/15/14
REVISED

DECORATIVE STREET LIGHT

DRAWING NO.
E-12



City of Morgan Hill
Public Works Department

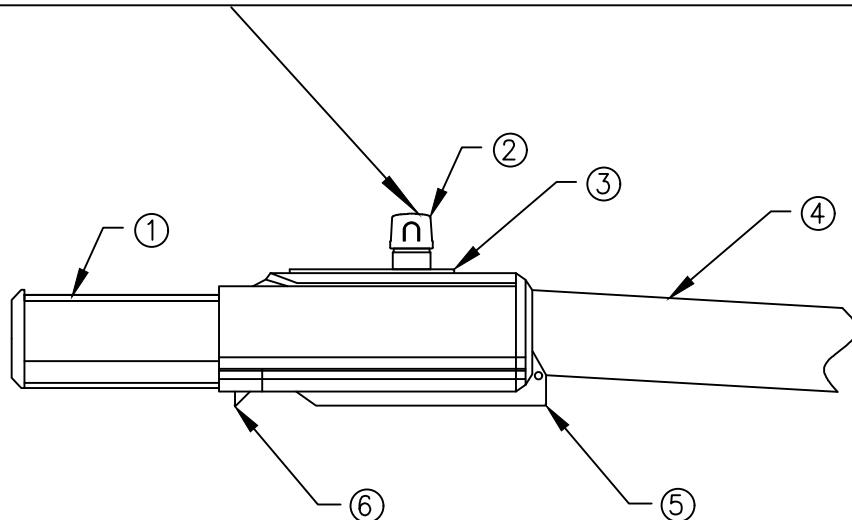
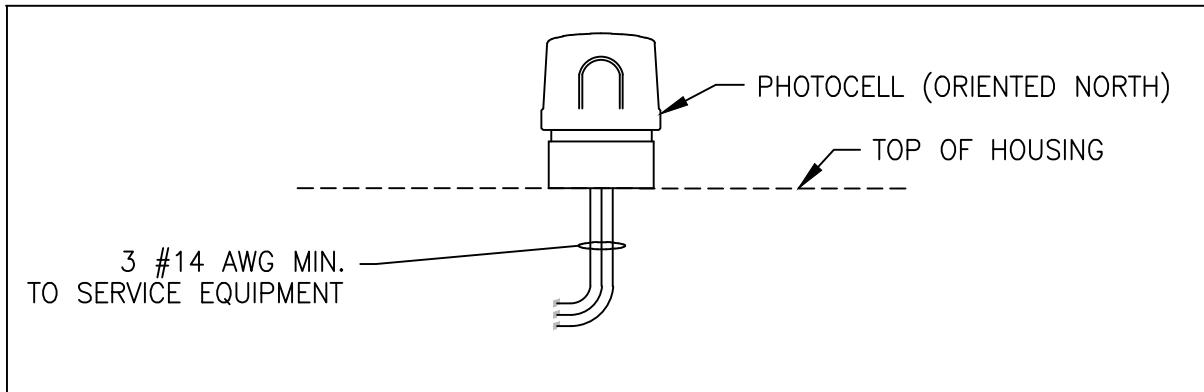
Jim Ashcraft
CITY ENGINEER

4/1/96
DATE

8/6/98
REVISED

ELECTROLIER SERVICE CONNECTION

DRAWING NO.
E-13



SIDE VIEW

LED STREETLIGHT SERIES E
TYPE II MEDIUM

NOTES:

- ① LIGHT ENGINE PORTION OF EXTRUSION TO REMAIN NATURAL ALUMINUM, NO PAINTING
- ② NEMA PHOTOCELL(NOT INCLUDED) AND RECEPICAL
- ③ FIXTURE HOUSING IS ALL ALUMINUM AND DESIGNED TO MOUNT ON 1.25" OR 2" O.D. HORIZONTAL TENON, 3 BOLT PATTERN, POLE TYPE 15
- ④ MAST/ARM LENGTH 10' FOR POLE AT BACK OF WALK, OR 8' LENGTH FOR USE IN PARK STRIP
- ⑤ COVER
- ⑥ LATCH
- ⑦ UTILIZE CREE BRAND FIXTURE OR CITY APPROVED EQUIVALENT.
WATTAGE SHALL BE BASED ON EQUIVALENT WATTAGE. RESIDENTIAL STREETS WILL BE 53 WATTS, COLLECTOR WILL BE 89 WATTS AND ARTERIAL STREETS WILL BE 139 WATTS.
- ⑧ ALL RESIDENTIAL FIXTURES SHALL HAVE BACKLIGHTING SHIELDS.



City of Morgan Hill
 Public Works Department

Ken Bial

CITY ENGINEER

3/4/14

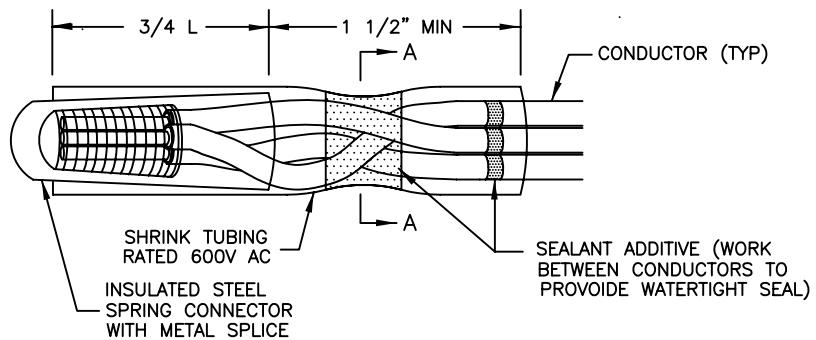
DATE

11/2/17

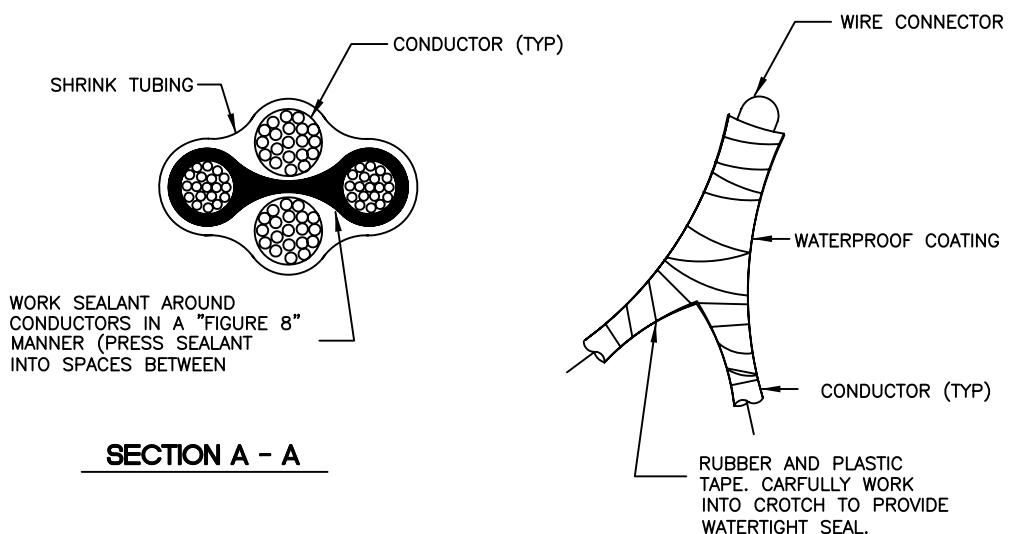
REVISED

LED LUMINAIRE

DRAWING NO.
 E-14

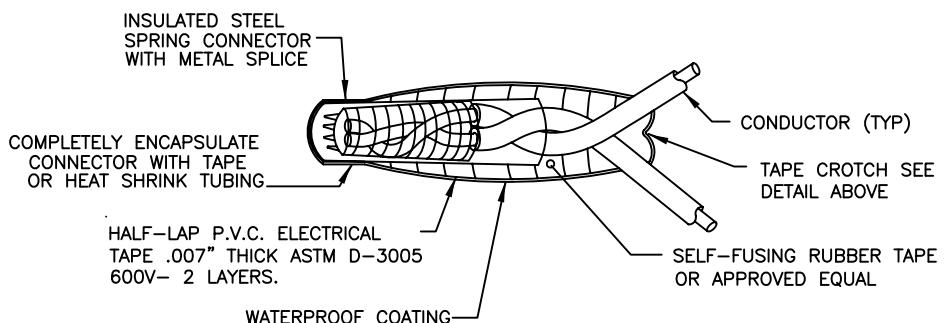


SPlice WITH SHRINK TUBING



SECTION A - A

CROTCH DETAIL



SPlice WITH OUT SHRINK TUBING

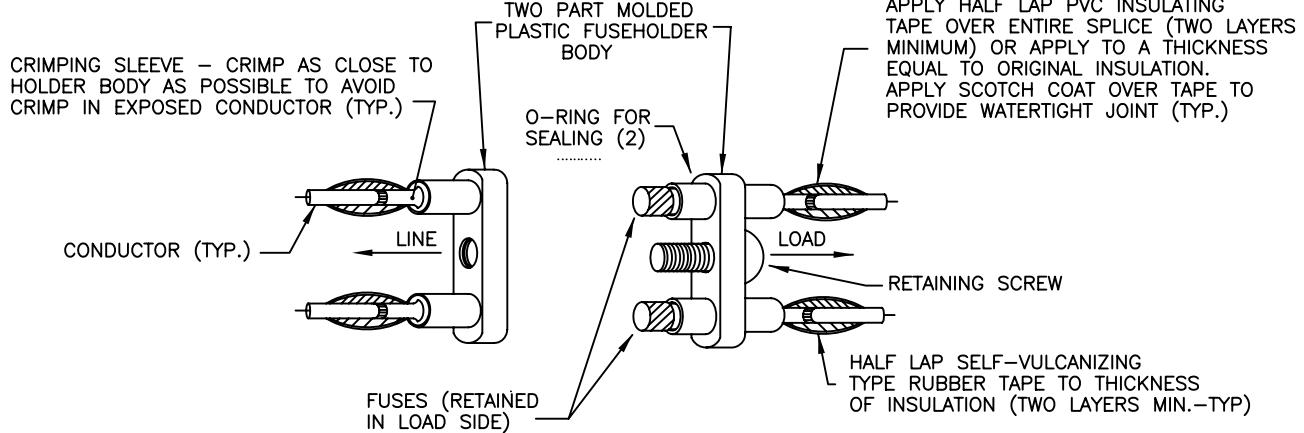
NOTES:

1. PAINT ALL TAPED SPLICES WITH ELECTRICAL WATERPROOF COATING.
2. DO NOT EXCEED SPRING CONNECTOR MANUFACTURER'S RECOMMENDATIONS FOR AWG COPPER WIRE SPLICING COMBINATIONS.

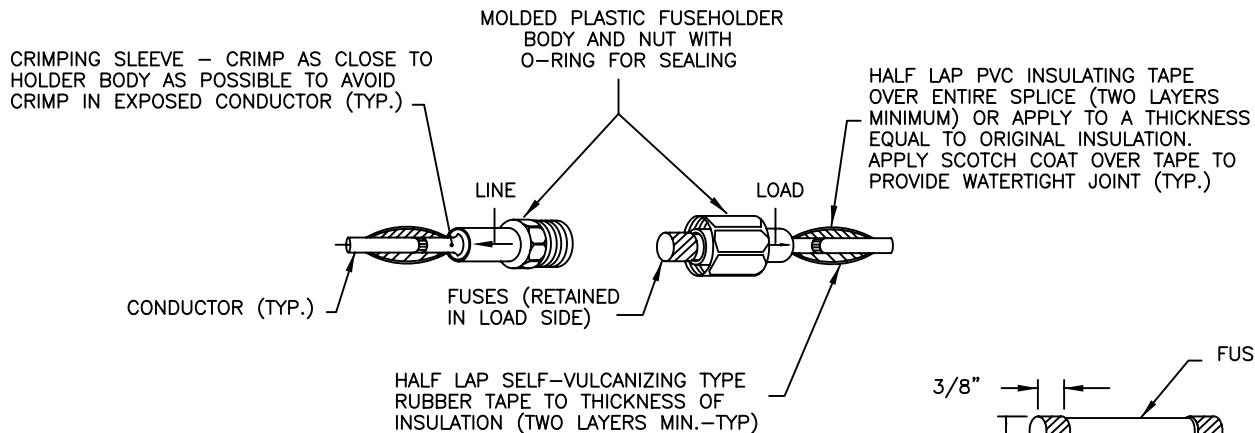
	City of Morgan Hill Public Works Department
<i>Jim Ashurst</i> CITY ENGINEER	4/1/96 DATE

CONDUCTOR SPLICING SPRING CONNECTORS

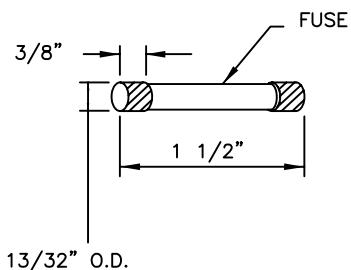
DRAWING NO.
E-15



2 POLE, 600V



1 POLE, 600V



FUSE DETAIL

NOTES:

1. STRIP ENDS OF CONDUCTOR INSULATION.
2. CRIMP CONNECTOR WITH TOOL DESIGNED FOR THIS PURPOSE.
3. AMPERE RATING OF FUSEHOLDERS SHALL BE RATED 30A MIN.
4. VOLTAGE RATING OF FUSEHOLDERS SHALL BE 600V MIN.
5. PAINT ALL FINISHED TAPED CONNECTIONS WITH ELECTRICAL INSULATING COMPOUND (COATING) TO PROVIDE WATERTIGHT JOINTS.
6. FUSEHOLDERS SHALL BE TRON TYPE "HEX" (240V) OR "HEB" (120V) AS MANUFACTURED BY BUSSMAN DIV. MCGRaw-EDISON CO. OR APPROVED EQUAL. REJECTION TYPE FUSEHOLDERS ARE NOT ACCEPTABLE.
7. USE 10A, 250V A.C. RATED, GENERAL PURPOSE NON-TIME DELAY TYPE "BAF" OR "BAN" FUSES AS MANUFACTURED BY BUSSMAN DIV. OR APPROVED EQUAL FOR INDIVIDUAL STREETLIGHT FUSING APPLICATIONS.
8. FUSE EACH 240V OR 120V STREETLIGHT LUMINAIRE INDIVIDUALLY WITH A 10A FUSE.
9. USE 30A, 250V A.C. RATED, TRON TIME-DELAY TYPE "FNQ" FUSES AS MANUFACTURED BY BUSSMAN DIV. OR APPROVED EQUAL FOR SERVICE APPLICATIONS AS REQUIRED.
10. FUSES FOR UNDERGROUND FED ELECTROLIERS SHALL BE INSTALLED IN THE BASE OF THE ELECTROLIER. SEE DTL. E-13

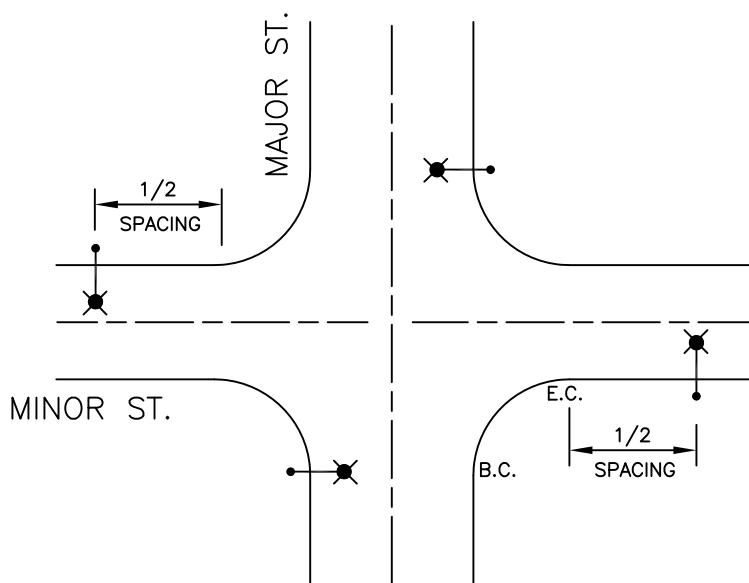
	City of Morgan Hill Public Works Department
<i>Jim Ashcraft</i> CITY ENGINEER	4/1/96 DATE REVISED

FUSED SPLICE CONNECTORS

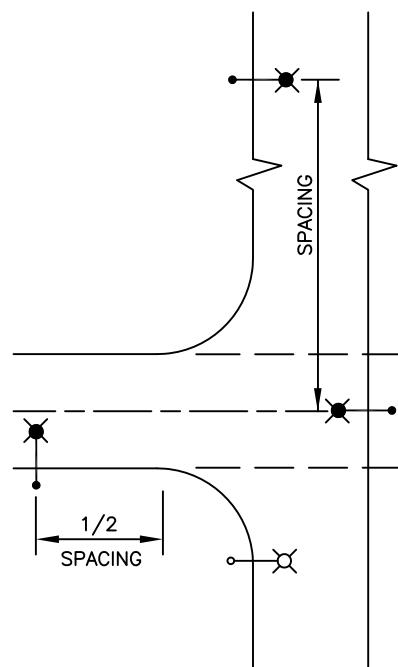
DRAWING NO.
E-16

**WATTAGE OF
HIGH PRESSURE
SODIUM**

ROAD TYPE	WATTAGE OF HIGH PRESSURE SODIUM	SPACING
ARTERIAL	150	160' - 180' OPPOSITE
COLLECTOR	150	130' - 140' STAGGERED
LOCAL	100	130' - 140' STAGGERED
RURAL	100	380' - 420' STAGGERED



4-WAY INTERSECTION SPACING



"T" INTERSECTION SPACING

—●— "BASIC" ELECTROLIER

—○— ADDITIONAL (WHEN REQUIRED)



City of Morgan Hill
Public Works Department

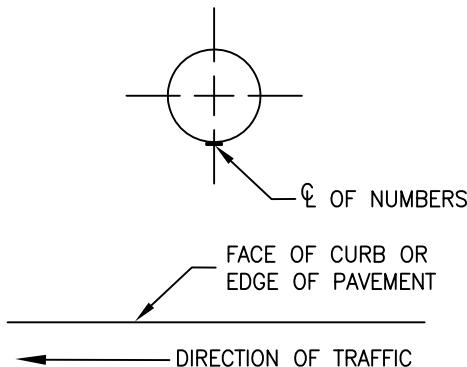
Jim Oshaght
CITY ENGINEER

4/1/96
DATE

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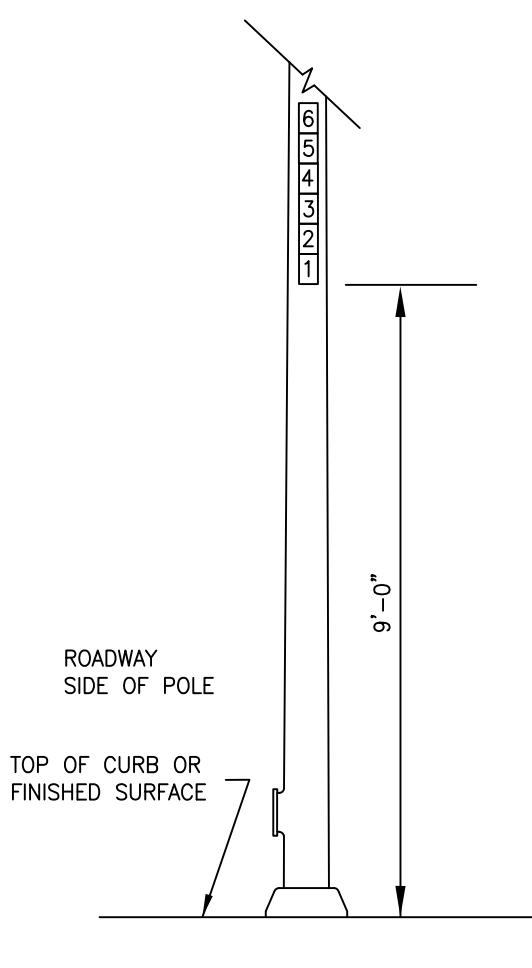
ELECTROLIER SPACING

DRAWING NO.
E-17



PLAN VIEW

N.T.S.

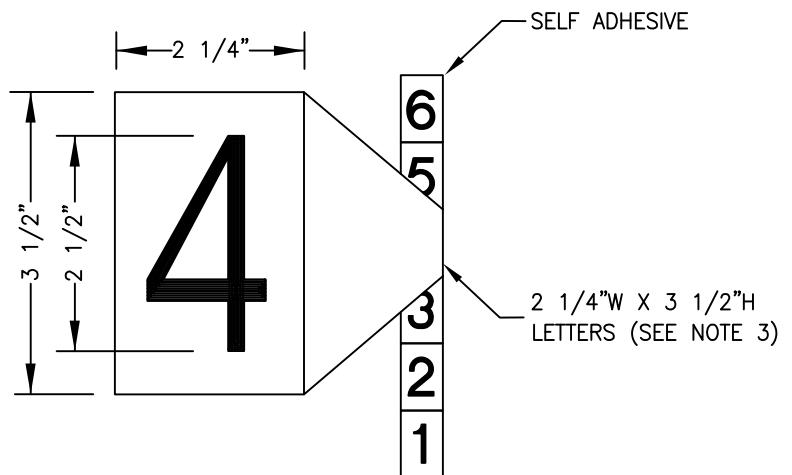


NUMBER LOCATION

N.T.S.

NOTES

1. STICK-ON REFLECTIVE NUMBERS AND LETTERS SHALL BE PLACED ON ALL ELECTROLIERS AND TRAFFIC SIGNAL POLES. ALL LUMINAIRES SHALL HAVE WATTAGE CODES AFFIXED TO THE BOTTOM OF LAMP HOUSING AND SHALL BE VISIBLE FROM DIRECTLY BELOW THE LAMP. ALL NUMBERING AND/OR LETTERING FOR POLES AND LAMPS SHALL BE PLACED IN ACCORDANCE WITH PACIFIC GAS AND ELECTRIC (P.G.&E.) ENGINEERING STANDARD 015137 "IDENTIFICATION OF STREET LIGHT NUMBERS".
2. REFLECTIVE SHEETING, NUMBERS AND LETTERS SHALL COMPLY WITH THE RESPECTIVE SPECIFICATIONS IN THE STATE DEPARTMENT OF TRANSPORTATION PUBLICATION "SPECIFICATIONS FOR ALUMINUM REFLECTIVE SHEETING SIGNS".
3. THE NUMBERS AND EDGE SEALER SHALL BE PLACED ON THE EQUIPMENT WHERE DESIGNATED BY THE PLANS OR THE ENGINEER. THE CONTRACTOR SHALL OBTAIN THE SPECIFIC DESIGNATION FROM THE ENGINEER.
4. REFLECTIVE NUMBERS AND LETTERS SHALL HAVE SILVER REFLECTIVE ADHESIVE SHEETING, 2 1/4" IN WIDTH, WITH 3 1/2" IN HEIGHT BLACK SERIES D LETTERS AND NUMBERS. THE LETTERS AND NUMBERS MAY BE SCREENED ON TO THE REFLECTIVE SHEETING OR MAY BE DIE-CUT AND ADHESIVELY ATTACHED.
5. THE LABELS FOR EACH LOCATION MAY BE INDIVIDUAL CHARACTERS APPLIED OR A CONTINUOUS STRIP APPLIED. THE LABELS SHALL BE VERTICALLY ARRANGED WITH THE BOTTOM HEIGHT PLACED 9'-0" FROM THE TOP OF CURB OR FINISHED GRADE.
6. REFLECTIVE NUMBERS SHALL BE APPLIED TO A CLEAN SURFACE. THE EDGES OF THE NUMBERS SHALL BE TREATED WITH EDGE SEALER.
7. WHERE NEW NUMBERS ARE TO BE PLACED ON EXISTING OR RELOCATED EQUIPMENT, THE EXISTING NUMBERS SHALL BE REMOVED AND THE SURFACE SHALL BE CLEANED.



NUMBER DETAIL

N.T.S.



City of Morgan Hill
Public Works Department

Jim Ashurst
CITY ENGINEER

4/1/96
DATE

REVISED

**POLE NUMBERING
FOR TRAFFIC SIGNAL POLES
AND ELECTROLIERS**

DRAWING NO.
E-18