ADDENDUM NO. 5
TO
CITY OF FRESNO
PUBLIC WORKS STANDARD SPECIFICATIONS
ADOPTED MARCH 4, 1970
RESOLUTION NO. 70-36
UPDATED VERSION APPROVED October 15, 2014

This addendum is attached to and made a part of the above-entitled standard specifications.

The following City Standard Drawings have been amended as indicated below:

P-1	Adjusted minimum driveway lengths and pedestrian requirements.
P-2	Adjusted minimum driveway lengths and pedestrian requirements.
P-3	Added notes regarding compaction.
P-4	Added notes regarding compaction.
P-5	Added notes regarding compaction.
P-6	Revised and corrected notes.
P-7	Revised notes and implemented a minimum radius.
P-9	Provided soil compaction requirements.
P-10	Corrected notes and added notes regarding compaction.
P-18	Provided clarity.
P-28	Corrected dimensions and wheelchair ramp, corrected notes.
P-29	Corrected dimensions and wheelchair ramp, corrected notes.
P-30	Corrected dimensions and wheelchair ramp, corrected notes.
P-41	Added RW (Recycled Water) to this utility location guideline.
P-42	Added RW (Recycled Water) to this utility location guideline.
P-50	Added R-value testing requirements. Added notes 9 and 10.

P-51	Showed expressway barrier fences at expressways.
P-52	Corrected drawing to accurately reflect dimensions, corrected lane width dimensions.
P-54	Corrected drawing to accurately reflect dimensions, corrected lane width dimensions.
P-55	Removed former note #3.
P-56	Corrected drawing to accurately reflect dimensions. Added notes 5, 6 and 7.
P-58	Revised notes, decreased shoulder width and slope, and added shoulder material.
P-59	Increased soil compaction requirement, decreased shoulder width and slope, and added shoulder material.
P-69	Adjusted curve radii and provided a varied left turn lanes.
P-70	Adjusted curve radii and provided a varied left turn lanes.
P-75	Relocated the location of the expressway barrier fence and adjusted curve radii.
P-85	Removed bump outs and added soil compaction requirements.
P-97	Changed dimensions of temporary ponding basins.
E-1	Added drawing references to notes in lieu of former text, clarified text and drawing details.
E-2	Added drawing references to notes, clarified text, changed PVC conduit to NM.
E-3	Added drawing references to notes, clarified text.
E-4	Deleted, replaced with new drawings E-4A, E-4B & E-4C.
E-5	Added note regarding “no splices in pull boxes”.
E-13	Deleted PVC loop drawing, replaced with bike loop detector drawing.
E-14	Add note and symbol for Bike Loop Detector.

E-15	Changed 2-pole branch circuit breakers to 1-pole.
E-17	Added "Note 2", corrected service conduit size.
E-18	Changed 2-pole branch circuit breakers to 1-pole.
E-19	Changed "Note 2".
E-20	Changed "Note 2", added Ped PB Post reference.
E-21	Changed "Note 3" to "Lock Jaw Locking Lid".
E-24A	Modified drawing for clarity.
E-26	Updated part numbers.
E-27	Modified conduit drawing for clarity.
E-28	Deleted, replaced with E-4C.
E-34A	Corrected text errors in "Caution" note, changed "752" discriminator to "762".
E-34B	Deleted "Curve 3 or Delay 22" requirement, added detector number labels.
E-34C	Removed jumpers from diagram, added lower input panel diagram.
E-35	Changed "Note 3".
E-36	Changed 2-pole branch circuit breakers to 1-pole.
ITS-18A	Added (Gooseneck) to Title Block
	Added, Camera Cat 5 – "Red Taped"
	Updated, access hole see note 1, replaced with text, "access hole see note 2"
	Deleted reference, "See note 1"
	Callout beginning with, Cat 5e, deleted, "and power cables". And inserted text after RED, "electrical waterproof."
	Deleted, "See Note 2", replaced with text, "See Note 1"

Deleted "Note 1", text.
(Numbered Notes re-numbered accordingly.)

Note 1, inserted text after RED, "electrical waterproof", the word RED shall be made bold.

Note 2, Replaced second sentence with, "Use rubber grommet to seal."

Note 3, Removed period and Added, "or as directed by City engineer."

Note 4, Added.

Note 5, Added.

Note 6, Added.

ITS-20A — Added, Note 4, 5 & 6.

Side View & Front view, deleted 1" and replaced text with ¾".

Side View & Front view, Added, "Grounding Clamp (Acorn) ½" x 8' copper clad."

Updated callout, to, *Pipe height shall be 2"-3" above foundation.

Updated callout, deleted text Communication and replaced with," HDPE"

Side view and Front view drawing, added, grounding rod.

ITS-21 — Note 5, deleted "with approved lug", and added, "per current NEC Standards."

Drawing: deleted "120v to Transformer", text, and transformer depiction.

ITS-21A — Sheet deleted – "Model 336 Communication Cabinet Wiring Diagram".

ITS-21B — Add Callout, "Fiber Optic Jumper"

Delete, callout, "Camera Power Assembly … Cable"

Add callout, 4' Cat5e Patch Cable"
Remove, Camera Power Assembly line drawing in its entirety.

ITS-22	Drawing: Added various callouts and expanded concrete foundation area. Added note 5, regarding foundation grounding.
ITS-23	Drawing: Added various callout notes and expanded concrete foundation area. 12" Concrete apron expanded to 48" around hub pedestal," 18" thick concrete foundation, 4"x4" #2 wire reinforced". Placement of round hand holes is 8.5" from hub pedestal within 48" concrete apron area. Added five numbered notes, regarding foundation construction.

The following City Standard Drawings are new as indicated below:

E-4A	Traffic Signals concrete pull boxes.
E-4B	Streetlights concrete pull boxes.
E-4C	Streetlights point of service concrete pull boxes.
E-37	332L Cabinet foundation.
ITS-18B	Traffic Signal Mounted IP Camera.
ITS-21C	336 Communication Cabinet Wiring Diagram, 1 of 2.
ITS-21D	Model 336 Communication Cabinet Power Distribution, 2 of 2.
ITS-28A	ITS Wireless Pole Repeater Installation (Powered through street light)
ITS-28B	ITS Wireless Pole Repeater Installation (Powered through service pedestal).
ITS-28C	Repeater Circuit Breaker
ITS-29A	ITS Hub Cabinet, I of 2
ITS-29B	ITS Hub Cabinet, Plate Anchor, 2 of 2

In addition to the standard drawings, changes that have been made to the Standard Specifications are as follows:

13-5	Changed "Seal Coat" to "Slurry Seal" and aggregate type and asphalt emulsion gradation.
16-6	New Section added, "Pave Back Requirements for City Streets".
16-7	Revised Section number for old Section 16-6
17-2.2.1	Changing Pipe Size from 18-48 to 18-60. ASTM F 679 now goes up to 60-inch.
	Changing Pipe Size from 21-54 to 18-60. ASTM F1803 has changed.
17-2.2.2	Added text "or pipe stiffness" to #3 regarding identification marks.
17-2.2.3 B	In paragraph 3 added the word "of" to make the sentence grammatically correct.
	In Property chart, row 5, replaced "o" with degree symbol. Typo error.
	In Property chart, row 7, replaced 70 with 72. Updated to match F477 ASTM Standard.
	In Property chart, row 7, replaced "o" with degree symbol. Typo error.
17-2.2.4	In paragraph A, removed D 3033. This standard no longer exists.
	In paragraph A, added F 1803. New ASTM standard
	In paragraph A, revised the word "manufacture" to "manufacturer" to correct a spelling error.
	In paragraph B, replaced "E" the degrees symbol for all temperature references. Typo error.
17-2.3.1	In paragraph 2, added degree symbol to 360. Was left out.
17-2.3.2	Added "or C-655" as an option for ASTM reinforced concrete pipe.
17-2.4	Removed the word "State" from State Standard. This is not a state standard.

17-7 In paragraph 2, changed the word "providing" to "provided". Fixing grammatical error.

In paragraph 2, deleted the last sentence "New connections must comply with drawing S-1, S-8, and 2-9." This sentence is covered in paragraph 1 of this section.

17-8.1 Change "Standard Drawings S-2 through S-5" to "Standard Drawings S-2 through S-4". S-5 doesn't apply.
Change "slope 1:12" to "slope minimum 1:12". Makes it consistent with call out in the sewer drawing.

17-8.2 Changed paragraph 4 to read "Manholes shall not be installed in flow channels of gutters, or in depressions subject to storm waters or other infiltration, sidewalks, roundabouts, brick crosswalks or have any brick surrounding the manhole cover." To avoid damage to existing structures.

17-8.3 In paragraph 1, remove "Class II" from sentence. No longer referenced in the City Standard.

In paragraph 4, change "Class II" to "6 sack" to better define concrete requirements.

Add paragraph 5, which reads: "Unless specified otherwise, manholes on sewer mains 12 inches in diameter or larger, or on any size sewer mains within 600 feet of and connected to sewer mains 30 inches in diameter or larger shall be lined with T-lock or coated with one of the following: Raven 400 or Raven 405, products of RLS Solutions; Neopoxy 5300 series, products of Neopoxy International; or Quadex Structure Guard, a product of Quadex." The coating will aid in protecting the manhole from corrosion.
Add paragraph 6, which reads: "Approved products shall be applied per manufacturer's specifications. No substitutions are acceptable." To ensure proper installation.

17-8.4 In paragraph 2, removed "size and" from sentence 2, to make it consistent with Standard Drawing S-12.

In paragraph 4, added sentence "When connecting to the existing stub-outs and the plug is removed, a new square cut shall be done to the existing stub-out prior to connection on the new sewer main." To ensure a smooth transition and eliminate build-up.

17-8.5 Changed section title from "Removal" to "Abandon and Removal". This section now covers manholes being abandoned and removed.

17-9 Revised thimble to stub. Added sentence, "When connecting to the existing stubs and the plug is removed, a new square circumferentially cut shall be done to the existing stub prior to connection on the new sewer main." To ensure a smooth transition and eliminate build-up.

17-12 Added 2 new requirements, numbered 3 and 4. To ensure adequate video inspection and assure proper installation.

Requirements 3 through 13 changed to 5 through 15.

Requirement 7 (now 9), added "to identify any rolled gasket in" to the sentence for clarification.

In paragraph 1, changed "is" to "will be" to correct grammatical error.

Change hourly pricing from $135.39 to $134.39

23-1.1 Paragraph 2: Delete "latest edition" reference.

23-1.5 Paragraph 1 added, requiring the continued operation of existing systems.

23-1.7 Paragraph 2: Remove first sentence regarding use of Portland Cement Concrete

Paragraph 5: Add text "in pole foundations".

Paragraph 6: added 3rd sentence restricting cabinet modification.

Paragraph 11: added "as shown in Dwg. E-37"

23-1.9 Paragraph 2: Clarified use of PVC conduit.

Paragraph 6: Clarified bonding bushings shall have integral lay-in lugs

Paragraph 8: Added sentence regarding conduits not placed under sidewalk and that they will be encase in slurry.

Paragraph 10: Add note, "No 90° elbows shall be installed unless specified or approved.

23-1.10	Paragraph 4: Clarify PG&E lid requirement. Deleted Fyberlite pull box lids. Paragraph 6: Clarify concrete collar depth.
23-1.11	Paragraph 8: Detailed pushbutton conductor installation . Paragraph 10: Clarified "stranded" wire and tinning of loose strands. Paragraph 11: Clarified AMP/TYCO 320359 terminals for load bay only. Paragraph 12: Deleted AMP/TYCO terminal usage on input terminal blocks. Deleted coaxial cable references.
23-1.12	Moved fuses from hand hole to luminaire.
23-1.13	Paragraph 3: Clarified use of proper ring terminal for stranded ground wire.
23-1.15	Paragraph 2: Added "when allowed".
23-1.18	Paragraph 9: "When allowed" reused pedestrian signals shall have an LED ... Deleted obsolete reference to medium base lamp socket. Deleted obsolete LED power consumption and arrangement references.
23-1.19	Paragraph 1: Noted; Detectors shall "be supplied by an approved manufacturer and"... Deleted obsolete reference to encased loop wire. Paragraph 3: Clarified DLC "IMSA spec. 50-2" requirement. Paragraph 4: Detailed DLC drain wire termination.
23-1.20	Paragraph 2: Updated; Pedestrian pushbuttons shall meet or exceed "the 2010" ADA req. Paragraph 6: DLC connection to pushbutton.
23-1.21	Updated audible Pedestrian Signal specs, deleted obsolete text.

23-1.22	Paragraph 3: Deleted green monitor requirement. Paragraph 8: Detailed detector mounting requirements. Paragraph 9: Changed phase selector type from 752 to 762 or equiv.
23-1.23	Paragraph 1,2,3: Changed luminaire from HPS to LED. Moved fuse location from the hand hole to the luminaire, added luminaire internal fuse requirement. Paragraph 6: Added reference to DWG. E-25, noted adhesive backed numbers shall be Almetek PS-2.5 or equivalent, pole numbers shall be shown on "as-built" plans.
23-1.25	Added Note "2", requiring pre-inspection one day prior to turn-on.
23-1.26	added Manual of Traffic Control "Caltrans adopted" notations.
23-2	Deleted references to Model 170E controllers and 332A controller cabinets. Listed required modifications per Dwgs. E-34A, E-34B and required equipment and quantities. Changed approved controller manufacturer to Naztec 2070L.
23-3.5	Add paragraph 1 requiring existing systems to remain operational.
23-3.7	Paragraph 3: Noted all dirt and debris to be cleaned before pouring concrete.
23-3.8	Paragraph 2: Specified all hand hole covers must be steel. Paragraph 6: Added reference to DWG. E-25, noted adhesive backed numbers shall be Almetek PS-2.5 or equivalent, pole numbers shall be shown on "as-built" plans.
23-3.9	Paragraph 6: Clarified bonding bushings shall have integral lay-in lugs. Paragraph 13: Added note pertaining to conduit entry in bottom of pull boxes in non-concrete areas. Deleted PVC bushing requirement.
23-3.10	Paragraph 3: Updated locking lid specifications. Paragraph 6: Changed conduit bottom entry specifications for pull boxes in non-concrete areas.

23-3.12	Relocated fuse from hand hole to luminaire, specified fuse holder.
23-3.16	Changed luminaire from HPS to LED, specified internal fuse. Added reference to DWG. E-25, noted adhesive backed numbers shall be Almetek PS-2.5 or equivalent, pole numbers shall be shown on "as-built" plans.
23-3.17	Paragraph 2: Added "long life" to PEC spec.
23-4	Added Ornamental Street Lighting specifications.
28-3	Specified minimum application of a slurry seal application when removing pavement markings.
30	Deleted section, incorporated into section 23.
31-9	Added, 18 fiber optic holding racks
	Deleted, "steps to climb down into the vault for maintenance"
	Added, conduits shall extend minimum 6", 8" maximum, beyond the inner wall of any vault or structure
	Deleted, "pull box" added vault
31-10	Added, 18 fiber optic holding racks
	Deleted, "steps to climb down into the vault for maintenance"
	Added, conduits shall extend minimum 6", 8" maximum, beyond the inner wall of any vault or structure
	Deleted, "pull box" added "vault"
31-11	Added, conduit shall be certified by the manufacturer with a Letter of Certification documenting that the conduit meets the performance requirements and material requirements of ASTM F2160. Communication conduit shall be marked with the ASTM F2160 designation. In the event of a discrepancy between these specifications and ASTM F2160, the requirements of ASTM F2160 shall govern.
	Added, one conduit shall be installed with a tonable pull tape.

The following City Standard Specifications are new as indicated below:

35-1	General
35-2	Sewer Crossings
35-3	Recycled Water Crossings

Reviewed and Approved:

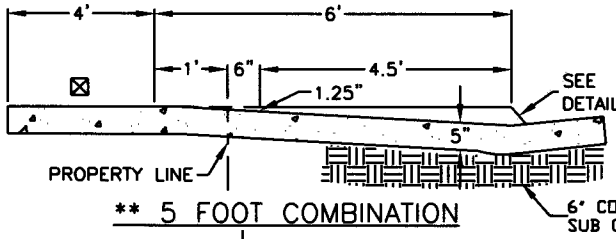
Andrew Benelli, P.E.
City Engineer

June 25, 2015
Date

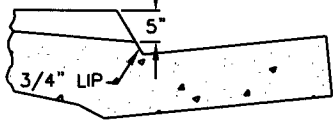
Scott Mozier, P.E.
Public Works Director

June 25, 2015
Date

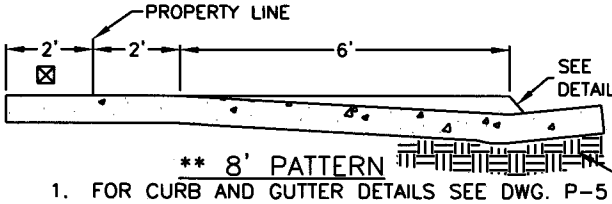
DENOTES UNOBSTRUCTED ONSITE PEDESTRIAN LANDING AREA PER A.D.A. REQUIREMENTS
PEDESTRIAN EASEMENT REQUIRED



** 5 FOOT COMBINATION

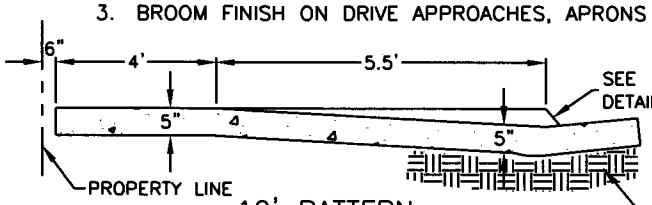


DETAIL "A"



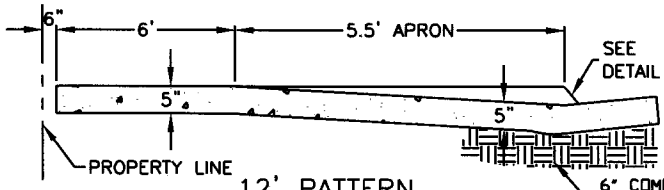
** 8' PATTERN

1. FOR CURB AND GUTTER DETAILS SEE DWG. P-5
2. ** 5' AND 8' PATTERNS ARE FOR USE ON RETROFITS AND/OR WITH APPROVAL OF THE CITY ENGINEER.
3. BROOM FINISH ON DRIVE APPROACHES, APRONS

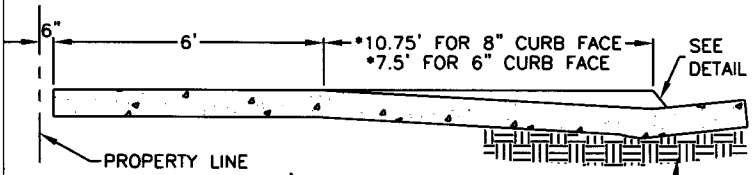


10' PATTERN

NOTE: CONSTRUCT WEAKENED PLANE JOINT ON CENTERLINE WHEN WIDTH IS 10 FEET OR GREATER.



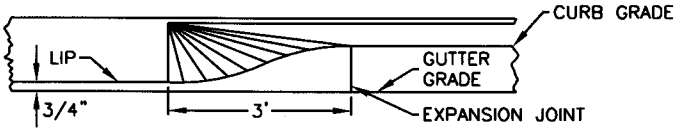
12' PATTERN



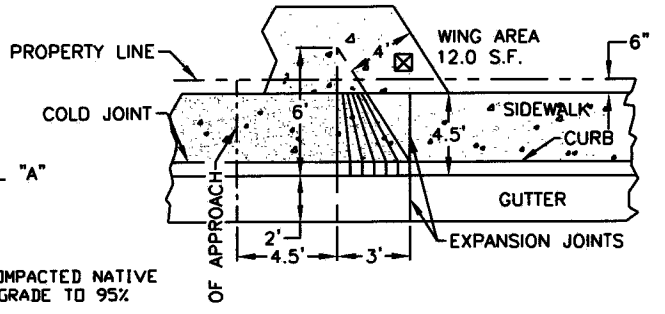
14' PATTERN

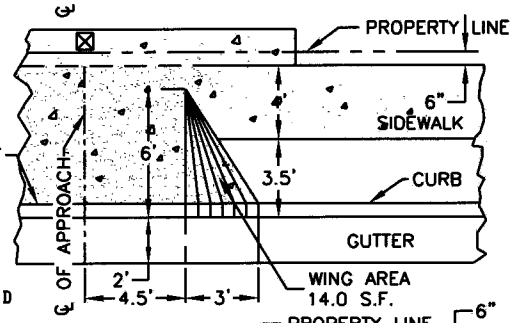
NOTE: DRIVEWAY APPROACH THICKNESS SHALL BE 6" WHEN USAGE IS OTHER THAN WITH NORMAL PASSENGER VEHICLES.

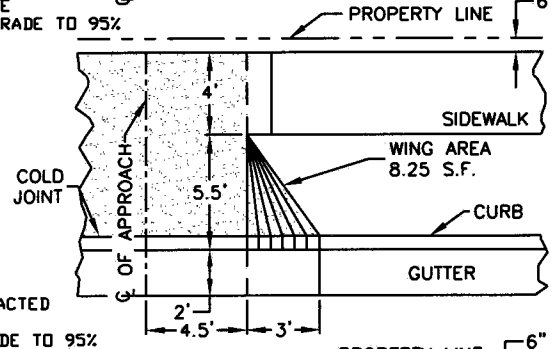
* MINIMUM LENGTH OF APRON

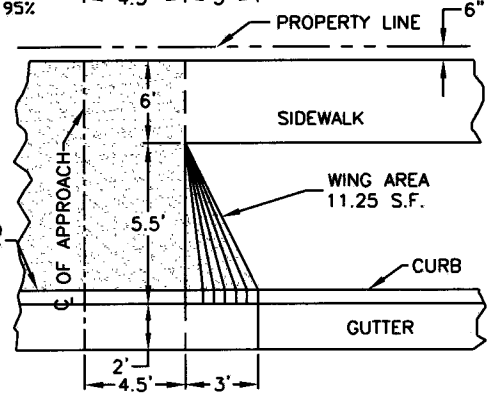


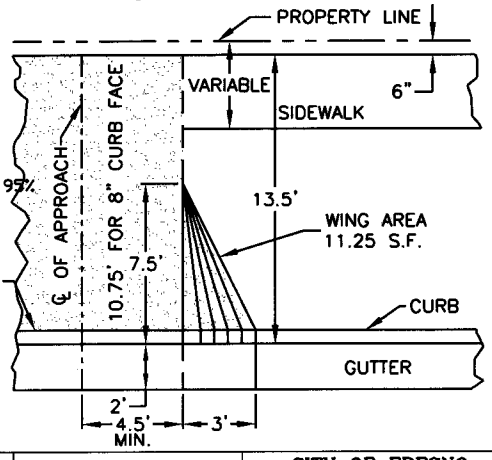
ELEVATION











RESIDENTIAL DRIVEWAY APPROACHES

FOR 14' - 12' - 10' - 8' PATTERN AND FOR 5' COMBINATION

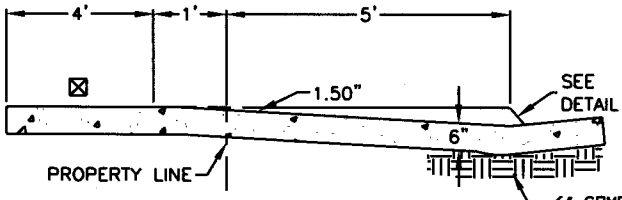
REF. & REV. JUNE 2015

CITY OF FRESNO

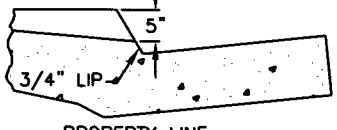
P-1

DENOTES UNOBSTRUCTED ONSITE PEDESTRIAN LANDING AREA PER A.D.A. REQUIREMENTS

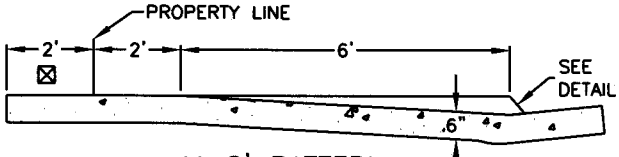
PEDESTRIAN EASEMENT REQUIRED



** 5 FOOT COMBINATION

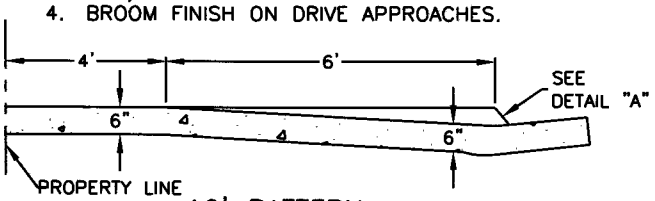


DETAIL "A"



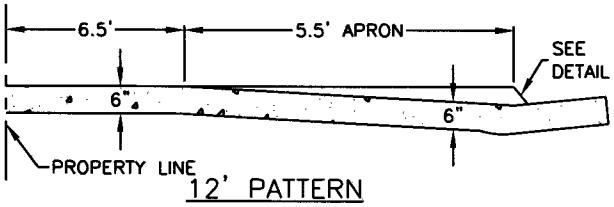
** 8' PATTERN

1. FOR CURB AND GUTTER DETAILS SEE DWG. P-5
2. CONCRETE SHALL BE 6 SACK MIX.
3. ** 5' AND 8' PATTERNS ARE FOR USE ON RETROFITS AND/OR WITH APPROVAL OF THE CITY ENGINEER.
4. BROOM FINISH ON DRIVE APPROACHES.

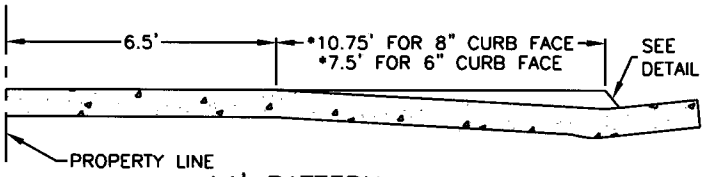


10' PATTERN

NOTE: CONSTRUCT WEAKENED PLANE JOINT ON CENTERLINE WHEN WIDTH IS 10 FEET OR GREATER.



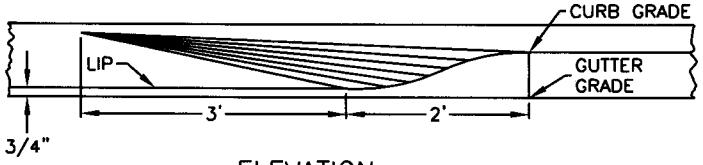
12' PATTERN



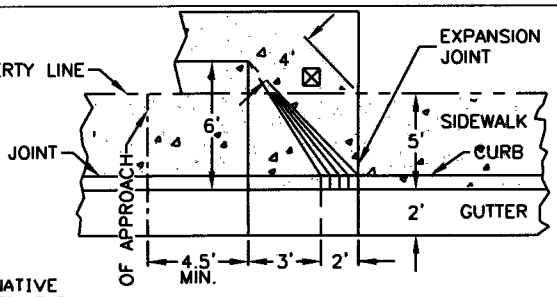
14' PATTERN

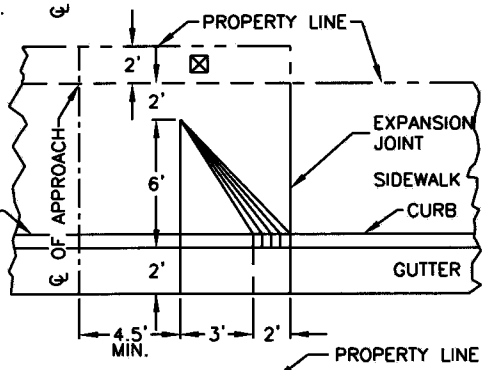
NOTE: APRON MAY BE EXTENDED TO THE NEAREST SCORE LINE GREATER THAN THE MINIMUM DISTANCE FROM THE CURB. MAXIMUM APRON SLOPE IS 7.5%.

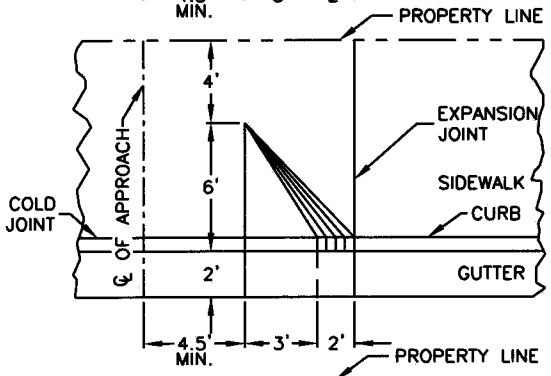
* MINIMUM LENGTH OF APRON

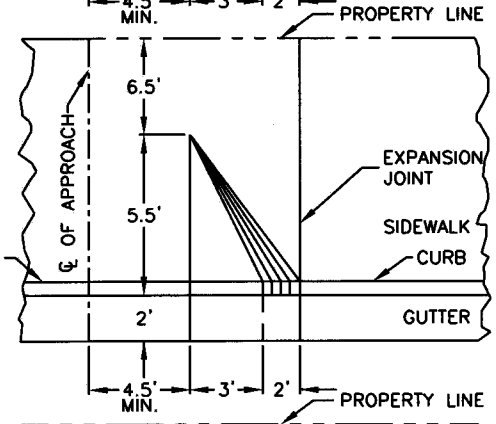


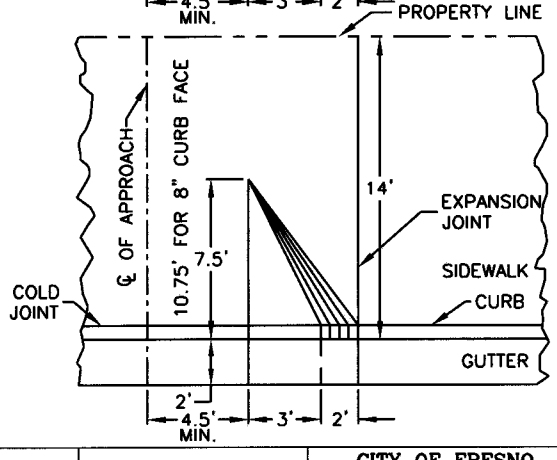
ELEVATION











COMMERCIAL DRIVEWAY APPROACHES

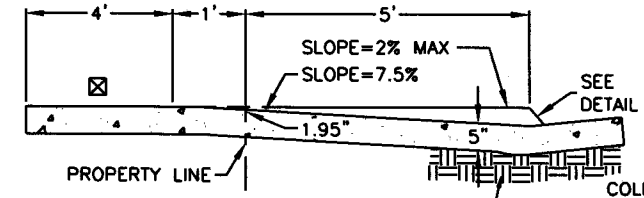
FOR 14' - 12' - 10' - 8' PATTERN AND FOR 5' COMBINATION

REF. & REV. JUNE 2015

CITY OF FRESNO

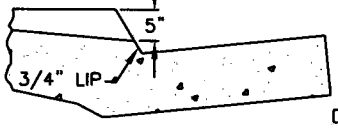
P-2

DENOTES UNOBSTRUCTED ONSITE PEDESTRIAN LANDING AREA PER A.D.A. REQUIREMENTS
PEDESTRIAN EASEMENT REQUIRED

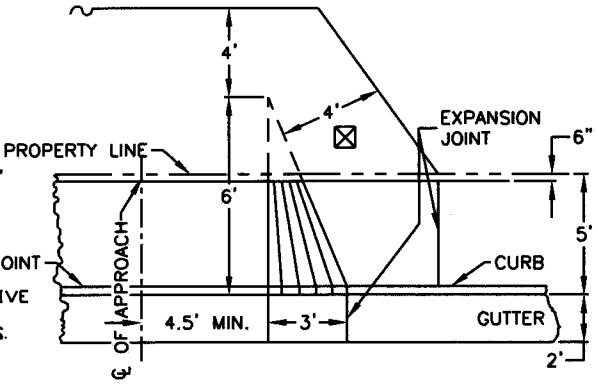


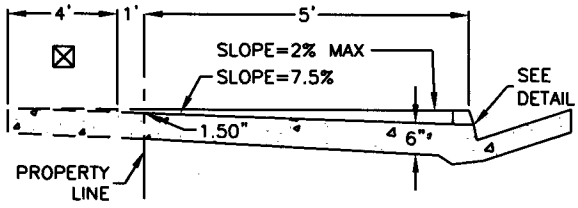
** RESIDENTIAL 5' COMBINATION

6" COMPACTED NATIVE SUBGRADE TO 95%, TYP. ALL PATTERNS.

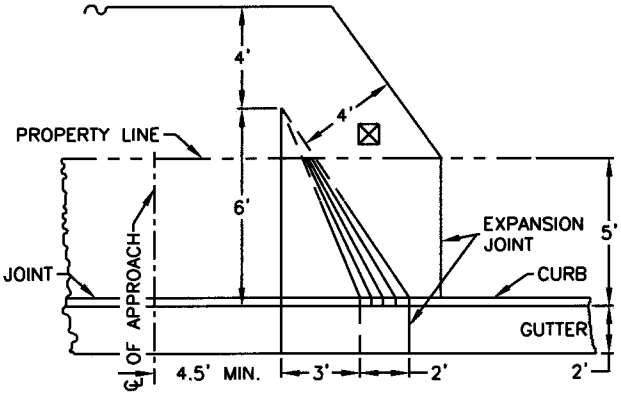


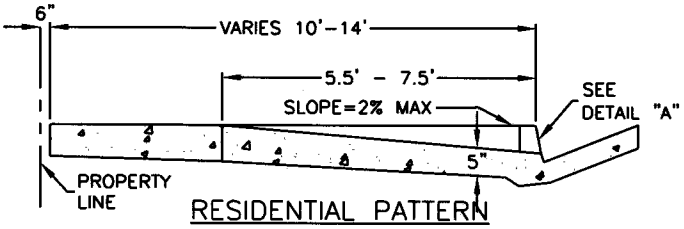
DETAIL "A"
FOR CURB & GUTTER DETAILS, SEE CITY STD. P-5



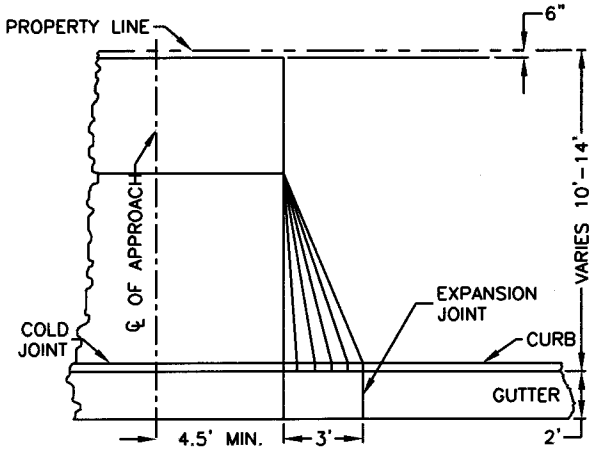


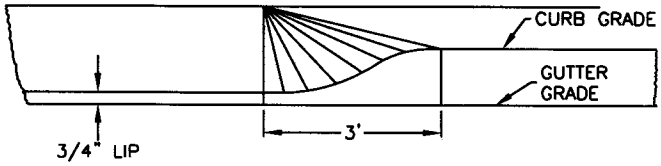
** COMMERCIAL 5' COMBINATION

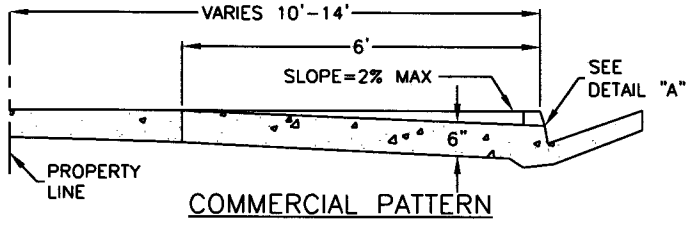




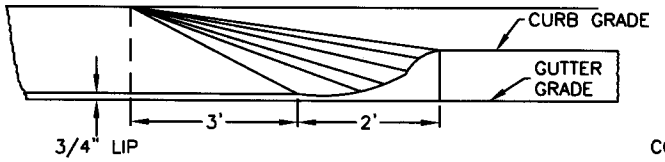
RESIDENTIAL PATTERN

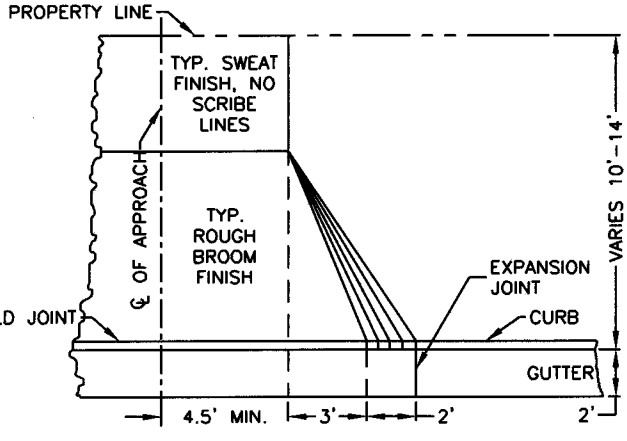






COMMERCIAL PATTERN





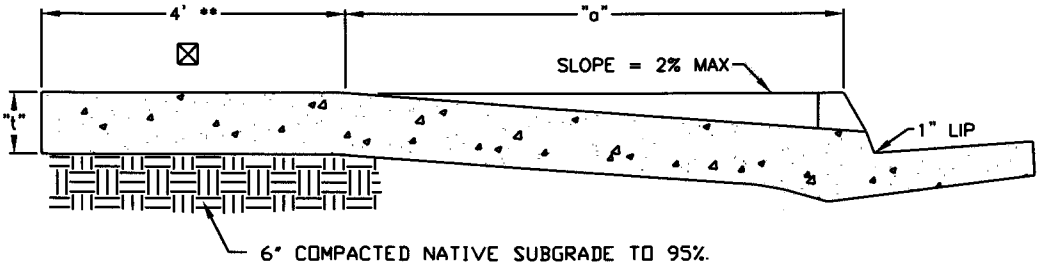
NOTE: WHERE STANDARD WALK IS NOT REQUIRED BY ORDINANCE OR WHERE WALK HAS BEEN WAIVED.
** 5' PATTERNS ARE FOR USE ON RETROFITS AND/OR WITH APPROVAL OF THE CITY ENGINEER.

DRIVEWAY APPROACHES
FOR VARIOUS CURB PATTERNS

REF. & REV.
JUNE 2015

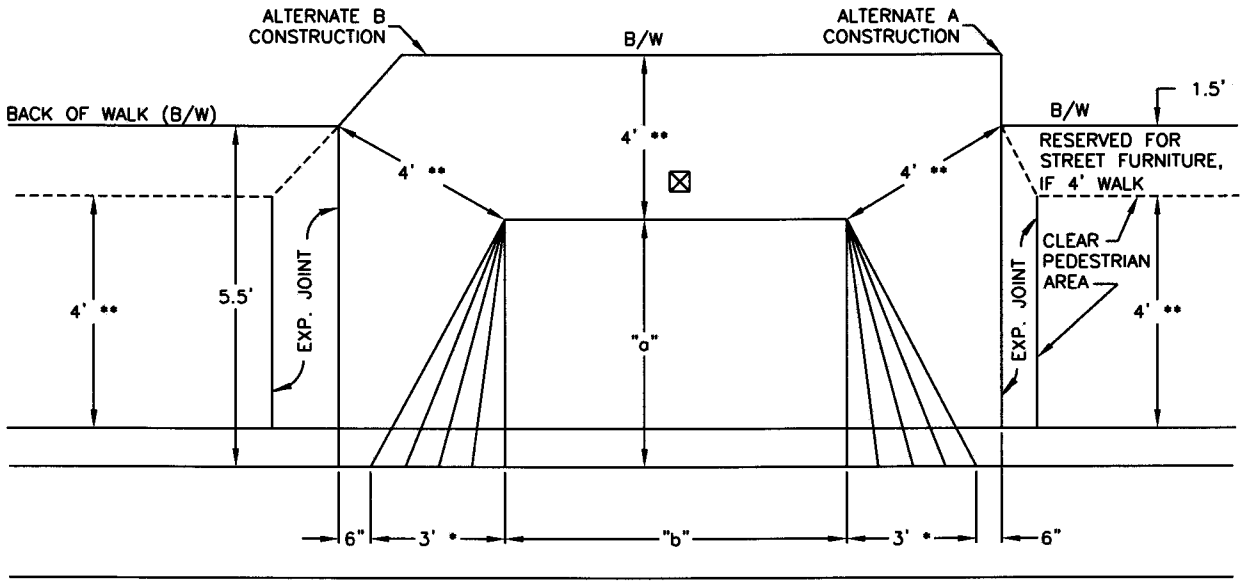
CITY OF FRESNO
P-3

⊠ = DENOTES UNOBSTRUCTED ONSITE PEDESTRIAN LANDING AREA REQUIRED IN ACCORDANCE WITH A.D.A. A PUBLIC PEDESTRIAN EASEMENT SHALL BE DEDICATED IF 4' SIDEWALK EXTENDS INTO PRIVATE PROPERTY.



"a" = 3.75' FOR 1 OR 2 DWELLING UNITS
"a" = 4.75' FOR MULTIFAMILY, OFFICE, AND COMMERCIAL WITH UP TO 10 PARKING SPACES.
"a" = 5.75' FOR MULTIFAMILY, OFFICE, AND COMMERCIAL WITH MORE THAN 10 PARKING SPACES.
"t" = RESIDENTIAL EQUALS 5", COMMERCIAL USE EQUALS 6".

"b" = 9', SINGLE FAMILY RESIDENTIAL D.W.
"b" = 12', ONE WAY EXIT
"b" = 15', ONE WAY ENTRANCE
"b" = 22', TWO WAY D.W.

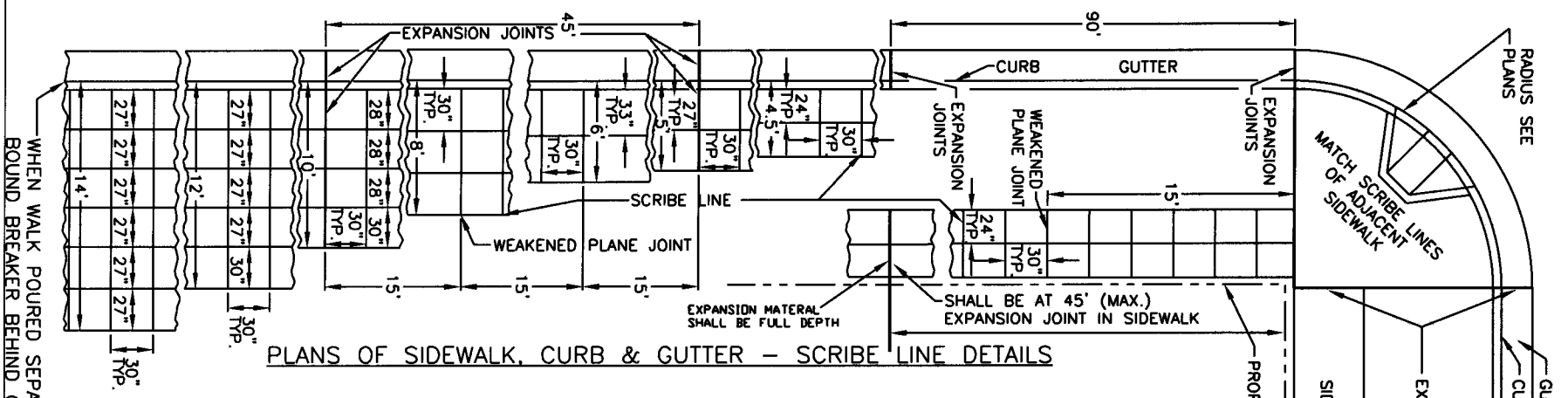


*5' FLARE IF ON STREET PARKING IS PROHIBITED.

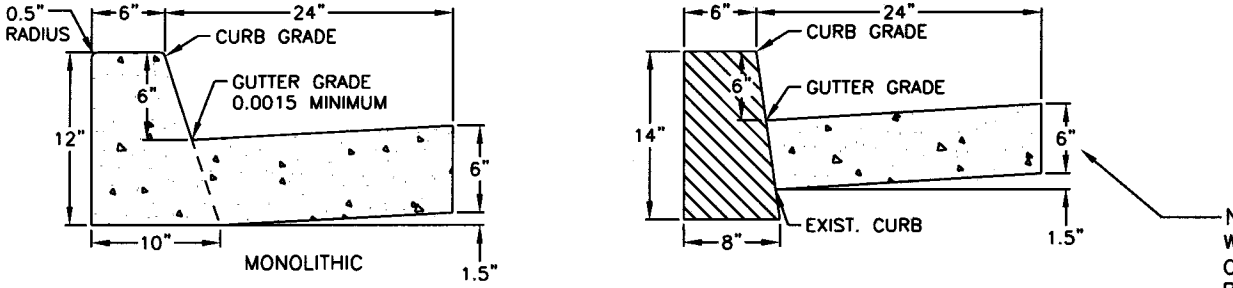
**SIDEWALK WIDTH, 4.0' MINIMUM, FOR ADA REQUIREMENTS, CROSS SLOPE NOT TO EXCEED 2%. SIDEWALK CAN BE CONSTRUCTED IN ACCORDANCE WITH ALTERNATES (A) OR (B) ABOVE OR AS APPROVED BY THE CITY.

LOCAL STREET DRIVEWAY APPROACHES FOR MONOLITHIC SIDEWALKS	REF. & REV. JUNE 2015	CITY OF FRESNO P-4

CONSTRUCTION DETAILS
FOR CONCRETE SIDEWALK, CURB & GUTTER



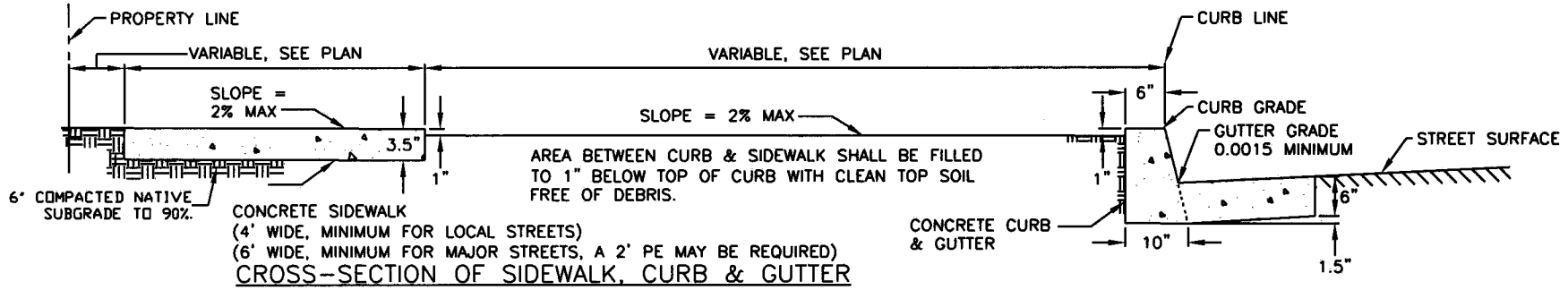
PLANS OF SIDEWALK, CURB & GUTTER – SCRIBE LINE DETAILS



SECTIONS OF CURB & GUTTER

NOTE:
WHEN REQUIRED BY THE ENGINEER THE CONTRACTOR SHALL FILL AND/OR GRADE AREA BETWEEN NEW GUTTER AND EXISTING STREET SURFACE WITH A.C. SURFACING TO A MIN. DEPTH OF 4" TO MEET EXISTING STREET SURFACING. COMPACTION SHALL BE MADE TO THE SATISFACTION OF THE ENGINEER. CLEAN FACE OF EXIST CURB BEFORE POURING CONCRETE GUTTER.

NOTE:
WHERE SIDEWALK IS NOT CONSTRUCTED, CUT OR FILL FROM 1" BELOW TOP OF CURB TO PROPERTY LINE AT A SLOPE OF 1/4" PER FOOT. A STEEPER SLOPE OF UP TO 10% MAY BE USED IN EXISTING RESIDENTIAL NEIGHBORHOODS WHERE (1) THE CONSTRUCTION OF SIDEWALK IS NOT EXPECTED IN THE FUTURE, (2) THE STEEPER SLOPE IS COMPATIBLE WITH THE ADJACENT PROPERTY, AND (3) THE STEEPER SLOPE WILL ELIMINATE THE NEED FOR A RETAINING WALL. SLOPES IN EXCESS OF 10% MAY BE APPROVED BY THE PUBLIC WORKS DIRECTOR ON A CASE-BY-CASE BASIS. 4' MINIMUM SIDEWALK FOR LOCAL STREETS AND 6' MINIMUM SIDEWALK FOR MAJOR STREETS.



CROSS-SECTION OF SIDEWALK, CURB & GUTTER

REF. & REV. JUNE 2015

CITY OF FRESNO

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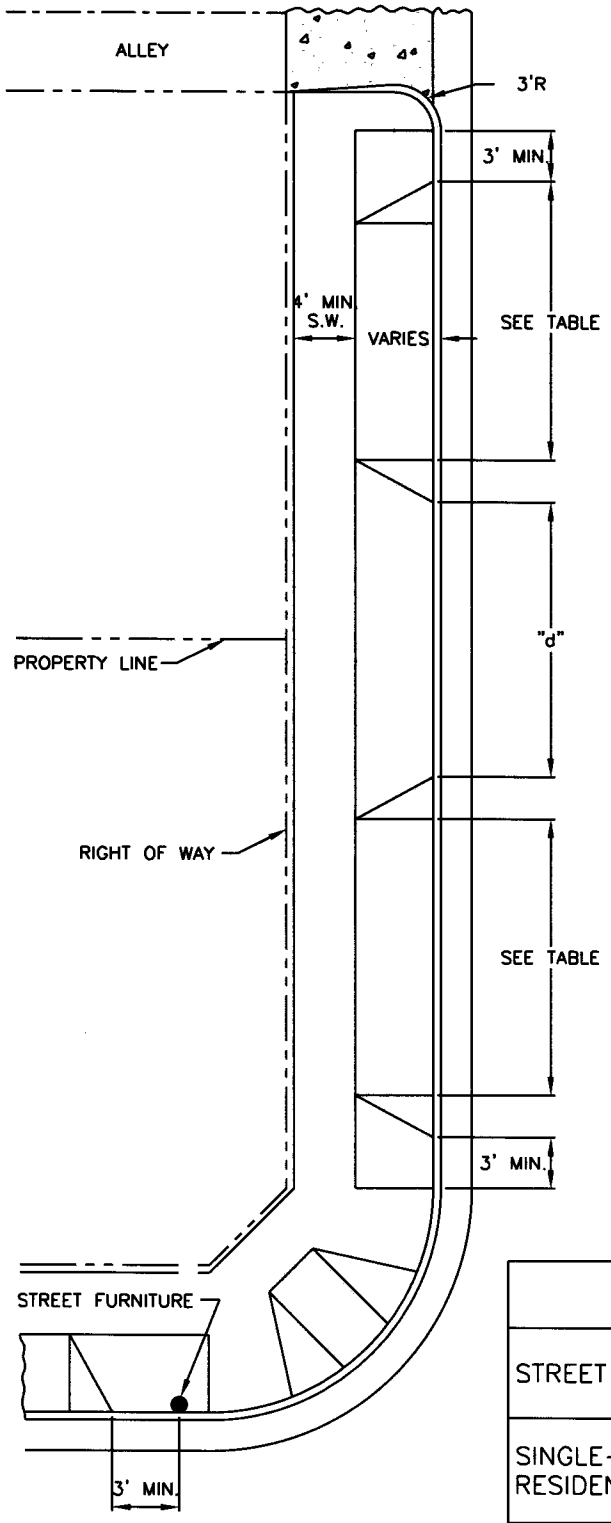

NOTES:

1. NO MORE THAN 60% OF STREET FRONTAGE SHALL BE CONSTRUCTED AS DRIVEWAY OPENINGS.
2. "d" = 6' MINIMUM AND LESS THAN 12' OR GREATER THAN 20'.
3. THE TRAFFIC ENGINEER MAY APPROVE >35', <40'.
4. IN COMMERCIAL, INDUSTRIAL, AND MULTI-FAMILY DEVELOPMENTS, CITY ENGINEER MAY APPROVE ≥40'.
5. MAJOR STREETS: PROVIDE 10' OF RED CURBING (3 COATS) ON BOTH SIDES OF DRIVEWAY APPROACHES.
6. FOR COMMERCIAL, INDUSTRIAL OR MULTI-FAMILY: 16' MIN.
7. ANY DRIVEWAY APPROACHES ON MAJOR STREET WITHIN 300' OF MAJOR INTERSECTIONS REQUIRE THE APPROVAL OF THE TRAFFIC ENGINEER. THE TRAFFIC ENGINEER MAY APPROVE ONE DRIVEWAY APPROACH WITHIN THAT ENTIRE LENGTH. ADDITIONAL DRIVEWAY APPROACHES REQUIRE THE REVIEW AND APPROVAL OF THE CITY ENGINEER.

DRIVEWAY OPENING

	MINIMUM		MAXIMUM	
STREET TYPE	MAJOR STREET	LOCAL STREET	MAJOR STREET	LOCAL STREET
SINGLE-FAMILY RESIDENTIAL DRIVE	18'	12'	24' ③	35'
ALL OTHER TWO-WAY	30'	24'	35' ④	35'
ONE-WAY ENTRANCE	18'	15' ⑥	24'	24'
ONE-WAY EXIT	12' ⑥	12' ⑥	24'	24'

DRIVEWAY OPENING AND CLEARANCE REQUIREMENTS

REF. & REV. JUNE 2015

CITY OF FRESNO

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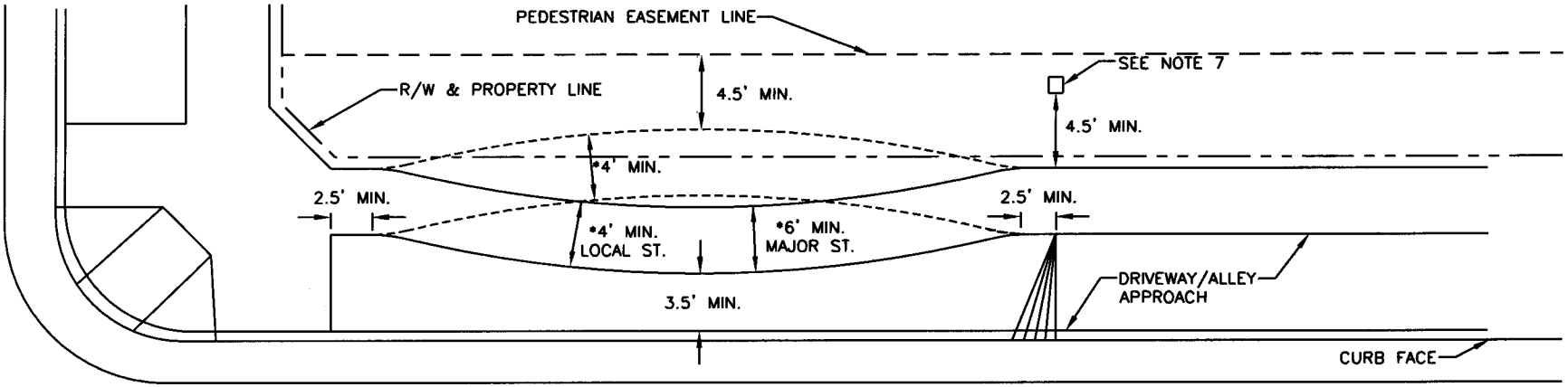
CURVILINEAR SIDEWALK



NOTES:

1. PRECISE DATA SHALL BE PROVIDED TO STAKE THE ALIGNMENT AND SET APPROPRIATE GRADES.
2. SIDEWALK CONSTRUCTION SHALL CONFORM TO CITY STANDARD SPECIFICATIONS.
3. SIDEWALK WIDTH SHALL NOT VARY, EXCEPT WHERE APPROVED BY THE CITY ENGINEER; MINIMUM WIDTH SHALL BE 4' (6' ON MAJOR STREETS).
4. LANDINGS AND DIRECT ACCESS TO THE CURVILINEAR SIDEWALK SHALL BE PROVIDED TO EXISTING AND PROPOSED BUS STOP ZONES (INCLUDING SHELTERS AND BENCHES).
5. SIDEWALK LOCATION AT DRIVEWAY AND ALLEY APPROACHES AND AT LANDINGS AT STREET INTERSECTIONS SHALL BE ADJACENT TO THE PROPERTY LINE (STANDARD LOCATION, IN STREET R/W).
6. AT STREET INTERSECTION LANDINGS THE CURVILINEAR PATTERN SHALL COMMENCE AFTER A MINIMUM 2.5' LONG STANDARD SECTION OF SIDEWALK (ALIGNED PERPENDICULAR TO THE STANDARD LANDING AREA); THE WIDTH OF THE 2.5' LONG SECTION SHALL COINCIDE WITH THE ESTABLISHED CURVILINEAR SIDEWALK WIDTH.
7. SIDEWALK SHALL NOT BE CLOSER THAN 3.5' TO THE CURB FACE AND 4.5' TO ON-SITE PARKING LOT, STRUCTURES AND OTHER ITEMS WHICH MAY BE DETRIMENTAL TO PUBLIC SAFETY AND AESTHETIC VALUE.
8. ALL SIDEWALKS OUTSIDE THE PUBLIC RIGHT-OF-WAY SHALL BE IN RECORDED PEDESTRIAN EASEMENTS.
9. AT STREET INTERSECTIONS, SIDEWALK LOCATION SHALL BE INCORPORATED INTO THE DESIGN FOR PROPOSED HANDICAP RAMPS.
10. MINIMUM RADIUS 150'.

REF. & REV.
JUNE 2015

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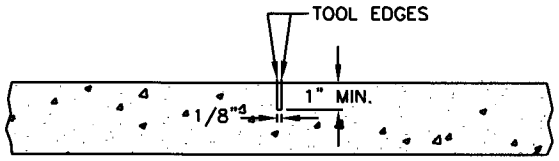
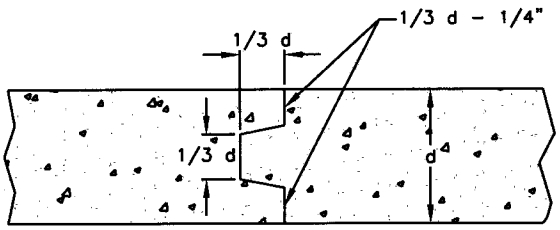
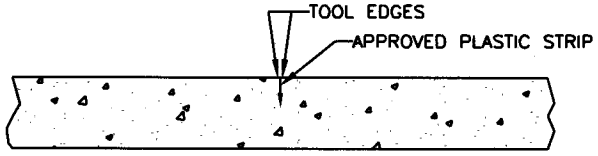


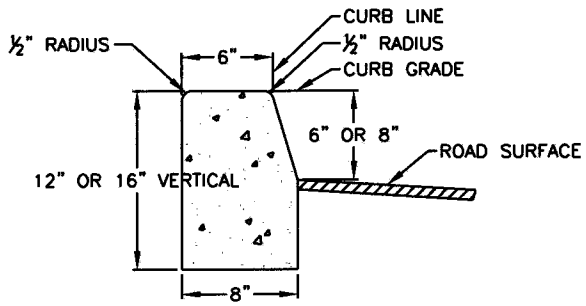
WEAKENED PLANE JOINT DETAILS



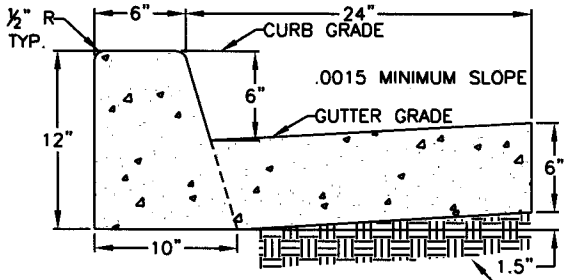
CONSTRUCTION JOINT DETAILS



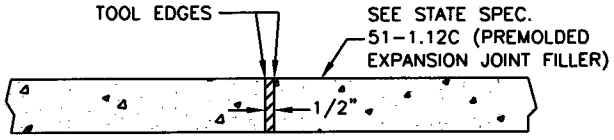
ALTERNATE DESIGN WEAKENED PLANE JOINT



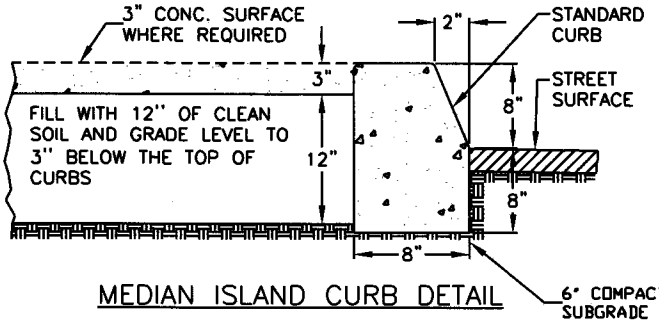
CROSS – SECTION OF CURB



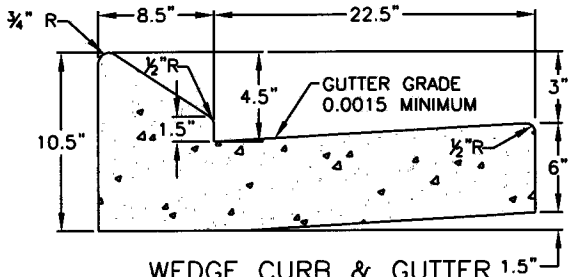
CROSS – SECTION OF MONOLITHIC CURB AND GUTTER



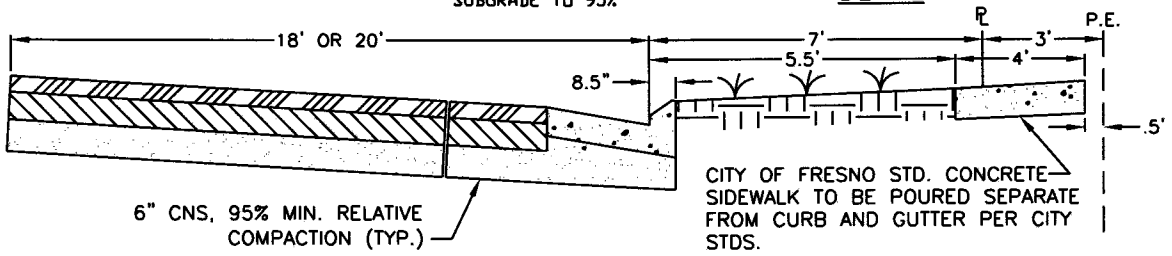
EXPANSION JOINT DETAIL



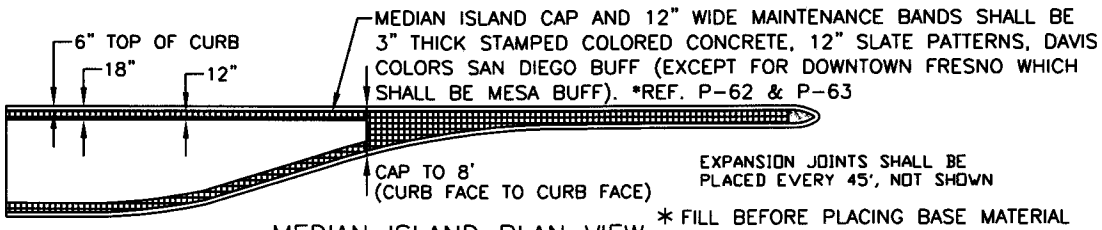
MEDIAN ISLAND CURB DETAIL



WEDGE CURB & GUTTER DETAIL



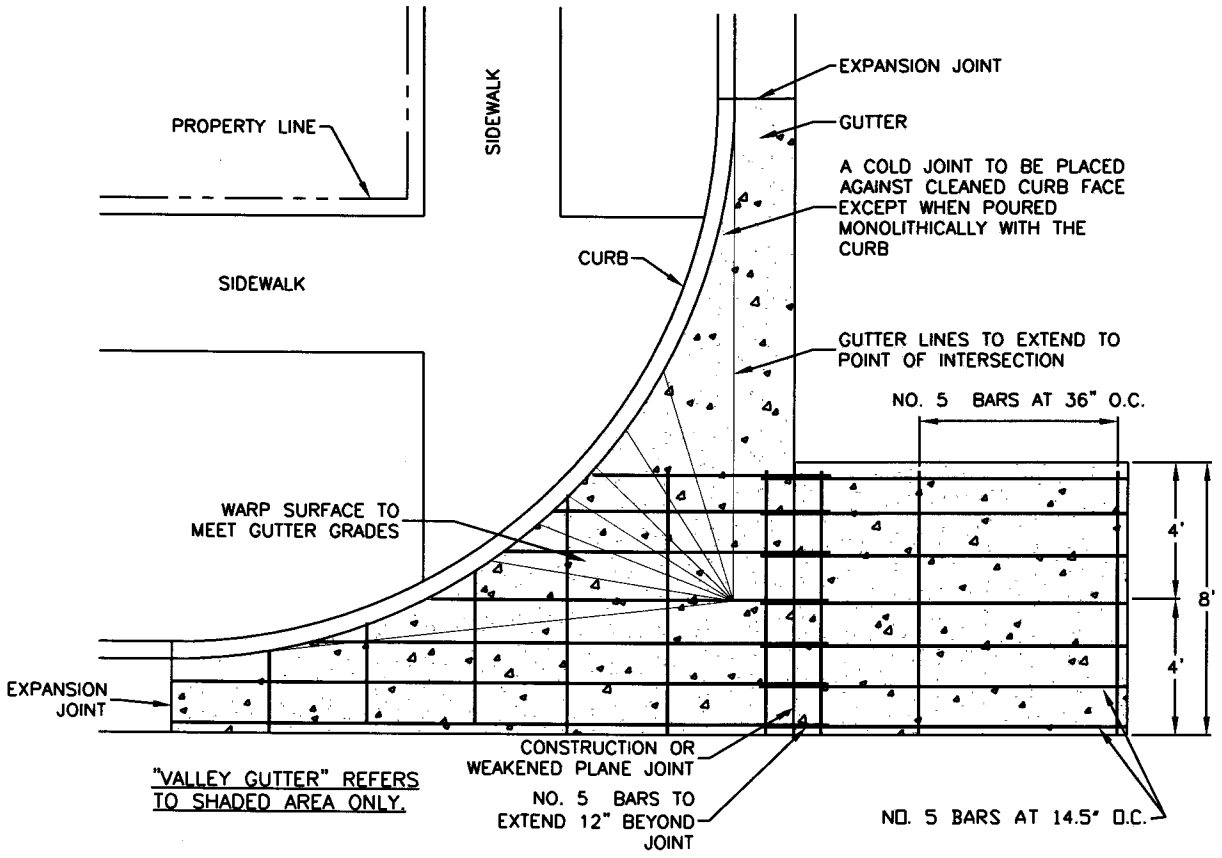
1/2 RESIDENTIAL STREET WITH WEDGE CURBS



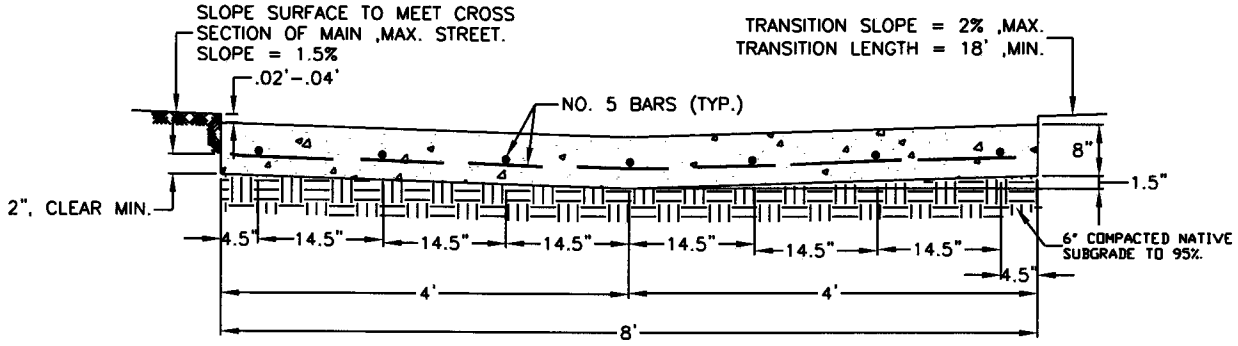
MEDIAN ISLAND PLAN VIEW

* FILL BEFORE PLACING BASE MATERIAL OR COMPACTING IN THE TRAVELED WAY

CONCRETE CONSTRUCTION DETAILS	REF. & REV. JUNE 2015	CITY OF FRESNO P–9



PLAN

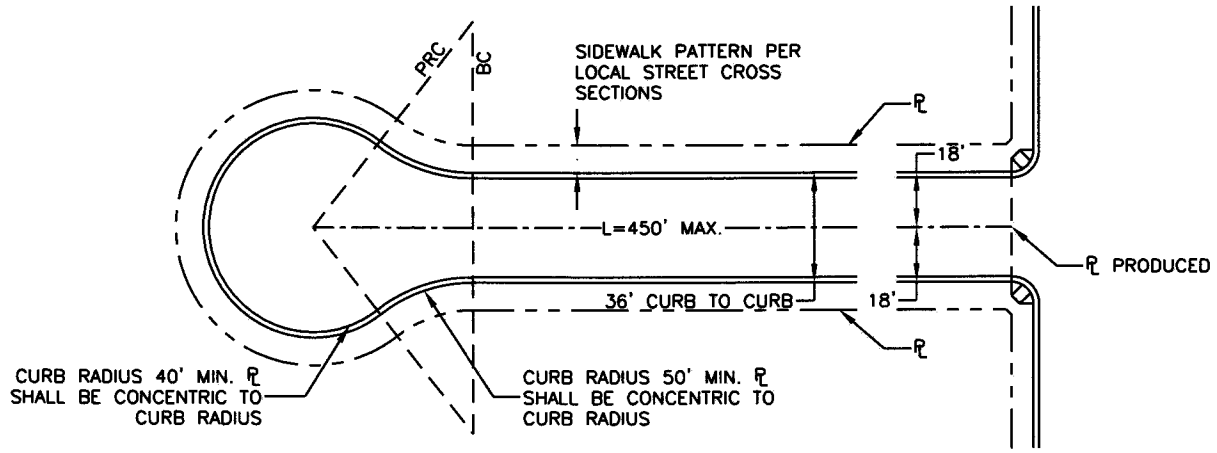


NOTES:

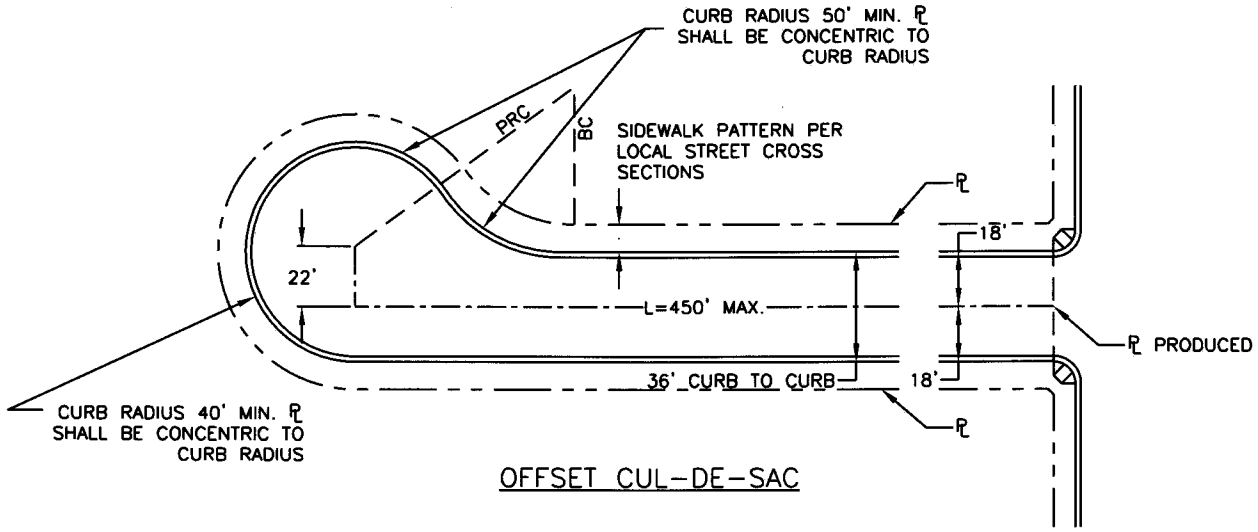
1. IN NEW CONSTRUCTION AREAS, VALLEY GUTTERS SHALL BE DESIGNED TO PROVIDE A MINIMUM DIFFERENCE OF THIRTY-FIVE HUNDREDTHS OF A FOOT (.35') FROM END OF RETURN TO END OF RETURN.
2. ALL VALLEY GUTTERS SHALL BE CONSTRUCTED USING 6 SACK CLASS A CONCRETE PER STD. SPECIFICATIONS 14-2

SECTION OF GUTTER

CONCRETE VALLEY GUTTER	REF. & REV. JUNE 2015	CITY OF FRESNO P-10



CENTERED CUL-DE-SAC



OFFSET CUL-DE-SAC

STANDARD CUL-DE-SAC
FOR LOCAL RESIDENTIAL STREETS

REF. & REV.
JUNE 2015

CITY OF FRESNO

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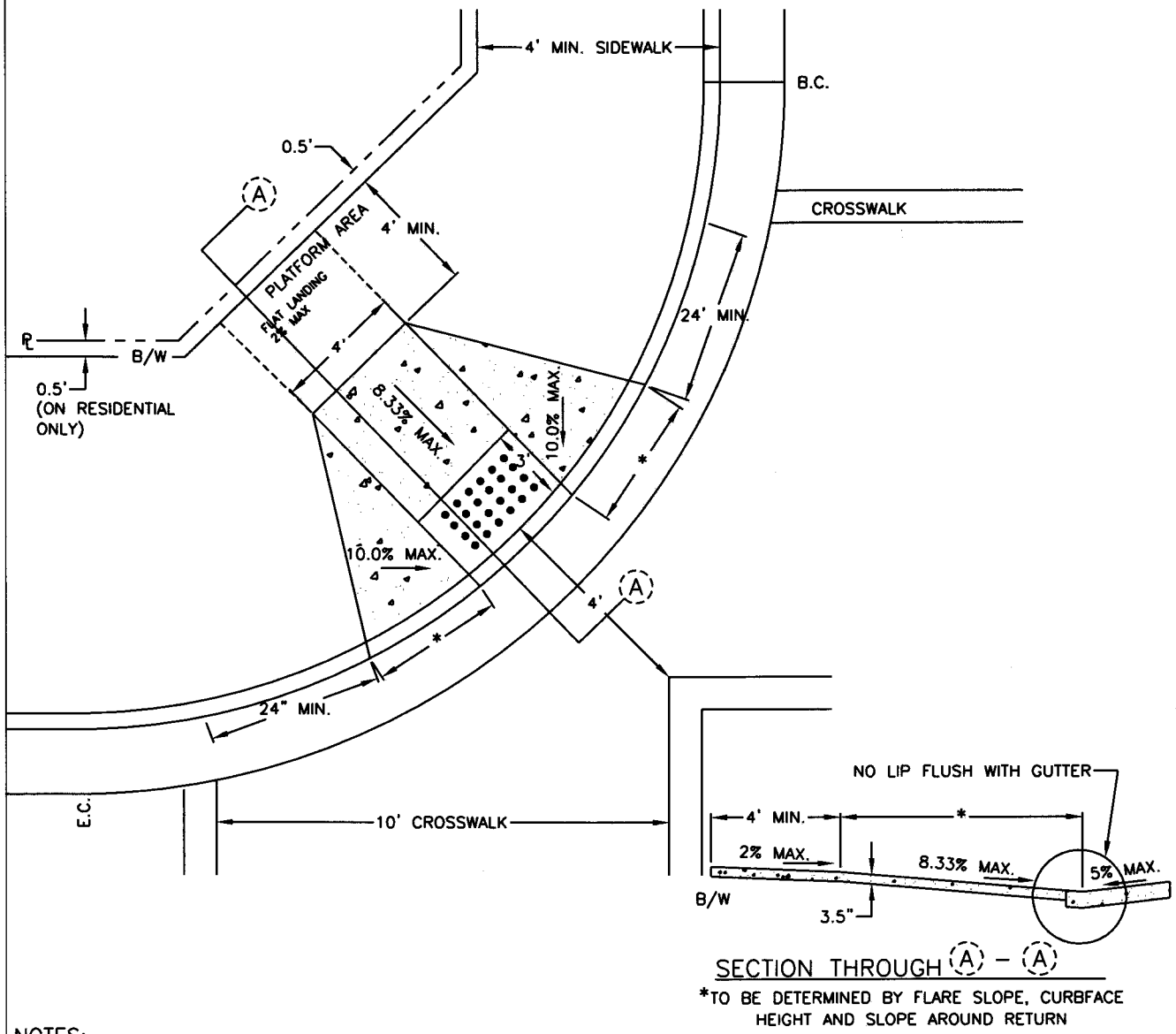

SECTION THROUGH (A) - (A)

*TO BE DETERMINED BY FLARE SLOPE, CURBFACE HEIGHT AND SLOPE AROUND RETURN

NOTES:

1. TRANSITIONS FROM RAMPS AND LANDING TO WALK, GUTTERS OR STREETS SHALL BE FLUSH AND FREE OF ABRUPT CHANGES.
2. SURFACE OF CURB RAMP AND FLARED SIDES SHALL HAVE MEDIUM BROOM FINISH TRANSVERSE TO PATH OF TRAVEL AND SHALL BE OF CONTRASTING FINISH TO THAT OF ADJACENT SIDEWALK.
3. RAMP SLOPE SHALL NEVER EXCEED 8.33%.
4. THE SLOPE OF ADJOINING GUTTERS, ROAD SURFACE OR ACCESSIBLE ROUTE WITHIN 4' OF THE BOTTOM OF THE RAMP SHALL NOT EXCEED 5% SLOPE.
5. THERE SHALL BE A SEGMENT OF STRAIGHT CURB, AT LEAST 24" LONG ON EACH SIDE OF THE CURB RAMP. THESE CURBS SHALL ALSO BE WITHIN THE MARKED CROSSWALK.
6. NOT USED.
7. PROVIDE LEVEL LANDING OF AT LEAST 48" ON UPPER END AND OVER FULL WIDTH OF RAMP, 2% MAX LANDING
8. THE 4' CLEAR SPACE AT BOTTOM OF RAMP SHALL BE WITHIN THE MARKED CROSSINGS.
9. RAMP SHALL BE MINIMUM OF 4' WIDE AND SHALL LIE GENERALLY IN A SINGLE SLOPED PLANE WITH A MINIMUM OF SURFACE WARPING AND CROSS SLOPE.
10. THE FLARED SIDE SHALL NOT EXCEED 10% SLOPE.
11. CURB RAMPS SHALL BE LOCATED OR PROTECTED TO PREVENT THEIR OBSTRUCTION BY PARKED CARS.
12. THE DETECTABLE WARNING SHALL CONTRAST VISUALLY WITH ADJOINING SURFACES, EITHER LIGHT-ON-DARK OR DARK-ON-LIGHT. THE MATERIAL USED SHALL BE AN INTEGRAL PART OF THE WALKING SURFACE.

DIAGONAL CURB RAMP
(USE ONLY WHEN NECESSARY)

REF. & REV.
JUNE 2015

CITY OF FRESNO
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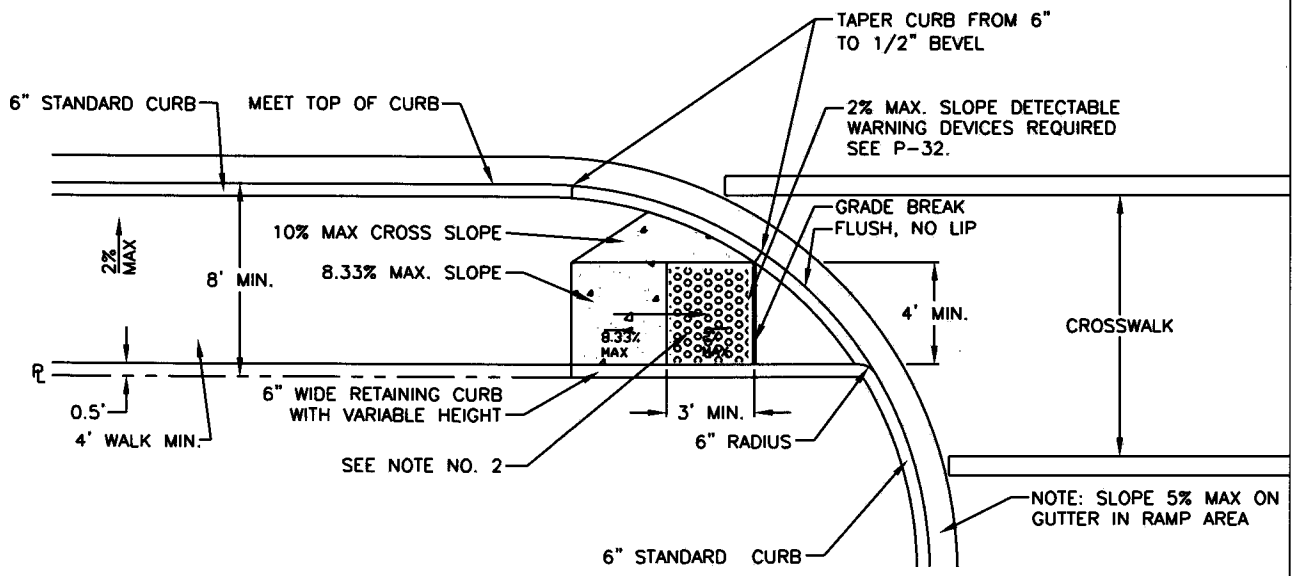
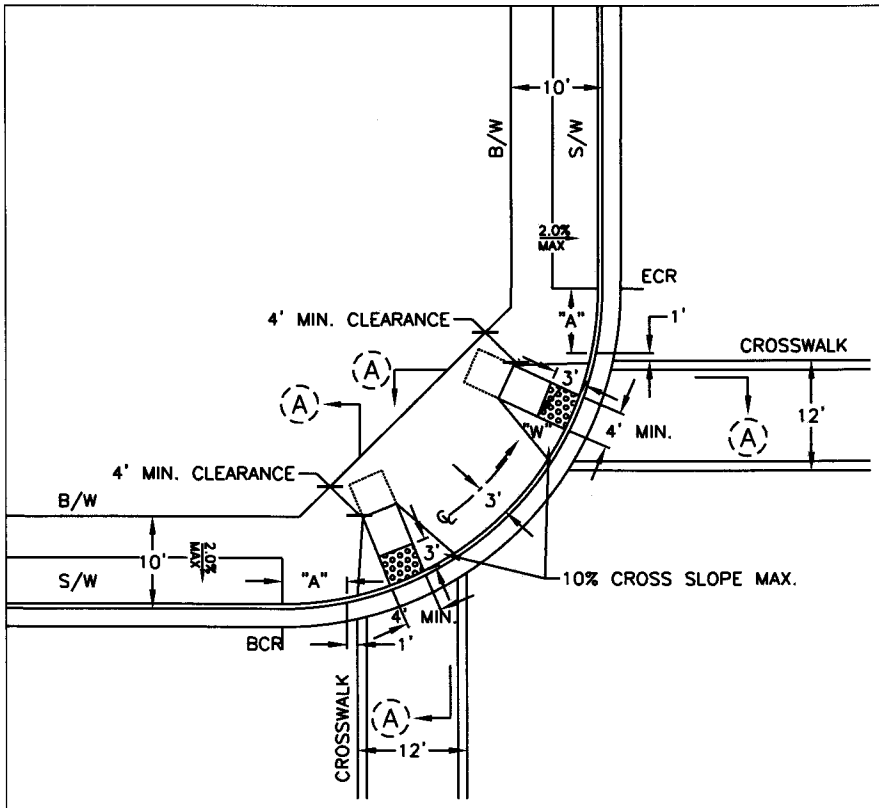


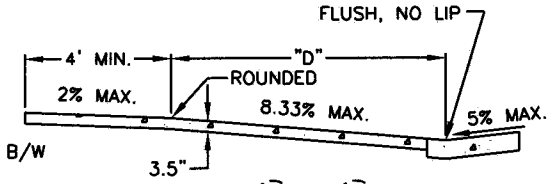
NOTES:

1. SURFACE OF CURB RAMP AND FLARED SIDE SHALL HAVE BROOM FINISH TRANSVERSE WITH THE PATH OF TRAVEL AND SHALL BE OF CONTRASTING FINISH TO THAT OF ADJOINING SIDEWALK.
2. ON THE BOTTOM LANDING WITH A 2% MAX. SLOPE, WHERE WALK ADJOINS A VEHICULAR WAY, USE TRUNCATED DOMES, IN-LINE PATTERN PER P.W. STD. P-32. WHERE BOTH ENDS OF THE BOTTOM GRADE BREAK FOR THE RAMP ARE LESS THAN 5' FROM THE BACK OF THE CURB THE DETECTABLE WARNING SURFACES SHALL BE PLACED ON THE RAMP RUN WITH ONE DOME SPACING OF THE BOTTOM GRADE BREAK.
3. THE SLOPE OF ADJOINING GUTTERS, ROAD SURFACE OR ACCESSIBLE ROUTE WITHIN 4' OF THE BOTTOM OF THE RAMP SHALL NOT EXCEED 5% SLOPE.
4. RAMP SLOPE SHALL NEVER EXCEED 8.33%.
5. NOT USED.
6. PROVIDE LEVEL LANDING OF AT LEAST 48" ON UPPER END OVER FULL WIDTH OF RAMP, 2% MAX LEVEL LANDING.
7. THE LOWER END OF THE CURB RAMP SHALL TERMINATE WITHIN THE MARKED CROSSINGS.
8. RAMP SHALL BE MINIMUM OF 4' WIDE AND SHALL LIE GENERALLY IN A SINGLE SLOPED PLANE WITH A MINIMAL OF SURFACE WARPING AND CROSS SLOPE.
9. CURB RAMPS SHALL BE LOCATED OR PROTECTED TO PREVENT THEIR OBSTRUCTION BY PARKED CARS.

MODIFIED CURB RAMP AT STREET TYPE DRIVEWAY APPROACH	REF. & REV. JUNE 2015	CITY OF FRESNO P-29



CURB RADIUS	"A" DISTANCE
30'	5'
35'	7'
40'	11'
45'	15'
50'	18'



SECTION THROUGH (A) - (A)

DIMENSIONS "D" AND "W" TO BE DETERMINED BY FLARE SLOPE, CURBFACE HEIGHT AND SLOPE AROUND RETURN

NOTES:

1. TRANSITIONS FROM RAMPS AND LANDING TO WALK, GUTTERS OR STREETS SHALL BE FLUSH AND FREE OF ABRUPT CHANGES.
2. SURFACE OF CURB RAMP AND FLARED SIDES SHALL HAVE BROOM FINISH TRANSVERSE TO PATH OF TRAVEL AND SHALL BE OF CONTRASTING FINISH TO THAT OF ADJACENT SIDEWALK.
3. RAMP SLOPE SHALL NEVER EXCEED 8.33%.
4. THE SLOPE OF ADJOINING GUTTERS, ROAD SURFACE OR ACCESSIBLE ROUTE WITHIN 4' OF THE BOTTOM OF THE RAMP SHALL NOT EXCEED 5% SLOPE.
5. NOT USED.
6. PROVIDE LEVEL LANDING OF AT LEAST 48" ON UPPER END AND OVER FULL WIDTH OF RAMP, 2% MAX LEVEL LANDING.
7. THE CLEAR SPACE AT BOTTOM OF RAMP SHALL BE WITHIN THE MARKED CROSSINGS.
8. RAMP SHALL BE MINIMUM OF 4' WIDE AND SHALL LIE GENERALLY IN A SINGLE SLOPED PLANE WITH A MINIMUM OF SURFACE WARPING AND CROSS SLOPE.
9. THE FLARED SIDE SHALL NOT EXCEED 10% SLOPE.
10. CURB RAMPS SHALL BE LOCATED OR PROTECTED TO PREVENT THEIR OBSTRUCTION BY PARKED CARS.
11. THE DETECTABLE WARNING SHALL CONTRAST VISUALLY WITH ADJOINING SURFACES, EITHER LIGHT-ON-DARK OR DARK-ON-LIGHT. THE MATERIAL USED SHALL BE AN INTEGRAL PART OF THE WALKING SURFACE.

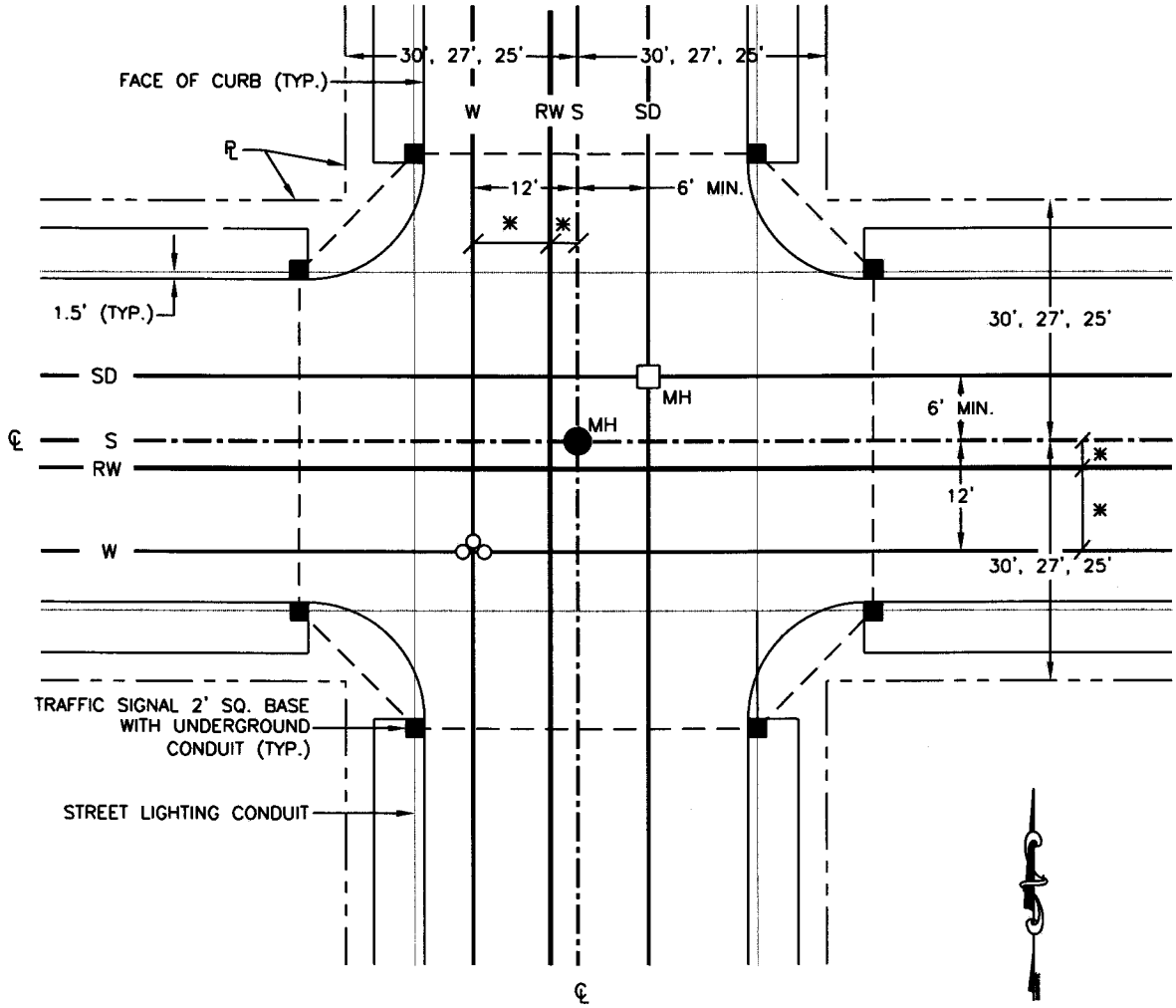
DUAL CURB RAMPS
MAJOR STREET INTERSECTION

REF. & REV.
JUNE 2015

CITY OF FRESNO

P-30

LEGEND
- S - SANITARY SEWER
- SD - STORM SEWER
- W - WATER MAIN
- RW - RECYCLED WATER
- MH - MANHOLE
- ℄ - CENTERLINE OF PROPOSED STREET
- P℄ - PROPERTY LINE



NOTES:

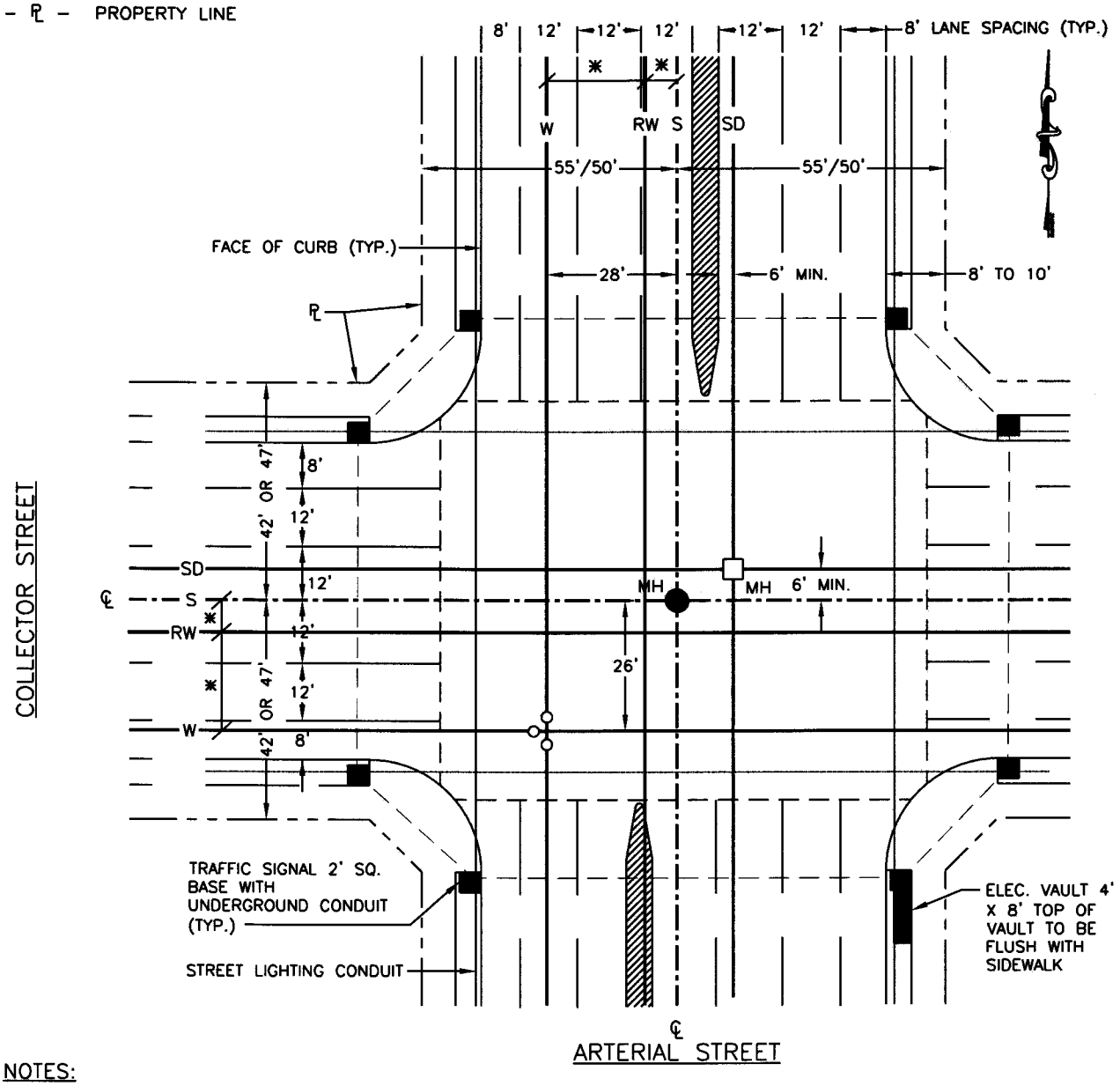
1. THIS "STANDARD" IS A GUIDE ONLY AND DEVIATIONS WILL BE ACCEPTABLE WHERE CONDITIONS DICTATE.
2. DIMENSIONS SHOWN ARE DESIRABLE, BUT DO NOT GOVERN. THE INTENTION IS TO SHOW THE RELATIVE POSITION OF ALL UTILITIES.

APPROVED BY SUBSTRUCTURE COMMITTEE.

* SEE RW-12 DRAWING.

LOCATION OF UNDERGROUND FACILITIES RESIDENTIAL STREETS	REF. & REV. JUNE 2015	CITY OF FRESNO P-41

LEGEND
- S - SANITARY SEWER
- SD - STORM SEWER
- W - WATER MAIN
- RW - RECYCLED WATER
- MH - MANHOLE
- ℄ - CENTERLINE OF PROPOSED OFFICIAL PLAN LINE OR DIRECTOR'S DETERMINATION
- ℙ - PROPERTY LINE



NOTES:

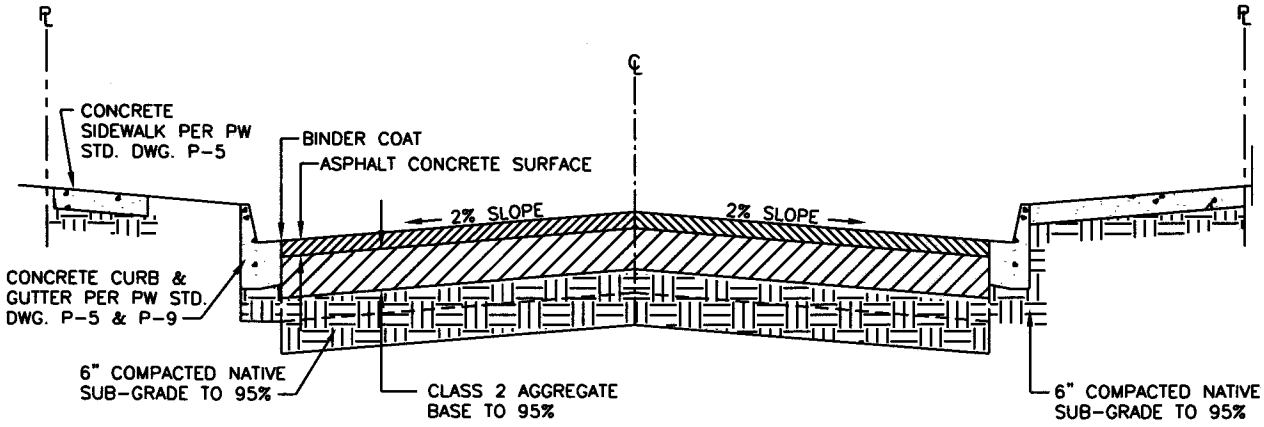
1. THIS "STANDARD" IS A GUIDE ONLY AND DEVIATIONS WILL BE ACCEPTABLE WHERE CONDITIONS DICTATE.
2. DIMENSIONS SHOWN ARE DESIRABLE, BUT DO NOT GOVERN. THE INTENTION IS TO SHOW THE RELATIVE POSITION OF ALL UTILITIES.

APPROVED BY SUBSTRUCTURE COMMITTEE.

* SEE RW-12 DRAWING.

LOCATION OF UNDERGROUND FACILITIES ARTERIAL & COLLECTOR STREETS	REF. & REV. JUNE 2015	CITY OF FRESNO P-42

FOR STREET WIDTHS AND RIGHT-OF-WAY REQUIREMENTS, REFER TO PW STANDARDS FOR MAJOR AND LOCAL STREETS



CROSS SECTION OF PUBLIC STREET

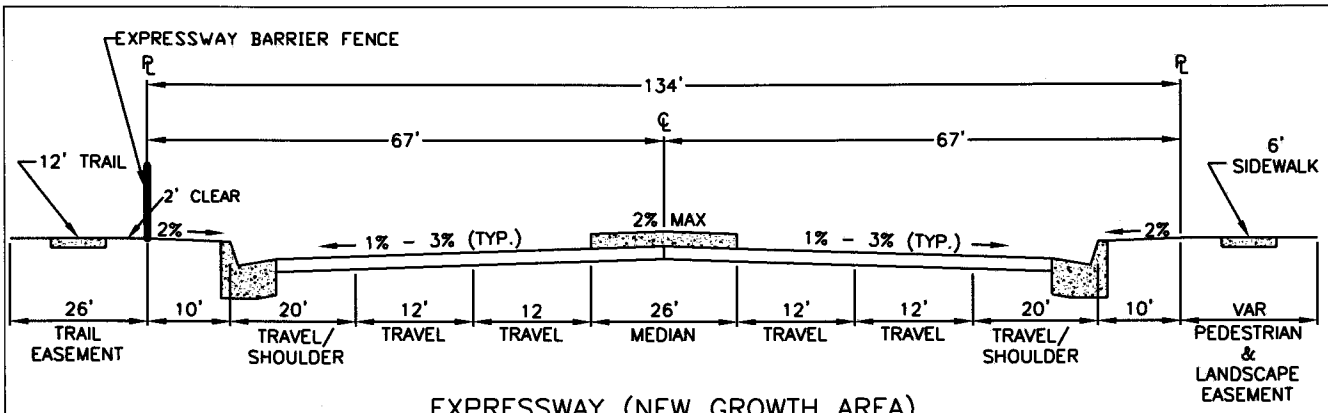
TRAFFIC INDICES AND MINIMUM PAVEMENT SECTIONS

CLASS OF STREET	TRAFFIC INDEX	MIN. AC	MIN. AB
EXPRESSWAY	10.0	6.0"	6"MIN
SUPERARTERIAL	10.0	6.0	6"MIN
INDUSTRIAL ARTERIAL	9.00	5.5"	6"MIN
ARTERIAL	9.00	5.5"	6"MIN
INDUSTRIAL COLLECTOR	8.00	5.0"	6"MIN
COLLECTOR	7.50	4.5"	6"MIN
LOCAL INDUSTRIAL OR COMMERCIAL	6.50	3.0"	6"MIN
LOCAL COLLECTOR/BOULEVARD	6.00	2.5"	6"MIN
LOCAL	5.00	2.5"	4"MIN

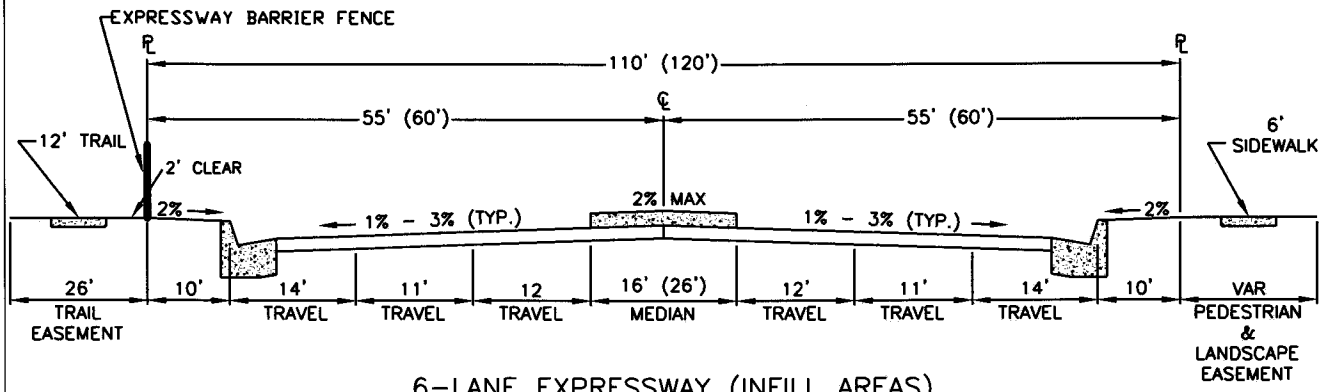
NOTES:

1. TRANSITIONS SHALL BE APPROPRIATE TO THE DESIGN SPEED OF THE STREET BOTH VERTICALLY AND HORIZONTALLY.
2. TRANSITION SLOPE ALONG THE STREET SHALL BE A MAX. 2% GRADE DIFFERENCE. (TEMPORARY)
3. TRANSITION SLOPE ACROSS THE STREET SHALL BE A MAX. SLOPE OF 5%. (TEMPORARY)
4. WHEN SIDEWALK IS NOT REQUIRED, FINISHED GRADE SHALL BE 2% FROM BACK OF CURB TO PROPERTY LINE.
5. THE ASPHALT PAVEMENT SECTION SHALL BE DESIGNED BASED UPON THE CALTRANS METHODOLOGY IN CHAPTER 600 OF THE HIGHWAY DESIGN MANUAL.
6. THE CITY ENGINEER MAY APPROVE A FULL DEPTH A.C. SECTION OR AN A.C./A.B./A.S.B. SECTION WHERE APPROPRIATE.
7. LOCAL INDUSTRIAL STREETS SERVING LAND USES WITH HIGH VOLUMES OF TRUCK TRAFFIC SHALL BE DESIGNED FOR A T.I. OF 7.0 OR 7.5, AS DETERMINED BY THE CITY ENGINEER.
8. "R" VALUE TESTS SHALL BE PROVIDED AT A RATE OF 1 PER 500 FT OF STREET CONSTRUCTION. THE "R" VALUE OF THE SOIL SHALL BE WITHIN 12" BELOW OF THE APPROXIMATE SUBGRADE.
9. STREET FURNITURE SHALL BE LOCATED IN ACCORDANCE WITH STREET FURNITURE LOCATION DIAGRAM.
10. ON CORNER LOTS, THE PLANTING AND UTILITY EASEMENT ALONG THE SIDE YARD MAY BE REDUCED TO EIGHT FEET AND IS MAINTAINED BY PROPERTY OWNER IF NOT IN A CFD.

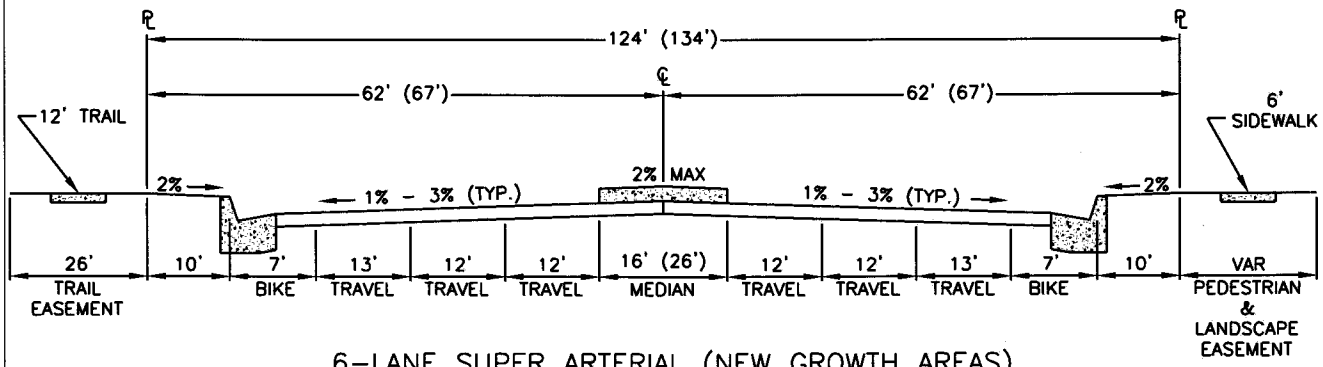
STREET CONSTRUCTION REQUIREMENTS AND TRAFFIC INDICES	REF. & REV. JUNE 2015	CITY OF FRESNO P-50



EXPRESSWAY (NEW GROWTH AREA)



6-LANE EXPRESSWAY (INFILL AREAS)

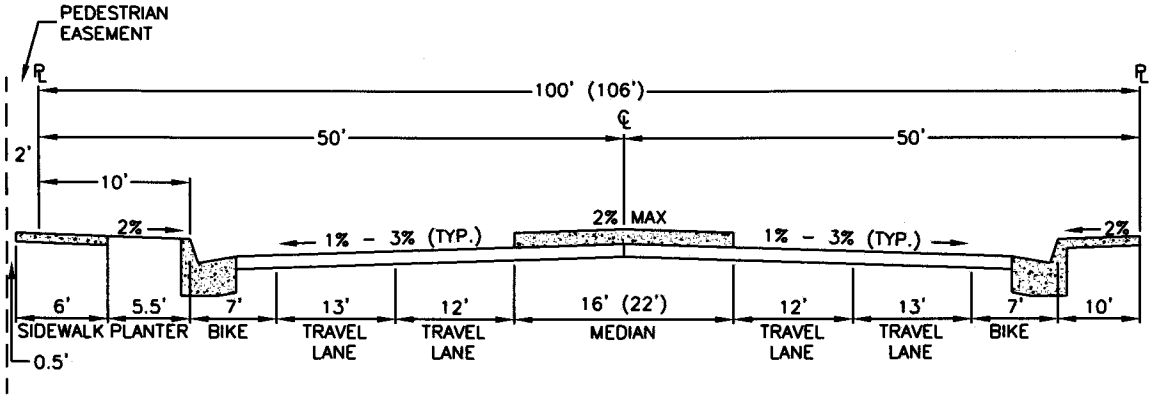


6-LANE SUPER ARTERIAL (NEW GROWTH AREAS)

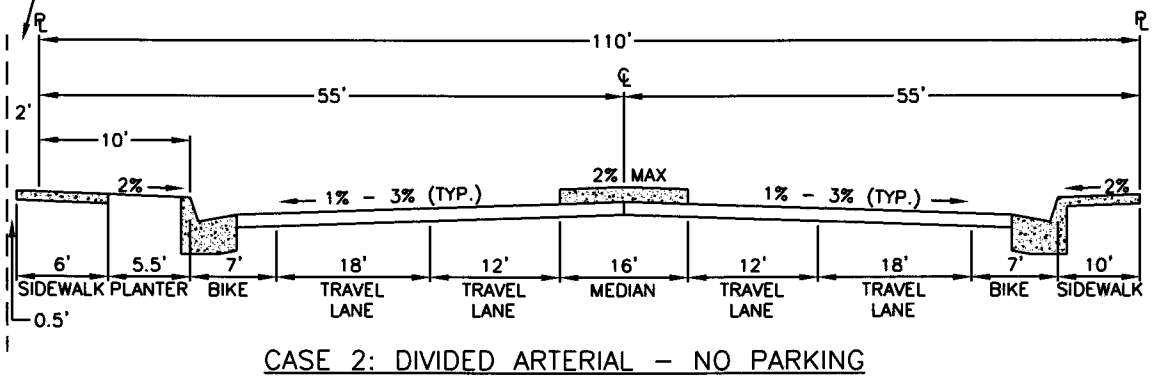
NOTES:

1. FOR DUAL LEFT TURN LANES USE 26' MEDIAN.
2. SEE P-69 AND P-70 FOR ADDITIONAL WIDTH AT MAJOR STREET INTERSECTIONS.
3. OFFSET CROWN REQUIRES APPROVAL OF THE CITY ENGINEER.
4. DEVIATIONS FROM THE STANDARDS REQUIRE APPROVAL OF THE CITY ENGINEER.
5. ( ) PERTAINS TO DIFFERENCE WITH 26' MEDIAN WIDTH WHERE NECESSARY TO ACCOMMODATE DUAL LEFT TURN LANES.
6. SEE P-74 AND P-75 FOR EXPRESSWAY BARRIER FENCE LOCATION AND DETAILS.

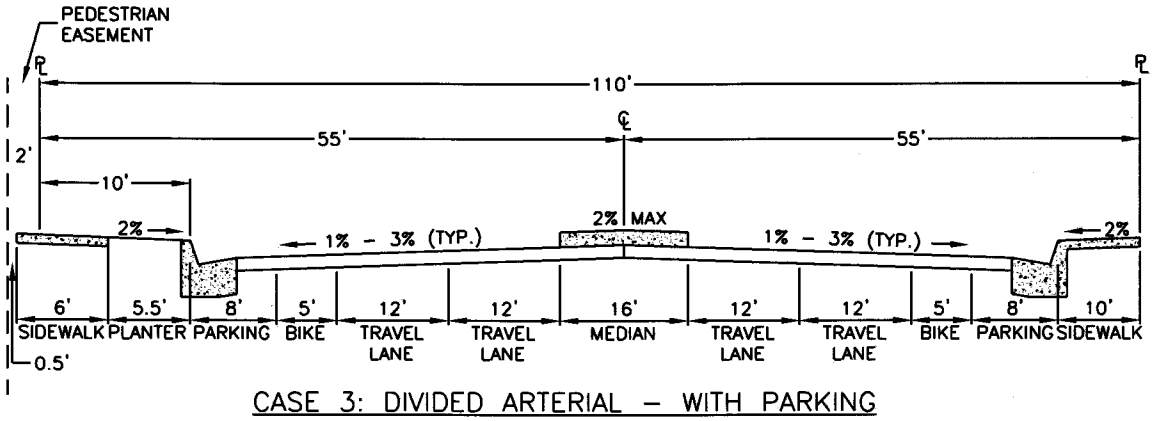
EXPRESSWAY AND SUPER ARTERIAL CROSS-SECTION	REF. & REV. JUNE 2015	CITY OF FRESNO P-51



CASE 1: DIVIDED ARTERIAL – NO PARKING



CASE 2: DIVIDED ARTERIAL – NO PARKING
AND WIDER OUTSIDE TRAVEL LANE

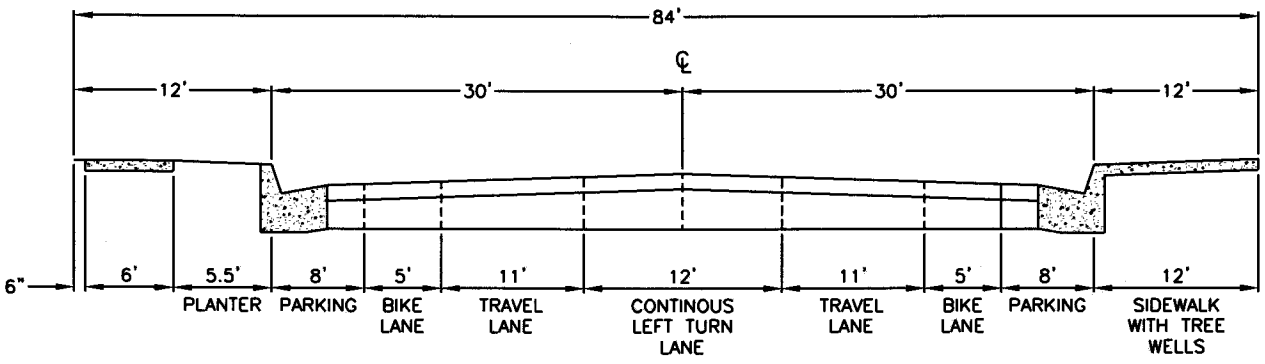


CASE 3: DIVIDED ARTERIAL – WITH PARKING
OR SCHOOL DROP OFF ZONES

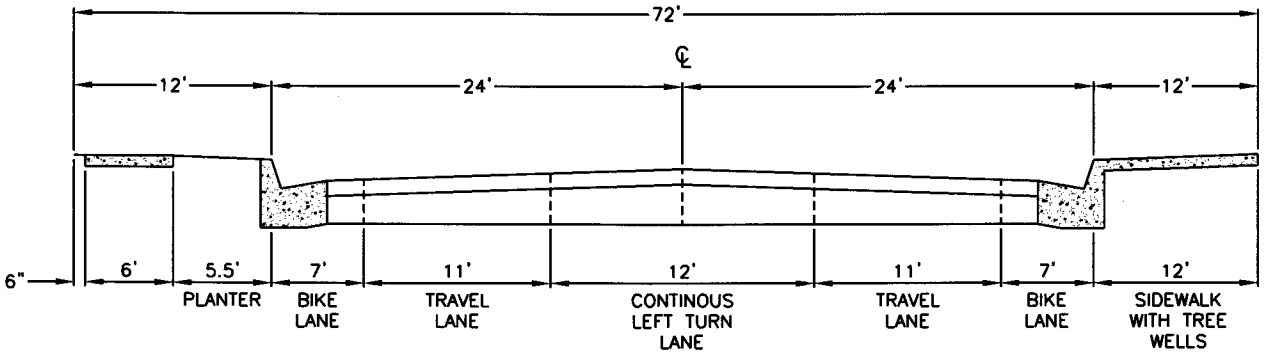
NOTES:

1. USE 26' MEDIAN WHEN DUAL LEFT TURNS ARE REQUIRED.
2. OFFSET CROWN REQUIRES APPROVAL OF THE ENGINEER
   DEVIATIONS FROM STANDARDS REQUIRE APPROVAL OF THE ENGINEER.
3. ( ) INDICATE A 22' MEDIAN WIDTH ONLY WHERE A SPECIFIC ARTERIAL HAS BEEN PLANNED FOR A 22' MEDIAN ISLAND.
4. CASE 2 SHALL ONLY BE USED FOR SHORT GAP FILLING BETWEEN EXISTING CASE 2 ARTERIALS.
5. CASE 3 SHALL NOT BE USED UNLESS APPROVED BY THE CITY TRAFFIC ENGINEER.

ARTERIAL STREET CROSS-SECTION	REF. & REV. JUNE 2015	CITY OF FRESNO P-52

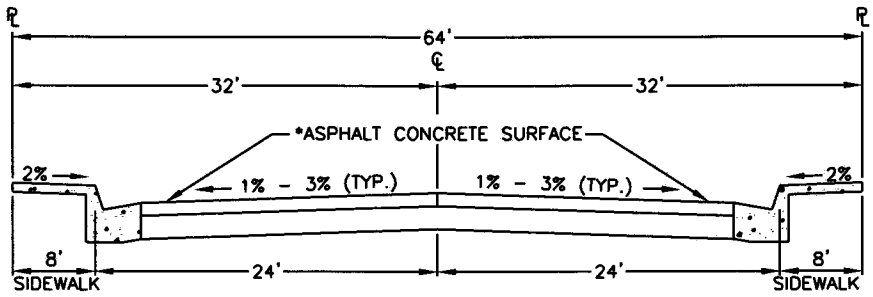


COLLECTOR STREET WITH PARKING
(2 TRAVEL LANES) 84' ROW

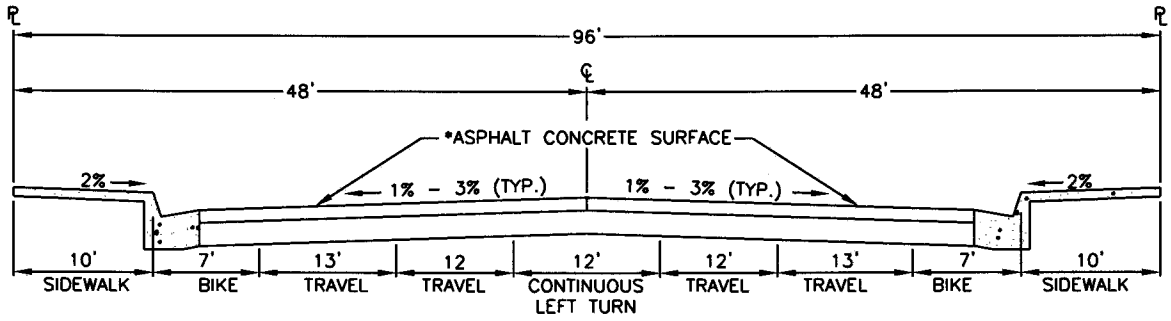


COLLECTOR STREET – NO PARKING
(2 TRAVEL LANES) 72' ROW

COLLECTOR STREET CROSS-SECTION (2 TRAVEL LANES)	REF. & REV. JUNE 2015	CITY OF FRESNO P-54



LOCAL INDUSTRIAL STREET



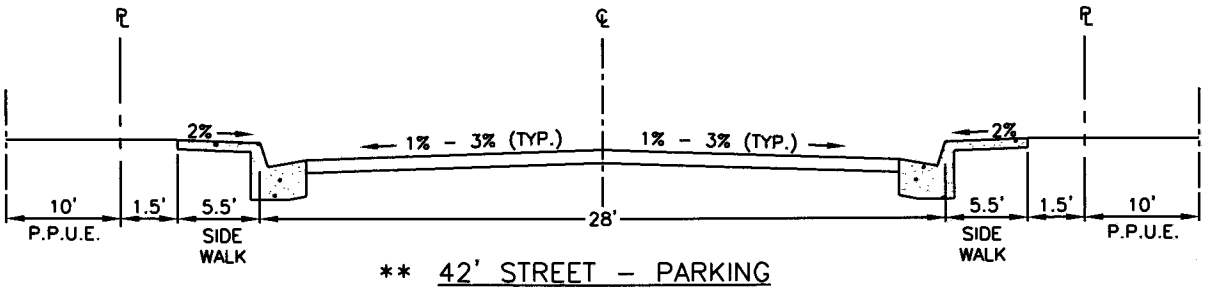
INDUSTRIAL ARTERIAL STREET

* THICKNESS BASED UPON TRAFFIC INDEX FOR SPECIFIC STREET.
BASED UPON CALTRANS METHOD FOR FLEXIBLE PAVEMENT DESIGN, SEE P-50.

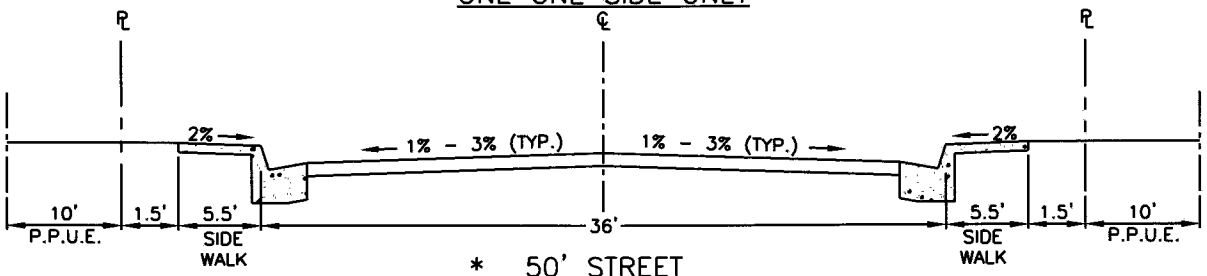
NOTES:

1. ACTUAL SECTION DEPENDS ON TRAFFIC INDEX AND SOIL TESTS.
2. WHERE NO SIDEWALK IS CONSTRUCTED, FINISH GRADE SHALL BE 2% FROM BACK OF CURB TO PROPERTY LINE.

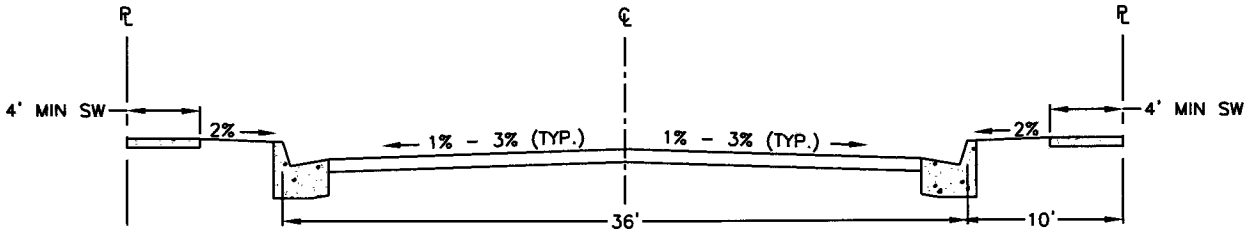
INDUSTRIAL STREET CROSS SECTIONS	REF. & REV. JUNE 2015	CITY OF FRESNO P-55



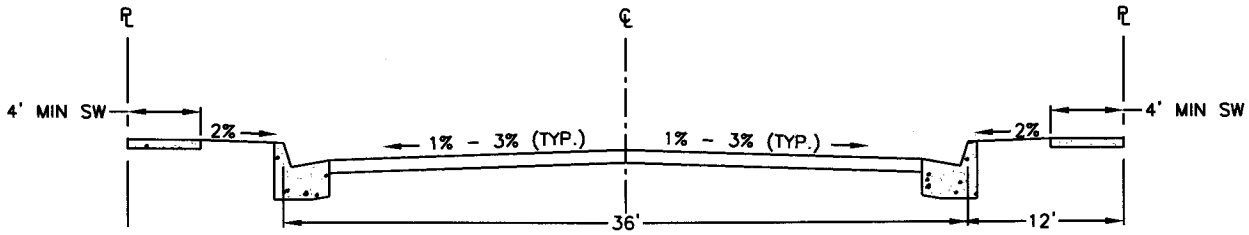
** 42' STREET - PARKING
ONE ONE SIDE ONLY



* 50' STREET
**



56' STREET



60' STREET

NOTES:

1. FOR DRIVEWAY DETAIL SEE STREET SECTIONS THAT MAY BE USED, SEE P.W. DWGS. P-4.
2. OFFSET CROWN REQUIRES APPROVAL OF THE ENGINEER DEVIATIONS FROM STANDARDS REQUIRE APPROVAL OF THE ENGINEER.
3. ( ) INDICATE AN ALTERNATIVE CROSS-SECTION LAYOUT.
4. SIDEWALKS MAY BE LOCATED PARTIALLY OR FULLY OUTSIDE THE STREET RIGHT-OF-WAY WITH THE DEDICATION OF A PEDESTRIAN EASEMENT, WHEN APPROVED BY THE CITY ENGINEER.
5. * 1,500 FEET MAXIMUM BLOCK LENGTH.
6. ** IN OTHER THAN SINGLE FAMILY AREAS, THIS STREET SECTION CAN ONLY BE USED ON CUL-DE-SACS AND ON BLOCK STREETS NOT EXCEEDING 800 FEET IN LENGTH.
7. ** FRESNO IRRIGATION DISTRICT FACILITIES SHALL BE LOCATED IN A SEPARATE EASEMENT OUT OF THE STREET AREA.

LOCAL STREET CROSS-SECTION	REF. & REV. JUNE 2015	CITY OF FRESNO P-56

NOTES:

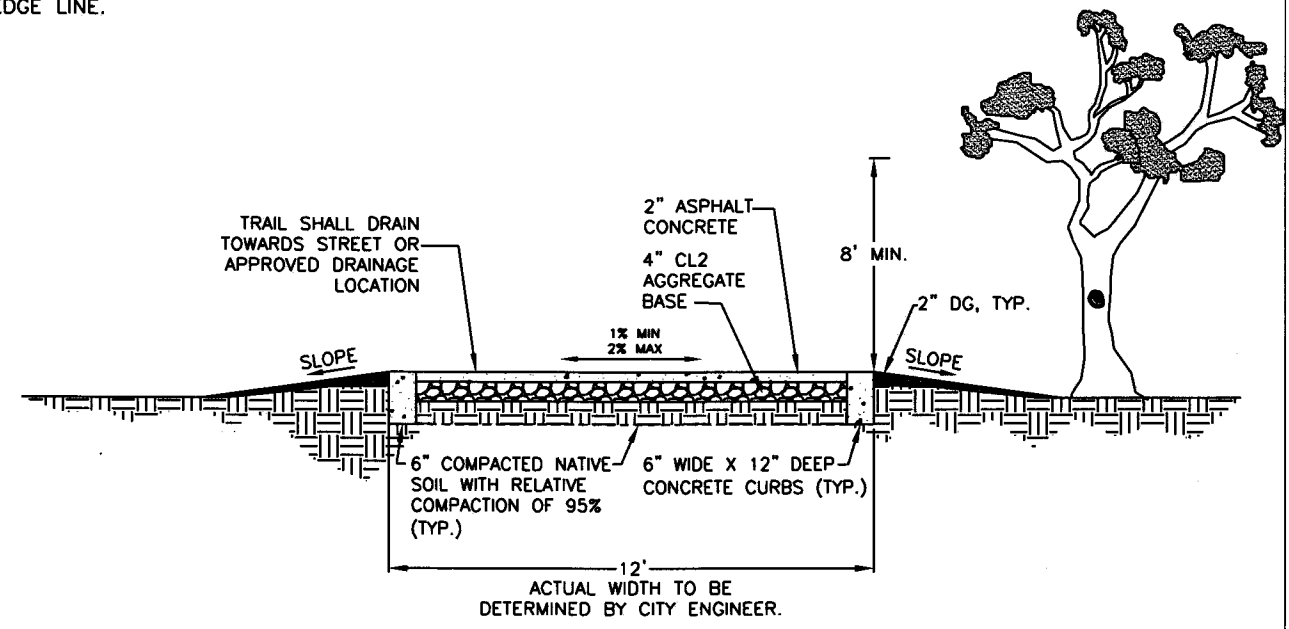
1. THIS STANDARD SHALL BE USED ONLY UPON APPROVAL BY CITY ENGINEER.

2. THIS STANDARD SHALL NOT BE USED IN AREAS OF INUNDATION.

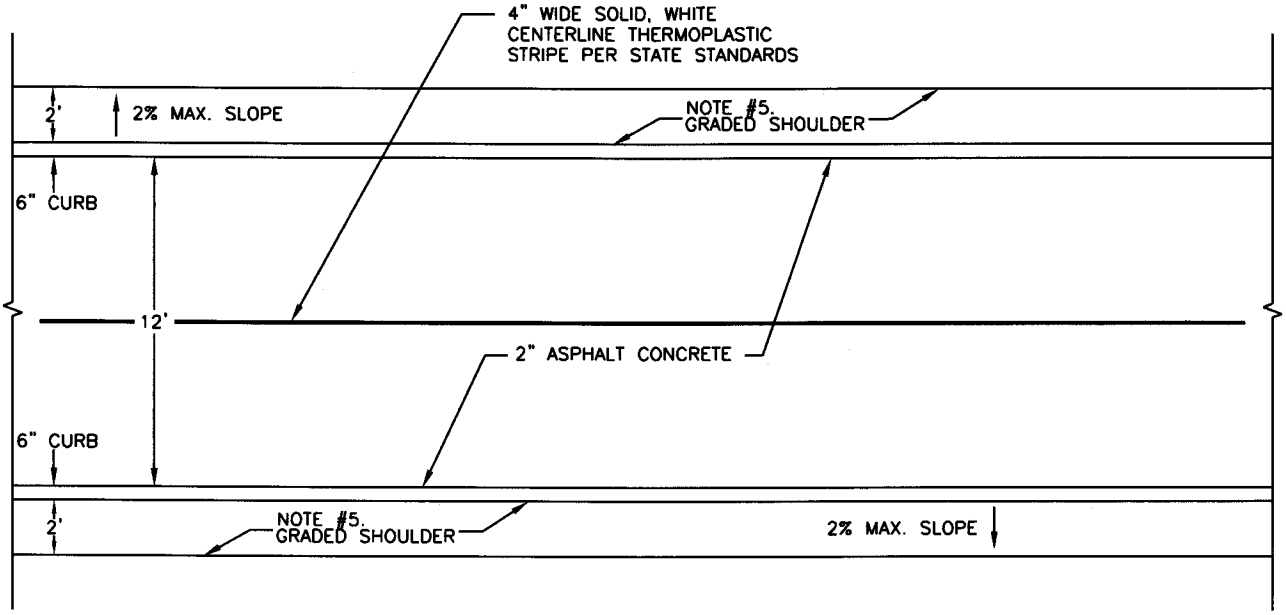
3. CITY ENGINEER MAY PERMIT A CURVILINEAR DESIGN. PRECISE DATA SHALL BE PROVIDED TO STAKE THE ALIGNMENT AND SET APPROPRIATE GRADES. R=160'.

4. TRAIL DESIGN SHALL COMPLY WITH THE LATEST VERSION CHAPTER 1000 OF THE CALTRANS HIGHWAY DESIGN MANUAL AND THE PROWAG FOR SHARED USE PATHS.

5. IF ALL OR PART OF THE SHOULDER IS PAVED WITH THE SAME MATERIAL AS THE PATH, IT IS TO BE DELINEATED FROM THE TRAVELED WAY OF THE PATH WITH AN EDGE LINE.



ELEVATION VIEW



PLAN VIEW

ASPHALT MULTI-PURPOSE TRAIL	REF. & REV. JUNE 2015	CITY OF FRESNO P-58

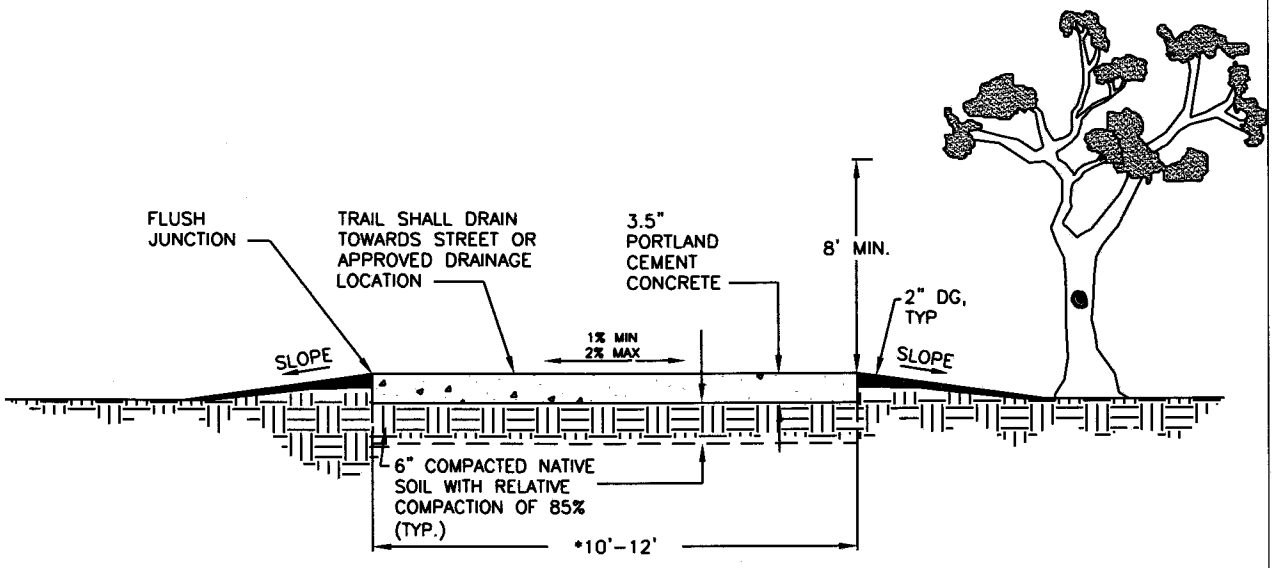
NOTES:

1. *TO BE SPECIFIED BY THE CITY ENGINEER.

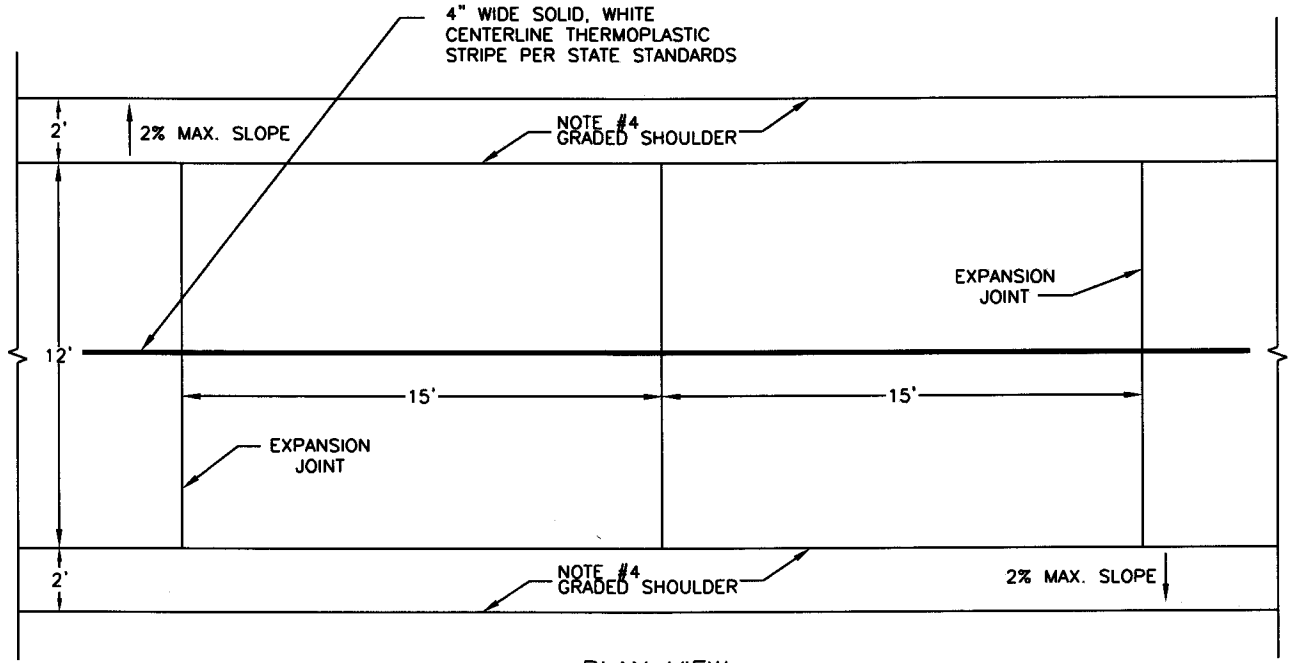
2. CITY ENGINEER MAY PERMIT A CURVILINEAR DESIGN. PRECISE DATA SHALL BE PROVIDED TO STAKE THE ALIGNMENT AND SET APPROPRIATE GRADES. R=160'.

3. TRAIL DESIGN SHALL COMPLY WITH THE LATEST VERSION OF CHAPTER 1000 OF THE CALTRANS HIGHWAY DESIGN MANUAL AND THE PROWAG FOR SHARED USE PATHS.

4. IF ALL OR PART OF THE SHOULDER IS PAVED WITH THE SAME MATERIAL AS THE PATH, IT IS TO BE DELINEATED FROM THE TRAVELED WAY OF THE PATH WITH AN EDGE LINE.

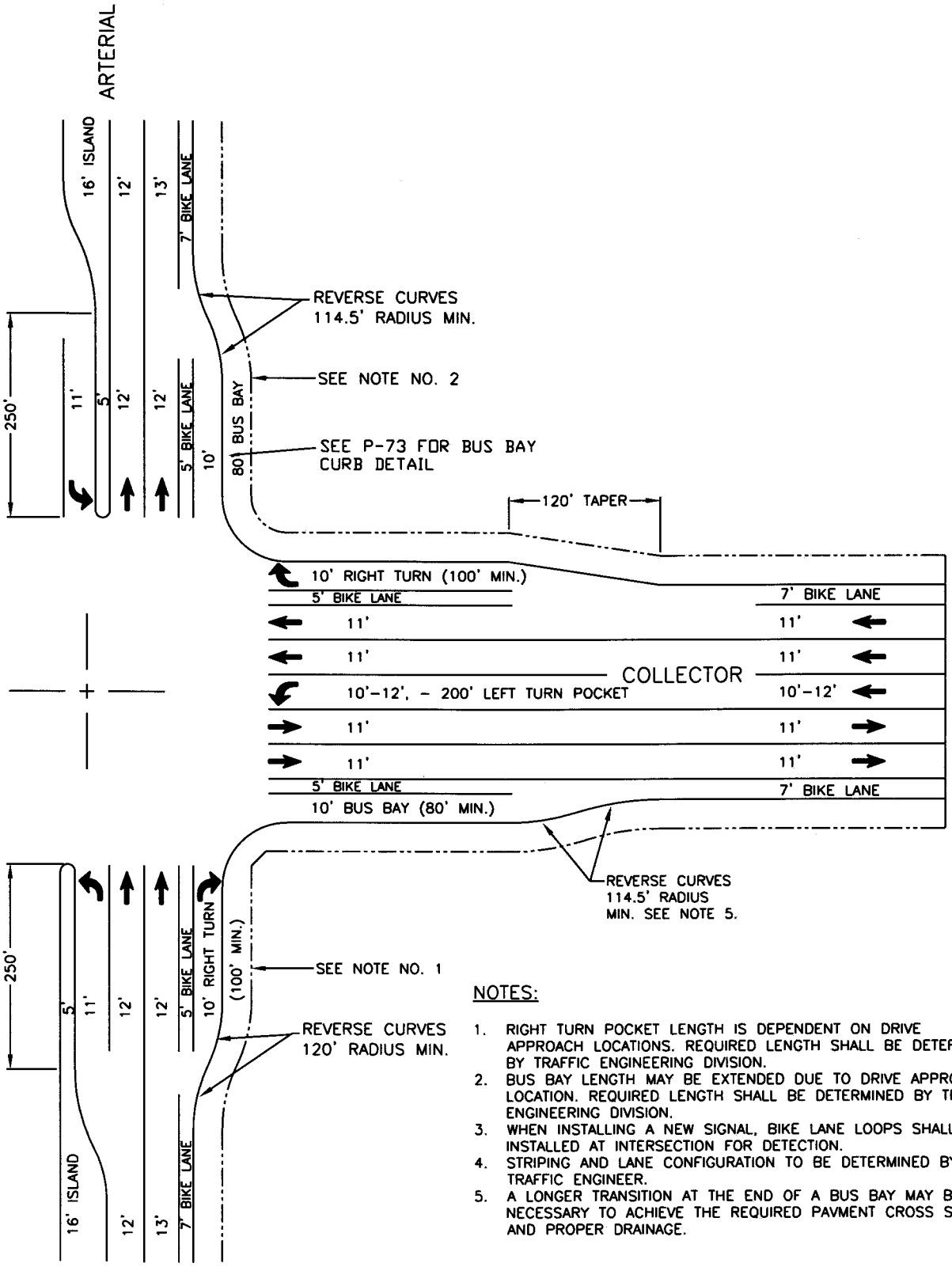


ELEVATION VIEW



PLAN VIEW

CONCRETE MULTI-PURPOSE TRAIL	REF. & REV. JUNE 2015	CITY OF FRESNO P-59



NOTES:

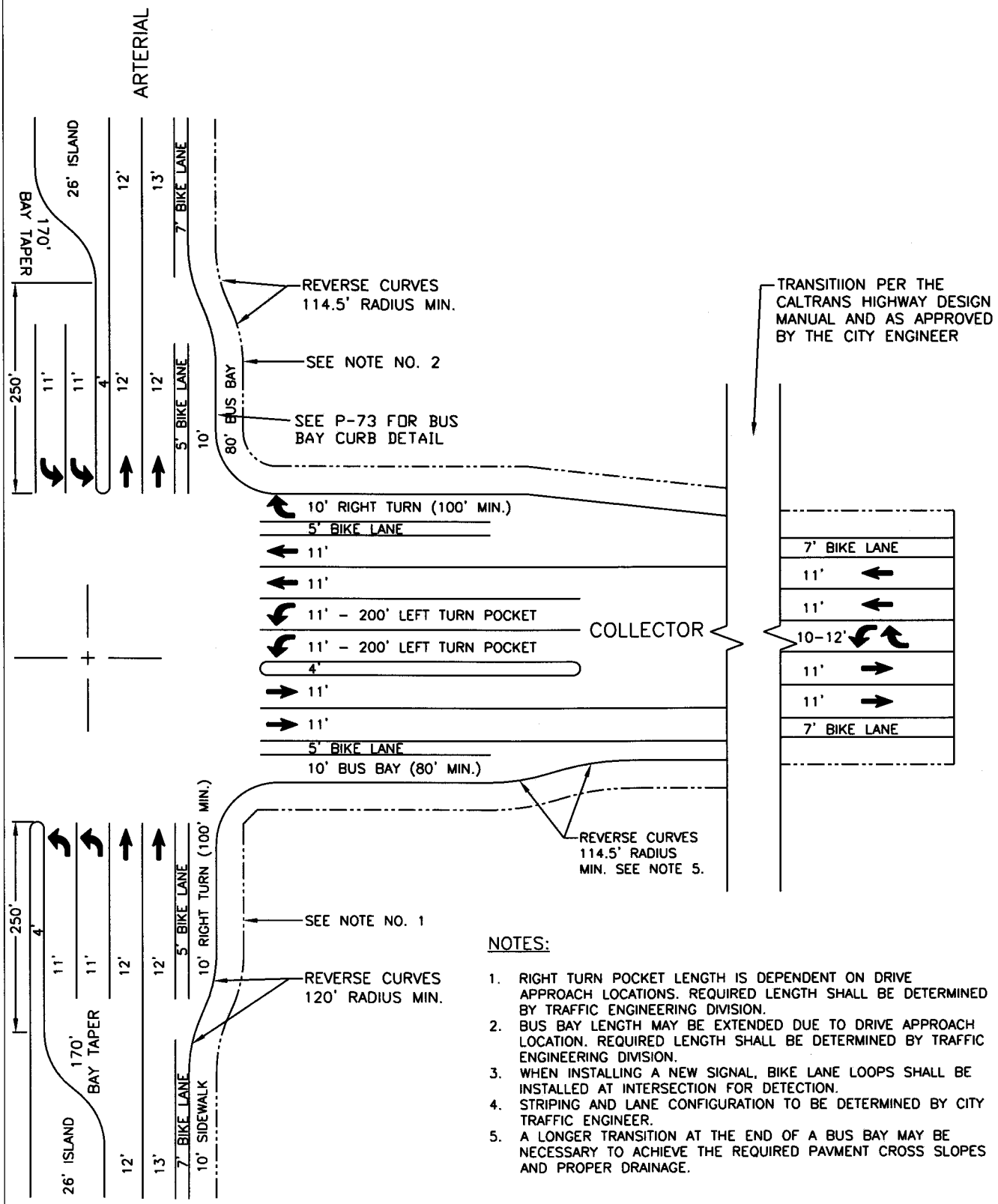
1. RIGHT TURN POCKET LENGTH IS DEPENDENT ON DRIVE APPROACH LOCATIONS. REQUIRED LENGTH SHALL BE DETERMINED BY TRAFFIC ENGINEERING DIVISION.
2. BUS BAY LENGTH MAY BE EXTENDED DUE TO DRIVE APPROACH LOCATION. REQUIRED LENGTH SHALL BE DETERMINED BY TRAFFIC ENGINEERING DIVISION.
3. WHEN INSTALLING A NEW SIGNAL, BIKE LANE LOOPS SHALL BE INSTALLED AT INTERSECTION FOR DETECTION.
4. STRIPING AND LANE CONFIGURATION TO BE DETERMINED BY CITY TRAFFIC ENGINEER.
5. A LONGER TRANSITION AT THE END OF A BUS BAY MAY BE NECESSARY TO ACHIEVE THE REQUIRED PAVMENT CROSS SLOPES AND PROPER DRAINAGE.

STREET INTERSECTION DETAIL

REF. & REV.
JUNE 2015

CITY OF FRESNO

P-69



NOTES:

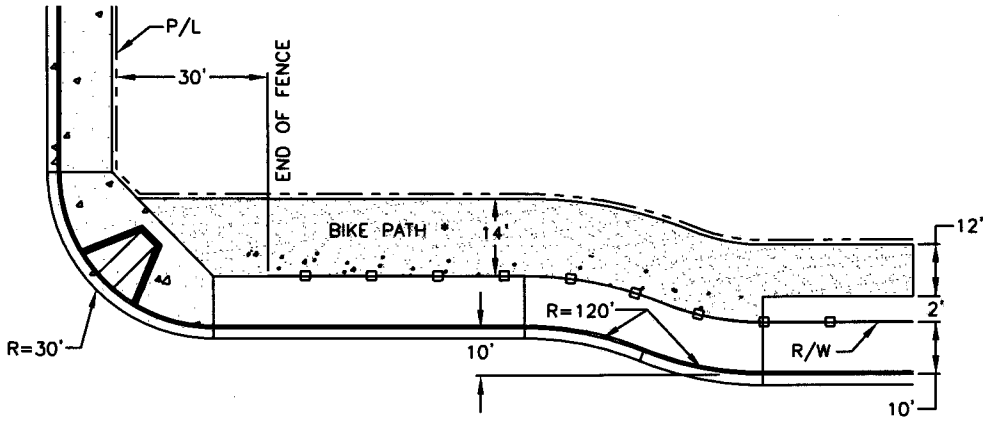
1. RIGHT TURN POCKET LENGTH IS DEPENDENT ON DRIVE APPROACH LOCATIONS. REQUIRED LENGTH SHALL BE DETERMINED BY TRAFFIC ENGINEERING DIVISION.
2. BUS BAY LENGTH MAY BE EXTENDED DUE TO DRIVE APPROACH LOCATION. REQUIRED LENGTH SHALL BE DETERMINED BY TRAFFIC ENGINEERING DIVISION.
3. WHEN INSTALLING A NEW SIGNAL, BIKE LANE LOOPS SHALL BE INSTALLED AT INTERSECTION FOR DETECTION.
4. STRIPING AND LANE CONFIGURATION TO BE DETERMINED BY CITY TRAFFIC ENGINEER.
5. A LONGER TRANSITION AT THE END OF A BUS BAY MAY BE NECESSARY TO ACHIEVE THE REQUIRED PAVMENT CROSS SLOPES AND PROPER DRAINAGE.

STREET INTERSECTION DETAIL
WITH DUAL LEFT TURN LANES

REF. & REV.
JUNE 2015

CITY OF FRESNO

P-70

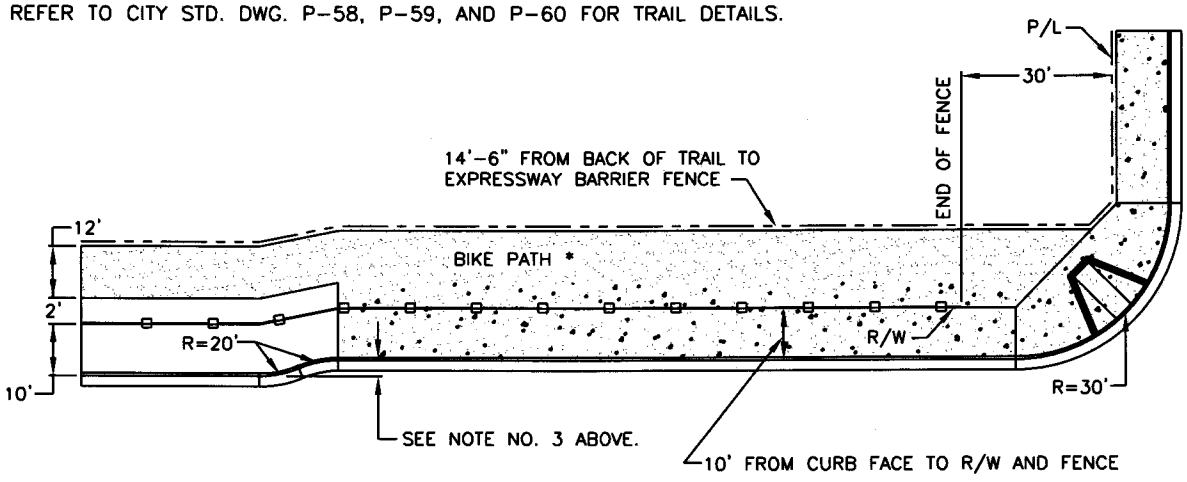


RIGHT TURN LANE LOCATION

*IF BIKE PATH CONSTRUCTION IS REQUIRED.

NOTES:

1. EXPRESSWAY BARRIER FENCE SHALL BE ON STREET RIGHT-OF-WAY.
2. BIKE PATH MAY MEANDER OUTSIDE OF RIGHT TURN AND BUS BAY AREA.
3. REFER TO CITY STD. DWG. P-58, P-59, AND P-60 FOR TRAIL DETAILS.

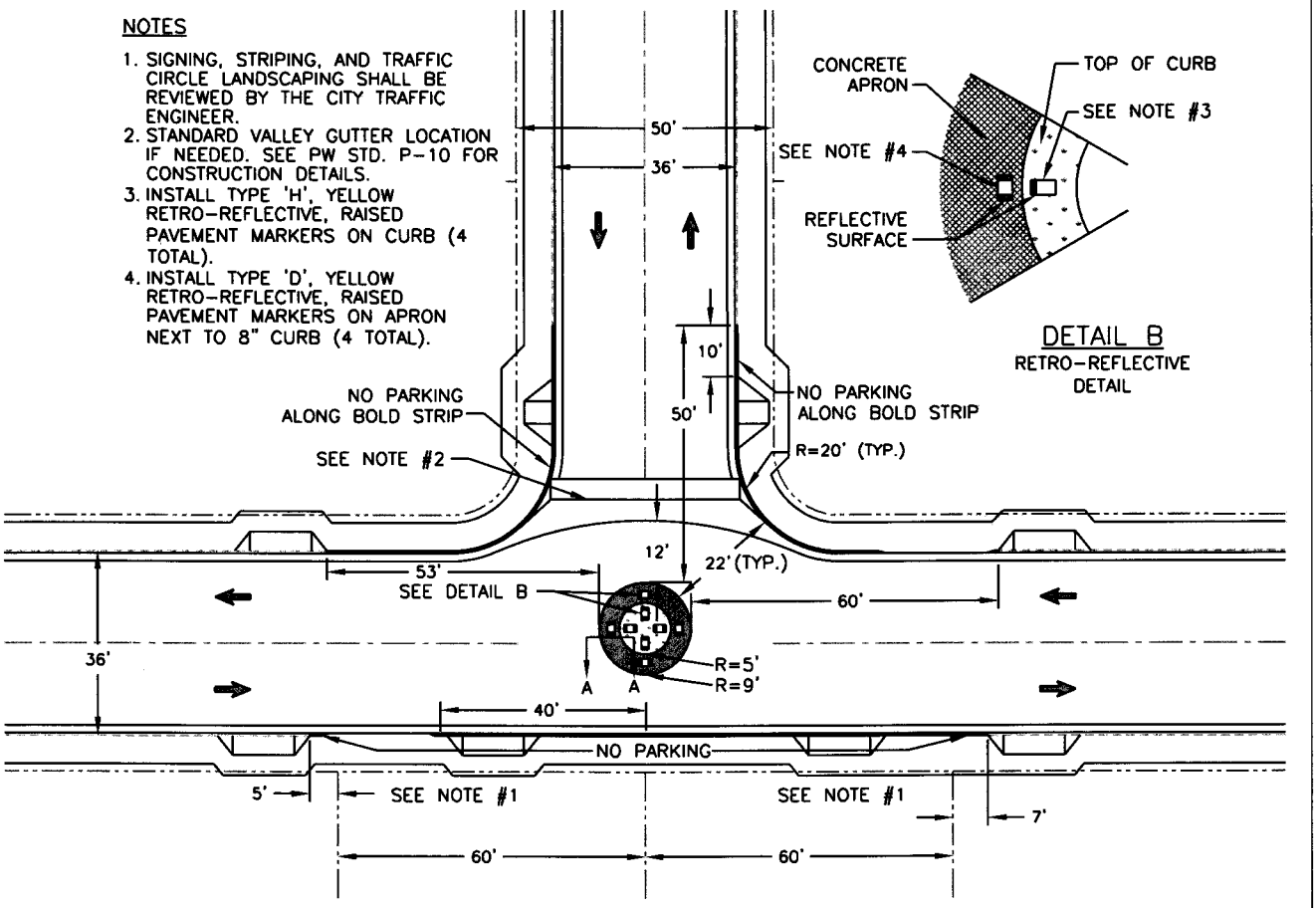


BUS BAY LOCATION

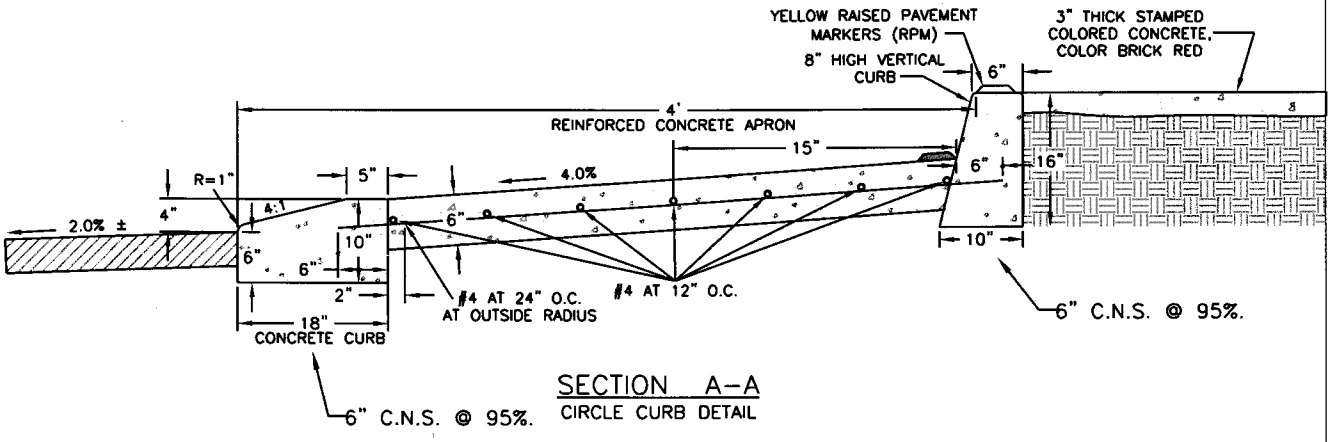
EXPRESSWAY BARRIER FENCE LOCATION	REF. & REV. JUNE 2015	CITY OF FRESNO P-75

NOTES

1. SIGNING, STRIPING, AND TRAFFIC CIRCLE LANDSCAPING SHALL BE REVIEWED BY THE CITY TRAFFIC ENGINEER.
2. STANDARD VALLEY GUTTER LOCATION IF NEEDED. SEE PW STD. P-10 FOR CONSTRUCTION DETAILS.
3. INSTALL TYPE 'H', YELLOW RETRO-REFLECTIVE, RAISED PAVEMENT MARKERS ON CURB (4 TOTAL).
4. INSTALL TYPE 'D', YELLOW RETRO-REFLECTIVE, RAISED PAVEMENT MARKERS ON APRON NEXT TO 8" CURB (4 TOTAL).



DETAIL B
RETRO-REFLECTIVE DETAIL

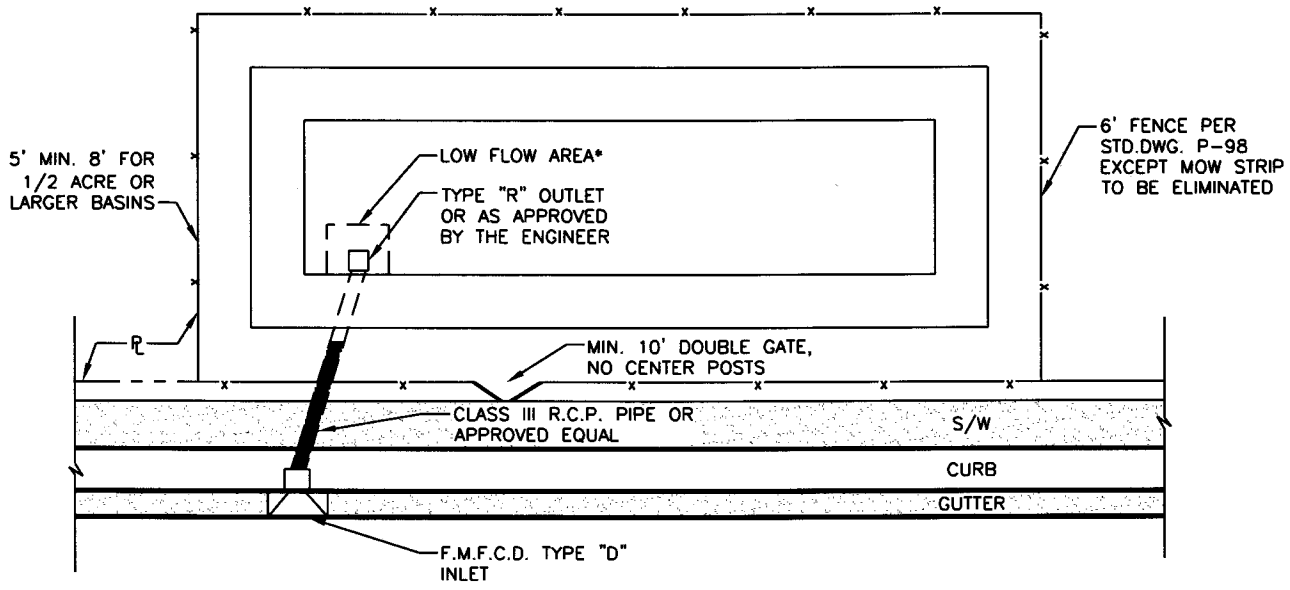


SECTION A-A
CIRCLE CURB DETAIL

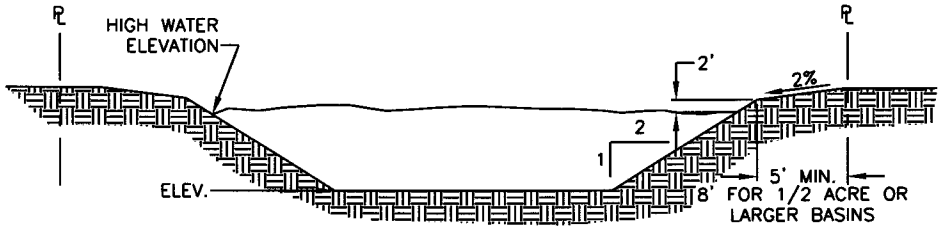
RESIDENTIAL TRAFFIC CIRCLE
CASE NO.2

REF. & REV.
JUNE 2015

CITY OF FRESNO
P-85



PLAN VIEW OF TYPICAL TEMPORARY PONDING BASIN



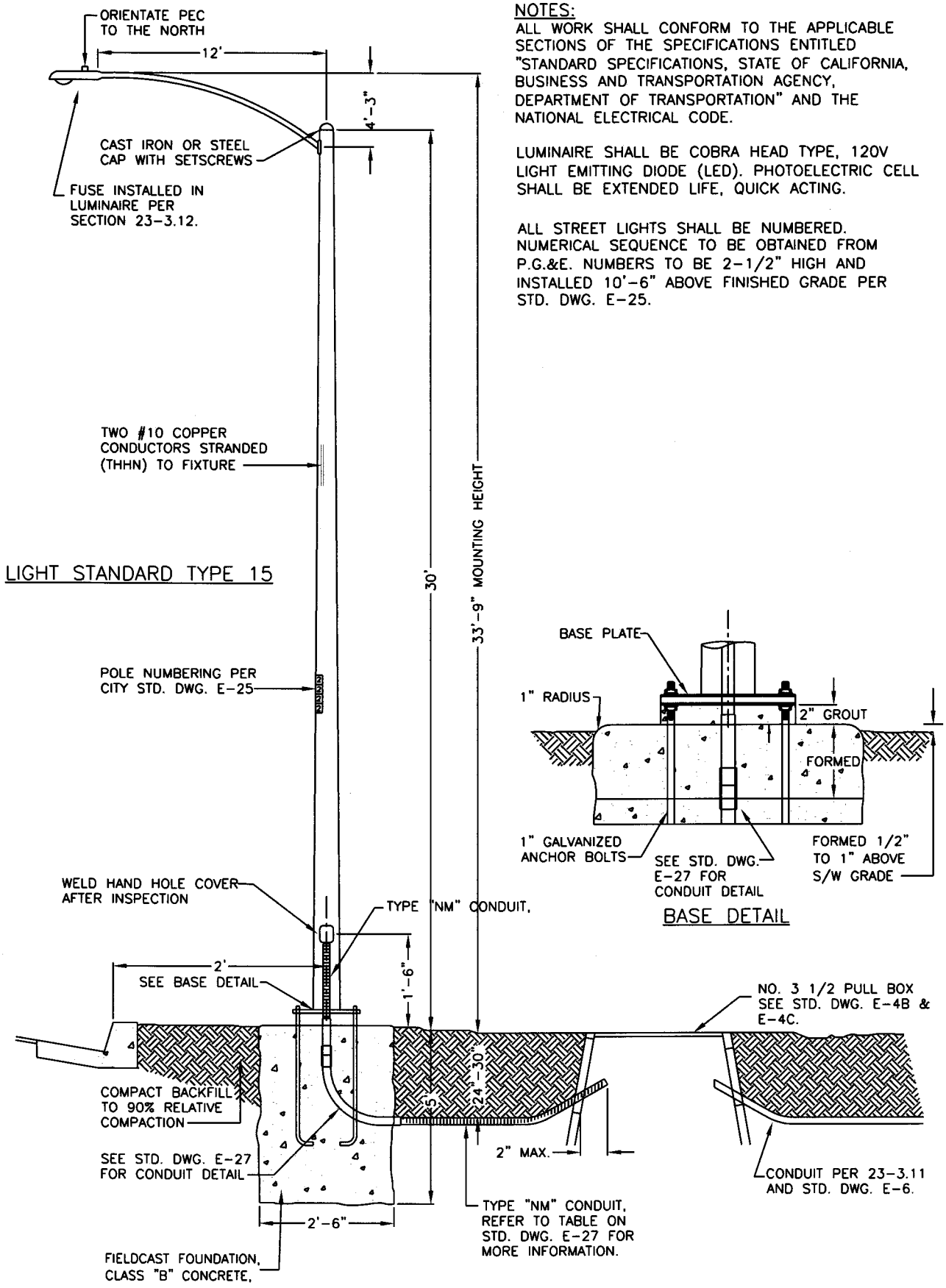
SECTION

NOTES: DESIGN MINIMUMS

1. OVERFLOW MUST BE TO THE STREET.
2. DESIGN WATER SURFACE ELEVATION SHALL BE TWO FEET BELOW THE LOWEST INLET FLOW LINE OR POND PERIPHERAL ELEVATION, WHICHEVER IS LOWER.
3. REQUIRED CAPACITY: V=CIA WHERE V=REQUIRED BASIN CAPACITY IN CUBIC FEET, C=RUNOFF COEFFICIENT, I=RAINFALL FROM A DESIGN STORM (0.35 FEET), AND A=TRIBUTARY AREA IN SQUARE FEET.
4. PROVIDE COMPOSITE "C" CALCULATIONS.
5. THE ENGINEER MAY REQUIRE AN 8' WIDE VEHICLE RAMP WITH A MAX. SLOPE OF 15% IN ½ ACRE OR LARGER BASINS.
6. TEMPORARY PONDING BASINS SHALL BE FENCED WITHIN 7 DAYS TIME AFTER THEY BECOME OPERATIONAL OR WHEN REQUIRED BY THE ENGINEER.
7. THE CITY ENGINEER MAY CONSIDER OTHER BASIN DESIGN ALTERNATIVES, AS A SUBSTITUTE FOR PROVIDING THE 2 FOOT FREEBOARD, WHEN THE BASIN SIZE IMPACTS PROJECT FEASIBILITY.
8. LOCKS FOR THE GATE TO BE #5 MASTER LOCKS, NO. 1C95, 3203 OR 0855.

• SIZE AND DEPTH OF LOW FLOW AREA TO BE DETERMINED BY THE ENGINEER.

TEMPORARY PONDING BASIN	REF. & REV. JUNE 2015	CITY OF FRESNO P-97



NOTES:

ALL WORK SHALL CONFORM TO THE APPLICABLE SECTIONS OF THE SPECIFICATIONS ENTITLED "STANDARD SPECIFICATIONS, STATE OF CALIFORNIA, BUSINESS AND TRANSPORTATION AGENCY, DEPARTMENT OF TRANSPORTATION" AND THE NATIONAL ELECTRICAL CODE.

LUMINAIRE SHALL BE COBRA HEAD TYPE, 120V LIGHT EMITTING DIODE (LED). PHOTOELECTRIC CELL SHALL BE EXTENDED LIFE, QUICK ACTING.

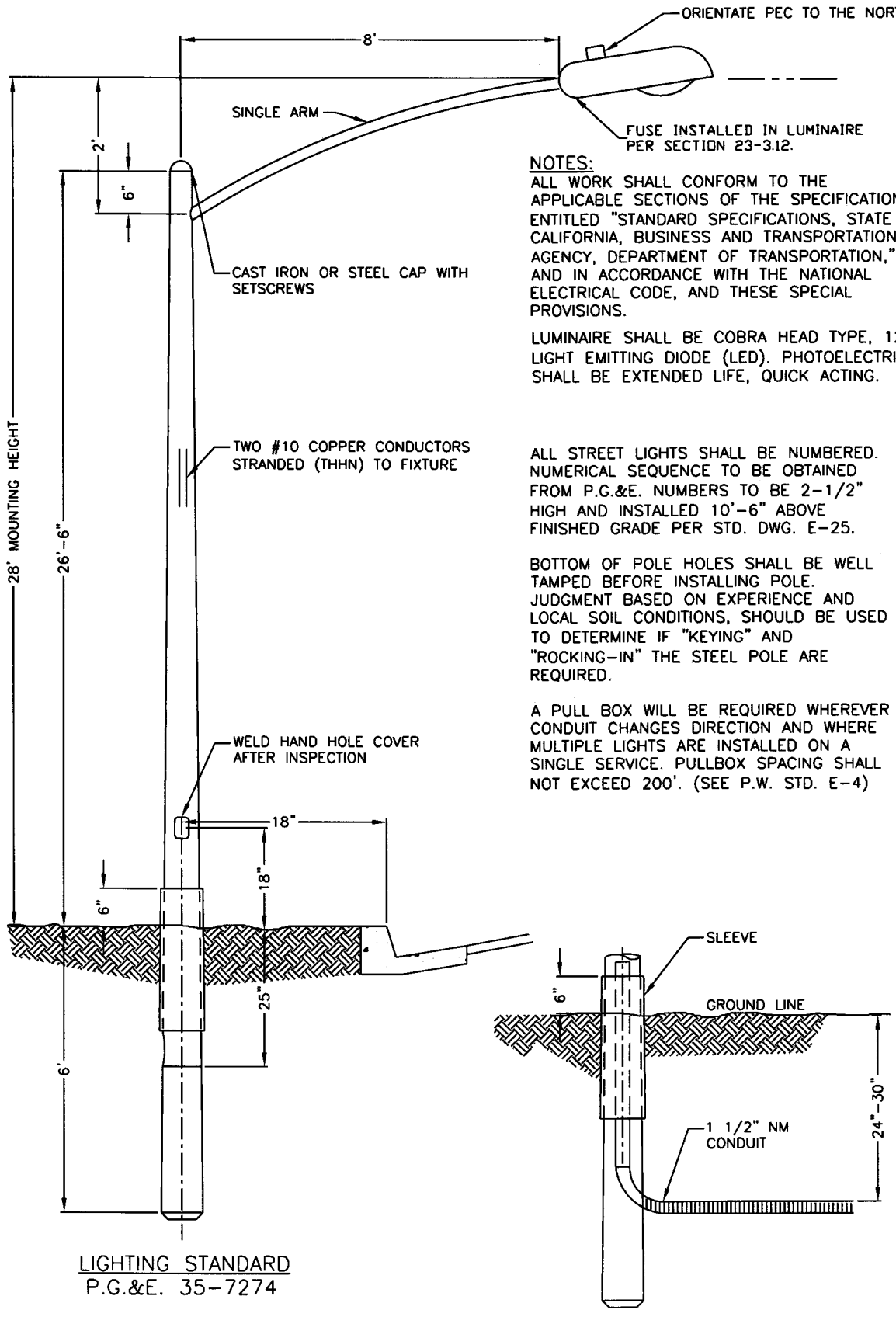
ALL STREET LIGHTS SHALL BE NUMBERED. NUMERICAL SEQUENCE TO BE OBTAINED FROM P.G.&E. NUMBERS TO BE 2-1/2" HIGH AND INSTALLED 10'-6" ABOVE FINISHED GRADE PER STD. DWG. E-25.

STREETLIGHT-MAJOR STREET
WITH BASE, PULL BOX & PVC CONDUIT

REF. & REV.
JUNE 2015

CITY OF FRESNO

E-1



LIGHTING STANDARD
P.G.&E. 35-7274

NOTES:

ALL WORK SHALL CONFORM TO THE APPLICABLE SECTIONS OF THE SPECIFICATIONS ENTITLED "STANDARD SPECIFICATIONS, STATE OF CALIFORNIA, BUSINESS AND TRANSPORTATION AGENCY, DEPARTMENT OF TRANSPORTATION," AND IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, AND THESE SPECIAL PROVISIONS.

LUMINAIRE SHALL BE COBRA HEAD TYPE, 120V LIGHT EMITTING DIODE (LED). PHOTOELECTRIC CELL SHALL BE EXTENDED LIFE, QUICK ACTING.

ALL STREET LIGHTS SHALL BE NUMBERED. NUMERICAL SEQUENCE TO BE OBTAINED FROM P.G.&E. NUMBERS TO BE 2-1/2" HIGH AND INSTALLED 10'-6" ABOVE FINISHED GRADE PER STD. DWG. E-25.

BOTTOM OF POLE HOLES SHALL BE WELL TAMPED BEFORE INSTALLING POLE. JUDGMENT BASED ON EXPERIENCE AND LOCAL SOIL CONDITIONS, SHOULD BE USED TO DETERMINE IF "KEYING" AND "ROCKING-IN" THE STEEL POLE ARE REQUIRED.

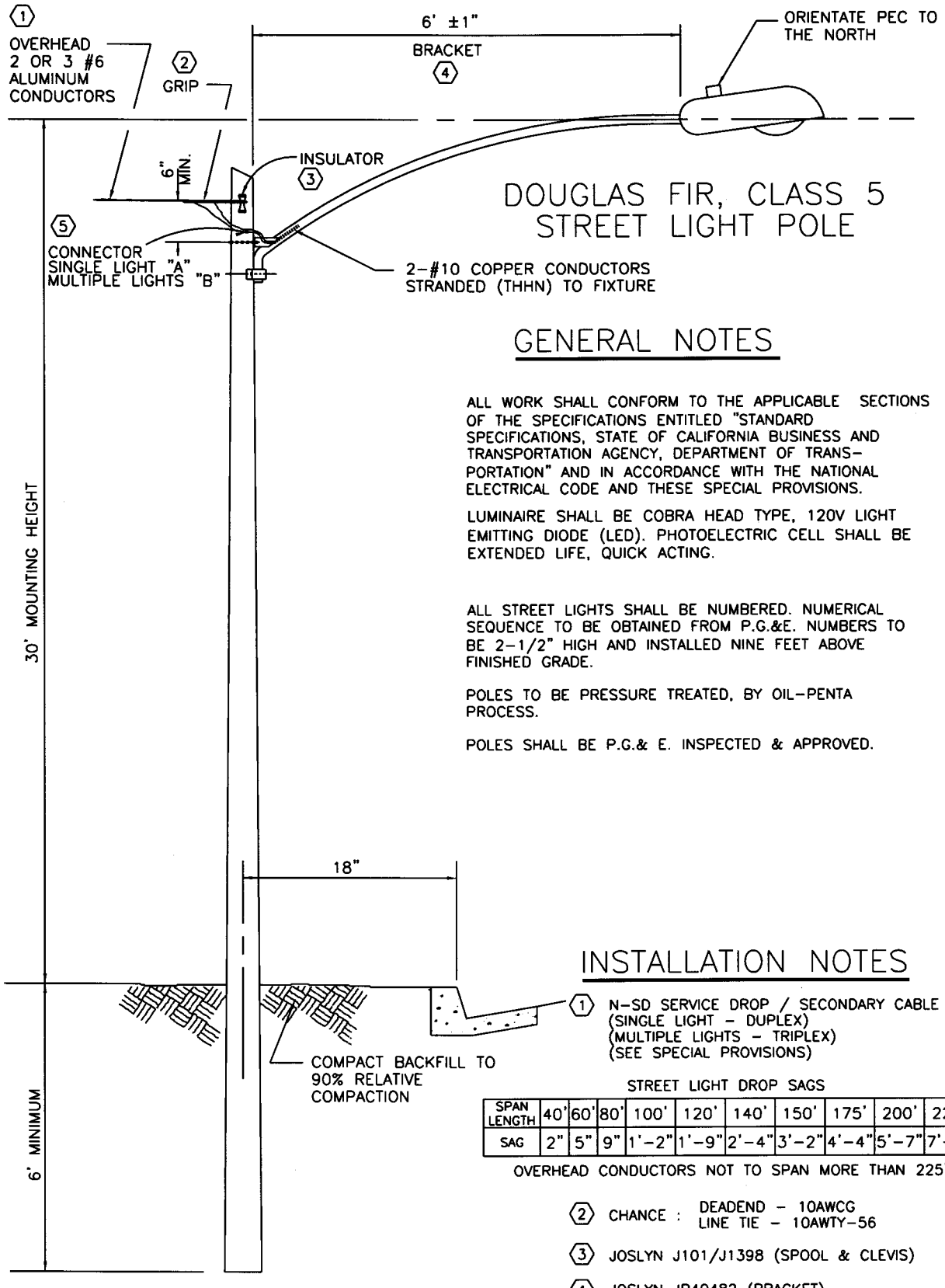
A PULL BOX WILL BE REQUIRED WHEREVER CONDUIT CHANGES DIRECTION AND WHERE MULTIPLE LIGHTS ARE INSTALLED ON A SINGLE SERVICE. PULLBOX SPACING SHALL NOT EXCEED 200'. (SEE P.W. STD. E-4)

STREETLIGHT-LOCAL STREET
DIRECT BURY WITH NO BASE

REF. & REV.
JUNE 2015

CITY OF FRESNO

E-2



DOUGLAS FIR, CLASS 5 STREET LIGHT POLE

GENERAL NOTES

ALL WORK SHALL CONFORM TO THE APPLICABLE SECTIONS OF THE SPECIFICATIONS ENTITLED "STANDARD SPECIFICATIONS, STATE OF CALIFORNIA BUSINESS AND TRANSPORTATION AGENCY, DEPARTMENT OF TRANS-PORTATION" AND IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND THESE SPECIAL PROVISIONS.

LUMINAIRE SHALL BE COBRA HEAD TYPE, 120V LIGHT EMITTING DIODE (LED). PHOTOELECTRIC CELL SHALL BE EXTENDED LIFE, QUICK ACTING.

ALL STREET LIGHTS SHALL BE NUMBERED. NUMERICAL SEQUENCE TO BE OBTAINED FROM P.G.&E. NUMBERS TO BE 2-1/2" HIGH AND INSTALLED NINE FEET ABOVE FINISHED GRADE.

POLES TO BE PRESSURE TREATED, BY OIL-PENTA PROCESS.

POLES SHALL BE P.G.& E. INSPECTED & APPROVED.

INSTALLATION NOTES

1. N-SD SERVICE DROP / SECONDARY CABLE
(SINGLE LIGHT - DUPLEX)
(MULTIPLE LIGHTS - TRIPLEX)
(SEE SPECIAL PROVISIONS)

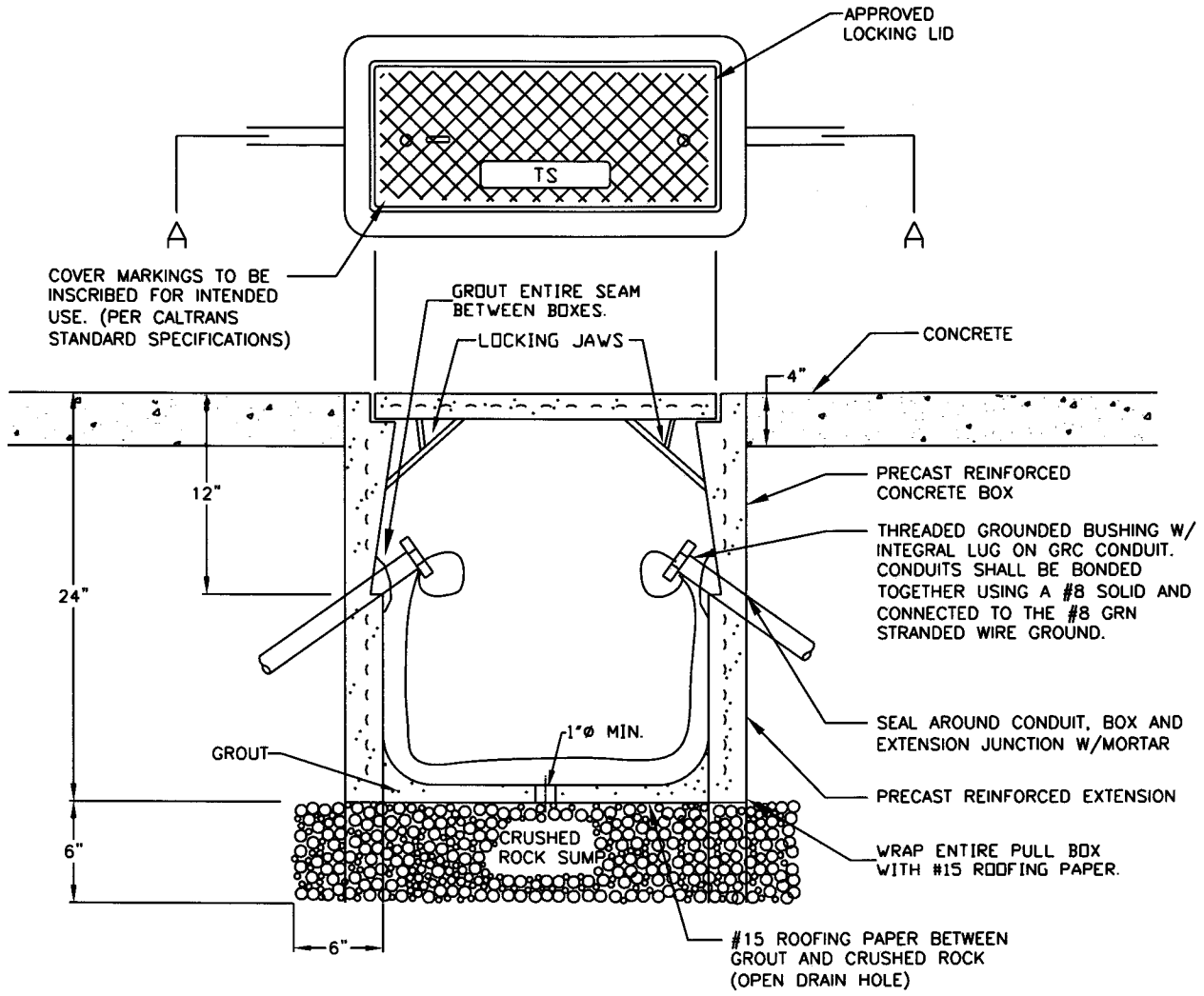
STREET LIGHT DROP SAGS

SPAN LENGTH	40'	60'	80'	100'	120'	140'	150'	175'	200'	225'
SAG	2"	5"	9"	1'-2"	1'-9"	2'-4"	3'-2"	4'-4"	5'-7"	7'-1"

OVERHEAD CONDUCTORS NOT TO SPAN MORE THAN 225'

2. CHANCE : DEADEND - 10AWCG
LINE TIE - 10AWTY-56
3. JOSLYN J101/J1398 (SPOOL & CLEVIS)
4. JOSLYN JP40482 (BRACKET)
5. CONNECTOR (SEE SPECIAL PROVISIONS)

STREETLIGHT-LOCAL STREET OVERHEAD SERVICE - WOOD POLE	REF. & REV. JUNE 2015	CITY OF FRESNO E-3

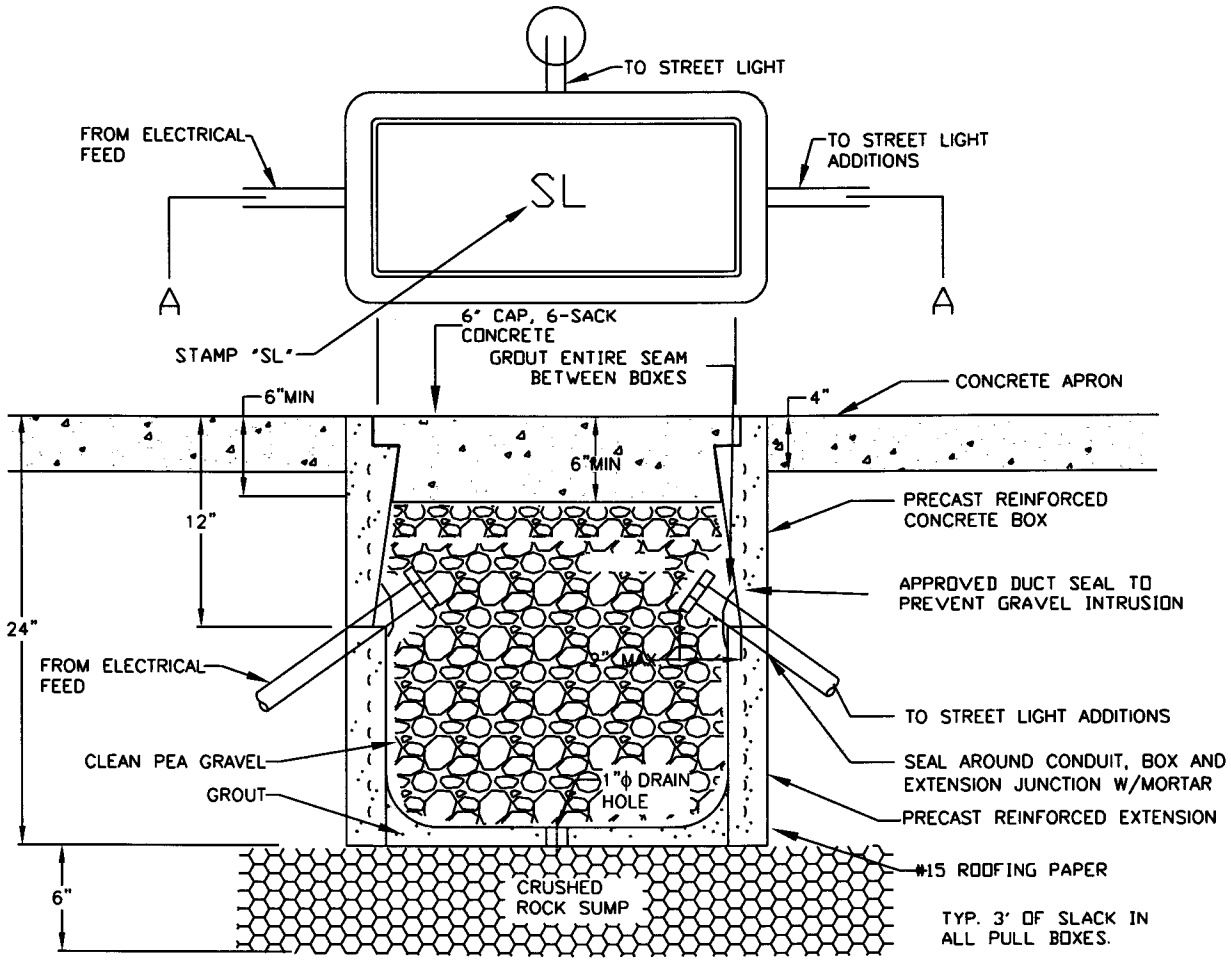


Section A–A

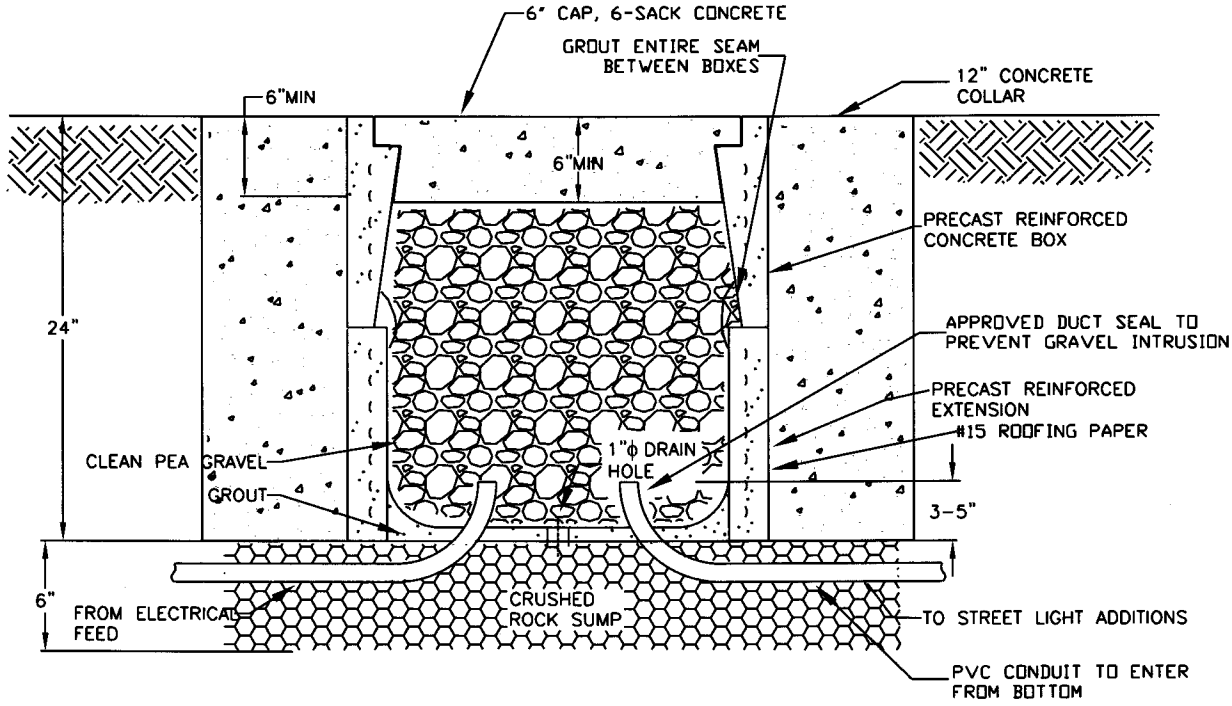
NOTES:

1. PULL BOXES SHALL BE #5 UNLESS OTHERWISE NOTED ON PLANS.
2. WRAP PULL BOX WITH ROOFING PAPER BEFORE BACKFILLING.
3. INSTALL A ONE–FOOT RING OF CONCRETE, 24" DEEP, AROUND THE WRAPPED PULL BOXES INSTALLED IN NON–CONCRETE AREAS, SLOPED TO DRAIN AWAY FROM THE PULL BOX. PULL BOXES IN SIDEWALKS MUST BE SET AT FINISHED GRADE WITH TEMPORARY CONCRETE APRON OR SECTION OF SIDEWALK POURED.
4. PULL BOXES SHALL BE GROUTED PRIOR TO INSTALLATION OF CONDUCTORS, SLOPED TOWARD THE DRAIN HOLE. PLACE A LAYER OF ROOFING PAPER BETWEEN THE CRUSHED ROCK AND THE GROUT, OPEN AT THE DRAIN HOLE.
5. AN APPROVED LOCKING LID SHALL BE INSTALLED ON ALL TRAFFIC SIGNAL PULL BOXES.
6. TYPICAL, 3' OF SLACK IN ALL PULL BOXES.

TRAFFIC SIGNALS CONCRETE PULL BOXES	REF. & REV. JUNE 2015	CITY OF FRESNO E–4A

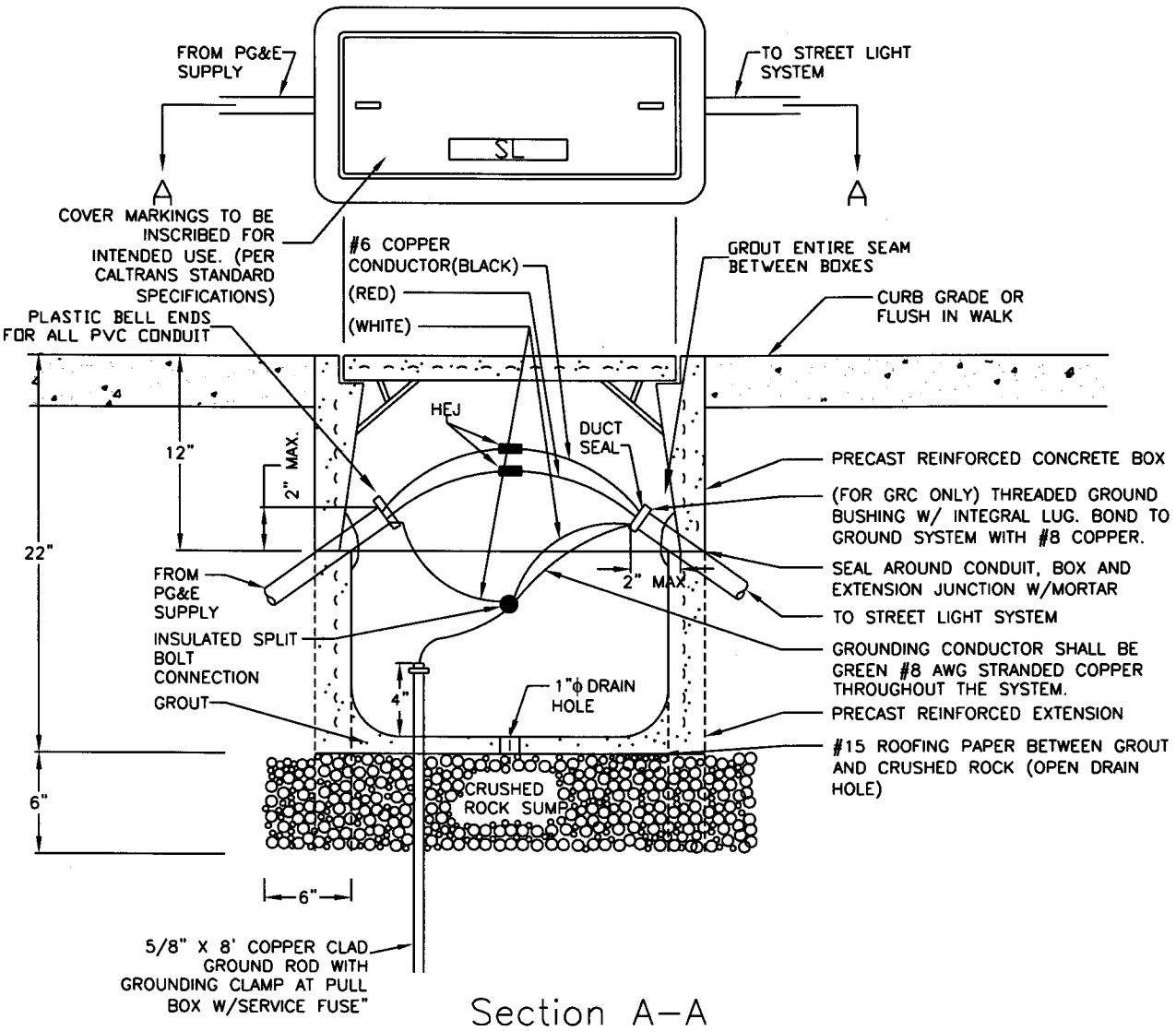


STREET LIGHT PULL BOX IN CONCRETE AREA



STREET LIGHT PULL BOX IN DIRT AREA

STREETLIGHTS CONCRETE PULL BOXES DETERRENT DETAIL	REF. & REV. JUNE 2015	CITY OF FRESNO E-4B



Section A–A

NOTES:

1. PULL BOXES SHALL BE #3 1/2 UNLESS OTHERWISE NOTED ON PLANS.
2. SERVICE PULL BOX SHALL BE WITHIN THE STREET R.O.W. AND NOT PRIVATE PROPERTY.
3. WRAP PULL BOX WITH ROOFING PAPER BEFORE BACKFILLING.
4. INSTALL A ONE–FOOT CONCRETE COLLAR, 24" DEEP, AROUND THE WRAPPED PULL BOXES WHEN INSTALLED IN DIRT OR TURF AREAS, SLOPED TO DRAIN AWAY FROM THE PULL BOX. PULL BOXES IN SIDEWALKS MUST BE SET AT FINISHED GRADE WITH A TEMPORARY CONCRETE APRON OR SECTION OF SIDEWALK POURED.
5. PULL BOXES SHALL BE GROUTED PRIOR TO INSTALLTION OF CONDUCTORS, SLOPED TOWARD THE DRAIN HOLE. PLACE A LAYER OF ROOFING PAPER BETWEEN THE CRUSHED ROCK AND THE GROUT, OPEN AT THE DRAIN HOLE.
6. FUSE AT POINT OF SERVICE SHALL BE 60A IF #6 CONDUCTOR AND 40A IF #8 CONDUCTOR AND SHALL HAVE A TRON HEJ TYPE FUSE HOLDER (SINGLE POLE). INSULATE WIRE CONNECTION SAME AS SPLICES (23–3.13).
7. AN APPROVED LOCKING LID SHALL BE INSTALLED AT THE "POINT OF SERVICE" PULL BOX.

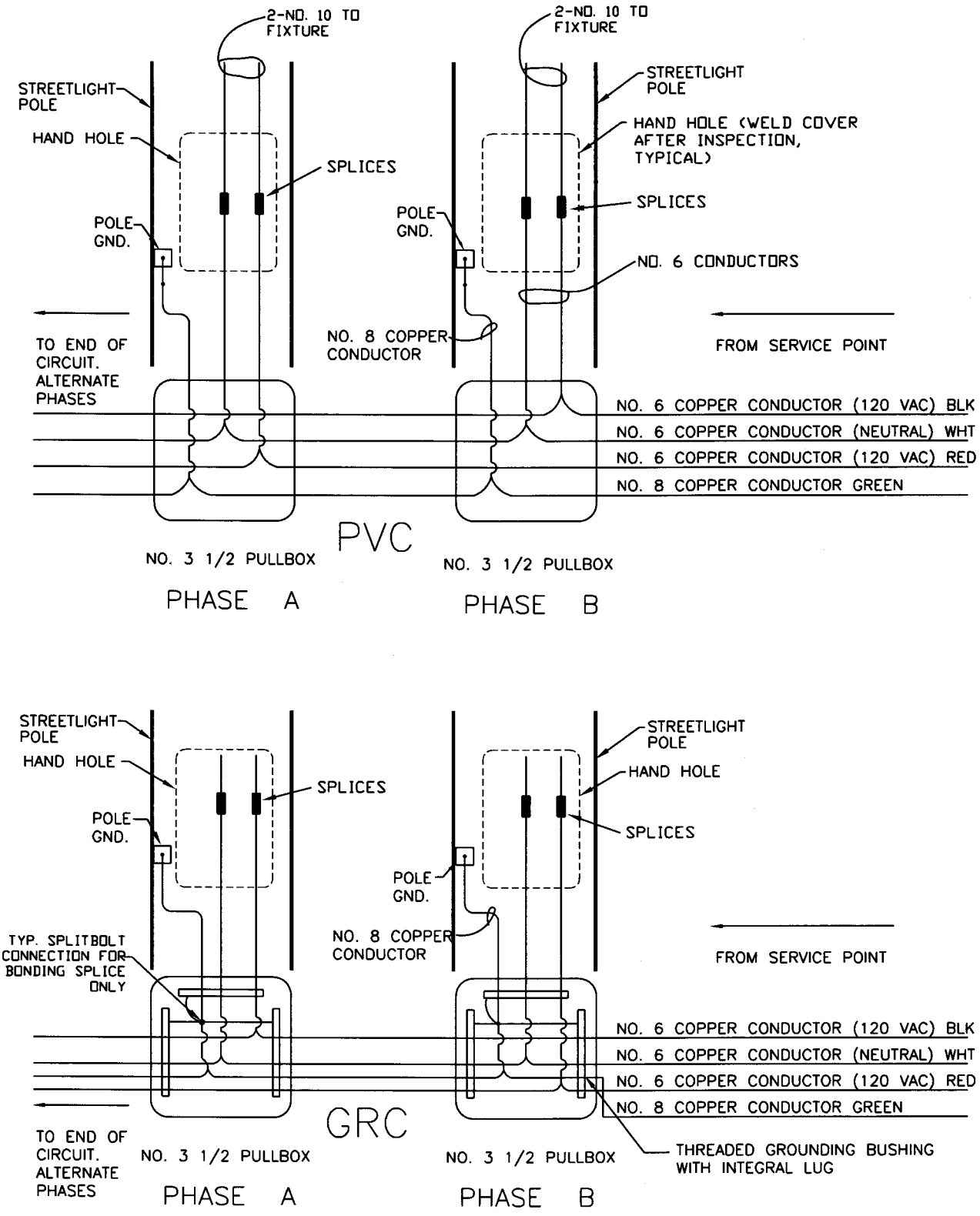
STREETLIGHT POINT OF SERVICE

CONCRETE PULL BOX

REF. & REV.
JUNE 2015

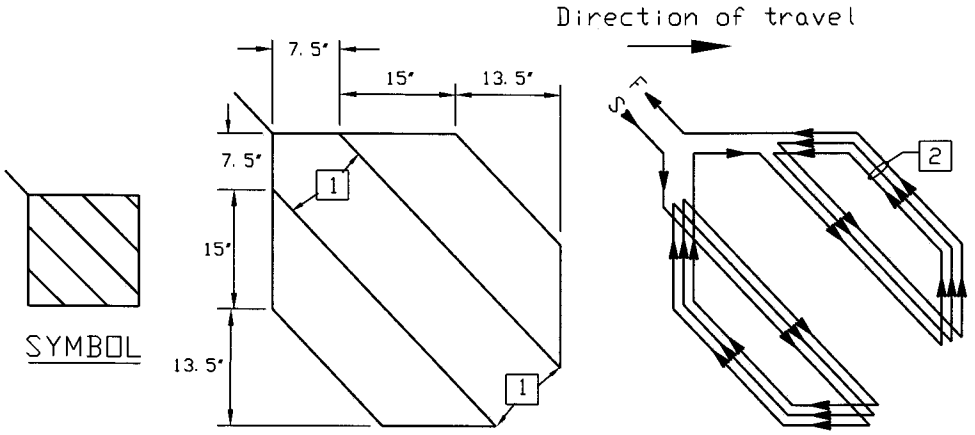
CITY OF FRESNO

E–4C



NOTES:
WITH EXCEPTION OF BONDING JUMPERS, NO SPLICES WILL BE ALLOWED IN PULL BOXES.

STREETLIGHT–CONNECTION DIAGRAM	REF. & REV. JUNE 2015	CITY OF FRESNO E–5

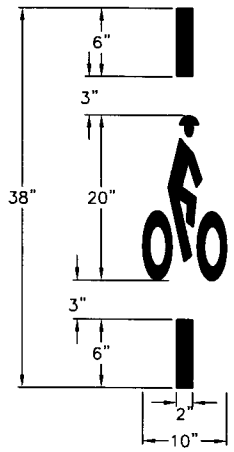


BIKE LOOP (3' X3')
DETECTOR CONFIGURATION

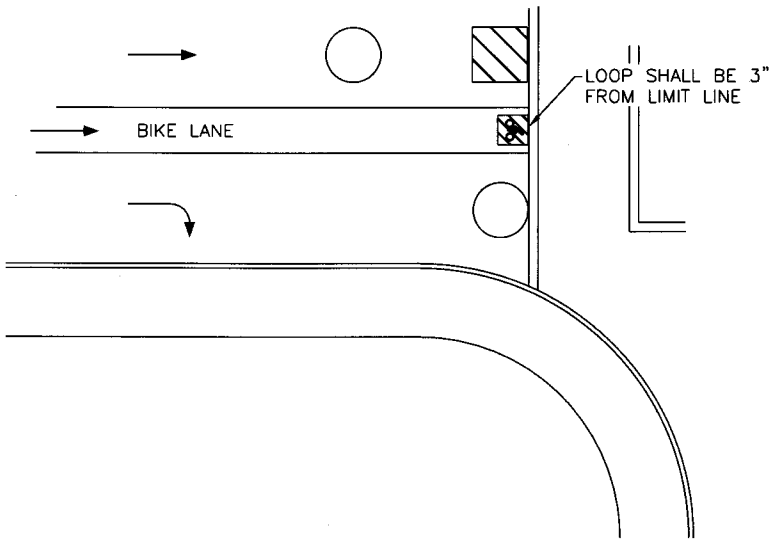
[1] Round corners of acute angle sawcuts to prevent damage to conductors.

[2] Install 3 turns when only one BIKE loop is on a sensor unit channel. Install 5 turns when one BIKE loop is connected in series with 3 additional 6' x6' loops on a sensor unit channel.

CITY OF FRESNO BIKE LOOP WITH BIKE LOOP DETECTOR SYMBOL 9C-7 OF THE CA-MUTCD, CENTERED ON LOOP.



BICYCLE LOOP DETECTOR SYMBOL FOR 3'X3' LOOP



NOTES:

1. LOOP SEALANT SHALL BE CALTRANS APPROVED ELASTOMERIC SEALANT OR HOT MELT RUBBERIZED ASPHALT SEALANT.
2. ALL NEW LOOPS SHALL BE TESTED AND DOCUMENTED ON SHEET PROVIDED IN THE SECTION 23-2, TESTING SHALL BE TO CALTRANS STATE STANDARD PLANS.
3. REFER TO STD. DWG. E-14 FOR LOOP PLACEMENT.

SIGNAL LIGHTS BIKE LOOP DETECTOR DETAIL (3'X3')	REF. & REV. JUNE 2015	CITY OF FRESNO E-13

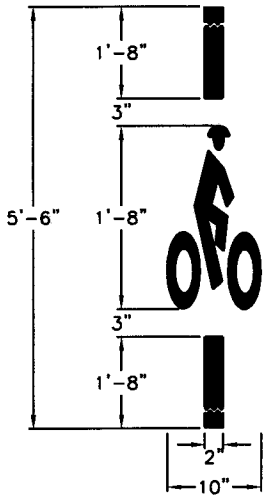
LEGEND:

CALTRANS TYPE 'E' – SAWCUT CIRCULAR LOOP DETECTOR – "TYPE 2" LOOP WIRE (ES-5B).

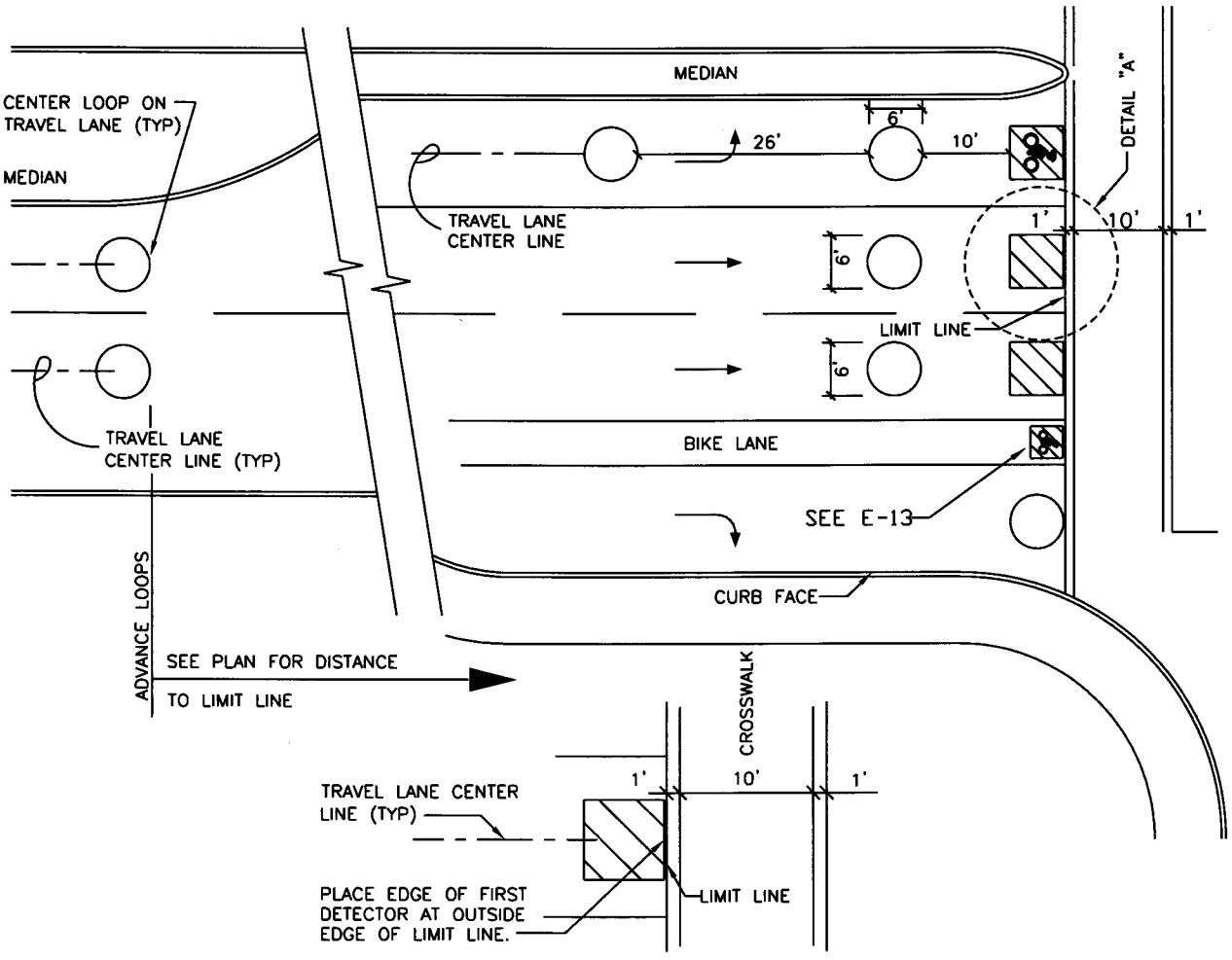
CALTRANS TYPE 'D' – SAW CUT DIAGONAL LOOP DETECTOR "TYPE 2" LOOP WIRE (ES-5B).

CALTRANS TYPE 'D' W/BIKE DETECTOR SYMBOL (ON STATE STD. PLANS A24C & FIG. 9C-7 (CA) CA-MUTCD) CENTERED ON LOOP.

CITY OF FRESNO STD. DWG. E-13 BIKE LOOP (3'x3') WITH BIKE DETECTOR SYMBOL CENTERED ON LOOP.



BICYCLE LOOP DETECTOR SYMBOL FOR CALTRANS TYPE 'D'

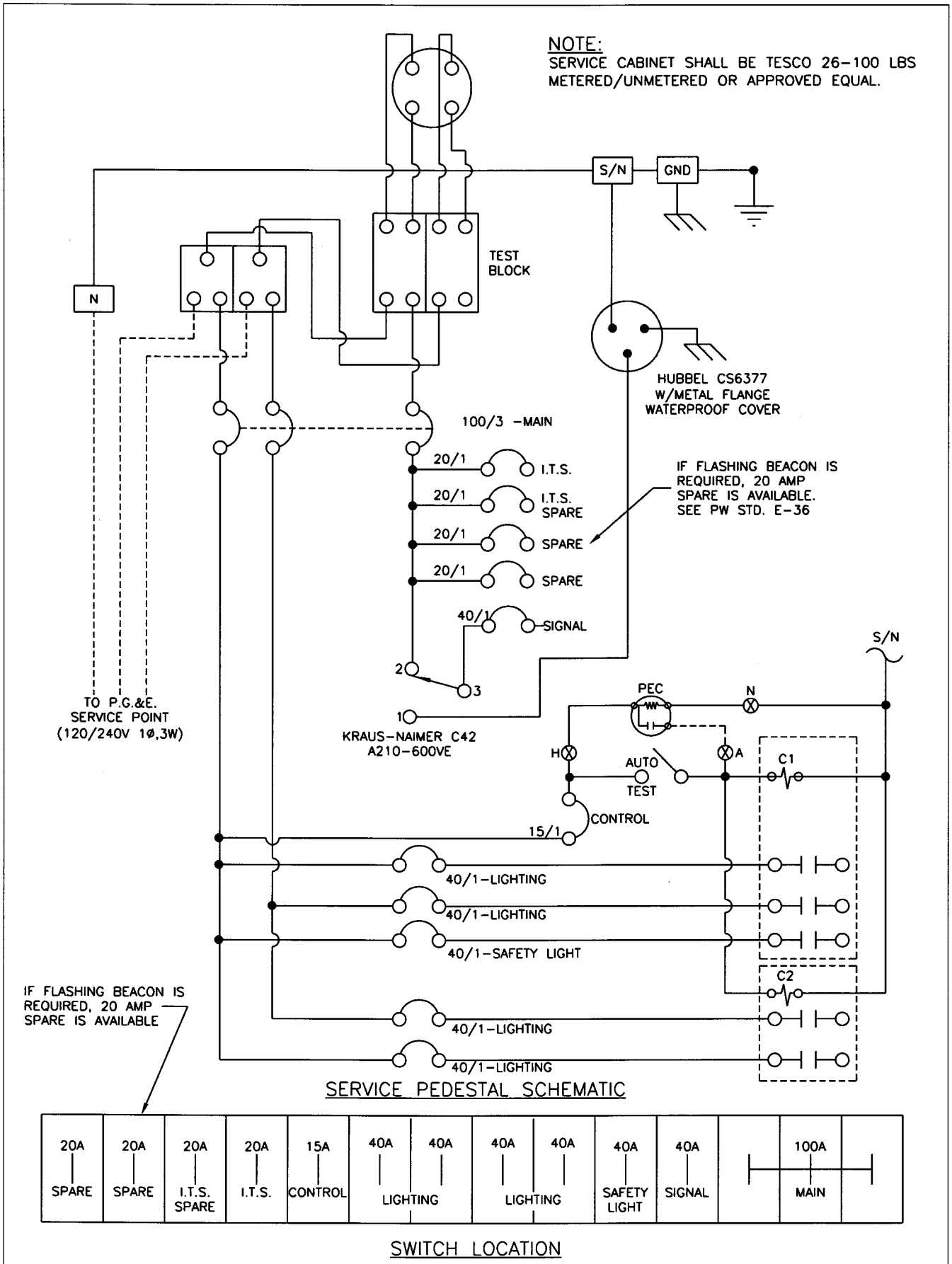


DETAIL "A"

NOTES:

1. CIRCULAR DETECTION SHALL BE DETERMINED BY THE CONDITION OF EXISTING PAVEMENT AND SHALL HAVE THE APPROVAL OF THE CITY TRAFFIC ENGINEER. CIRCULAR LOOP SAWCUTS SHALL BE PER CALTRANS ES-5B, LOOP SEALANT SHALL BE CALTRANS APPROVED ELASTOMERIC SEALANT OR HOT MELT RUBBERIZED ASPHALT SEALANT.
2. ALL NEW LOOPS SHALL BE TESTED AND DOCUMENTED ON SHEET PROVIDED IN THE SECTION 23-2, TESTING SHALL BE TO CALTRANS STATE STANDARD PLANS.

SIGNAL LIGHTS LOOP DETECTOR PLACEMENT	REF. & REV. JUNE 2015	CITY OF FRESNO E-14



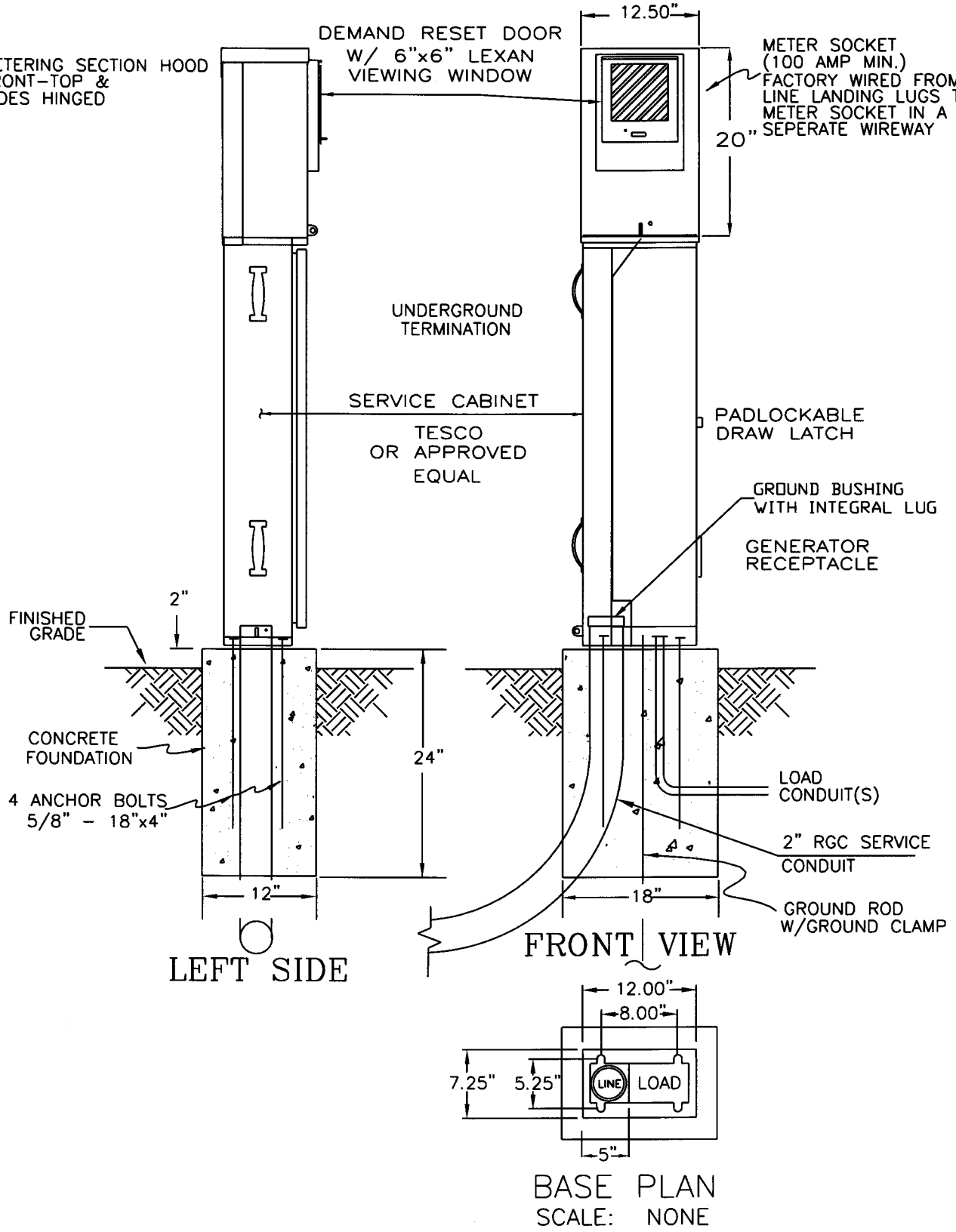
SIGNAL LIGHT

WIRING NEW INSTALLATIONS 26-100 CABINETS

REF. & REV.
JUNE 2015

CITY OF FRESNO

E-15

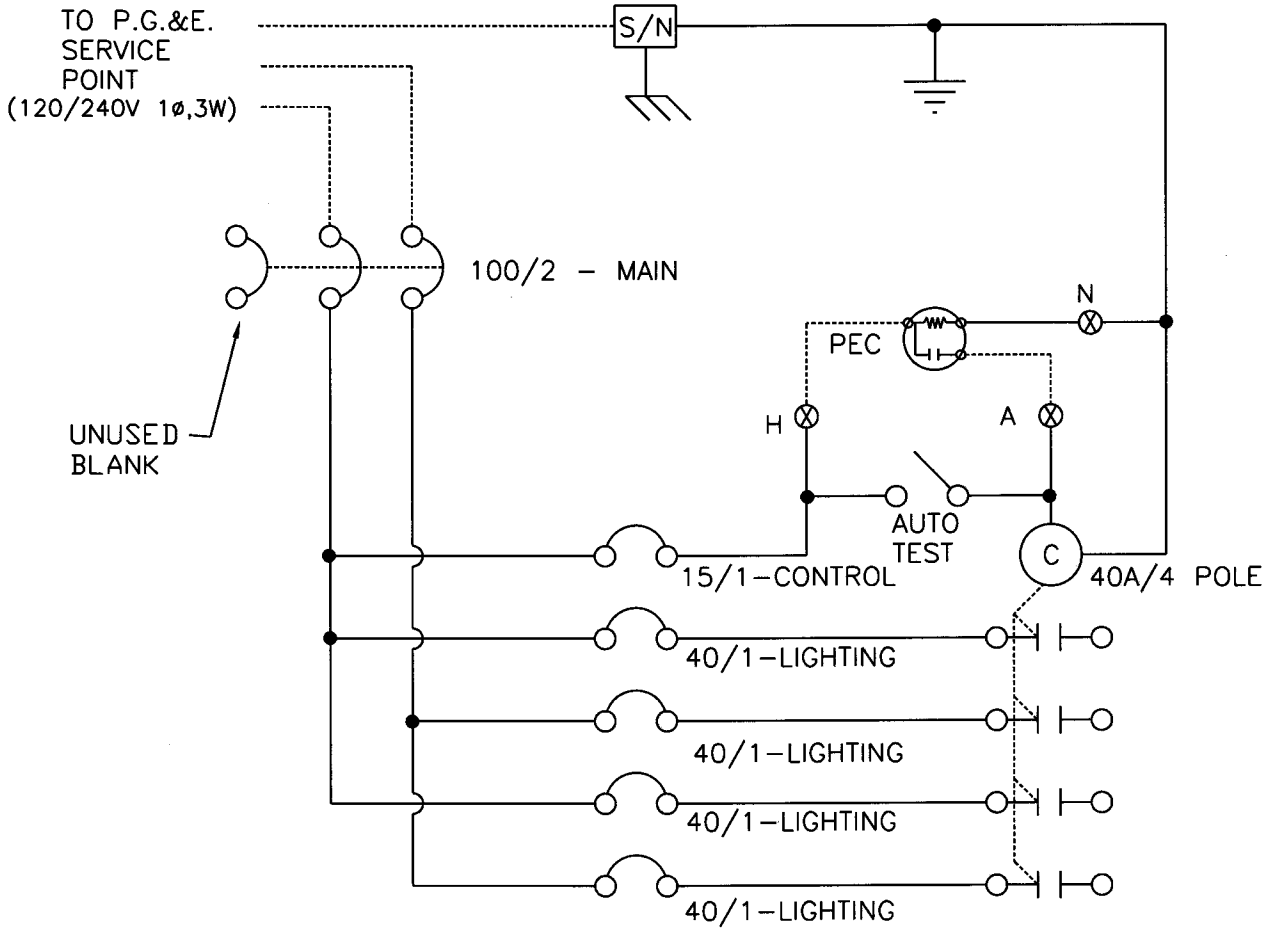


NOTES

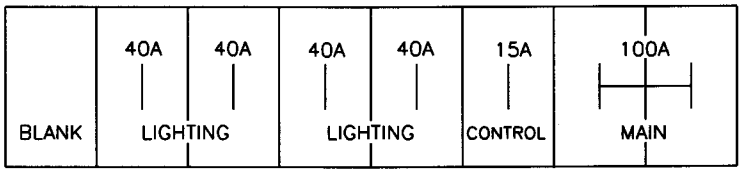
1. IN ORDER FOR CONFORMITY AND REPLACEMENT PURPOSES ALL SERVICE PEDESTAL FOUNDATIONS TO BE CONSTRUCTED TO THESE SPECIFICATIONS. ANY DEVIATIONS FROM THESE REQUIREMENTS SHALL HAVE THE APPROVAL OF THE ELECTRICAL SUPERINTENDANT.
2. FRONT OF CABINET SHALL FACE ACCESSIBLE RIGHT OF WAY.

SIGNAL LIGHT SERVICE FOUNDATION DETAIL	REF. & REV. JUNE 2015	CITY OF FRESNO E-17

NOTE:
SERVICE CABINET SHALL BE TESCO 26-000 NM UNMETERED OR APPROVED EQUIVALENT.

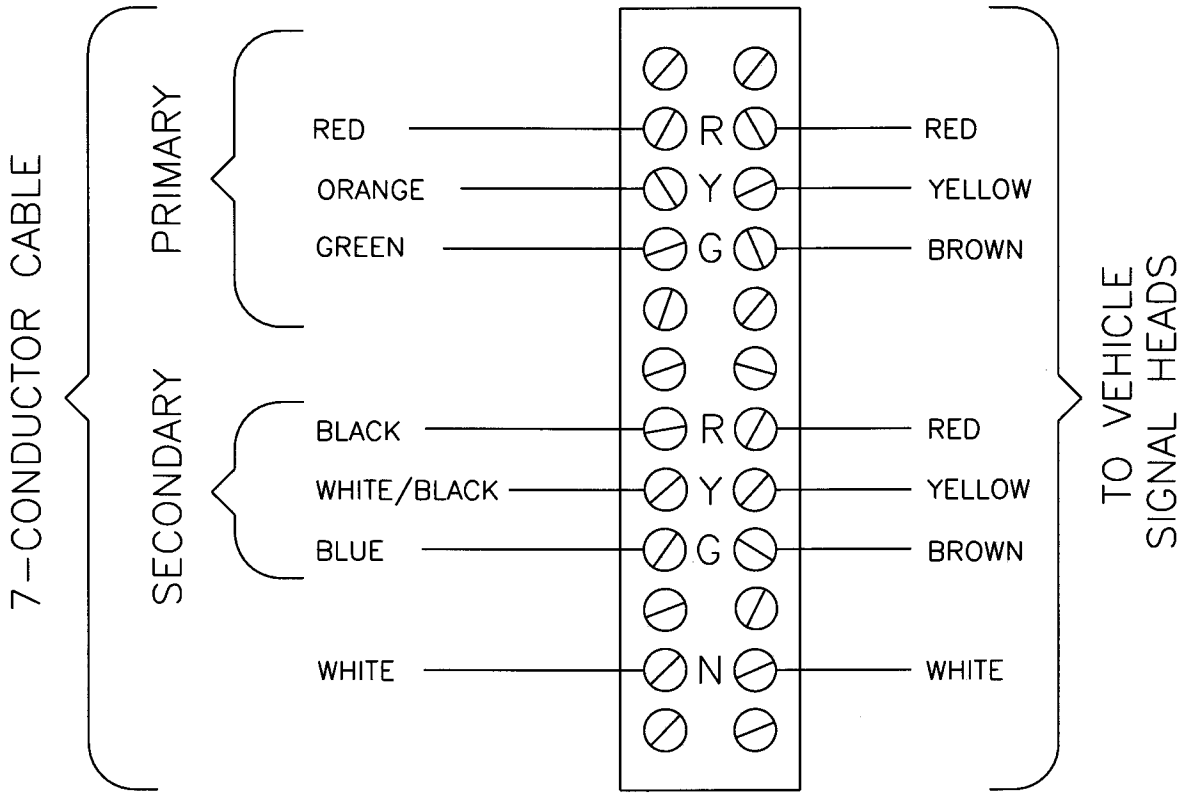


SERVICE PEDESTAL SCHEMATIC



SWITCH LOCATION

STREETLIGHT WIRING	REF. & REV. JUNE 2015	CITY OF FRESNO E–18



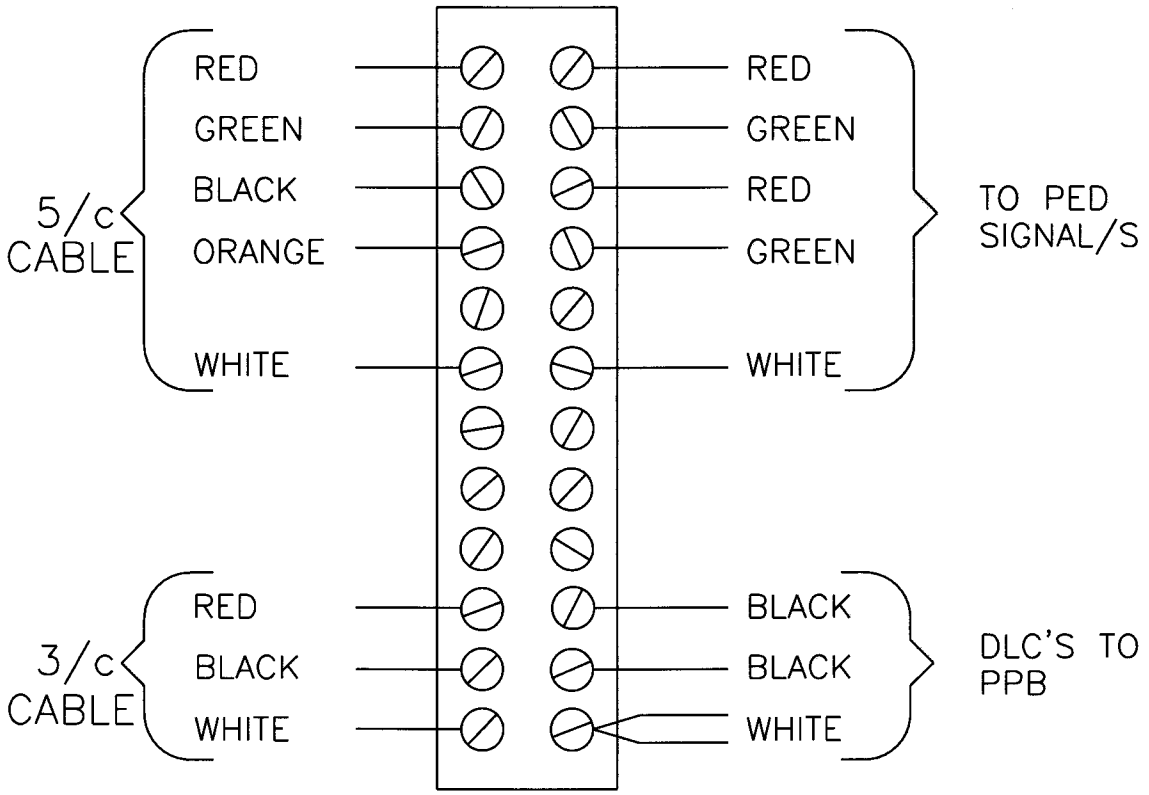
VEHICLE TERMINAL COMPARTMENT

NOTES:

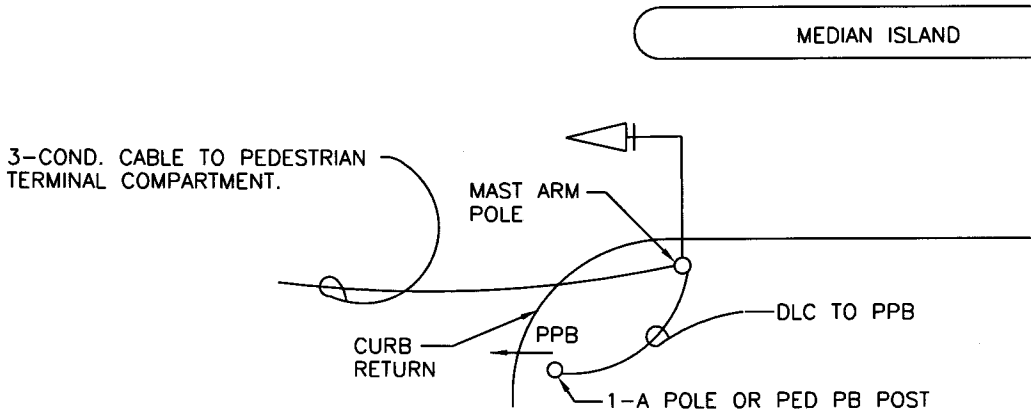
1. INSTALL SINGLE CONDUCTOR COLOR CODED #14 THWN COPPER WIRE BETWEEN TERMINAL STRIP AND EACH SIGNAL ASSEMBLY AND CONNECT.
2. ALL STRANDED CONDUCTORS SHALL HAVE ALL LOOSE STRANDS TIGHTLY TWISTED TOGETHER AND INDIVIDUAL CONDUCTORS TINNED WITH SOLDER.
3. WITHIN INDIVIDUAL CABLES THE ASSIGNMENTS OF PRIMARY OR SECONDARY COLORS ARE BASED UPON THE TABLE BELOW:

PRI	SEC
NB	EB or SB or WB
EB	SB or WB
SB	WB
THRU	TURN

VEHICLE SIGNAL TERMINAL LOCATION	REF. & REV. JUNE 2015	CITY OF FRESNO E-19



TERMINAL STRIP



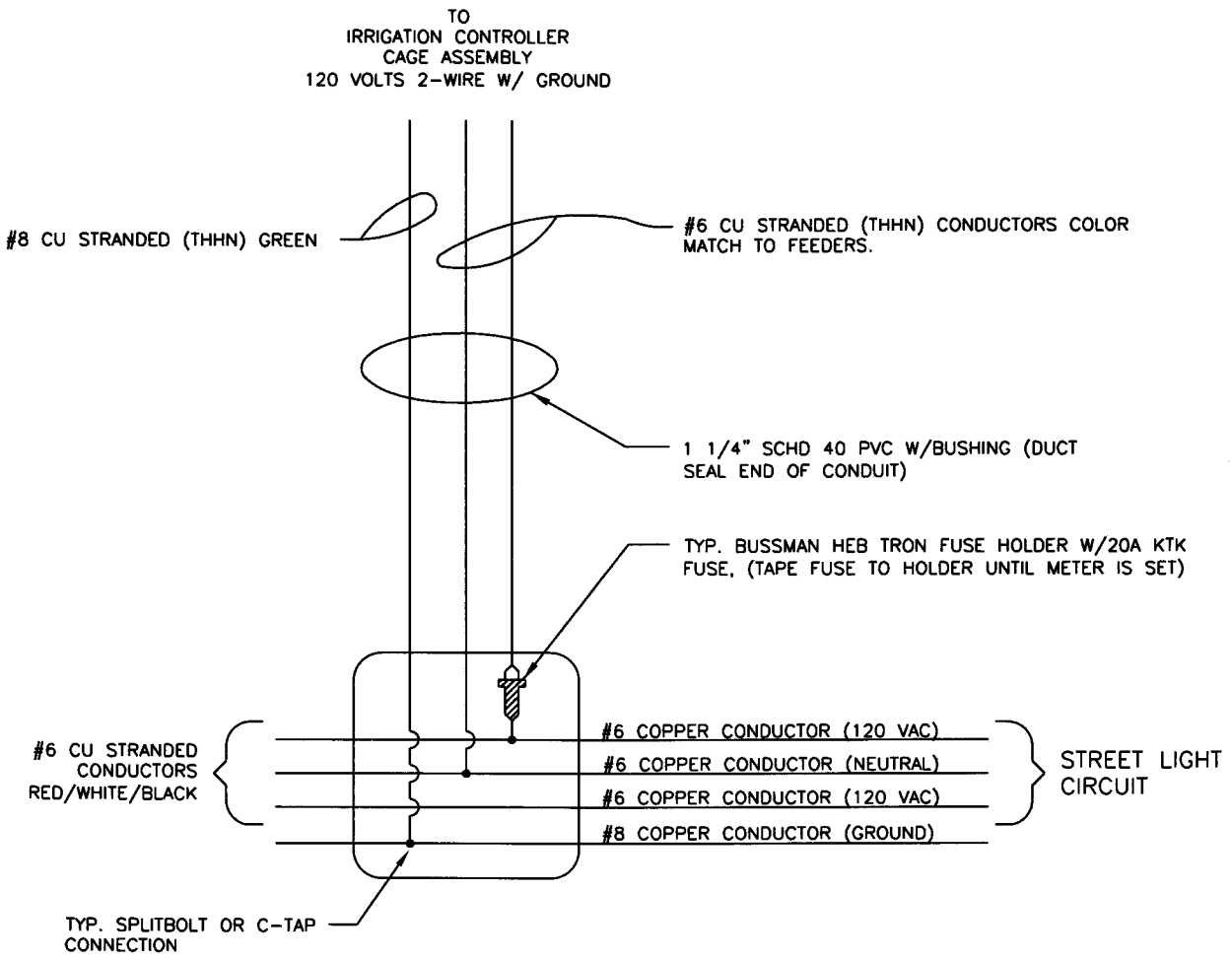
TYPICAL CORNER CONNECTIONS

NOTES:

1. INSTALL SINGLE CONDUCTOR COLOR CODED #14 THWN COPPER WIRE BETWEEN TERMINAL STRIP AND EACH SIGNAL ASSEMBLY AND CONNECT.

2. ALL STRANDED CONDUCTORS SHALL HAVE ALL LOOSE STRANDS TIGHTLY TWISTED TOGETHER AND INDIVIDUAL CONDUCTORS TINNED WITH SOLDER.

PEDESTRIAN SIGNAL, & PPB TERMINAL LOCATIONS	REF. & REV. JUNE 2015	CITY OF FRESNO E-20



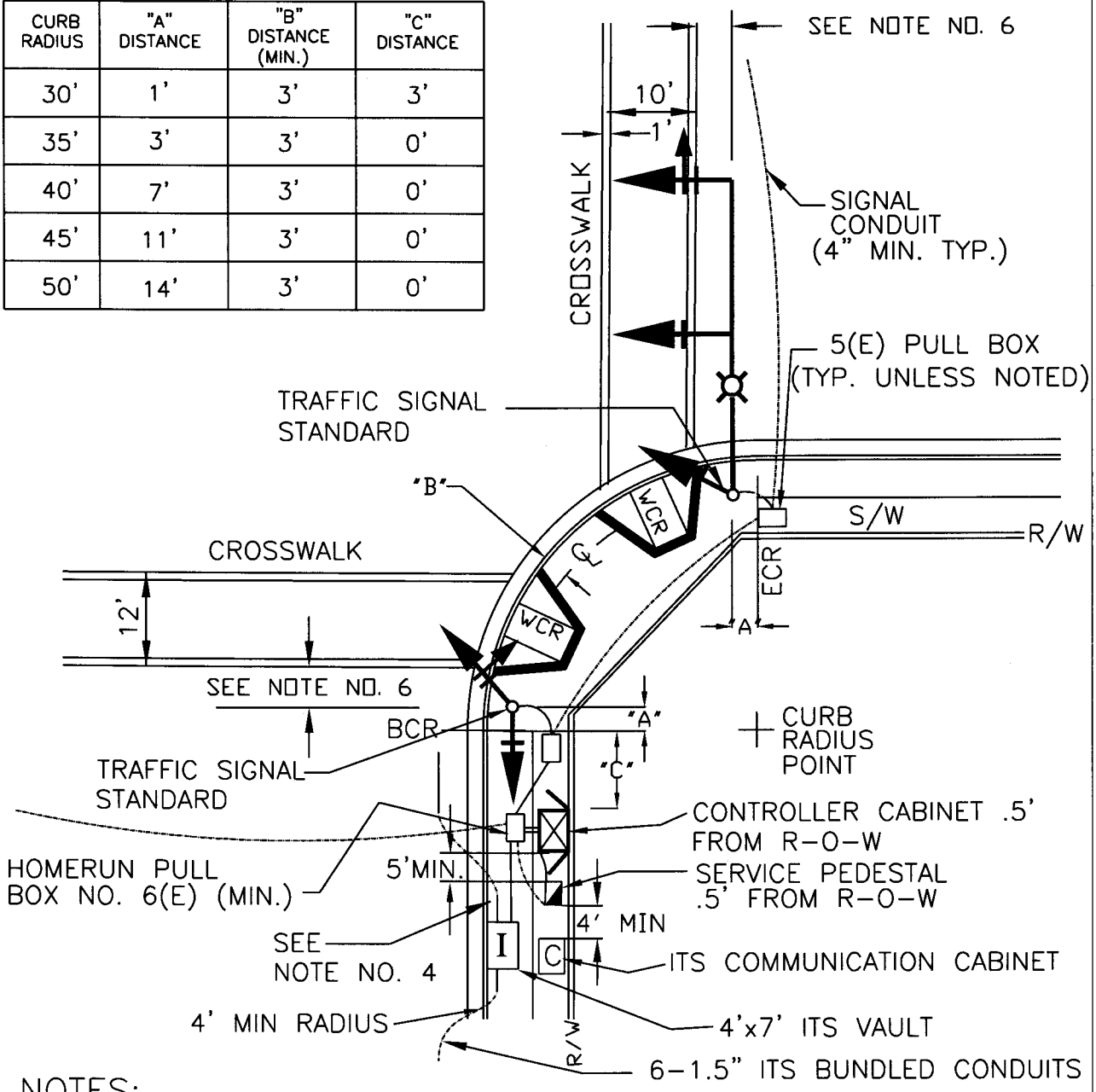
TYPICAL NO. 3 1/2 PULLBOX

NOTES:

1. GROUT BOX AT CONDUIT ENTRANCE. RESTORE ANY GROUT DAMAGED BY INSTALLATION.
2. INSULATE HOT/NEUTRAL SPLICES AS FOLLOWS:
   COVER WITH 2-LAYERS RUBBER TAPE-FILLING VOIDS.
   APPLY 1-LAYER 1/2 LAPPED PVC TAPE.
   APPLY 1-LAYER FRICTION TAPE & COAT WITH AN APPROVED ELECTRICAL SEALING COMPOUND.
3. PULL BOX LID SHALL BE A "LOCK JAW LOCKING LID" OR EQUIVALENT.

STREETLIGHT IRRIGATION SERVICE INSTALLATION	REF. & REV. JUNE 2015	CITY OF FRESNO E-21

CURB RADIUS	"A" DISTANCE	"B" DISTANCE (MIN.)	"C" DISTANCE
30'	1'	3'	3'
35'	3'	3'	0'
40'	7'	3'	0'
45'	11'	3'	0'
50'	14'	3'	0'



NOTES:

1. ALL EQUIPMENT SHALL BE LOCATED ACCORDING TO CITY OF FRESNO APPROVED PLANS. ANY VARIATION TO THE PLANS SHALL HAVE THE APPROVAL OF THE CITY TRAFFIC ENGINEER.
2. ALL EQUIPMENT SHALL BE LOCATED ACCORDING TO THE ULTIMATE STREET WIDTH AND CURB RETURNS.
3. ULTIMATE AND EXISTING CURB RETURN ARE/SHALL BE SHOWN ON CONSTRUCTION PLANS.
4. ADDITIONAL SIDEWALK TO BE INSTALLED PER CITY STANDARDS AS APPLICABLE TO MAINTAIN A 4' MINIMUM ADA CLEAR PATH ADJACENT TO EQUIPMENT.
5. DISTANCE "C" SHALL BE ADJUSTED AS NECESSARY FOR THE 4' ADA CLEARANCE REQUIREMENT.
6. DISTANCE "A" HAS BEEN CALCULATED TO PLACE A PEDESTRIAN PUSH BUTTON APPROXIMATELY 5' FROM CROSSWALK. IF UNFORESEEN CONDITIONS DO NOT ALLOW SIGNAL STANDARD OR CROSSWALK PLACEMENT AS SHOWN, A PEDESTRIAN PUSH BUTTON POST SHALL BE INSTALLED TO MEET ADA GUIDELINES.

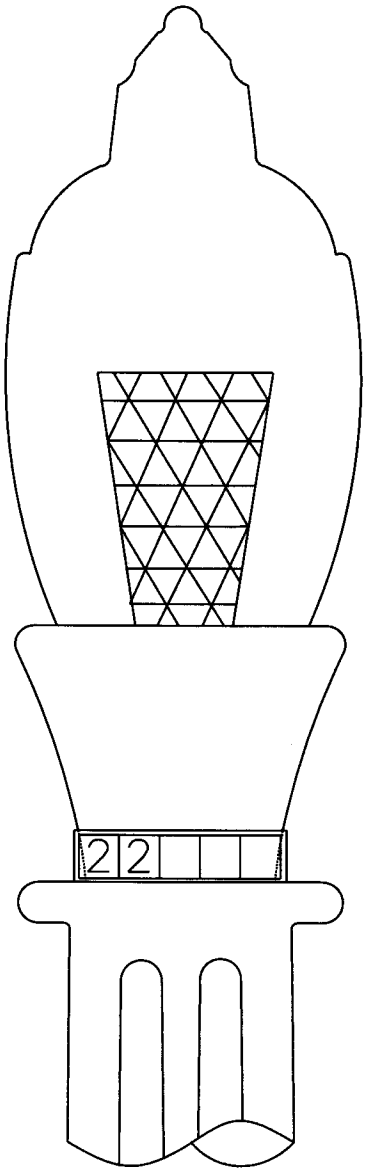
SIGNAL LIGHTS/DUAL RAMPS
EQUIPMENT PLACEMENT GUIDELINE

REF. & REV.
JUNE 2015

CITY OF FRESNO
E-24A

NOTES:

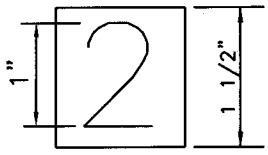
INSERT #'S AS NEEDED INTO HOLDER. FORM TO BASE OF CAPITAL & SECURE WITH STAINLESS STEEL STRAP.



GLOBE

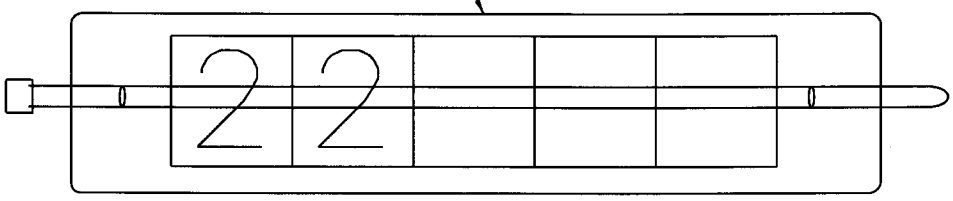
CAPITAL

POLE



UV RESISTANT POLY NUMERAL TAGS ALMETEK H900 SERIES BLACK ON YELLOW.

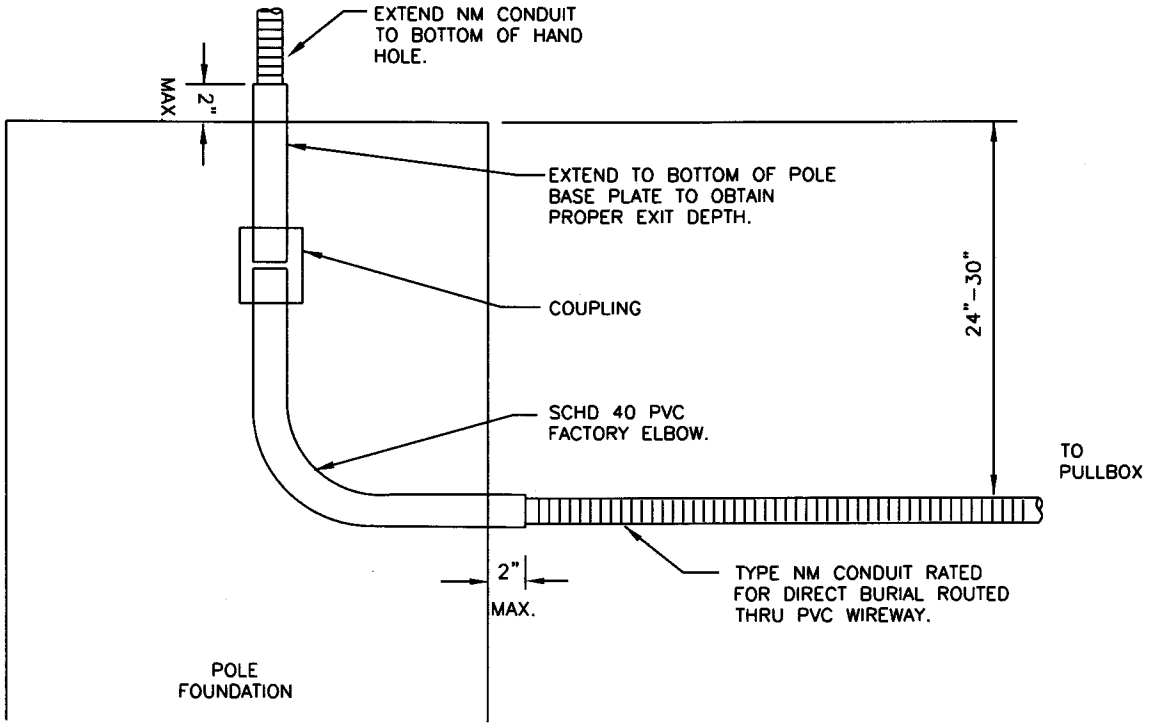
UV RESISTANT POLY TAG HOLDER ALMETEK TH-6P



STAINLESS STEEL STRAP PANDUIT MLT8H-LP OR APPROVED EQUAL.

NUMERAL HOLDER DETAIL

STREETLIGHT ORNAMENTAL POLE NUMBERING	REF. & REV. JUNE 2015	CITY OF FRESNO E-26



POLE TYPE	PVC	NM	GRC
PPBP	--	--	1"
POLE TYPE 1A	2.5"	1.5"	--
POLE TYPE 15	2.5"	1.5"	--
POLE TYPES 16-61	3"	2"	--

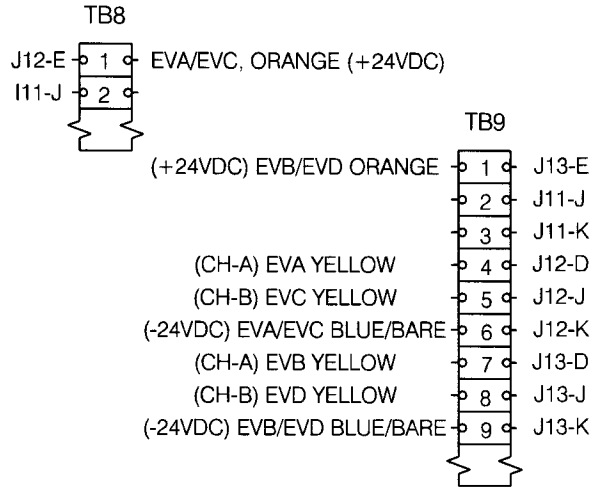
SIGNAL LIGHT
FOUNDATION WIRE-WAY DETAIL

REF. & REV.
JUNE 2015

CITY OF FRESNO
E-27

OPTICOM FIELD WIRE DETAIL

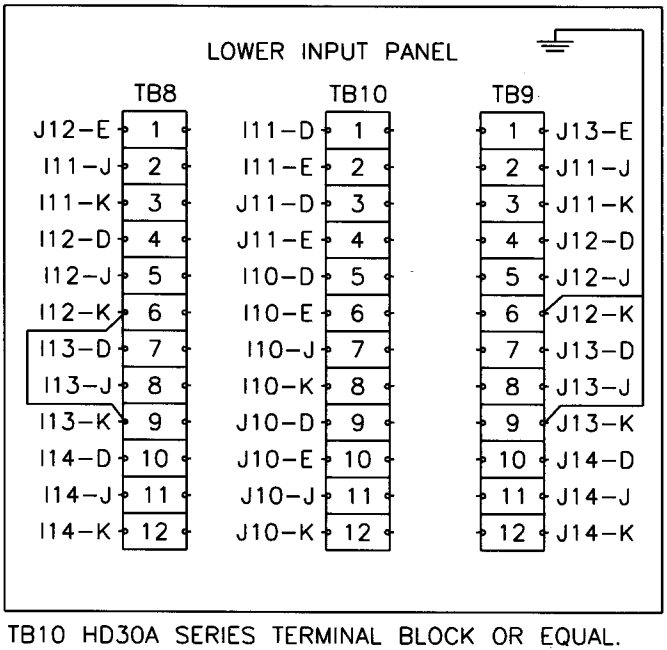
(FOR STANDARD MODEL 721/752 INSTALLATIONS)



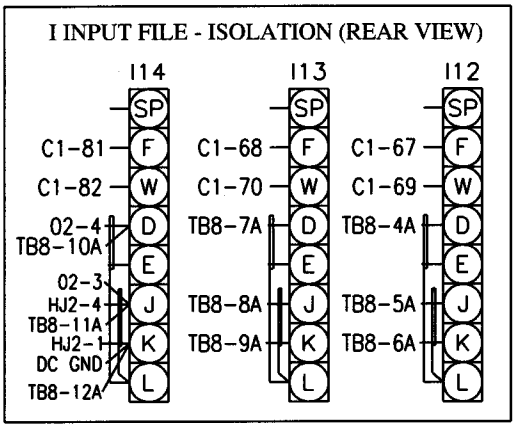
NOTES: 332 CABINET MODIFICATIONS FOR OPTICOM MODEL 762 DISCRIMINATORS (TWO-CHANNEL, DUAL PRIORITY, ENCODED) AND MODEL 721 DETECTORS (TWO DIRECTION, SINGLE CHANNEL).

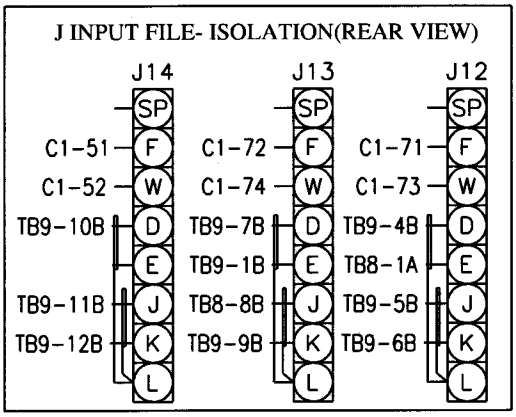
CAUTION

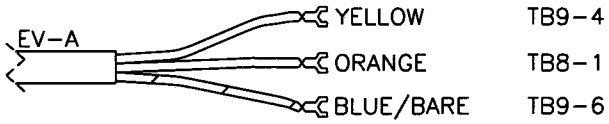
CONNECT TERMINAL K OF THE INPUT FILE SLOTS J12&J13 TO THE EARTH GROUND TO ALLOW DISSIPATION OF STATIC CHARGES ON THE DETECTOR CABLE. FAILURE TO CONNECT TERMINAL K TO THE EARTH GROUND MAY DAMAGE THE EQUIPMENT. IF DETECTORS HAVE BEEN MOUNTED BUT NOT CONNECTED TO THE PHASE SELECTOR, STRIP INSULATION FROM EACH DETECTOR CABLE AND CONNECT ALL THE WIRES TO EARTH GROUND UNTIL THE INSTALLATION CAN BE COMPLETED.

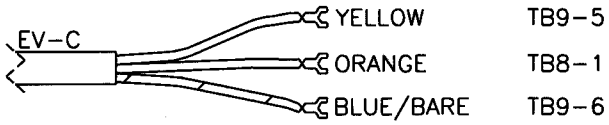


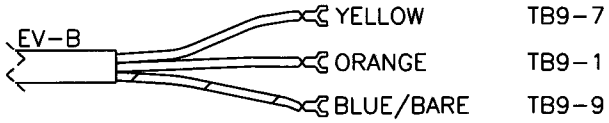
TB10 HD30A SERIES TERMINAL BLOCK OR EQUAL.

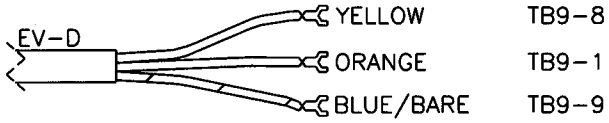












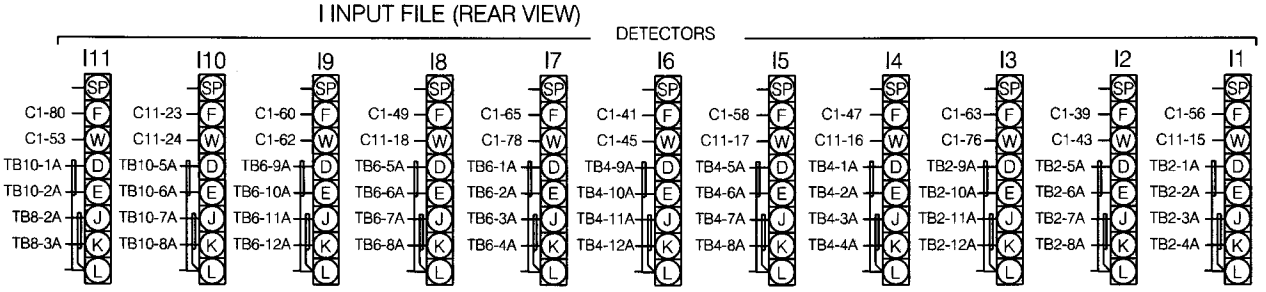
EMERGENCY VEHICLE PREEMPTION OPTICOM CONNECTIONS

721 DETECTOR AND TERMINAL BLOCK CONNECTIONS

REF. & REV. JUNE 2015

CITY OF FRESNO

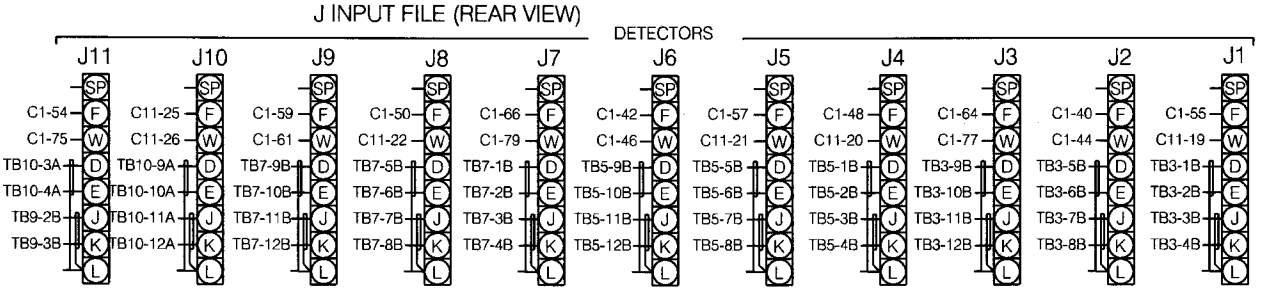
E-34A



NOTE:
SEE CITY STANDARD DRAWING E-34 WIRING DETAILS FOR INPUT FILE I12, I13, I14, J12, J13 & J14.

INPUT FILE FRONT VIEW

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	1I1U (1)	2I2U (2)	2I3U (4)	2I4U (6)	3I5U (7)	4I6U (8)	4I7U (10)	4I8U (12)	1I9U (13)	SPI10U (41)	2I11U (29)	Ø2P	Ø6P	FS
L	1I1L (33)	2I2L (3)	2I3L (5)	2I4L (34)	3I5L (35)	4I6L (9)	4I7L (11)	4I8L (36)	3I9L (14)	SPI10L (42)	4I11L (30)	Ø4P	Ø8P	ST

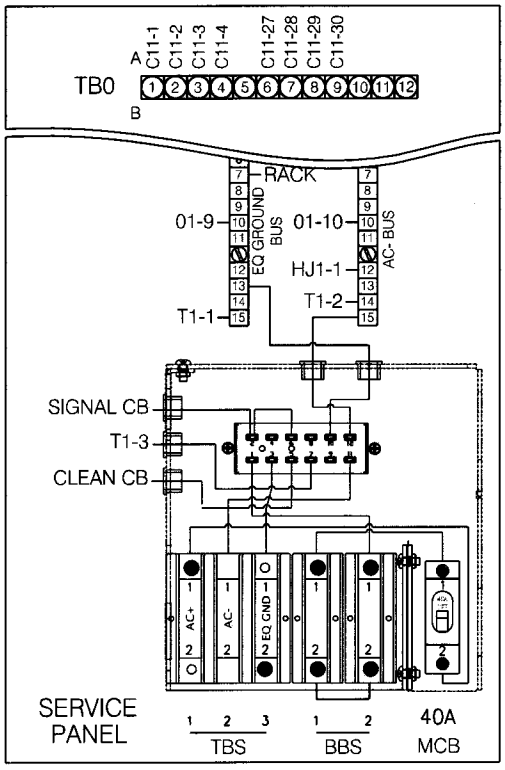


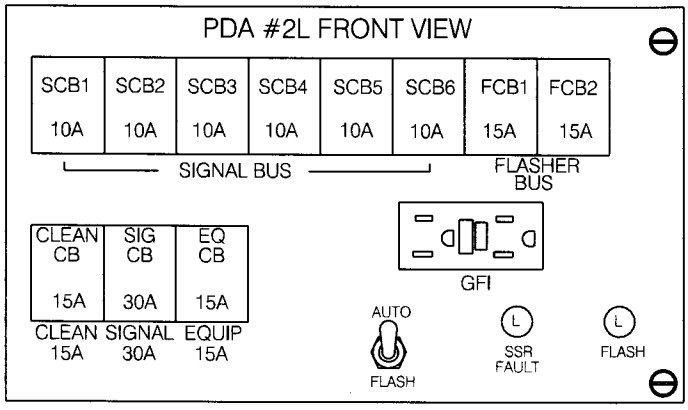
CABLE C11S		
PIN NO.	UNIVERSAL FUNCTION	CONN. TO
1	SPECIAL-OUTPUT	TB0-1A
2	SPECIAL-OUTPUT	TB0-2A
3	SPECIAL-OUTPUT	TB0-3A
4	SPECIAL-OUTPUT	TB0-4A
5-14	NOT USED	NOT USED
15	1 CALL, EXT	I1-W
16	2 CALL, QUEUE	I4-W
17	3 CALL, EXT	I5-W
18	4 CALL, QUEUE	I8-W
19	5 CALL, EXT	J1-W
20	6 CALL, QUEUE	J4-W
21	7 CALL, EXT	J5-W
22	8 CALL, QUEUE	J8-W
23	SPECIAL-INPUT	I10-F
24	SPECIAL-INPUT	I10-W
25	SPECIAL-INPUT	J10-F
26	SPECIAL-INPUT	J10-W
27	SPECIAL-INPUT	TB0-6A
28	SPECIAL-INPUT	TB0-7A
29	SPECIAL-INPUT	TB0-8A
30	SPECIAL-INPUT	TB0-9A
21-34	NOT USED	NOT USED

INPUT FILE FRONT VIEW

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	5J1U (15)	6J2U (16)	6J3U (18)	6J4U (20)	7J5U (21)	8J6U (22)	8J7U (24)	8J8U (26)	5J9U (27)	SPJ10U (43)	6J11U (31)	EVA	EVB	RR1
L	5J1L (37)	6J2L (17)	6J3L (19)	6J4L (38)	7J5L (39)	8J6L (23)	8J7L (25)	8J8L (40)	7J9L (28)	SPJ10L (44)	8J11L (32)	EVC	EVD	RR2

NOTES: 332L CONTROLLER CABINETS MASTER CIRCUIT BREAKER SHALL BE 40A AND THE SIGNAL CIRCUIT BREAKER SHALL BE 30A AND THE FLASHER BUS SHALL BE 2P-15A . C11S CABLE SHALL BE PROVIDED WITH CABINET.





332L CABINET/2070L DETECTION

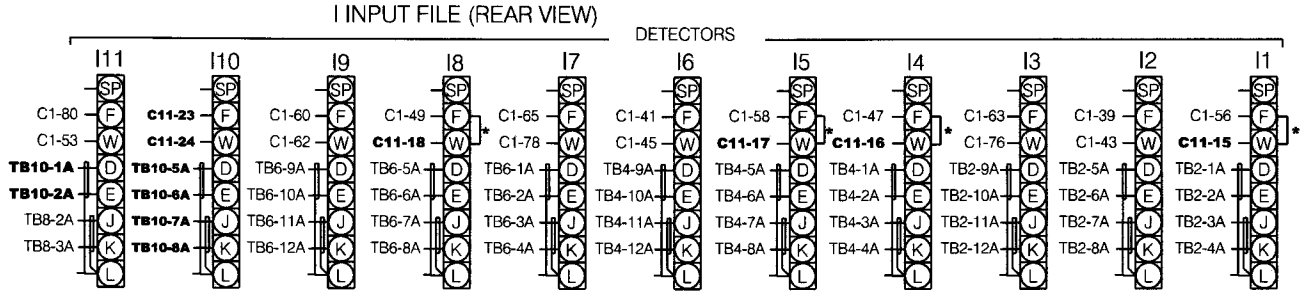
C11S CABLE CONNECTIONS AND MASTER/SIGNAL CB

REF. & REV. JUNE 2015

CITY OF FRESNO

E-34B

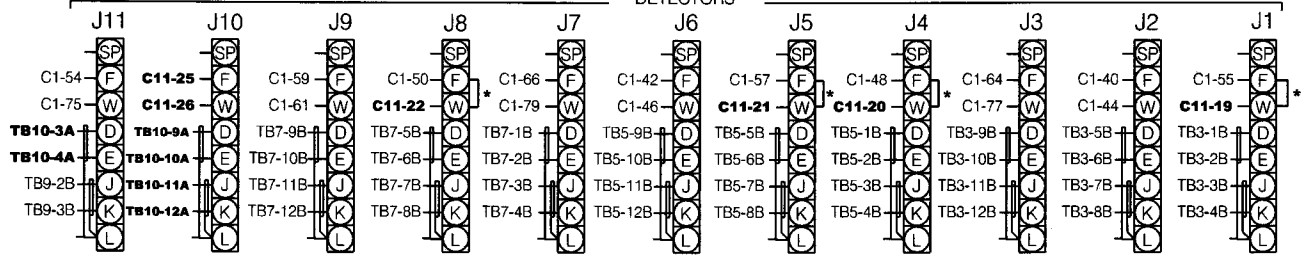
I INPUT FILE (REAR VIEW)

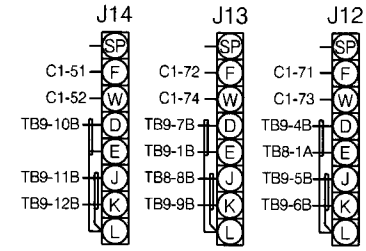


NOTE:
SEE CITY STANDARD DRAWING E-34 WIRING DETAILS FOR INPUT FILE I12, I13, I14, J12, J13 & J14.

INPUT FILE FRONT VIEW														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	1I1U (1)	2I2U (2)	2I3U (4)	2I4U (6)	3I5U (7)	4I6U (8)	4I7U (10)	4I8U (12)	1I9U (13)	SPI10U (41)	2I11U (29)	Ø2P	Ø6P	FS
L	1I1L (33)	2I2L (3)	2I3L (5)	2I4L (34)	3I5L (35)	4I6L (9)	4I7L (11)	4I8L (36)	3I9L (14)	SPI10L (42)	4I11L (30)	Ø4P	Ø8P	ST

J INPUT FILE (REAR VIEW)



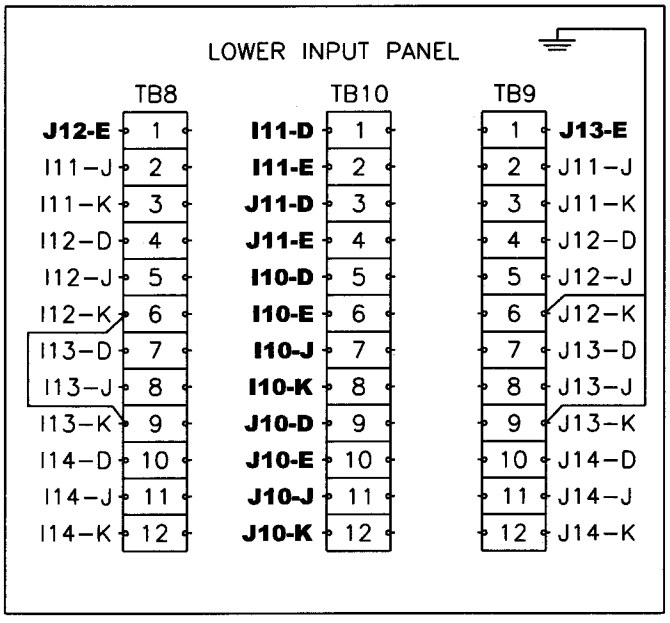


INPUT FILE FRONT VIEW														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	5J1U (15)	6J2U (16)	6J3U (18)	6J4U (20)	7J5U (21)	8J6U (22)	8J7U (24)	8J8U (26)	5J9U (27)	SPJ10U (43)	6J11U (31)	EVA	EVB	RR1
L	5J1L (37)	6J2L (17)	6J3L (19)	6J4L (38)	7J5L (39)	8J6L (23)	8J7L (25)	8J8L (40)	7J9L (28)	SPJ10L (44)	8J11L (32)	EVC	EVD	RR2

* REMOVE EXISTING JUMPERS FROM I AND J FILES

INSTALL TERMINAL BLOCK TB10, REWIRE TERMINAL BLOCKS TB8-1 AND TB9-1.

CABLE C11S		
PIN NO.	UNIVERSAL FUNCTION	CONN. TO
1	SPECIAL-OUTPUT	TB0-1A
2	SPECIAL-OUTPUT	TB0-2A
3	SPECIAL-OUTPUT	TB0-3A
4	SPECIAL-OUTPUT	TB0-4A
5-14	NOT USED	NOT USED
15	1 CALL, EXT	I1-W
16	2 CALL, QUEUE	I4-W
17	3 CALL, EXT	I5-W
18	4 CALL, QUEUE	I8-W
19	5 CALL, EXT	J1-W
20	6 CALL, QUEUE	J4-W
21	7 CALL, EXT	J5-W
22	8 CALL, QUEUE	J8-W
23	SPECIAL-INPUT	I10-F
24	SPECIAL-INPUT	I10-W
25	SPECIAL-INPUT	J10-F
26	SPECIAL-INPUT	J10-W
27	SPECIAL-INPUT	TB0-6A
28	SPECIAL-INPUT	TB0-7A
29	SPECIAL-INPUT	TB0-8A
30	SPECIAL-INPUT	TB0-9A
21-34	NOT USED	NOT USED



TB10 HD30A SERIES TERMINAL BLOCK OR EQUAL.

332 CABINET C11 RETRO-FIT

C11S CABLE CONNECTIONS

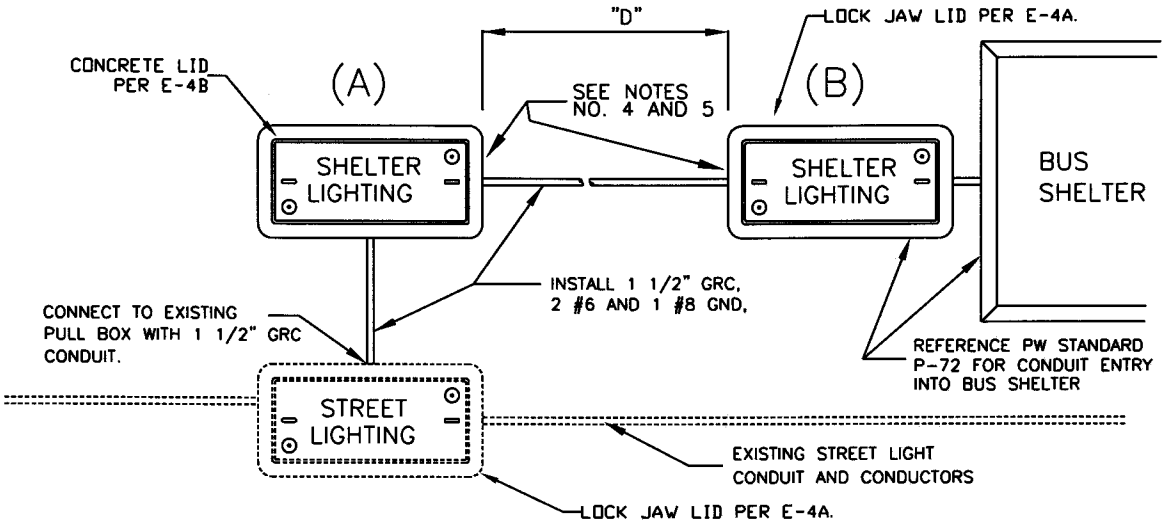
REF. & REV. JUNE 2015

CITY OF FRESNO

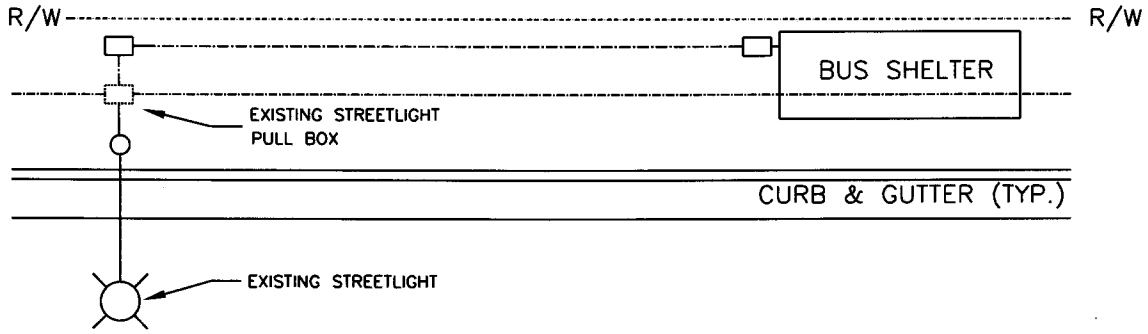
E-34C

INSTALLATIONS TO BE APPROVED AND MAINTAINED BY CITY OF FRESNO, FACILITIES MANAGEMENT DIVISION

PHONE: 621-1487 OR CHIEF OF FACILITIES (ELECTRICAL) 621-1230



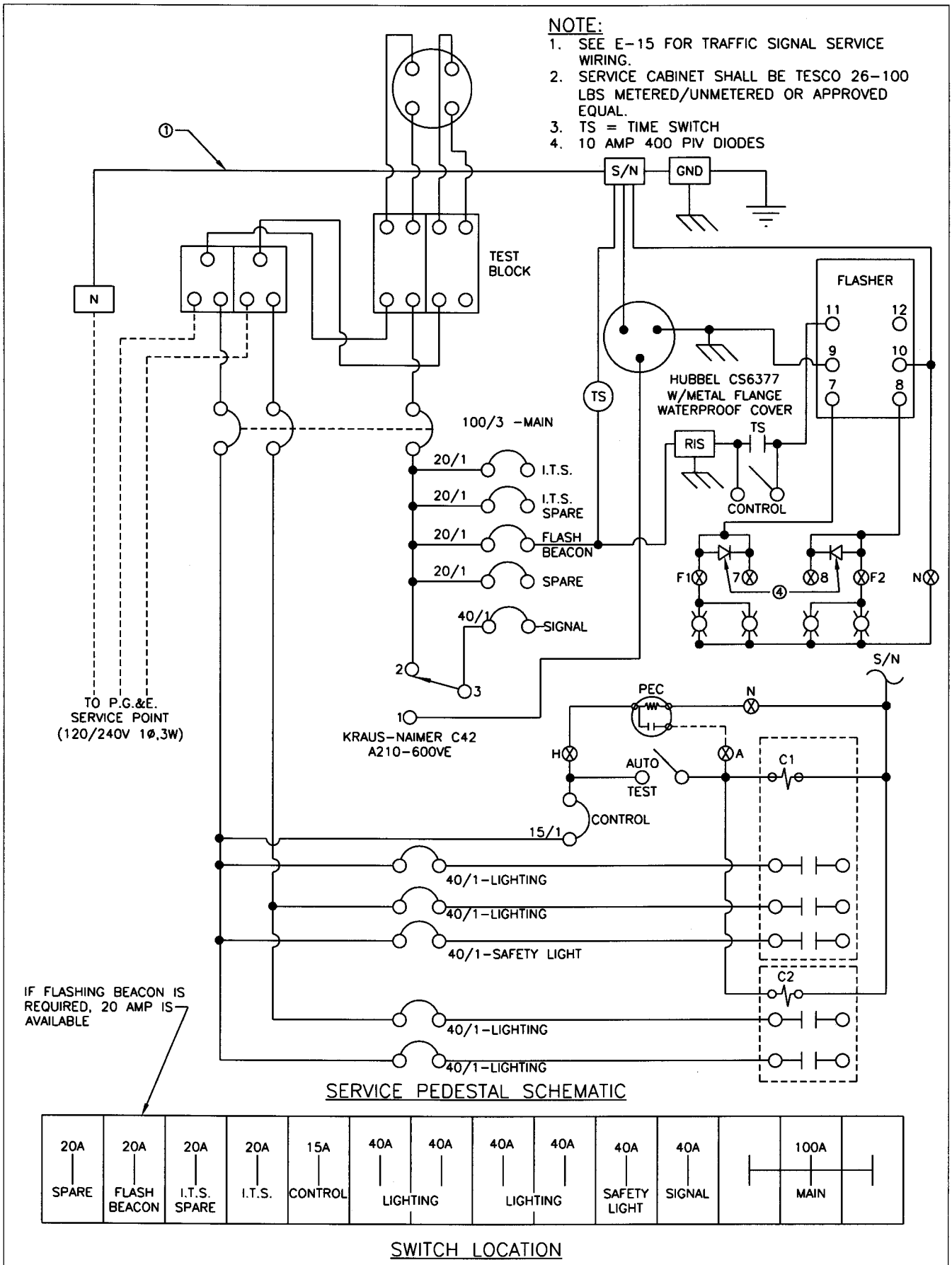
BUS SHELTER LIGHTING CONNECTION



GENERAL NOTES

1. PULL BOXES SHALL BE INSTALLED PER CITY STANDARD E-4. PULL BOXES SHALL UTILIZE LOCKING LIDS PER E-4.
2. DO NOT LOCATE THE PULL BOXES ABOVE THE JOINT TRENCH.
3. PULL BOX COVER SHALL BE AN APPROVED LOCKING TYPE AND SHALL BE INSCRIBED "SHELTER LIGHTING".
4. IF DISTANCE "D" EXCEEDS 20 FT. PULL BOX "A" IS REQUIRED ADJACENT TO EXISTING STREET LIGHT PULL BOX. IF DISTANCE "D" IS LESS THAN 20', PULL BOX " A" IS NOT REQUIRED.
5. A TRON TYPE FUSE HOLDER WITH 5A FUSE TO BE INSTALLED IN NEAREST PULL BOX. INSCRIBED "SHELTER LIGHTING" ADJACENT TO EXISTING STREET LIGHT PULL BOX.
6. ALL BUS SHELTER LIGHTING CONDUCTOR SPLICES SHALL BE TO APPLICABLE ELECTRICAL, STATE AND CITY STANDARDS.
7. ALL SHELTER LIGHTING SHALL BE NUMBERED. NUMERICAL SEQUENCE TO BE OBTAINED FROM PG&E. NUMBERS TO BE 2 1/2" HIGH AND INSTALLED ON SHELTER STRUCTURE.
8. ELECTRICAL FEED FROM EXISTING STREET LIGHTING SYSTEM TO SHELTER LIGHTING SHALL BE CONTINUOUS AND NOT BE IMPACTED BY A MASTER PHOTO CELL (PEC). INSTALL PEC'S ON STREET LIGHT LUMINAIRES AFFECTED BY SHELTER LIGHTING INSTALLATION REQUIREMENTS.

BUS SHELTER LIGHTING CONNECTION DETAIL	REF. & REV. JUNE 2015	CITY OF FRESNO E-35



SERVICE PEDESTAL SCHEMATIC

20A	20A	20A	20A	15A	40A	40A	40A	40A	40A	40A		100A	
SPARE	FLASH BEACON	I.T.S. SPARE	I.T.S.	CONTROL	LIGHTING		LIGHTING		SAFETY LIGHT	SIGNAL		MAIN	

SWITCH LOCATION

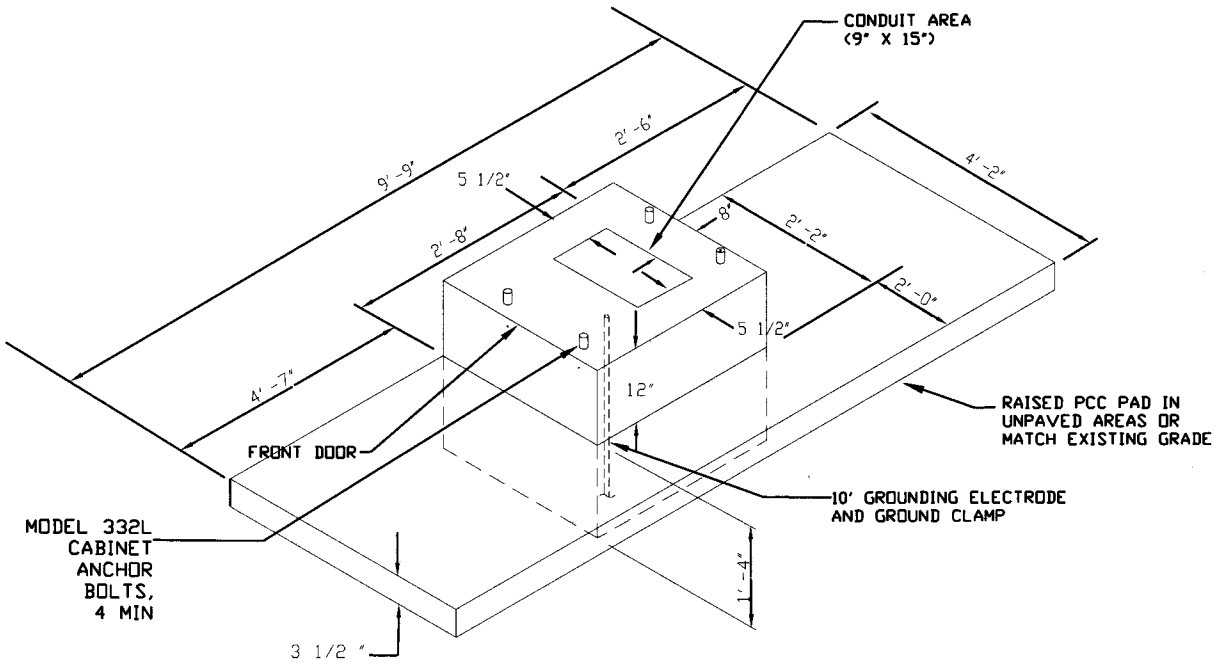
FLASHING BEACON

WIRING NEW INSTALLATIONS 26-100 CABINETS

REF. & REV. JUNE 2015

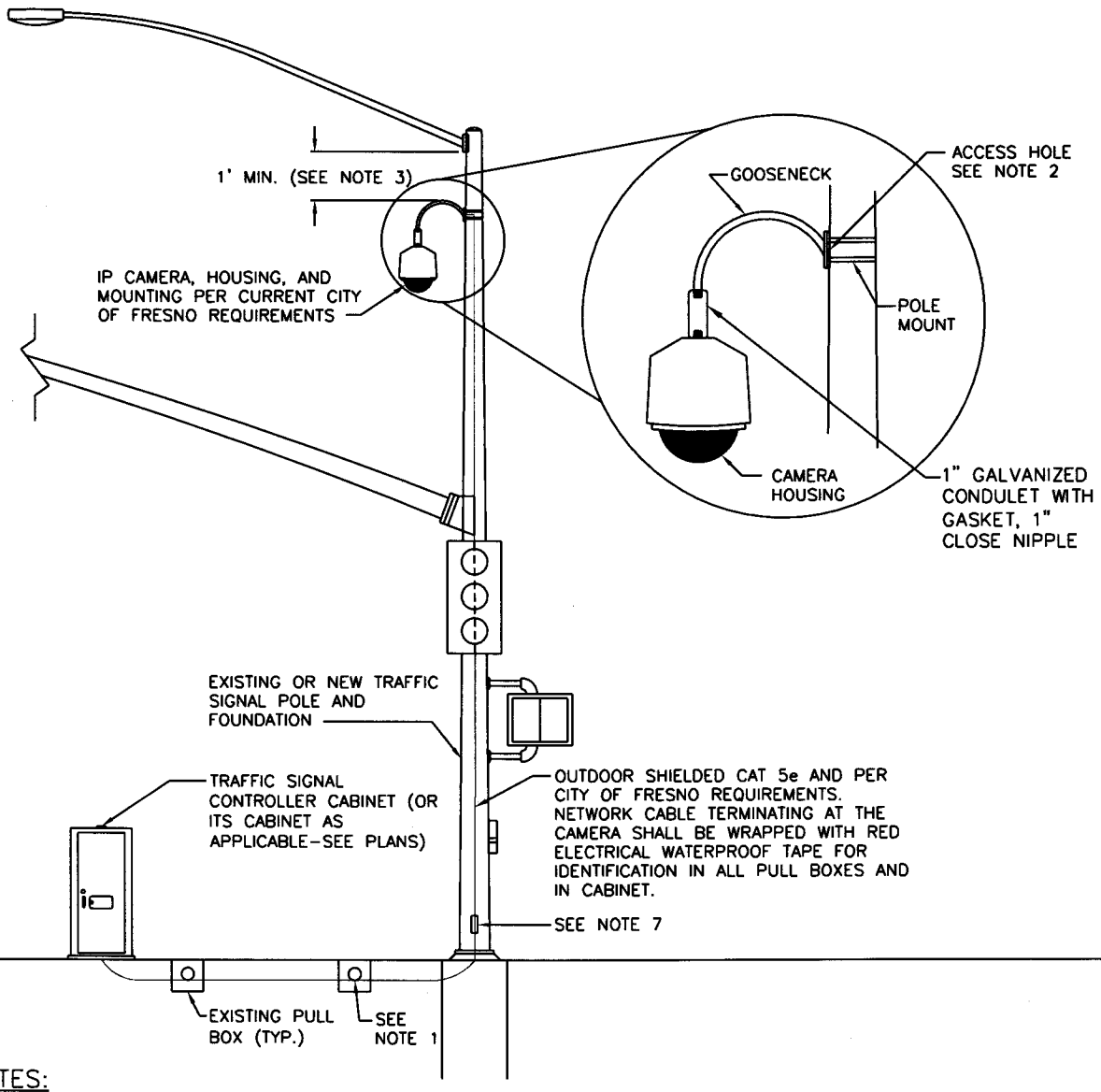
CITY OF FRESNO

E-36



332L FOUNDATION DETAILS

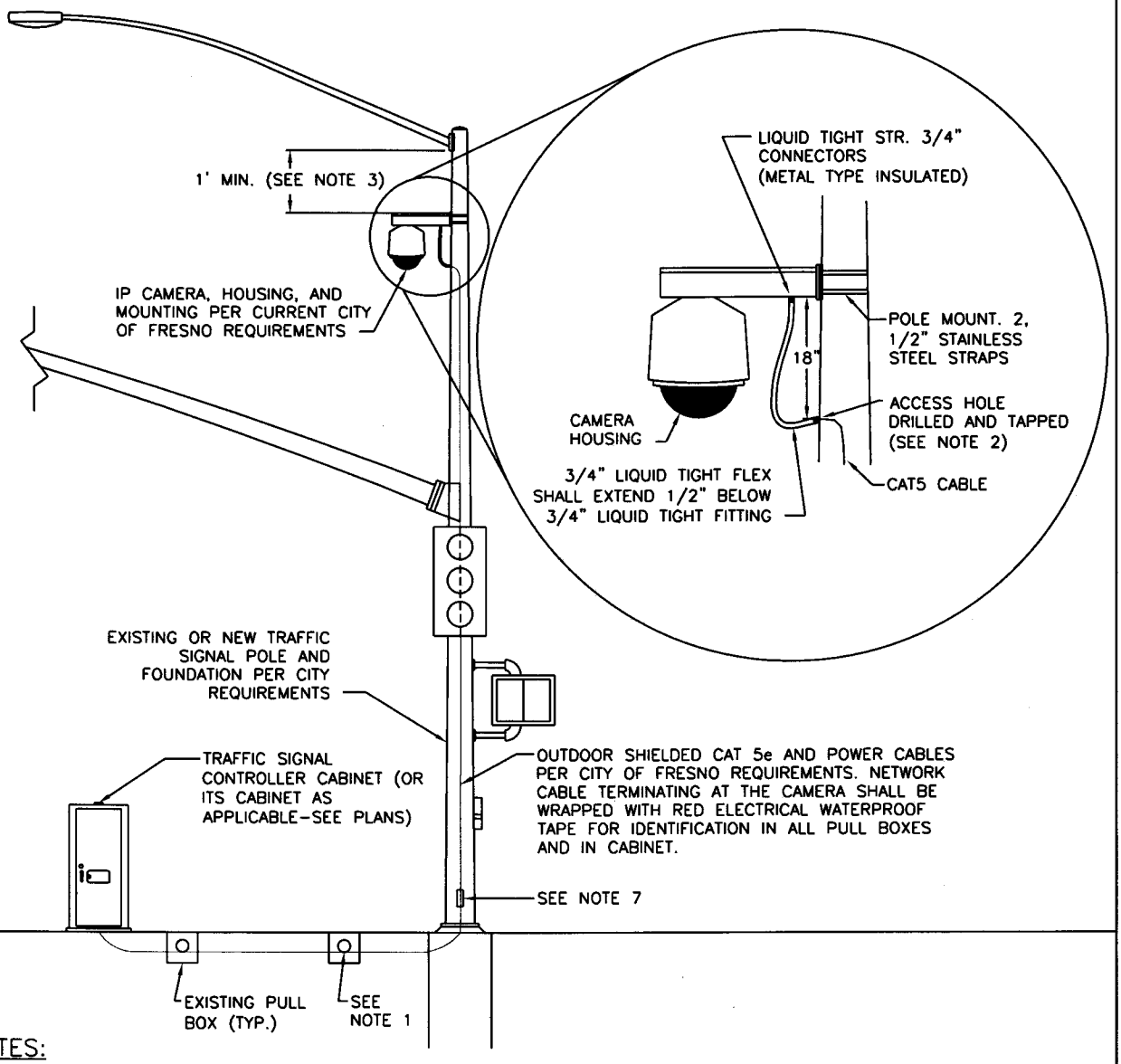
332L CABINET FOUNDATION	REF. & REV. JUNE 2015	CITY OF FRESNO E-37



NOTES:

1. EXTEND CABLES THROUGH TRAFFIC SIGNAL CONDUIT AND PULL BOXES. COIL MAX. 2' OF SLACK IN EACH PULL BOX. NETWORK CABLE TERMINATING AT THE CAMERA SHALL BE WRAPPED WITH RED ELECTRICAL WATERPROOF TAPE FOR IDENTIFICATION IN ALL PULL BOXES AND IN CABINET.
2. DRILL MAX ¾" BEVELED HOLE. USE RUBBER GROMMET TO SEAL.
3. CAMERA SHALL BE MOUNTED TO ATTAIN MAXIMUM HEIGHT UNLESS OTHERWISE NOTED ON PLANS, OR DIRECTED BY ENGINEER.
4. CAMERA SHALL BE MOUNTED WITH BRACKET AND CAMERA HOUSING FACING CENTER OF INTERSECTION OR AS DIRECTED BY ENGINEER.
5. BOND ALL CONNECTIONS PER CURRENT NEC STANDARD.
6. SHIELDED AND APPROVED RJ-45 CONNECTOR SHALL BE USED FOR GROUNDING TO OUTDOOR SHIELDED CAT5e CABLE.
7. POLE HAND HOLE SHALL BE WELDED IN PLACE AFTER ALL PROPOSED WORK ON EXISTING POLE IS COMPLETED AND INSPECTED. CONTRACTOR SHALL PROTECT CONDUCTORS FROM DAMAGE DURING WELDING.

TRAFFIC SIGNAL MOUNTED IP CAMERA (GOOSENECK)	REF. & REV. JUNE 2015	CITY OF FRESNO ITS-18A



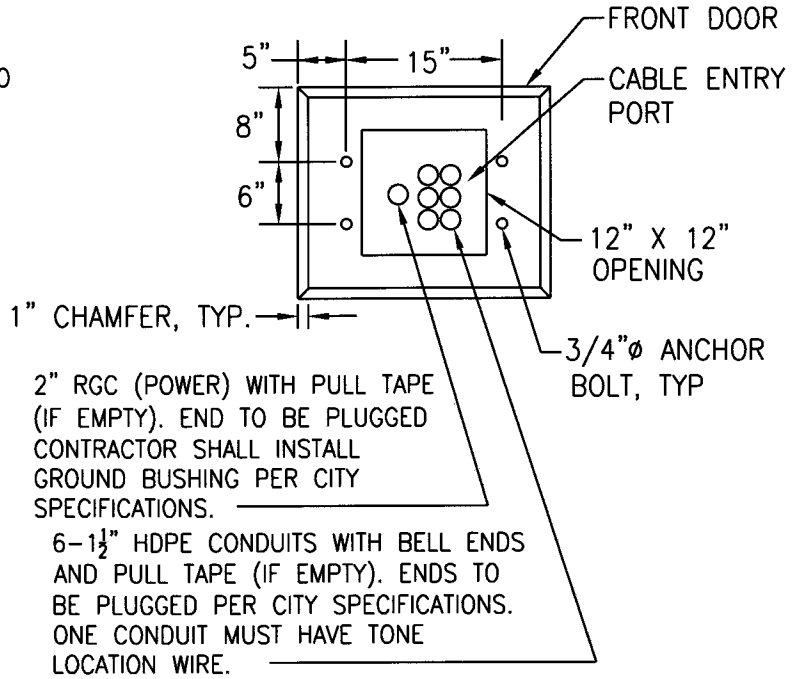
NOTES:

1. EXTEND CABLES THROUGH TRAFFIC SIGNAL CONDUIT AND PULL BOXES. COIL MAX. 2' OF SLACK IN EACH PULL BOX. NETWORK CABLE TERMINATING AT THE CAMERA SHALL BE WRAPPED WITH RED ELECTRICAL WATERPROOF TAPE FOR IDENTIFICATION IN ALL PULL BOXES AND IN CABINET.
2. DRILL MAX ¾" BEVELED HOLE. WEATHERPROOF FLEX CONDUIT CONNECTOR SHALL BE THREADED INTO POLE.
3. CAMERA SHALL BE MOUNTED TO ATTAIN MAXIMUM HEIGHT UNLESS OTHERWISE NOTED ON PLANS, OR DIRECTED BY ENGINEER.
4. CAMERA SHALL BE MOUNTED WITH BRACKET AND CAMERA HOUSING FACING CENTER OF INTERSECTION OR AS DIRECTED BY ENGINEER.
5. BOND ALL CONNECTIONS PER CURRENT NEC STANDARD.
6. APPROVED AND SHIELDED RJ-45 CONNECTOR SHALL BE USED FOR GROUNDING TO OUTDOOR SHIELDED CAT5e CABLE.
7. POLE HAND HOLE SHALL BE WELDED IN PLACE AFTER ALL PROPOSED WORK ON EXISTING POLE IS COMPLETED AND INSPECTED. CONTRACTOR SHALL PROTECT CONDUCTORS FROM DAMAGE DURING WELDING.

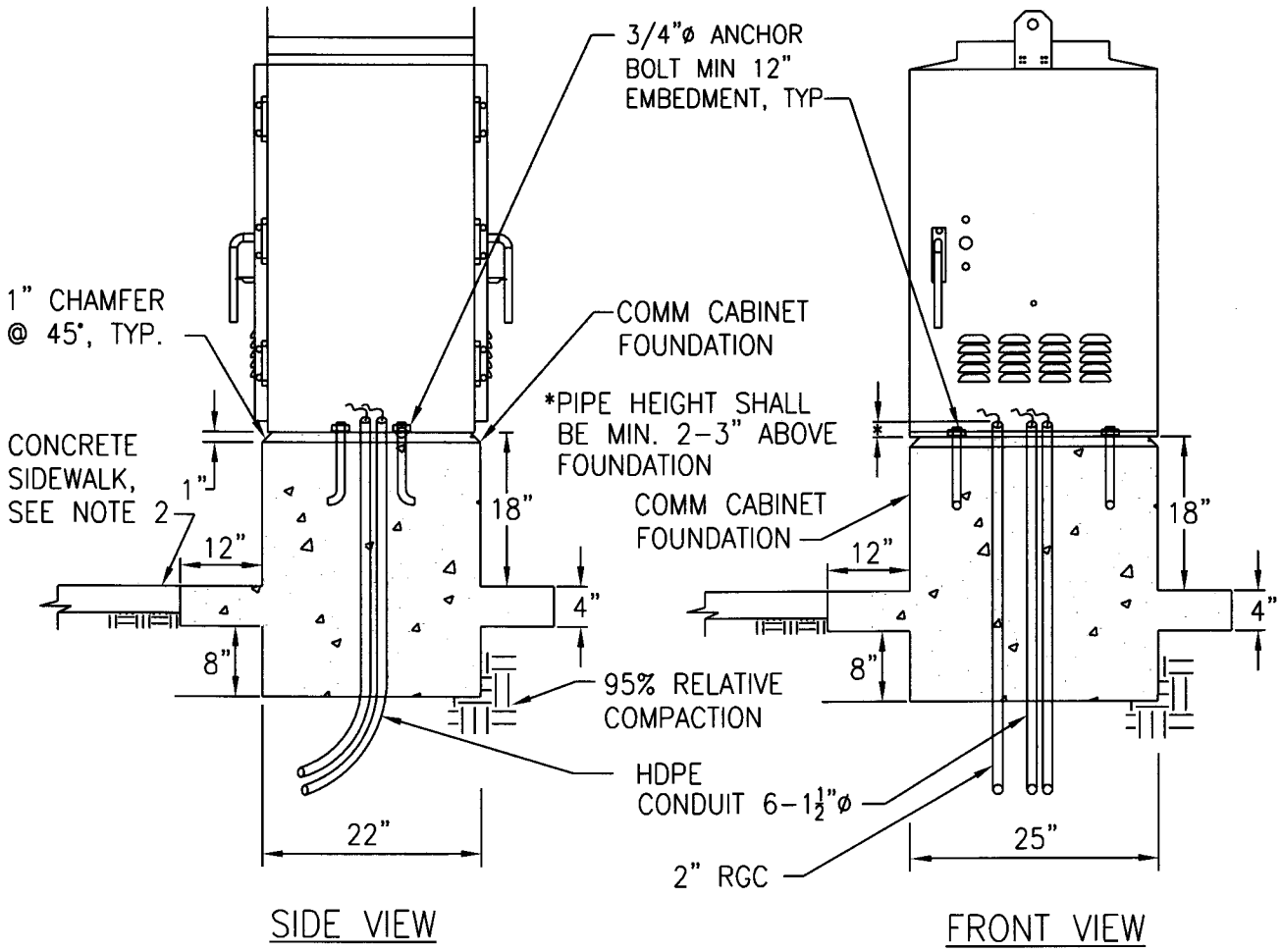
TRAFFIC SIGNAL MOUNTED IP CAMERA	REF. & REV. JUNE 2015	CITY OF FRESNO ITS-18B

NOTES:

1. INSPECTOR SHALL APPROVE FORMS AND CONDUIT PLACEMENT PRIOR TO PLACING CONCRETE.
2. CONSTRUCT MINIMUM 36"X36"X4" CONCRETE MAINTENANCE PAD AT FRONT AND BACK DOORS IF NO SIDEWALK EXISTS.
3. MAINTAIN WORKING CLEARANCES PER NEC.
4. BOND PER CURRENT NEC STANDARD. .
5. BOND ALL CONDUIT PER NEC STANDARDS USE #6 SOLID BARE COPPER FOR BONDING.
6. DOORS SHALL HAVE 4' WORKING CLEARANCE.
7. FINISH SHALL BE ANODIZED PER CITY OF FRESNO REQUIREMENTS.
8. CABINET BASE SHALL NOT BE MODIFIED FOR INSTALLATION.



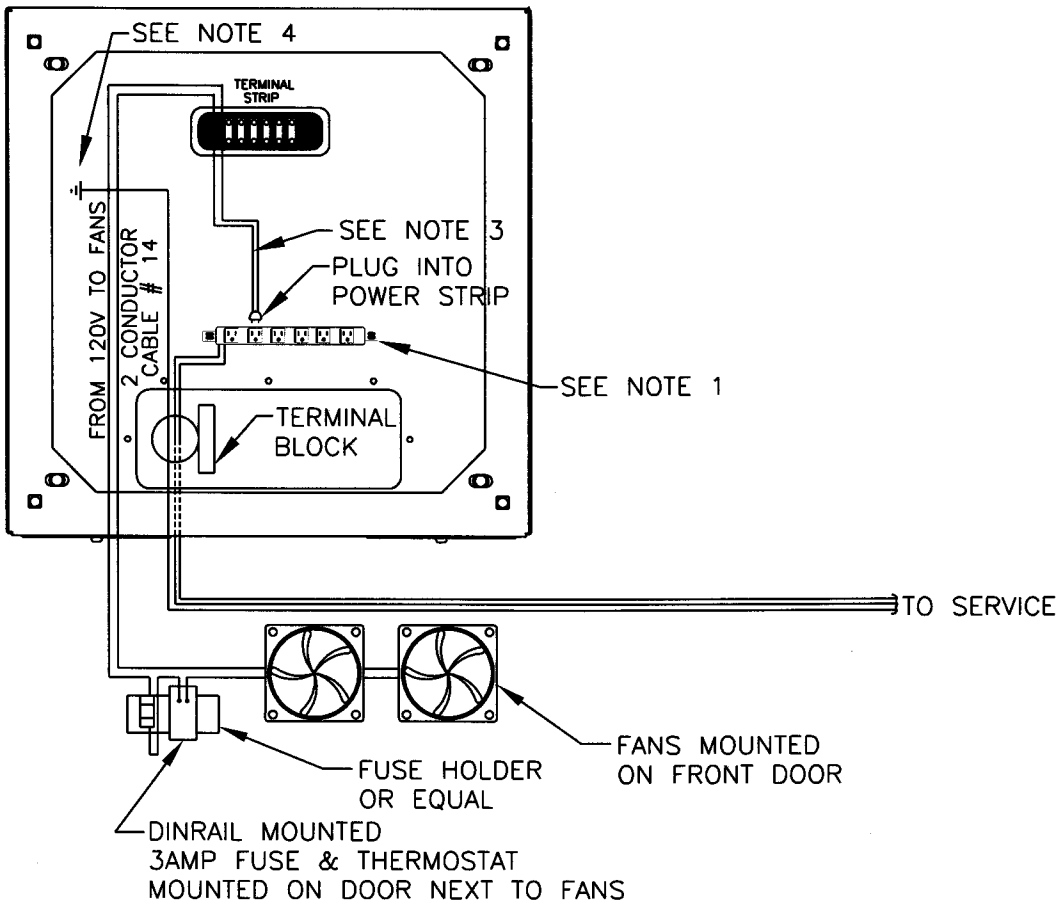
PLAN VIEW



SIDE VIEW

FRONT VIEW

MODEL 336 COMMUNICATION CABINET DETAILS	REF. & REV. JUNE 2015	CITY OF FRESNO ITS-20A



PLAN VIEW

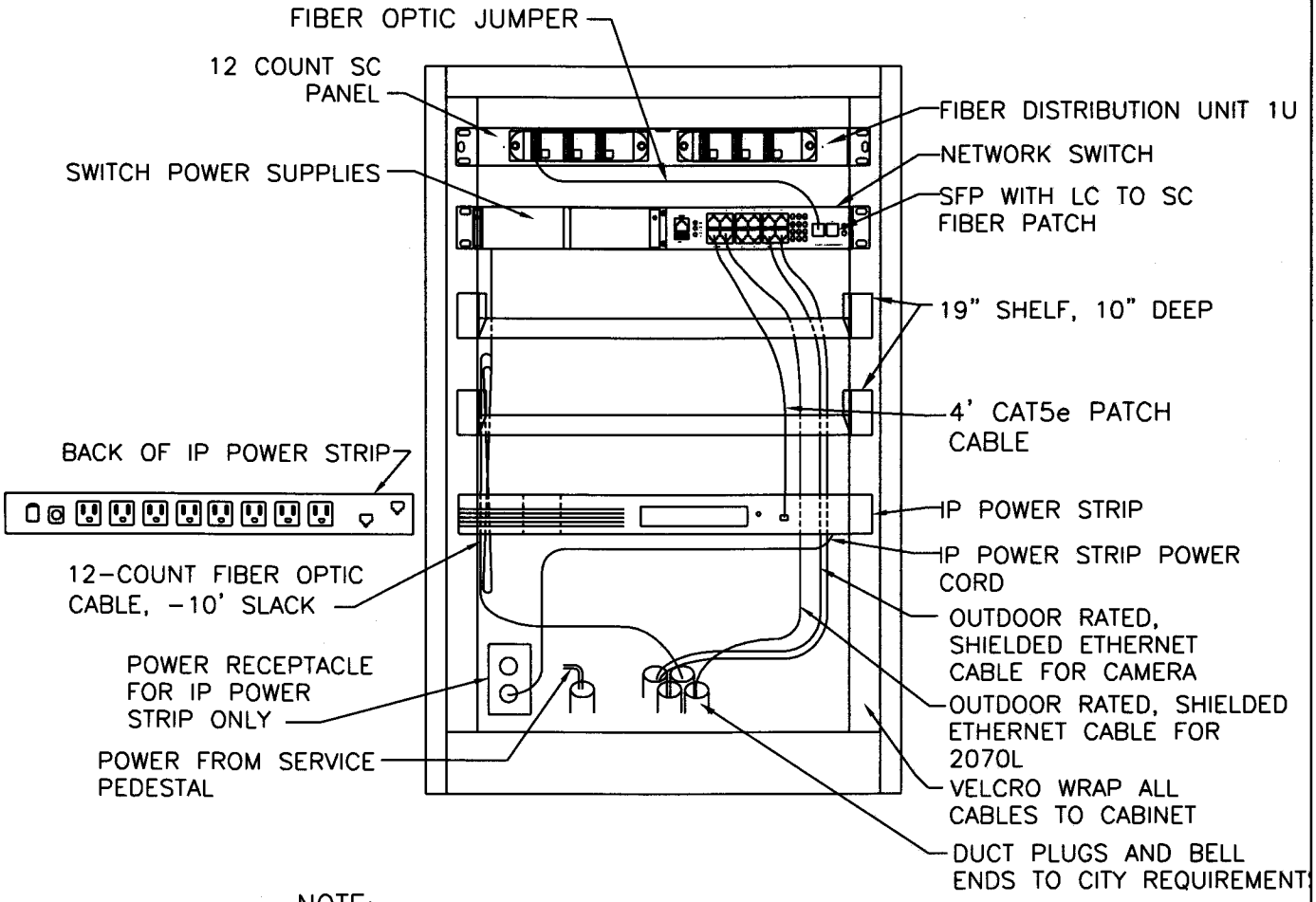
NOTES:

1. PROVIDE AND SECURE RACK MOUNTED POWER STRIP. POWER STRIP TO HAVE ON/OFF SWITCH AND OVER-CURRENT PROTECTION AND SIX RECEPTACLES. CORD CAP ON POWER MUST HAVE RIGHT ANGLE.
2. ALL WIRING BETWEEN COMPONENTS SHALL BE SJO CORD SECURED BY AN APPROVED METHOD.
3. PROVIDE POWER FROM TERMINAL STRIP TO FANS WITH 14/2 SJO CORD. SECURE CORD USING APPROVED METHOD AS NOT TO DAMAGE CORD DURING OPENING AND CLOSING CABINET DOOR (AVOID PINCHING AND AS NOT TO TRANSMIT STRAIN TO TERMINATIONS (STRESS RELIEF). POWER TO FAN WILL BE PROTECTED VIA A 3 AMP FUSE AND THERMOSTAT.
4. BOND TO CABINET PER CURRENT NEC STANDARDS.

COMMUNICATION CABINET WIRING DIAGRAM	REF. & REV. JUNE 2015	CITY OF FRESNO ITS-21

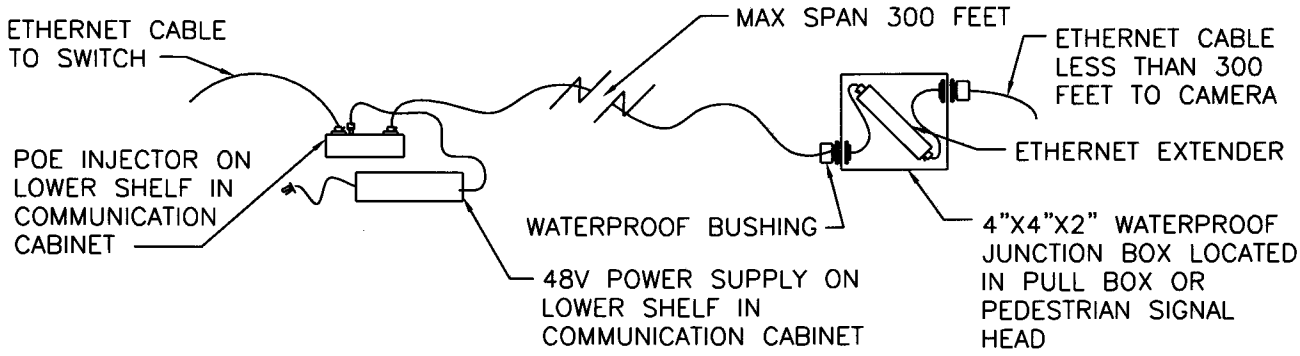
NOT USED

MODEL 336 COMMUNICATION CABINET WIRING DIAGRAM	REF. & REV. JUNE 2015	CITY OF FRESNO ITS-21A

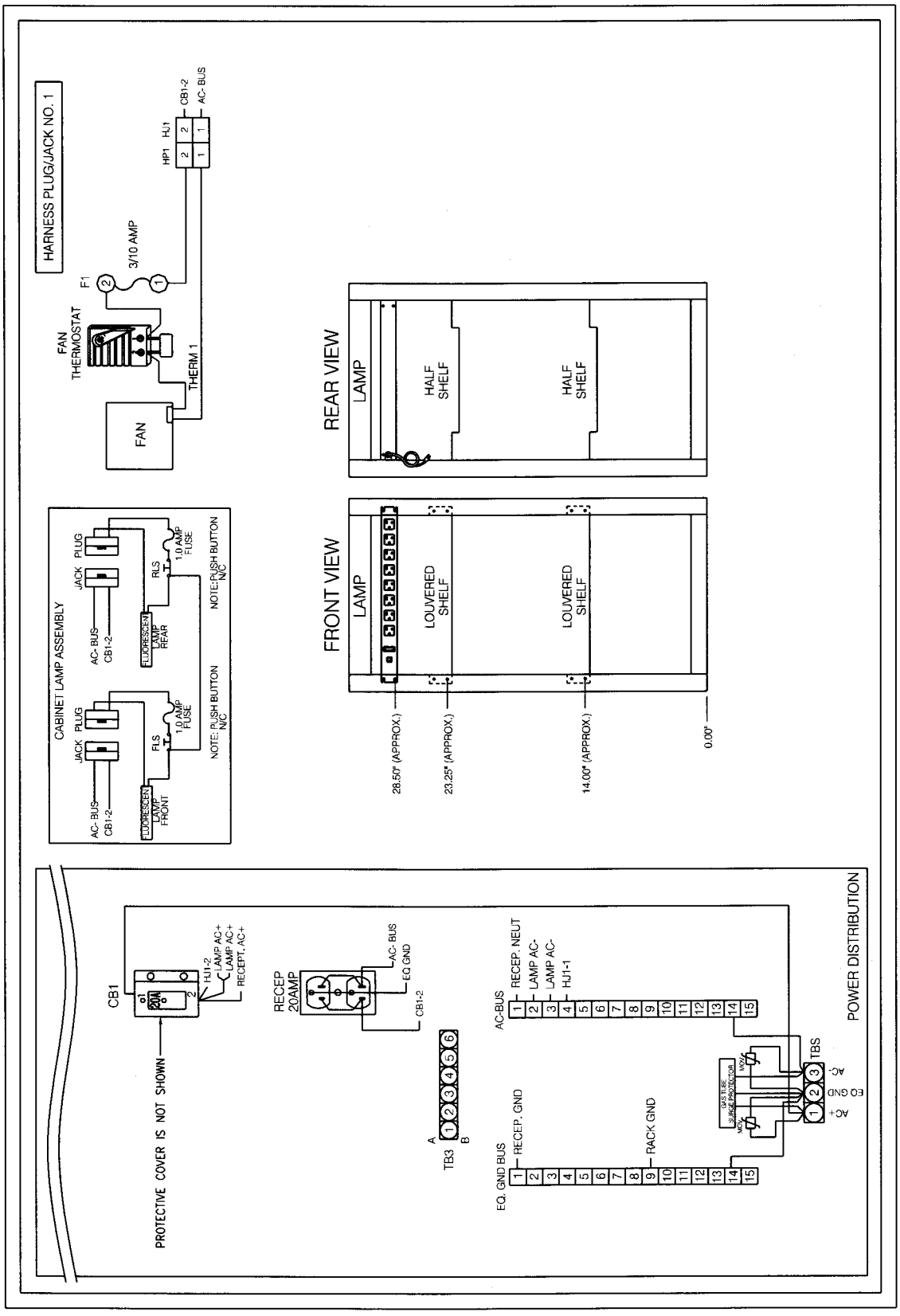


NOTE:
MINIMUM 4" VERTICAL SPACING BETWEEN EQUIPMENT.

(ONLY FOR ETHERNET RUNS LONGER THAN 300')
ETHERNET EXTENDER FOR CAMERA



MODEL 336 COMMUNICATION CABINET EQUIPMENT ASSEMBLIES	REF. & REV. JUNE 2015	CITY OF FRESNO ITS-21B



336 COMMUNICATION CABINET WIRING DIAGRAM, 1 OF 2

REF. & REV.
JUNE 2015

CITY OF FRESNO

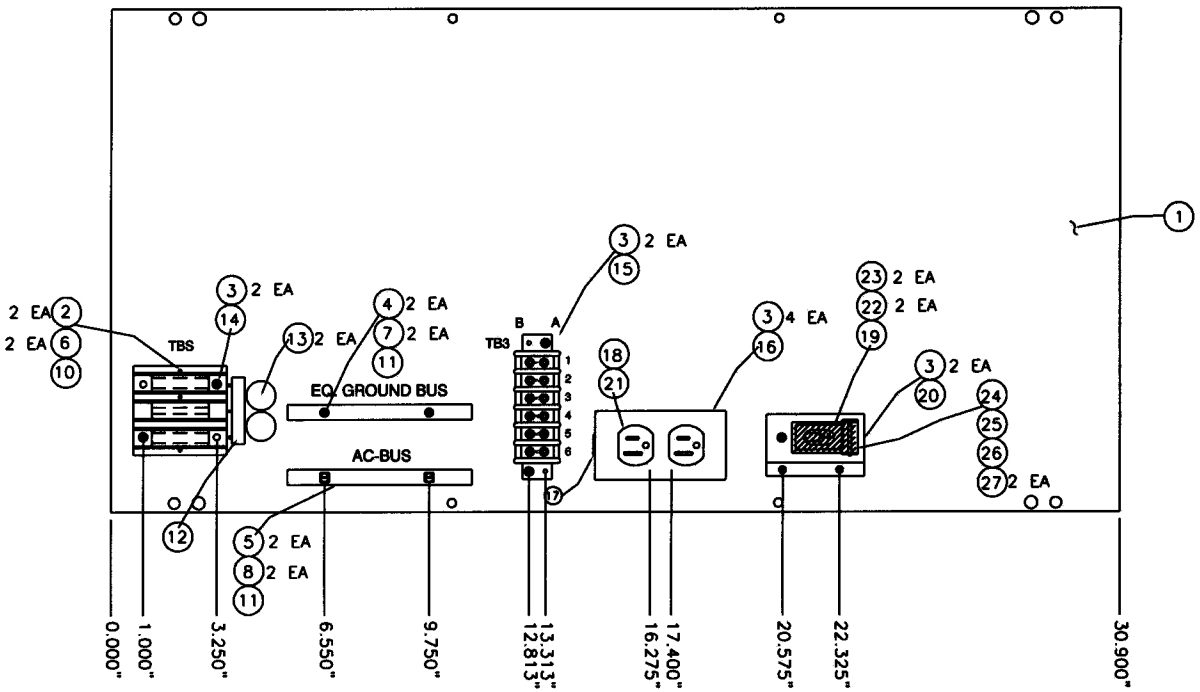
ITS-21C

MODEL 336 COMMUNICATION CABINET POWER DISTRIBUTION, 2 OF 2

REF. & REV. JUNE 2015

CITY OF FRESNO

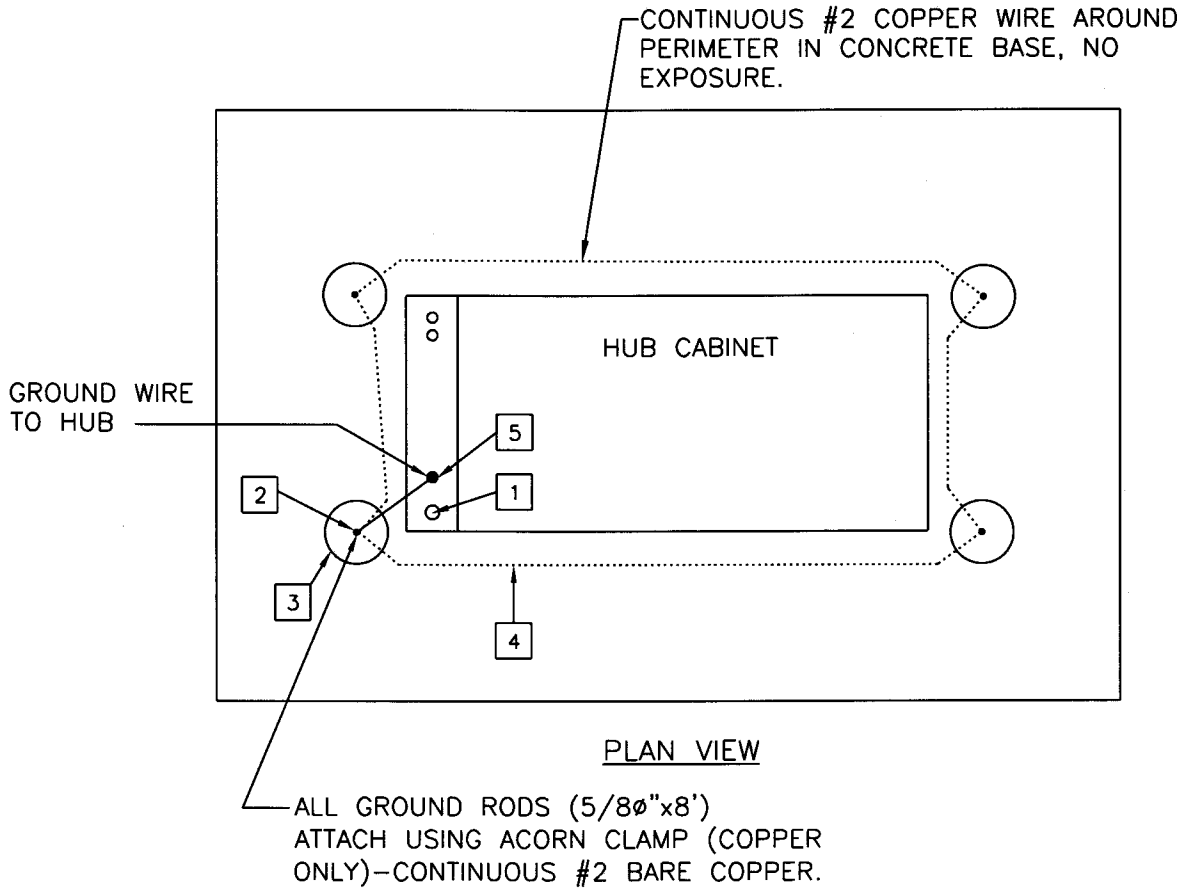
ITS-21D



ALL DIMENSIONS SHOWN FOR REFERENCE ONLY.

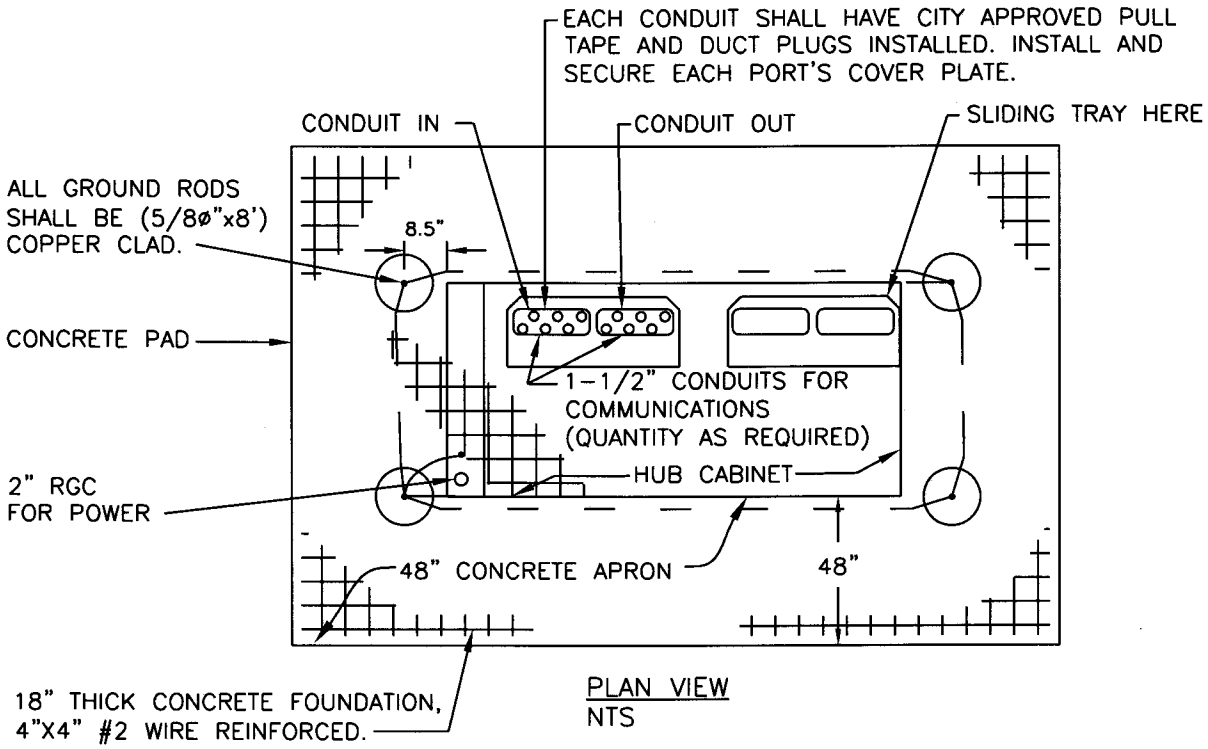
ITEM	QTY.	NOMENCLATURE OR DESCRIPTION
27	2	SCREW, 2-56 X 3/16, PH, PN, SS
26	1	STANDOFF, 2-56 X 1, FEM-FEM, RN, AL
25	1	COVER, CB, LEXAN
24	1	BRACKET, SUPPORT COVER
23	2	WASHER #6 INT. TOOTH SS
22	2	SCREW 6-32 X 1/4,PH,PN
21	1	RECEPTACLE, 5-20R,20A DUPLEX
20	1	BRKT, ENCLOSED, 334Z, CKT
19	1	CKT BKR,20A,1P W/O AUX
18	1	HANDY BOX COVER, METAL DUPLEX
17	1	GROMMET PLASTIC SB-875-11
16	1	HANDY BOX, 4 X 2-1/8,METAL
15	1	TERM BLK, 6POS, 2R, COMB
14	1	TERM BLK, 3POS, 6-32 SCREWS
13	2	ASSY, VARISTOR, M.O.

ITEM	QTY.	NOMENCLATURE OR DESCRIPTION
12	1	SURGE ARRESTOR, GAS TUBE
11	2	BUS BAR ASSY, 15POS, COPPER
10	1	COVER, POWER BLOCK, LEXAN
9	1	HARN, SVC PNL, 336S,
8	2	NUT, SQ HD GROMMET
7	2	WASHER, #8, EXT. TOOTH, SS
6	2	WASHER, #4, SPLIT LOCK, SS
5	2	SCREW, 10-24 X 1, PH, SL, NYLON
4	2	SCREW, #8 X 3/4, PH, PN, SS
3	10	SCREW, #8 X 5/8, PH, PN, SS,
2	2	SCREW, 4-40 X 3/8, SL, FIL
1	1	SVC PANEL, 336S

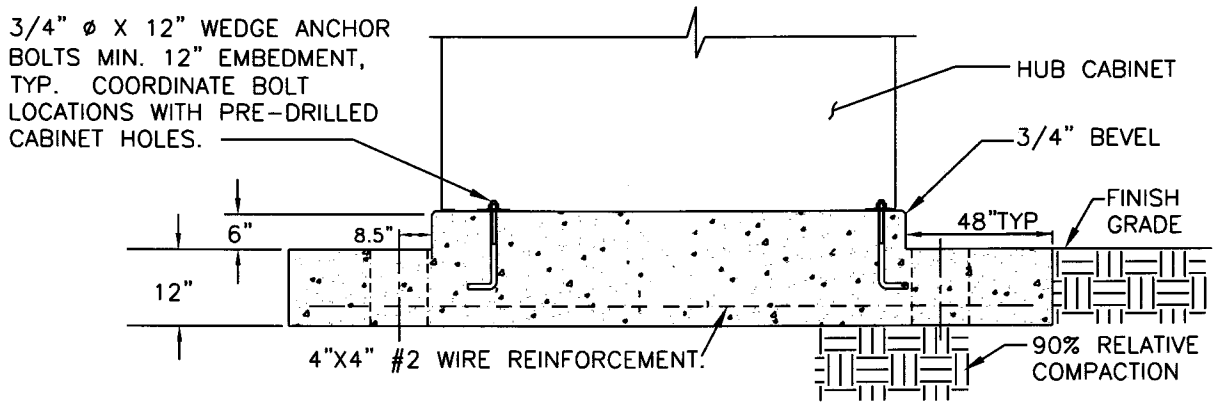


1. FURNISH AND INSTALL 1 – 8' GROUND ROD FOR POWER.
2. FURNISH AND INSTALL 4 – 8' GROUND RODS FOR GROUND CORNERS.
3. FURNISH AND INSTALL 4 – 9" FLOWER ROUND HAND HOLES, LID INSCRIBED "GROUND".
4. #2 AWG BARE TINNED WIRE.
5. GROUND #2 AWG BARE COPPER WIRE TO HUB POWER GROUND ROD. USE ACORN CLAMP FOR BONDING.

HUB FOUNDATION GROUNDING DETAILS	REF. & REV. JUNE 2015	CITY OF FRESNO ITS–22



PLAN VIEW
NTS



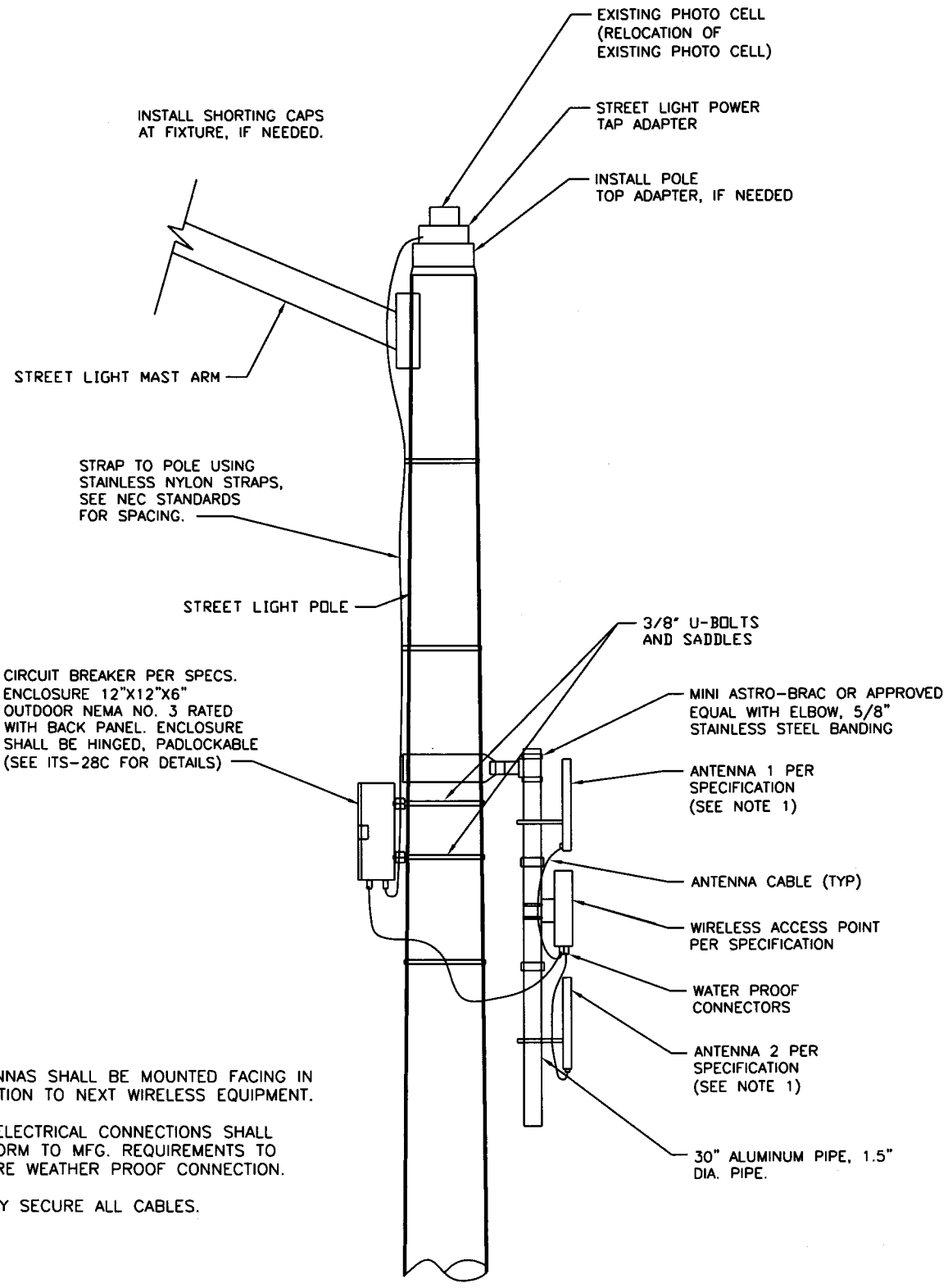
FRONT VIEW
NTS

NOTES:

CABINET'S MANUFACTURERS TEMPLATE SHALL BE USED AND APPROVED BY CITY ENGINEER.

SEE ITS-22 FOR GROUNDING.

HUB CABINET FOUNDATION DETAIL	REF. & REV. JUNE 2015	CITY OF FRESNO ITS-23



NOTES:

1. ANTENNAS SHALL BE MOUNTED FACING IN DIRECTION TO NEXT WIRELESS EQUIPMENT.
2. ALL ELECTRICAL CONNECTIONS SHALL CONFORM TO MFG. REQUIREMENTS TO ENSURE WEATHER PROOF CONNECTION.
3. NEATLY SECURE ALL CABLES.

FOR POLES WITH MASTER PHOTOCELL

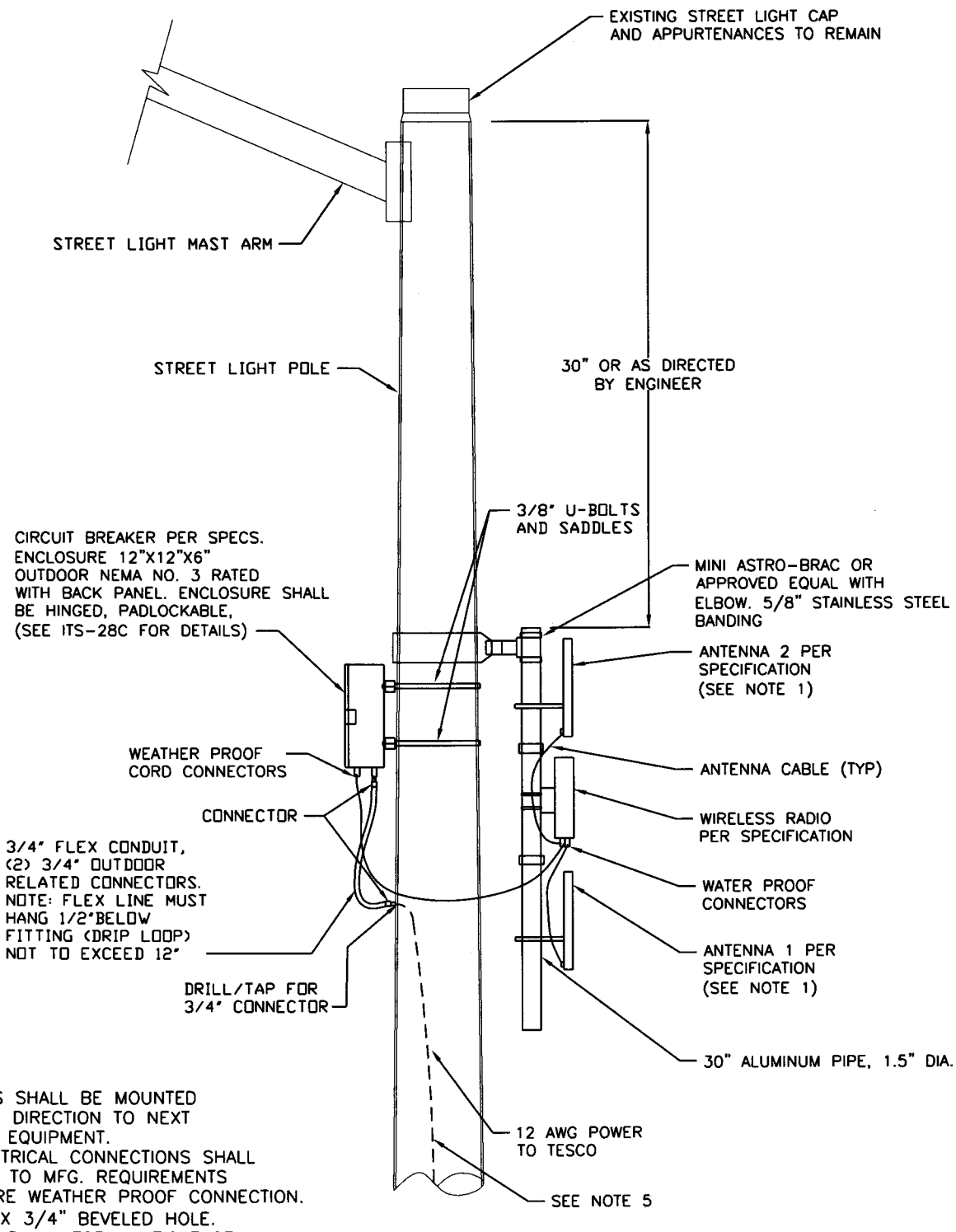
ITS WIRELESS POLE REPEATER INSTALLATION

(POWERED THROUGH STREET LIGHT)

REF. & REV.
JUNE 2015

CITY OF FRESNO

ITS-28A



NOTES:

1. ANTENNAS SHALL BE MOUNTED FACING IN DIRECTION TO NEXT WIRELESS EQUIPMENT.
2. ALL ELECTRICAL CONNECTIONS SHALL CONFORM TO MFG. REQUIREMENTS TO ENSURE WEATHER PROOF CONNECTION.
3. DRILL MAX 3/4" BEVELED HOLE. GROMMET SHALL FORM A TIGHT SEAL BETWEEN POLE AND CABLE.
4. SECURELY STRAP ANTENNA CABLE TO POLE WITH STAINLESS STEEL NYLON COATED STRAPS (FOLLOW NEC STANDARDS FOR SPACING.)
5. CONTRACTOR SHALL CONNECT THE 120VAC POWER TO THE NEAREST EXISTING TESCO PEDESTAL WITH REQUIRED ADDITIONAL CIRCUIT BREAKER (20 AMP) AND NECESSARY CONDUCTORS (2 SOOW CONDUCTOR, 12 AWG). EXISTING PULLBOX ADJACENT TO EXISTING STREET LIGHT POLE WITH CONCRETE FILLED TO BE BROKE-OUT AND WELDS ON POLE. HAND HOLE COVER TO BE GROUND OFF, IN ORDER TO ACCESS AND INSTALL THE NECESSARY CONDUCTORS. POLE HAND HOLE SHALL BE WELDED BACK AND CONCRETE SHALL BE REPLACED BACK TO EXISTING PULLBOX AFTER ALL PROPOSED WORK IS COMPLETED AND INSPECTED.
6. THE CONTRACTOR SHALL CONNECT EARTH GROUND FROM A LOCAL GROUND ROD TO THE BUSSED TERMINALS MARKED "GROUND".

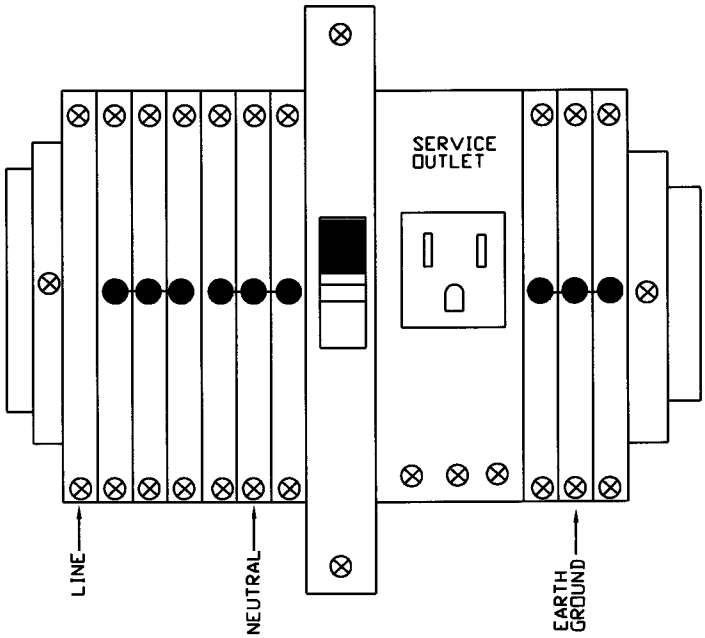
ITS WIRELESS POLE REPEATER INSTALLATION

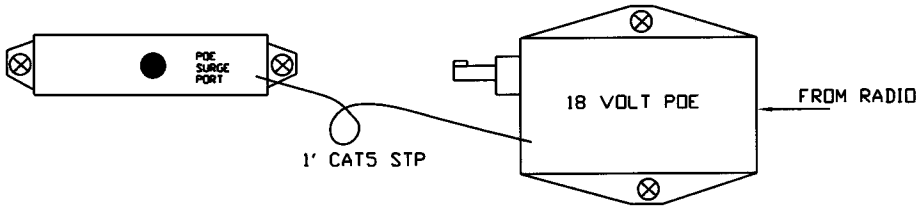
(POWERED THROUGH SERVICE PEDESTAL)

REF. & REV. JUNE 2015

CITY OF FRESNO

ITS-28B





NOTES:

1. POWER DISTRIBUTION BOX TO BE POLE MOUNTED AT SELECT LOCATIONS TO SUPPORT MESH BROADBAND RADIO REPEATER CO-LOCATED ON POLE.
2. BOX WILL BE MOUNTED ON THE SIDE OF POLE AWAY FROM TRAFFIC AT A HEIGHT SPECIFIED IN THE PLANS OR BY THE ENGINEER ON SITE.
3. THE CONTRACTOR WILL CONNECT THE 120VAC POWER TAPPED FROM THE STREET LIGHT CIRCUIT TO THE BUSSED TERMINALS MARKED 'LINE' & 'NEUTRAL'
4. THE CONTRACTOR WILL CONNECT EARTH GROUND FROM A LOCAL GROUND ROD TO THE BUSSED TERMINALS MARKED 'GROUND'.
5. PADLOCK TO BE PROVIDED BY THE CITY.

DESCRIPTION	QTY
12"X12"X6" OUTDOOR RATED, NEMA 3 WITH BACK PANEL, HINGED, PADLOCK ENCLOSURE	1
ALUMINUM PANEL	1
SWEEP ELBOW	2
SS BANDING 5/8" W/ BUCKLE	4
ALUM DIN RAIL	A/R
END STOP	2
DIN MOUNT TERM BLOCK-GRAY	7
DIN MOUNT TERM BLOCK-GREEN	3
DIN MOUNT CIRCUIT BREAKER-4A	1
DIN MOUNT DUPLEX OUTLET	1
POE SURGE SUPPRESSOR	1
CAT5 JUMPER-12" SHIELDED	1

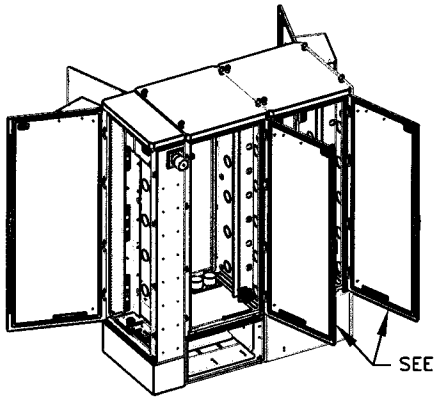
REPEATER CIRCUIT BREAKER

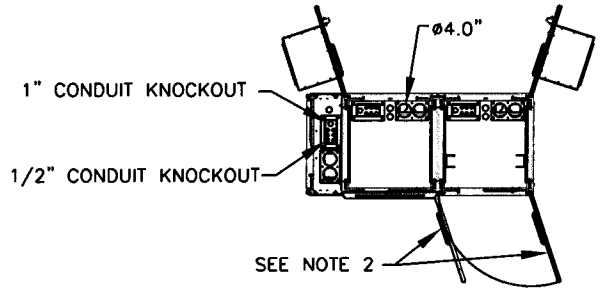
REF. & REV.
JUNE 2015

CITY OF FRESNO

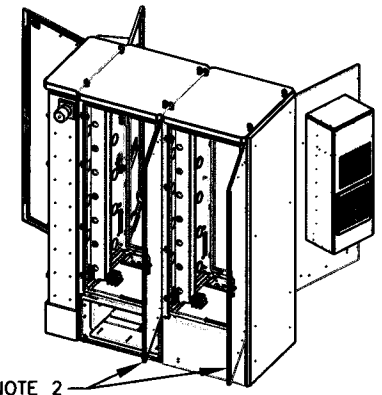
ITS-28C

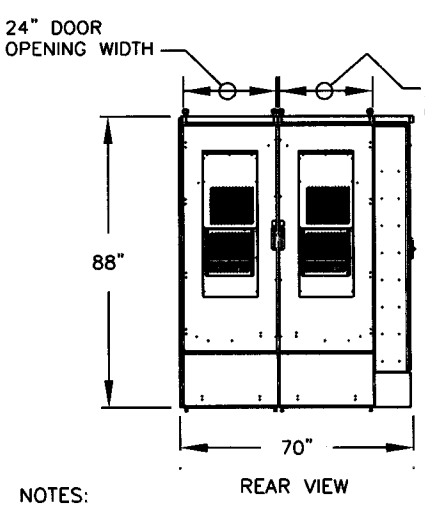
ITS HUB CABINET
1 OF 2



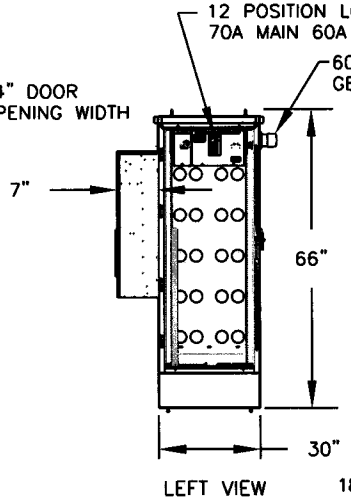


TOP VIEW LOOKING DOWN
(TOP REMOVED FOR CLARITY)

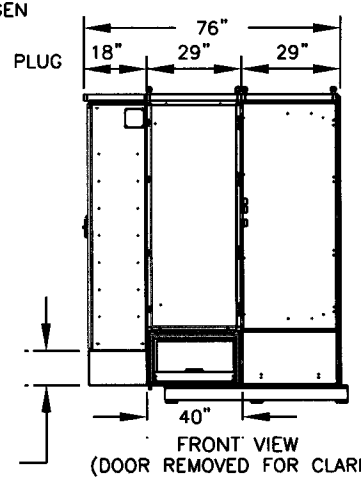




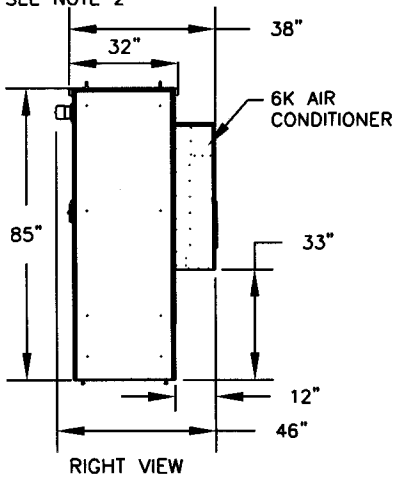
REAR VIEW



LEFT VIEW



FRONT VIEW
(DOOR REMOVED FOR CLARITY)



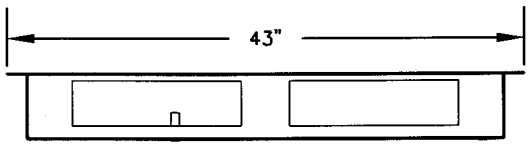
RIGHT VIEW

NOTES:

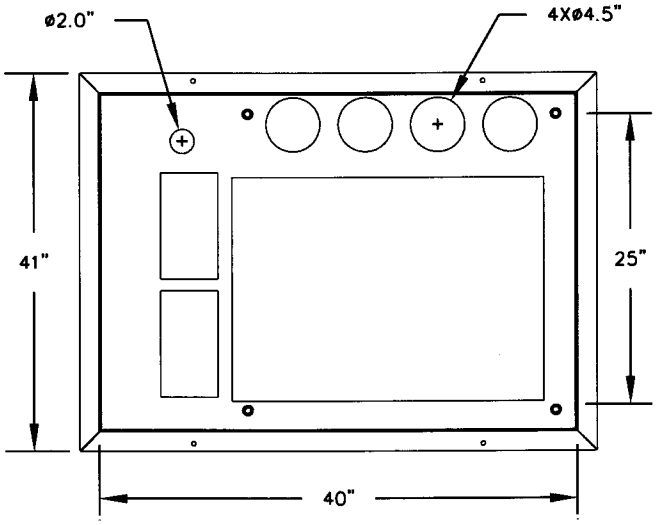
1. REFER TO ITS-23 FOR HUB CABINET FOUNDATION DETAIL.
2. BOTH DOORS HINGES SHALL BE INSTALLED AT OPPOSITE ENDS.
3. REFER TO ITS-29B FOR REQUIRED HUB CABINET PLATE ANCHOR.
4. ALL DOORS SHALL REQUIRE A CITY APPROVED LOCKING FEATURES AND KEYS SHALL BE PROVIDED TO CITY. ALL LOCKS TO BE KEYED TO CITY REQUIREMENTS.
5. ALL DIMENSION SHOWN ARE APPROXIMATE WITH ±3% TOLERANCE.

REF. & REV.
JUNE 2015

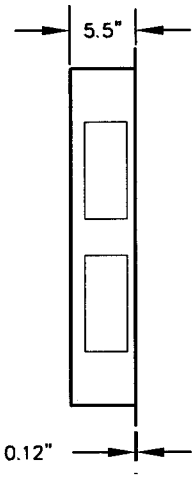
CITY OF FRESNO
ITS-29A



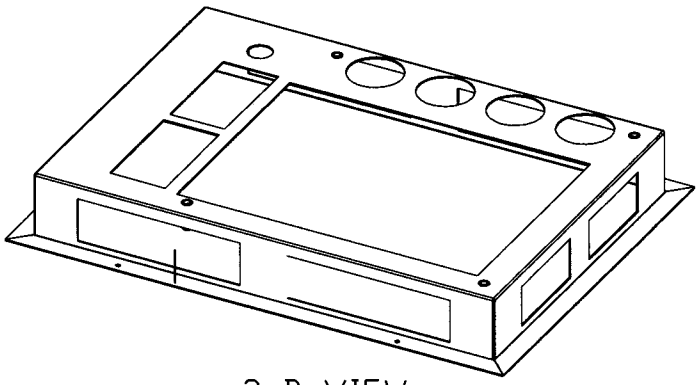
FRONT VIEW



TOP VIEW



SIDE VIEW



3-D VIEW

NOTES:

1. MATERIAL: STEEL ALLOY OPTIONAL, 0.120" THICKNESS UNLESS OTHERWISE SPECIFIED.

2. ALL DIMENSION SHOWN ARE APPROXIMATE WITH ±3% TOLERANCE.

ITS HUB CABINET, PLATE ANCHOR 2 OF 2	REF. & REV. JUNE 2015	CITY OF FRESNO ITS-29B

13-5 SLURRY SEAL

Slurry seal shall be as specified in the Special Conditions and shall conform to Section 37 of the State Standard Specifications. Aggregate type for seal coat shall be type II. Asphaltic emulsion gradation shall be medium fine, 5/16 inches maximum. All existing striping, pavement markings, and raised pavement makers shall be removed by mechanical means prior to the application of the seal coat. All water valve lids, survey monuments, and utility manhole covers shall be protected prior to application and cleaned after the slurry has set.

16-6 PAVE BACK REQUIREMENTS FOR CITY STREETS

On City of Fresno streets that have been overlaid or reconstructed within the past five years, the following requirements shall apply:

a. All backfill and resurfacing shall comply with P.W. Dwg. P-48.
b. No open cut trenching shall be allowed without prior City approval.
c. Where practical, boring of all new services shall be required.
d. For all bell holes, potholes and approved trenching, the final lift of pavement shall extend a minimum of one lane width wide for the length of the trench or excavation but in no case shall the pave n\back be less than 12 feet in length.
e. All resurfacing with 7" pave back shall be done in no less than three lifts with the final lift being no less than 0.20' in thickness.

16-7 PAYMENT

Payment for trenching shall be included in the unit price of installing the pipe or conduit to be installed in said trench.

Payments for trench resurfacing shall be as specified in the Specifications.

17-2.2 Polyvinyl Chloride (PVC) Pipe

17-2.2.1 General

Polyvinyl Chloride (PVC) sewer pipe for sanitary Sewers, and house connection Sewers shall conform to the following requirements:

Pipe Size (inches)	A.S.T.M.	Min. Wall Thickness
4-15	D 3034	SDR35
18-60	F 679	PS46
18-60	F 1803	PS46

17-2.2.2 Manufacturing Requirements

A. Identification Marks

All pipe, fittings, and couplings shall be clearly marked at intervals not to exceed 5 feet as follows:

1. Normal pipe diameter
2. PVC cell classification
3. Company, plant, shift, ASTM, SDR or pipe stiffness, and date designation

For fittings and couplings, the SDR designation is not required.

B. Cell Classification

PVC pipe shall be made of PVC compound having a cell classification of 12454-B, 13364-A, or 13364-B conforming to ASTM D 1784. The fittings shall be made of PVC compound having a cell classification of 12454-B, 12454-C, or 13343-C. Additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, colorants, etc., shall not exceed 10 parts by weight per 100 of PVC resin in the compound.

17-2.2.3 Jointing Systems

A. General

All pipe shall have a home mark on the spigot end to indicate proper penetration when the joint is made. The socket and spigot configurations for the fittings and couplings shall be compatible to those used for the pipe.

B. Elastomeric Gasket Joins

Pipe shall be manufactured with a socket configuration which will prevent improper installation of the gasket and will ensure that the gasket remains in place during the joining operation.

PVC pipe shall be joined with rubber gaskets. Rubber gaskets shall be manufactured from a synthetic elastomer and shall comply in all respects with the physical requirements specified in ASTM F 477. The compound shall contain not less than 50% by volume of first-grade rubber. The remainder of the compound shall consist of pulverized fillers free of rubber substitutes, reclaimed rubber, and deleterious substances. The Contractor shall retest within 60 Days prior to installation, any pipe gasket that is more than 180 Days old from the date of manufacture to ensure compliance with the requirements of the Specifications.

The Contractor shall not install any pipe gasket that is more than 2 years old from the date of manufacture.

Gaskets shall be extruded or molded and cured in such a manner as to be dense, homogenous and of smooth surface, free of pitting, blisters, porosity and other imperfections. The tolerance for any diameter measured at any cross section shall be ± 1/32 inch.

When required by the Engineer, the Contractor shall furnish test samples of gaskets from each batch used in the Work. Gasket material shall meet the following requirements:

Property	**Value**	**ASTM Test Method**
Tensile strength, psi min.	1500	D 412
Elongation at break (% min.)	350	D 412
Shore durometer, Type A (Pipe manufacturer shall select value suitable for type of joint)	40 to 65'	D 2240
Compression set (constant deflection) max. % of original deflection	16	D 395 Method B
Tensile strength after oven aging (96 hours, 158°F) % of tensile strength before aging	80	D 573
Increase in shore durometer hardness after over aging. Maximum increase over original Shore durometer	10	D 2240
Physical requirements after exposure to ozone concentration (150 pphm. 72 hours, 104°F, 20% strain)	No Cracks	D 1149

No more than one splice will be permitted in a gasket. A splice shall be made by applying a suitable cement to the ends and vulcanizing the splice in a full mold. The splice shall show no separation when subjected to the following tests:

1. Elongation Test

The part of the gasket which includes the splice shall withstand 100 percent elongation with no visible separation of the splice. While in the stretched position, the gasket shall be rotated in the spliced area minimum of 180° in each direction in order to inspect for separation.

2. Bend Test

The portion of the unstretched gasket containing the splice shall be wrapped a minimum of 180° and maximum of 270° around a rod of a diameter equal to the cross section diameter of the gasket.

Solvent cements are not allowed for joining pipe.

17-2.2.4 Test Requirements

A. General

Pipe, fittings, and couplings shall meet the requirements of the section titled "Requirements" of ASTM, D 3034, F 679 (PS46), F 1803. During production of the pipe, the manufacture shall perform the specified tests for each pipe marking. A certification by the manufacturer indicating compliance with the specification requirements shall be delivered with the pipe. The certification shall include the test result data. The PVC compound shall also meet the chemical resistance requirements of 17-2.2.4 D.

B. Acceptance

The basis for acceptance will be the inspection of pipe, fittings, and couplings; the tests specified in subsection 17-2.2.4A; and compliance with the Specifications. When the pipe is delivered to the work site, the Engineer may require additional testing to determine conformance with the requirements of pipe flattening, impact resistance, pipe stiffness, and extrusion quality. Installation time shall conform to subsection 17-2.2.4 E.

Sodium Hypochlorite	1%
Soap	0.1%
Detergent (Linear alkyl benzyl sulfonate or LAS)	0.1%
Bacteriological	BOD not less than 700 ppm

[1] Volumetric percentages of concentrated reagents of C.P. grade. Weight change specimens shall be 2 inches in diameter and may be molded discs or discs cut from the pipe wall. They shall be conditioned in a mechanical convection oven for 7 Days at 110°F± 4°F, then cooled in a desiccator for 3 hours at 73°± 4°F, weighed, and then immersed in the above solutions. At 28-Day intervals selected specimens shall be removed, washed, surface dried and weighed. These same specimens shall be reconditioned in a mechanical convection oven for 7 Days at 110°± 4°F, then cooled in a desiccator for 3 hours at 73°F± 4°F and weighed again. If any specimen fails to meet these requirements at any time, the material will be rejected.

C. Installation Time Limit

The Contractor shall retest within 60 Days prior to the installation of all pipe and fittings that are more than 180 Days old from the date of manufacture to ensure compliance with the requirements of the Specifications. The Contractor shall not install any pipe that is more than 2 years old from the date of manufacture.

17-2.3 PVC – Lined Reinforced Concrete Pipe

17-2.3.1 General

These Specifications shall apply to reinforced concrete pipe manufactured with a plastic lining for use in sanitary Sewers.

All reinforced concrete pipe used for sanitary Sewers shall be 360° PVC T-lock lined.

The size, type, and D-load of the concrete pipe to be furnished shall be as shown on the Plans, or as specified under the item of Work for the project of which the pipe is a part and shall be for pipe installed by open-cut method of construction.

17-2.3.2 Manufacturing Requirements

Reinforced concrete pipe shall be manufactured and tested in conformance with the requirements of ASTM C-76 or C-655, except as modified herein and to the "D" load, class and size as shown on the Plans with the following addition:

The joints shall be O-ring rubber gasket type, the gasket will be enclosed on all four surfaces in an annular space formed by shoulders on the bell end spigot or in a groove on the spigot. The pipe shall be self-centering and the gasket or gaskets shall not be required to support the weight of the pipe.

Portland cement shall comply with ASTM C-150, Type II, low alkali.

17-2.4 Ductile Iron Pipe

Sewer pipe of ductile iron shall comply with ASTM A746 (Standard Specification for Ductile Iron Gravity Sewer Pipe) and shall be used only in special locations shown on the Plans or as specified in the Special Conditions.

17-2.5 Prohibited Pipe Material

The following pipe materials are not allowed for use in the construction of sanitary Sewers:

1. Asbestos Cement Pipe
2. High Density Polyethylene
3. (HDPE) High Density Polyethylene Plastic Pipe
4. (PE) Polyethylene Solid Wall Pipe
5. Concrete Truss Pipe
6. Cement or Mortar Lined Ductile Iron Pipe
7. Concrete Pipe (unlined or nonreinforced)

17-7 INSTALLATION OF SEWER HOUSE BRANCHES

Sewer House Branches shall be constructed in accordance with Standard Drawing Nos. S-1, S-8 and S-9 of the City Standard Drawings. Sewer House Branch must connect to Sewer main at least five feet (5') away from the outside edge of a manhole.

Sewer House Branches 4 inches (100mm) and 6 inches (150mm) in diameter may be connected to all Sewer mains less than 18 inches (460mm) in diameter at prefabricated wye or Tee fittings conforming to City Standard Drawing S-8 and S-9. Sewer House Branches 4 inches (100mm) and 6 inches (150mm) in diameter may also be connected directly to existing Sewer mains 18 inches (460mm) to 27 inches (685mm) in diameter, provided that a machine core is utilized to connect to the main Sewer. Direct connection to mains larger than 27 inches (685mm) in diameter shall only be approved in special cases where approved by the Engineer. Connection to these Sewer mains by means other than a machine core will not be allowed. House Branch Sewers 8" (200mm) in diameter or greater connecting to Sewer mains shall require the construction of a manhole at the point of connection.

House branches shall be constructed at locations shown on the Plans or as may be directed by the Engineer and shall extend from the outlet of the "Y" or "T" branch at the Sewer main to the right-of-way line of the Street or alley, where the house branch shall be promptly closed at the bell end with a plug manufactured for that purpose.

The slope and general arrangements of the house branches shall be as shown on the Plans.

Plugs used to seal the ends of house branches shall be of a type approved by the manufacturer of the pipe.

Excavations for laying house branches shall be made in such a manner that at no time will the Street be closed to traffic. Whenever house branches are to be installed in major Streets that have been resurfaced within the last five (5) years, or in pavement that is in good condition and free of cracking, they shall be installed by boring methods rather than open cuts trenches.

Where curb and gutter exists, or is to be constructed concurrently with Sewer facilities, the location of each Sewer service shall be permanently indicated by inscribing the letter "S" two inches (2") in height in the curb directly above the line when the service is perpendicular to the Street centerline. Otherwise, the "S" mark for skewed or angling services shall be placed at a right angle to the end of the service. When Sewer services are installed in an existing Street, the curb mark shall be placed at the time the service is installed to assure proper location. In cases where a concrete curb does not exist, the Contractor shall mark the location of the terminus of the house branch by driving a one-half inch (1/2") iron pipe or rod in the end of the trench before backfilling. The pipe or rod shall extend to within six inches (6") of ground surface.

In new subdivisions when the Sewer services are installed before the curb is constructed, it shall be the Contractor's responsibility to establish the exact location of each Sewer service and to furnish this information to the Engineer.

17-8 MANHOLE CONSTRUCTION AND DROP SEWER CONNECTIONS

17-8.1 General

Manholes shall be constructed in accordance with Standard Drawings S-2 through S-4 of the City Standard Drawings and as specified herein or directed by the Engineer.

Manholes shall be complete structures in place and backfilled including the furnishing and placing of all materials involved. Precast concrete pipe manholes shall consist of a poured in place concrete base section, reinforced concrete pipe section(s), cast iron frame and cover and a poured in place concrete collar with paving patch. Invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent pipe invert, or flow channels may be provided by use of the bottom half of the specified main pipe. The floor and wall of the manhole outside the channels shall be smooth and shall slope minimum 1:12 towards the channels.

The top of the manhole base section shall be keyed to receive the tongue end of the riser section. The key shall be formed in the freshly poured concrete by using a template manufactured to the dimensions of the riser section. If the riser is cast in-place monolithically with the base section by using a slip form or other means, the key may be omitted between the base and riser. If the base and riser sections are not poured monolithically, but separately, a key shall be provided in the base section. In either case, a key will be required in the top of the riser section to receive the tongue end of the tapered cone.

The joints between the base and all precast elements of the manhole, including adjustment rings and manhole frame, shall be filled with cement mortar, or approved equal, prior to joining the elements.

The interior of the manhole shall be troweled smooth with a wooden trowel, removing excess mortar extruded out of joints for the entire height of the manhole, from the manhole frame to the floor. All excess mortar and any other debris shall be removed from the manhole.

17-8.2 Design and Spacing

Sewer lines shall be laid straight between manholes, unless otherwise specified in the Plans and/or Specifications. The installation of lamp holes or clean-outs on public Sewer mains is forbidden.

Manholes are to be installed at the end of each line; at all changes in grade, size, or alignment; at all intersections; and at distances not greater than 600 feet.

A grade drop of 0.1 foot (30mm) min. shall be provided through manholes, when grade permits.

Manholes shall not be installed in flow channels of gutters, or in depressions subject to storm waters or other infiltration, sidewalks, roundabouts, brick crosswalks or have any brick surrounding the manhole cover.

Flat-top manholes are not permitted. Minimum depth of manhole above the manholes base shall be 42 inches (1.08 m).

17-8.3 Materials

Pre-cast concrete pipe manholes shall consist of a poured in-place concrete base section, reinforced-concrete pipe section(s), a reinforced concrete taper section, grade rings and cast-iron frame and cover. Precast sections shall be manufactured in conformity to ASTM Designation: C-478-(Latest Revision) for their respective diameters.

Elliptical single-line reinforcement will not be permitted. Single line circular reinforcement will be permitted and the minimum steel area shall equal the minimum steel area required for the inter-cage reinforcement.

Tapered sections shall conform to the requirements for pipe of the size equal to the largest internal diameter of the tapered sections.

Concrete for the base section shall be 6 sack. Precast manhole bases are not allowed.

Unless specified otherwise, manholes on sewer mains 12 inches in diameter or larger, or on any size sewer mains within 600 feet of and connected to sewer mains 30 inches in diameter or larger shall be lined with T-lock or coated with one of the following: Raven 400 or Raven 405, products of RLS solutions; Neopoxy 5300 series, products of Neopoxy International; or Quadex Structure Guard, a product of Quadex. Approved products shall be applied per manufacturer specifications. No substitutions are acceptable.

17-8.4 Installation

The inside of the manhole shall be formed to the flow line of the Sewer. The formed flow channel depth shall extend above spring line up to half of the pipe. The bench shall slope a minimum 1:12.

Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in grade of the channels shall be made gradually and evenly. Where the pipe size of the entering and

leaving pipe is different, the larger diameter must be maintained in the manhole.

A channel shall be formed in the bottom of all new starting manholes (a terminal manhole at the upstream end of a sewer main) and it shall extend completely through the manhole. The upstream end of the new flow channel shall terminate at the manhole wall, and the end of the flow channel shall be vertical with no fillet between the flow channel bottom and the manhole wall.

Stub-outs shall be installed in manholes at the locations and sizes shown on the Plans. All stub-outs shall be sealed with a plug of a type approved by the manufacturer of the pipe. When connecting to the existing stub-outs and the plug is removed, a new square cut shall be done to the existing stub-out prior to connection on the new sewer main.

All manholes shall be completed to finish grade with concrete collar and paving patches (where indicated) as shown on the City Standard Drawings and as herein specified. In undeveloped areas where no Street or alley surfacing is to be done in conjunction with or immediately after Utility installation, the manhole cover shall be finished off to a level 1 inch (25mm) above ground elevation and shall be provided with 12 inches (300mm) of grade rings. In existing Street areas where surfacing exists and no new Street regrading is contemplated in conjunction with or immediately after Utility installation, such as new subdivisions, manholes shall initially terminate with the top of the cone 6 inches (150mm) below subgrade and shall be brought to Street or alley surface with grade adjustment rings and completed after Street paving is accomplished. Unless specifically otherwise indicated in the Specifications, it will be the responsibility of the Sewer Contractor to return and install the manhole covers to finish grade as specified and shown on the City Standard Drawings.

The Contractor is aware that connections to existing Sewers will be "wet" and the Contractor shall make whatever arrangements are necessary to complete the manhole connections under the "wet" conditions.

Where necessary, manholes shall be equipped with an approved water-tight insert placed under the manhole cover to prevent rainwater or other inflow.

No steps shall be installed in manholes unless otherwise noted on the Plans.

17-8.5 Abandon and Removal

Manholes abandoned in place shall be broken out within 2 inches (0.6m) of the finished grade.

The manhole frame and cover will be delivered to the City Corporation Yard. The Sewer mains entering the manholes shall be sealed with concrete and the

manhole backfilled with sandy soil and compacted to a relative compaction of 90% using optimum moisture and tested in accordance with ASTM D1557.

Manholes to be removed shall have the base removed with the barrel and taper. The manhole frame and cover will be delivered to the City Corporation Yard. After the complete manhole has been removed the excavation will be backfilled in accordance with backfill requirements. Before backfilling, all Sewer pipes that have entered the manhole will be sealed with concrete.

17-8.6 Adjustments

Where existing manholes need to be raised or lowered to meet a new Street grade, they will be left in place and marked until the Street has been paved. After the paving material has been compacted they will be dug out and the ring and cover removed and lowered or raised to grade by use of concrete around the frame but left two (2) inches below the-finished surface in asphalt concrete Streets and the top two inches filled with A.C. and rolled. In concrete surfaced Streets the concrete will be brought to the surface.

"Jiffy Rings" (manhole adjusting riser rings that feature a turnbuckle linkage pivoted at each end, that provide the ultimate means to expand a manhole riser) for raising manholes will be allowed.

17-8.7 Drop Sewer Connections

Drop Sewer connections at manholes shall be constructed in accordance with City Standard Drawings S-11A and S-11B, and only at locations approved by the Engineer and shown on the approved Plans.

17-8.8 Payment

If existing manholes are to be removed and replaced they shall be included in the bid price of new manholes unless otherwise specified in the Specifications.

The bid price of adjusting manholes to the new Street grade shall include surface restoration.

17-9 FUTURE STUB OUTS

Stubs shall be installed in the manholes at the locations and of the size shown on the Plans. All stubs shall be sealed with a plug of a type approved by the manufacturer of the pipe for use with his/her product. When connecting to the existing stubs and the plug is removed, a new square circumferentially cut shall be done to the existing stub prior to connection on the new sewer main.

17-10 DEFLECTION TEST OF PVC SEWER LINES

PVC Sewer pipe, which is designated as flexible in nature, shall be tested for excessive deflection. This test shall be performed after backfilling and compaction but prior to the placement of aggregate base or asphalt-concrete surfacing, and prior to television inspection as specified in Subsection 17-12, "TELEVISION INSPECTION OF INTERIOR OF INSTALLED PIPE," of these Specifications.

The Contractor shall demonstrate that the maximum pipe deflection does not exceed 5 percent by pulling a properly sized rigid ball or a mandrel through the main line pipe. A "rubber flush ball" does not meet this requirement for deflection testing.

Failure of the deflection test shall be grounds for rejection of the section tested, until correction of the reason for the failure and successful retesting of the section.

17-11 LEAKAGE TEST OF SEWER LINES AND SERVICE LATERALS

After completing the installation, backfill and compaction of a section of Sewer line with service laterals, and after all other underground Utilities (including gas, electric, telephone, cable television, water and Storm Drain) are in and compacted, but prior to the placement of aggregate base or asphalt-concrete pavement, the Contractor shall, at his/her expense, conduct a leakage test using low pressure air. The test shall be performed using the following procedures and under the Supervision of the inspecting Engineer.

Each section of Sewer between two successive manholes shall be tested by plugging all pipe outlets with suitable test plugs.

All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 170 MPa (25 pounds per square inch) gauge pressure. The sealed pipe shall be pressurized to 35 MPa (5 psig). The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

To commence the leakage test, air shall be slowly added until the internal pressure is raised to 27 MPa (4.0 psig). The compressor used to add air to the pipe shall have a blow-off valve set at 35 MPa (5 psig) to assure that at no time the internal pressure in the pipe exceeds 35 MPa (5 psig). The internal pressure of 27 MPa (4 psig) shall be maintained for at least two minutes to allow the air temperature to stabilize after which the air supply shall be disconnected and the pressure reduced to 24 MPa (3.5 psig). The time in minutes that is required for the internal air pressure to drop from 24 MPa (3.5 psig) to the lower pressure indicated in the appropriate table below shall be measured and the results compared with the values tabulated below.

Gauges used to measure test pressures shall read from 0 MPa (0 psig) to 69 MPa (10 psig) maximum with 3.5 MPa (½ psig) increments. If required, the Contractor shall supply necessary fittings to accept a City supplied gauge.

All gauging and testing shall be done outside the manholes and no one shall be allowed to enter the manholes while the line is pressurized.

PVC Gravity Sewer Pipe

Minimum Acceptable Time Required for Pressure decrease from 24 MPa (3.5 psig) to 20 MPa (3.0 psig):

Pipe Diameter	Test Time (Minutes)	(Seconds)
4" (100 mm)	2	32
6" (150 mm)	3	50
8" (200 mm)	5	6
10" (250 mm)	6	22
12" (300 mm)	7	39
15" (380 mm)	9	30

Vitrified Clay Sewer Pipe
Minimum Acceptable Time Required for Pressure decrease from 3.5 to 2.5 psig:

Pipe Diameter (Inches)	Test Time (Minutes)	(Seconds)	Minimum Distance Between Manholes (Feet)	K Value
4	2	0	430	0.428
6	2	45	380	0.592
8	3	45	320	0.702
10	4	46	260	1.100
12	5	40	215	1.58
15	7	0	170	2.470

18	8	36	145	3.560
21	10	6	125	4.850
24	11	6	105	6.34
27	12	42	95	8.020
30	14	1	85	9.900
33	15	0	75	12.000
36	16	41	70	14.300
39	18	5	65	16.700
42	19	24	60	19.400

The above-tabulated values shall be used for the respective diameter pipes except where the distance between successive manholes is less than the above-tabulated values, in which case, the following formula will be used to determine the test time.

T = KL
T = test time in seconds
K = value from table
L = distance between successive manholes in feet

Failure of the leakage test will be grounds for rejection of the section tested, until discovery and correction of the reason for the failure and successful retesting of the section.

17-12 TELEVISION INSPECTION OF INTERIOR OF INSTALLED PIPE

The Contractor shall furnish closed circuit television inspection for an interior inspection of the newly installed Sewer mains. The television check of the Sewer mains shall be made after leakage and deflection tests have been performed and prior to placing of Street aggregate base or asphalt paving. Any broken pipe, separation of joints, or any pipe exceeding the permitted tolerances for line and grade shall be replaced or repaired.

Any pipe repaired or replaced as a result of television inspection shall be retested for leakage and deflection. An electronic copy of the television inspection (standard DVD or in Mpeg file format) shall be provided the City at no additional cost to the City. The Contractor shall be responsible for all costs associated with furnishing the television inspection and making final repairs to the Sewer mains and reinspection utilizing the closed circuit television equipment.

At the request of the Contractor, the City may at its option perform the closed circuit television inspection or reinspection on the Contractor's installation at a cost designated in the City's Master Fee Resolution for such Television Inspection work.

Requirements for Sewer Video Inspections:

1. The Video Inspection Company is to certify as to their ability to adequately perform the video inspection.

2. The City Inspector will provide 24 hour notice of inspection schedule and will be present to monitor the inspection.

3. Clean mainlines and manholes of all debris prior to inspection.

4. After cleaning and prior to video inspection, water shall be dumped into the upstream manhole via a flusher hose or hydrant. Until the water flow reaches the downstream manhole. As an alternative, a flusher nozzle may be used by running it upstream from the downstream manhole however, it is to remain on in the upstream manhole until the water flow reaches the downstream manhole, at which point it shall be pulled back downstream with the water pressure off.

5. A flush truck will be required to be on-site to aid in the video inspection.

6. A DVD shall be submitted to the City as proof of inspection and be certified to comply with Plan requirements or pointing out by station any defects found.

7. Lateral lines to be documented by stationing from center line of manhole and the inspection firm shall provide a map of the inspected lines.

8. In order to facilitate review a log of the inspections performed shall correlate from manholes, stationing, etc., between the Sewer Plans and the DVD produced.

9. Joints- Shall have a perspective view, and have each joint inspected by turning the camera 90 degrees to identify any rolled gasket in the joint and inspecting all 360 degrees of the connection.

10. Laterals- Shall have a perspective view identifying clock position to the main and a view into the lateral to identify any rolled gasket in the lateral connection.

11. Sags- A guide shall be used that is 1" in diameter to identify sags and must be visible during the entire inspection. Give a perspective view of the start of the sag, a view of the guide at the deepest part of the sag and the end of the sag.

12. Downstream Access Point- A perspective view of the channel from the mainline at the downstream access point must be shown. Provide a snapshot of the bottom of the channel and the shelves looking downstream.

13. Debris- if debris is found during the inspection, the inspection needs to be terminated and restarted once the debris has been removed and more water dumped into the main.

14. Video Inspection shall be performed in the direction of flow.

15. Liner Job (e.g. Cured in Place Pipe) - The bottom of the pipe needs to be free of water and the camera lens shall have a visible view of the pipe.

17-12 TELEVISION INSPECTION OF INTERIOR OF INSTALLED PIPE (ADDITIONAL INFORMATION)

INSPECTION OF NEW CONSTRUCTION-SEWER INFRASTRUCTURE MAIN SEWER LINES AND MANHOLES

Before new construction of sewer infrastructure (main sewer line, manholes, etc.) is approved by the City, a video of the construction will be reviewed to ensure specific guidelines are followed. If these are not met, the approval is put on hold until the problem is fixed. A follow up video inspection is then required which will be reviewed and approved if in compliance. The video can be done by private contractors while the final review and approval is done by the City.

The City of Fresno is also available to do the video inspection and will charge a fee to recover the cost of the labor and equipment utilized on the video inspection and cleaning of debris if necessary. If using the City's resources, provide billing information and project identification. The costs for utilizing the City's services are as follow:

Television Inspection/Sewer (Master Fee Schedule)

CCTV Inspection, per hour (one hour minimum)	$134.39*
CCTV Standby, per 15-minute period	$ 33.60*
Cleaning of minor debris for inspection, per hour (30 minutes minimum)	$141.09*

*This price is changed periodically in the Master Fee- Schedule update.

Ensuring proper construction of main sewer lines and manholes prevents future maintenance issues that could increase the potential for blockages and possible sanitary sewer overflows.

Guidelines for Inspecting New Construction

• Ensure access area is free of construction debris. Standby charges may apply if work is scheduled and staff is unable to access the area to be inspected.

• Clean mainlines and manholes of all debris prior to inspection.
• After cleaning, water is to be dumped in to the upstream manhole via flusher nozzle or hydrant. If flusher nozzle is used by running it upstream, it needs to be pulled back without pressure to keep water in the line.

CCTV Inspections

- Joints-Need to have a perspective view and have the joint inspected by turning the camera 90 degrees to the joint and inspecting all 360 degrees of the connection.
- Laterals-Need to have a perspective view identifying clock position to the main and a view into the lateral to identify any rolled gasket in the lateral connection.
- Sags-A guide needs to be used that is 1" in diameter to identify sags and should be visible during the entire inspection. Give a perspective view of the start of the sag, a view of the guide at the deepest part of the sag and the end of the sag.
- Downstream Access Point-Give a perspective view of the channel from the mainline at the downstream access point. Make sure to have the bottom of channel and the shelves in the snapshot.
- Debris-If debris is found during the inspection, then, the inspection needs to be terminated and restarted once the debris has been removed and more water dumped into the main.

Manhole Inspections

- A top view snapshot of each manhole.
- A full frame view of the channel work from the top down for each manhole.
- Each snapshot needs to be identified by manhole/station number any inspections submitted that have debris will not be accepted.
- Any joints, laterals, or connections that have not been inspected will not be accepted.
- Any manholes that have not been inspected will not be accepted.
- All media to be provided in DVD formal.

17-13 MEASUREMENT

Measurement for Sewer main installation and service lateral installation shall be by the lineal feet of pipe installed, and shall be actual horizontal length installed, measure through wye fittings.

Measurement for wye or Tee fittings shall be per each wye or Tee fitting installed.

Measurement for manholes shall be per each manhole installed.

17-14 PAYMENT

The unit price bid per lineal foot for Sewer mains shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the Work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the pipe, trenching, backfilling, compacting, testing and internal inspection.

The unit price bid per lineal foot for service laterals (house branches) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the Work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the pipe, trenching, backfilling, compacting, testing.

The unit price bid per each for wye or tee fittings shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the Work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer, in excess of the cost of installing the main line pipe and service lateral. This shall include, but not be limited to, furnishing and installing the wye or tee fitting and plug, trenching, backfilling, compacting, testing and internal inspection.

When the contract does not include a pay item for wye fittings as above specified, and unless otherwise provided in the Specifications, full compensation for wye or tee fittings shown on the Plans shall be considered as included in the prices bid for other Sewer pipeline items of Work and no separate payment will be made therefore.

The unit price bid per each for manholes shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the Work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the manhole and stub-outs, backfilling and compaction, returning and adjusting manhole lids and frames to final grade following Street or alley construction or reconstruction, and connection to all pipes, wet or otherwise.

No separate pay item will be included in the Proposal, nor direct payment made for trench or structure excavation, backfilling, compaction, or placement of temporary pavement. The cost of these features of the Work shall be included in the unit price bid per linear foot for furnishing and laying pipe or installing structures.

SECTION 23 – TRAFFIC SIGNALS AND STREET LIGHTING

23-1 TECHNICAL SPECIFICATIONS FOR TRAFFIC SIGNALS

23-1.1 General

Traffic Signal Poles Standards shall be in accordance with State Standard Specifications, 1997 Edition, (113 km rating/70 mph rating).

Furnishing and installing traffic signals and highway lighting and payment therefore shall conform to the provisions in Section 86, "Electrical Systems," of the State Standard Specifications and the State Standard Drawings, the City Standard Drawings, Plans and Specifications.

Signals and lighting Work is to be performed at the locations shown on the Plans.

Existing electrical systems, or approved temporary replacements thereof, shall be kept in effective operation during the progress of the Work, except when shutdown is permitted.

Work or equipment not specified or shown on the Plans which is necessary for the proper operation of the traffic signal in this section shall be provided and installed at no additional cost to the City.

The locations of foundations, standards, services, pull boxes and other appurtenances shown on the Plans are approximate. Exact locations and grades will be established as necessary by either the Traffic Engineer and/or City CM Engineer in the field.

23-1.5 Maintaining Existing and Temporary Electrical Systems

Existing traffic signal systems, including detection, and/or safety lighting, shall remain operational during construction, unless otherwise authorized in writing by the City Engineer.

The Contractor shall notify the City CM Engineer at least one full working day (not less than 24 hours) prior to the shutdown of any traffic signal and lighting system. The Contractor may use temporary splices and wiring as approved by the City CM Engineer to maintain existing and temporary traffic signal and lighting systems. Shutdowns of traffic signal and lighting systems shall be limited to the period from 9 a.m. to 4 p.m. of normal working days, excluding legal holidays, weekends, and non-working days as determined by the City CM Engineer.

23-1.7 Foundations

Foundations shall conform to the provisions in Section 86-2.03, "Foundations," of the State Standard Specifications and these Specifications.

Concrete for reinforced pile foundations shall contain not less than 564 pounds of cement per cubic yard.

Foundation concrete shall be placed in a single pour except that pouring of the top six inches may be postponed when prior approval has been obtained. Exact location for controller cabinet shall be designated by the Traffic Engineer and approved by Electrical Superintendent, 48-hour notice required.

No Utilities shall be permitted to run through any foundations.

PVC wire-ways in pole foundations shall be installed as detailed in City Standard Drawing No. E-27. Foundations shall be poured against undisturbed earth where practicable. The exposed portion shall be formed and finished to present a neat appearance. Where obstructions or other conditions prevent construction of planned foundations, the Contractor shall construct an effective foundation satisfactory to the City CM Engineer.

The bottom of concrete foundations shall rest on firm ground. When placing the foundations, the Contractor shall place all conduit ends in their proper position, at the correct heights and shall securely hold them in position during the pouring of concrete. Conduits exiting the controller foundation and entering into the controller cabinet shall be aligned to enter within the ~~tees~~ TEES specified cabinets without any modifications to the cabinet base. Conduit shall be capped before any concrete is poured. Both forms and earth to be in contact with foundations shall be thoroughly moistened before placing concrete.

Anchor bolts shall be galvanized and shall extend above the finished base as needed to ensure a minimum extension above the top nut of 3 threads. The maximum extension above the top nut is 1 inch. Each bolt shall be supplied with 2 nuts and 2 flat washers to facilitate leveling. The distance between the bottom nut and the top of the finished foundation shall vary depending on the diameter of the anchor bolt being used. For anchor bolts 1" or less in diameter this distance is 1" minimum and 1-1/2" maximum. For anchor bolts greater than 1" in diameter the distance is 1-1/2" minimum and 2" maximum.

The anchor bolts and conduits shall be held in place by means of a template until the concrete sets.

Locations shown on the Plans are schematic.

Poles, standards and pedestals shall not be erected until the foundation concrete has set at least seven Days and shall be plumbed or raked as directed by the City CM Engineer. Top of concrete foundations shall be finished relative to curb or sidewalk grade or as shown on the Plans or as directed by the City CM Engineer.

The top of controller cabinet foundation shall be 12 inches above the surrounding grade or sidewalk, as shown in Dwg. E-37.

23-1.9 Conduit

Conduit shall conform to the provisions in Section 86-2.05, "Conduit," of the State Standard Specifications and these Specifications.

Nonmetallic-type conduit shall not be used, unless specifically called for on Plans, with the exception of conduits between standards and adjacent pull boxes which shall be installed per City Standard Drawing No. E-27.

Conduit shall be of rigid type, conforming to Article 346 of the National Electrical Code. All conduit and fittings shall be hot dip galvanized. Each length shall bear the labels of Underwriters Laboratories, Inc. Installation shall conform to appropriate Articles of the Code.

All couplings shall be tightened to provide a good electrical and mechanical connection throughout the entire length of the conduit run. The use of threadless or set screw fittings is not allowed. No running threads are permitted.

Conduit threads and damaged conduit surfaces on metal conduit shall be thoroughly painted with zinc rich paint conforming to Military Specification DOD-P-21035A.

All conduit ends shall be threaded and capped with standard conduit caps until wiring is started. When the caps are removed the threaded ends shall be provided with approved insulated hot dipped galvanized malleable iron bushings with cast integral lay-in lugs.

It shall be the privilege of the Contractor, at his/her own expense, to use larger size conduit if desired, and where larger size conduit is used, it shall be for the entire length of the run from outlet to outlet. No reducing couplings will be permitted.

All conduit shall be laid to a depth of not less than twenty-four inches, nor greater than thirty-six inches below the curb grade in the sidewalk areas and from the finished surface in Street areas. Conduits in sidewalk areas parallel to the curb shall not be installed more than twenty-four inches from inside of curb line toward property line.
Conduit shall be placed under existing pavement by directional boring and jacking method. Pavement shall not be disturbed without the written permission of the City

CM Engineer and then only in the event insurmountable obstructions are encountered. Conduits not able to be placed under sidewalk shall be encased in at least 6" of slurry. Excessive use of water, such that pavement might be undermined, or subgrade softened, will not be permitted.

Conduit in pull boxes shall not extend more than two inches inside the box wall. No conduit may enter the pull box from the bottom unless approved by the City CM Engineer. No conduit or Utility shall pass through a signal, controller or Street light base or pull box except the conduit which terminates within the base or pull box.

No 90° elbows shall be installed unless specified or approved by City of Fresno, Construction Management.

After the installation of all conductors and cables, the ends of conduits terminating in pull boxes, the controller cabinet and service pedestal shall be sealed with an approved duct seal material. In as much as possible, conduit shall be run in a straight line from one pull box or pole to the next, maintaining a consistent setback from the curb. Any variation from this requirement shall be approved by the City CM Engineer.

23-1.10 Pull Boxes

Concrete pull boxes shall conform to the provisions in Section 86-2.06, "Pull Boxes," of the State Standard Specifications and these Specifications.

All pull boxes shall be No. 5 unless otherwise noted on the Plans. See Section 86-2.06 of the State Standard Specifications and City Standard Drawing No. E-4 regarding requirements for grouting, drain hole, etc.

All pull boxes shall be installed with extensions.

The pull box lid at the Pacific Gas & Electric Company's point of connection shall be marked "PG&E." All others shall be inscribed "Traffic Signal," "Interconnect," "Electrical" or "Street Lights" as appropriate.

Pull boxes on long runs shall be installed and spaced at not over 200-foot intervals, and shall be required in all conduit change of directions.

All pull boxes shall be wrapped with building paper prior to backfilling. Pull boxes installed in non-concrete areas shall be surrounded by a one (1) foot wide concrete collar and to a depth equal to the pull box and extension. The collar shall be sloped to drain away from the pull box.

Vandal resistant locking lids shall be installed by the contractor at final inspection. Contractor shall provide temporary lids during construction. Locking lids shall be

galvanized steel diamond plate, minimum thickness 3/16 inches, with minimum two (2) clamping jaws and be keyed to the City of Fresno key.
For concrete fiber optic vaults, refer to Section 31, "Technical Specifications for Intelligent Transportation Systems," of the City Standard Specifications.

23-1.11 Conductors and Wiring

Conductors and wiring shall conform to the provisions in Section 86-2.08, "Conductors and Cables," and Section 86-2.09, "Wiring," of the State Standard Specifications and these Specifications.

All 7-conductor, 5-conductor and 3-conductor cables shall conform to the latest International Municipal Signal Association (IMSA) Specification 20-1. The cable conductors shall be 14 AWG solid copper.

When cables are pulled into the conduit, all ends of the cables shall be taped to exclude moisture, and shall be so kept until connected to terminals.

A minimum of three feet of slack in each single conductor and cable run shall be left at each signal or lighting standard and in each pull box.

No splices shall be allowed in multi-conductor cables. They shall run from the controller terminal strip to the appropriate TS-4 terminal block. (Delete the paragraph under number 5 in Section 86-2.09D, "Splicing and Terminations," of the State Standard Specifications which permits splicing of underground conductors.)

All single conductor wire shall be copper and of stranded construction with THWN type insulation. All conductors shall have insulation colors appropriate to their use and all applicable codes. The use of colored phase tape is not allowed.

Splices in single conductor wire shall be limited to the load side of the service pedestal breakers and to tap type splices located in pull boxes. These splices shall be made using either split bolts or c-tap connectors. The c-taps shall be properly sized for the wires being joined and installed with the proper tooling. The splice shall be insulated as follows: minimum 2 layers of rubber tape, 1 layer--½ lapped plastic tape, 1 layer friction tape and then coated with an approved electrical sealing compound.

Pedestrian push button circuits shall utilize a 3-conductor cable between the controller and a pedestrian TS-4 terminal assembly. The individual buttons shall be connected to the terminal assembly using DLC. At the pushbutton end, the conductors shall be attached using an insulated fork terminal properly sized for the wire and screw. At the terminal assembly end, the wire shall be stripped, loose strands of individual conductors twisted neatly and soldered prior to installation into the box type pressure connector. Reference City Standard Drawing No. E-20.

Conductors within the 3, 5 and 7 conductor cables shall be connected within the terminal assemblies as shown on the "Terminal Location," City Standard Drawing Nos. E-19 and E-20.

The single conductor #14 AWG THWN stranded copper wire installed between the TS-4 terminal block and the individual signal heads terminal block shall be terminated as follows:

> At the signal head end, it will be installed using an insulated spade terminal properly sized for the wire and the screw. The terminal shall be installed using the proper tooling. At the terminal assembly end, the wire shall be stripped, loose strands twisted neatly and tinned with solder prior to installation into the box type pressure connector.

All multi-conductor cable conductors connected to the load bay shall be terminated at the controller cabinet using the AMP/TYCO 320359 spade terminals.

All multi conductor cable conductors connected to the input terminal blocks shall be terminated at the controller cabinet using a fork terminal properly sized for the wire and the screw.

The lugs used to connect with controller field terminals shall be soldered after being properly crimped. Soldering shall be by means of an iron or gun. No open flame torch may be used.

Optical Detector Cable shall meet the requirements of IPCEA-S-61-402/NEMA WC5, Section 7.4, 600 volt control cable, 75°C., Type B, and the following:

(a) The cable shall contain 3 conductors, each of which shall be No. 20 (7x28) stranded, tinned copper with low-density polyethylene insulation.

Minimum average insulation thickness shall be 25 mils. Insulation of individual conductors shall be color coded: 1-yellow, 1-blue, 1-orange.

(b) The shield shall be either tinned copper braid or aluminized polyester film with a nominal 20 percent overlap. Where the film is used, a No. 20 (7x28) stranded tinned, bare drain wire shall be placed between the insulated conductors and in contact with the conductive surface of the shield.

(c) The jacket shall be black polyvinyl chloride with a minimum rating of 600 volts and 80° C (176°F) and a minimum average thickness of 45 mils. The jacket shall be marked as required by IPCEA/NEMA.

(d) The finished outside diameter of the cable shall not exceed 10 mm (0.35 inch).

(e) The capacitance, as measured between any conductor and the other conductors and the shield, shall not exceed 48 picofarads per foot at 1,000 Hz.

(f) The cable run between each detector and the controller shall be continuous without splices or shall be spliced only as directed by the detector manufacturer and approved by the City.

23-1.12 Fused Splice Connectors

Each luminaire shall be internally fused with an OEM fuse holder and a 5 amp fuse or with a 5 amp KTK type fuse installed in a TRON HEB type fuse holder. The fuse and holder shall be located in the luminaire. Sufficient slack shall be provided to allow easy changing of the fuse as needed. The fuse holder shall be crimped to the wire and the crimp joints insulated as described above for tap type splices.

23-1.13 Bonding and Grounding

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding," of the State Standard Specifications and these Specifications.

Ground will be obtained by installation of a ground rod within the service pedestal foundation. This ground rod shall be bonded to all metallic conduits within the controller cabinet and all pull boxes shall be bonded in a similar manner. Within the service pedestal, controller cabinet and pull boxes adjacent to signal standards, one end of the solid #8 bonding conductor shall be extended to and attached to the pedestal, controller cabinet or signal standard using the grounding point as furnished. For signal standards not supplied with a hand hole, the grounding conductor shall be terminated on an anchor bolt between two washers installed above a leveling nut.

A green #8 stranded wire may be used for pole grounding if a ring terminal, appropriately sized for the grounding bolt, is installed.

All ground connections shall be left visible and accessible until the final acceptance inspection is complete.

To ensure proper ground distribution, a #8 stranded copper conductor with green THWN insulation shall be installed in all conduits. The ends shall be attached to the bonding jumper at each end using split bolt or c-tap splices.

23-1.15 Painting

All paint shall be furnished and applied by the Contractor. Minor touch-up painting on all material whose surface is damaged or not protected from rusting shall be painted as directed by the City CM Engineer. Cold galvanized zinc-rich paint, Military Specifications DOD-P-21035 A, shall be used on all damaged galvanized surfaces.

When allowed, any reused pedestrian and vehicle signals, visors, and backplates shall be repainted to match new equipment. Painting shall conform to the provisions of Section 86-2.16, "Painting," of the State Standard Specifications.

23-1.18 Pedestrian Signals

Pedestrian signals shall conform to the provisions in Sections 86-4.03, "Pedestrian Signal Faces" and 86-4.04, "Signal Mounting Assemblies," of the State Standard Specifications and these Specifications.

Pedestrian signals shall be Type A. International type symbols shall be used.

All pedestrian signal housings shall be metallic. The lenses and egg crate type visors shall be polycarbonate.

Mounting framework shall consist of 1-1/2" steel pipe, ductile iron fittings and bronze terminal compartments.

Clam shell mounting hardware shall not be used.

After installation of the signal mounting framework, any through bolts that extend more than 1" beyond the nut shall be cut to three threads beyond the nut and painted with a zinc rich cold galvanizing compound.

All set screws exposed to weather shall be zinc or cadmium plated and have square heads.

The signal shall have an LED Hand and White Walking Man with a countdown feature.

When allowed, reused pedestrian signals shall have an LED retrofit kit installed. The installation shall not require any special tools or the drilling of any holes in the reflector or housing. If existing pedestrian housing will not accommodate an LED retrofit kit, the Contractor shall furnish and install a new pedestrian housing.

The luminous intensity, quantity and color of the LEDs shall be such that the intent of the current ITE specification for Pedestrian Traffic Control Signal Indications is

satisfied.

23-1.19 Detection

Detectors shall be supplied by an approved manufacturer and conform to provisions in Section 86-5, "Detectors," of the State Standard Specifications and these Specifications.
Pavement saw cut detector loop wire shall be type 2.

Loop Detector Lead-in Cable (DLC) shall be Type "C" IMSA spec. 50-2. Cable shall not be spliced between the termination pull box and the controller terminals.

DLC drain wires shall be terminated in the cabinet as individual wires (Not twisted into groups) to allow for ease of future relocation.

Loops in adjacent lanes shall be polarized and the loop conductor ends identified as detailed in State Standard Drawing, ES-5A note #8 and the 'winding Details'.

Loops locations shall be per City Standard Drawing No. E-14.

The loop wire when spliced to the lead-in cable shall be insulated using Method 'C' Handcrafted Insulation or by using approved heavy wall shrink tubing. All splices shall be made using uninsulated inline connectors, crimped and soldered.

Resistance: max = 0.51 + 0.35Ω/c of DLC.
Insulation: min = 100 meg Ω.

The loop test measurements as detailed in the State Standard Drawing, ES-5A note # 17, shall be documented on the "Detector Loop Test Results" form provided in the controller cabinet and a copy is provided at the end of these Specifications. The form will be signed and dated by the individual performing the tests.

The sealant for filling slots shall be ELASTOMERIC SEALANT or HOT-MELT RUBBERIZED ASPHALT SEALANT, and shall conform to State Standard Specification Section 86-5.01A (3), "Construction Materials."

23-1.20 Pedestrian Push Buttons

Pedestrian push buttons shall conform to the provisions in Section 86-5.02 "Pedestrian Push Button Assemblies" of the State Standard Specifications and these Specifications.

Pedestrian push buttons shall meet or exceed the 2010 Americans with Disabilities Act Standards for Accessible Design as specified in The Federal Register, as printed on September 15, 2010.
Pedestrian push buttons, housing and sign shall be pre-approved by the City CM Engineer.

Pedestrian push buttons shall be Type "B" with sign and housing. Housing shall be metallic and sign shall be international symbol and arrow. Push buttons shall be 2" diameter.
The housing shall be sized to conform closely to the curvature of the pole.

The DLC shall be connected to the pushbutton using an insulated fork connector. At the TS-4 terminal assembly, the loose strands shall be tightly twisted together and tinned with solder.

23-1.21 Audible Pedestrian Signal Specification

When specified, the contractor shall furnish and install an Accessible (Audible) Pedestrian Signal (APS) system (2-wire Polara Navigator or approved equal) in conformance with the city's Standard Specifications. The APS shall provide both a vibrating arrow button and audible sounds during the "Walk" interval as well as a locating tone during the pedestrian clearance and don't walk intervals. The APS shall meet current ADA and MUTCD requirements.
The contractor shall supply the latest means of programming the APS system to the City of Fresno TSSL department.

23-1.22 Emergency Vehicle Priority Control System

The priority control system shall offer the capability of identifying two levels of priority vehicles at signalized intersections and one level of probe vehicle. High priority for emergency vehicles and low priority for other authorized users will request the traffic signal controller to advance to and/or hold a desired traffic signal display selected from phases normally available. A Probe Vehicle Mode must be available for traffic engineering, run time analysis and response time data gathering. The probe vehicle mode will not preempt the traffic signal. The Probe Mode will record of the probe vehicle's presence at a Priority Controlled intersection. The system will only allow users with flash rates of 14.0359Hz +/-0.05% for high priority and 9.63855Hz +/-0.05% for low priority activation of the system. The system shall also be capable of identifying up to 10,000 individual vehicles by the coded light signal of the vehicle emitter for security and vehicle logging.

The system will have non-authorized vehicle control with the capability of only allowing use of the system to authorized users with valid identification codes. The system must be fully compatible with existing vehicle emitters currently installed on City-owned fire

apparatus, and City-owned signalized traffic signals, as well as contractually obligated mutual aid providers.

The system will record up to 1000 activations, on a continuous basis. The latest preemption will replace the oldest preemption. The system must record the date and time of the preemption, the duration of the preemption, the direction from which the call was received, the vehicle identification number (class and ID), intersection name, log entry number, priority of vehicle and duration of call. Further, the system must record approximate distance of each emitter recorded during last moment of detection. This data is to be recorded in the phase selector located inside the cabinet. Information is to be easily accessible via RS232 port and software. The phase selector shall also have the capability to assign a relative priority to a call request within high or low priority based on the received vehicle ID class.

The system shall offer automated signal intensity threshold settings. Activation range to be set by downloading a code through the software and by using a combination of the software and a special range setting emitter. The system range shall be capable of precise settings using 1200 increments; and actuating between 100 feet and up to 2500 feet passage of 8 separate emergency vehicles, individually approaching the test intersection. Each equipped emergency vehicle will be required to activate the test intersection at 1800 feet with a variance of 100 (+-) feet. The system must be able to set separate ranges on any detector; one for low priority and one for high priority.

The system will be a matched component system with all components from one manufacturer consisting of:

- A Data-Encoded Emitter. The data-encoded emitter will trigger the system. It will send the infrared signal to the detector. It will be located on the priority or probe vehicle.
- Phase Selectors to be located in the controller cabinet with green sense harnesses wired into the traffic controller per manufacturer specifications. Phase selectors shall have two channels.
- Detector cable with four conductors yellow, blue, orange and bare.
- Vehicle detectors shall be dual input single output.

The system shall offer the capability of detector diagnostics through connecting a lap top computer to the phase selector and reading electrical line noise between the traffic signal cabinet and detector mounted in the intersection. System must display information, such as optical noise levels, so as to confirm proper operation of detector and therefore reduce inspection time and effort.

All EVP system equipment submitted to the City must include a certificate of product liability insurance protection of at least $5,000,000.00.

Detectors shall be mounted with an Astro-Mini-Brac, or other approved bracket, on the traffic signal mast arm and aligned with the number one through traffic lane. Prior to mounting the bracket, the contractor shall drill a 1" diameter hole in the mast arm at the desired bracket location. All burrs and sharp edges shall be removed. The area will be cleaned of any oil or drilling compound and a zinc-rich cold galvanizing compound will be applied to the bare metal. A 1" grommet will be installed in the drilled hole to protect the wiring.
Phase selectors shall be a two channel type. (Opticom 762 or approved equivalent.)

23-1.23 Luminaires

Luminaires shall conform to the provisions in Section 86-6.02, "LED Luminaires;" of the State Standard Specifications and these Specifications.

The luminaires shall be of the "cobra-head" type, 120V light emitting diode (LED) as approved and specified in the City of Los Angeles, Department of Public Works, Bureau of Street Lighting, High Pressure Sodium Equivalent Chart for 150, 200 or 250 watt.

Luminaires shall be internally fused with a 5 amp fuse.

After installation and plumbing of the pole, the luminaire shall be leveled on both the long and transverse axis by use of spirit level.

If the service pedestal is equipped with a lighting contactor and no master photo control is installed, the Contractor shall install one atop the traffic signal mast arm pole adjacent to the service pedestal or atop the nearest streetlight pole. The master photo control shall be wired back to the service pedestal using three #12 AWG stranded copper wires color matched to the PEC. The PEC will be mounted using hardware manufactured for that purpose or fabricated and approved by the Electrical Superintendent.
All streetlights and safety lights fed from a pedestal equipped with a contactor shall be switched by that contactor and their PEC's replaced with shorting caps.

The street light numbers shall be installed on the poles using minimum 2 1/2" high numerals in accordance to City Standard Drawing No. E-25. Numbers shall be adhesive backed Almetek PS-2.5 or approved equivalent. The numbers shall be black on a contrasting background. Pole numbers shall be shown on the as-built plans.

23-1.25 Signal Turn-On Requirements

1. The Traffic Engineer, TSSL Supervisor, and the City Traffic Operations Center Chief shall be notified in writing, seven (7) working days in advance of proposed turn-on.

2. All turn-ons will have a pre-inspection one (1) day prior to turn-on.

3. All wiring shall have passed the test for shorts and continuity. Detector loops shall have been "Meggered" and meet Specifications.

4. All "field" connections shall be made and verified, including the pedestrian push buttons and the vehicular and pedestrian signal heads.

5. All signal heads shall be properly aimed as directed by the City CM Engineer.

6. All signal poles and heads shall have been in place a minimum of seven (7) Days.

7. All auxiliary functions (e.g., safety lights, etc.) shall be operational.

8. The "service" shall be complete, including the utility company meter.

9. All signing and striping (including sign removal) shall be in place before signal can be turned on.

When all of the above are complete and the intersection ready for turn-on, the Contractor shall notify the City CM Engineer. The City CM Engineer will then arrange with the Electrical Superintendent to meet with the Contractor at the Site to perform an initial inspection of the installation. If satisfactory, the signal may be placed in operation. Any items needing additional Work or correction will be listed and that list provided to City Construction Management and the Contractor. City Construction Management will ensure that these items are corrected as needed. The initial turn on shall be made between 9:00 a.m. and 2:00 p.m. unless otherwise specified. Functional tests shall start on any working day except Monday, Friday or the Day preceding a legal holiday. The Contractor is cautioned not to attempt turn-on prematurely. **Time spent by the City's Traffic Signals and Streetlights staff at the Site in excess of two hours due to Work not completed by the Contractor prior to turn-on will be paid by the Contractor. Any inspections in excess of 2 re-inspections after a punch list has been generated will be paid by the Contractor.**

23-1.26 Traffic Control

Traffic control shall be provided in accordance with State of California, "Manual of Traffic Controls," latest Caltrans adopted edition.

A traffic control plan shall be provided in accordance with State of California, "Manual of Traffic Controls," latest Caltrans adopted edition.

Payment shall be included in lump sum bid for signals and lighting.

23-2 TRAFFIC CONTROLLERS, CABINETS AND ANCILLARY DEVICES

23-2.1 General

a) It is the purpose and intent of these Specifications to describe the minimum requirements for traffic signal controllers, cabinets, and other ancillary devices to be used by the City Traffic Engineering and Street Maintenance Divisions.

b) All items not specifically mentioned which are required for a complete 8-phase unit shall be included in the unit.

c) All equipment and accessories to be furnished must be new and in current production. All products shall conform in design, strength, quality of material and workmanship to current industry standards.

d) Each item shall be accompanied by two (2 sets) of the manufacturer's illustrated descriptive literature and specifications. A copy of the manufacturer's standard warranty shall also be attached to the equipment.

All equipment and accessories shall comply with:

- Regulations of the Federal Occupational Safety and Health Administration (OSHA) and/or the California Occupational Safety and Health Administration (Cal/OSHA), whichever is more restrictive.

- Title 49, Code of Federal Regulations, Chapter III, Federal Highway Administration Department of Transportation.

- California Vehicle Code.

- State Standard Specifications, the most recent Traffic Signal Control Equipment Specifications, and all subsequent addenda.

Technical Specifications:

All material and equipment supplied must comply with the State Standard Specifications, except for those exceptions allowed herein, and must be manufactured by companies on CALTRANS' Qualified Products List (QPL). The most recent QPL will be the list used to determine the qualification of the products offered. Any submittal with any products not on the QPL will be rejected. Any changes occurring in subsequent QPL's shall be considered in effect on all subsequent orders.

Model 2070L Controller Assemblies:

New Model 2070L controller assembly or assemblies shall be furnished by the Contractor, as shown on Plans, and shall conform to Section 86-3.01A, "Controller assemblies," of the State Standard Specifications and all addenda thereto, current at the time of project advertising, and these Specifications.

The Contractor shall provide the Model 2070L unit as a complete, operational assembly, with local intersection-control software that is 100% compatible with current City Traffic Operations Center software and can be fully integrated into the City Traffic Operations Center without any additional hardware or software, pre-installed in the controller. The software license registration sticker shall be attached alongside the hardware serial number plate inside the front panel.

The controller shall be the "lite" version Model 2070L (California Transportation Department Rack Mount type) ATC traffic controller per State Standard Specifications, shall conform to the Transportation Electrical Equipment Specifications (TEES) Errata 2. The controller shall be equipped with the following modules:

- 2070-1B CPU with 8MB RAM, 10MB Ethernet Port, Data key
- 2070-2A I/O Module for 332 cabinets
- 2070-3B 8x40 Line Display and dual keyboard panel
- 2070-4B Heavy-Duty 3A Power Supply Module
- 2070-7A Dual Serial Port Card, RS-232
- OS-9 Microware OS9 v3.2 or higher operating system

332L Cabinet:

Shall meet all California Transportation Department and Federal Highway Administration requirements. The Model 332L Cabinets shall be anodized aluminum (0.125" thick).

The 332L cabinet suppliers shall be qualified 332L suppliers.
The cabinet shall include the power supply, two Model 204 flashers, all necessary relays, the Conflict Monitor, a red interface adaptor, a thermostatically controller fan, a door switch operated fluorescent light, a slide out shelf/drawer storage unit and four anchor bolts. All crimp type terminals between the Lower Input Panel and the Input files shall be soldered. For matching purposes, the City will accept the Corbin 3-point locking system lock, which shall be keyed alike to the City Standard Specifications, (No Substitutions).

Model 332L Traffic Signal Controller Cabinet Modifications:

Modify to City Standard Drawing No. E-34A for preemption and E-34B for the C-11 cable connections. Upgrade service panel Traffic Signal circuit breaker to 40A.

Upgrade signal bus circuit breaker to 30A, flasher breaker to 15A and label PDA #2L breakers accordingly. Furnish and install any and all equipment for proper operation of traffic signals and cabinet as described in this Section 23-2 of the City Standard Specifications.

200 Load Switch:

The load switch is a tri-pack, modular, solid state relay designed specifically to meet NEMA specifications, as well as California and New York Model 200 specifications. Each load switch contains 3 individually replaceable modules that are enclosed in a dust resistant metal enclosure. The load switch shall integrate with the Model 332 cabinet output file as well as with any NEMA loadbay. Quantities shall be supplied for an 8-phase operation. 12 shall be required installed at time of delivery.

222 Two Channel Loop Monitor:

The loop inputs incorporate lightening and transient protection devices and the loop oscillator circuitry is transformer isolated. The lightening protection will withstand the discharge of a 10uF capacitor charged to 2,000V across the loop inputs or between any loop input and earth ground. The transformer isolation allows operation with loops which are grounded at a single point. 22 shall be required installed at time of delivery.

242 Two-Channel D.C. Isolator:

Two-channel dual change (DC) Isolator is designed to comply with CALTRANS Model 242 specifications. Each channel of the D.C. Isolator shall present a true signal (ground closure) at the input voltage of less than 8 VDC, for longer than 5 milliseconds. The D.C. Isolator shall integrate with the model 332 cabinet input file. 3 shall be required installed at time of delivery.

204 Flasher Unit:

The flasher unit shall integrate with the model 332 cabinet. It has a dual circuit flasher designed for the traffic control industry, specifically to meet the CALTRANS Model 204 specifications. This unit is rated up to a 15 A per circuit. The flash rate is 56.25 flashes per minute and does not vary due to voltage or temperature variations. Two shall be required installed at time of delivery.

Conflict Monitor 2010ECL Series + features:

The Conflict/Voltage Signal Monitor unit is exempt from QPL qualification and shall be a Model 2010ECL, as manufactured by Solid State Devices or Eberle Designs Inc. The interface for the conflict/voltage signal monitor shall be installed in the cabinet

output file at the factory per the conflict/voltage signal monitor manufacturer's instructions. The unused channel programming of the interface shall be configured for full quad 8-phase operation. Modification of the programming shall be possible without the use of any tools. For conflict monitors ordered as individual units, the interface provided shall be the monitor manufacturer's generic interface complete with all cables and hardware necessary to provide complete operation of the monitor. Conflict Monitor shall be installed at time of delivery.

Testing:

Prior to installation the Contractor must be able to deliver to the City facilities for testing and inspection all equipment. The controllers, cabinets and ancillary devices will be evaluated for performance. The Model 2070L controller must pass the City diagnostic test. The City diagnostic is essentially identical to the CALTRANS Diagnostic and Acceptance Test Program, version 2.4, dated 1/04/95. The purpose of the testing is to ensure that the equipment will work in the field, and as stated above meet all requirements.

The City reserves the right during the testing process to contact the Contractor for additional information. Any equipment found to be defective will be rejected and shall be replaced by the Contractor within 30 Days of the date of notification by the City and at no cost to the City. Testing of replacement equipment will be at the Contractor's expense. Any equipment not approved by the City because of testing failure shall be picked up by the Contractor at the Contractor's expense. The Contractor shall have 48 hours to remove equipment failures after notification by the Electrical Superintendent. The City will not accept or have installed any rejected equipment.

Approved Manufacturer Equipment and Brands

Controllers:

Naztec 2070L

Cabinets and Ancillary Devices:

Precision Design Company (PDC)
Eberle Design Inc. (EDI)
Solid State Devices
McCain Traffic Supply
Traffic Safety Supply
Safetran Traffic Systems, Inc.
Global Traffic Technologies (GTT)
Polara Engineering
Reno A&E

Detector Loop Test Results

Location: _____ Int. # _____

Tested By: _____ Date: _____

✓	Movement	Ø	Det. Slot	TB #	Term #	Loop Ω	Insulation Meg Ω
	NBLT-1-CT	1	I1U	2	1-2		
	NBLT-2-CT	1	I1L	2	3-4		
	SB Far	2	I2U	2	5-6		
	SB Near	2	I2L	2	7-8		
	SB-3-CT	2	I3U	2	9-10		
	SBRT	2	I3L	2	11-12		
	SB-1-CT	2	I4U	4	1-2		
	SB-2-CT	2	I4L	4	3-4		
	EBLT-1-CT	3	I5U	4	5-6		
	EBLT-2-CT	3	I5L	4	7-8		
	WB Far	4	I6U	4	9-10		
	WB Near	4	I6L	4	11-12		
	WB-3-CT	4	I7U	6	1-2		
	WBRT	4	I7L	6	3-4		
	WB-1-CT	4	I8U	6	5-6		
	WB-2-CT	4	I8L	6	7-8		
	NBLT	1	I9U	6	9-10		
	EBLT	3	I9L	6	11-12		
	-Far-2		I10U	10	5-6		
	-Far-3		I10L	10	7-8		
	SB Bike	2	I11U	10	1-2		
	WB Bike	4	I11L	8	2-3		

✓	Movement	Ø	Det. Slot	TB #	Term #	Loop Ω	Insulation Meg Ω
	SBLT-1-CT	5	J1U	3	1-2		
	SBLT-2-CT	5	J1L	3	3-4		
	NB Far	6	J2U	3	5-6		
	NB Near	6	J2L	3	7-8		
	NB-3-CT	6	J3U	3	9-10		
	NBRT	6	J3L	3	11-12		
	NB-1-CT	6	J4U	5	1-2		
	NB-2-CT	6	J4L	5	3-4		
	WBLT-1-CT	7	J5U	5	5-6		
	WBLT-2-CT	7	J5L	5	7-8		
	EB Far	8	J6U	5	9-10		
	EB Near	8	J6L	5	11-12		
	EB-3-CT	8	J7U	7	1-2		
	EBRT	8	J7L	7	3-4		
	EB-1-CT	8	J8U	7	5-6		
	EB-2-CT	8	J8L	7	7-8		
	SBLT	5	J9U	7	9-10		
	WBLT	7	J9L	7	11-12		
	-Far-2		J10U	10	9-10		
	-Far-3		J10L	10	11-12		
	NB Bike	6	J11U	10	3-4		
	EB Bike	8	J11L	9	2-3		

✓ = Check active locations

Loop Ω = Ohmmeter reading across loop, in Ohms. (Max. 0.5Ω per loop + 0.65Ω per 100' #14 DLC or 1.05Ω per 100' #16 DLC)

Insulation Meg Ω = Megohm Meter reading, loop to ground @ 500 volts, in Megohms. (Min. 100 Meg Ω)

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Detector Loop Test Results

Location: _____ Int. # _____

Tested By: _____ Date: _____

✓	Movement	Ø	Det. Slot	TB #	Term #	Loop Ω	Insulation Meg Ω
		1	I1U	2	1-2		
		1	I1L	2	3-4		
		2	I2U	2	5-6		
		2	I2L	2	7-8		
		2	I3U	2	9-10		
		2	I3L	2	11-12		
		2	I4U	4	1-2		
		2	I4L	4	3-4		
		3	I5U	4	5-6		
		3	I5L	4	7-8		
		4	I6U	4	9-10		
		4	I6L	4	11-12		
		4	I7U	6	1-2		
		4	I7L	6	3-4		
		4	I8U	6	5-6		
		4	I8L	6	7-8		
		1	I9U	6	9-10		
		3	I9L	6	11-12		
			I10U	10	5-6		
			I10L	10	7-8		
		2	I11U	10	1-2		
		4	I11L	8	2-3		

✓	Movement	Ø	Det. Slot	TB #	Term #	Loop Ω	Insulation Meg Ω
		5	J1U	3	1-2		
		5	J1L	3	3-4		
		6	J2U	3	5-6		
		6	J2L	3	7-8		
		6	J3U	3	9-10		
		6	J3L	3	11-12		
		6	J4U	5	1-2		
		6	J4L	5	3-4		
		7	J5U	5	5-6		
		7	J5L	5	7-8		
		8	J6U	5	9-10		
		8	J6L	5	11-12		
		8	J7U	7	1-2		
		8	J7L	7	3-4		
		8	J8U	7	5-6		
		8	J8L	7	7-8		
		5	J9U	7	9-10		
		7	J9L	7	11-12		
			J10U	10	9-10		
			J10L	10	11-12		
		6	J11U	10	3-4		
		8	J11L	9	2-3		

✓ = Check active locations

Loop Ω = Ohmmeter reading across loop, in Ohms. (Max. 0.5Ω per loop + 0.65Ω per 100' #14 DLC or 1.05Ω per 100' #16 DLC)

Insulation Meg Ω = Megohm Meter reading, loop to ground @ 500 volts, in Megohms. (Min. 100 Meg Ω)

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23-3 CITY SPECIFICATIONS FOR STREET LIGHTING

23-3.5 Maintaining Existing and Temporary Electrical Systems

Existing lighting systems shall remain operational during construction, unless otherwise authorized in writing by the City Engineer.
The Contractor shall notify the City CM Engineer at least one full working day (not less than 24 hours) prior to the shutdown of any street lighting system. The Contractor may use temporary splices and wiring as approved by the City CM Engineer to maintain existing and temporary street lighting systems.

23-3.7 Foundations

Foundations shall conform to the provision in Section 86-2.03, "Foundations," of the State Standard Specifications and these Specifications.

Portland cement concrete shall conform to Section 90-2, "Minor Concrete," of the State Standard Specifications and shall contain not less than 470 pounds of cement per cubic yard.

Foundation concrete shall be placed in a single pour except that pouring of the top six (6) inches may be postponed when prior approval has been obtained. All dirt and debris shall be cleaned from the top of the foundation prior to pouring the top 6".

No utilities shall be permitted to run through a foundation.

Foundations shall be poured against undisturbed earth where practicable. The exposed portion shall be formed and finished to present a neat appearance. Where obstructions or other conditions prevent construction of planned foundations, the Contractor shall construct an effective foundation satisfactory to the City CM Engineer.

The bottom of concrete foundations shall rest on firm ground. When placing the foundations, the Contractor shall place all conduit ends in their proper position, at the correct heights and shall securely hold them in position during the pouring of concrete. The conduit ends shall be capped before any concrete is poured.

Both forms and earth to be in contact with foundations shall be thoroughly moistened before placing concrete.

Anchor bolts shall be galvanized and shall extend above the finished base as needed to ensure a minimum extension above the top nut of 3 threads. The maximum extension above the top nut is 1 inch. The distance below the base plate allowed for leveling shall not be less than 1.5 times nor more than 2 times the thickness of the leveling nut. Each bolt shall be supplied with 2 nuts and 2 flat washers to facilitate

leveling. The anchor bolts and conduits shall be held in place by means of a template until the concrete sets.

Poles shall not be erected until the foundation concrete has set at least seven days and shall be plumbed as directed by the City CM Engineer. The top of concrete foundations shall be finished relative to curb or sidewalk grade as shown on the Plans or as directed by the City CM Engineer.

When grouting the base of the pole, the Contractor shall take care not to allow grout to enter or foul the conduit within the foundation.

Locations shown on the Plans are schematic.

23-3.8 Poles

Poles shall conform to the provisions in Section 86-2.04, "Standards, Poles, Steel Pedestals, and Posts," of the State Standard Specifications and these Specifications.

All hand hole covers must be of steel construction to allow welding after installation.

Embedded Steel poles shall conform to PG&E specifications for pole type 35-7274.

If relocation of Utilities is required, immediate notification shall be given to the appropriate Utility company by the Contractor.

The Contractor may install all underground electrical components, including foundations at the Site of the project; however, no streetlight poles shall be erected until underground conduit is in place.

Street light numbers shall be installed on the poles using minimum 2 ½" high numerals in accordance to City Standard Drawing No. E-25. Numbers shall be adhesive backed Almetek PS-2.5 or approved equivalent. The numbers shall be black on a contrasting background. Pole numbers shall be shown on the as-built plans.

All nuts, washers, screws and other post hardware shall be galvanized.

23-3.9 Conduit

Conduit shall conform to the provisions in Section 86-2.05, "Conduit," of the State Standard Specifications and these Specifications.

Nonmetallic-type conduit may be used on minor/local and major Streets as shown on the Plans. All Street crossings using nonmetallic conduit shall be Schedule 80 conduit.

Rigid Conduit shall conform to Article 346 of the National Electrical Code. All conduit and fittings shall be hot dip galvanized. Each length shall bear the UL label. Installation shall conform to appropriate Articles of such Code. All conduit ends shall be threaded and joined with approved fittings. The use of threadless or set-screw type fittings is not allowed.

All couplings shall be tightened to provide a good electrical and mechanical connection throughout the entire length of the conduit run.

Conduit threads cut in the field and damaged conduit surfaces on metal conduit shall be thoroughly painted with zinc rich paint conforming to Military Specifications DOD-P-21023A.

All conduit ends shall be threaded and capped with standard conduit caps until wiring is started. When the caps are removed the threaded ends shall be provided with approved insulated hot dipped galvanized malleable iron bushings with cast integral lay-in lugs.

The size of conduit used shall be as shown on the Plans.

It shall be the privilege of the Contractor, at his/her own expense, to use larger size conduit if desired, and where large size conduit is used, it shall be for the entire length of the run from outlet to outlet. No reducing couplings will be permitted.

All conduit shall be laid to a depth of not less than twenty-four inches nor greater than thirty-six inches below the curb grade in the sidewalk areas and from the finished surface in Street areas. Conduits in sidewalk areas and parallel to the curb shall not be installed more than twenty-four inches back of curb unless approved by the City CM Engineer.

Conduit shall be placed under existing pavement by approved jacking or boring methods. The pavement shall not be disturbed without the written permission of the City CM Engineer and then only in the event insurmountable obstructions are encountered. Excessive use of water, such that pavement might be undermined, or subgrade softened, will not be permitted.

Conduit ends terminating in pole foundations shall extend 2" vertically above the top of the foundation. Conduit in direct buried poles shall extend to within 2" of the bottom of the hand hole and may not extend above the lowest part of the hand hole opening.

Attention is called to City Standard Drawing No. E-1 with regard to the requirements of conduit within the foundation.

Conduit in pull boxes shall not extend more than two inches inside the box wall. With the exception of pull boxes in non-concrete areas, all conduit entering the pull box from the bottom shall be approved by the City CM Engineer. No conduit or Utility shall pass through a streetlight foundation or pull box except the conduit which terminates within the foundation or pull box.

After the installation of all conductors the ends of conduits terminating in pull boxes and service pedestals shall be sealed with an approved duct seal material.

Where shown on the Plans, conduit will be extended to the limits of the project for future use. The end of such conduits shall be threaded and capped.

In as much as possible, conduit shall be run in a straight line from one pull box or pole to the next maintaining a consistent setback from the curb. Any variation from this requirement shall be approved by the City CM Engineer or Electrical Superintendent.

23-3.10 Pull Boxes

Concrete pull boxes shall conform to the provisions in Section 86-2.06, "Pull Boxes," of the State Standard Specifications and these Specifications.

All pull boxes shall be #3-1/2 unless otherwise noted on the Plans.

All pull boxes shall be installed with extensions. The pull box lid at PG&E's point of connection shall be marked 'PG&E'. All others shall be marked "Street Lights." Vandal resistant locking lids shall be installed by the contractor at final inspection for the point of service pull box. Contractor shall provide temporary lids during construction. Locking lids shall be galvanized steel diamond plate, minimum thickness 3/16 inches, with minimum two (2) clamping jaws and be keyed to the City of Fresno key.

Attention is directed to Section 86-2.06C, "Installation and Use," of the State Standard Specifications where pull boxes, on long runs, shall be installed and spaced at not over 200-foot intervals.

All pull boxes shall be wrapped with building paper prior to backfilling.

Pull boxes installed in non-concrete areas shall be surrounded by a one (1) foot wide concrete collar, and to a depth equal to the pull box and extension. All conduits shall enter these pull boxes through the bottom, using 90 degree elbows and extend 3-5 inches above the finished grout in the pull box. The collar shall be sloped to drain away from the pull box.

Should grout within existing pull-boxes be disturbed by the Contractor, it shall be restored.

23-3.12 Fused Splice Connectors

Each streetlight shall be internally fused with an OEM fuse holder and a 5 amp fuse or with a 5 amp KTK type fuse installed in a TRON HEB type fuse holder. The fuse and holder shall be located in the luminaire. Sufficient slack shall be provided to allow easy changing of the fuse as needed. The fuse holder shall be crimped to the wire and the crimp joints insulated as described above for tap type splices.

At service points other than pedestals, a fuse holder and fuse shall be installed in each current carrying conductor. The fuse holder shall be a TRON HEJ type with an SC fuse; 40 amp for #8 awg wire, 60 amp for #4 or #6 awg wire. The holder shall be crimped to the wire using the proper tooling and insulated as described above for tape type splices.

23-3.16 Luminaire

The luminaire shall conform to the provisions in Section 86-6.02, "LED Luminaires," of the State Standard Specifications and these Specifications.

The luminaires shall be of the 'cobra-head' type, 120V light emitting diode (LED) as approved and specified in the City of Los Angeles, Department of Public Works, Bureau of Street Lighting, High Pressure Sodium Equivalent Chart for 150 watt or 70 watt.

Luminaires shall be internally fused with a 5 amp fuse.

Street light numbers shall be installed on the poles using minimum 2 ½" high numerals in accordance to City Standard Drawing No. E-25. Numbers shall be adhesive backed Almetek PS-2.5 or approved equivalent. The numbers shall be black on a contrasting background. Pole numbers shall be shown on the as-built plans.

23-3.17 Photoelectric Control

Photoelectric controls (PEC) shall conform to the provisions in Section 86-6.11, "Photoelectric Controls," of the State Standard Specifications and these Specifications.

The PEC shall be a quick acting, twist lock, long life, Type IV.
If the service pedestal is equipped with a lighting contactor and no master photo control is installed, the Contractor shall install one atop the traffic signal mast arm pole adjacent to the service pedestal or atop the nearest streetlight pole. The master photo control shall be wired back to the service pedestal using three #12 AWG stranded

copper wires color matched to the PEC. The PEC will be mounted using hardware manufactured for that purpose or fabricated and approved by the Electrical Superintendent.

All streetlights and safety lights fed from a pedestal equipped with a contactor shall be switched, by that contactor and their PEC's replaced with shorting caps.

SECTION 23.4 – ORNAMENTAL STREET LIGHTING (Section 30 incorporated into Section 23)

23-4.1 INTENT

It is the intent of these Specifications to describe the minimum acceptable parameters for ornamental streetlight installation in the City.

23-4.2 GENERAL

Each project may select a pole, color, luminaire and ornamentation as provided by this standard. To provide adequate individualization the following variety is provided as an example of style only:

Poles	3 designs (different lengths)
Colors	2 (black, grey)
Configurations	2 (single/double-may be mixed)
Cross Arms	2 designs
Luminaries:	
Capitals	2 designs
Globes	2 designs/2 sizes
Wattage	3 (50, 70 & 150)
Ornamentation	Final and/or Band

To minimize future costs to the City in view of the wide range of design options, each installer must provide to the City spares of all components in quantities dependent upon the number of poles installed in the project.

Poles Installed	Spares
12 or less	2
13-30	3
31 or more	4

23-4.3 SPECIFICATIONS

Furnishing and installing streetlights shall conform to the provisions of Section 86, "Electrical Systems," of the State Standard Specifications and the State Standard Drawings, most recent version; City Standard Drawing Nos. E-1 thru E-27, as applicable; these Specifications and the streetlight Plan(s).

23-4.4 STREETLIGHT PLAN

The designer shall submit to the City Engineering Division for review a detailed plan of the proposed installation. This plan shall include proposed locations of the streetlights, existing streetlights in or adjacent to the project, location of electrical service, photo electric control, pull boxes and routing of conduit.

After any required changes are made, the plan(s) will be approved and signed. No installation Work shall be undertaken until the plans are signed.

Work or equipment not specified or shown on the Plan(s) which is necessary for the proper operation of the installation shall be provided and installed at no additional cost to the City.

The locations of foundations, poles, services, pull boxes and other appurtenances shown on the Plan(s) are approximate. Exact locations and grades will be established if necessary by either the Project inspector or the TSSL Supervisor or his/her authorized representative.

When the project is complete and all lights are working, a final inspection has been made and all punch list items are corrected, the Contractor shall provide an "as-built" drawing to the City.

23-4.5 MATERIALS

All materials required to complete the Work under this contract shall be furnished by the Contractor.

The materials furnished and used shall be new, except such used materials as may be specifically provided for on the Plans.
All Work and materials shall be in full accordance with the latest rules and regulations of the National Board of Fire Underwriters, local and State laws and regulations, the State Industrial Accident Commission's Safety Orders, and the regulations of the Pacific Gas and Electric Company pertaining to service equipment and installations thereof. All Work shall comply with Section 11-104 of the City of Fresno Municipal Code, the National Electrical Manufacturer's Association Standards and all regulations and codes as stated in Section 86-1.02, "Regulations and Codes," of the State Standard Specifications. Nothing in these Plans and Specifications shall be construed to permit work not complying with these codes.

23-4.6 EQUIPMENT LIST

All equipment and materials that the Contractor proposes to install shall conform to these Specifications and the Plans. A list of substitute equipment and/or materials, along with a written descriptive summary, describing the functions of the components which the Contractor proposes to install shall be submitted along with his/her streetlight plan. The list shall be complete as to the name of the manufacturer, size and identifying number of each item. The list shall be supplemented by such other data as may be required. In all cases, the judgment of the TSSL Supervisor shall be final as to whether substitute equipment and/or material recommended by the Contractor conforms to the intent of these Specifications and is acceptable for use.
The wattage and spacing of the streetlights shall be such that the appropriate average maintained illuminance is provided per ANSI/IES RP-8, Table 2(b).

23-4.7 WARRANTIES, GUARANTEES AND INSTRUCTION SHEETS

All equipment furnished shall be guaranteed to the City by the manufacturers for a period of not less than one (1) year, unless otherwise indicated, following the date of acceptance of such equipment. If any part(s) is found to be defective in materials or workmanship within the one-year period, and it is determined by the TSSL Supervisor or by an authorized manufacturer's representative that said part(s) cannot be repaired on the Site, the manufacturer shall provide a replacement part(s) of equal kind and/or type during the repair period and shall be responsible for the removal, handling, repair or replacement and reinstallation of the part(s) until such time as the street lighting equipment is functioning as specified and as intended herein; the repair period shall in no event exceed 72 hours, including acquisition of parts.

The one-year guarantee on the repaired or replaced parts shall again commence with the date of reassembly of the system.

All Work done by the Contractor shall be guaranteed in writing to the Engineer for the one-year period from the date of acceptance.

Copies of all operating instructions, parts lists, assembly diagrams, etc., shall be provided to the City with the "As-Built" plan(s).

23-4.8 FOUNDATIONS

The size of the foundations will be dependent on the pole length. Poles over 12 feet shall have a foundation 48" deep. Poles 12 feet or less in length shall use a 36" deep foundation. The foundations shall be 24" in diameter. The top 8" to 12" shall be formed round or square as appropriate to the individual installation.

The foundation shall be set back 30 inches on center from the face of the curb.

Foundation concrete shall contain not less than 470 pounds of cement per cubic yard. It shall be placed in a single pour against undisturbed earth where practicable. The top portion shall be formed and finished to present a neat appearance. The top of the finished foundation shall be level. The use of leveling nuts to plumb a pole will not be permitted.

No Utilities shall be permitted to run through a foundation.

Where obstructions or other conditions prevent construction of planned foundations, the Contractor shall construct an effective foundation satisfactory to the Engineer.

The bottom of concrete foundations shall rest on firm ground. When placing the foundations, the Contractor shall place all conduit ends in their proper position and at the correct heights and shall securely hold them in position during the pouring of concrete. The conduits ends shall be capped before any concrete is poured.

Both forms and earth to be in contact with foundations shall be thoroughly moistened before placing concrete.

Anchor bolts shall be galvanized and shall extend above the finished base as needed to ensure the proper installation of anchoring hardware. The anchor bolts and conduits shall be held in place by means of a template until the concrete sets.

Poles shall not be installed until the foundation concrete has set at least five Days.

23-4.9 POLES

In order to reduce the possibility of wire theft, all poles must be of steel construction and approved by TSSL. All hardware shall be tamper resistant stainless steel. The color of the poles shall be black or gray. The poles shall be engineered to withstand 100 mph wind forces per the AASHTO standards including a 30% gust factor.

If relocation of Utilities is required, immediate notification shall be given to the appropriate Utility company by the Contractor.
The Contractor may install all underground electrical components, including foundations at the site of the project; however, no streetlight poles shall be installed until underground conduit is in place.

The anchor bolts and associated hardware shall be hot dipped galvanized. The anchor bolts shall be 3/4" x 18", "L" type.

The top of the pole shall be provided with a 3 inch outside diameter tenon to facilitate mounting of the luminaire assembly or cross arm.

The two way cross arm assembly, if and where used, shall be galvanized steel or cast aluminum. The finish shall be a premium polyurethane coating and shall match the color of the pole.

23-4.17 LUMINAIRE

The luminaries shall be High Pressure Sodium of the "acorn" type equipped with a UV inhibited polycarbonated globe. An internal glass/borosilicate refractor providing for IES Type III MCO distribution is required.

The luminaire ballast shall be designed for 120 volt operation at 50, 70 or 150 watts as shown on the Plans and shall have a high power factor. The starting aid shall be of the 3-wire type.

The capital portion of the luminaire assembly shall be cast aluminum. The finish shall be a premium polyurethane coating and shall match the color of the pole.

23-4.18 PHOTOELECTRIC CONTROL

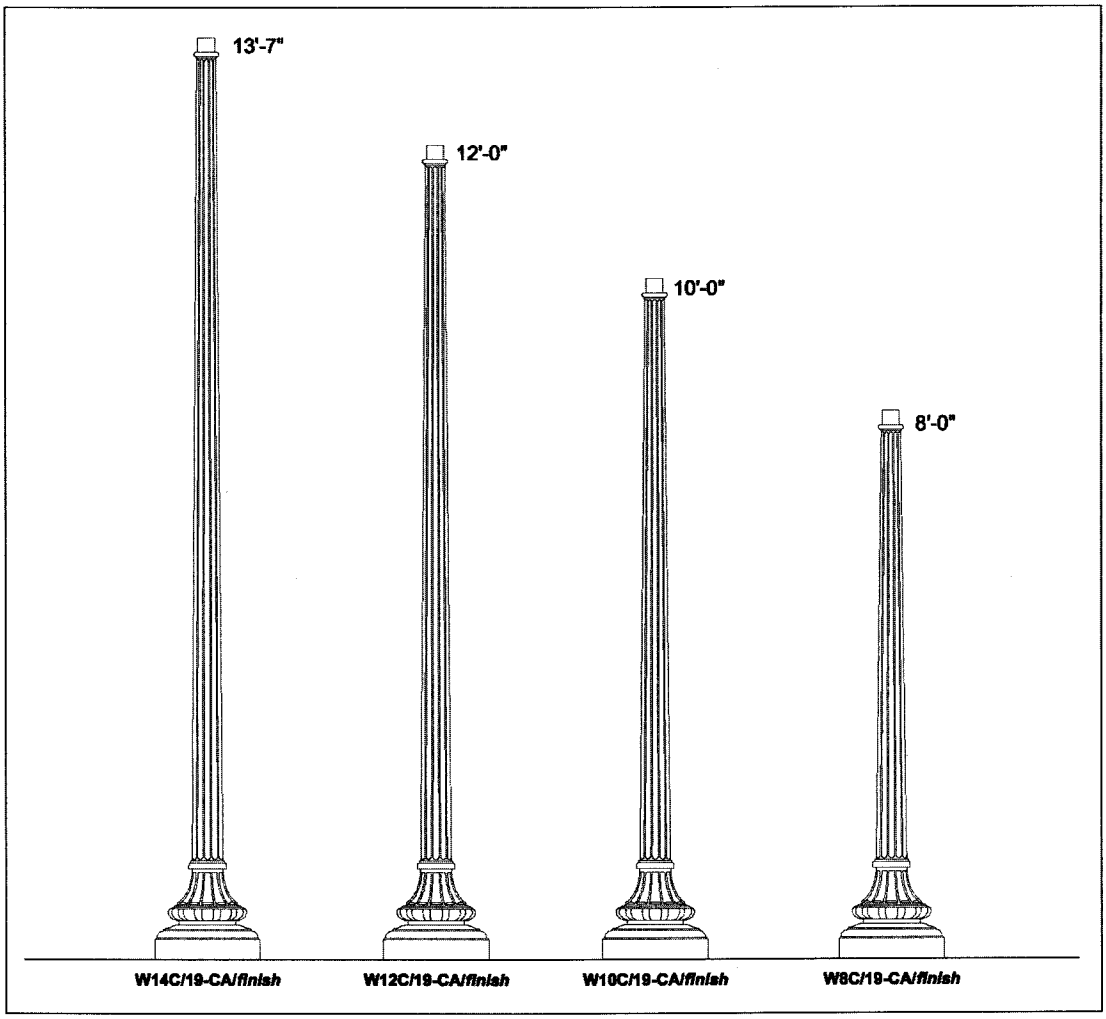
The Photoelectric Control (PEC) shall be a twist lock, long life type installed in the capital portion of the pole. If controlled from a service pedestal, the PEC shall be installed at the pole nearest the service pedestal. The PEC shall be rated at 1000 watts minimum. It shall be wired back to the service pedestal with 3 #12 AWG stranded copper conductors color coded to match the PEC.

If controlled from a Combination Traffic Signal/Streetlight service pedestal, no additional PEC is required. The associated safety light PEC will control the lighting contactor.

23-4.19 ORNAMENTATION

Luminaire globes may be modified using a finial, decorative band or both. The finial is available on either globe option. The band is available only on the 8" neck model.

Cast Aluminum Posts tapered fluted shafts	**WADSWORTH Series** 19" dia. base



SPECIFICATIONS

DESCRIPTION The post shall be all cast aluminum construction with a classic double-tapered, fluted base and a gracefully tapered 12-flute cast shaft. The post shall be Holophanes' catalog number *WXXC/19-CA/finish*.

MATERIALS The post shall be heavy wall, cast aluminum produced from certified ASTM 356.1 ingot per ASTM B179-95a or ASTM B26-95. The castings shall be formed true to the pattern with complete detail. All hardware shall be tamper resistant stainless steel. Anchor bolts to be completely hot dip galvanized.

CONSTRUCTION The cast shaft shall be circumferentially welded to the base casting and shipped as one piece for maximum structural integrity. All exposed welds below 8' shall be ground smooth. All welding shall be per ANSI/AWS D1.2-90. All welders shall be certified per Section 5 of ANSI/AWS D1.2-90.

DIMENSIONS The post shall be X'- XX" in height with a 19" diameter base. The shaft diameter shall taper from 3.5" at the top to 5.5" above the base. An integral 3" O.D. tenon shall be provided at the top for luminaire mounting. The post top shall include a transitional donut between the fluted shaft and the tenon.

INSTALLATION The post shall be provided with four, hot dip galvanized L-type anchor bolts to be installed on a slotted 15" diameter bolt circle. A door shall be provided in the base for anchorage and wiring access. A grounding screw shall be provided inside the base opposite the door.

For finish specifications and color options, see " Finish" section in catalog.

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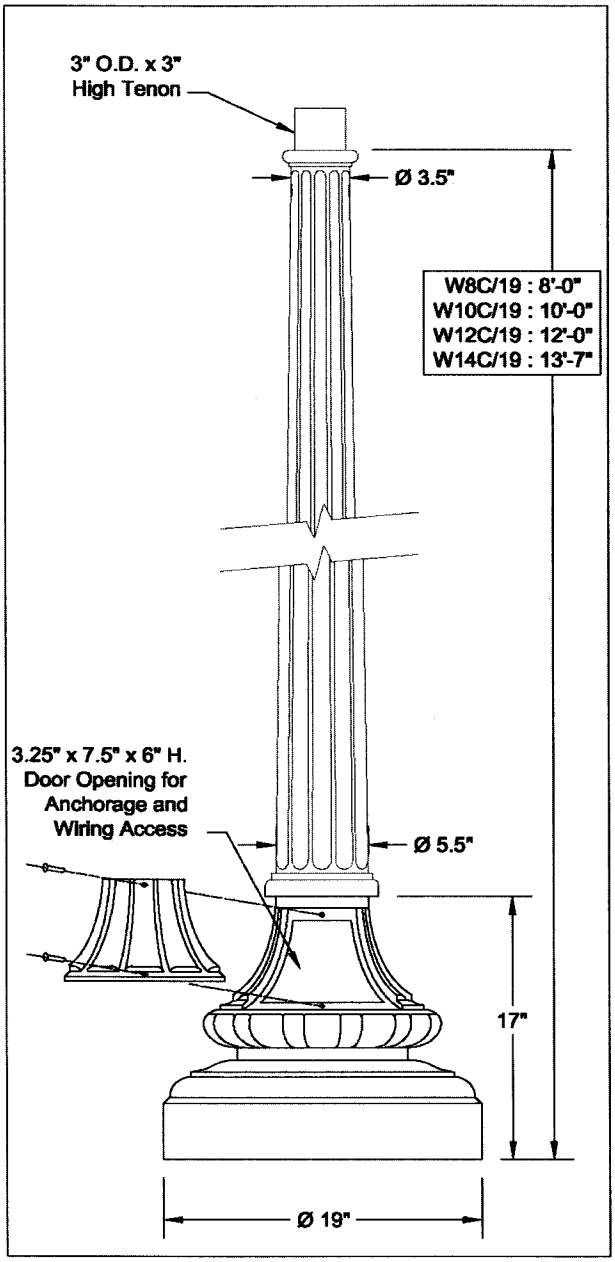
LEADER IN LIGHTING SOLUTIONS 214 OAKWOOD AVENUE - NEWARK, OHIO 43055

Shown as a style example only, all poles must be of steel construction with steel hand hole covers.

WADSWORTH Series
Cast Aluminum Posts



Ordering Guide

sample catalog number

W12C/19 - CA/BK -

Post -	material/finish -	options
WADSWORTH 12' 12' height cast shaft 19" dia. base	Cast Aluminum Black	

Post (check appropriate boxes, add height in blank)

Catalog #	*Heights*
☐ W8C/19	8'-0"
☐ W10C/19	10'-0"
☐ W12C/19	12'-0"
☐ W14C/19	13'-7"

Material/Finish

Catalog Suffix	Description
☐ -CA/BK	Cast Aluminum/Black (std.)
☐ -CA/DG	Cast Aluminum/Dark Green
☐ -CA/DB	Cast Aluminum/Dark Bronze
☐ -CA/PP	Cast Aluminum/Prime Painted
☐ -CA/CC	Cast Aluminum/Custom Color

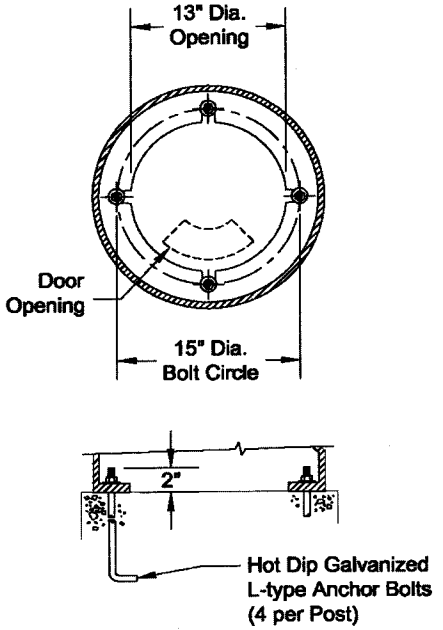
(for complete finish and color options, see " Finish" section in catalog)

Optional Equipment

Catalog Suffix	Description
☐ -_____	Receptacles (see Accessories section)
☐ -_____	Banner Arms (see Accessories section)
☐ -_____	Flag Pole Holders (see Accessories section)
☐ -_____	Custom Logos (see Accessories section)
☐ -_____	Signage (see Signage section)

(for optional equipment not found in catalog, consult factory)

ANCHORAGE GUIDE



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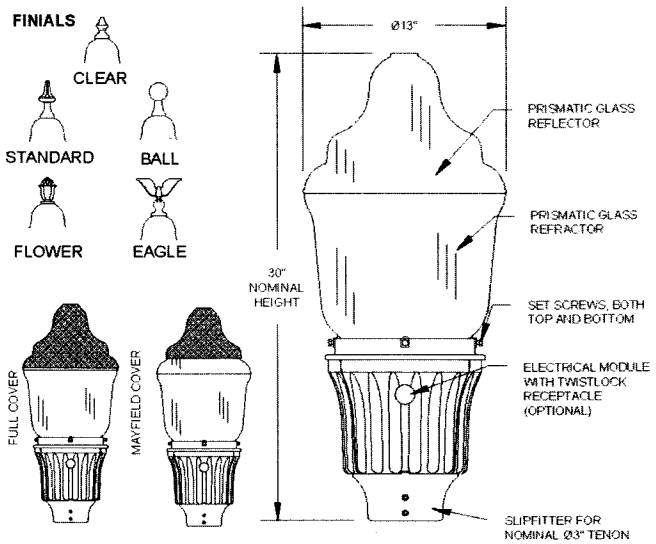
Shown as a style example only, all poles must be of steel construction with steel hand hole covers.

UTILITY GRANVILLE® SERIES LUMINAIRE

MAXIMUM WEIGHT - 48 lbs.

MAXIMUM EFFECTIVE PROJECTED AREA - 1.38 sq. ft.



ORDERING INFORMATION

EXAMPLE: *GVU 050HP 12 B 3 N N U*

GVU

N

BALLAST TYPE (MOGUL BASE)	VOLTAGE	HOUSING COLOR	OPTICS	NO DECORATIVE OPTIONS
050HP = 50W HPS	20 = 208 VOLT	B = BLACK	3 = IES TYPE III DISTRIBUTION	N = NONE
070HP = 70W HPS	24 = 240 VOLT	Z = BRONZE	4 = IES TYPE IV DISTRIBUTION	
100HP = 100W HPS	27 = 277 VOLT	N = GREEN	5 = IES TYPE V DISTRIBUTION	
15AHP = 150W 55V HPS	34 = 347 VOLT	A = AS SPEC		
175MH = 175W MH	48 = 480 VOLT			
100MV = 100W MV	MT = MULTITAP (120, 208 240, 277 VOLT)			
175MV = 175W MV				
250MV = 250W MV				

BALLAST TYPE (MEDIUM BASE)
50DHP = 50W HPS
70DHP = 70W HPS
10DHP = 100W HPS
15DHP = 150W 55V HPS
70DMH = 70W MH (NOT AVAIL W/ 480V)
10DMH = 100W MH (NOT AVAIL W/ 480V)
15DMH = 150W MH (NOT AVAIL W/ 480V)
17DMH = 175W MH

FINIAL
N = NONE
C = 3"CLEAR
S = 5" STANDARD
F = FLOWER
B = BALL
E = EAGLE
P = PAWN

TRIM FINISH
U = NO TRIM USED
B = BLACK
Z = BRONZE
G = GOLD
N = GREEN
U = NO TRIM, AND CLEAR OR NO FINIAL
A = AS SPEC

OPTIONS
P = PROTECTED STARTER FOR HPS UNITS ONLY
H = PHOTOCONTROL RECEPTACLE
T = BOTH NEMA TWISTLOCK RECEPTACLE AND PROTECTED STARTER TOGETHER (HPS UNITS ONLY)
FCOVX - FULL DECORATIVE ALUMINUM TOP COVER (FOR X INSERT B, Z, N, G, OR A COLOR)
MCOVX - MAYFIELD ALUMINUM TOP COVER (COVERS 2/3) (FOR X INSERT B, Z, N, G, OR A COLOR)

ACCESSORIES
LAMP = SHIP APPROPRIATE LAMP AS A LINE ITEM. SEE LAMP SHEET
GV1ASDXX = INTERNAL SHIELD. XX = 90, 120, OR 180 DEGREES OF HOUSE SIDE CUT-OFF
GVBANDX = AN OPTIONAL DECORATIVE BAND KIT ADDED TO GLASS ASSEMBLY. FIELD INSTALLED (FOR X INSERT B, Z, N, OR A)

Specifications

GENERAL DESCRIPTION

The Utility GranVille is designed for ease of maintenance with the plug-in electrical module common to each of the luminaires in Holophane's Utility Luminaire Series. The traditional acorn shaped luminaire, while reminiscent of the 1920's, contains a precision optical system that maximizes post spacings while maintaining uniform illumination.

OPTICAL SYSTEM

The optical system consists of a precisely molded thermal resistant borosilicate glass refractor and top reflector. The glass top reflector redirects over 50 % of the upward light into the controlling refractor while allowing a soft uplight component to define the traditional acorn shape of the luminaire. Two decorative aluminum covers are available. The lower refractor uses precisely molded prisms to maximize pole spacings while maintaining uniform illuminance. Three refractors are available, designed for I.E.S. type III, IV, and V distributions.

LUMINAIRE HOUSING

The luminaire housing, cast of aluminum, provides an enclosure for the plug-in electrical module. Four uniquely designed stainless steel spring clips enclosed in a clear polyvinyl chloride sleeve and adjusted by hex head stainless steel 1/4-20 bolts securely cradle the prismatic glass refractor. The nickel plated lamp grip socket and three station incoming line terminal block are prewired to a five conductor receptacle for ease in connection the electrical module. The slipfitter will accept a 3" by 2-7/8" to 3-1/8" O.D. tenon.

LUMINAIRE HOUSING / DOOR

Cast of aluminum, the housing / door is removable without the use of tools and is retained by a stainless steel aircraft cable. For units with an E.E.I.-N.E.M.A. twist lock photocell receptacle, the door contains an acrylic "window" to allow light to reach the cell.

ELECTRICAL MODULE

The ballast components are mounted on a steel plate that is removable without the use of tools. A matching five conductor plug connects to the receptacle in the luminaire housing to complete the wiring. Where a starting aid is required, it is provided with a separate plug-in connector and can be replaced without the use of tools. For photoelectric operation, the electrical module is provided with an E.E.I.-N.E.M.A. twist lock photocell receptacle.

BALLASTS

(Refer to Ballast Data Sheet for specific operation characteristics)

50 watt 120 volt High Pressure Sodium (HPS) ballasts are High Power Factor Reactor type. All other HPS ballast are High Power Factor Autotransformer type.

175 watt Metal Halide (MH) ballasts are Peak Lead Autotransformer type. 70 and 100 watt MH units are available only with High Power Factor High Reactance type ballast.

All Mercury Vapor (MV) ballasts are High Power Factor Constant Wattage Autotransformer (CWA) type.

FINISH

The luminaire is finished with polyester powder paint applied after a seven stage pretreatment precess to insure maximum durability.

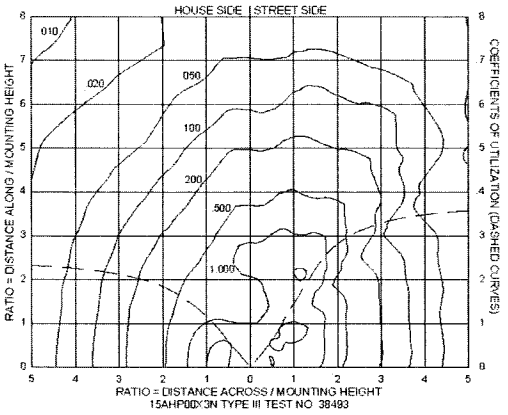
ARCHITECTURAL OUTDOOR ORDER #:

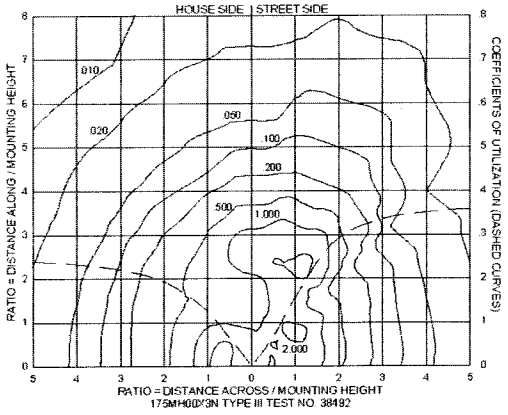
TYPE:

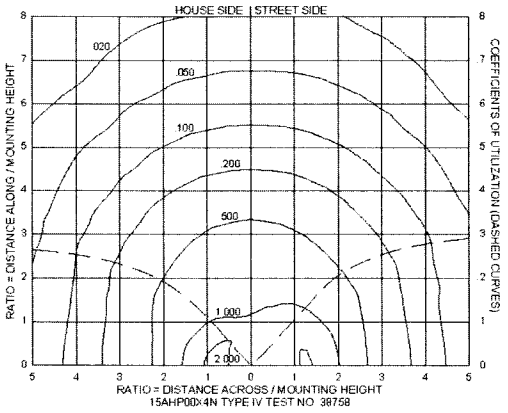
DRAWING NO: US-2590

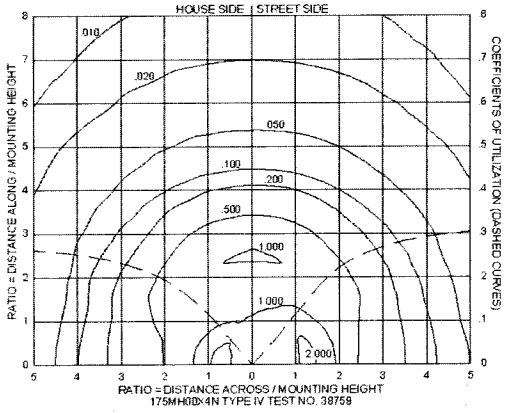
HOLOPHANE
LEADER IN LIGHTING SOLUTIONS
An AcuityBrandsCompany
214 OAKWOOD AVENUE - NEWARK, OHIO 43055

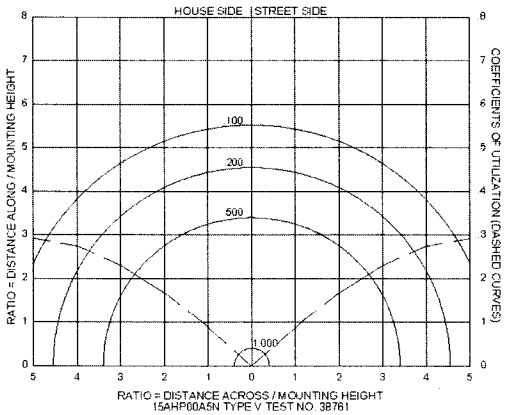
SCALE: N/A
DRAWN: RAF
APP'D:
DATE: 08-06-02

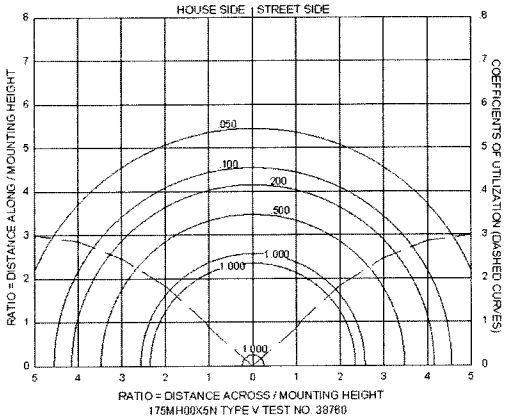












HOLOPHANE
LEADER IN LIGHTING SOLUTIONS
An AcuityBrandsCompany
214 OAKWOOD AVENUE - NEWARK, OHIO 43055

TYPICAL PHOTOMETRIC DATA
(ISOFOOTCANDLE CHARTS AND
COEFFICIENT OF UTILIZATION
CURVES)

Isofootcandle data is based on a 15 foot mounting height. To determine values for mounting heights other than 15 feet, multiply the values for mounting heights following factors:

10' - 2.25	12' - 1.56	14' - 1.15
16' - 0.88	18' - 0.69	20' - 0.56
22' - 0.46	24' - 0.39	

US-2590

Holophane Granville® Luminaire

GENERAL DESCRIPTION
The Utility GranVille is designed for ease of maintenance with the plug-in electrical module common to each of the luminaires in Holophane's Utility Luminaire Series. The traditional acorn shaped luminaire, while reminiscent of the 1920's, contains a precision optical system that maximizes post spacings while maintaining uniform illumination.

OPTICAL SYSTEM
The optical system consists of a precisely molded thermal resistant borosilicate glass refractor and top reflector. The glass top reflector redirects over 50 % of the upward light into the controlling refractor while allowing a soft uplight component to define the traditional acorn shape of the luminaire. The lower refractor uses precisely molded prism s to maximize pole spacings while maintaining uniform illuminance. Three refractors are available, designed for I.E.S. type III, IV, and V distributions.

LUMINAIRE HOUSING
The luminaire housing, cast of aluminum, provides an enclosure for the plug-in electrical module. Four uniquely designed stainless steel spring clips enclosed in a clear polyvinyl chloride sleeve and adjusted by hex head stainless steel 1/4-20 bolts securely cradle the prismatic glass refractor. The nickel plated lamp grip socket and three station incoming line terminal block are prewired to a five conductor receptacle for ease in connection the electrical module. The slipfitter will accept a 3" by 2-7/8" to 3-1/8" O.D. tenon.

LUMINAIRE HOUSING / DOOR
Cast of aluminum, the housing / door is removable without the use of tools and is retained by a stainless steel aircraft cable. For units with an E.E.I.-N.E.M.A. twist lock photocell receptacle, the door contains an acrylic "window" to allow light to reach the cell.

ELECTRICAL MODULE
The ballast components are mounted on a steel plate that is removable without the use of tools. A matching five conductor plug connects to the receptacle in the luminaire housing to complete the wiring. Where a starting aid is required, it is provided with a separate plug-in connector and can be replaced without the use of tools. For photoelectric operation, the electrical module is provided with an E.E.I.-N.E.M.A. twist lock photocell receptacle.

BALLASTS
(Refer to Ballast Data Sheet for specific operation characteristics)
50 watt 120 volt High Pressure Sodium (HPS) ballasts are High Power Factor Reactor type. All other HPS ballast are High Power Factor Autotransformer type.
175 watt Metal Halide (MH) ballasts are Peak Lead Autotransformer type. 70 and 100 watt MH units are available only with High Power Factor High Reactance type ballast.
All Mercury Vapor (MV) ballasts are High Power Factor Constant Wattage Autotransformer (CWA) type.

FINISH
The luminaire is finished with polyester powder paint applied after a seven stage pretreatment process to insure maximum durability.

Holophane Wadsworth Cast Aluminum Post

DESCRIPTION The post shall be all cast aluminum construction with a classic double-tapered, fluted base and a gracefully tapered 12-flute cast shaft. The post shall be Holophane catalog number *W12C/19-CA/finish. (e.g. BK = Black)*

MATERIALS The post shall be heavy wall, cast aluminum produced from certified ASTM 356.1 ingot per ASTM B179-95a or ASTM B26-95. The castings shall be formed true to the pattern with complete detail. All hardware shall be tamper resistant stainless steel. Anchor bolts to be completely hot dip galvanized.

CONSTRUCTION The cast shaft shall be circumferentially welded to the base casting and shipped as one piece for maximum structural integrity. All exposed welds below 8' shall be ground smooth. All welding shall be per ANSI/AWS D1.2-90. All welders shall be certified per Section 5 of ANSI/AWS D1.2-90.

DIMENSIONS The post shall be X'- XX" in height with a 19" diameter base. The shaft diameter shall taper from 3.5" at the top to 5.5" above the base. An integral 3" O.D. tenon shall be provided at the top for luminaire mounting. The post top shall include a transitional donut between the fluted shaft and the tenon.

INSTALLATION The post shall be provided with four, hot dip galvanized L-type anchor bolts to be installed on a slotted 15" to 16" diameter bolt circle. (Optional base slotted for 7" to 9" diameter bolt circle.) A door shall be provided in the base for anchorage and wiring access. A grounding screw shall be provided inside the base opposite the door.

For finish specifications and color options, see **"Finish"** section in catalog.

28-3 REMOVAL OF EXISTING MARKINGS

Where called for on the Plans and/or Specifications existing pavement striping, symbols, legend, and markings proposed for removal shall be removed by wet sandblasting or other approved methods which will cause the least possible damage to the pavement. Dry sandblasting may be used in selected areas only with the permission of the Engineer and with approval of the air pollution control authority having jurisdiction over the area in which the Work will be performed. Alternate methods of removal require prior approval of the Engineer.

Where their removal is called for on the Plans and /or Specifications, raised markers shall be removed by an approved method that will result in the least possible damage to the pavement. Where raised pavement markers are to remain, the Contractor shall take special care to protect existing reflective pavement markers and shall, at Contractor's expense, replace all coated markers.

Where an existing lane stripe is removed, slurry seal shall be applied to the affected areas. Width of the slurry seal application shall be at least three times wider than proposed or existing stripe, whichever is wider. Where more than one lane stripe is removed in the same travel direction, the extent of the slurry seal application shall be the full pavement width of the travel direction's cross section for the full length of lane stripe removal. Where a series of gore stripes or hatch markings are removed within a travel lane, the extent of slurry seal application shall be the entire travel lane for the length of the gore stripes or hatch markings removal. Where existing pavement legends or symbols are removed, slurry seal shall be applied to the affected areas in a uniform square or rectangle that extends at least six inches past the limits of the removed legend or symbol.

All existing striping, stenciling or raised pavement markers, whether shown for removal or not, that will be in conflict with the intent of any new striping diagram, will be removed. Removal shall be at the direction of the Engineer and no additional compensation will be allowed.

SECTION 31 – TECHNICAL SPECIFICATIONS FOR INTELLIGENT TRANSPORTATION

31-9 36" X 60" ITS VAULT(S)

Vaults shall be concrete with a reinforced spring loaded torsion assisted steel lid, have 18 fiber optic holding racks, and cross bar to hold the lid from closing. All vaults shall have a smooth finished bottom including a sump hole for drainage. The concrete box design shall be reinforced to provide high strength without excess weight. Special knockouts shall be provided and incorporated into the construction of each wall. Each communication conduit entrance shall be sealed with duct plugs and trimmed smooth. Wall penetrations shall be water resistance and seal from the interior to the exterior.

Vault Body and Lid Specifications

Dimensions:

Cover: 36" x 60"
Base: 36" x 60" x 5.25"
Shipping: 2-pc. with C.I. cover
Lid Markings: "ITS COMMUNICATIONS"

Tension assisted spring loaded for light weight checker plate cover with strength galvanizing finish with non-skid surface. Vault shall have sump hole in vault base with 2 ton riss pin for handling. Knockouts shall be on all corners. Knockouts shall be thinwall, 8" x 16," 4 each per side.

Installation Procedures for 36" X 60" Vault(s)

Conduit entrances to vaults shall be spaced approximately 2 inches from bell edge to bell edge. Provide a uniform separation of conduit bells with complete grouting to make a smooth wall without blockage of conduit access. Conduits shall extend a minimum of 6 inches, 8 inches maximum, beyond the inner wall of any vault or structure. Start pacing conduits in a gradual taper 10 feet prior to entrance of vault. Use of concrete vibrator shall be required to ensure complete distribution of concrete sand slurry around outside wall of the vault.

Conduit Identification: Identify each conduit using the conduit number shown in drawings by means of a stamped brass tag at each end at access vaults.

All vaults shall rest on a 6 inch layer of crushed rock which extends past the wall of the vault as shown on the City Standard Drawings. The void between the edge of the vault and native soil shall be backfilled with sand.

Vaults shall be installed to matched existing grade and conform to sloped areas for drainage.

All vaults shall be installed with extensions.

All vaults shall be wrapped with building paper prior to backfilling. When the vault is installed in a non-sidewalk area, install a formed concrete apron, 1-foot wide and 4 inches deep around the vault. The apron shall be sloped to drain away from the vault.

Non-Abrasive Non-Slip Coating

Non-Slip Coating shall comply with MIL-W-5044 and shall be applied to all vault covers. Coating shall be a one component, brushable, non-abrasive, non-slip deck coating formulated with fast drying resins. Aggregates shall be non-abrasive and non-sparking and shall not scratch or damage underlying metal surfaces.

Non-slip coating shall be resistant to fire, acids, alkalis, solvents, grease, oil, salt water, detergents, alcohol, gasoline, cellulube and other hydraulic fluids.

Non-slip coating shall be applied over a primer. Two component epoxy primers shall be used. Non-Slip coating shall be applied to a clean, dry surface. All rust, mill scale, paint, dirt, grease, oil, etc. must be completely removed. Methods of cleaning steel surface are as follows:

Wash metal surface with one coat of a wash primer conforming to MIL-C-8514, applied in accordance with MIL-C-8507. Primer shall be applied before coating.

Primer shall be applied on surfaces immediately after the surface has been cleaned and before rust or oxidation.

31-10 48" X 84" ITS VAULT(S)

Vaults shall be concrete with a reinforced spring loaded torsion assisted steel lid, have 18 fiber optic holding rack, and cross bar to hold the lid from closing. All vaults shall have a smooth finished bottom including a sump hole for drainage. The concrete box design shall be reinforced to provide high strength without excess weight. Special knockouts shall be provided and incorporated into the construction of each wall. Each communication conduit entrance shall be sealed with duct plugs and trimmed smooth. Wall penetrations shall be water resistance and seal from the interior to the exterior.

Vault Body and Lid Specifications

Dimensions:

Cover: 48" x 78"
Base: 48" x 78" x 5.25"
Shipping: 2-pc. with C.I. cover
Lid Markings: "ITS COMMUNICATIONS"

Tension assisted spring loaded for light weight checker plate cover with strength galvanizing finish with non-skid surface. Vault shall have sump hole in vault base with 2 ton riss pin for handling. Knockouts shall be on all corners. Knockouts shall be thinwall, 8" x 16", 4 each per side.

Installation Procedures for 48" X 84" Vault(s)

Conduit entrances to vaults shall be spaced approximately 2 inches from bell edge to bell edge. Provide a uniform separation of conduit bells with complete grouting to make a smooth wall without blockage of conduit access. Conduits shall extend a minimum of 6 inches, 8 inches maximum, beyond the inner wall of any vault or structure. Start pacing conduits in a gradual

taper 10 feet prior to entrance of vault. Use of concrete vibrator shall be required to ensure complete distribution of concrete sand slurry around outside wall of the vault.

Conduit Identification: Identify each conduit using the conduit number shown in drawings by means of a stamped brass tag at each end at access vaults.

All vaults shall rest on a 6 inch layer of crushed rock which extends past the wall of the vault as shown on City Standard Drawings. The void between the edge of the vault and native soil shall be backfilled with sand.

Vaults shall be installed to matched existing grade and conform to sloped areas for drainage.

All vaults shall be installed with extensions.

All vaults shall be wrapped with building paper prior to backfilling. When the vault is installed in a non-sidewalk area, install a formed concrete apron, 1-foot wide and 4 inches deep around the vault. The apron shall be sloped to drain away from the vault.

Non-Abrasive Non-Slip Coating

Non-Slip Coating shall comply with MIL-W-5044 and shall be applied to all vault covers. Coating shall be a one component, brushable, non-abrasive, non-slip deck coating formulated with fast drying resins. Aggregates shall be non-abrasive and non-sparking and shall not scratch or damage underlying metal surfaces.

Non-slip coating shall be resistant to fire, acids, alkalis, solvents, grease, oil, salt water, detergents, alcohol, gasoline, cellulube and other hydraulic fluids.

Non-slip coating shall be applied over a primer. Two component epoxy primers shall be used.

Non-Slip coating shall be applied to a clean, dry surface. All rust, mill scale, paint, dirt, grease, oil, etc. must be completely removed. Methods of cleaning steel surface are as follows:

Wash metal surface with one coat of a wash primer conforming to MIL-C-8514, applied in accordance with MIL-C-8507. Primer shall be applied before coating.

Primer shall be applied on surfaces immediately after the surface has been cleaned and before rust or oxidation.

31-11 ITS CONDUITS / FIBER DUCTS

This Specification covers the performance characteristics with minimum and maximum acceptable performance levels for 1.5" SDR 11 conduit. Vendors supplying conduit as described by this Specification shall demonstrate compliance with the values described in this document. All duct shall be smooth wall, direct burial rated and specifically designed for fiber optic cable. Electrical conduit, PVC pipe, galvanized pipe or other similar products will not be allowed.

It is the intent of these Specifications to define the parameters by which conduit will be evaluated. Furthermore, the Specifications will serve as a guide for the purpose of vendor qualification.

The ITS / Fiber Duct conduits shall include bundles of two (2) – 1-1/2", four (4)-1-1/2", six (6) 1 1/2", twelve (12) 1-1/2" or one (1) 2" as shown on the Plans.

Material Specifications

Material Specifications

Property	Test Method (ASTM)	Value	Cell Class.
Density (g/cm)	D 792A or D 1505	0.940 -0.955	3
Melt Index (g/10 min)	D 1238	< 0.15	4
Flexural Modulus (psi)	D 790	110,000 -160,000	5
Tensile Strength @ Yield (psi)	D 638	3,000 -3,500	4
ESCR, Condition B	D 1693	0/10 Failures / 1000 hrs.	7
Hydrostatic Design Basis (psi)	D 2837	Not Pressure Rated	0
Tensile Strength @ Break	D 638	4,500 Min.	
Tensile Elongation @ Break (%)	D 638	750 Min.	
Brittleness Temp. (C)	D 746	< -76	

Conduit Physical Properties:

Dimensional measurements shall be performed on samples removed from each complete length of finished conduit, unless otherwise specified. All dimensions will be expressed in inches and carried out three decimal places. Outer diameter and wall thickness will be provided as a stated standard for each conduit size with a plus/minus tolerance. Inner diameter will be stated as a nominal value.

Dimensional requirements for 1.5" SDR 11 conduit:

Nominal Size	Outside Diameter	Wall Thickness	Nominal Inner Diameter
1.50"	1.900 +/-0.012	0.173 +0.026	1.528"

Ovality shall be expressed as a percent and calculated using IEEE Standards and included with the submittals. The ovality shall be no more than five percent.

The conduit shall have a minimum bend radius equal to twenty inches and shall have a safe working pull strength greater than 3,000 pounds.
Conduit shall be certified by the manufacturer with a Letter of Certification documenting that the conduit meets the performance requirements and material requirements of ASTM F2160. Communication conduit shall be marked with the ASTM F2160 designation.
In the event of a discrepancy between these specifications and ASTM F2160, the requirements of ASTM F2160 shall govern.

Quality Control:

Manufacturer will be responsible for inspecting 100% of the conduit supplied for Conduit Dimensions, Ovality, and Visual Appearance.

Contractor shall provide a Certificate of Compliance that the conduits meet the provisions of this section.

Print Legend:

The conduit shall be printed in intervals of two feet (+/-1%) with a standard print height of ¼" (+/- 1/16") and shall contain the following information:

- Current Year
- Manufacturer
- Conduit Diameter
- Wall Thickness
- Product Trade Name
- Sequential Footage Markings

The manufacturer shall be capable of supplying conduit with longitudinal stripes or tracers of the above data in increments of four, at ninety-degree intervals around the circumference of the conduit.

Physical Appearance:

The inside surface is a smooth wall or longitudinal ribbed construction. The outside shall be smooth wall construction and shall be in new condition.

Packaging and Shipping:

The conduit shall be supplied in standard lengths of 3,000 feet and shall be placed on an 80" x 40" x 38" reel (Flange x Drum x Traverse). The HDPE conduit shall be delivered to the Site with Cargo Master Lift Gate service, or approved equal. Each reel shall be tagged with the following information:

- Manufacturer's Shipping Address
- Manufacturer's Product Code
- Length of Conduit
- Product Description
- Tracer Color
- Reel Number and Bar Code
- Certificate of Compliance that the conduits meet the provisions of this section

Pull-Tape:

Pull-tape shall be installed in ALL HDPE conduit as described in this section. The ends of the tape shall be secured to the conduit to ensure that the tape does not draw back into the conduit. Pull tape shall have a pull strength of 1,800 lbs. One conduit shall be installed with a tonable pull tape. Furthermore, there shall be 3% (+/ 0.5%) of excess tape fill inside the final conduit product.

Couplings & Bells:

Coupling: All couplings shall be a compression type fitting.

Communication Bells: Communication bells installed on the ends of conduits shall be joined with a glue compatible with the materials in which it is supplied. Bells shall be installed on each conduit that enters or exits any type of pull box or vault. See Plans and details for sweep and entrance construction requirements for the construction of vaults.

Toneable Conduit (White)

Description:

All HDPE conduit shall have toneable capabilities. Only one conduit in each bundle of conduits is required to have toneable capabilities. This toneable conduit shall be an 18-guage wire built into the wall of the conduit. See detail for conduit splice at the coupler.

Toneable conduit shall be combined with a polyethylene conduit with an integrated toning wire. The toning wire shall have the ability to be 'ripped' or pulled out of the conduit wall with simple hand tools, enabling easy access for toning and/or splicing to subsequent lengths.

Product Details:

The toneable conduit (white) shall be made from high quality high-density polyethylene (HDPE), conforming to the performance criteria as identified in the Material Specifications table above within this section 31-11, "ITS CONDUITS / FIBER DUCTS."

Toneable conduit shall have a wire that is 18-gauge copper clad steel coated with fluoropolymer jacket. The wire shall be embedded in the wall of the conduit. The copper clad steel (CCS) shall be necessary for amount of copper to carry a tone over long distances and shall have a steel core that is durable (copper not allowed). CCS shall easily be ripped out of the wall without breaking the wire. The wire shall meet the specifications listed in this Specification.

The fluoropolymer-coated wire shall be 'ripped' out of the conduit wall using a pair of pliers. The fluoropolymer shall allow the wire to move independent of the conduit eliminating stresses on the wire and conduit, and eases the separation of the wire from the wall of the conduit. The fluoropolymer coating shall provide critical insulative and corrosion protection to the 'exposed' wire.

Toning Function:

Contractor shall test all conduits using a generated signal, or 'tone', that is transmitted over a conductor so that the portion of the conductor buried below the earth's surface can be located without digging or using any special tools. Any conduits that cannot be located using this method of toning shall be removed and replaced.

The tone shall be produced at a very low frequency with a transmitter tuned to a particular frequency. The frequency range available on the transmitter may vary between equipment used and range shall be from 400Hz to about 80KHz. Transmission power shall be controlled in a range of .033 watts up to 5.0 watts. A 'radio' receiver tuned to locater shall be able to transmit frequencies is then used to precisely locate the energized wire.

The set-up requires a transmitter be attached to the conductive material that will act as an 'antenna' and a ground plane shall be established at the end of the antenna to close the circuit.

Contractor shall proof each toneable conduit to accepted practices and tolerances and to ensure continuity with City representative on walkout proofing. This shall be required of all trench line construction.

Installation Procedure:

Splicing the wire together with insulation shall be conducted. The wire from each Toneable conduit shall be grounded in every vault, pull-box or termination point. Each grounding system shall include a six foot grounding rod and attachment system for the wire installed in each vault, pull-box or termination point. Contractor shall remove the fluoropolymer jacket before crimping the connector. Contractor shall minimize the amount of fluoropolymer jacket to be removed in making the connection, leaving the remainder of the jacket intact to protect the wire from corrosion.

Simple wire splices for 18 AWG copper clad steel wire shall be used and environmentally protected with a self-healing waterproof tape.

All splices below grade shall be environmentally sealed against the elements by the Contractor.

Splices above grade such as inside an enclosure shall have the ends sealed with tape per manufacturer specifications.

At each end of the conduit the wire shall be stripped from the conduit to a length long enough for splicing, or ground for toning.

Toneable Wire:

Shall have "Clean Design" or smooth wall for non-interference during installations.

Shall have high tensile strength copper clad steel 18 AWG wire to transmit tone-able signals over extended distances.

Shall have capabilities to locate with toning equipment from the ground surface.

Shall have Teflon coated toning wire to provide extended underground service.

Shall have easily coupled to provide extended lengths.

Shall have easy/convenient wire "Rip Out" for coupling. "Rip Out" design for toneable wires to be connected outside the coupling maintaining the dry seal.

Colors & Sizes (See Approved Engineered Plans)

Duct Plugs

Duct plugs shall be all high-impact plastic construction with durable elastic gaskets, corrosion proof, water-tight and reusable. Duct plugs shall consist of a bottom and top compression plate, gasket and tightening nut.

Duct plugs shall either be blank or consist of a biplex sealing system or approved equal.

Installation

The Contractor shall pot-hole, daylight and identify the precise location of existing Utilities prior to crossing them with the proposed conduit system. The Contractor shall conduct a USA investigation prior to construction. The Contractor shall also video tape and date all Utility markings prior to construction. Any marked Utility damaged by the Contractor shall be replaced at the expense of the Contractor. The Contractor shall take immediate action to resolve emergency situations.

All spoils from trenching shall be removed daily. Spoils piles will not be allowed to be stored in the Street, on sidewalk, curb & gutter, on private property without written permission.

All trenches and Utility crossings shall be backfilled with a two (2) sack colored (red) sand slurry. Mechanical vibration of the slurry will be required to ensure all voids have been filled. Conduits shall be properly secured by an approved method prior to mechanical vibration. All trenches in the asphalt roadway shall be filled with slurry up to the edges of the asphalt. The trenches shall be protected until the slurry hardens and can be opened to traffic. Slurry of trenches in landscape and dirt areas only needs to cover the top of conduits by 12 inches.

All trenches shall be constructed parallel to the edge of pavement or to the face of curb. Any deviation shall take place in a 50 foot gradual transition. The trench locations vary and will be adjusted for conflicts with utilities. All trenches in the roadway or sidewalks shall not deviate from line (parallel to edge of pavement or curb face) more than three inches unless a 50 foot transition is required.

All landscape irrigation facilities shall be modified as necessary to allow for new conduits. All damaged landscape material, ground cover, grass, plants, etc. shall be replaced in kind. All damaged grass shall be replaced with sod.

At locations where no relocation of existing sprinkler systems are shown on the Plans and the Contractor must disturb said systems in order to complete the Work under this and other items, such as while removing concrete Work and forming new concrete Work, the Contractor shall temporarily cap said line and then return sprinkler systems to service within 48 hours. If Contractor cannot restore service in 48 hours, then Contractor shall make provision for temporary irrigation of affected landscape every 48 hours until permanent irrigation service is restored. The method of temporary irrigation service shall be approved by the City CM, City CM Engineer or their representative.

Tree Diameter (inches)	Distance from Tree Trunk (ft.)
4	1 ¼
5	1 ½
6	1 ¾
7	2
8	2 ¼
9	2 ¼
10	2 ½
11	2 ¾
12	3
13	3 ¼
14	3 ½

15	3 ¾
16	4
17	4 ¼
18	4 ½
19	4 ¾
20	5

Note: When it is absolutely necessary to cut closer than the safe distance from a tree trunk, only cut one side the smallest amount possible. All tree root pruning which is necessary but closer than the safe distance shall be approved by the City CM, City CM Engineer or their representative.

Trenching shall be conducted in areas shown on the Plans and in accordance with Section 16 of the City Standard Specifications. It is the responsibility of the Contractor to identify the location and elevation of all Utilities that intersect the proposed trench alignment. The alignment as shown on the Plans is schematic and may require adjustment in the field. Hand trenching under curb, gutter, utilities and other permanent facilities will be required. A 1 foot separation is required when crossing any structure or other Utility. Maintain a minimum 50 foot transition on both the approach and departure tapers when deviating from the alignment on the Plans.

Backfill of Conduit Trenches

All conduit trenches shall be backfilled with a 2 sack colored (red) sand slurry. If conduit trench is located in landscape areas, stop slurry backfill 12 inches below finished grade. The conduit trench shall be completely filled with the 2 sack colored (red) sand slurry. Slurry shall be scraped smooth as to provide an even road surface. For permanent paving, the trench shall be ground to the width and depth shown on the Plans. The 20 inch trench patch shall be centered on the conduit trench. If the edge of the new 20" trench patch is less than or equal to 2 feet (24") from the lip of gutter or edge of paving, the entire section (from edge of trench patch to lip of gutter) of paving 3 inches deep shall be removed and replaced.

Minimum Trench Width – 6 inches

Maximum Trench Width – 10 inches

Minimum Trench Patch – 20 inches centered on conduit trench

Minimum Trench Paving Depth– 3 inches

Minimum Trench Paving Width – 18 inches Maximum Trench Paving Width – 42 inches (*)

(*) If edge of Trench Patch is less than or equal to 24 inches from lip of curb or edge of paving, grind and replace entire paved area from edge of trench patch to lip of gutter.

Special Trench Protection Requirements:

All trenches within 3 feet of a 12 foot travel lane or within a pedestrian travel path shall be backfilled with 2 sack (red) sand slurry or trenched plated and opened to vehicular or pedestrian traffic at the end of each working day. Trenches outside of vehicular or pedestrian travel lanes

SECTION 35 – NON-CITY OF FRESNO PUBLIC RIGHT OF WAY

35-1 General

A. This Section 33 of the City Standard Specifications is to provide standard requirements for the installation of public right of way projects which are not owned by the City of Fresno (i.e. Freeways, Railways, Irrigation canals). The purpose of this section is to ensure the ability of the City to provide uninterrupted utility services to all customers and also retain the ability to maintain it's infrastructure without major disruption to the public.

35-2 Sewer Crossings

A. There shall be no City owned access structures located in a non City owned right of way unless the length of sewer in said ROW is in excess of 700 feet. All sewers existing or new which cross the ROW must be protected with a steel casing per City Standard Drawing S-7. The casing must extend 10 feet beyond the entire length of the ROW. For each sewer casing installed an additional redundant parallel casing must be installed with identical slope and elevation and must be located no more than 5 feet (facing edge to facing edge) from the original casing. However the casings must be separated by enough distance to allow adequate compaction around the casings. There must be a 12" concrete plug installed in each end of the redundant casing.

B. If any Sewer pipes are to be abandoned or rerouted during the installation of the project, the sewer must be CCTV inspected prior to commencement of the work. All laterals must be investigated and if active shall be rerouted to an active sewer. If the project includes the rerouting of any sewer or installation of new sewers access structures must be installed at each change indirection and at a minimum spacing of every 600 feet.

35-3 Recycled Water Crossings

A. All recycled water pipes existing or new which cross the ROW must be protected with a steel casing per City Standard Drawing W-24. The casing must extend 10 feet beyond the entire length of the ROW. For each casing installed an additional redundant parallel casing must be installed with identical slope and elevation and must be located no more than 5 feet from the original casing.