Installation of Underground Substructures by Developers

ISSUING DIVISION: Electric Engineering
SVP SPONSOR: Kevin Keating, Manager

Signed by Kevin Keating
Date Signed 2 May, 2014

SECTION: Substructures — UG 1000

Scope of Standard

This standard is intended for use by **Developers** as required by City ordinance, Contractors under contract to the City of Santa Clara, and City forces. Its purpose is to:

1. Provide a uniform electric substructure construction standard for new electric service installations within the City of Santa Clara.
2. Define material requirements for electric substructures.
3. Define Developer's substructure work requirements for electric installations.
4. Provide a guide, with respect to utility substructures, for new electric power system projects and for changes to existing facilities.
5. Act as a supplement to detailed design drawings prepared by **Silicon Valley Power (SVP)**.

Purpose of the Revision

This revised standard outlines and details the installation of underground substructures. This is a minor revision to the previous revision 5 of the UG 1000 document that incorporates the references to conduit spacer and trench backfill standard documents. Since it is a minor revision, it is numbered 5.1. No other revisions were made to this document.

References

ANSI F 512 - 77 "Smooth-Wall PVC conduit and Fittings for Underground Installation"
ANSI C 857-95
ANSI/SCTE 77 2002 "Specification for Underground Enclosure Integrity"
ASTM C 94
ASTM C 150
NEC
NEMA TC-8
NEMA TC-9
W.U.C. Guide 3.1 "Plastic Conduit and Fittings"
W.U.C. Guide 3.6 "Non-Concrete Enclosures"
CPUC General Order 128 "Rules for Construction of Underground Electric Supply Systems"
Silicon Valley Power, City of Santa Clara, Rules and Regulations
Standard Specification 19-3.025
Silicon Valley Power Standard Document UG-340, "Conduit Spacers," latest revision
Silicon Valley Power Standard Document UG-345, "Trench Backfill," latest revision

Rescissions

UG 1000 – Installation of Substructures by Developers, Revision 5

Definition of Terms

- **Building Inspector**: City of Santa Clara Building Dept. Inspector, responsible for verifying proper installation and repair of all private building facilities. This includes the electric service entrance and meter service panel.

- **Contractor**: The person or persons, firm, partnership, corporation or combination thereof, who has entered into a contract with the City of Santa Clara, as a party or parties of the second part of his or their legal representative.

- **City:** City of Santa Clara or the City Council of the City of Santa Clara.

- **City Engineer:** City Engineer of the City of Santa Clara.

- **Developer**: A developer is any person who causes land to be divided into two or more parcels for himself or others; or is engaged in the development of property, in whole or in part, by the placing of any improvements thereon, whether the property was previously developed in whole, in part, or at all.

- **High Voltage (Marking):** Safety identifier of any electric system where the nominal system voltage is greater than 1000 volts. This is not the same as the NEC definition for "High Voltage".

- **Low Voltage:** Any electric system where the nominal system voltage is less than 600 volts

- **Primary:** SVP Electric facilities operating at 12,000V

- **Public Works Inspector:** City of Santa Clara Public Works Dept. Inspector, responsible for verifying proper installation and repair of all facilities within City right of ways and easements.

- **Secondary:** SVP Electric facilities operating at 480V or less.

- **Service Entrance:** The underground service conductors and duct(s) between the customer's main switch and the utility connection point.

- **Silicon Valley Power (SVP):** Municipal Electric Department of the City of Santa Clara.

- **Street Lighting:** Electric System for providing City street lighting.

- **SVP Inspector:** Silicon Valley Power Electric Inspector responsible for verifying proper installation of electric substructures installed for use of SVP.

- **Utility Connection Point (UCP):** Electric service point determined by SVP.

- **Utility Electric:** SVP Electric System for alarm and control circuits, including fire alarm, SCADA, fiber optic cable, protection circuits, etc.

Work Requirements

A. The Developer, Contractor or SVP shall furnish and install all facilities as shown and specified on the detailed drawing(s).

B. Developer shall run underground **Service Entrance** conduit(s) and conductors to utility connection point(s) shown on detailed drawing(s). The Service Entrance conduits and conductors shall be "privately" owned and maintained and installed per City Building Inspection Division Codes with the following exceptions:

1. Three Phase Padmount Transformers

   a. All underground Service Entrance conductors and conduit(s) shall run directly to transformer pad, whenever possible. Use 90º duct bends to elbow up into the transformer pad's 16" x 18" secondary area.

   b. Maximum number of conduits in transformer pad 16" x 18" secondary area:

      1. Five (5) 5" conduits.
      2. Nine (9) 4" conduits.
      3. Twelve (12) 3½" conduits or smaller.

   c. Maximum size of Service Entrance conductors. 750 MCM CU or AL.

   d. Maximum number of Service Entrance conductors allowed in City transformer pad 16" x 18" secondary area:

      1. Twelve (12) 500 MCM, or smaller, AL or CU conductors per phase and neutral.
      2. For conductors above 500 MCM, up to and including 750 MCM, only four (4) AL or CU conductors per phase and neutral.

2. Single Phase Padmount Transformer
   Do not run Service Entrance conduit(s) and conductors directly to transformer pad.

WORK REQUIREMENTS (Cont.)

3. Standard Underground Electric Service
   Table 1 shows the available underground service voltages for various types of services. It also shows the maximum main switch size for each voltage. Not all service voltages are available at all locations. Three phase residential services are not allowed.

Table 1: Standard Underground Electric Service

SERVICE TYPE	VOLTAGE	MAX MAIN SIZE
RESIDENTIAL Single family Multiple family [Apts.]	120/208V 1ø 3W	400 Amp
	120/240V 1ø 3W	400 Amp
INDUSTRIAL/ COMMERCIAL	120/208V 1ø 3W	400 Amp
	120/208V 3ø 4W	3000 Amp
	480V 3ø 3W	4000 Amp
	480/277V 3ø 4W	4000 Amp
	12,000V 3ø 3W	*

* By Agreement

4. Customer shall provide 8’ minimum of service entrance conductor slack in all utility service boxes. For 17”x 30” and 24”x36” boxes, only 4’ minimum of service entrance conductor slack is required.

5. Customer shall provide 6’ minimum of service entrance conductor slack above the top of the transformer pad.

6. Silicon Valley Power will not permit bus bars from customer’s service equipment to run directly to SVP’s transformer.

7. Silicon Valley Power will not connect to bus heads that run directly out of a customer’s building.

8. A 3” minimum duct size is required for 400 amp panels.

Materials

A. DUCT

(Galv. Stl.) hot dipped galvanized steel electrical conduit.
(PVC) Polyvinyl Chloride Type DB 120 per NEMA Standard TC-8, ASTM F-512, and Western Underground Committee Guide 3.1

Approved PVC Duct Manufacturers:
Cantex, Carlon, Certainteed, PW Pipe

B. BOXES

Precast concrete enclosures shall meet specifications noted on appropriate sheets of this drawing. Polymer concrete boxes shall meet all tests described in ANSI/SCTE 77 2002 for Tier 15. All covers shall have a minimum coefficient of friction of 0.6 in accordance with ASTM C 1028. Test reports stamped by a registered Professional Engineer certifying passage of all ANSI/SCTE 77 Tier 15 provisions shall be submitted with each polymer concrete box shipment.

C. STREET LIGHT FOUNDATIONS

Specifications as contained herein.

D. CONCRETE (For Transformer Pads)

Ready-mix Type II Concrete, 5 sack Portland Cement, 3/4" aggregate in conformance with latest ASTM Specification C-94 and C-150, unless otherwise noted in this Specification.

E. SAND

Sand shall be clean, natural and free from clay or organic materials Sand is to be free of toxic constituents at or above State or Federal hazardous waste levels. Manufactured sand aggregate is not allowed.

F. GROUND ROD CLAMP (Approved List)

Blackburn - #JAB 58H; Joslyn - #J 8592H; Dossert - #GN-62; Penn Union - #CAB-2

G. EPOXYING OF COVERS

Metallic covers for all Manholes, Pullboxes and Vaults, which are located in sidewalks, shall be sand epoxied as follows:

1. Sand blast entire cover to gray metal (Commercial blast SSPC-No. 6). Blasted area shall be coated same day as cleaned.
2. Apply one coat (min. 2 mil) Dimetcote 9HS (Americoat Corp.) over entire unit.
3. Top surface only to receive epoxy finish as follows:
   a. One coat 72E Peace Gray Epoxy (Americoat Corp.)
   b. Apply completely dry sand.
   c. One coat 72E Peace Gray Epoxy.

Workmanship

A. CONCRETE

1. Forms shall be smooth and true to line and grade.
2. Forms shall be tight, of adequate strength and be completely removed upon completion of work.
3. Where material is to be embedded in concrete it shall be held securely in place.
4. Forms shall be clean and wetted prior to pouring of concrete.
5. Pouring shall be continuous, except for trench cap.
6. Finished surface shall be free of honeycomb or segregation. Unformed exterior surfaces shall be floated, steel trowled and lightly broomed to obtain a non-skid surface. Formed edges shall be rounded to remove any sharp edges.

B. DUCTS

1. Duct(s) shall be free and clear of foreign matter.
2. All burrs and rough edges in conduits shall be made smooth.
3. Duct(s) shall be separated, tied together and supported with 3" plastic spacers every five (5) feet. No metallic materials may be used to provide cross support or be placed across duct banks. Spacers used shall meet the requirements of SVP document UG-340.
4. Apply pipe compound to rigid galvanized steel joints.
5. Galvanized steel shall not be cut with a torch, welded or brazed.
6. All ducts shall be proved free of obstructions by passing a mandrel. A SVP inspector is to be present to witness the mandrel test for approval. Ducts shall be covered with removable caps to keep debris from entering the ducts after passing the mandrel test.
7. A polyester pull tape shall be installed in all ducts and secured at each end to avoid accidental removal of the pull tape.
8. Ducts shall be clearly marked at each enclosure to indicate destination of other end.
9. All ducts in boxes, vaults, manholes, and at equipment pads, shall be terminated with PVC end bells flush with the inside of the enclosure or top of the pad. They shall be grouted as directed by SVP inspectors or SVP project drawings.

C. BACKFILL

Refer to SVP Standard Document UG-0345 for backfill requirements around SVP electric substructures.

Inspections

A. WORK IN A PUBLIC RIGHT OF WAY OR PUBLIC EASEMENT

The Public Works Inspector shall be responsible for inspection. The Public Works Inspector will inspect all backfill. The Silicon Valley Power Inspector will be responsible only for inspecting ducts, manholes, vaults, boxes, and streetlight foundations.
Phone: *408-615-3000* for Public Works Inspector (Have permit number available).
408-640-6302 for S.V.P. Inspector (Give Estimate Number of job when calling).

B. WORK OUTSIDE PUBLIC RIGHT OF WAY OR PUBLIC EASEMENT

The Silicon Valley Power Inspector shall be responsible for inspection and will inspect all work including backfill.
Phone: *408-640-6302* (Give Estimate Number of job when calling)

C. INSPECTOR SHALL BE INFORMED

The Inspector shall be informed at least **24** hours in advance before commencing any item of construction or installation of material in order to permit proper inspection of materials and workmanship. No work shall be embedded, backfilled or otherwise covered until such time as it has been inspected and approved by the Inspector. Any material and / or workmanship failing to meet the requirements of this Specification, good acceptable engineering or construction practices, or installed without prior notice to Inspector shall be subject to rejection. If required by the Inspector, the Developer or Contractor shall, at his own expense, remove rejected work, finish and install approved material and /or workmanship.

D. PRIVATE ELECTRIC EQUIPMENT

For all work performed on the Service Entrance and other private-electrical equipment, a permit shall be obtained from the City Building Inspection Division.

E. SAFETY REGULATIONS

It is the Developer's and Contractor's responsibility to comply with all applicable Safety Regulations.

Permits

For all work performed within a public right of way or public easement, a street opening permit shall be obtained from the City Engineer's Office.

A street opening permit is not required for work outside of a public right of way or public easement.

Bonds

The amount of bond required of Contractors will be noted in the Specified Conditions of the Contract Agreement.

Acceptance

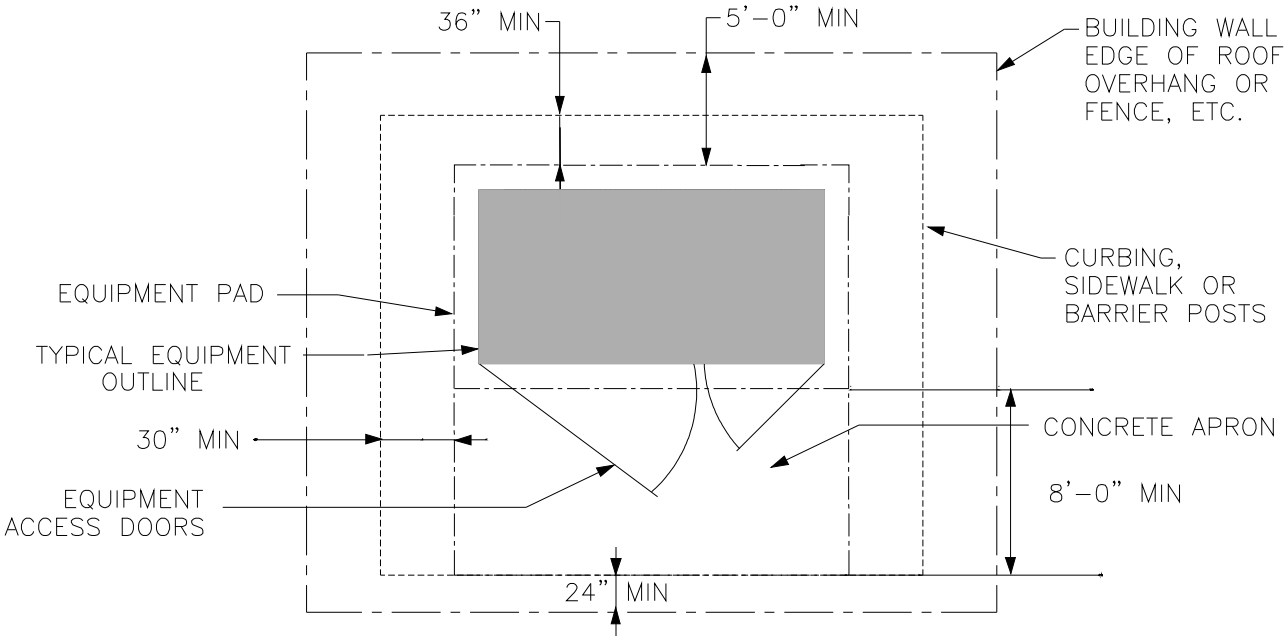
Upon completion of improvements satisfactory to SVP, SVP shall accept the work. After completion of the facilities installed by Developer, SVP shall furnish and install all cable, switches, street lighting poles, luminaires, transformers, meters and other equipment that it deems necessary for the betterment of the system.

Guarantee

It shall be the responsibility of the Developer or Contractor to repair and correct any defects or deficiencies due to workmanship or material, which are discovered within one year from date of acceptance by the City. Repairs and corrections will be made at no charge to SVP or the City of Santa Clara.

In the event that SVP must make repairs before the Developer or Contractor can be notified, or when SVP determines that it is not practicable for the Developer or Contractor to make the necessary repairs, SVP reserves the right to make the necessary repairs or replacements at the expense of the Developer. SVP will, as much as it is practicable, preserve the available evidence of cause of the failure for examination by the Developer or Contractor.

Equipment Pad Clearances



NOTES:

1. No equipment or other devices shall infringe on space indicated by minimum dimensions.

2. Clear and level work areas are required around pad mounted equipment to allow safe maintenance and operation of the equipment. A 10 foot minimum clearance is required in front of equipment doors and a 5 foot minimum clearance is required on sides without equipment access doors. Landscaping shall not restrict access to the equipment. Concrete work apron may be incorporated with sidewalk, if necessary.

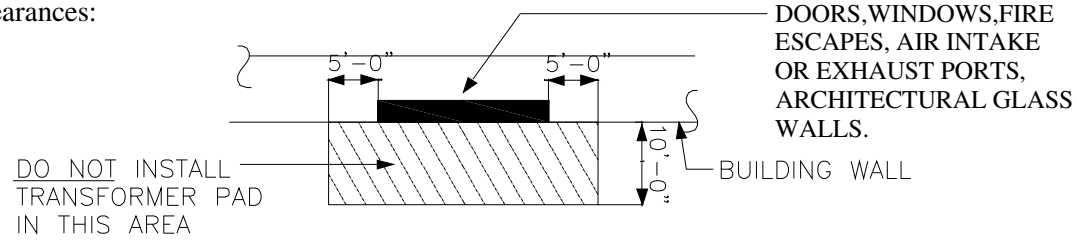
3. Equipment pad shall not be enclosed on all four (4) sides.

4. Minimum dimensions are defined for working and ventillation requirements. Noise abatement requirements may require an increase in the dimensions.

5. See sheets 12 and 13 for barrier post details and placement requirements.

6. Adequate space, 18' minimum width, shall be provided and maintained on one side of the equipment pad to allow an electric line truck to drive up next to the pad for installation and maintenance of the equipment. Landscaping shall not restrict this access area.

7. Special clearances:



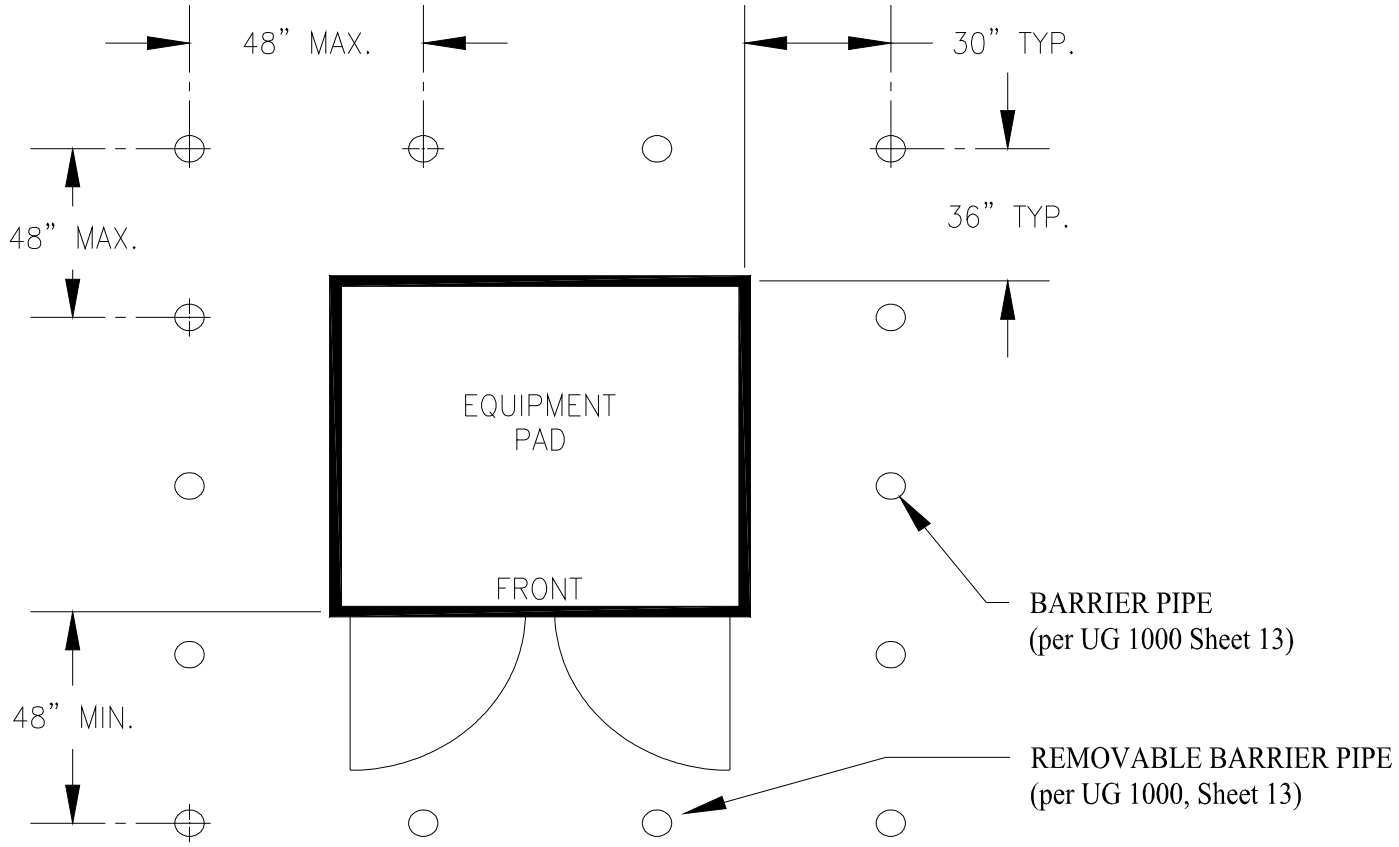
PLAN VIEW

EQUIPMENT PAD CLEARANCES

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating	
Approved: 2 May, 2014		SHEET 11 of 38	
Kevin Keating		UG 1000	Rev. 5.1

Barrier Pipe Placement



Notes:

1. Barrier Pipes are intended to provide reasonable warning from accidental vehicular contact with padmounted equipment. SVP may require the developer to install barrier pipes in accordance with the above diagram, unless otherwise specified by SVP.

2. Barrier pipes are required only on sides accessible to vehicles.

3. All barrier pipes installed will be at uniform height, per UG1000, Sheet 13.

4. Barrier pipes installed within 8' of equipment doors or that block access for installation or removal of equipment shall be removable.

5. Installation of barrier pipes must be coordinated with conduit installation to avoid conflicts.

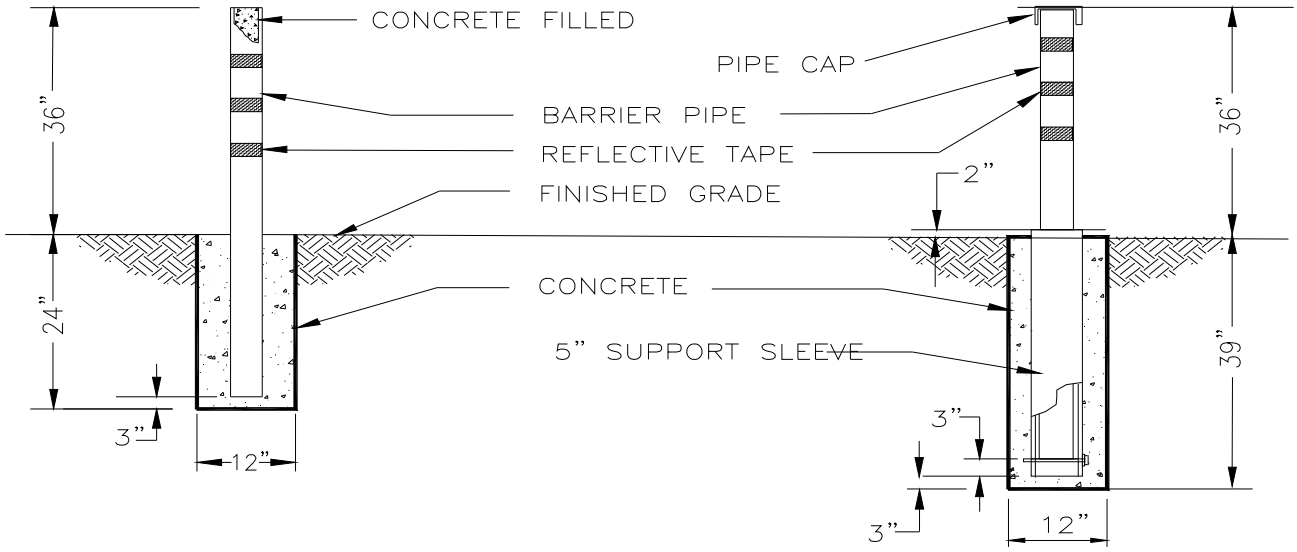
6. Barrier pipe installation details are shown on UG 1000, sheet 13.

BARRIER PIPE PLACEMENT

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 12 of 38
Kevin Keating		UG 1000 Rev. 5.1

Barrier Pipe Details



NOTES:

1. Barrier pipes shall be made of 4" galvanized steel schedule 40 standard pipe. Permanent pipes shall be filled with concrete as shown in the detail. Removable pipes shall remain hollow and be capped with a pipe cap.

2. All barrier pipes are to have 3 reflective tape bands, 2 inch minimum width, applied to the pipes as shown in detail. Reflective tape to be 3M "Scotch-Lite" silver reflective safety tape, or equivalent.

3. Permanent style barrier pipes are to be used where possible. Removable barrier pipes are to be used only when specified on SVP project design and construction estimate drawings or when directed by SVP inspectors.

4. Barrier pipes are to be painted safety yellow. Yellow polyethylene sleeves, such as Armorcast's "Guardian Sleeve," may be substituted for painting the pipe.

5. See sheet 12 for barrier pipe placement requirements.

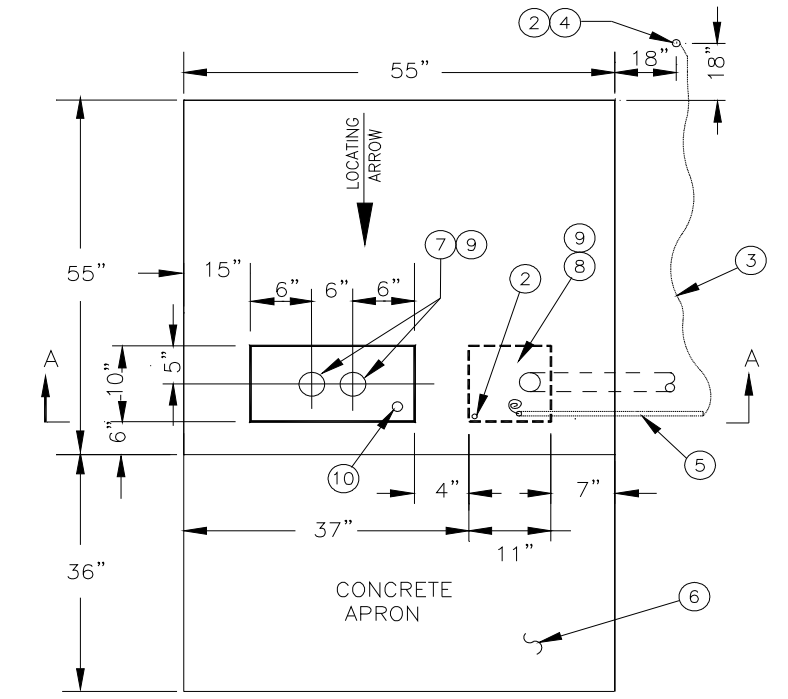
6. Support sleeves for removable barrier pipes shall be 5" galvanized steel schedule 40 standard pipe. A 3/4" x 8" galvanized machine bolt shall be installed 3" from the base of the sleeve to act as a support stop for the 4" removable barrier pipe.

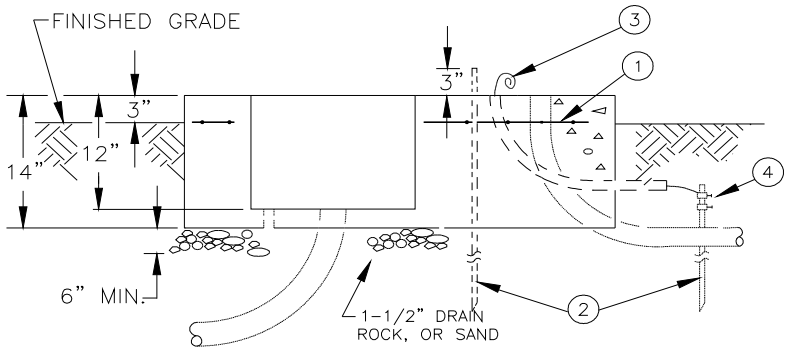
BARRIER PIPE DETAILS

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

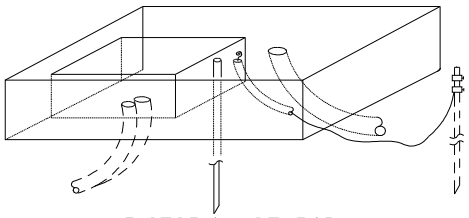
By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 13 of 38
Kevin Keating		UG 1000 Rev. 5.1

Single Phase Transformer Pads





SECTION A–A



PICTORIAL OF PAD
(CONCRETE APRON NOT SHOWN)

NOTES:

1. Install 6" x 6"/ 10 woven wire fabric.

2. Install 5/8" x 8'-0" copper ground rod. Maintain 6 foot minimum separation between ground rods.

3. Run #2 stranded bare copper wire from ground rod to pad at minimum of 12" below grade. Leave 8 ft. tail coiled on top of pad.

4. Install 2 ground rod clamps. See **Materials** section for approved styles and manufacturers.

5. Install 3/4" x 90 degree x 18" radius PVC bend for ground wire.

6. Install 3" concrete apron flush with finished grade.

7. Install 5" x 90 degree x 36" radius PVC primary duct bends.

8. Run SVP secondary ducts and conductors only into this area. Use 90 degree bends and center within boxed area shown.

9. Terminate and cap ducts with a plastic end bell grouted flush with top of the pad, or with bottom of primary pit as shown.

10. Install a 2" diameter drain hole as shown.

SINGLE PHASE TRANSFORMER PADS

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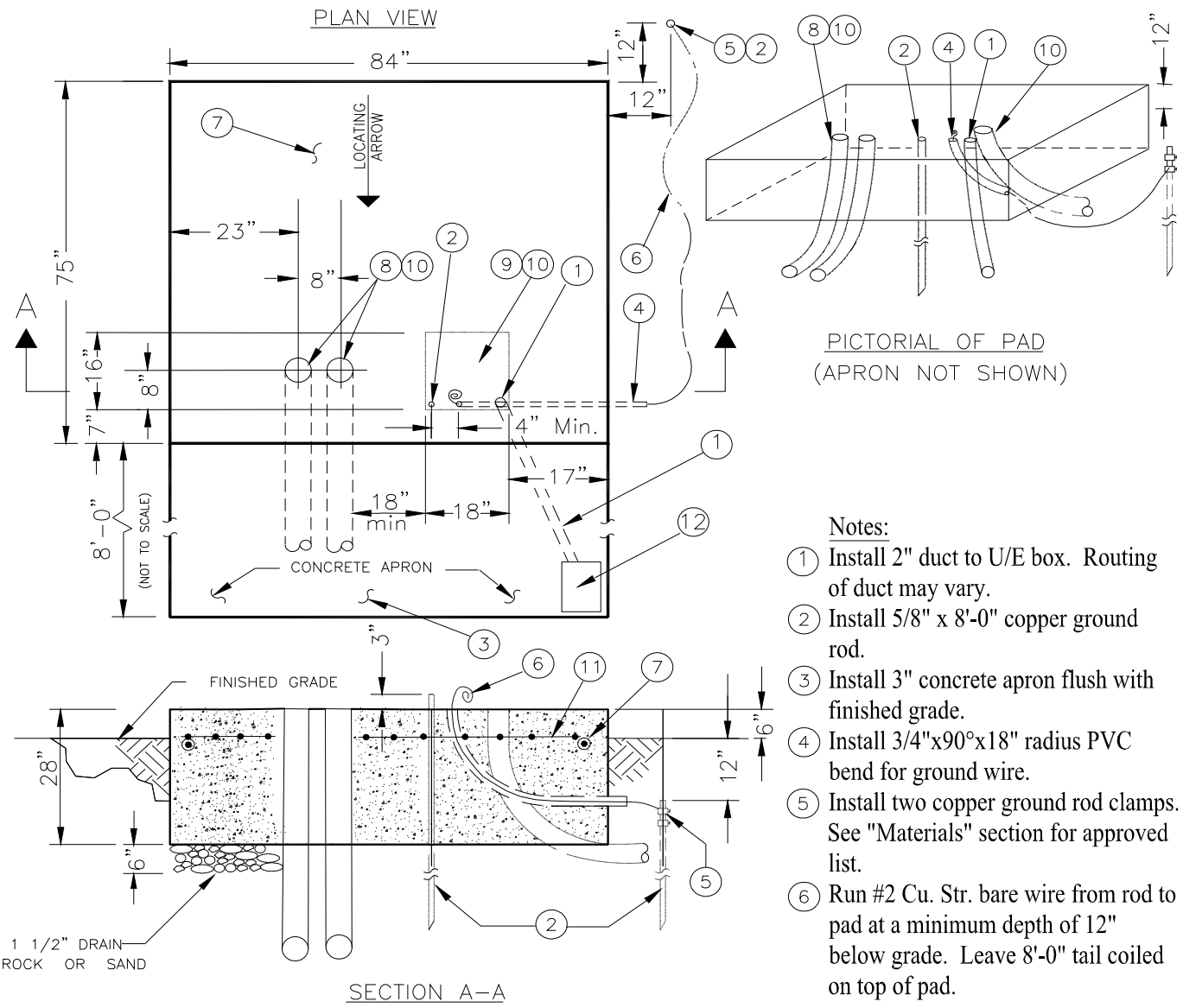
By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating	
Approved: 2 May, 2014		SHEET 14 of 38	
Kevin Keating		UG 1000	Rev. 5.1

Three Phase Transformer Pads



Notes:

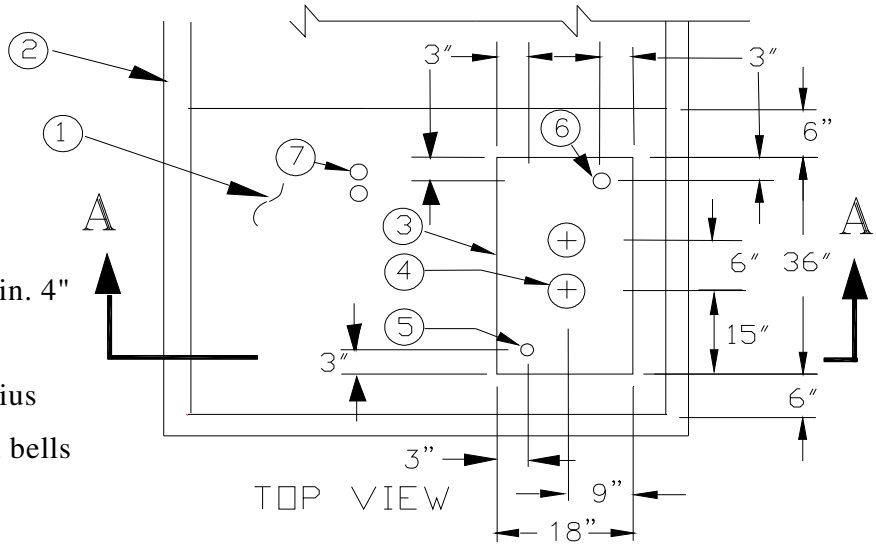
1. Install 2" duct to U/E box. Routing of duct may vary.
2. Install 5/8" x 8'-0" copper ground rod.
3. Install 3" concrete apron flush with finished grade.
4. Install 3/4"x90°x18" radius PVC bend for ground wire.
5. Install two copper ground rod clamps. See "Materials" section for approved list.
6. Run #2 Cu. Str. bare wire from rod to pad at a minimum depth of 12" below grade. Leave 8'-0" tail coiled on top of pad.
7. Install 1/4" rebar around perimeter of pad, 6" below the top of the pad. Install rebar between 3" and 6" from the edge of the pad.
8. Install 90° bends sized as noted on SVP project drawings. Radius of the bends shall be 36" unless noted otherwise on SVP project drawings.
9. Run SVP secondary ducts and/or customer service entrance ducts and conductors into this area. See "Work Requirements" section for details and maximum number of conduits.
10. Terminate and cap ducts with a plastic end bell grouted flush with the top of the pad.
11. Install 6"x6" #10 woven wire fabric. See "Materials" section for concrete specifications.
12. Install 24"x36" pull box. Location to be specified on SVP project drawings.

THREE PHASE TRANSFORMER PADS

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 15 of 38
Kevin Keating		UG 1000 Rev. 5.1

Primary Metering Enclosure Pads



LEGEND

(1) Metering Compartment

(2) Switchgear Concrete Pad

(3) Primary Pit: 36"x18"x24" deep, min. 4" thick wall

(4) SERVICE DUCTS: 5"x90°x5' radius PVC bends. Terminate with PVC end bells grouted flush with bottom of pit.

(5) Ground rod, 5/8"x8'-0" copper

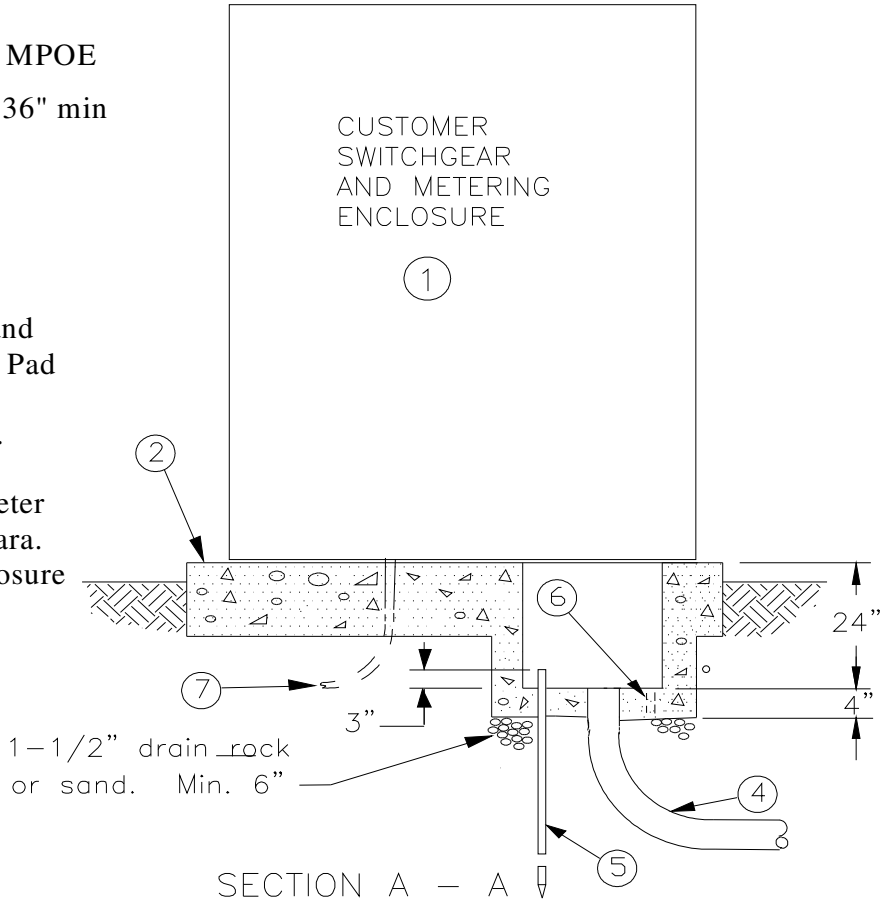
(6) 2" dia. drain hole

(7) 2" PVC duct to customer's telco MPOE board and 2" U/E duct to U/E box; 36" min radius bends.

NOTES:

a. This standard specifies location and details of the primary pit and ducts. Pad dimensions and depth shall be determined by the Developer to suit.

b. Contact Silicon Valley Power Meter Shop at 1705 Martin Ave., Santa Clara. ((408) 615-5626) for Metering Enclosure requirements & approvals and location of 2" duct to MPOE.

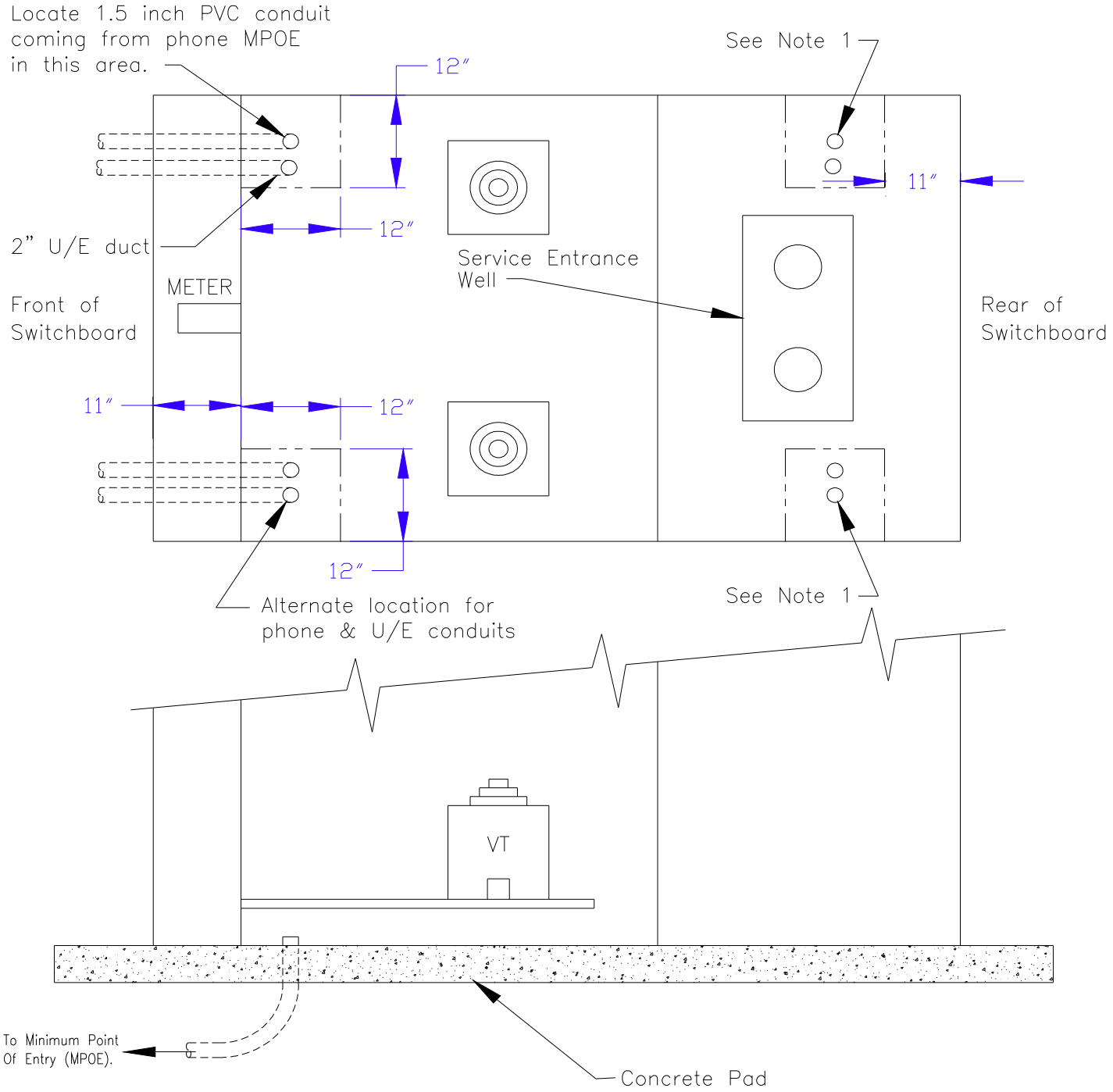


PRIMARY METERING ENCLOSURE PADS

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 16 of 38
Kevin Keating		UG 1000 Rev. 5.1

Communication Ducts in Switchgear Pads



NOTES:

1. When Meter Panel is mounted in front of the Service Termination / CT Compartment, Phone & U/E Conduits shall terminate in one of the two locations shown.

COMMUNICATION DUCTS IN SWITCHGEAR PADS

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Approved: 2 May, 2014		SHEET 17 of 38
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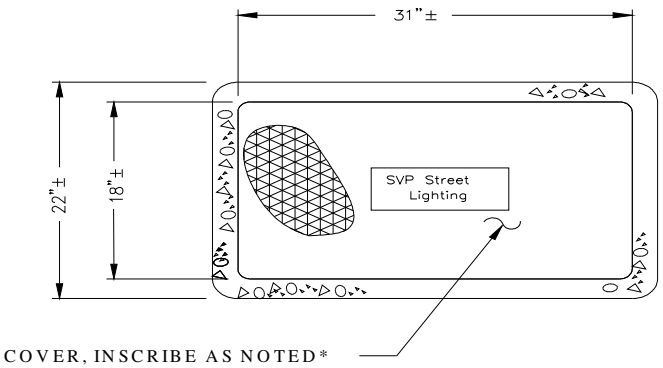
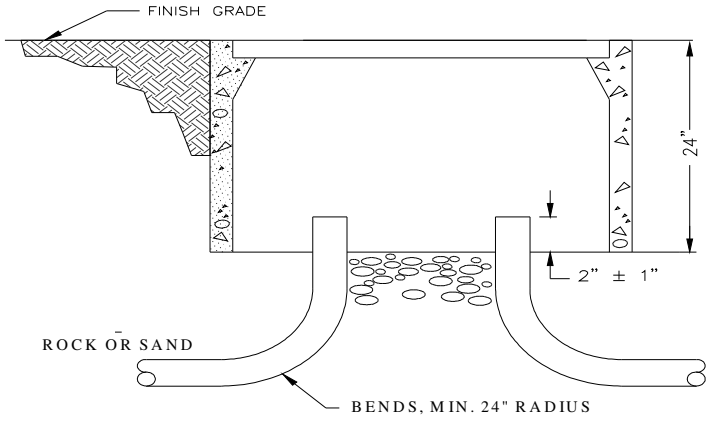
17” x 30” Splice Box – Non Traffic





* INSCRIBE:
SVP Street Lighting
SVP Low Voltage Electric
SVP Utility Electric
(See detailed drawing(s) for specific use)

NOTES:

Boxes shall meet latest revisions of ANSI/SCTE 77 2002 - Tier 15

Boxes & covers shall be meet the WUC 3.6 Interchangability requirements

Boxes & covers shall be made from polymer concrete and one piece design.

Boxes shall be stackable if extra depth is required.

Minimum box depth to be 24 inches.

Boxes are not recommended for installation in driveways.

PVC End Bells to be installed on ends of all ducts terminating in boxes.

Bend angles may be reduced to 45, 30, or 22.5 degrees but may not overlap. Bends must be oriented so that box does not interfere with clear pulling or feeding of cable in ducts. 11.25 degree bends recommended for all utility electric labeled boxes.

Minimum 6 inches drain rock or sand required under box

APPROVED SUPPLIERS

DESCRIPTION	BIN #	ARMORCAST PART NO.	WEIGHT (LBS)	CARSON IND. PART NO.	WEIGHT (LBS)	STRONGWELL PART NO.	WEIGHT (LBS)
Polymer Concrete Box	88234	A6001640PCX24	121	H1730–24	115	PG1730BA24	106
Cover – Low Volt. Electric	88285	A6001947T	72	H1730–P1	75	PG1730HA00–1U	83
Cover – St. Lighting	88286	A6001947T	72	H1730–P1	75	PG1730HA00–1T	83
Cover – Utility Electric	88288	A6001947T	72	H1730–P1	75	PG1730HA00–1V	83

17” x 30” SPLICE BOX – NON TRAFFIC

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

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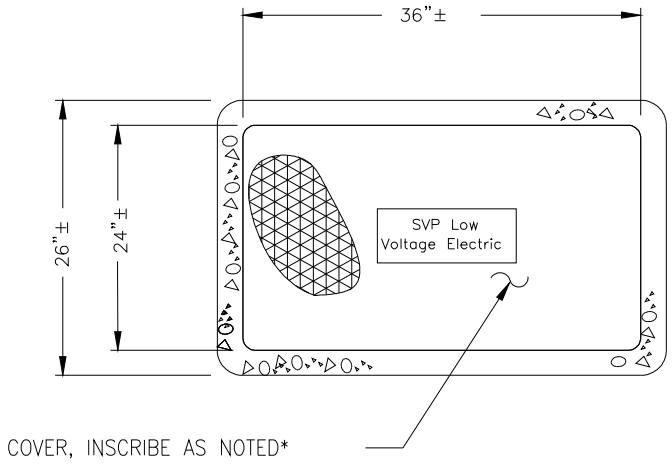
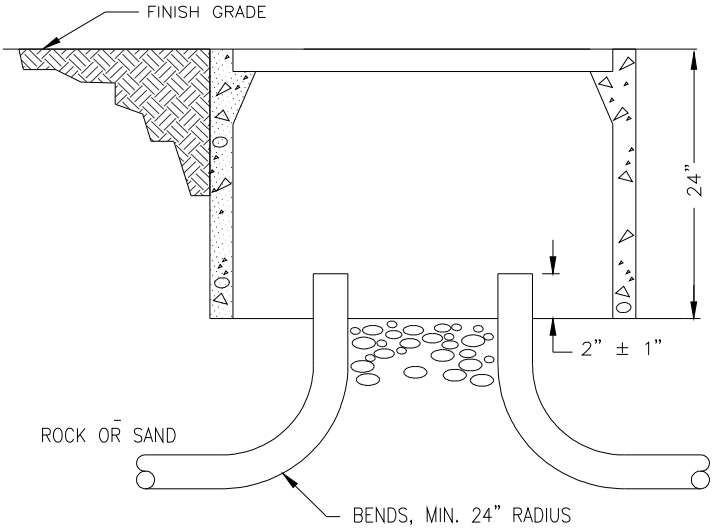
Approved: 2 May, 2014		SHEET 18 of 38
Kevin Keating		UG 1000 Rev. 5.1

24” x 36” Splice Box – Non Traffic





* INSCRIBE:
SVP Low Voltage Electric
SVP Utility Electric
(See detailed project drawing(s) for specific requirements)

NOTES:

Boxes shall meet latest revisions of ANSI/SCTE 77 2002 - Tier 15

Boxes & covers shall be meet the WUC 3.6 Interchangability requirements

Boxes & covers shall be made from polymer concrete and one piece design.

Boxes shall be stackable if extra depth is required.

Minimum box depth to be 24 inches.

Boxes are not recommended for installation in driveways.

PVC End Bells to be installed on ends of all ducts terminating in boxes.

Bend angles may be reduced to 45, 30, or 22.5 degrees but may not overlap. Bends must be oriented so that box does not interfere with clear pulling or feeding of cable in ducts. 11.25 degree bends recommended for all utility electric labeled boxes.

Minimum 6 inches drain rock or sand required under box

APPROVED SUPPLIERS

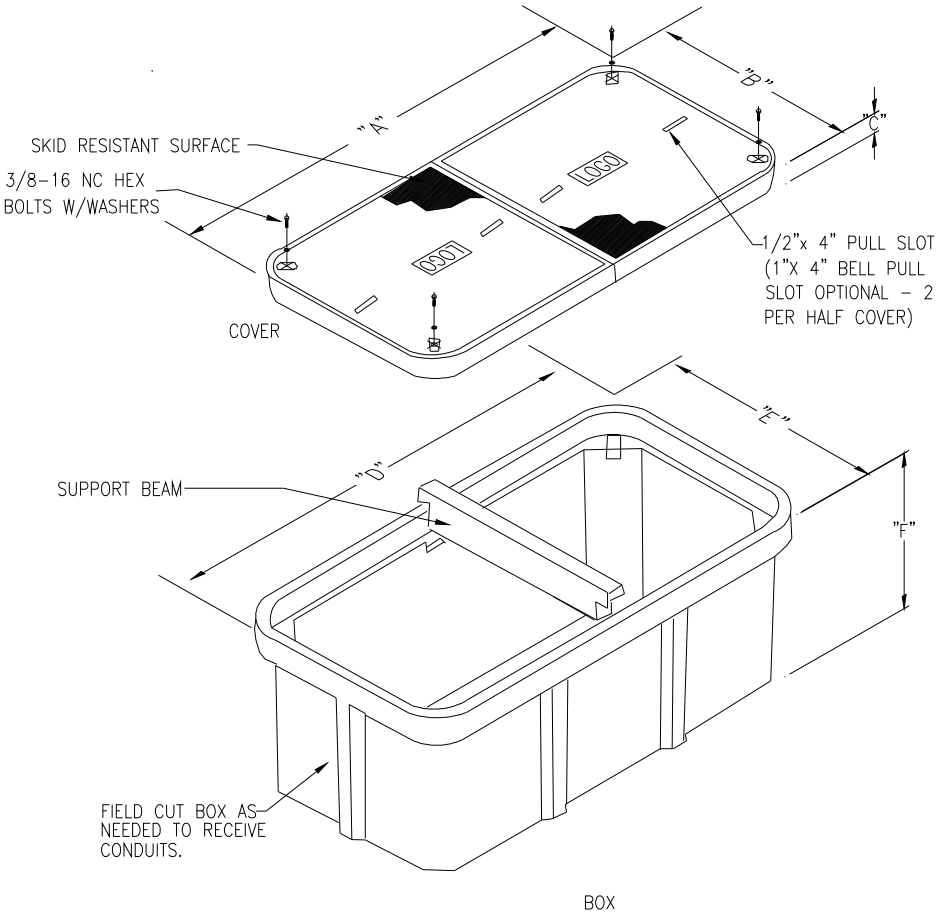
DESCRIPTION	BIN #	ARMORCAST PART NO.	WEIGHT (LBS)	CARSON IND. PART NO.	WEIGHT (LBS)	STRONGWELL PART NO.	WEIGHT (LBS)
Polymer Concrete Box	TBA	A6001974PCX24	182	H2436-24	147	PG2436BA24	180
Cover – Low Volt. Electric	TBA	A6001975T	105	H2436-P1	160	PG2436HA00-1U	115
Cover – ”Utility Electric”	TBA	A6001975T	105	H2436-P1	160	PG2436HA00-1V	115

24” x 36” SPLICE BOX – NON TRAFFIC

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating	
Approved: 2 May, 2014		SHEET 19 of 38	
Kevin Keating		UG 1000	Rev. 5.1

30” x 60” Splice Box – Non Traffic



STACKABLE STANDARD BOX (BIN# 88238)

MANUFACTURER	PART NO.	DIMENSIONS (INCHES) D	E	F	TOTAL WT. LBS.
ARMORCAST	A6001460PCX24	62-3/4	33-3/8	24	332
CARSON INDUSTRIES	H3060-24	63-3/8	35-1/2	24	253
STRONGWELL	PG3060BA21	63-7/8	35-7/8	21	309

2-PIECE HEAVY DUTY COVERS (INSCRIBED AS SPECIFIED)

MANUFACTURER	PART NO.	DIMENSIONS (INCHES) A	B	C	TOTAL WT. LBS.
ARMORCAST	A6001456T	59-1/2	30-1/8	3	246
CARSON INDUSTRIES	H3060-P1	61-9/16	33-3/4	3	296
STRONGWELL (U/E)	PG3060HA00-1U	61-5/8	33-3/4	3	346
STRONGWELL (LV)	PG3060HA00-1V	61-5/8	33-3/4	3	346
STRONGWELL (HV)	PG3060HA00-XF	61-5/8	33-3/4	3	346

COVER TO BE INSCRIBED AS SHOWN ON SVP PROJECT DESIGN DRAWINGS
1) SVP UTILITY ELECTRIC BIN: 88305
2) SVP LOW VOLTAGE ELECTRIC BIN: 88306
3) SVP HIGH VOLTAGE ELECTRIC BIN: 88307

PULLBOX SPECIFICATIONS

Grade level enclosures shall be all polymer concrete and one piece design. Covers shall be two piece design. Approved manufacturers are listed in table below.

Enclosures and covers shall be concrete grey in color.

Enclosures and covers shall be designed and tested to meet or exceed ANSI/SCTE 77 2002 Tier 15.

Boxes shall meet interchangability requirements as outlined in WUC 3.6.

Boxes shall be stackable if extra depth is required.

Boxes shall have an open bottom. 1 1/2" size drain rock, or sand, shall be installed under box to a minimum depth of 6".

Stub ducts into box using bends as directed on specific SVP project design drawings or by SVP inspectors.

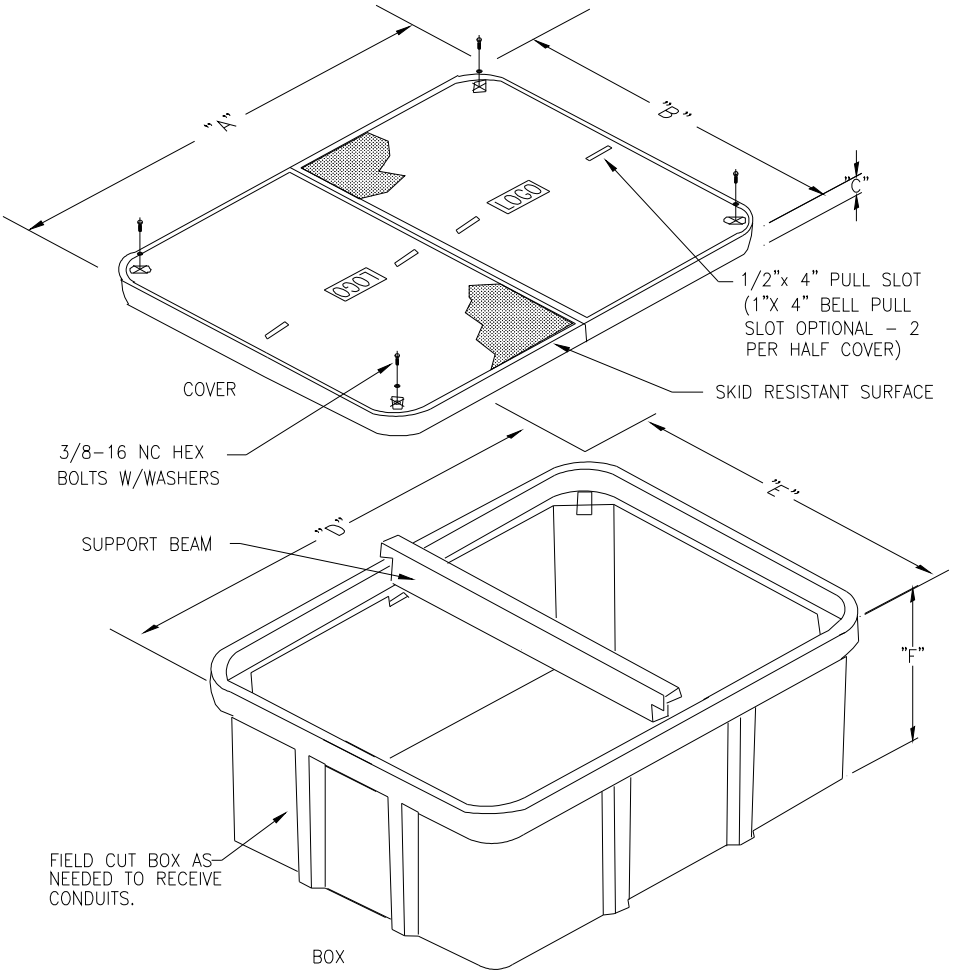
Install PVC End Bells on the ends of all ducts terminating in boxes.

30” x 60” SPLICE BOX – NON TRAFFIC

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating	
Approved: 2 May, 2014		SHEET 20 of 38	
Kevin Keating		UG 1000	Rev. 5.1

48” x 48” Splice Box – Non Traffic



STACKABLE STANDARD BOX (BIN# Not Assigned)

MANUFACTURER	PART NO.	DIMENSIONS (INCHES) D	E	F	TOTAL WT. LBS.
ARMORCAST	A6001433PCX36	51	51	36	403
STRONGWELL	PG4848BA36	54–5/8	54–5/8	36	665

2–PIECE HEAVY DUTY COVERS (INSCRIBED AS SPECIFIED)

MANUFACTURER	PART NO.	DIMENSIONS (INCHES) A	B	C	TOTAL WT. LBS.
ARMORCAST	A6001434T	48–1/4	48–1/4	3	326
STRONGWELL (LV)	PG4848HA00–1U	52–3/8	52–3/8	3	364
STRONGWELL (U/E)	PG4848HA00–1V	52–3/8	52–3/8	3	364

COVER TO BE INSCRIBED AS SHOWN ON SVP PROJECT DESIGN DRAWINGS
1) SVP UTILITY ELECTRIC BIN: TBA
2) SVP LOW VOLTAGE ELECTRIC BIN: TBA

PULLBOX SPECIFICATIONS

Grade level enclosures shall be all polymer concrete and one piece design. Covers shall be two piece design. Approved manufacturers are listed in table below.

Enclosures and covers shall be concrete grey in color.

Enclosures and covers shall be designed and tested to meet or exceed all portions of ANSI/SCTE 77 2002 Tier 15.

Covers and boxes shall meet WUC 3.6 interchangability requirements.

Boxes shall be stackable if extra depth is required.

Box covers shall have a minimum coefficient of friction of 0.6 per ASTM C 1028.

Boxes shall have an open bottom. 1 1/2" size drain rock, or sand, shall be installed under box to a minimum depth of 6".

Stub ducts into box using bends as directed on specific SVP project design drawings or by SVP inspectors.

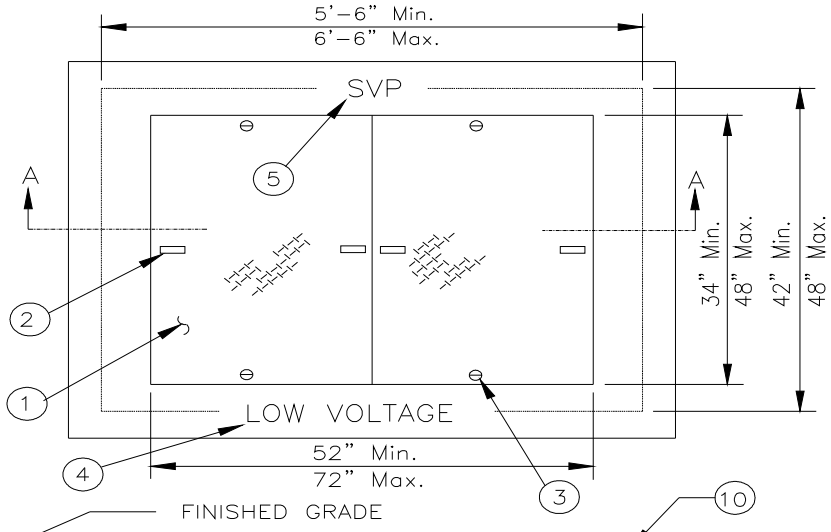
Install PVC End Bells on the ends of all ducts terminating in boxes.

48” x 48” SPLICE BOX – NON TRAFFIC

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating	
Approved: 2 May, 2014		SHEET 21 of 38	
Kevin Keating		UG 1000	Rev. 5.1

4’ x 6’ Secondary Splice Box – Light Traffic



Precast Box Requirements:

Box and cover shall meet AASHTO H-20 loading and all conditions shown noted in this drawing. Box is not rated for installation in street areas or where neavy truck traffic is anticipated.

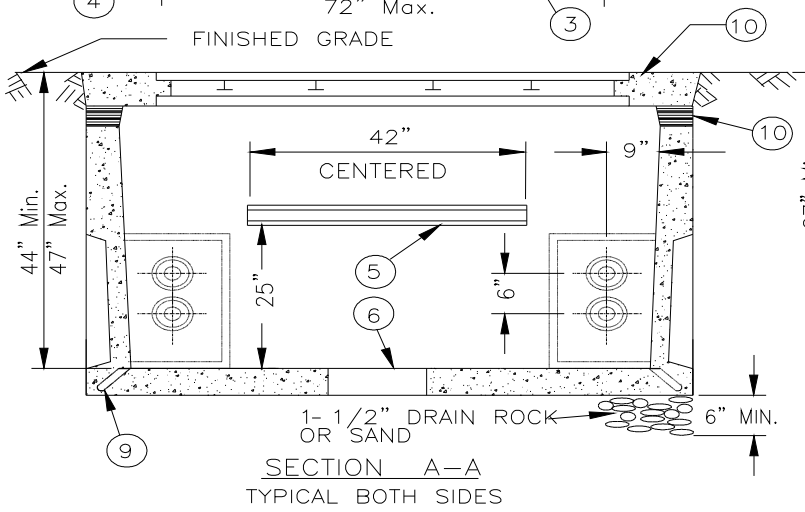
Excavation dimensions are to be supplied by the vendor.

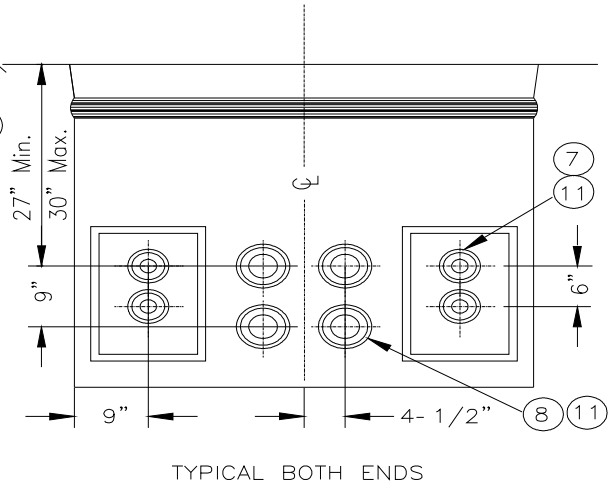
Box concrete mixture additives shall be 2% Calcium Nitrate and 7.5% microsilica by weight of concrete.

Approved Vendors & Catalog Numbers

Jensen Precast #CSC466S-2

Utility Vault Co. #644-LA-MS-3250-CSC





NOTES:

① Two piece 3/8" steel checker plate with underside bracing and non-slip epoxy coating as described in "Materials" section of this drawing.

② 1/2" x 1" lifting slot. Typical 4 places.

③ 3/8" - 16 UNC galvanized steel, flathead machine screws for bolting cover down. Top of screw shall be flush with top of box cover.

④ Concrete adjustable top. Inscribe letters as shown, 2" minimum height.

⑤ P-4000 unistrut or equal cast into walls. Typical 2 places.

⑥ 18" dia. x 2 3/4" sump centered in bottom of box.

⑦ 4-3/4" diameter knockout for customer service and street light ducts only. Typical 8 places.

⑧ 6-1/2" diameter knockouts for SVP 4" and 5" ducts only. Typical 8 places.

⑨ 1"-8 UNC pulling insert at each corner. Typical 4 places.

⑩ Level top of box with finish grade. Grout - 3 parts sand to 1 part cement.

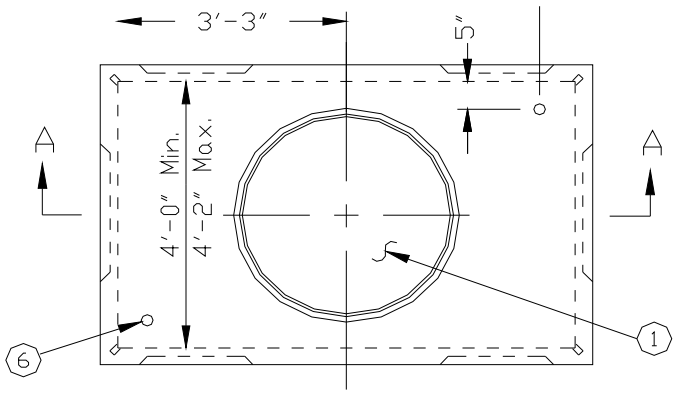
⑪ Terminate all ducts with PVC end bells.

4’ x 6’ SECONDARY SPLICE BOX – LIGHT TRAFFIC

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

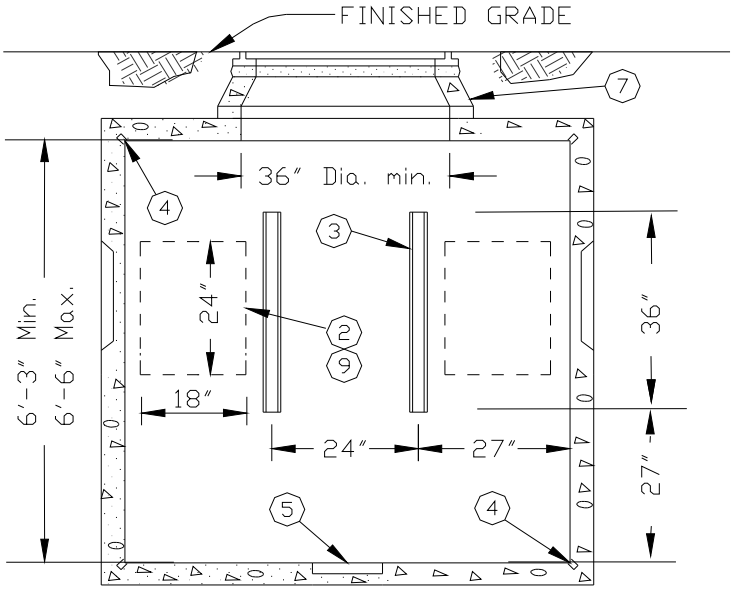
By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 22 of 38
Kevin Keating		UG 1000 Rev. 5.1

4’ x 6’ Secondary Splice Box – Full Traffic

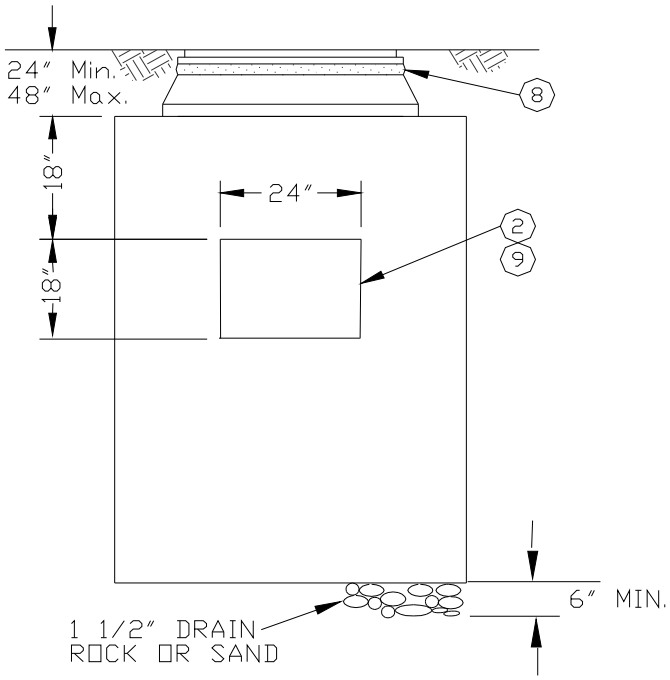


APPROVED VENDORS:
JENSEN PRECAST
UTILITY VAULT

Concrete mixture additives shall be 2% Calcium Nitrate and 7.5% microsilica by weight of cement.
Box shall meet H20-44 loading and all applicable conditions noted in this standard.
Excavation dimensions to be furnished by vendor.



SECTION A–A



Notes:

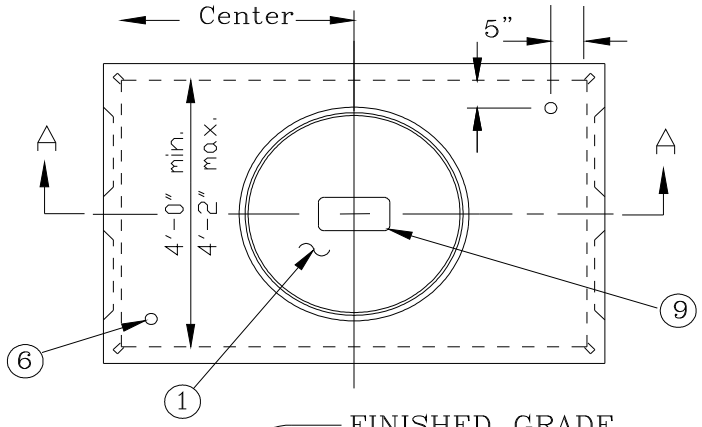
1. Steel frame and cover, inscribed "SVP LOW VOLTAGE ELECTRIC"
2. 6-18"x24" knockout areas, 2 per side and 1 on each end.
3. P-4000 Unistrut, or equal, cast into box walls; typical 4 places
4. 1"-8 UNC pulling inserts cast into box at each corner; typical 8 places.
5. Sump, 18" diameter x 2 1/2" deep, 1 required.
6. 2" diameter knockout, typical 2 places.
7. Concrete riser(s) as required. 24" min & 48" max.
8. Grout: 3 parts sand to 1 part Portland cement
9. Terminate all ducts with PVC end bells grouted flush with inside of wall.

4’ x 6’ SECONDARY SPLICE BOX – FULL TRAFFIC

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

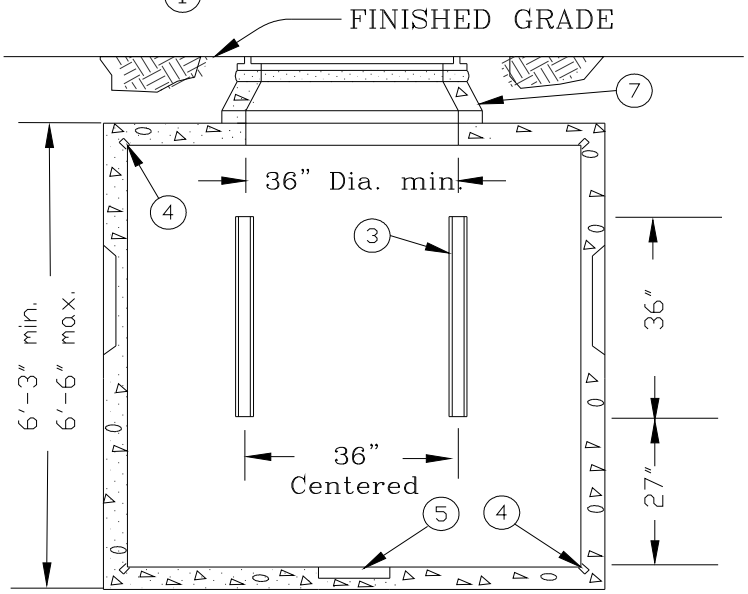
By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 23 of 38
Kevin Keating		UG 1000 Rev. 5.1

4’ x 6’ Primary Pullbox – Full Traffic

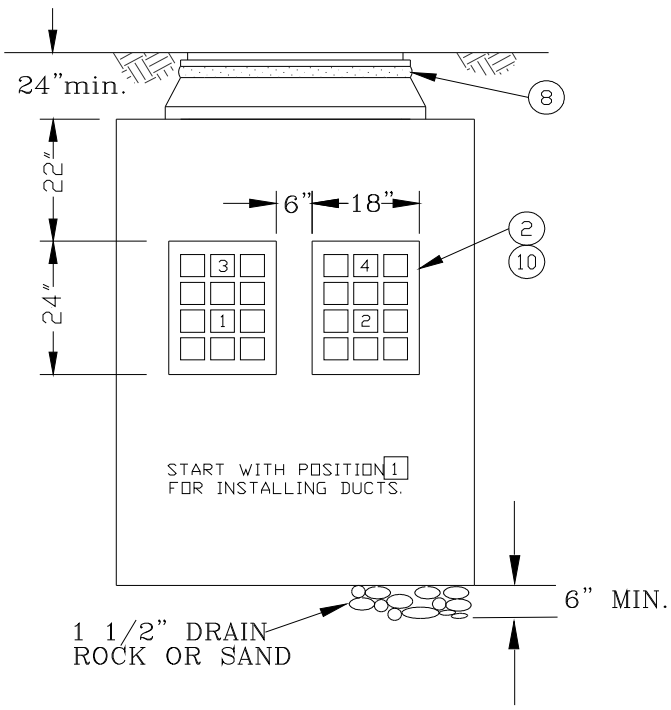


APPROVED VENDORS:
JENSEN PRECAST
UTILITY VAULT

Concrete mixture additives shall be 2% Calcium Nitrate and 7.5% microsilica by weight of cement.
Box shall meet H20-44 loading and all applicable conditions noted in this standard.
Excavation dimensions to be furnished by vendor.



SECTION A–A



NOTES:

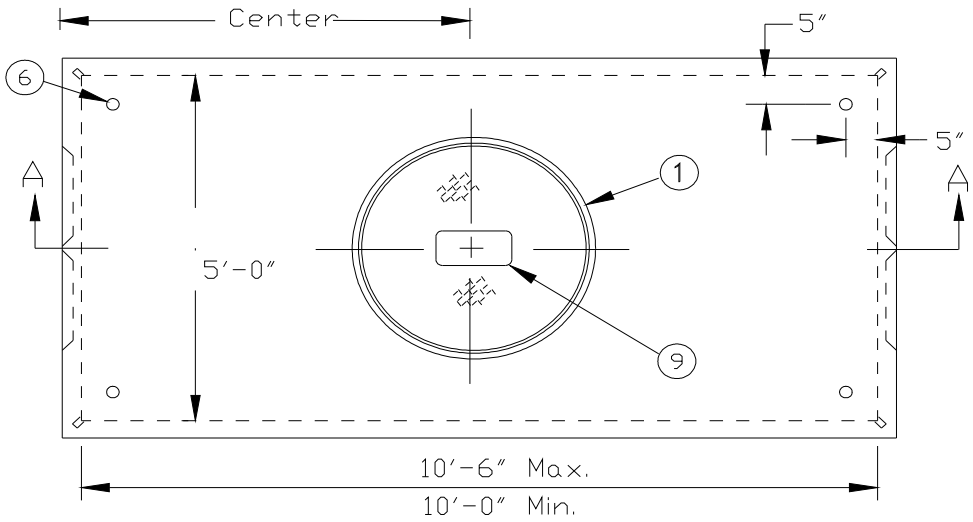
① Steel frame and cover (inscribed ”SVP HIGH VOLTAGE ELECTRIC”).
② 2–18”x 24” knockouts or 1–24”x 30” knockout centered on each end.
③ P–4000 Unistrut or equal cast into vault. Typical 4 places.
④ 1”–8 UNC pulling inserts cast into vault at each corner. Typical 8 places.
⑤ Sump, 18” Dia. x 2 1/2” Deep. 1 required.
⑥ 2” Diameter knockout, typical 2 places.
⑦ Concrete riser(s) as required. (Note: 24” min.)
⑧ Grout. 3 parts sand to 1 part cement.
⑨ Number cover as noted in ”Cover Details” section and on SVP project drawings.

4’ x 6’ PRIMARY PULLBOX – FULL TRAFFIC

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

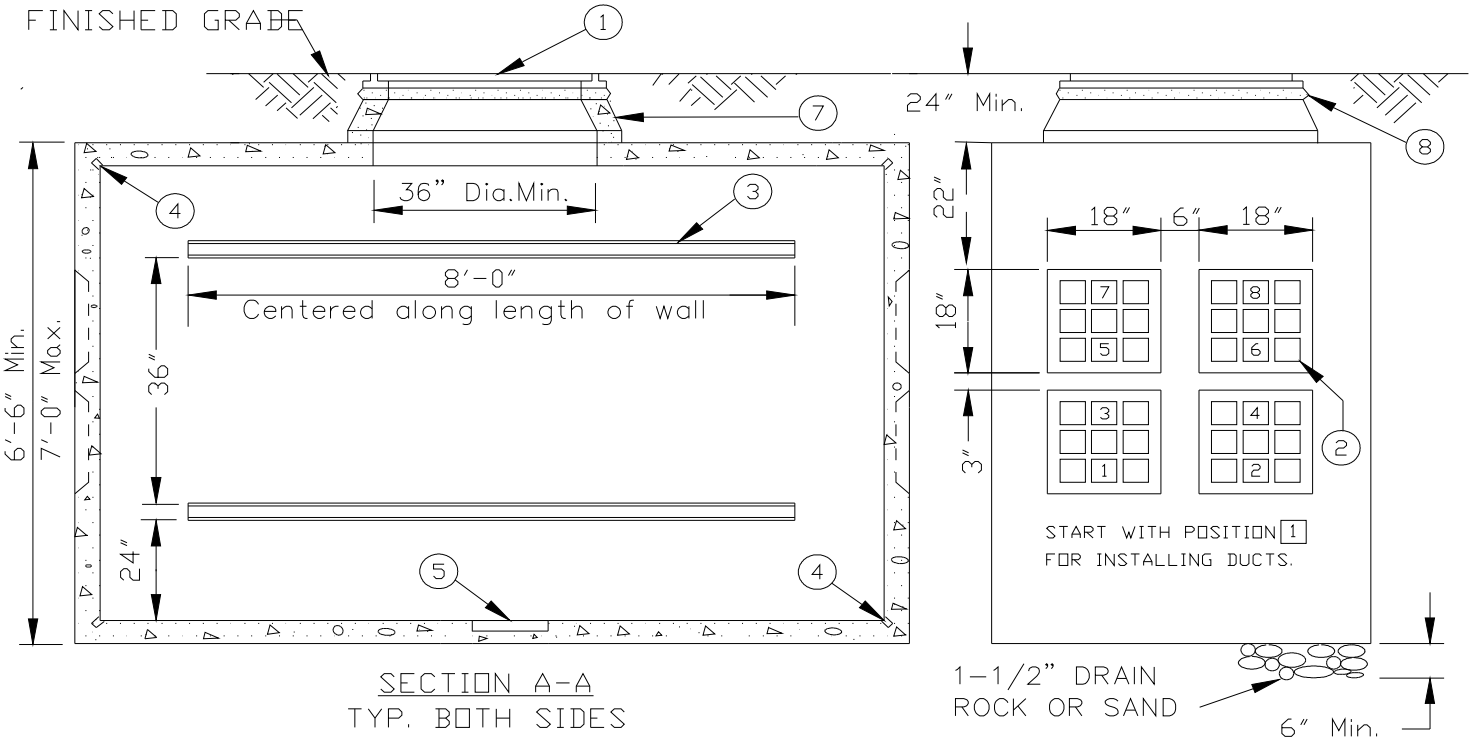
By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 24 of 38
Kevin Keating		UG 1000 Rev. 5.1

5’ x 10’ Primary Manhole – Full Traffic



APPROVED VENDORS:
JENSEN PRECAST
UTILITY VAULT

Concrete mixture additives shall be 2% Calcium Nitrate and 7.5 % microsilica by weight of cement.
Box shall meet H20-44 loading and all applicable conditions noted in this standard.
Excavation dimensions to be furnished by vendor.



SECTION A–A
TYP. BOTH SIDES

NOTES:
② 4–18″x 18″ knockouts. Typical both ends.
③ P-4000 Unistrut or equal, cast into vault, typical 4 places.
⑥ 2″ Diameter knockout. Typical 4 places.

For the following balloon numbers, see “4′ x 6′ Primary Pullbox” section.

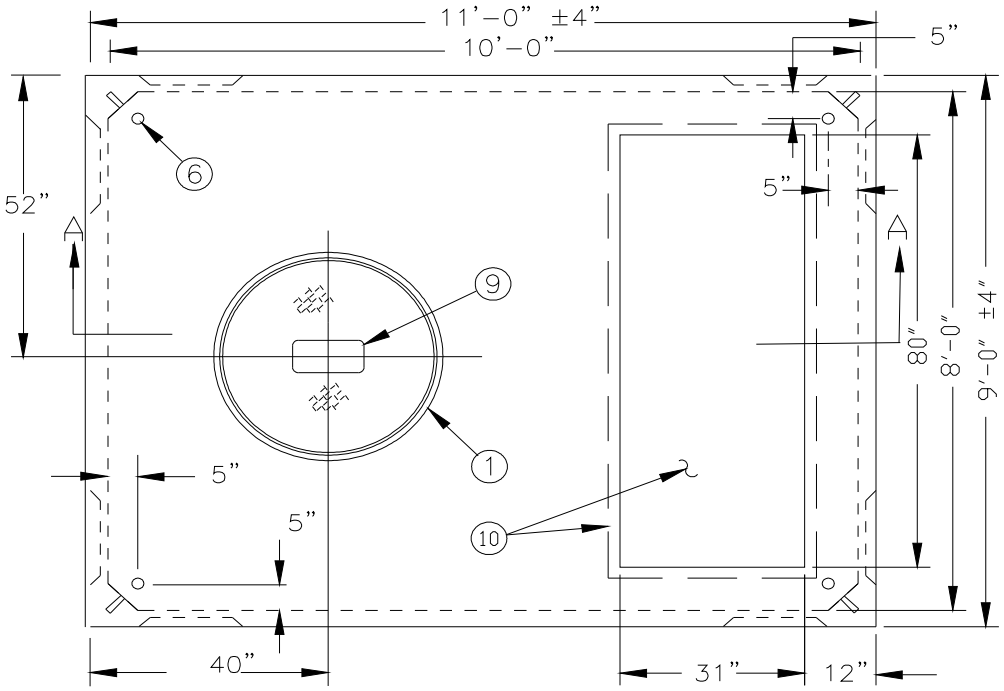
① ④ ⑤ ⑦ ⑧ ⑨

5’ x 10’ PRIMARY MANHOLE – FULL TRAFFIC

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

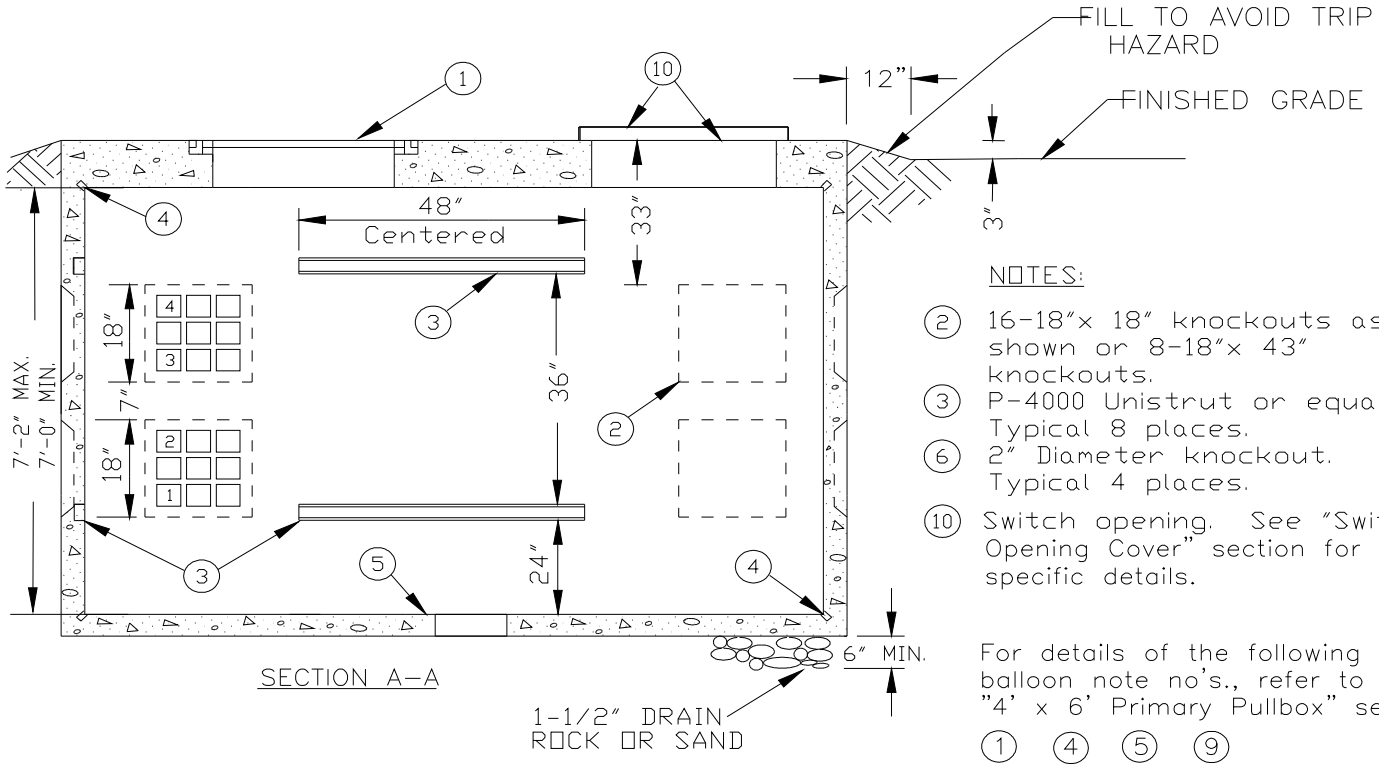
By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 25 of 38
Kevin Keating		UG 1000 Rev. 5.1

8’ x 10’ Primary Switch Vault – Full Traffic



APPROVED VENDORS:
JENSEN PRECAST
UTILITY VAULT

Concrete mixture additives shall be 2% Calcium Nitrate and 7.5% microsilica by weight of cement.
Box shall meet H20-44 loading and all applicable conditions noted in this standard.
Excavation dimensions to be furnished by vendor.



NOTES:

(2) 16-18”x 18” knockouts as shown or 8-18”x 43” knockouts.
(3) P-4000 Unistrut or equal. Typical 8 places.
(6) 2” Diameter knockout. Typical 4 places.
(10) Switch opening. See “Switch Opening Cover” section for specific details.

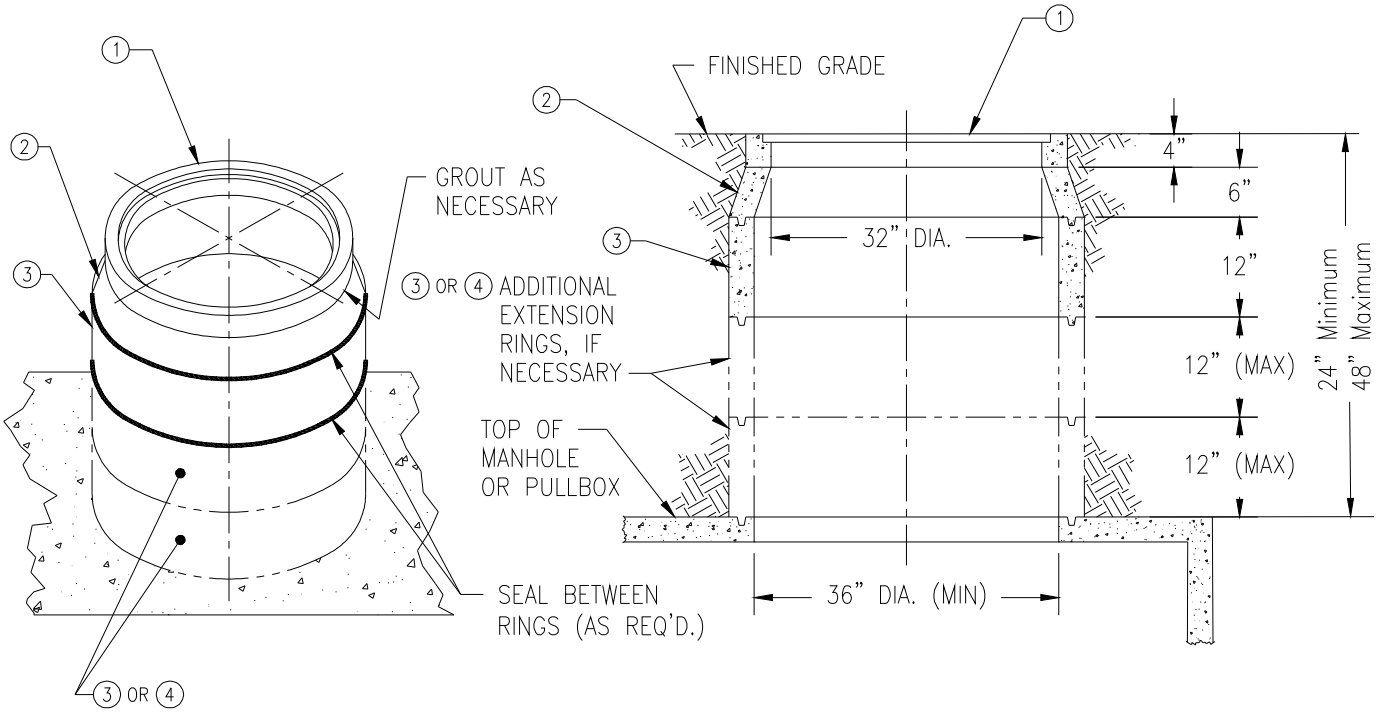
For details of the following balloon note no’s., refer to the ”4’ x 6’ Primary Pullbox” section
(1) (4) (5) (9)

8’ x 10’ PRIMARY SWITCH VAULT – FULL TRAFFIC

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 26 of 38
Kevin Keating		UG 1000 Rev. 5.1

Manhole and Pullbox Risers



NO.	DESCRIPTION	BIN
①	MH COVER ASSEMBLY	88302
②	6" REDUCER RING	88301
③	12" EXTENSION RING	88257
④	6" EXTENSION RING	88256

Notes:

Minimum distance between outside top of manhole or pullbox and finished grade is 24".
Maximum distance between outside top of manhole of pullbox and finished grade is 48".

Refer to "Manhole Covers" section for manhole cover details and requirements.

Sealing gasket material between riser rings shall be a hydrophilic type of material that swells upon contact with water, such as Adeka Ultra Seal. Seal material shall be installed on all riser joints from manhole to manhole ring.

Grout consisting of 3 parts sand to 1 part Portland Cement shall be used to fill in gaps between manhole ring and riser reducer ring. Refer to leveling detail in "Manhole Covers" section for specific details.

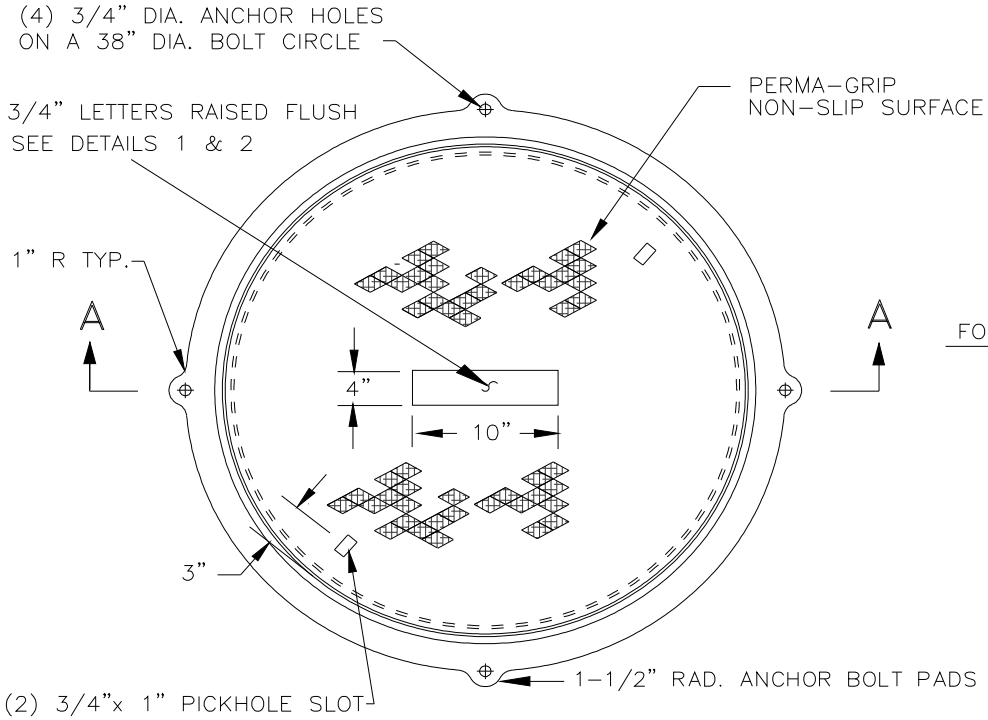
Approved Manufacturers:
- Jensen Precast
- Utility Vault

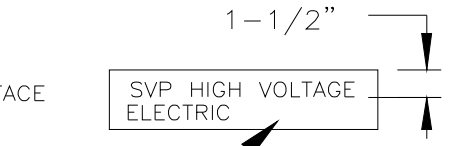
MANHOLE AND PULLBOX RISERS

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 27 of 38
Kevin Keating		UG 1000 / Rev. 5.1

Manhole Covers





THIS AREA FOR VAULT MANUFACTURER TO WELD ON NUMBER.

DETAIL 1

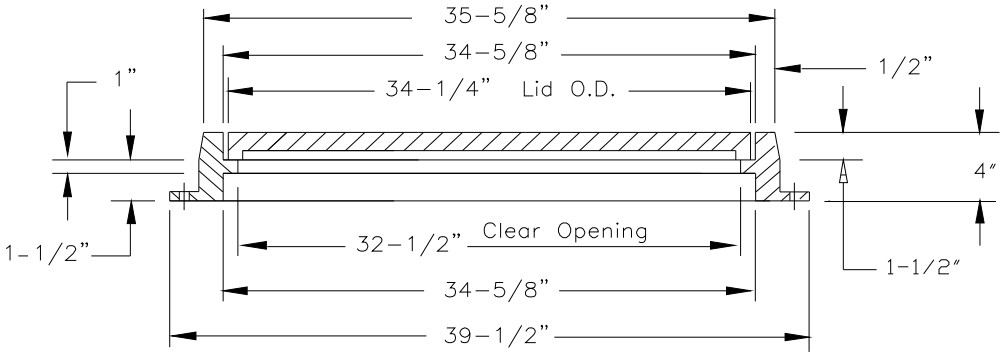
FOR PRIMARY VAULT, MANHOLE & PULL BOX COVER

SVP LOW VOLTAGE ELECTRIC

DETAIL 2

FOR SECONDARY SPLICEBOX IN TRAFFIC AREAS

NUMBERING NOT APPLICABLE TO SECONDARY PULLBOX



SECTION A-A

NOTES

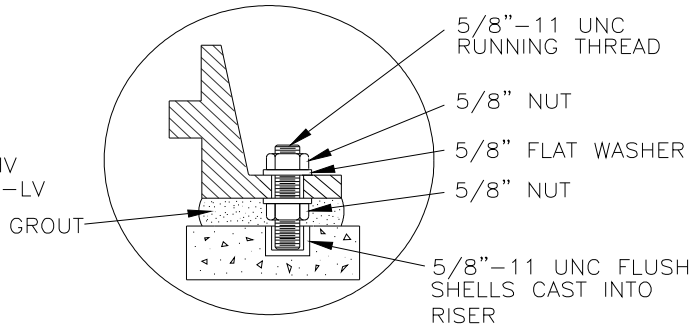
APPLICATION: Primary Vaults, Manholes, Pullboxes, & Full Traffic Secondary Splice Boxes.

APPROVED VENDOR: NEENAH FOUNDRY CO.

CATALOG NUMBERS: Primary Lid #N5900-0399-HV
Secondary Lid #N5900-0399-LV
Frame #N5900-0398

WEIGHT: Lid - 254 lbs.
Frame - 127 lbs.

MATERIAL: Cast Gray Iron
ASTM A-48 Class 35B
(Not Painted)



LEVELING DETAIL

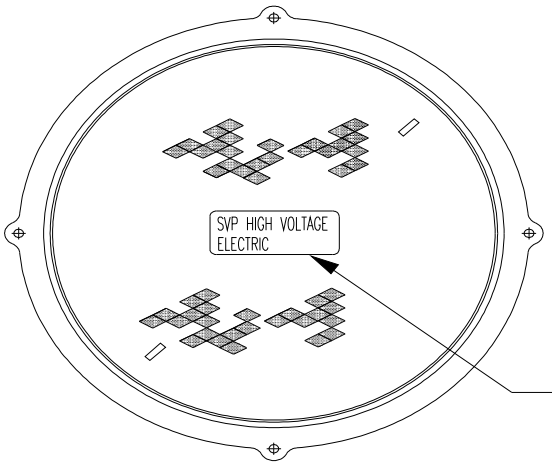
For Splice Boxes, Pullboxes, and Manholes

MANHOLE COVERS

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating	
Approved: 2 May, 2014		SHEET 28 of 38	
Kevin Keating		UG 1000	Rev. 5.1

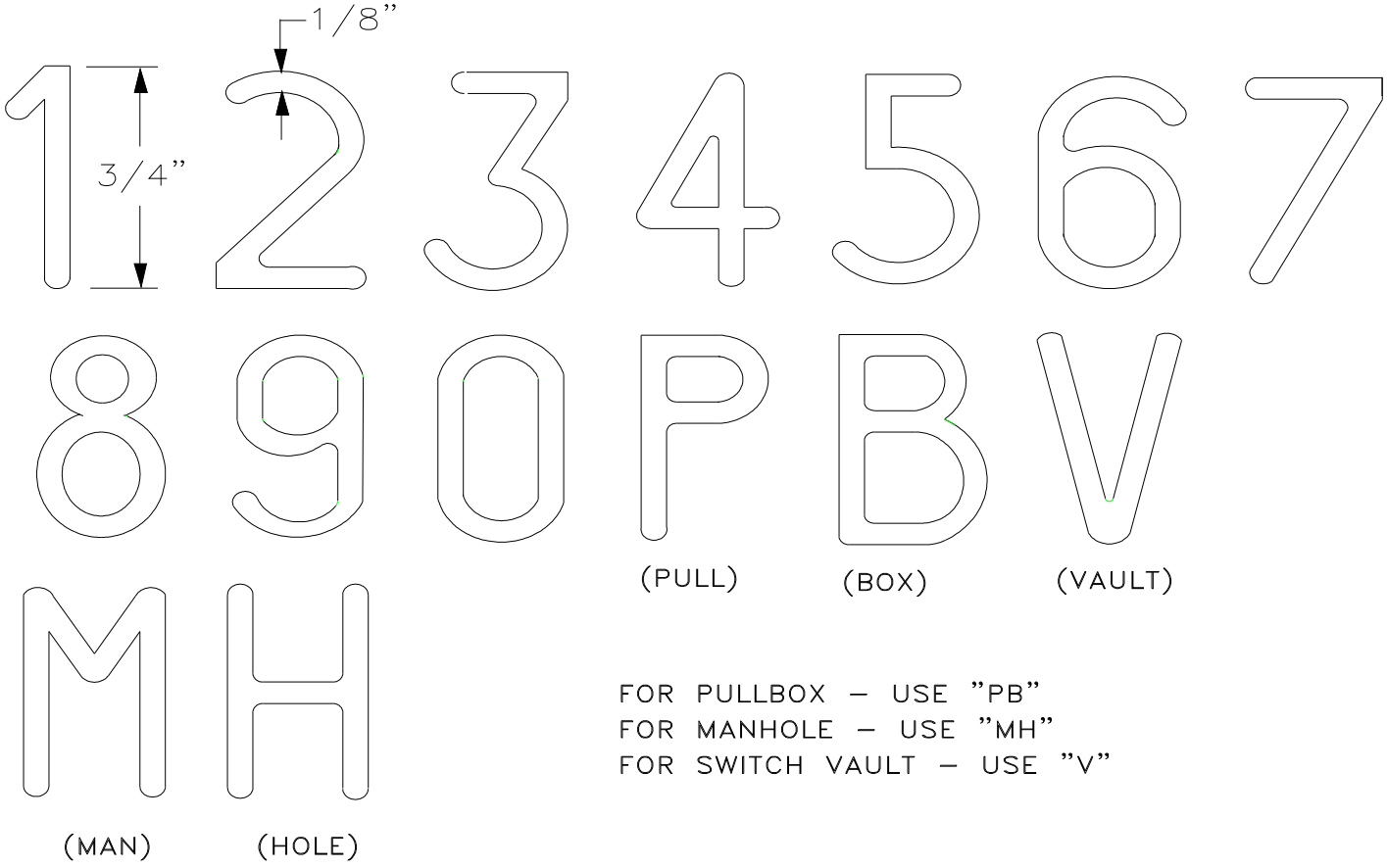
Manhole Cover Lettering and Numbering



NOTES:

1. Arc weld numbers and letters on frame as shown. Build bead to 1/16" high.
2. Covers for Manholes and Pull–boxes that are located in side–walks shall be sand epoxied by vault manufacturer as noted in "Materials" section.

SPACE FOR WELDING V, MH, OR PB NO. (Welding by Vault Manufacturer) Numbers will be specified on SVP project drawings.



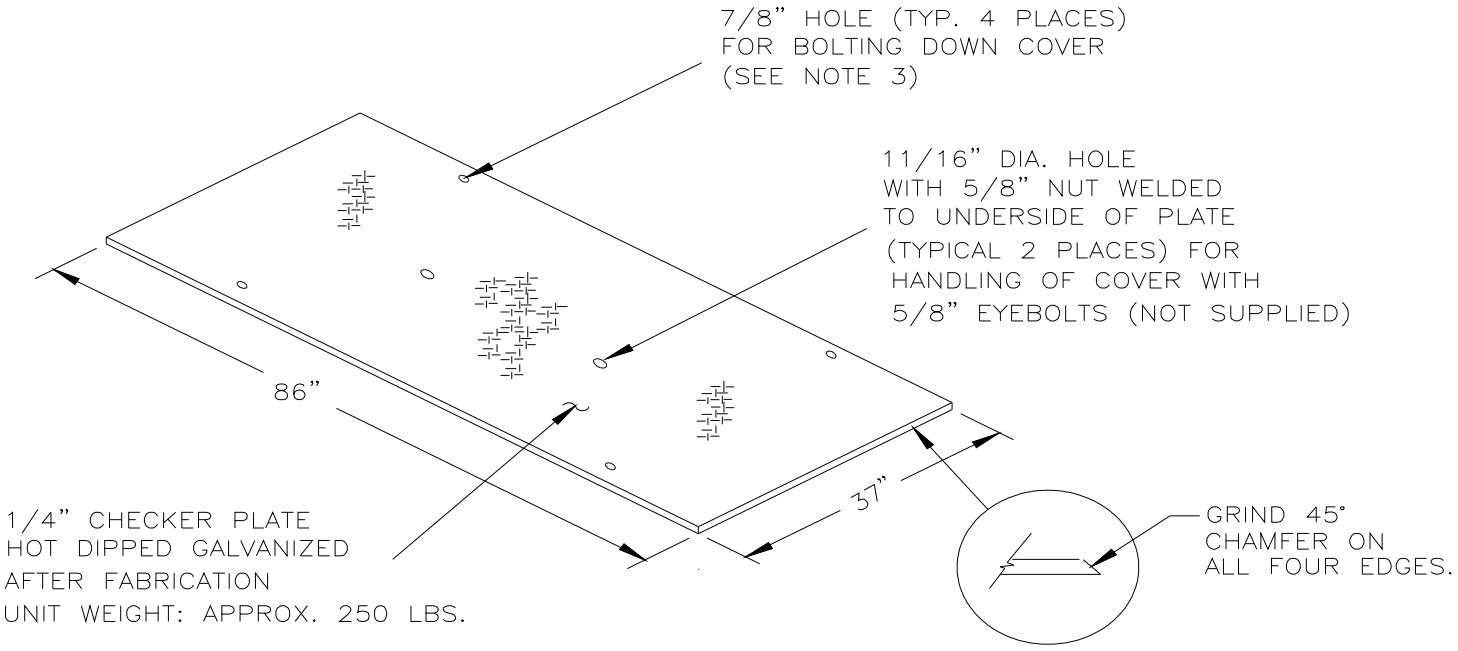
FOR PULLBOX – USE "PB"
FOR MANHOLE – USE "MH"
FOR SWITCH VAULT – USE "V"

MANHOLE COVER LETTERING AND NUMBERING

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

By: K. Keating	Installation of Underground Substructures by Developers	Drawn By: K. Keating
Approved: 2 May, 2014		SHEET 29 of 38
Kevin Keating		UG 1000 Rev. 5.1

Switch Opening Cover



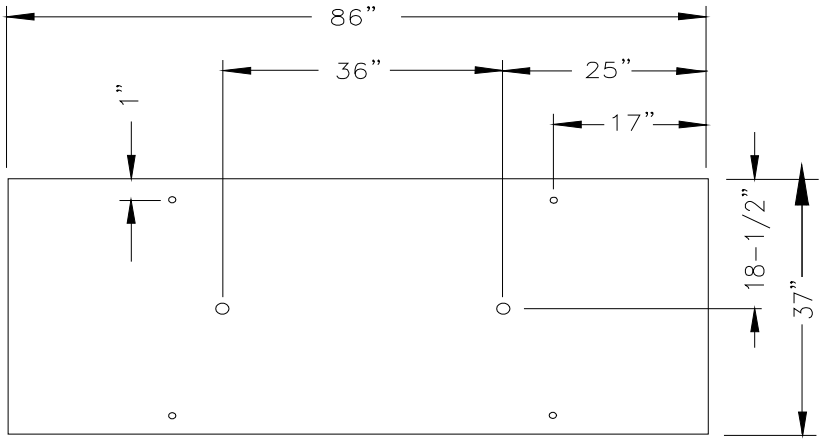
NOTES:

1. Cover, bin #88299, shall be provided by SVP. Developer is responsible for picking up cover from SVP Service Center at 1705 Martin Ave, Santa Clara, CA.

2. Developer shall install checker plate cover over switch vault opening as shown on "Primary Switch Vault" drawing detail.

3. Developer shall provide and install 4-5/8" anchors in vault to match the 7/8" diameter holes on the cover and bolt cover down with 4-1/2" hex head bolts and flat washers.

4. Developer shall be responsible for keeping cover bolted in-place over switch vault opening until acceptance by SVP.



TOP VIEW

SWITCH OPENING COVER

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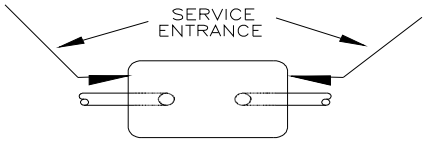
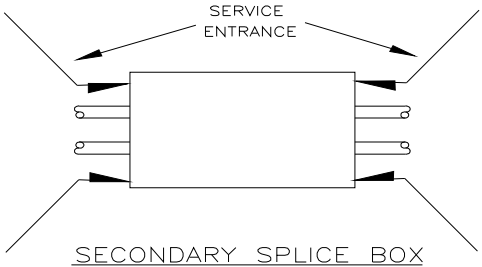
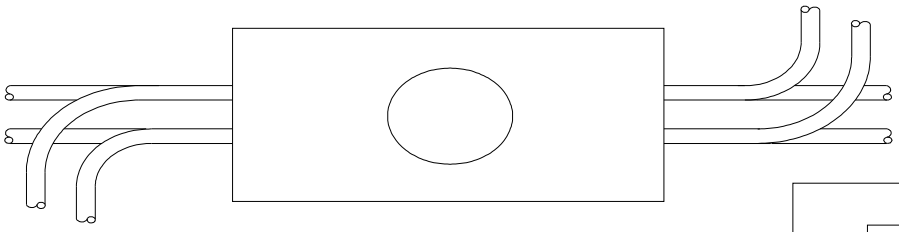
Routing of Ducts into Boxes



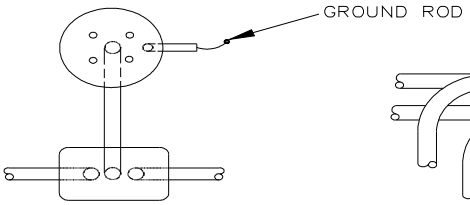
SECONDARY SPLICE BOX



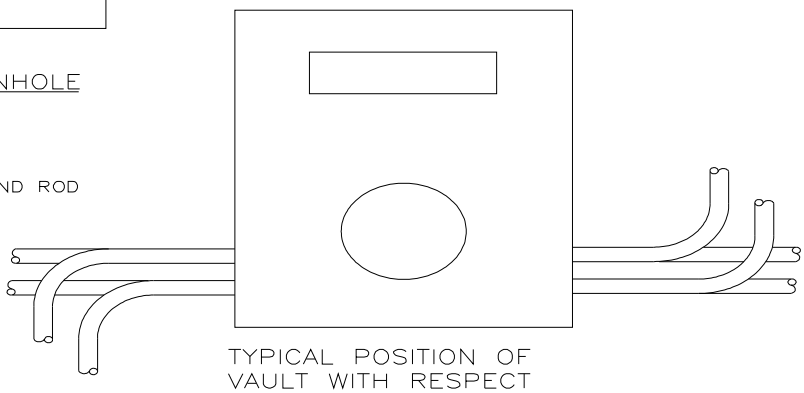
SECONDARY SPLICE BOX
Medium or Full Traffic



PRIMARY PULL BOX OR MANHOLE



STREET LIGHT FOUNDATION
WITH SPLICE BOX.



TYPICAL POSITION OF
VAULT WITH RESPECT
TO CURB IF APPLICABLE.

NOTES:

1. Route ducts into boxes as shown. These are typical examples. Any exceptions will be shown on SVP detailed project drawings.
2. Location and position of boxes will be shown on SVP project drawings.
3. For location of ducts in the knockouts, see appropriate box detail section of this standard.
4. In primary duct bank installations, ducts shall be terminated as specified on primary box detail section drawings of this standard. Duct terminations should be equally distributed among all knockout positions on the same box wall, unless otherwise directed by SVP project drawings or SVP inspectors.
5. Terminate ducts in boxes with PVC end bells. In precast concrete boxes, end bells shall be grouted flush with the box wall.
6. Size and number of ducts will be specified on SVP project drawings.

ROUTING OF DUCTS INTO BOXES

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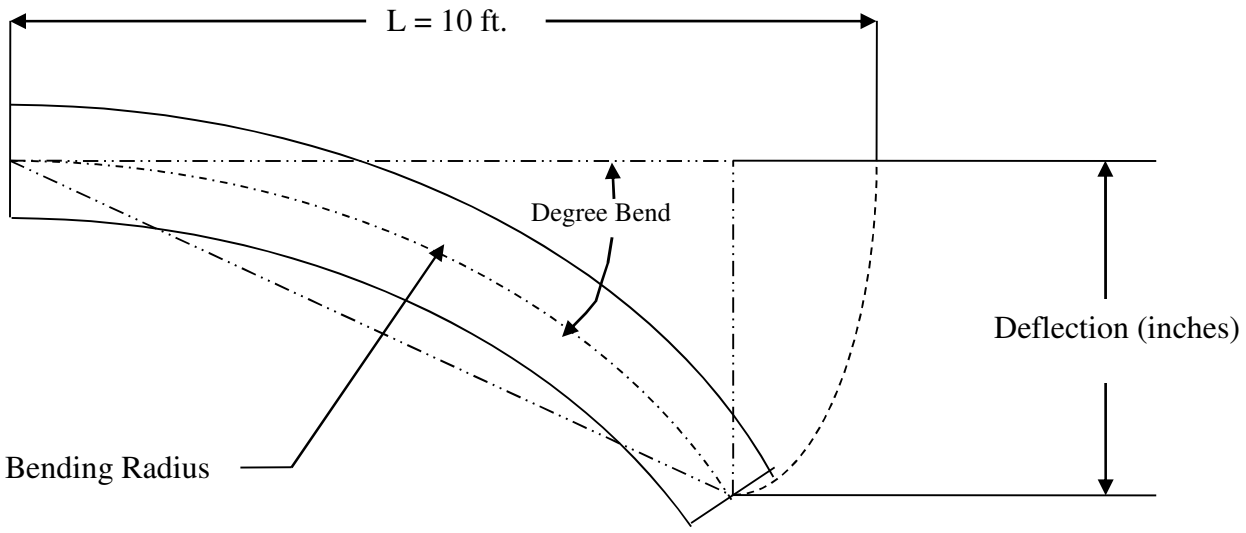
PVC Duct Sweep Limits

PVC Duct bends or sweeps can be made in the field without mechanical benders to get around obstructions.

The following diagram and table show safe bending amounts for various sizes of ducts. Bending a duct beyond these values may result in buckling of the duct. For sweeps with a shorter bending radius than shown, use factory made bends, referenced on sheet 31. Bends made in the field using a "hotbox" or similar techniques are **not** allowed.



Bending Allowance per 10 feet of PVC Duct			
Duct Size (In)	Bending Radius (ft.)	Max Degree Bend	Deflection (In)
1½	20	14.5	29.7
2	25	11.6	23.9
3	36	7.9	16.4
4	47	6.1	12.8
5	58	4.9	10.3
6	69	4.2	8.7

PVC DUCT SWEEP LIMITS

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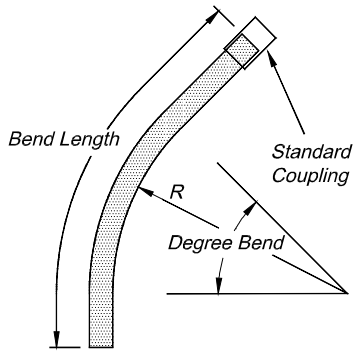
Manufactured Duct Bends

Factory made bends are to be used in situations where the required duct bending radius is less than as shown on sheet 30 of this standard - "PVC Duct Sweeps Limits". The following tables list duct bends that are approved for purchase by SVP. Bends shall meet the latest revision of ASTM Standard F 512, NEMA Standards TC-8 & 9, and W.U.C. Guideline 3.1. In the event of a conflict, the most stringent will apply. Bends made in the field using a "hotbox" or similar techniques are **not** allowed.

2 Inch Diameter DB-120 Duct

DEGREE BEND	2' R		3' R	
	Bin #	Bend Length	Bin #	Bend Length
22½ °	n/a		90260	18.5"
30 °	90235	13.5"	90261	22.75"
45 °	90236	22.75"	90262	32.25"
90 °	n/a		90263	60.5"

Note: 90235 is an 18" radius bend



4 Inch Diameter DB-120 Duct

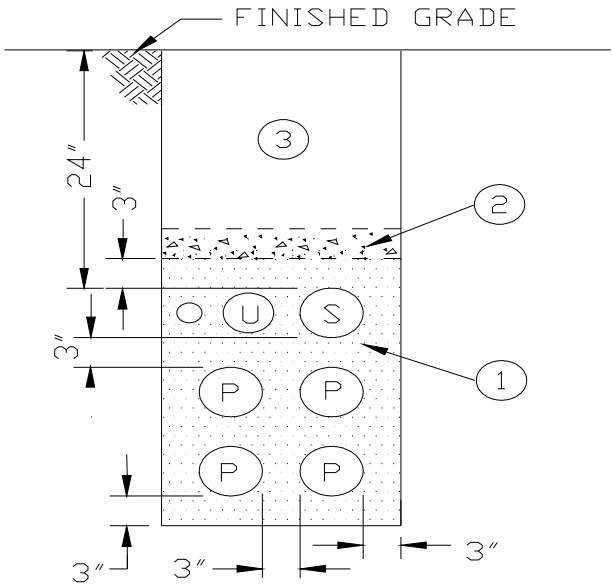
DEGREE BEND	3' R		5' R		12½' R	
	Bin #	Bend Length	Bin #	Bend Length	Bin #	Bend Length
11¼ °	n/a		n/a		90245	36.5"
22½ °	90264	21.5"	n/a		90246	66"
30 °	90240	25.75"	90265	38.5"	n/a	
45 °	new	35.25"	90266	54"	n/a	
90 °	90237	63.5"	90267	101.25"	n/a	

5 Inch Diameter DB-120 Duct

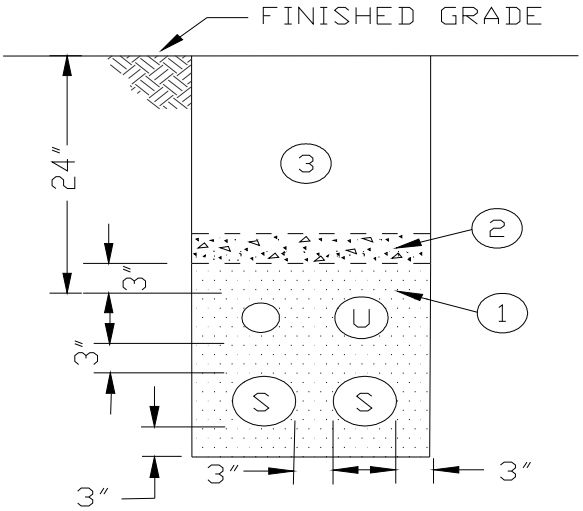
DEGREE BEND	3' R		5' R		12½' R	
	Bin #	Bend Length	Bin #	Bend Length	Bin #	Bend Length
11¼ °	n/a		n/a		90247	36.5"
22½ °	90268	21.5"	n/a		90248	66"
30 °	90269	25.75"	90242	38.5"	n/a	
45 °	90244	35.25"	90270	54"	n/a	
90 °	90243	63.5"	90250	101.25"	n/a	

Note: Bend lengths shown are minimum required lengths. Bends may be supplied with a belled end or with a coupling cemented in place.

Trench Cross Sections



STANDARD TRENCH
1-S/L2, 1-U/E4, 1-S5,
AND 4-P5 DUCTS



TYPICAL LOW
VOLTAGE TRENCH
1-S/L2, 1-U/E4,
AND 2-S5 DUCTS

(1) Sand encased. (2) 3" Concrete cap (3) Backfill.

NOTES:

1. Concrete cap required when ducts are installed in an area that can be planted. Use a 3 sack minimum mix for the concrete.

2. All dimensions shown are minimum required. 30" minimum cover over primary ducts is required. Number and sizes of ducts to be shown on detailed SVP project drawings.

3. Ducts shall be separated, tied together, and supported with 3" non-metallic spacers at 5'-0" intervals. No metallic materials may be used to provide cross support or be placed across duct banks.

4. If additional PRIMARY ducts are required, add them to the bottom of the trench using the same configuration as shown in the adjacent details.

5. Backfill in accordance with City of Santa Clara Engineering Department Specifications. Sand backfill around ducts with 90% minimum compaction. See "Materials" section for sand requirements.

TRENCH CROSS-SECTIONS

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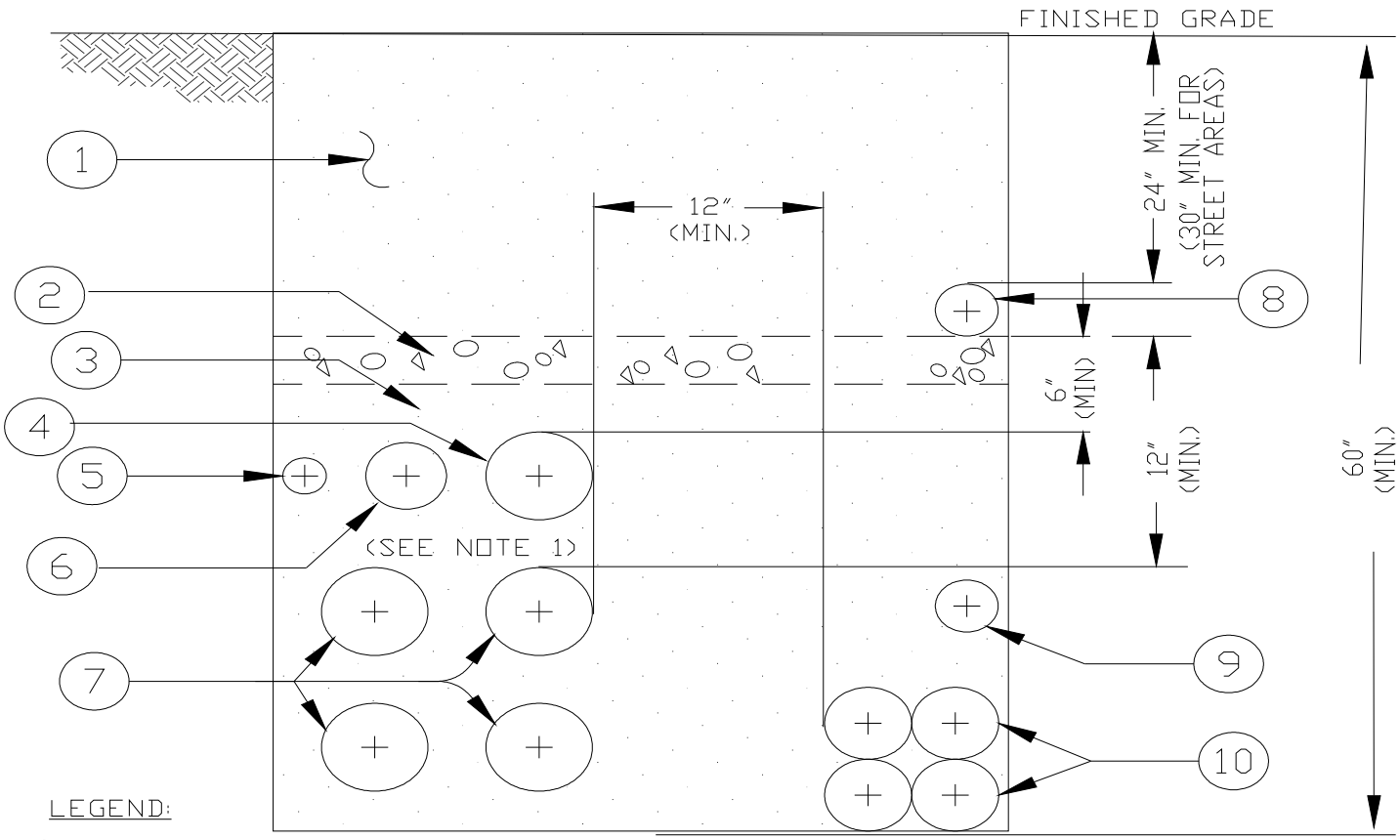
Joint Trench Configuration



LEGEND:

1. Natural Backfill
2. 3" Concrete Cap (required only for plantable areas and other locations as called for on plans)
3. Sand Backfill
4. 5" Secondary Conduit
5. 2" Street Light Conduit
6. 4" Utility Electric Circuit
7. 5" Primary Conduits
8. PG&E Gas
9. CATV
10. Telephone Conduits

NOTES:

1. Refer to "Trench Cross-Sections" for typical electric trench sections and minimum duct spacing requirements.

2. Minimum depth and separation requirements between gas, CATV, and telephone conduits to be provided by the respective utilities.

3. Depth and backfill requirements for joint trenches in public right of way shall comply with City of Santa Clara Engineering Department Standard Specifications.

4. Joint trench construction requirements apply when all utility substructures are installed at the same time.

JOINT TRENCH CONFIGURATION

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

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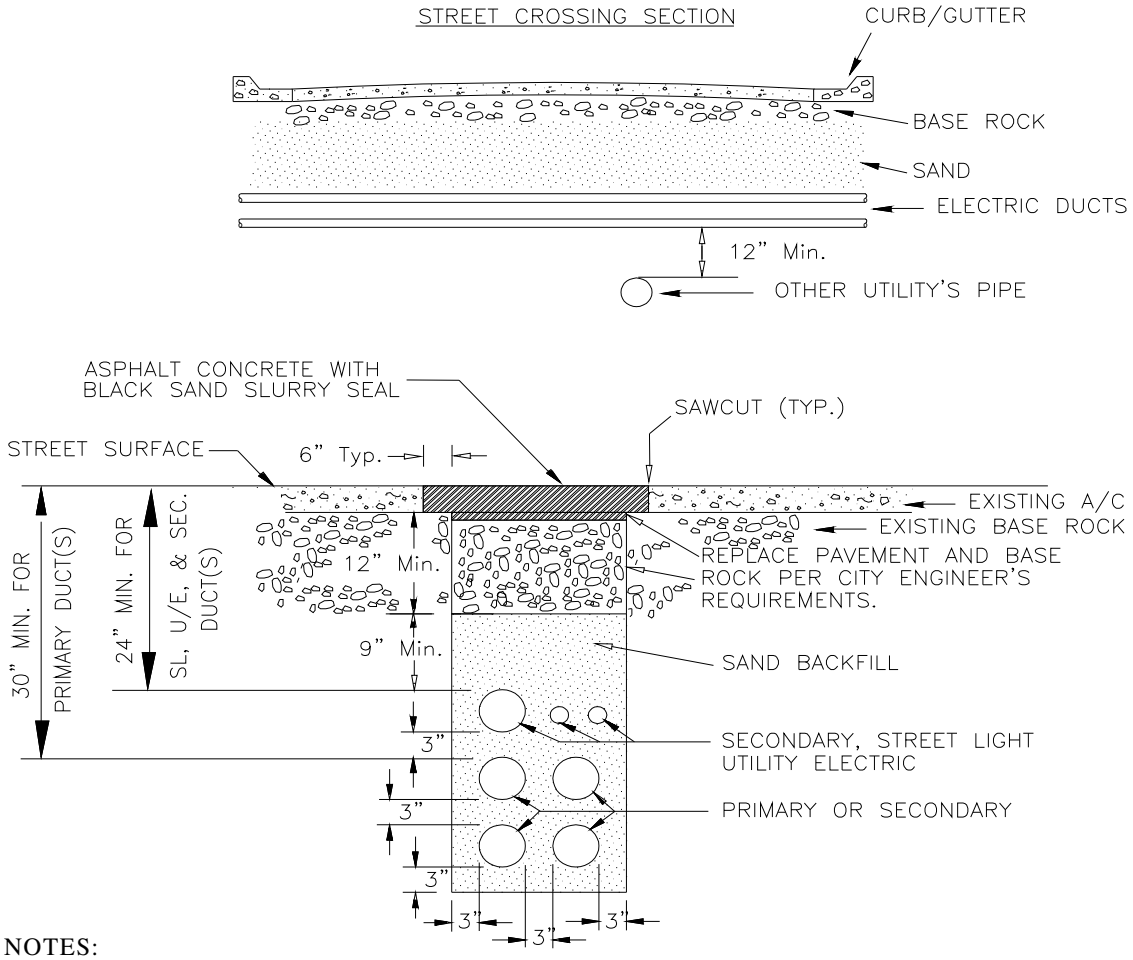
Street Crossing Trench Details



NOTES:

1. Backfill and compaction shall comply with City of Santa Clara Engineering Department Standard Specifications.

2. Comments apply to trenches in existing street areas. City Street Department will make final street repair unless noted otherwise.

3. Thickness of A/C paving and base rock in new construction shall conform to requirements of approved street improvement plans.

4. All dimensions shown are minimum required.

5. The 6" bench section for A/C shall be cut and removed immediately prior to finish paving operations.

6. Ducts may cross over or under crossing utilities as necessary to maintain a minimum 12" separation from other utility pipes.

7. Maintain a minimum 5' separation between ducts installed parallel to other utility ducts, except for joint trench installations. Refer to "Joint Trench Configuration" section for joint trench installation details and requirements.

STREET CROSSING TRENCH DETAILS

Rev.	Date	Description	Appr.	Rev.	Date	Description	Appr.

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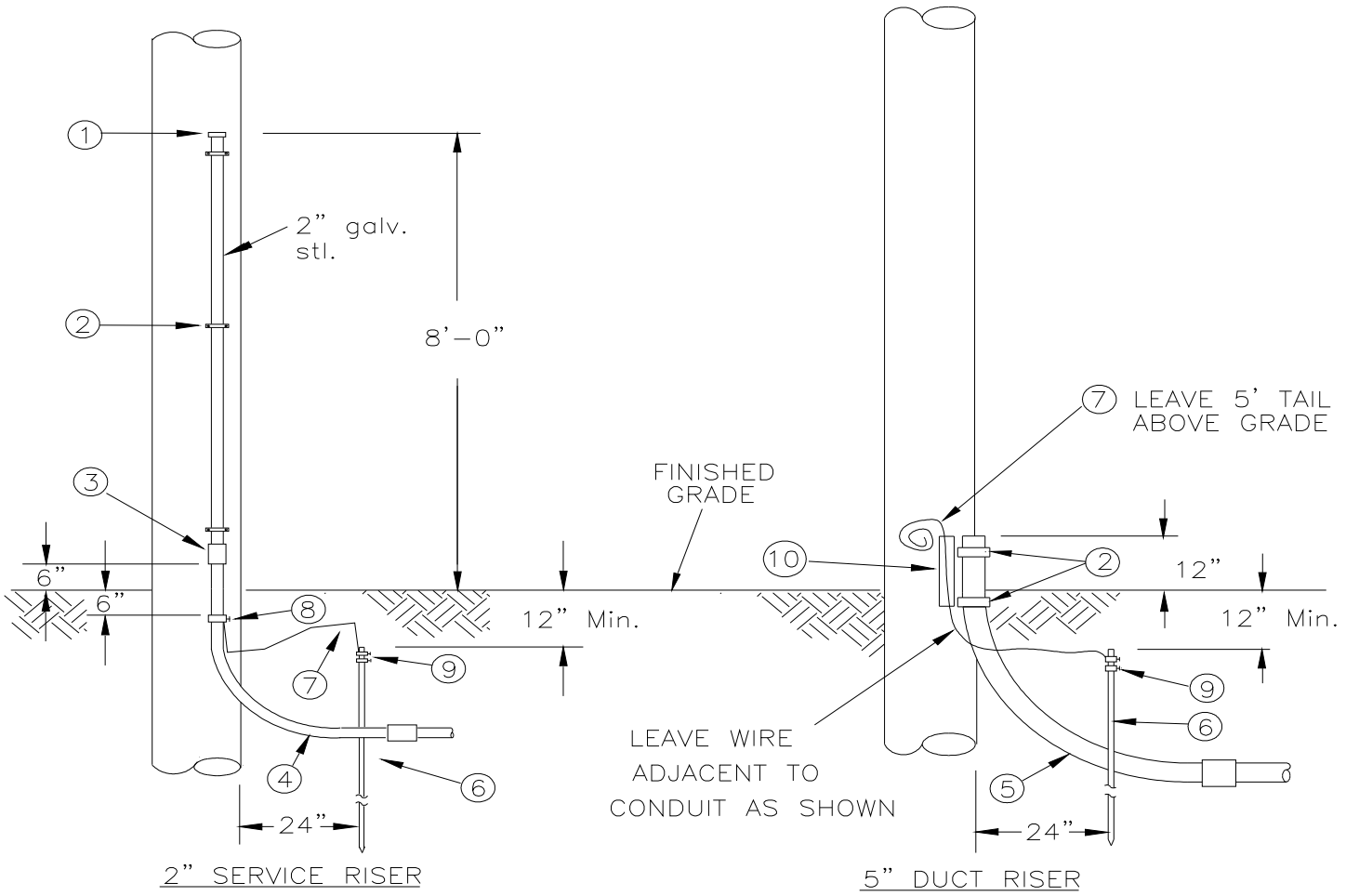
Riser Pole Details



NOTES:

1. 2" Threaded grounding bushing, galvanized steel.
2. Galvanized steel straps for rigid conduit.
3. Threaded galvanized steel coupling.
4. 2" x 24" radius, galvanized steel bend.
5. 5" x 90° x 36" minimum radius, PVC DB120 bend.
6. 5/8" x 8'-0" copper ground rod.
7. #2 AWG stranded bare copper ground wire.
8. Bronze ground pipe clamp; Burndy GAR, Penn-Union type GPL, or equal.
9. Install two copper ground rod clamps per "Materials" section.
10. Run ground wire inside 3/4" PVC sleeve 12" above grade.

Private risers are to be installed per City of Santa Clara Building Inspection Division Codes.

RISER POLE DETAILS

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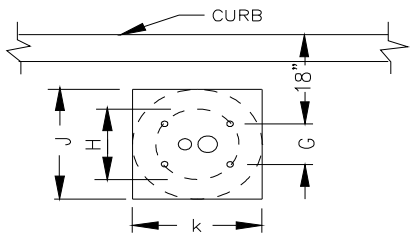
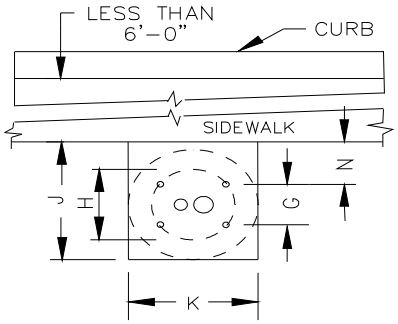
Street Light Foundation Details

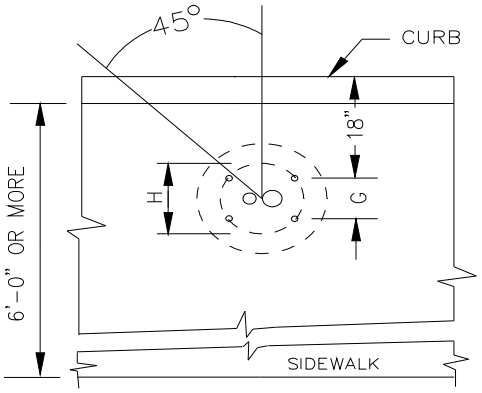
NO SIDEWALK

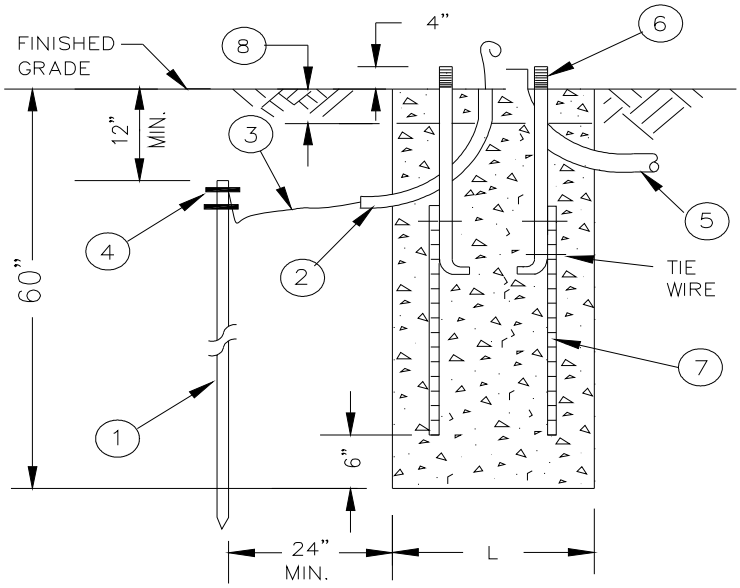


SIDEWALK
LESS THAN 6 FT.



SIDEWALK
6 FT & MORE.





DIMENSION TABLE

TYPE / DIM.	A	B
	25',30',32' AL, 24', & 30' Steel	(40' STEEL)
G	8-1/8"	9-3/16"
H	11-1/2" Bolt Circle	13-1/4" Bolt Circle
J	24"	30"
K	24"	30"
L	24"	30"
N	8"	12"

ANCHOR BOLT DIMENSIONS

TYPE A – 1" DIA. x 36" LG.
TYPE B – 1-1/8" DIA x 40" LG.

NOTES:

① Install 5/8" x 8'-0" Ground Rod.
② Install 3/4" x 90° x 12" radius PVC elbow for ground wire.
③ Install #2 AWG str. bare cu. Leave 24" coiled on top of foundation.
④ Install 2 copper ground rod clamps as described in "Materials" section.
⑤ Install 2" x 90° x 24" radius, PVC bend.
⑥ Install 4 - Galvanized steel anchor bolts. See table above for size.
⑦ Install 4 - 1/2" diameter x 40" long reinforcing bars. Wire tie to anchor bolts.
⑧ If foundation is installed in sidewalk, pour the foundation to within 4" of sidewalk surface. The rest will be filled in when the sidewalk is poured. If no sidewalk is installed or foundation is outside the sidewalk, finish top 6" of foundation to dimensions J & K flush with top of curb or back of sidewalk.

STREET LIGHT FOUNDATION DETAILS

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