Installation of Underground Substructures by Developers

ISSUING DIVISION: Electric Engineering
SVP SPONSOR: Sachin Bajracharya, Principal Electric Utility Engineer

Signed by Kevin Keating
Date Signed 1 April, 2024
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SECTION: Substructures — UG 1000

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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 approved Developer's Work Drawing (DWD) prepared by Silicon Valley Power (SVP).

This revised standard outlines and details the installation of underground substructures. This is a major revision to the previous revision 5.1 of the UG 1000 document that includes the following changes and additions:

- Table of Contents: added Appendix A, which lists relevant SVP standards.
- Work Requirements - eliminated 480V 3-phase, 3-wire as option for underground service.
- Bonds - removed section and notes.
- Mineral Oil Equipment Pad Clearances - showed equipment pad clearances and easement to scale.
- Transformer Pad Clearances - added new page to clarify transformer clearances.
- Single Phase Transformer Pads - revised detail.
- Three Phase Transformer Pads - revised detail.
- Pre-cast Pad for Temporary Transformer - included new sheets for temporary power pre-cast pads.
- Primary Metering Enclosure Pads - added clearance notes and included new sheet to show primary metering grounding details.
- Splice Box Sheets - replaced manufacturer Carson Ind. to Old Castle on all splice box sheets.
- 17"X30" Splice Box - adjusted ground rod location into street light pullbox.
- 4'X6' Secondary Splice Box: Light and Full Traffic - added elevation views.
- Primary Pullboxes, Manholes and Switch Vaults - added elevation views and increased minimum inner clearance height to 6'-6".
- Routing of Ducts into Boxes - added PVC Schedule 40 as approved conduit.
- Manufactured Duct Bends - changed SVP conduit standard from DB-120 to Schedule 40 PVC and added 6" conduit to chart.
- Joint Trench Configuration - changed primary feeder conduit minimum size from 5" to 6" conduit.
- Manhole and Joint Trench Clearances and Easements - new sheet included to show clearances and easements around manholes and trenches.
- Riser Pole Details - added new secondary splice box and 2" fiber conduit. Also added new page for Customer Riser Pole Details.
- Street Light Foundation Details - added ADA clearance requirements.
- Added Appendix A - Other Relevant Standards.

References

- American National Standards Institute F - 77 "Smooth-Wall PVC conduit and Fittings for Underground Installation" - latest revision.
- American National Standards Institute C 857-95 - latest revision.
- American National Standards Institute/Society of Cable Telecommunications Engineers 77 2002
- "Specification for Underground Enclosure Integrity" - latest revision.
- American Society for Testing and Materials C 94 - latest revision.
- American Society for Testing and Materials C 150 - latest revision.
- National Electric Code - latest revision.
- National Electrical Manufacturers Association TC-8 - latest revision.
- National Electrical Manufacturers Association TC-9 - latest revision.
- Western Underground Committee Guide 3.1 "Plastic Conduit and Fittings" - latest revision.
- Western Underground Committee Guide 3.6 "Non-Concrete Enclosures" - latest revision.
- CPUC General Order 128 "Rules for Construction of Underground Electric Supply Systems" - latest revision.
- Silicon Valley Power, City of Santa Clara, Rules and Regulations - latest revision.
- Silicon Valley Power "UG Standards" - Latest Revisions per Appendix A.

Rescissions

UG-1000 - Installation of Substructures by Developers, Revision 5.1

Definition of Terms

Barrier Pipes: Strong pipes that are used for mechanical protection of electrical equipment installed around it. Used interchangeably with the term "Guard Pipes".

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 party or parties on the second part of his or their legal representative.

City: City of Santa Clara or the City Council 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.

Developers Work Drawing (DWD): A detailed design drawing approved by SVP describing all required substructure work to be installed by developers for use and ownership by SVP.

Duct Bank: A group of electrical conduits that provide pathways and protection for electrical feeders. Used interchangeably with the terms "Conduits" or "Ducts".

High Voltage / Primary: SVP Electric facilities operating at 12,000V.

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

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. Used interchangeably with the term "Low Voltage".

Service Entrance: The underground service conductors and duct(s) between the customer's main switchgear 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 Underground Inspector - Service Coordinator: Silicon Valley Power Inspector who is responsible for verifying proper installation of electric substructures installed for SVP use.

Utility Connection Point (UCP): The location where customer owned service cables are connected to SVP owned cables. Typically either inside an SVP transformer or SVP low voltage splice box. For 12KV services, the UCP is inside the customer owned switchgear. All connections are made by SVP crews.

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 developers work drawing(s) (DWD).

Note: There are no customer owned splice boxes allowed between the main service panel and the utility connection point.

B. Developer shall run underground Service Entrance conduit(s) and conductors to utility connection point(s) shown on developers work 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 90° duct bends to route up into transformer pad's 16" x 18" secondary well area.

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

      1. Five (5) 5" conduits.

      2. Nine (9) 4" conduits.

      3. Twelve (12) 3 $\frac{1}{2}$" 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 well area:

      1. Twelve (12) 500 MCM, or smaller, AL or CU conductors per phase and neutral.

2. Single Phase Padmount Transformer

   a. Do not run Service Entrance conduit(s) and conductors directly to transformer pad.

3. Standard Underground Electric Service

   a. 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 1-Phase 3-Wire	400 Amps
	120/240V 1-Phase 3-Wire	400 Amps
INDUSTRIAL / COMMERCIAL	120/240V 1-Phase 3-Wire	400 Amps
	120/208V 1-Phase 3-Wire	400 Amps
	120/208V 3-Phase 4-Wire	3000 Amps
	277/480V 3-Phase 4-Wire	4000 Amps
	12,000V 3-Phase 3-Wire	To be approved by SVP Engineering.

4. Customer shall provide 8' minimum of service entrance conductor slack in all utlilty boxes. For 17"X30" and 24"X36" boxes, only 4' minimum of service entrance 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 3.5" minimum duct size is required for residential 400 amp panels and 4" minimum duct size required for commercial 400 amp panels.

Materials

A. DUCT

(PVC) Polyvinyl Chloride Type DB 120 per NEMA Standard TC-8, ASTM F-512, and Western Underground Committee Guide 3.1.
Schedule 40 PVC conduit.
(Galv. Stl.) hot dipped galvanized steel electric conduit.

Approved PVC Duct Manufacturers: Cantex, Carlan, 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 on page 52.

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. See reference UG-0345.

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.

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. Uniformed 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 burs 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. SVP Underground Inspector conduit 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 minimum 1/4" polyester pull tape shall be inserted 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 the 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 conduit inspectors of SVP project drawings.

C. BACKFILL

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

Inspections

A. WORK IN A PUBLIC RIGHT OF WAY OR EASEMENT

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

B. WORK OUTSIDE PUBLIC RIGHT OF WAY OR PUBLIC EASEMENT

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

C. INSPECTOR SHALL BE INFORMED

The inspector shall be informed at least 2 working days 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, 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 of Santa Clara Permit Center.

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, public easement or electric easement, an encroachment permit shall be obtained from the City of Santa Clara Department of Public Works.

An encroachment permit is not required for work outside of a public right of way or public utility easement.

Acceptance

Upon completion of improvements satisfactory to SVP, SVP shall accept the work. SVP inspector will sign off on SVP Developers Work Drawing Acceptance Form and uploads it into Job Manager with the date of SVP acceptance.

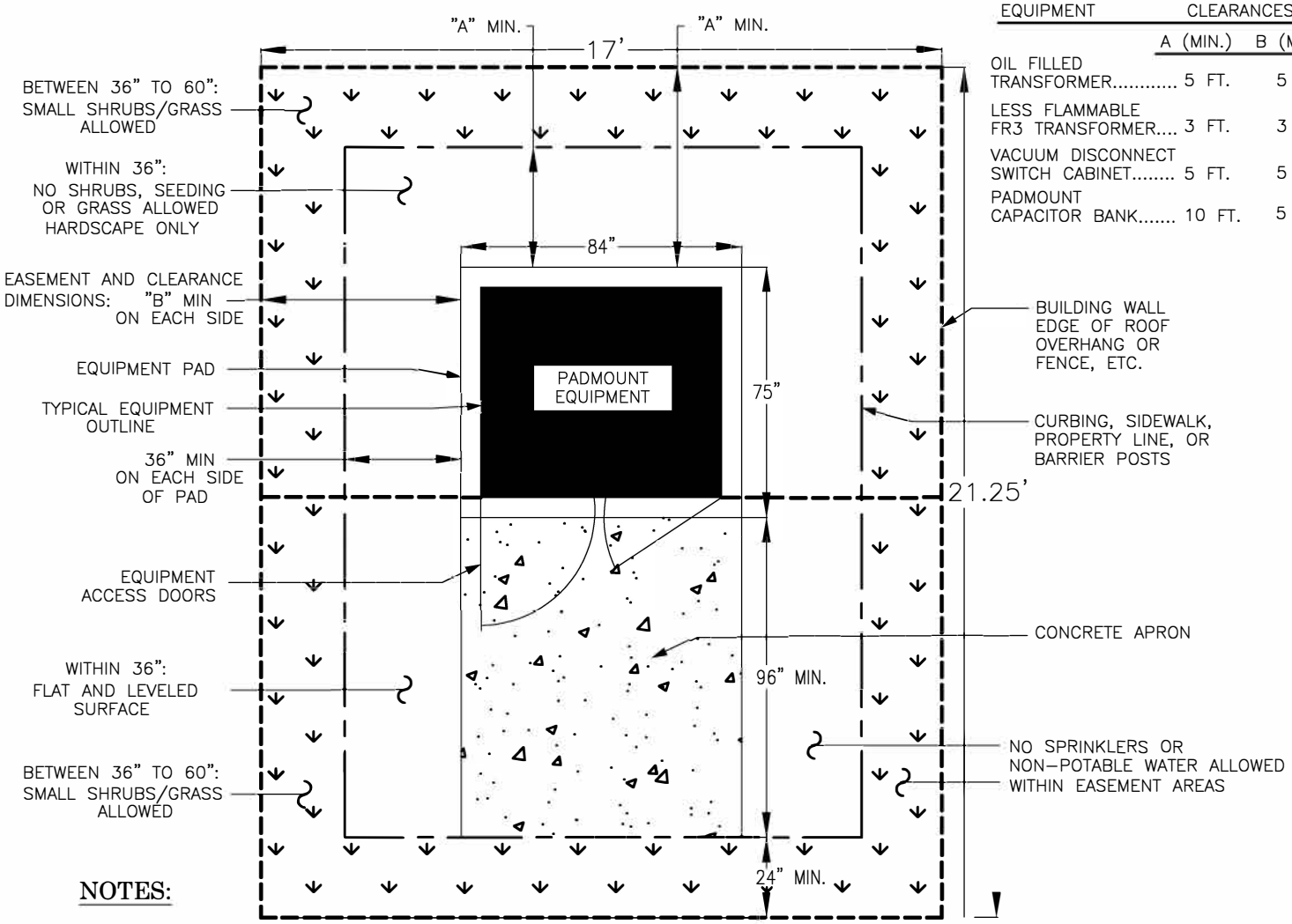
After completion of the facilities installed by the Developer, SVP shall furnish and install all cable, switches, street lighting poles, luminaires, transformers, meters and other equipment that it deems necessary for the betterment of the system.

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 SVP Inspector. 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 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

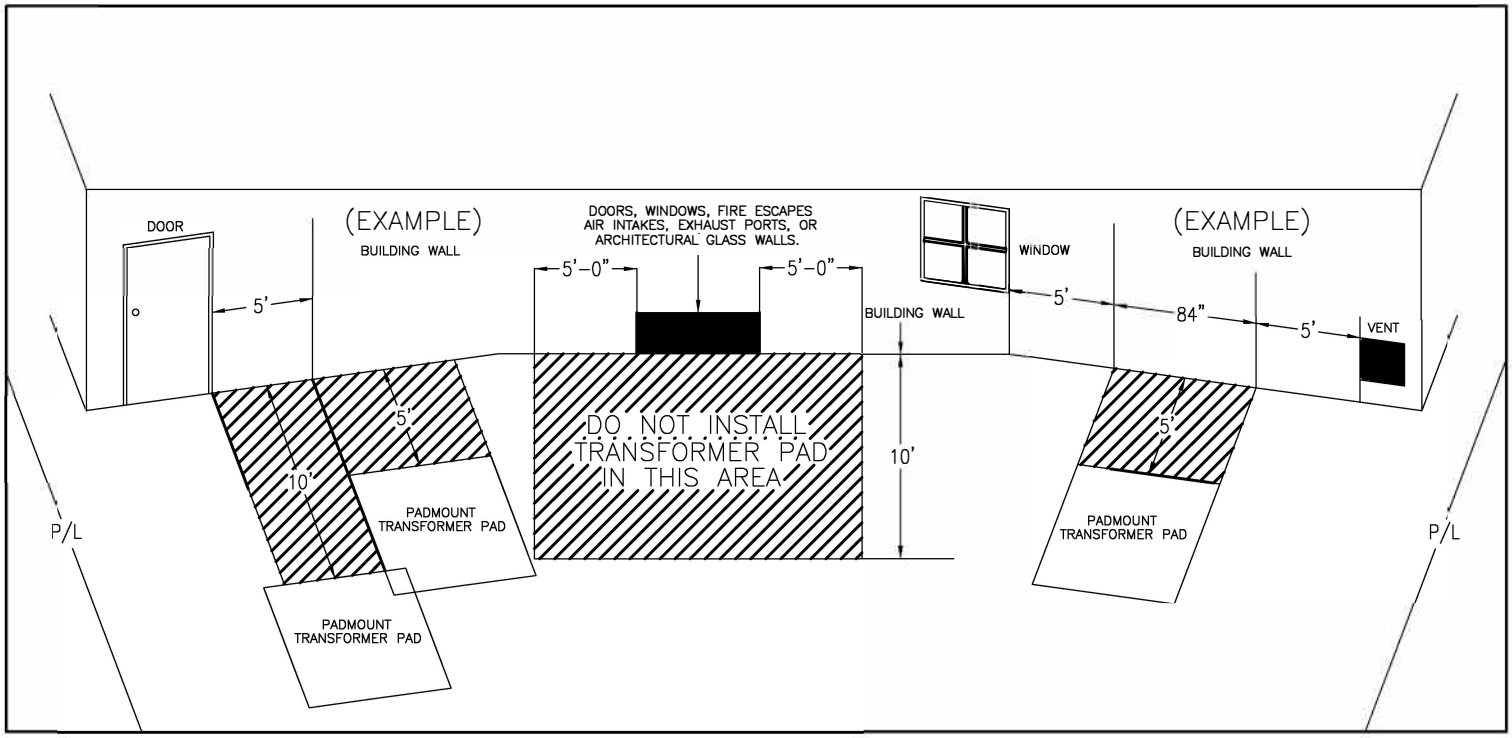


EQUIPMENT	CLEARANCES A (MIN.)	B (MIN.)
OIL FILLED TRANSFORMER.....	5 FT.	5 FT.
LESS FLAMMABLE FR3 TRANSFORMER....	3 FT.	3 FT.
VACUUM DISCONNECT SWITCH CABINET.....	5 FT.	5 FT.
PADMOUNT CAPACITOR BANK.....	10 FT.	5 FT.

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 doors. A 10 foot minimum clearance is required in front of equipment doors with cable terminations 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 ventilation requirements. Noise abatement requirements may require an increase in the dimensions.
5. See sheets 14 and 15 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. For high density development locations, refer to UG-1225 and FR3 filled equipment for reduced clearances.

Transformer Pad Clearances



NOTES:

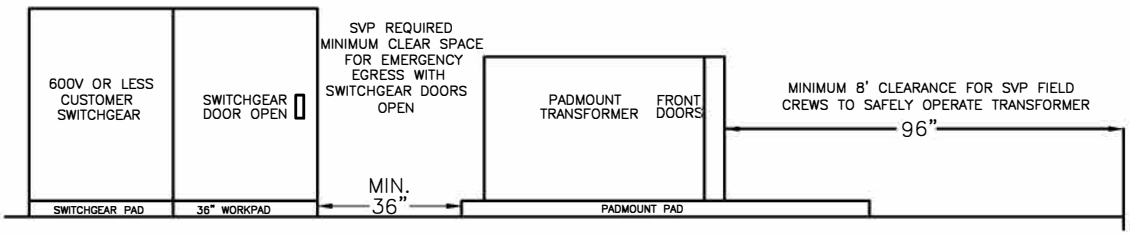
1. A minimum of 10' of clearance is required from a new padmount transformer pad to the building wall when there is a door, operable window, fire escape, air intake, exhaust port, or architectural glass wall within 5' lateral clearance to the edge of said equipment (see example above).

2. A utility easement is required around the padmount transformer pad; therefore, no overhead structures are allowed to encroach into the easement to prevent crane access for transformer installation and removal.

3. The transformer pad apron is required in landscaped areas and may not be required on level concrete or asphalt surfaces. Consult with the SVP Estimator/Engineer for consideration.

4. For Planting trees in the vicinity of new padmount transformer pads, see SVP Standard SD-1235 Tree Planting Requirements Near Underground Electric Facilities.

5. If new switchgear is placed adjacent to a padmount transformer pad and outside of the easement, then there is a minimum of double the required clearance in front of the switchgear, so that when the switchgear doors are open, there is sufficient clearance for the meter technician to safely egress in an emergency. (See diagram below).



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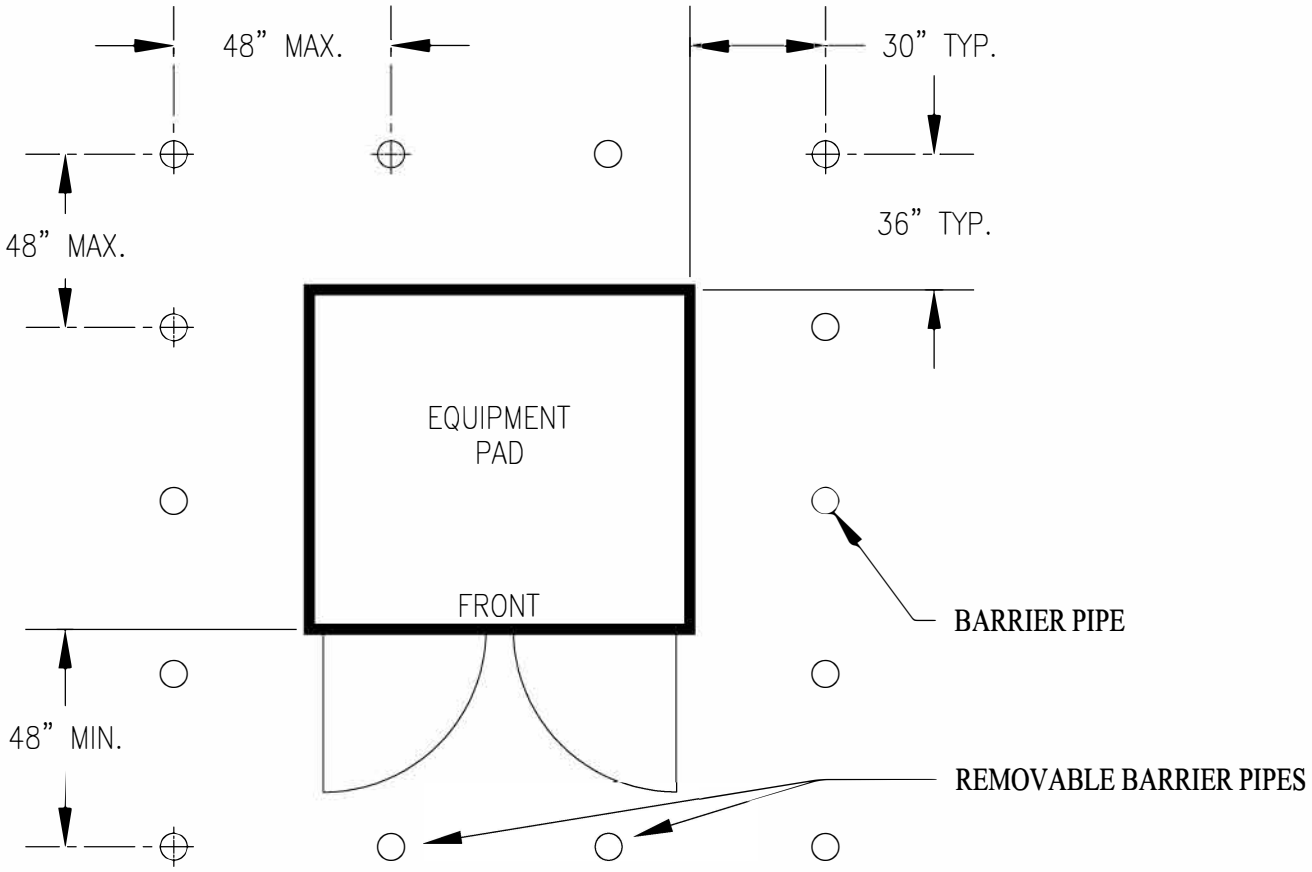
Barrier Pipe Placement



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.

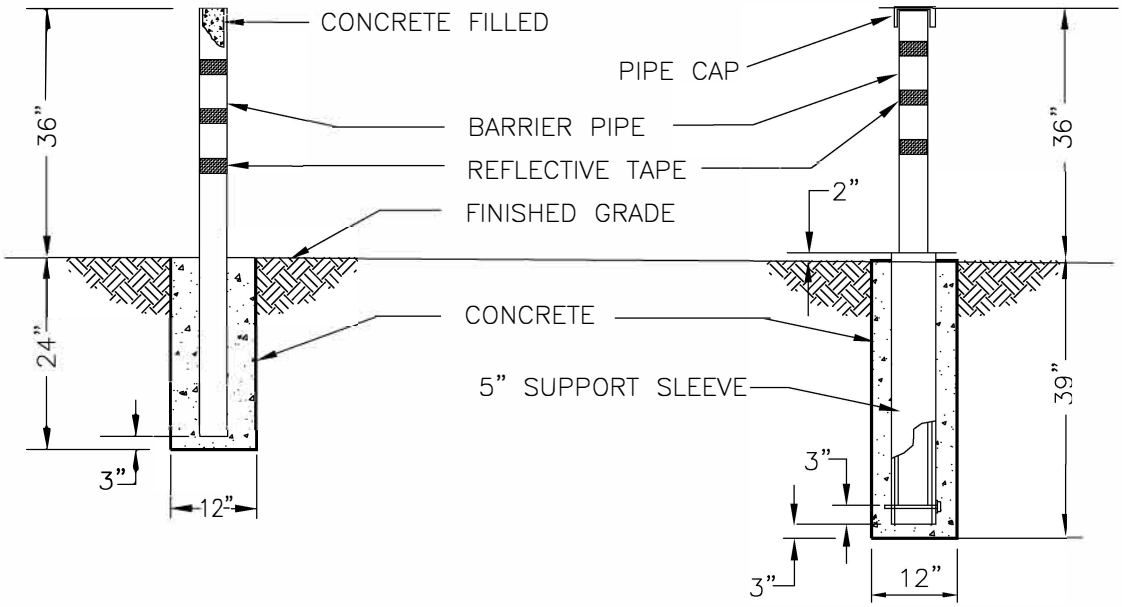
2. Barrier pipes are required only on sides accessible to vehicles unless otherwise called out by the SVP Developers work drawing.

3. All barrier pipes installed will be at uniform height, per UG-1000, Sheet 15.

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. Consult with the SVP underground inspector for pre-approval of any proposed field spacing adjustments.

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.

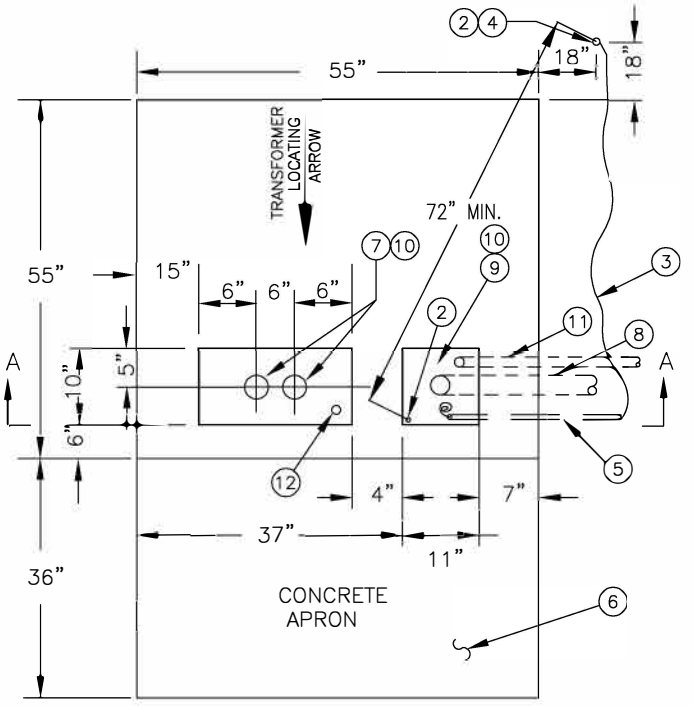
3. Permanent style barrier pipes are to be used where possible. Removable barrier pipes are to be used only when specified on SVP project design and Developers Work drawings or when directed by SVP underground inspector.

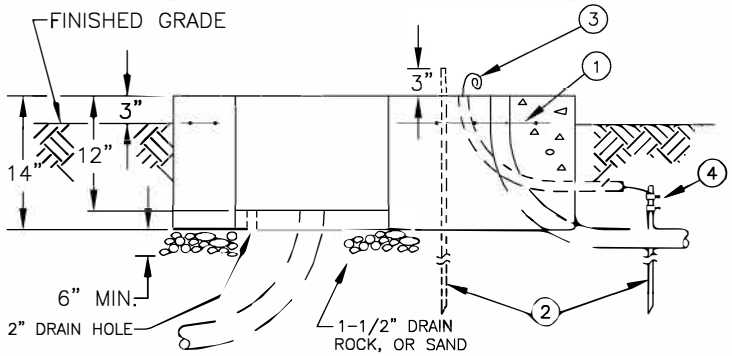
4. Barrier pipes are to be painted safety yellow. Yellow polyethylene sleeves, such as Armorcast's "Guardian Sleeve," may be substituted for painting the pipe.

5. See sheet 14 for barrier pipe placement requirements.

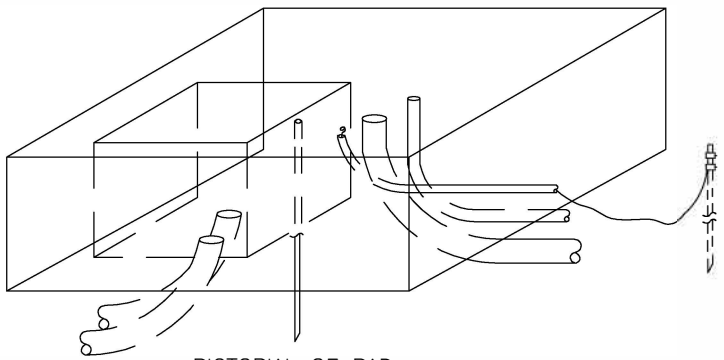
6. Support sleeves for removable barrier pipes shall be 5" galvanized steel schedule 40 standard pipe. A 3/4" x 8" galvanized machine bolt shall be installed 3" from the base of the sleeve to act as a support stop for the 4" removable barrier pipe.

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 8ft. 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 36" x 55" x 3" concrete apron flush with finished grade. A utility electric UE box may be required, consult with SVP estimator or Developers Work drawing.
7. Install (2) 6" x 90 degree x 36" radius PVC primary duct bends.
8. Install secondary conduit(s) from pad to Low Voltage box as shown on the Developers Work drawing. Customer to install secondary service conduit(s) to either the SVP low voltage box or SVP transformer utility connection point, which is per the review of CSC Building Division.
9. Run SVP secondary ducts only into this area. Use 90 degree bends and center within the secondary conduit well.
10. Terminate and cap ducts with a plastic end bell grouted flush with top of the pad, or with bottom of primary pit as shown.
11. Install a 2" UE/2 fiber conduit from pad to area shown on SVP Developer's Work drawing. Contractor to install plug or cap on UE2 immediately following installation.
12. Install a 2" diameter drain hole as shown.
13. Maintain a minimum of 8' of clearance in front of the transformer pad for SVP line crew to be able to safely hot stick the primary side connections and maintain a minimum of 5' of clearance at the sides and back of the transformer pad.

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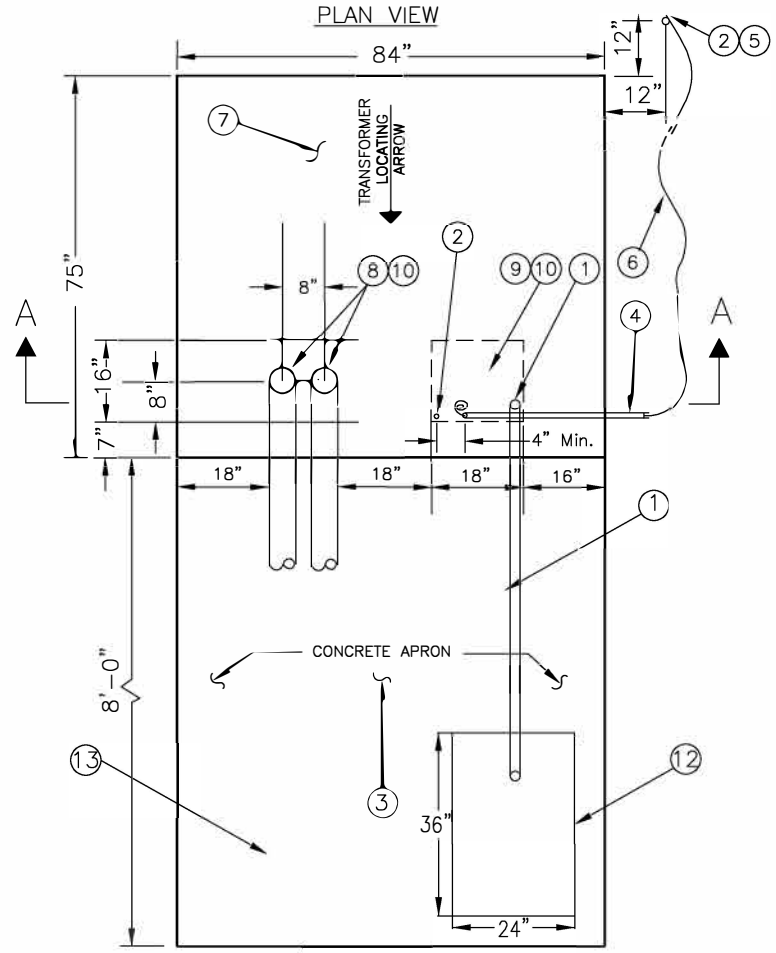
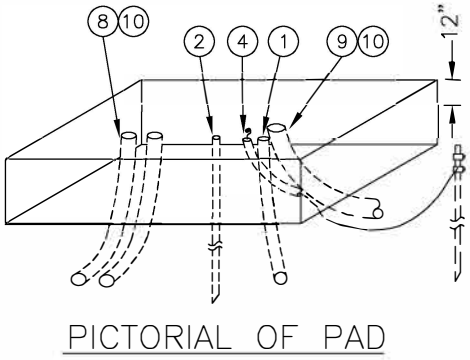
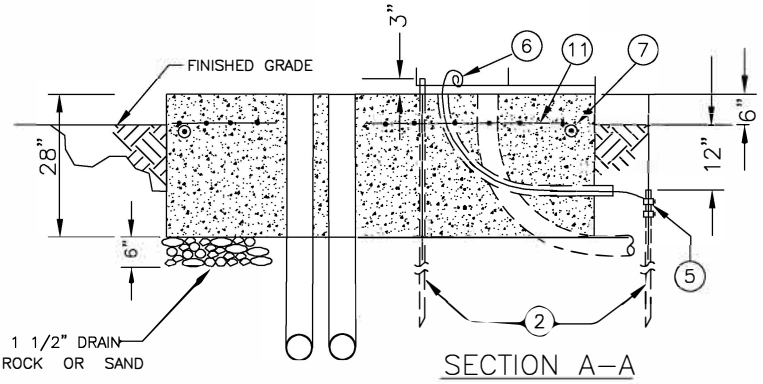
Three Phase Transformer Pads





PICTORIAL OF PAD



SECTION A–A

Notes:

(1) Install 2" duct to Utility Electric U/E box. Routing of duct may vary.

(2) Install 5/8" x 8'-0" copper ground rod.

(3) Install 84" x 96" x 3" concrete apron flush with finished grade.

(4) Install 3/4" x 90° x 18" radius PVC bend for ground wire.

(5) Install two copper ground rod clamps. See "Materials" section A-A 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 (2) 6" primary PVC schedule 40 conduits with 90° bends. Radius of the bends shall be minimum 36" unless noted otherwise on SVP Developer Work drawings.

(9) Install secondary conduit(s) per Developers Work drawing and service entrance conduit(s) per approved building permit plans. Run SVP secondary ducts and/or customer service entrance ducts and conductors into secondary conduit well. See "Work Requirements" section sheet 6 for details and maximum number of conduits.

(10) Terminate and cap ducts with a plastic end bell or duct plug grouted flush with the top of the pad.

(11) Install 6" x 6" #10 woven wire fabric. See "Materials" section for concrete specifications.

(12) Install 24" x 36" underground electric UE splice box. Location to be specified on SVP Developers Work drawings. Label cover, "SVP Utility Electric".

(13) Maintain a minium of 8' of clearance in front of the transformer pad for SVP line crew to be able to safely hot stick the primary side connections and maintain a minimum of 5' of clearance at the sides and back of the transformer pad.

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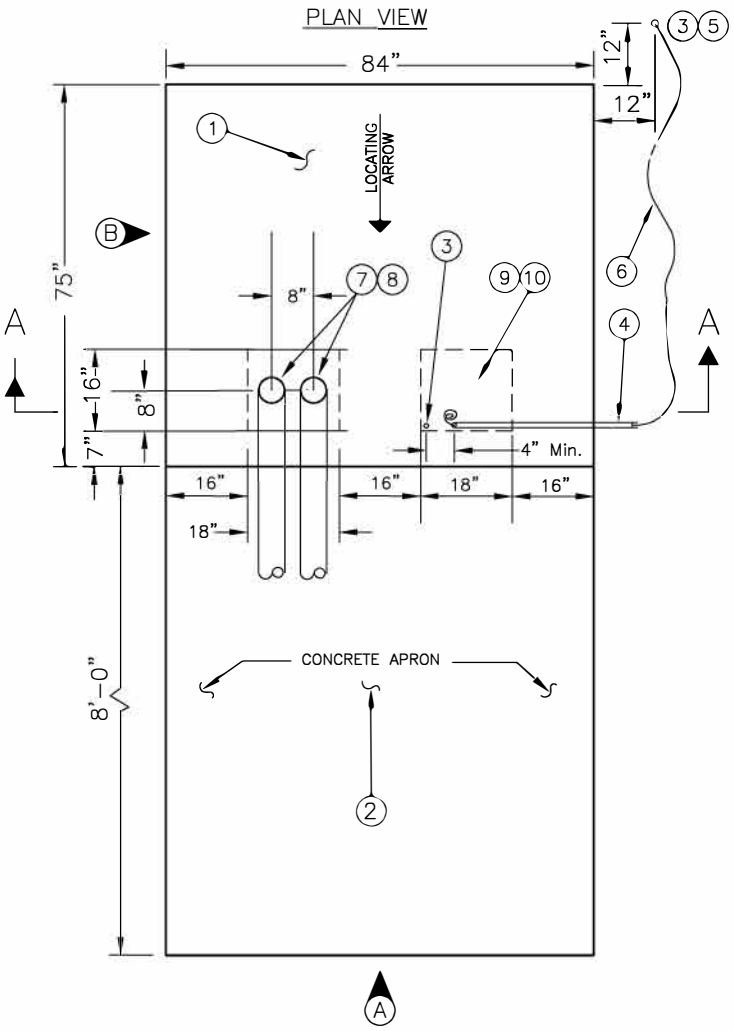
Pre-Cast Pad for Temporary Transformer - Part 1 of 2



Pre-cast pad minimum 75" X 84" X 6" - approved structural calc is required with transformer placed on pre-cast pad. Customer/developer to provide manufacturer's precast pad drawing and cutsheets for SVP's approval.

Notes:

① Pre-cast pad requirements: see the following notes on page 19.

② Install 84" x 96" x 3" concrete apron flush with finished grade.

③ Install 5/8" X 8'-0" copper ground rod.

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

⑤ Install two copper ground rod clamps. See "Materials" section A-A 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 (2) 6" primary PVC schedule 40 conduits into 16" x 18" conduit opening. Radius of the bends shall be minimum 36" unless noted otherwise on SVP project drawings.

⑧ Terminate and cap ducts with plastic end bell grouted flush with the top of the pad.

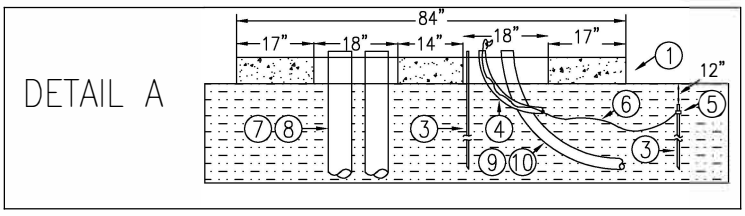
⑨ Install secondary conduit(s) per Developers Work drawing and/or service entry conduit(s) per approved building permit plans. Run SVP secondary ducts and/or customer service entrance ducts and conductors into this area. See "Work Requirements" section sheet 6 for details and maximum number of conduits .

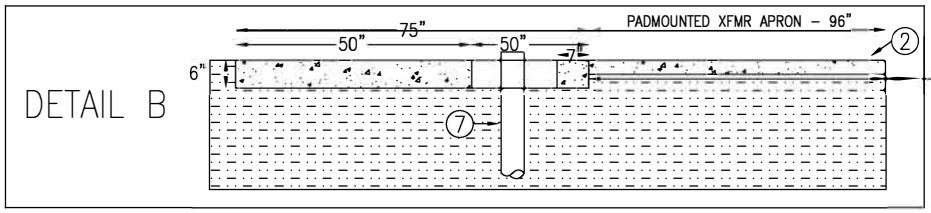
⑩ Terminate and cap ducts with plastic end bell grouted flush with the top of the pad.

⑪ Maintain a minimum of 8' of clearance in front of the transformer pad for SVP line crew to be able to safely hot stick the primary side connections and maintian a minimum of 5' of clearance at the sides and back of the transformer pad.

Approved Manufacturers: Jensen Precast & Old Castle

The pad must be able to withstand the weight of an 16,000 lbs padmount transformer.





PICTORIAL OF PRE-CAST PAD

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NOTES FOR PRE-CAST PAD FOR TEMPORARY TRANSFORMER

NOTES:

1. Pre-cast pads to be placed on flat and leveled surfaces. The transformer shall be placed on firm, compacted native material or on engineered fill which has been compacted at least to the requirements of note 3.

2. The area under the pad shall be excavated to the required grade or to a depth necessary to reach firm, undisturbed material, whichever is deeper. If the firm material has not been reached within a depth of 3 feet, excavate 3 feet beyond the perimeter of the pad and backfill the entire excavated area to the required grade and to the requirements of note 3.

3. In case it has been necessary to excavate deeper than the required grade to reach firm material, backfill to the required grade in one of the following ways:

    a. Backfill with clean, non expansive soil compacted to 90% of maximum density. Soil shall be placed in layers not more than 8" inches thick before compaction. Maximum density and in place density is to be determined by California Test Method No. 216-G, Part 1 and Part 2 respectively or by ASTM-D1556 and ASTM-D-1557 respectively.

    b. Backfill with soil-cement slurry consisting of one sack of Portland cement per cubic yard and clean native soil or sand.

4. Before setting the pad, the customer/contractor shall request an inspection by SVP to approve the installation. SVP shall determine the acceptability of each pad installation.

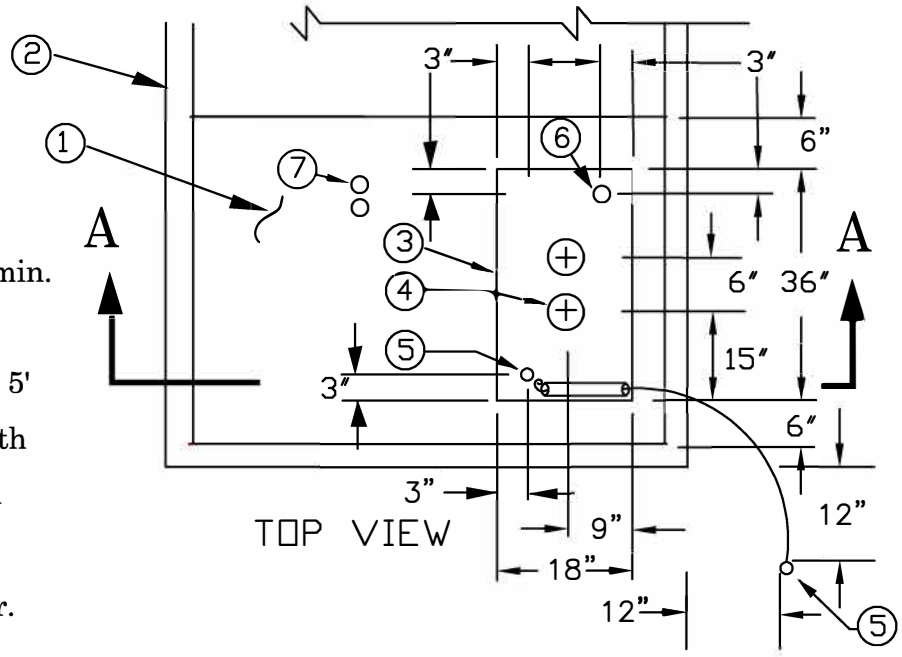
5. Pre-cast pads shall be placed on a 3-inch layer of slurry backfill or sand screened level to provide uniform bearing.

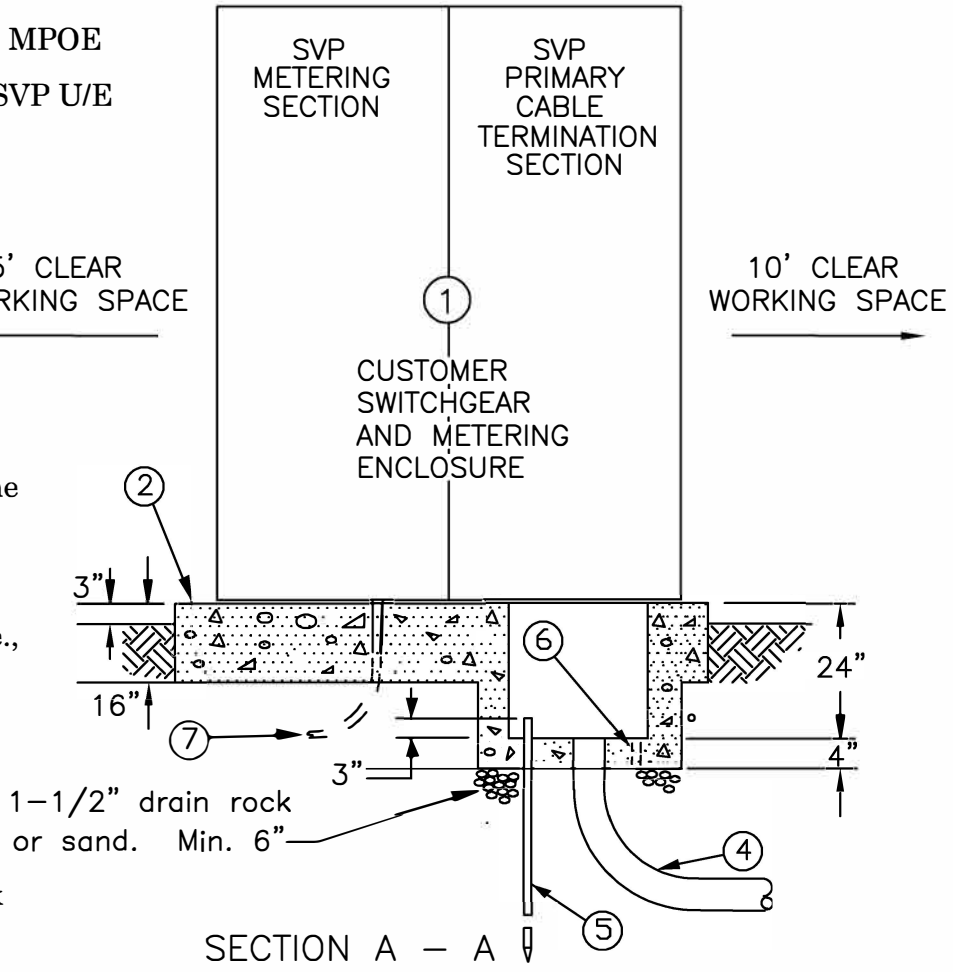
6. Pre-cast pads shall be permanently identified with manufacturer's name and have the weight stenciled on top of the pad.

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: (2) 6" x 90° x 5' radius PVC bends. Terminate with PVC end bells grouted flush with bottom of pit.
5. (2) Ground rods, 5/8"x8'-0" copper.
6. 2" dia. drain hole.
7. 2" PVC duct to customer's telco MPOE board and 2" SVP U/E duct to SVP 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.

c. A minimum of 10 feet of a clear and level 3" thick concrete work pad and working space is required at the rear of the switchgear.

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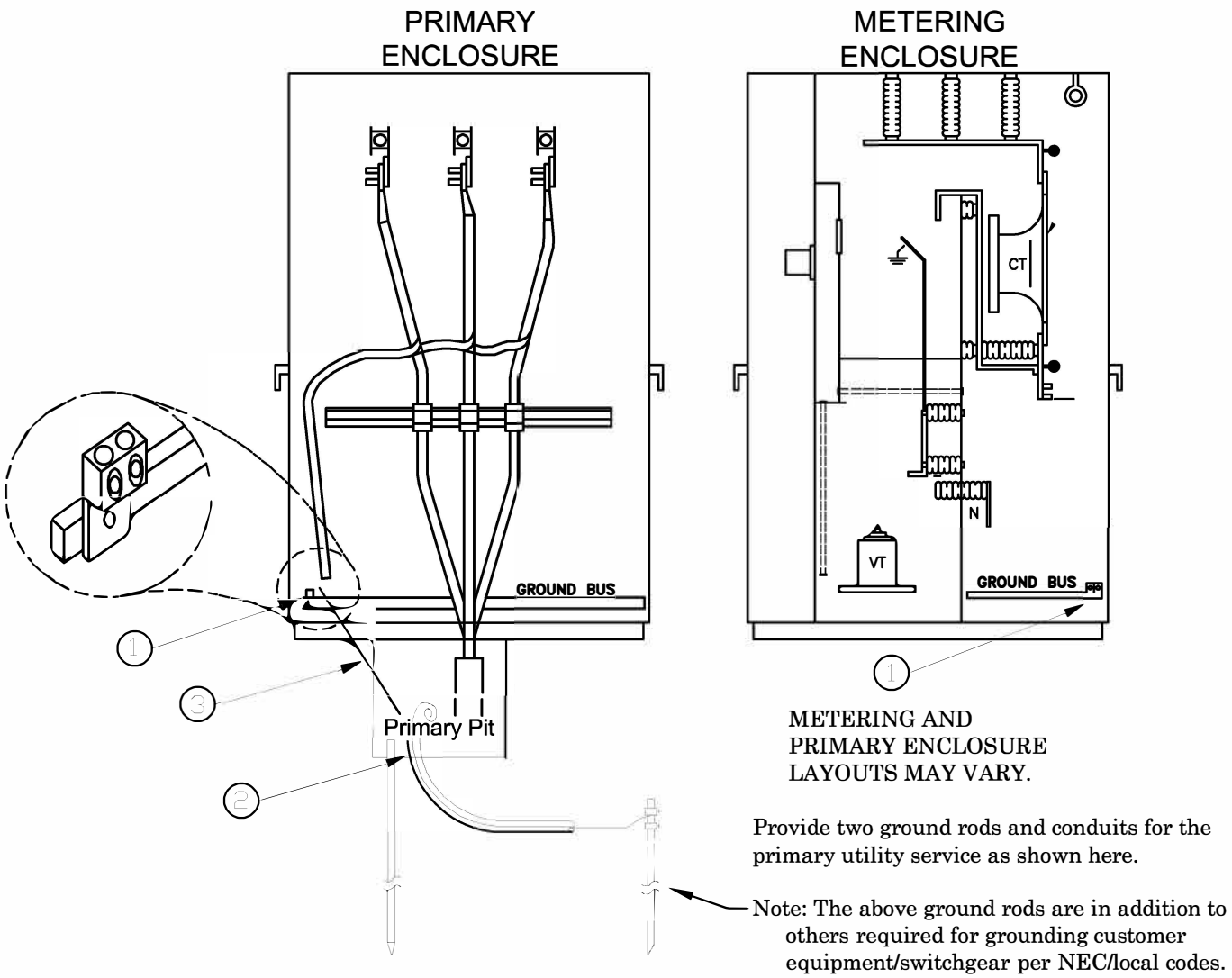
Primary Metering Grounding Details



METERING AND PRIMARY ENCLOSURE LAYOUTS MAY VARY.

Provide two ground rods and conduits for the primary utility service as shown here.

Note: The above ground rods are in addition to others required for grounding customer equipment/switchgear per NEC/local codes.

Notes:

(1) The grounding terminals for use with the ball studs shall be two aluminum-bodied mechanical lugs accepting a range of 6 AWG through 250 KCMIL conductors and shall be identified with a label reading "SAFETY GROUNDING POINT FOR UTILITY USE ONLY". Connect SVP equipment to ground bus.

(2) Connect ground rods together with # 2/0 Cu. insulated cable. Use ground rod clamps. See "Materials" section for approved list. Two ground rods shall be a minimum of 6' apart and provide 25 ohms or less to ground per NEC with one ground rod installed in the primary pit.

(3) Connect ground rod in primary pit to switchgear ground bus with # 2/0 Cu. insulated cable.

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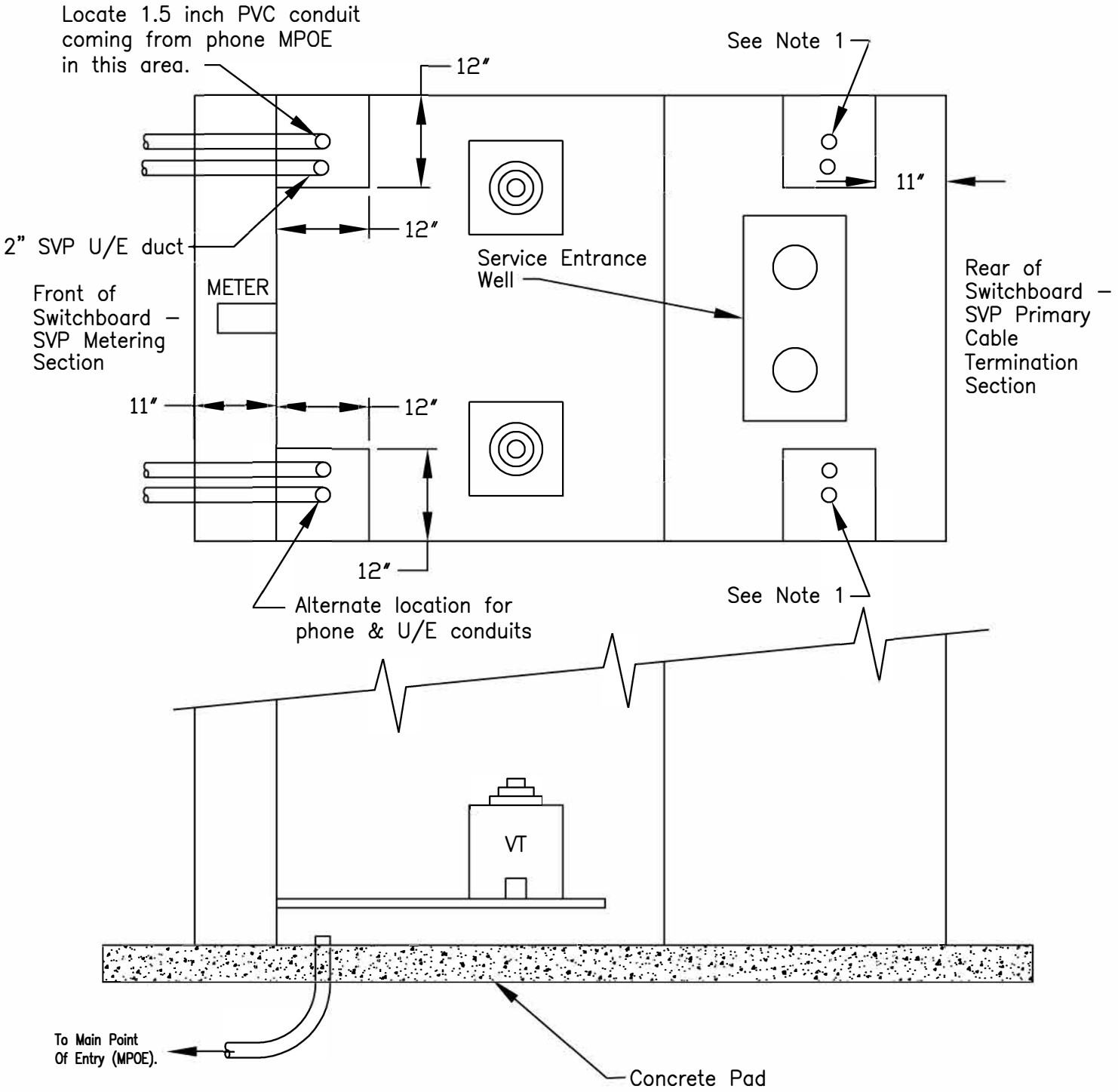
Communication Ducts in Primary Switchgear Pads



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.

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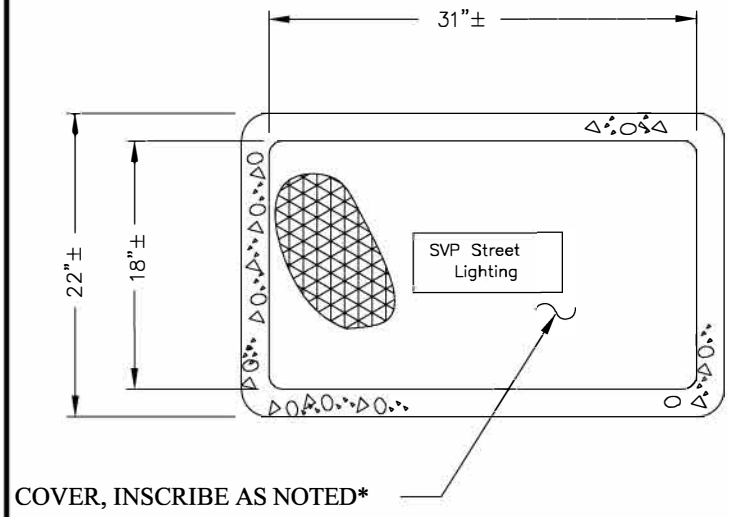
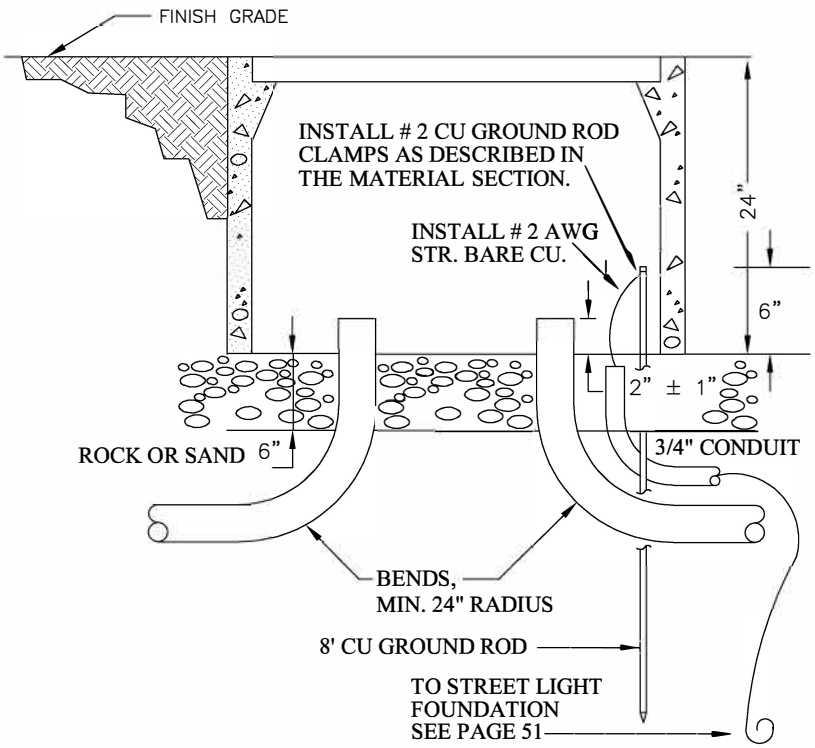
17" x 30" Street Light Splice Box - Non Traffic





NOTES:

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

Boxes & covers shall meet the WUC 3.6 Interchangeability 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 the box does not interfere with clear pulling or feeding of cables in ducts. 11.25 degree bends for all utility electric labeled boxes.

Minimum 6 inches drain rock or sand required under box. See reference SVP standard UG-0315 Base Materials for Boxes and Pads.

APPROVED SUPPLIERS:
ARMORCAST
OLD CASTLE
STRONGWELL
OR APPROVED EQUAL

COVER TO BE INSCRIBED AS SHOWN ON SVP DEVELOPER WORK DRAWINGS:
1) SVP STREET LIGHT

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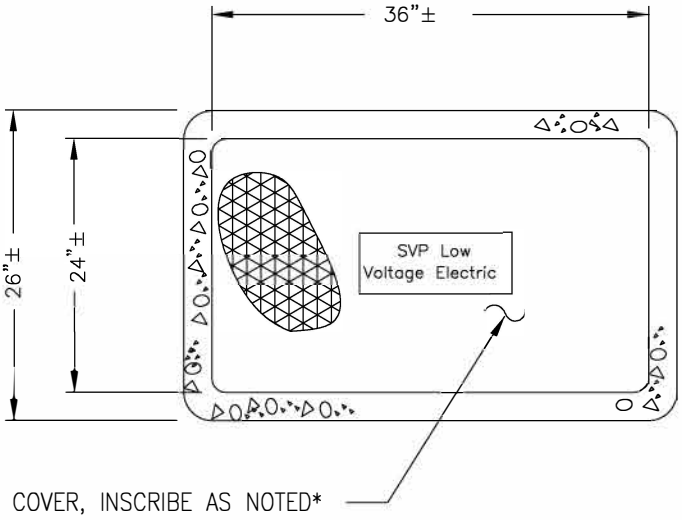
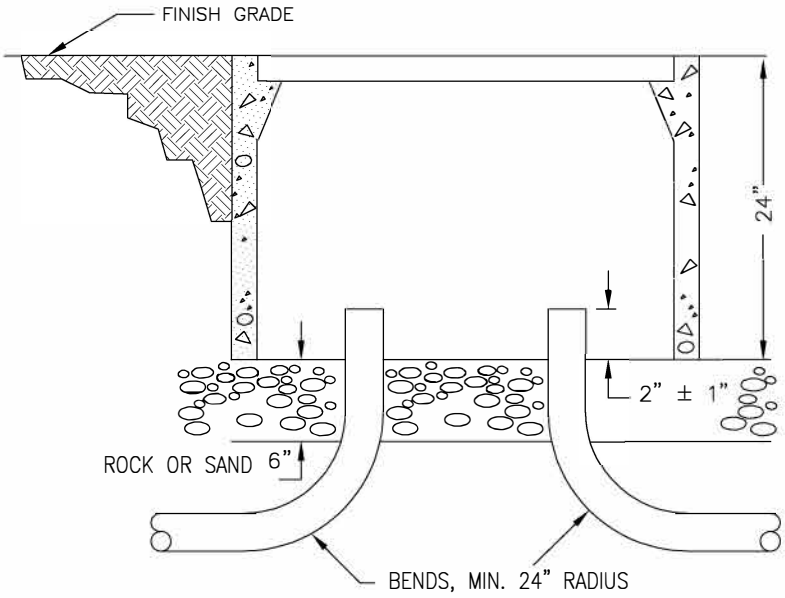
24" x 36" Splice Box - Non Traffic





NOTES:

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

Boxes & covers shall meet the WUC 3.6 Interchangeability 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 the box does not interfere with clear pulling or feeding of cables in ducts. 11.25 degree bends for all utility electric labeled boxes.

Minimum 6 inches drain rock or sand required under box. See reference SVP standard UG-0315 Base Material for Boxes and Pads.

APPROVED SUPPLIERS:
ARMORCAST
OLD CASTLE
STRONGWELL
OR APPROVED EQUAL

COVER TO BE INSCRIBED AS SHOWN ON SVP DEVELOPER WORK DRAWINGS:

1) SVP UTILITY ELECTRIC

2) SVP LOW VOLTAGE ELECTRIC

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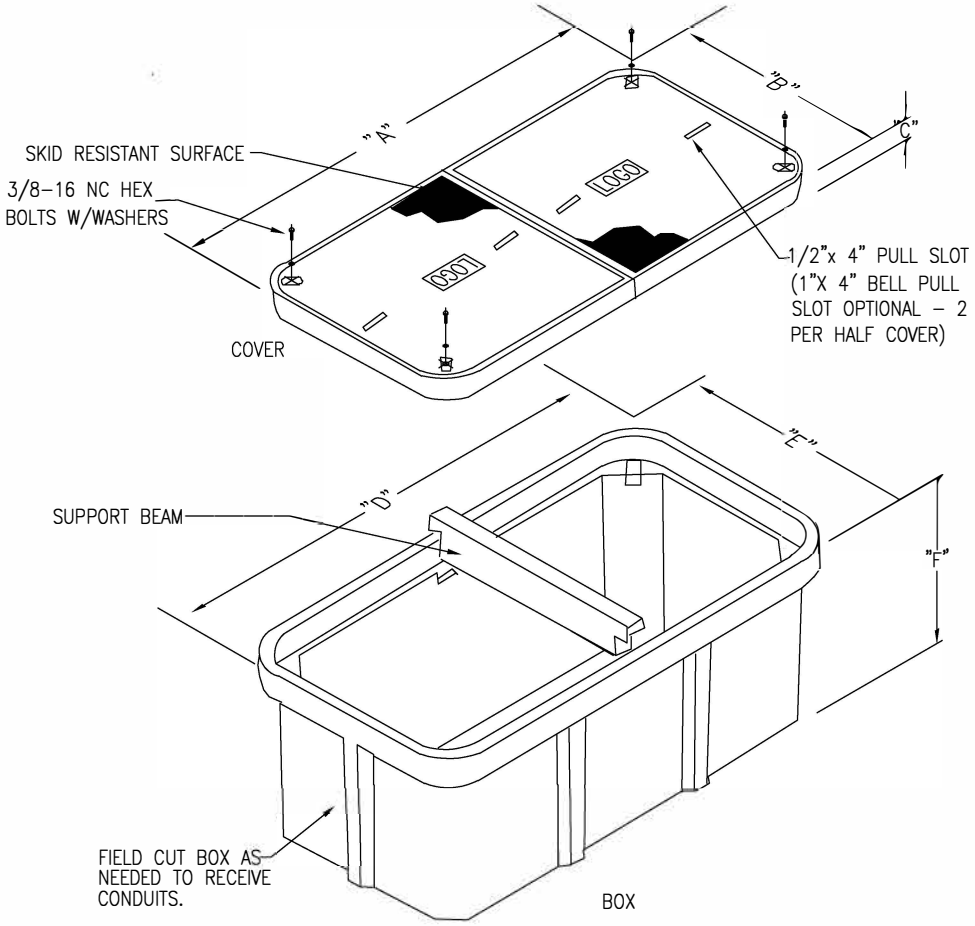
30" x 60" Splice Box - Non Traffic



NOTES:

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". See reference SVP standard UG-0315 Base Material for Boxes and Pads.

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

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

APPROVED SUPPLIERS:
ARMORCAST
OLD CASTLE
STRONGWELL
OR APPROVED EQUAL

COVER TO BE INSCRIBED AS SHOWN ON SVP DEVELOPER WORK DRAWINGS:

1) SVP UTILITY ELECTRIC

2) SVP LOW VOLTAGE ELECTRIC

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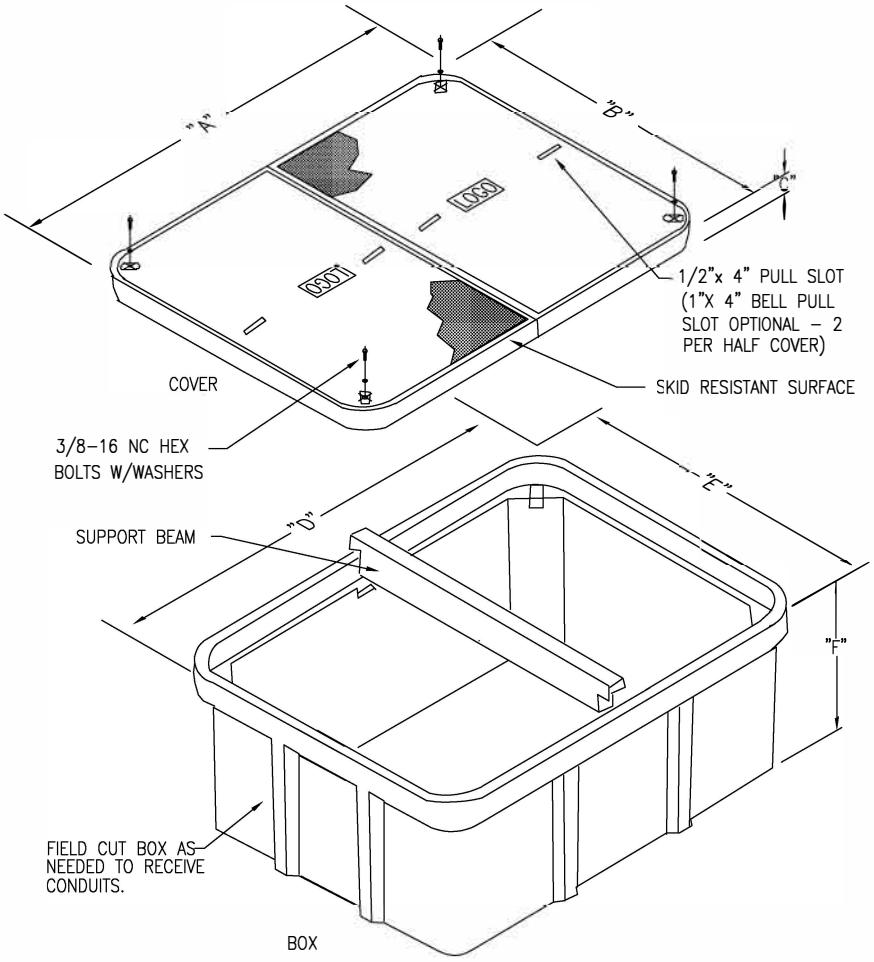
48" x 48" Splice Box - Non Traffic



NOTES:

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". See reference SVP standard UG-0315 Base Material for Boxes and Pads.

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

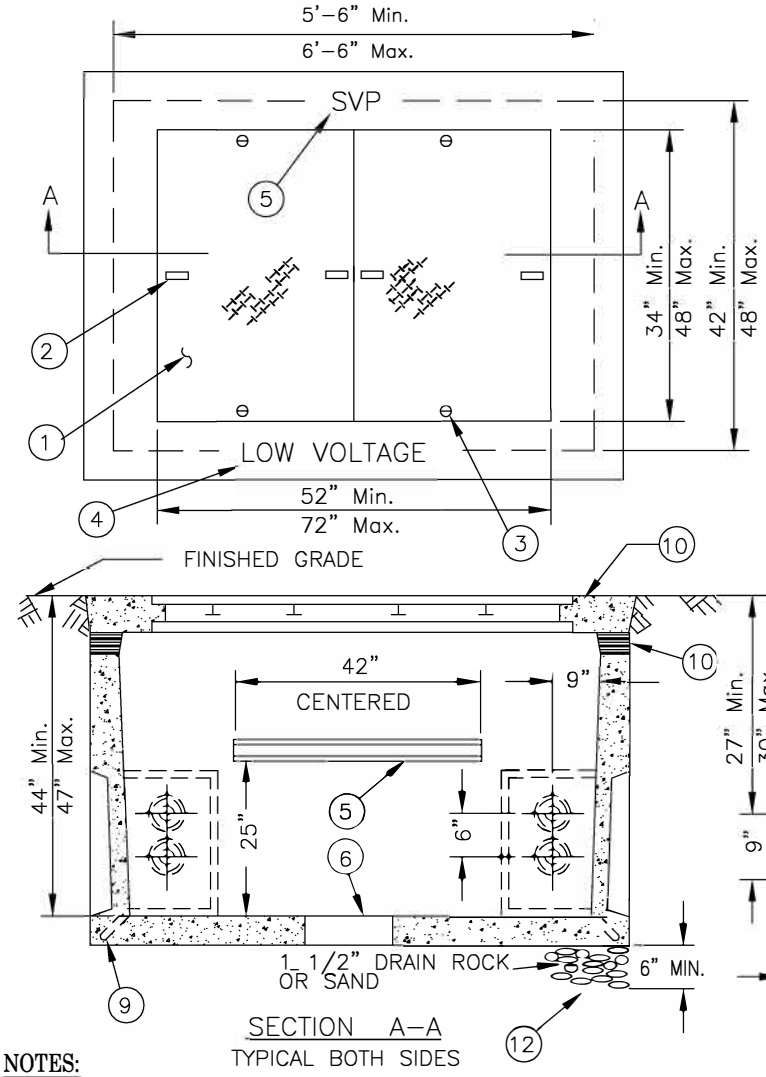
Install PVC End Bells on the ends of all ducts terminating in boxes.

COVER TO BE INSCRIBED AS SHOWN ON SVP DEVELOPER WORK DRAWINGS:

1) SVP UTILITY ELECTRIC

2) SVP LOW VOLTAGE ELECTRIC

4' x 6' Low Voltage 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 heavy 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

Jensen Precast

Old Castle

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: non-shrinking waterproof grout.

⑪ Terminate all ducts with PVC end bells.

⑫ 1 1/2" size drain rock, or sand shall be installed under box to a minimum depth of 6". See reference SVP standard UG-0315 Base Material for Boxes and Pads.

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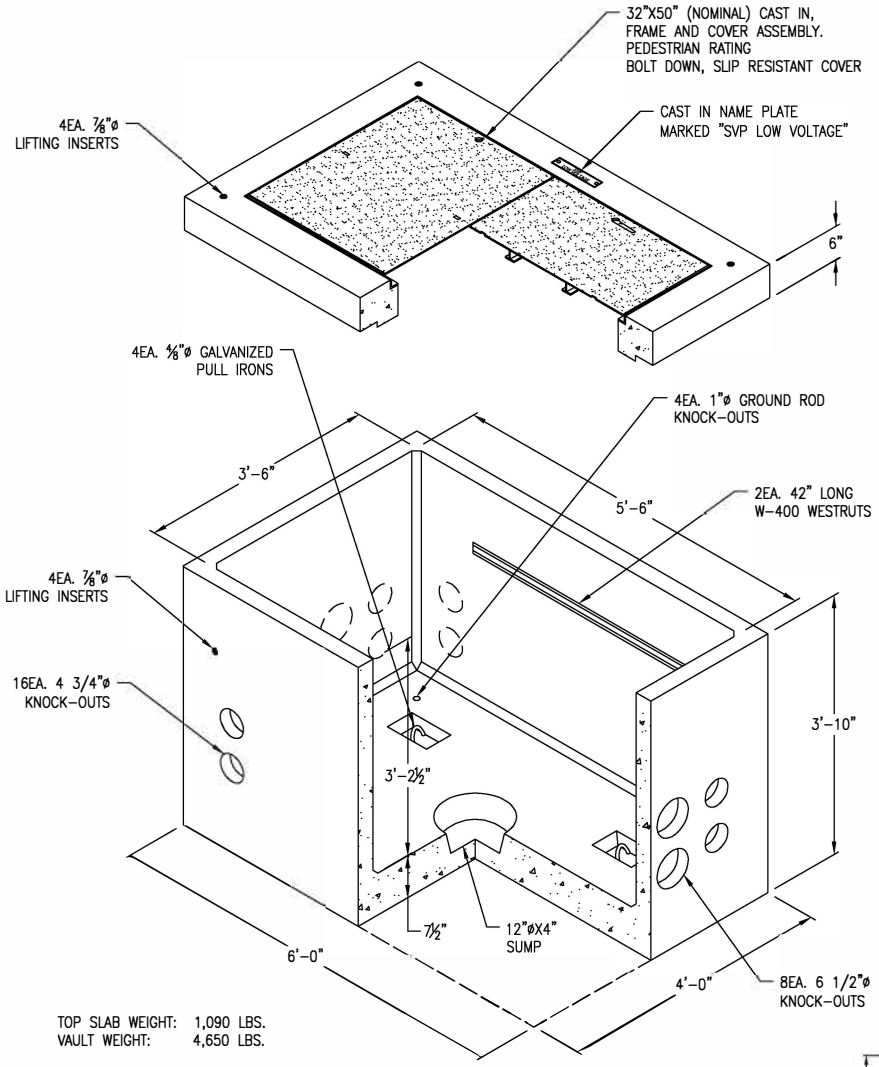
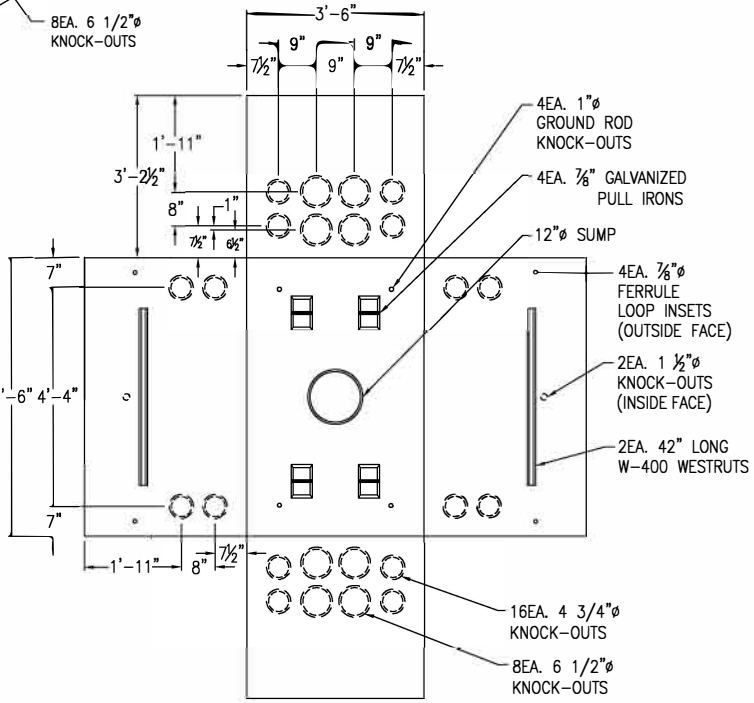
4' x 6' Low Voltage Splice Box - Light Traffic - Elevation View



TOP SLAB WEIGHT: 1,090 LBS.
VAULT WEIGHT: 4,650 LBS.

3'-6" X 5'-6" X 3'-2 1/2" (I.D.)
LOW VOLTAGE SPLICE BOX



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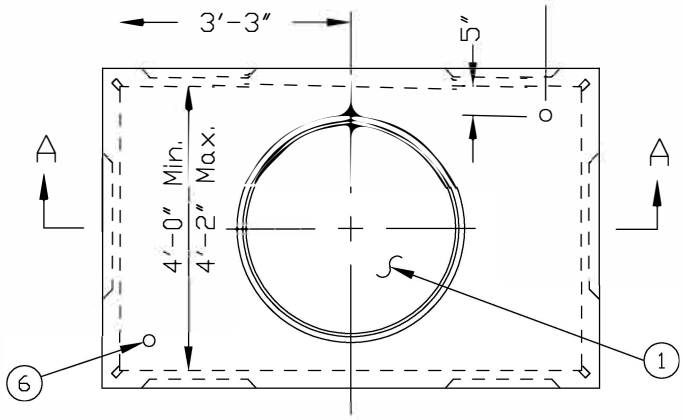
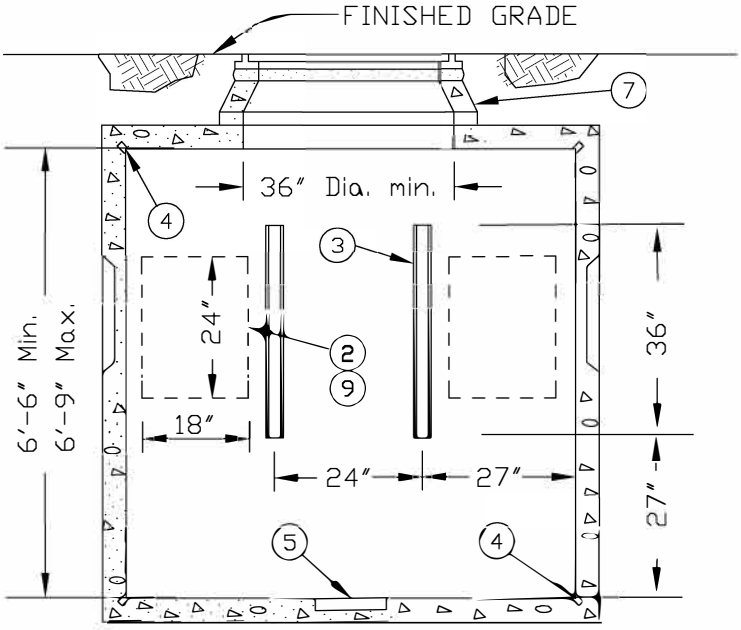
4' x 6' Low Voltage Splice Box - Full Traffic

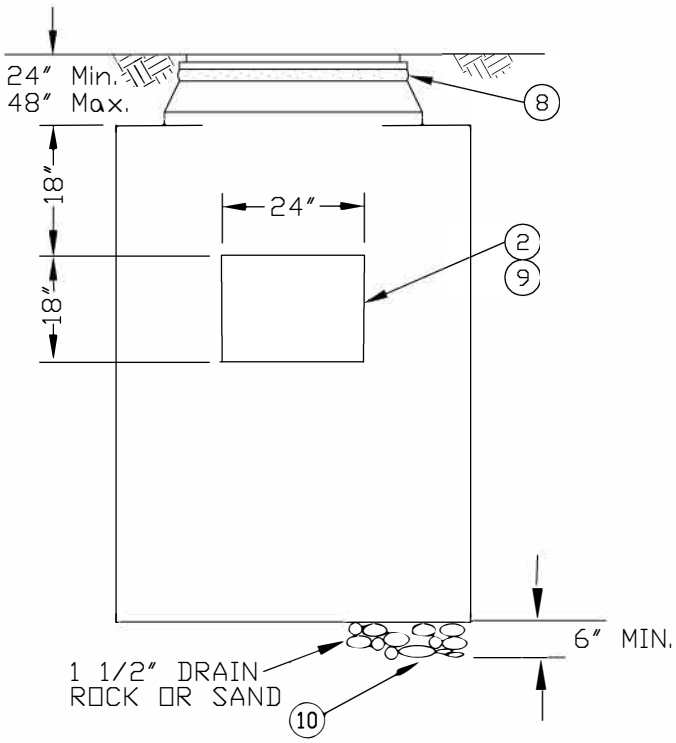


APPROVED VENDORS:
JENSEN PRECAST
OLD CASTLE

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: Non-shrinking waterproof grout.
⑨ Terminate all ducts with PVC end bells grouted flush with inside of wall.
⑩ 1 1/2" size drain rock, or sand shall be installed under box to a minimum depth of 6". See reference SVP standard UG-0315 Base Material for Boxes and Pads.

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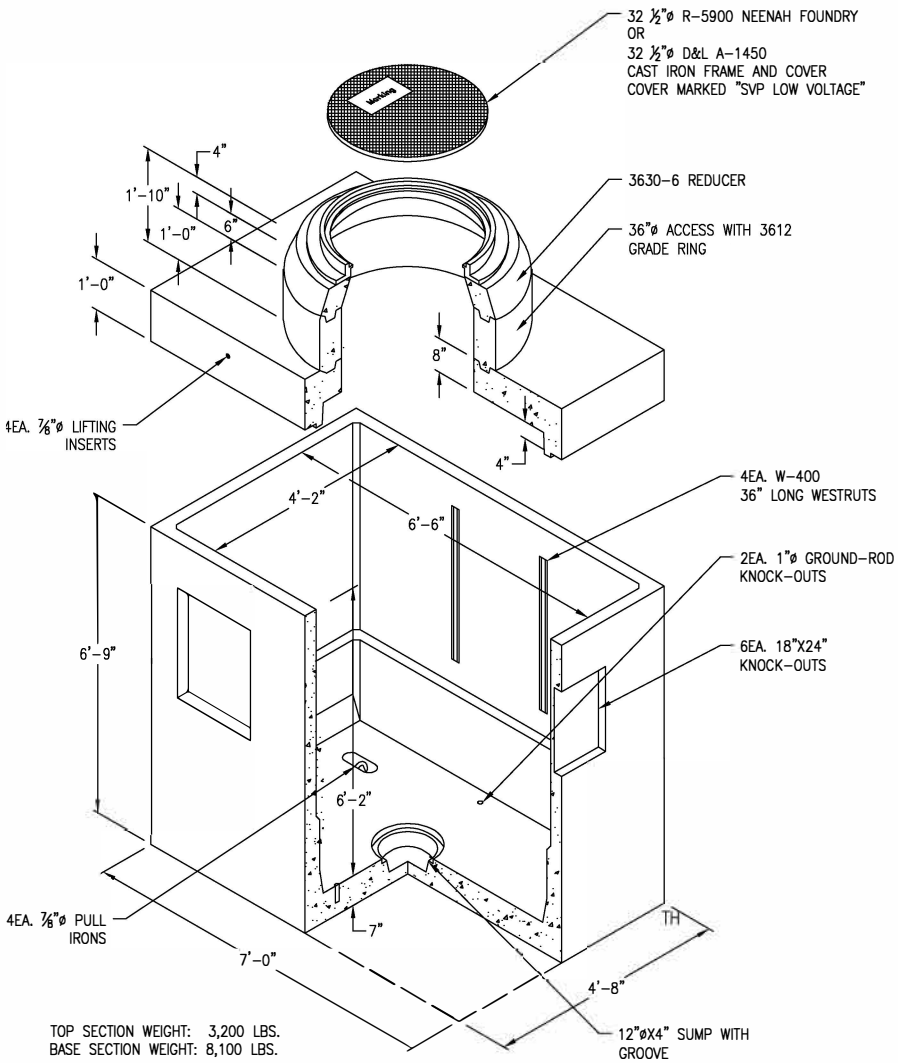
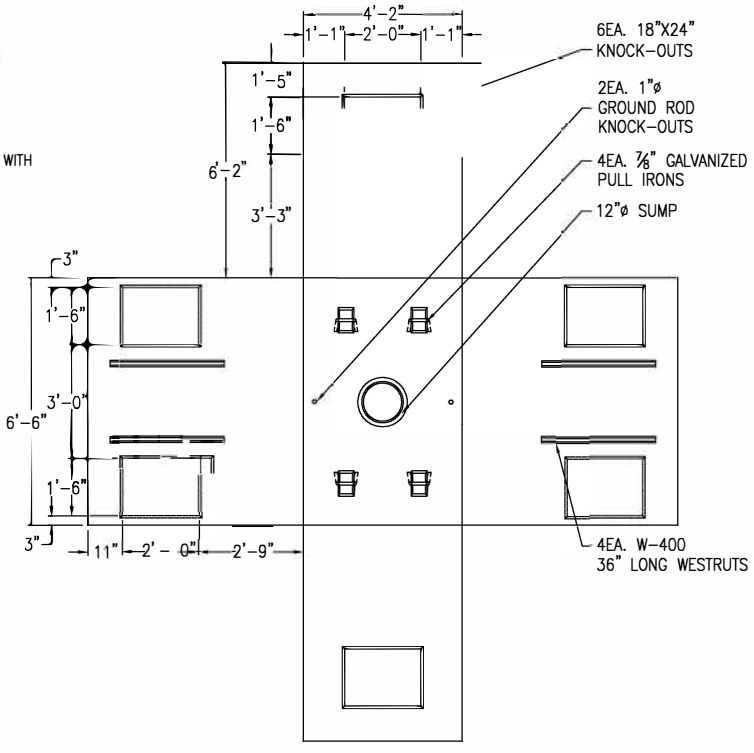
4' x 6' Low Voltage Splice Box - Full Traffic - Elevation View



TOP SECTION WEIGHT: 3,200 LBS.
BASE SECTION WEIGHT: 8,100 LBS.

To be designed for H20-44 Loading & hydrostatic pressure with water level assumptions at 3 feet.

4'-2" X 6'-6" X 6'-6" (I.D.)
LOW VOLTAGE PULL BOX



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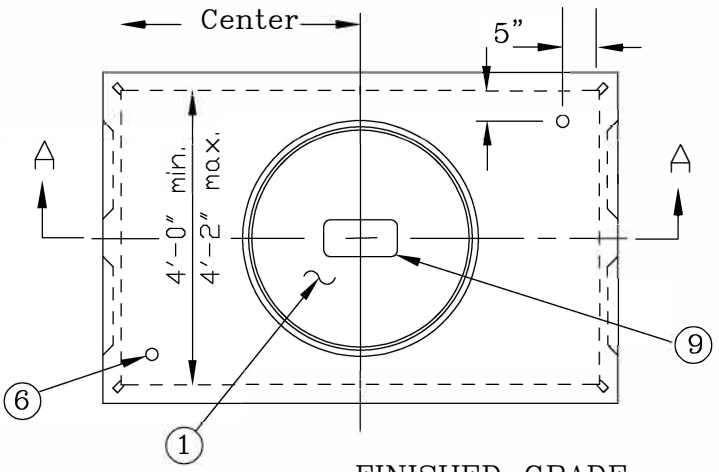
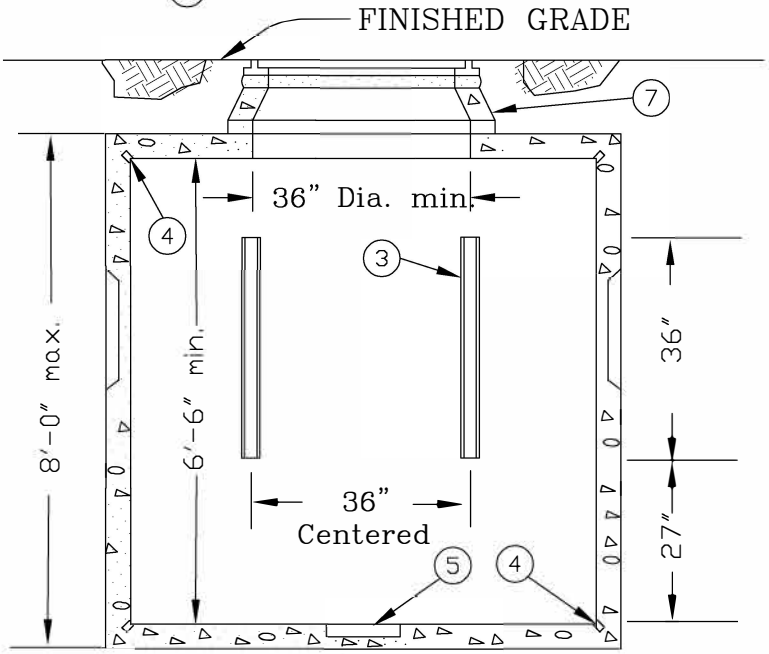
4' x 6' Primary Pullbox - Full Traffic



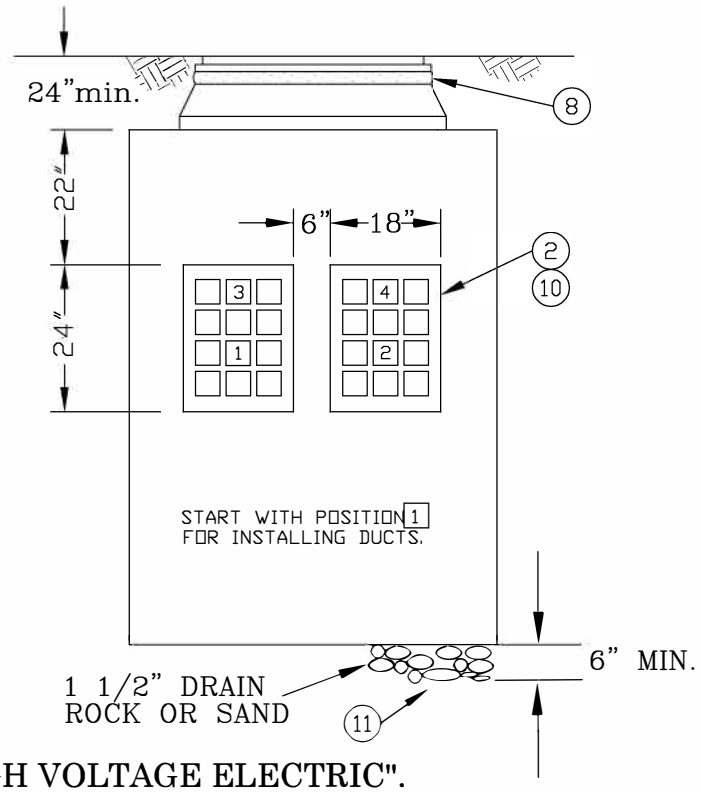
APPROVED VENDORS:
JENSEN PRECAST
OLD CASTLE

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"x24" knockout areas or 1-24" x 30" knockout centered on each side
3. P-4000 Unistrut, or equal, cast into vault; 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. (Note 24" min.)
8. Grout: Non-shrinking waterproof grout.
9. Number cover as noted in "Cover Details" section and on SVP Developer Work Drawings.
10. Terminate all ducts with PVC end bells grouted flush with inside of wall.
11. 1 1/2" size drain rock, or sand shall be installed under box to a minimum depth of 6". See reference SVP standard UG-0315 Base Material for Boxes and Pads.

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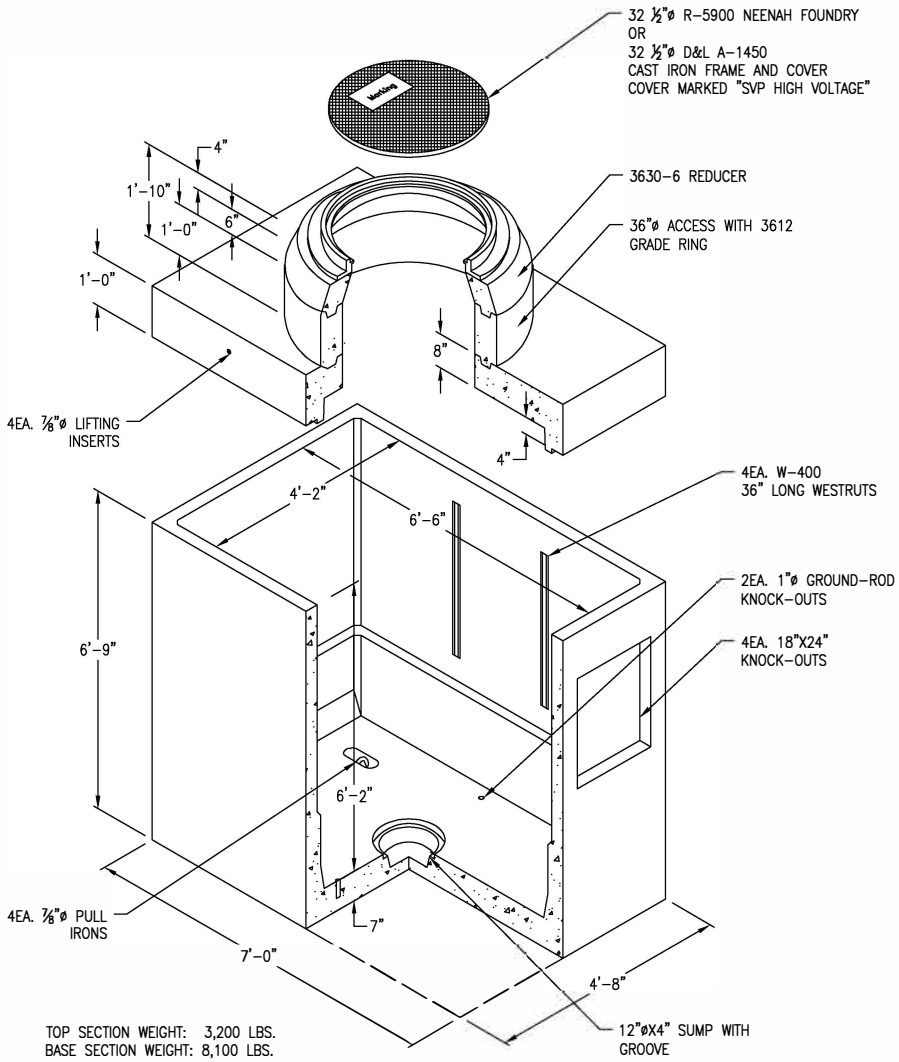
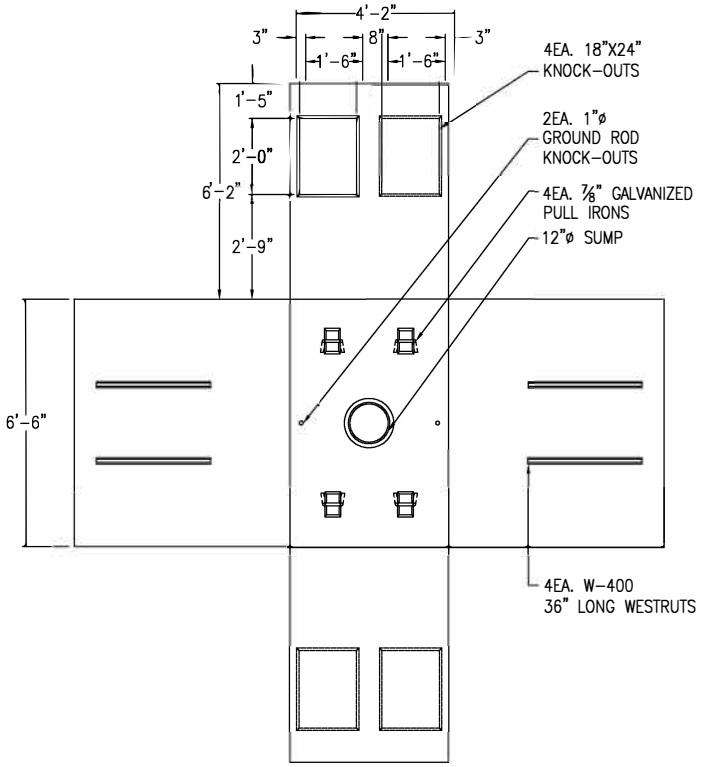
4' x 6' Primary Pullbox - Full Traffic - Elevation View



To be designed for H20-44 Loading & hydrostatic pressure with water level assumptions at 3 feet.

TOP SECTION WEIGHT: 3,200 LBS.
BASE SECTION WEIGHT: 8,100 LBS.

4'-2" X 6'-6" X 6'-6" (I.D.)
PRIMARY PULL BOX



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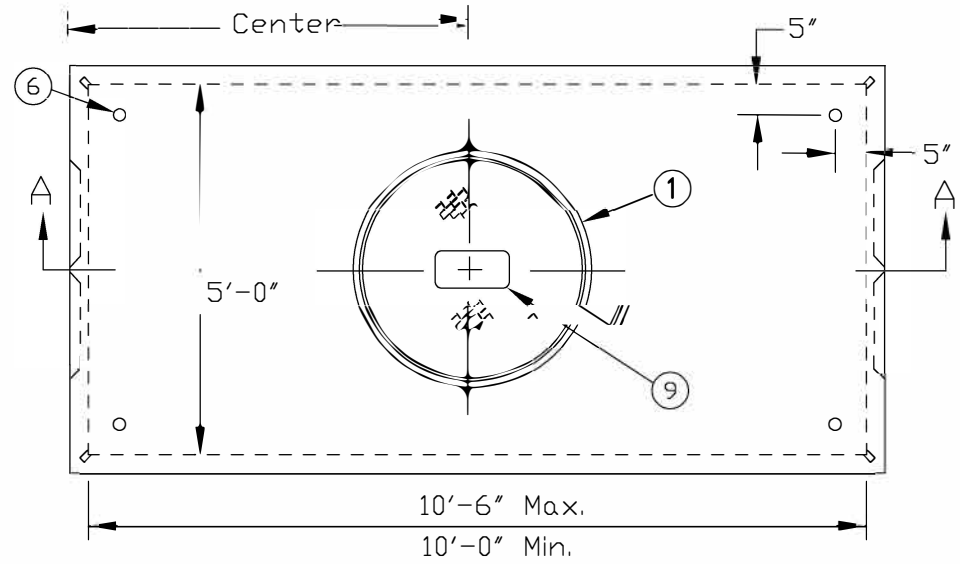
Kevin Keating		UG 1000 / Rev. 6

5' x 10' Primary Manhole - Full Traffic

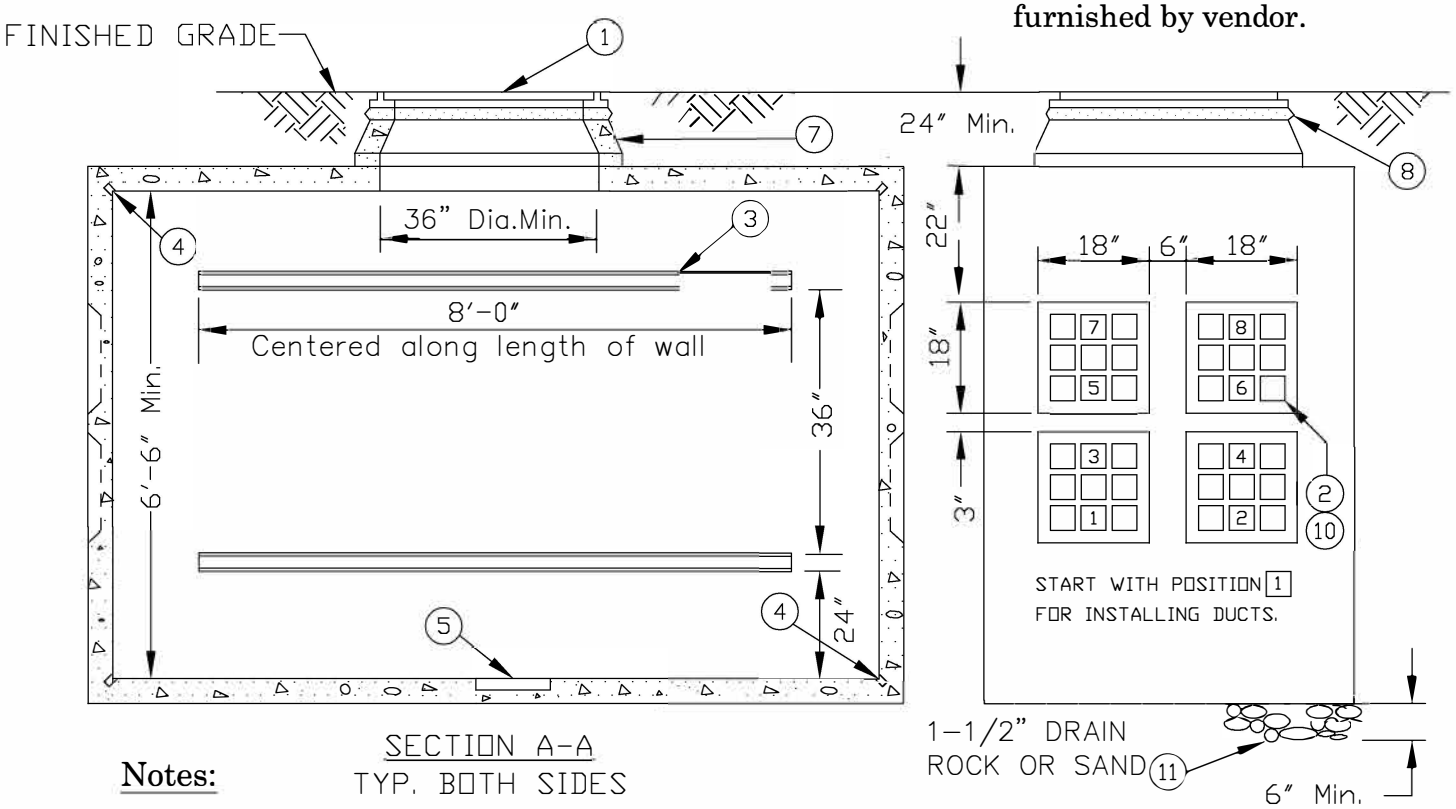


APPROVED VENDORS:
JENSEN PRECAST
OLD CASTLE

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 ⑩ ⑪

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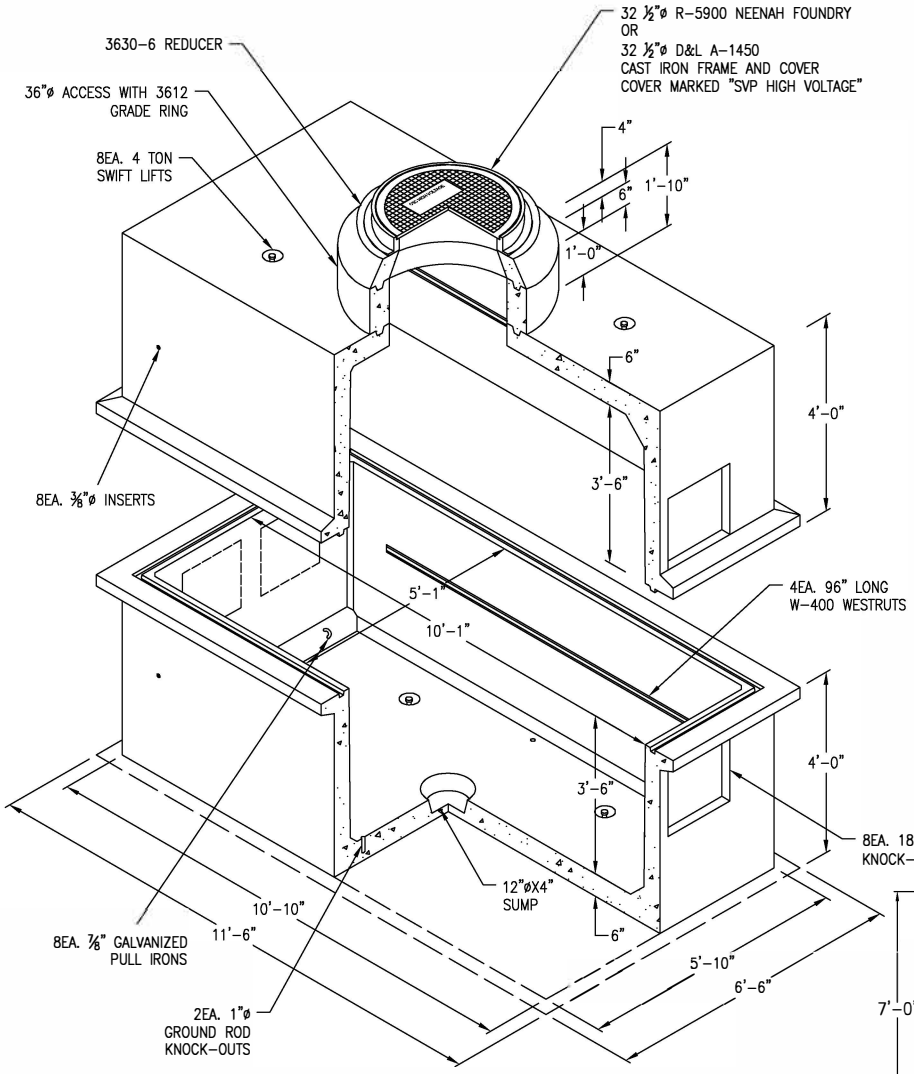
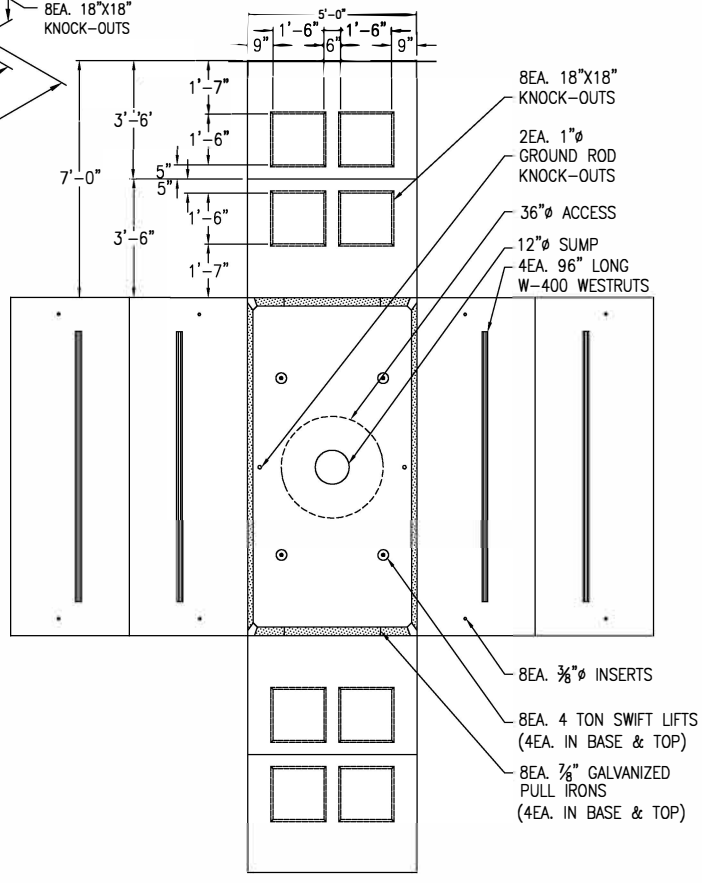
5' x 10' Primary Manhole - Full Traffic - Elevation View



To be designed for H20-44 Loading & hydrostatic pressure with water level assumptions at 3 feet.

TOP WEIGHT: 11,400 LBS.
BASE WEIGHT: 12,000 LBS.

5'-0" X 10'-0" X 7'-0" (I.D.)
PRIMARY MANHOLE



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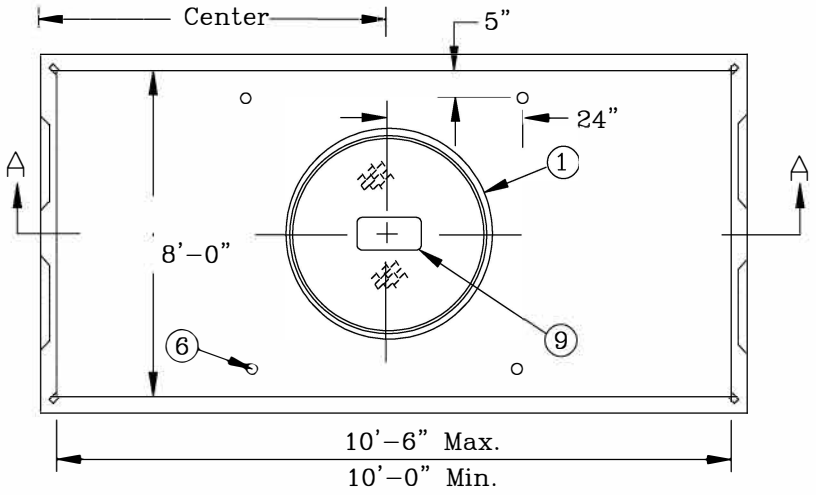
8' x 10' Primary Manhole - Full Traffic

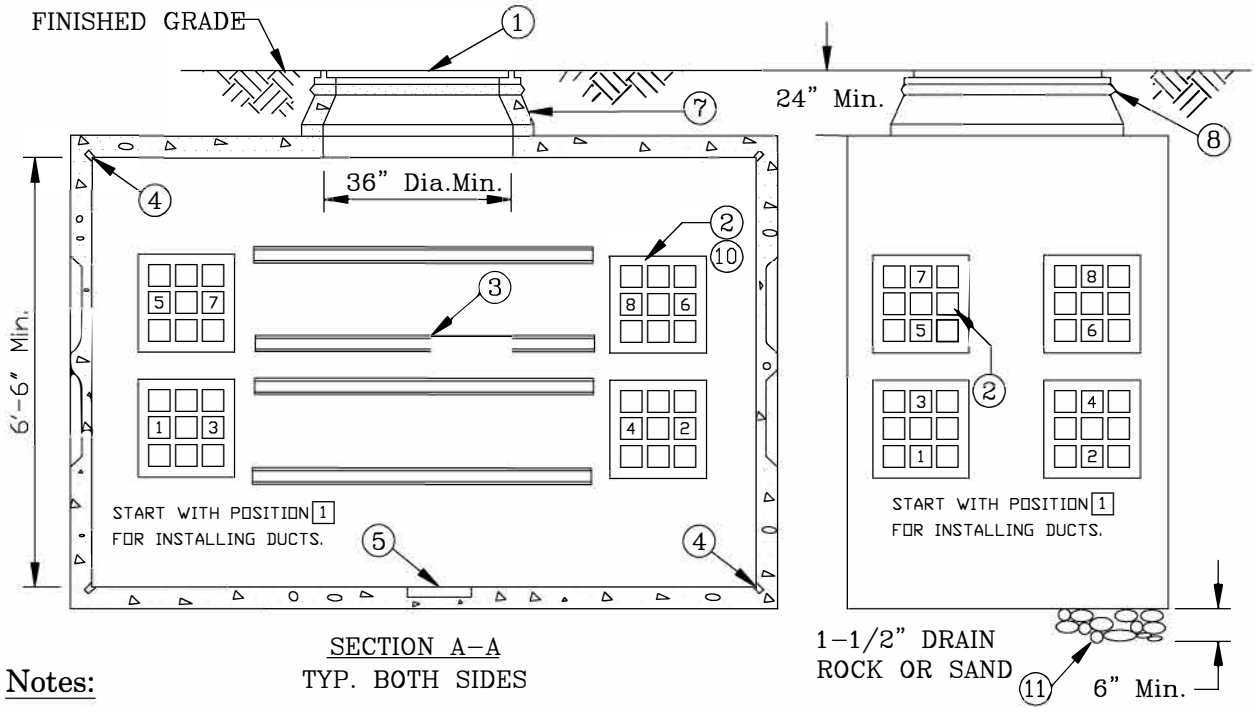


APPROVED VENDORS:
UTILITY VAULT

Box 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:

① Steel frame and cover per UG-1000 sheets 39 & 40 (inscribed "SVP HIGH VOLTAGE").
② 18" X 18" knockouts section for duct entry. See UG-0350 Sheet 7 for dimensional details.
③ P-4000 Unistrut or equal cast into each vault wall. See UG-0349 Sheet 7 for const. details.
④ 8-1" UNC pulling inserts cast into each vault at each corner. Typical 8 places.
⑤ Sump, 18" Diameter x 2 1/2" Deep. 1 required.
⑥ 2" Diameter knockout; typical 4 places.
⑦ Concrete riser(s) as required. (Note: 24" min.)
⑧ Grout, 3 parts sand to 1 part cement.
⑨ Number cover as noted on UG-1000 Sheet 41 and on SVP Developer Work drawings.
⑩ Terminate all ducts with PVC end bells grouted flush with inside of wall.
⑪ 1 1/2" size drain rock, or sand shall be installed under box to a minimum depth of 6". See reference SVP standard UG-0315 Base Material for Boxes and Pads.

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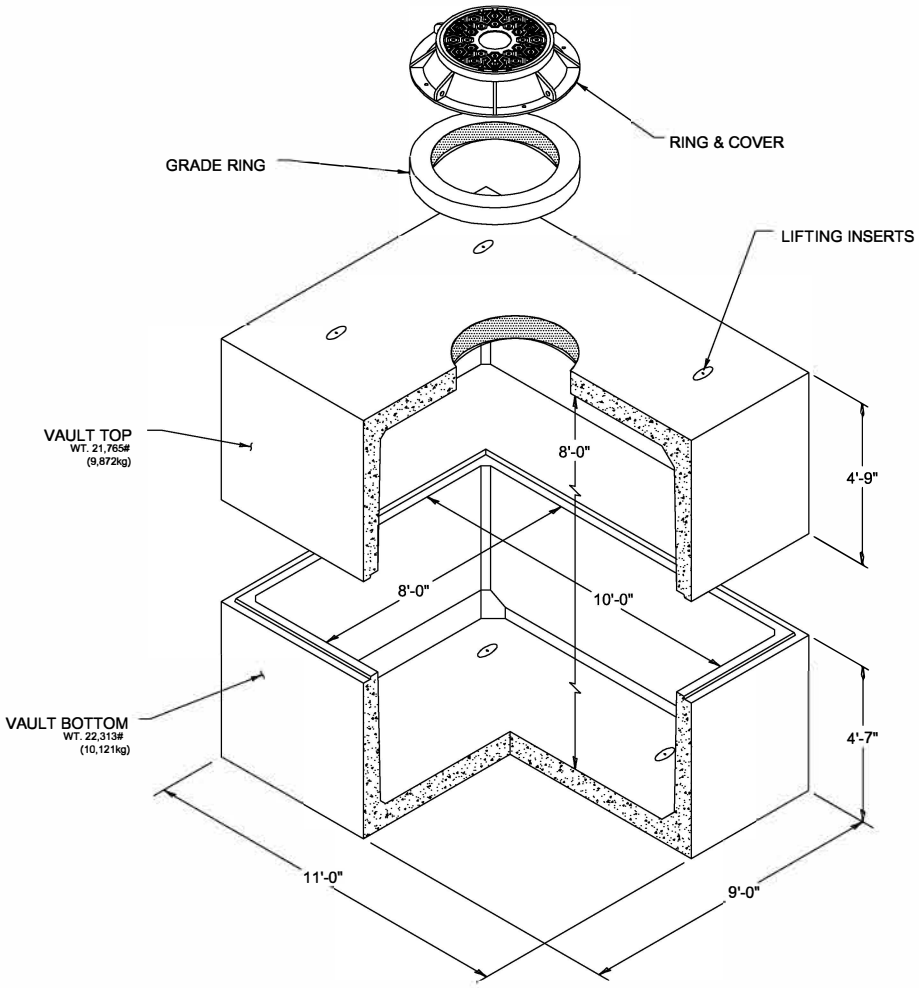
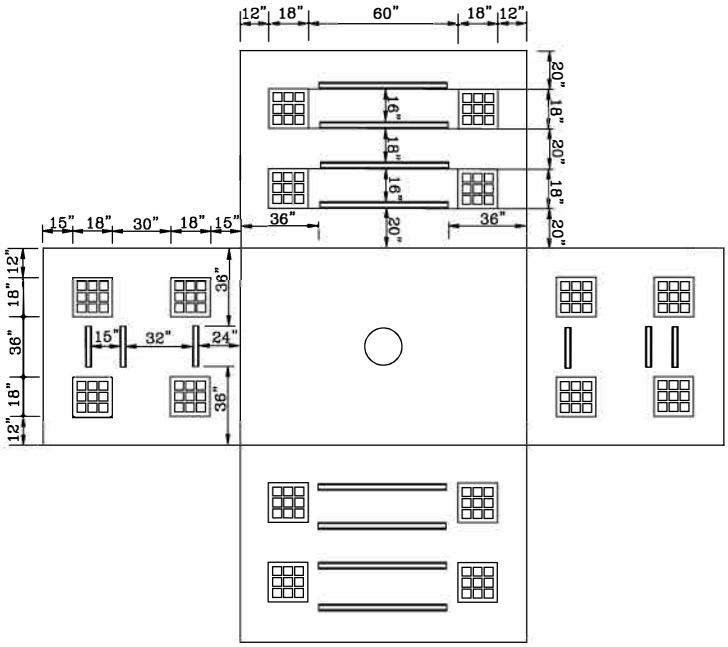
8' x 10' Primary Manhole - Full Traffic - Elevation View - See UG-0349 for Construction Details



To be designed for H20-44 Loading & hydrostatic pressure with water level assumptions at 3 feet.

8'-0" X 10'-0" X 8'-0" (I.D.)
PRIMARY MANHOLE

REFER TO UG-0349



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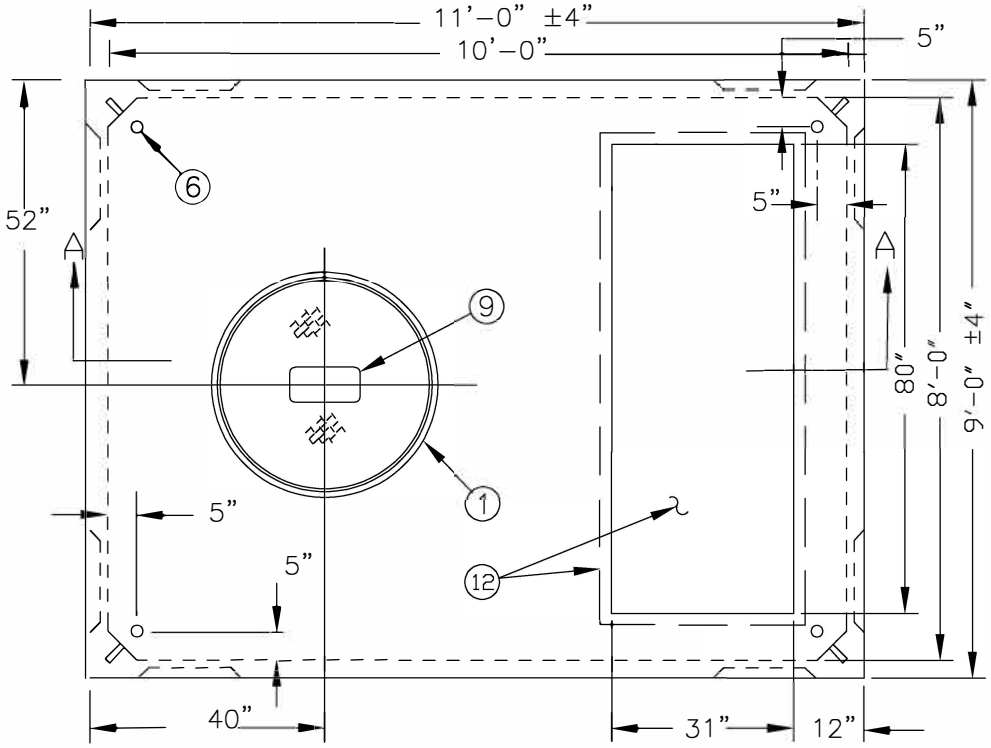
Kevin Keating		UG 1000	Rev. 6

8' x 10' Primary Switch Vault - Full Traffic

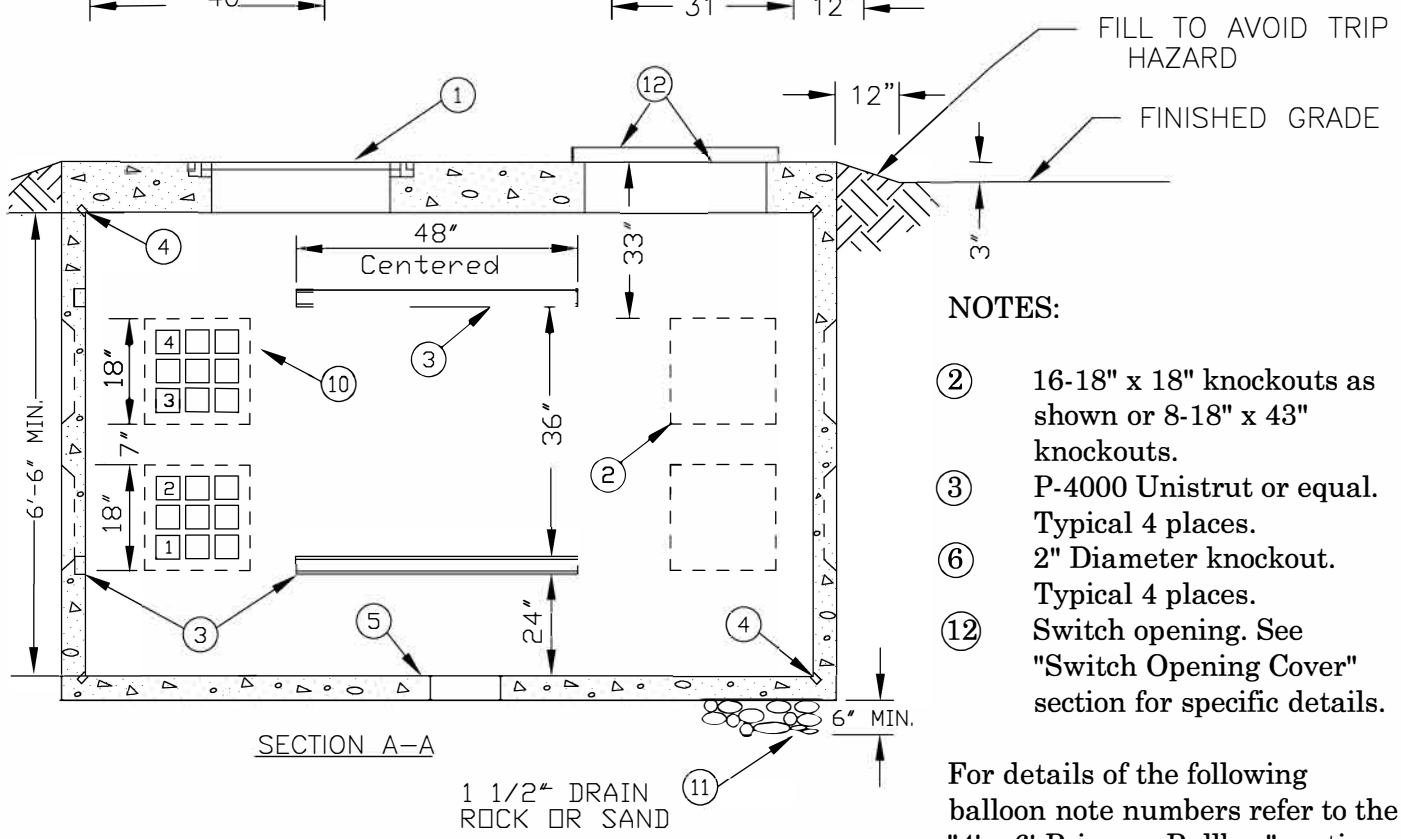


APPROVED VENDORS:
JENSEN PRECAST
OLD CASTLE

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 4 places.

(6) 2" Diameter knockout. Typical 4 places.

(12) Switch opening. See "Switch Opening Cover" section for specific details.

For details of the following balloon note numbers refer to the "4' x 6' Primary Pullbox" section.

(1) (4) (5) (9) (10) (11)

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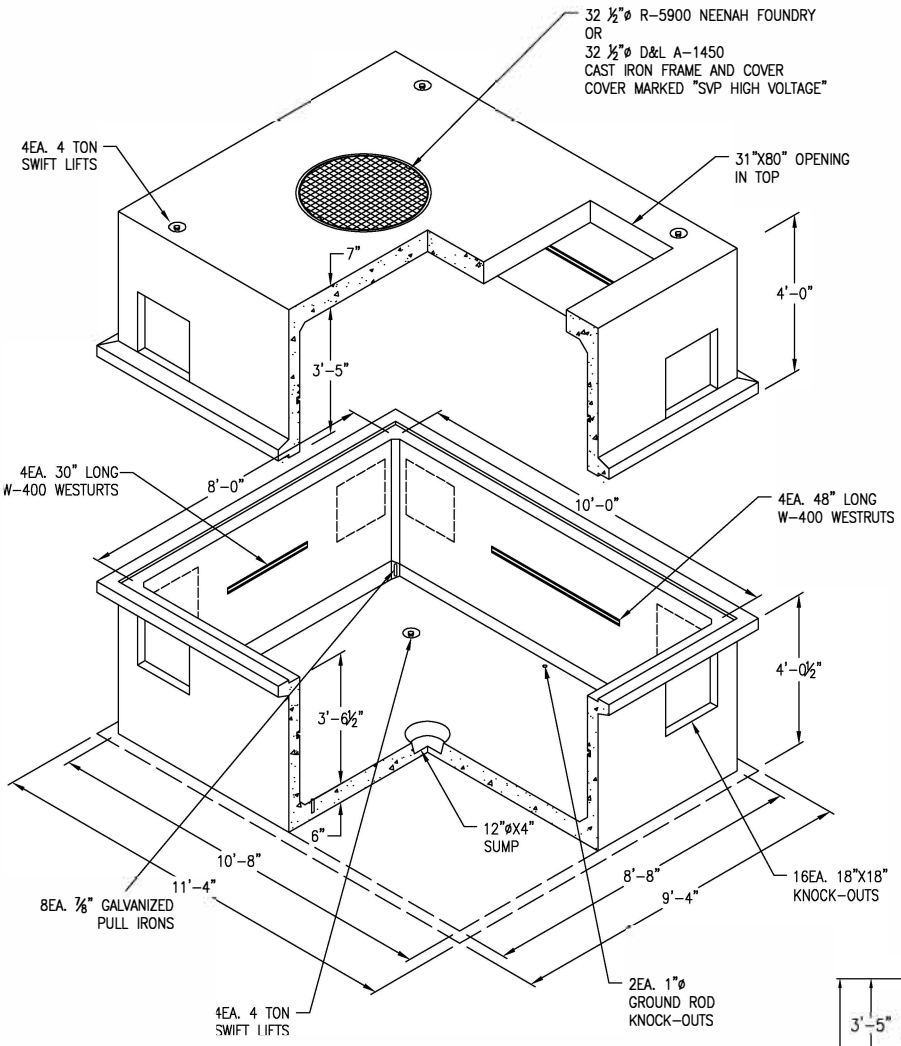
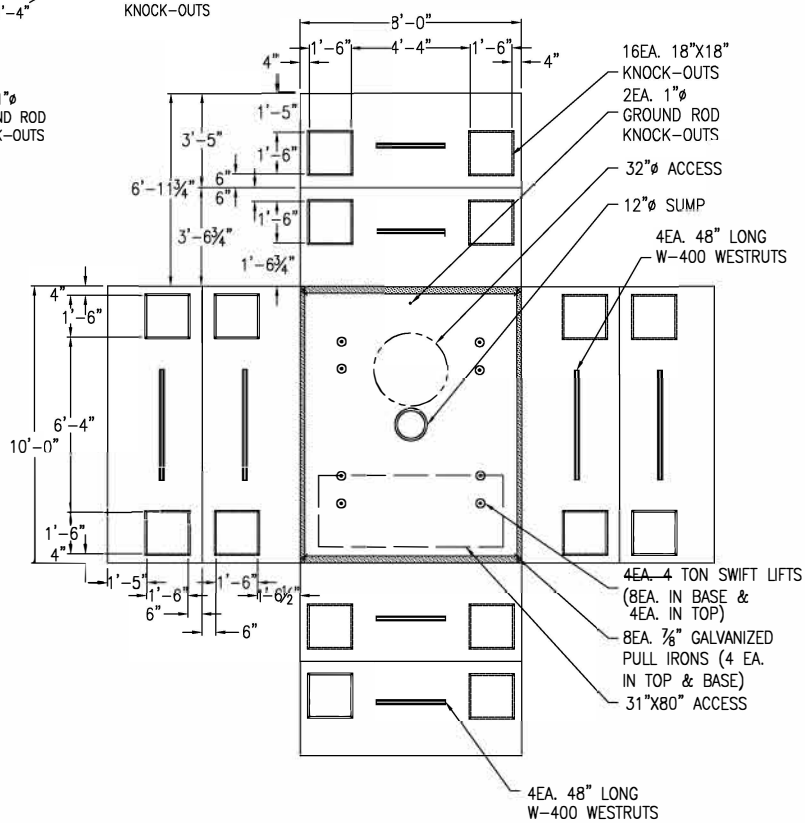
8' x 10' Primary Switch Vault - Full Traffic - Elevation View



To be designed for H20-44 Loading & hydrostatic pressure with water level assumptions at 3 feet.

TOP WEIGHT: 17,750 LBS.
BASE WEIGHT: 18,330 LBS.

8'-0" X 10'-0" X 7'-0" (I.D.)
PRIMARY SWITCH VAULT



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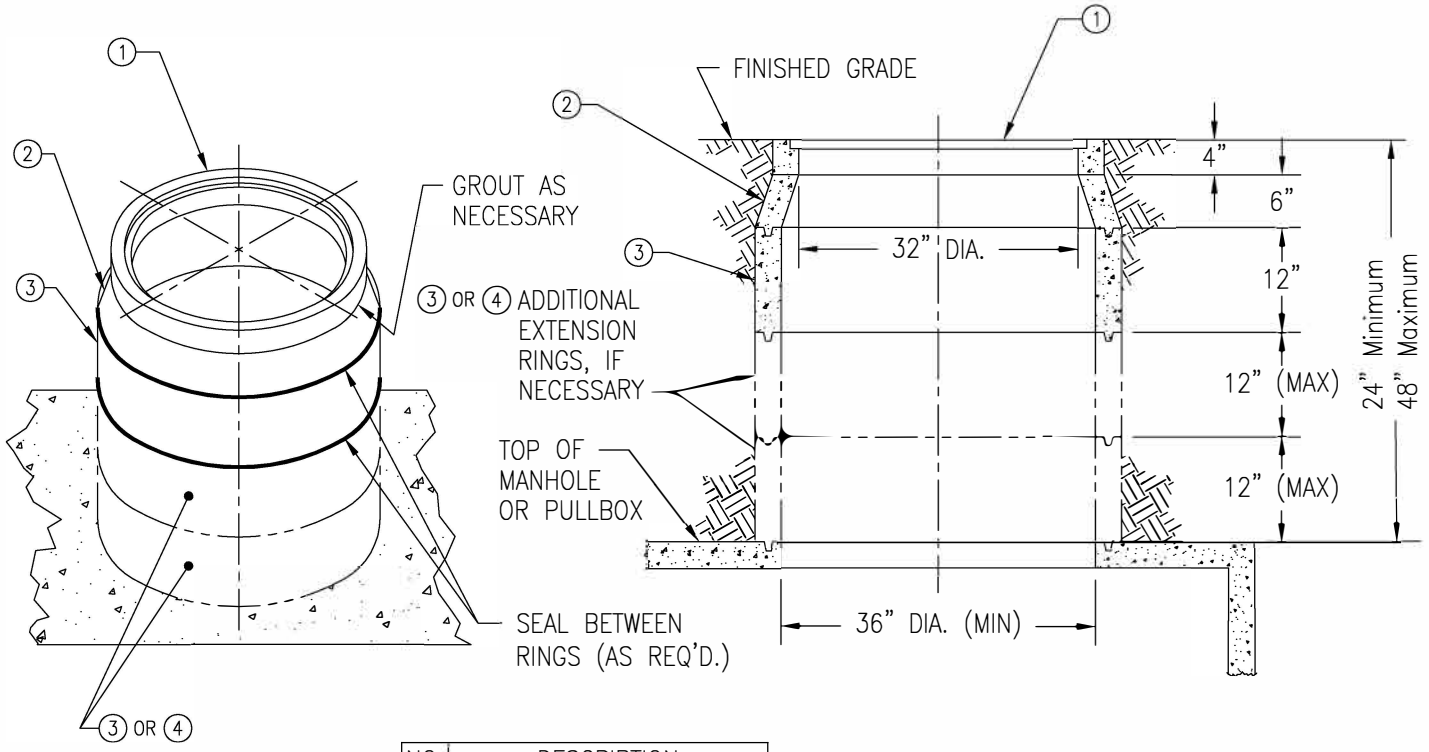
Manhole and Pullbox Risers



NO.	DESCRIPTION
①	MH COVER ASSEMBLY
②	6" REDUCER RING
③	12" EXTENSION RING
④	6" EXTENSION RING

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.

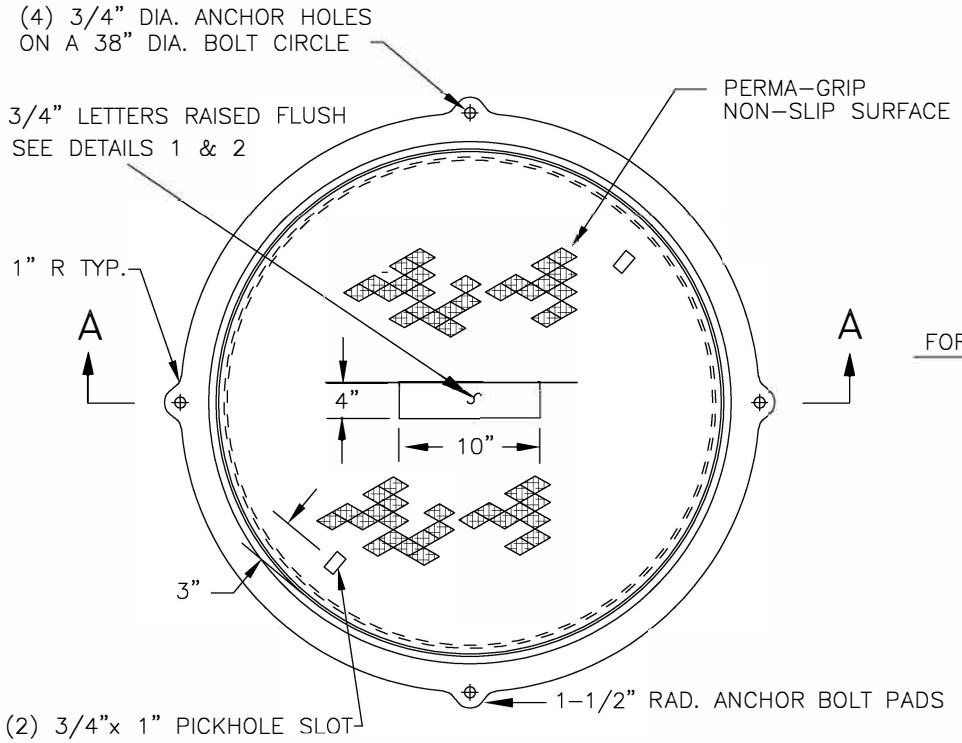
Sealing gasket material between riser rings shall be a hydrophilic type of material that swells upon contact with water, such as Adeka Ultra Seal. Seal material shall be installed on all riser joints from manhole to manhole ring.

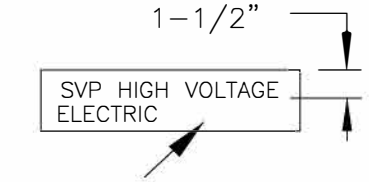
Grout consisting of 3 parts sand to 1 part Portland Cement shall be used to fill in gaps between manhole ring and riser reducer ring. Refer to leveling detail in "Manhole Covers" section for specific details.

Approved Manufacturers:

Jensen Precast
Old Castle

Manhole Covers

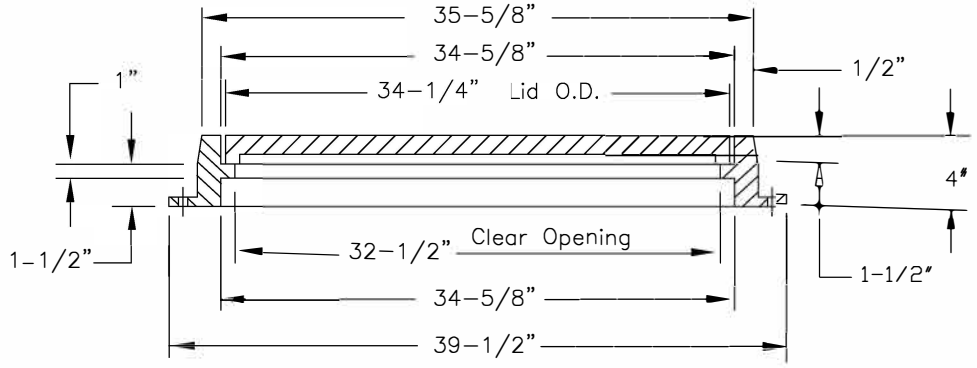




DETAIL 1
FOR PRIMARY VAULT, MANHOLE & PULL BOX COVER

SVP LOW VOLTAGE ELECTRIC

DETAIL 2
FOR LOW VOLTAGE SPLICEBOX IN TRAFFIC AREAS
NUMBERING NOT APPLICABLE TO LOW VOLTAGE SPLICE BOXES



SECTION A-A

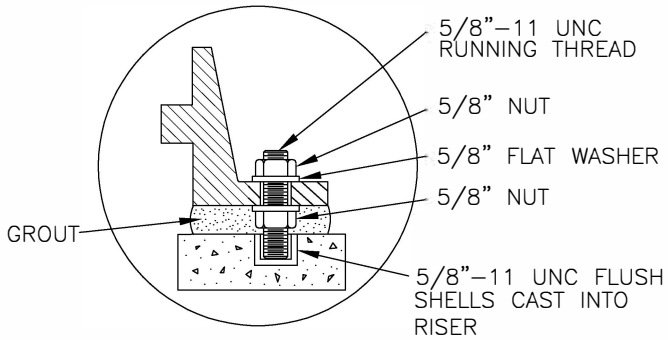
NOTES

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

APPROVED VENDOR: NEENAH FOUNDRY CO.

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

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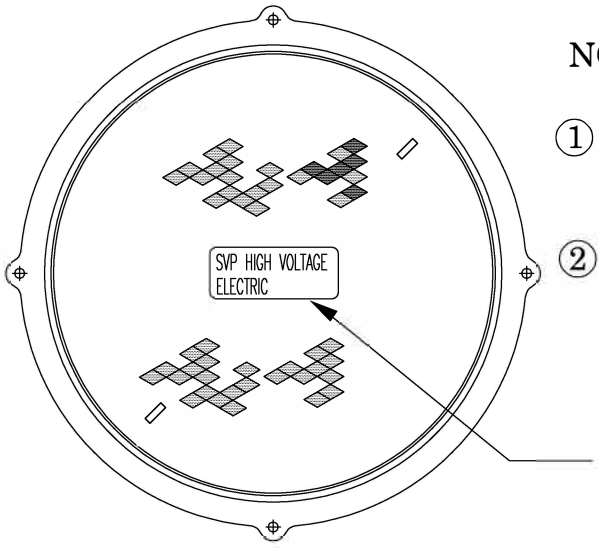
Manhole Cover Lettering and Numbering

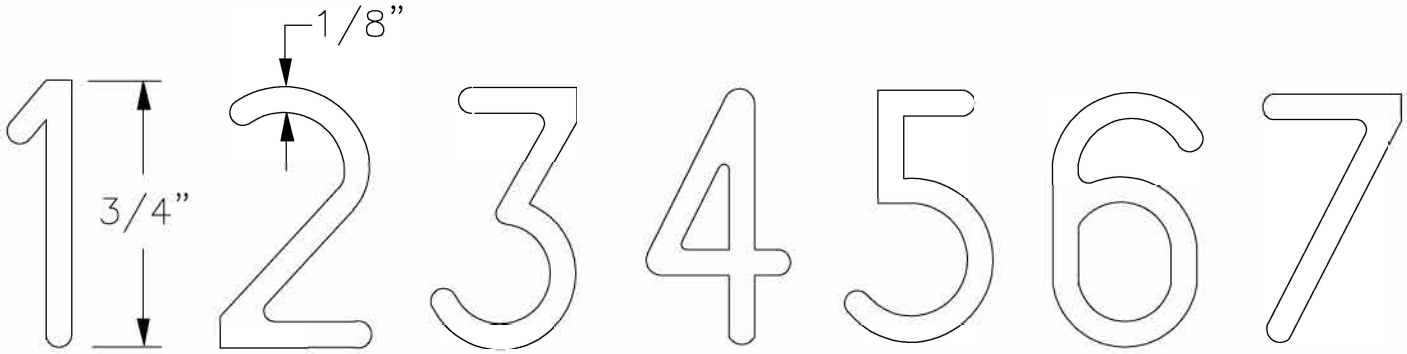


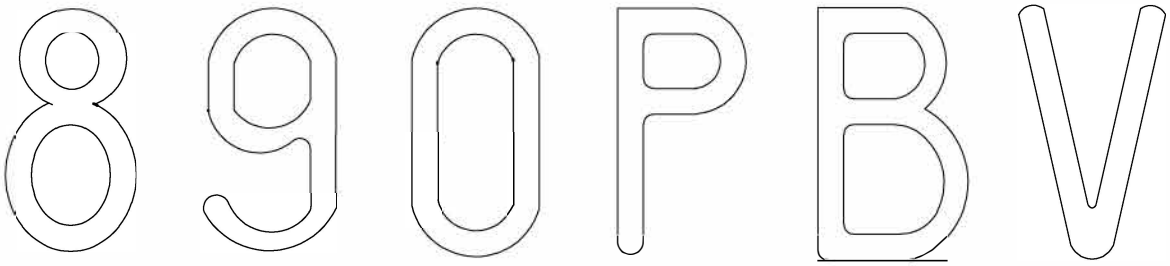
NOTES:

① Arc weld numbers and letters on frame as shown. Build bead to 1/16" high.

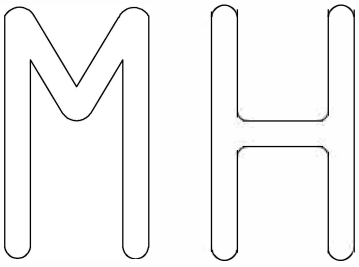
② Covers for manholes and Pull-boxes that are located in side-walks shall be sand epoxied by vault manufacturer as noted in "Materials" section.

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





(PULL) (BOX) (VAULT)



(MAN) (HOLE)

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

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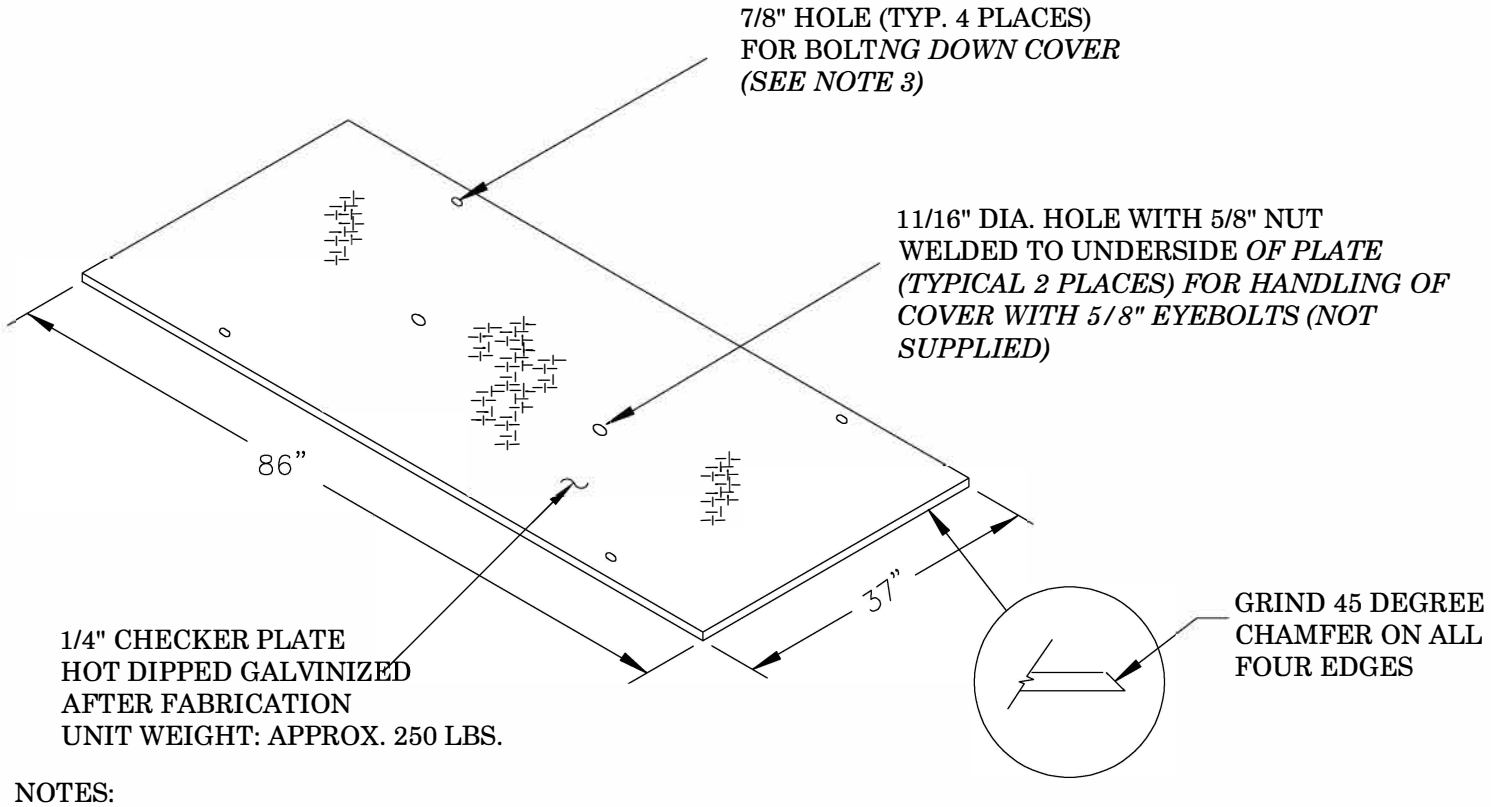
Switch Opening Cover



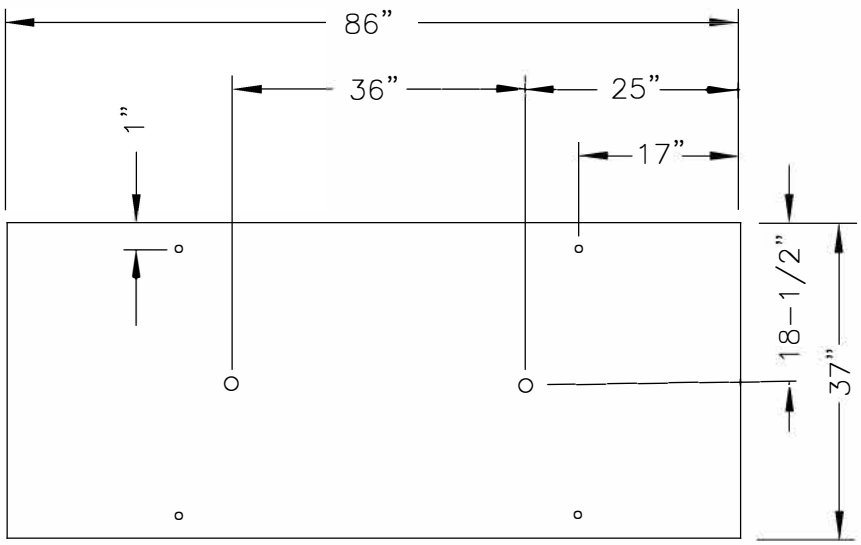
NOTES:

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

By: Scott Anderson / Krishn Patel	Installation of Underground Substructures by Developers	Drawn By: SVP Staffs
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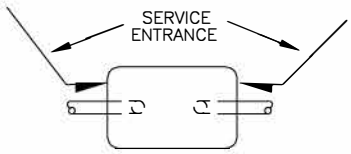
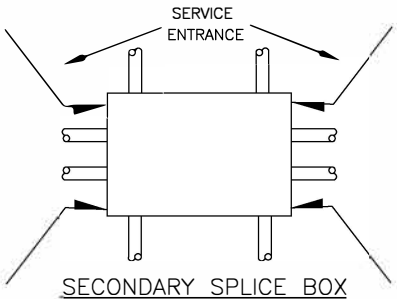
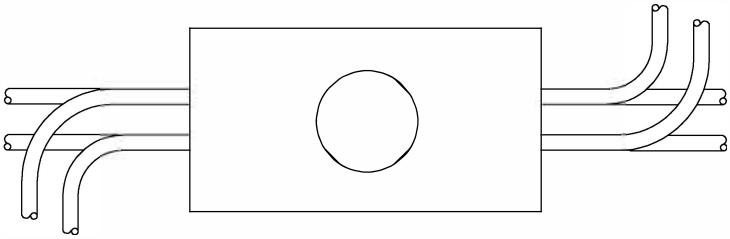
Routing of Ducts into Boxes



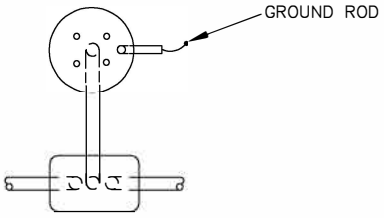
SECONDARY SPLICE BOX



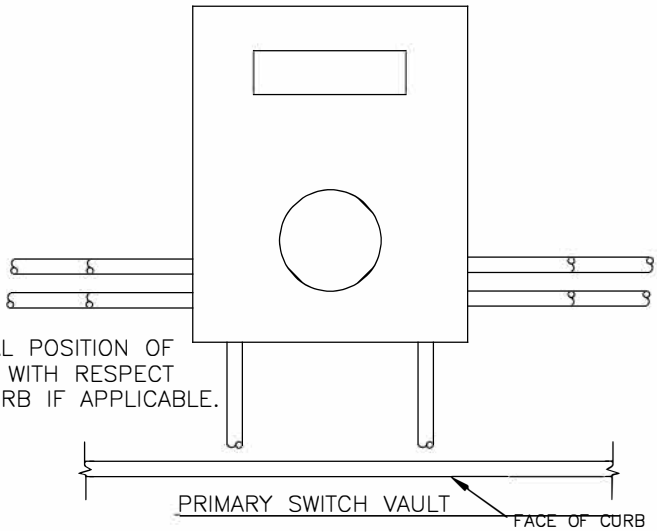
SECONDARY SPLICE BOX
Light or Full Traffic



PRIMARY PULL BOX OR MANHOLE



STREET LIGHT FOUNDATION
WITH SPLICE BOX.



TYPICAL POSITION OF
VAULT WITH RESPECT
TO CURB IF APPLICABLE.

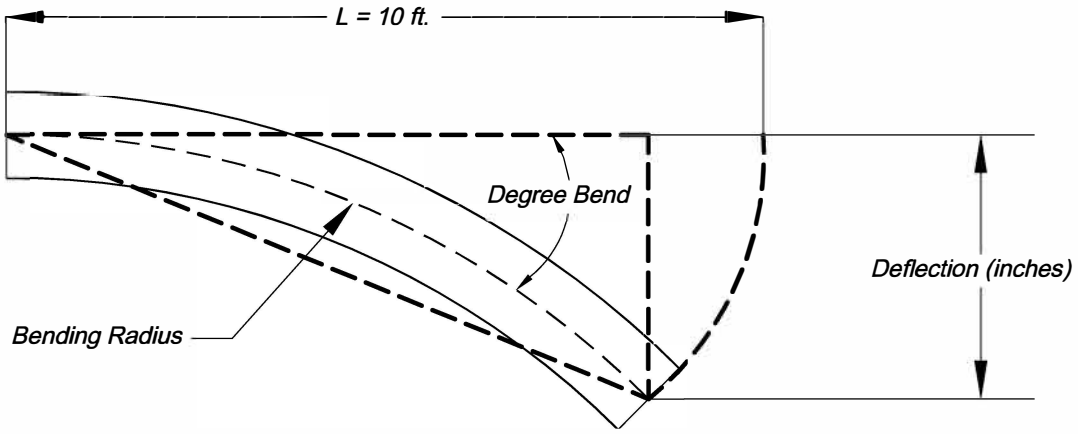
NOTES:

1. Route ducts into boxes as shown. These are typical examples. Any exceptions will be shown on SVP estimate Developers Work drawings.
2. Location and position of boxes will be shown on SVP Developers Work 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 Developers Work 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 Developers Work drawings.
7. Total conduit radius bends shall not exceed 270 ° degrees maximum on any conduit run. If SVP requires, then the customer/contractor shall provide cable pull calculations to SVP for review/approval prior to installation.

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 44. Bends made in the field using a "hotbox" or similar techniques are **not** allowed.

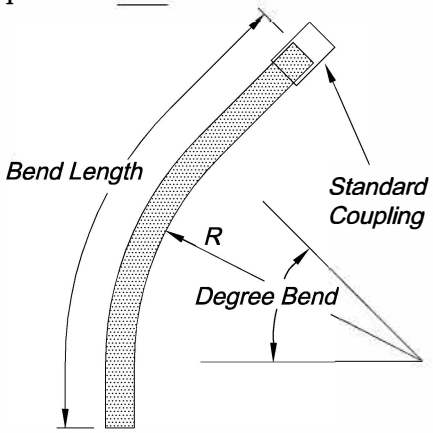


Bending Allowance per 10 feet of PVC Duct			
Duct Size (In)	Bending Radius (ft.)	Max Degree Bend	Deflection (In)
1 1/2	20	14.5	29.7
2	25	11.6	23.9
3	36	7.9	16.4
4	47	6.1	12.8
5	58	4.9	10.3
6	69	4.2	8.7

Manufactured Duct Bends DB-120

When conduits are to be installed by Developers for SVP, the conduits shall be DB-120 or PVC Schedule 40, unless specifically specified in the SVP Developer's Work Drawing. Consult with the SVP Conduit Inspector for pre-approval prior to installation.

Factory made bends are to be used in situations where the required duct bending radius is less than shown on sheet 43 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
22 1/2°	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		12 1/2' R	
	Bin #	Bend Length	Bin #	Bend Length	Bin #	Bend Length
11 1/4°	n/a		n/a		90245	36.5"
22 1/2°	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		12 1/2' R	
	Bin #	Bend Length	Bin #	Bend Length	Bin #	Bend Length
11 1/4°	n/a		n/a		90247	36.5"
22 1/2°	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	

6 Inch Diameter DB-120 Duct

DEGREE BEND	3' R		5' R		12 1/2' R	
	Bin #	Bend Length	Bin #	Bend Length	Bin #	Bend Length
11 1/4°	n/a		n/a			
22 1/2°	n/a		n/a			
30°	n/a		n/a	40.19"		
45°	n/a	37.02"	n/a	55.87"		
90°	n/a	65.25"	n/a	103.00"		

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

Manufactured Duct Bends PVC Schedule 40

2 Inch Diameter PVC Schedule 40

DEGREE BEND	2' R Bend Length	3' R Bend Length
11 1/4°	8.71"	11.07"
22 1/2°	13.42"	18.14"
30°	16.57"	22.85"
45°	22.85"	32.27"
90°	41.70"	60.55"

4 Inch Diameter PVC Schedule 40

DEGREE BEND	3' R Bend Length	5' R Bend Length
11 1/4°	13.82"	18.53"
22 1/2°	20.89"	30.31"
30°	25.60"	38.17"
45°	35.02"	53.87"
90°	63.30"	101.00"

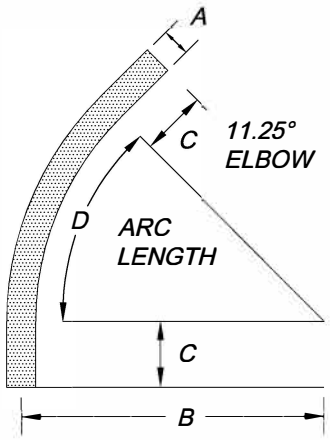
5 Inch Diameter PVC Schedule 40

DEGREE BEND	3' R Bend Length	5' R Bend Length
11 1/4°	14.32"	19.03"
22 1/2°	21.39"	30.81"
30°	26.10"	38.67"
45°	35.52"	54.37"
90°	63.80"	101.50"

6 Inch Diameter PVC Schedule 40

DEGREE BEND	3' R Bend Length	5' R Bend Length
11 1/4°	14.57"	19.28"
22 1/2°	21.64"	31.06"
30°	26.35"	38.92"
45°	35.77"	54.62"
90°	64.05"	101.75"

SCHEDULE 40 PVC BEND



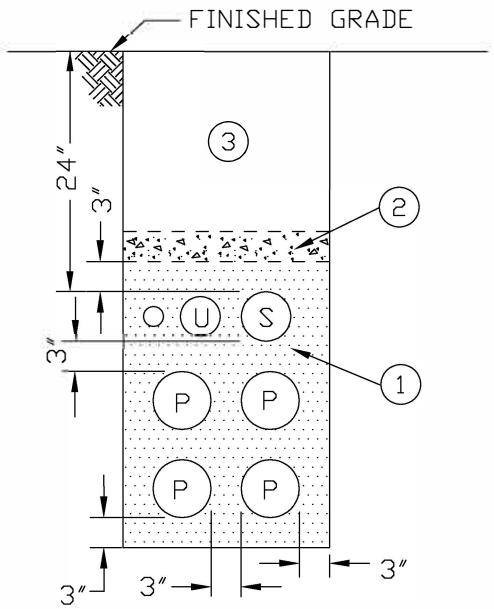
TRADE SIZE	AVERAGE OD "A"	MIN. STANDARD RADIUS "B"	MIN. TANGENT LENGTH "C"
1/2"	0.840"	4"	1 1/2"
3/4"	1.050"	4 1/2"	1 1/2"
1"	1.315"	5 3/4"	1 7/8"
1 1/4"	1.660"	7 1/4"	2"
1 1/2"	1.900"	8 1/4"	2"
2"	2.375"	9 1/2"	2"
2 1/2"	2.875"	10 1/2"	3"
3"	3.500"	13"	3 1/8"
3 1/2"	4.000"	15"	3 1/4"
4"	4.500"	16"	3 3/8"
5"	5.563"	24"	3 5/8"
6"	6.625"	30"	3 3/4"

Arc Length "D" = [2 x Radius] x 3.14 x [Angle / 360]

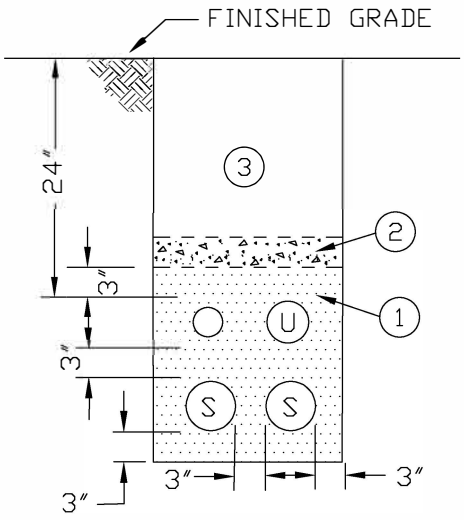
Example: Arc Length UA3AD = [2 X 4] X 3.14 X [11.25 / 360] = 0.79"

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-P6 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 only required when ducts are installed in an area that can be planted. Use a 3 sack minimum mix for the concrete when required.

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. See reference duct bank spacer standard UG-0340 Conduit Spacers.

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. See reference SVP standard UG-0345 Trench Backfill.

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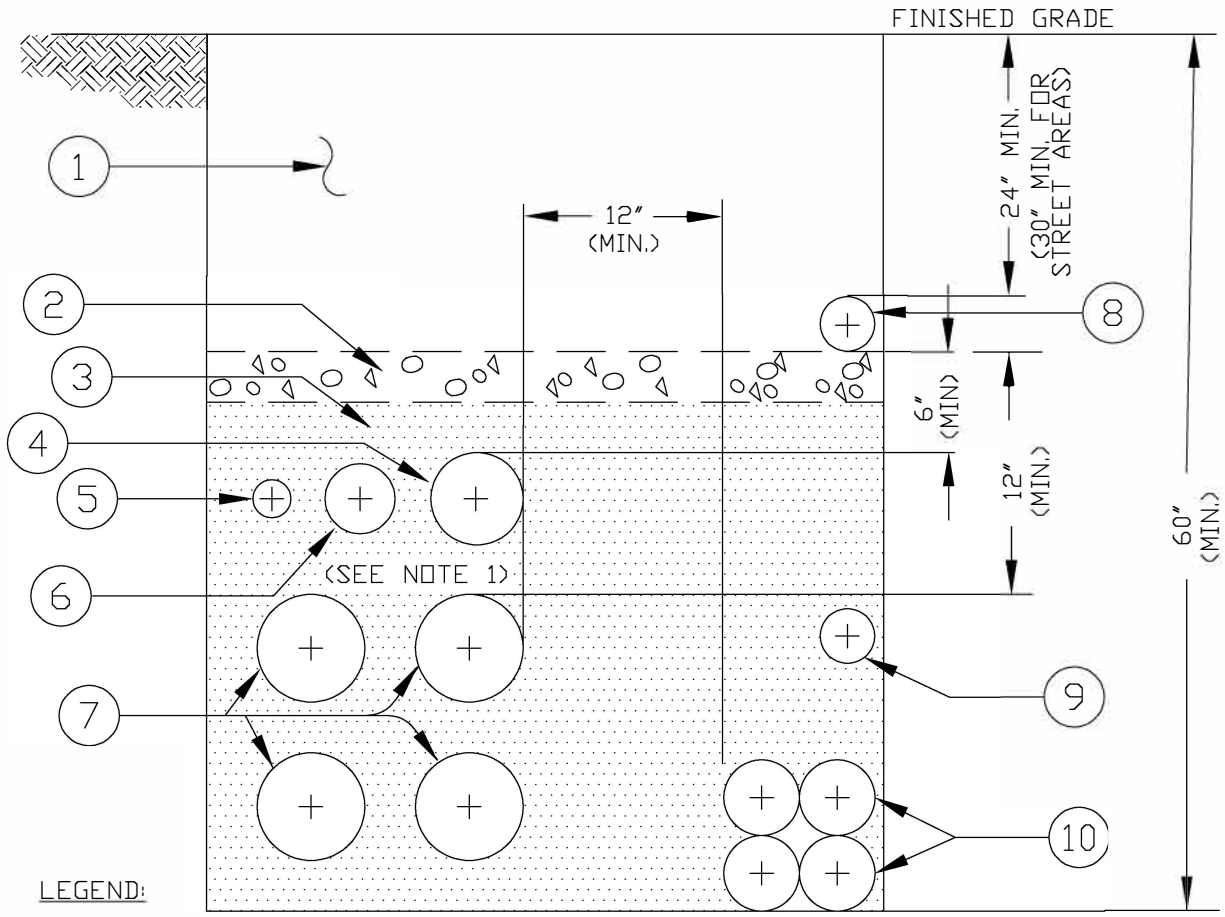
Joint Trench Configuration



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. See reference SVP standard UG-0345 Trench Backfill.

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

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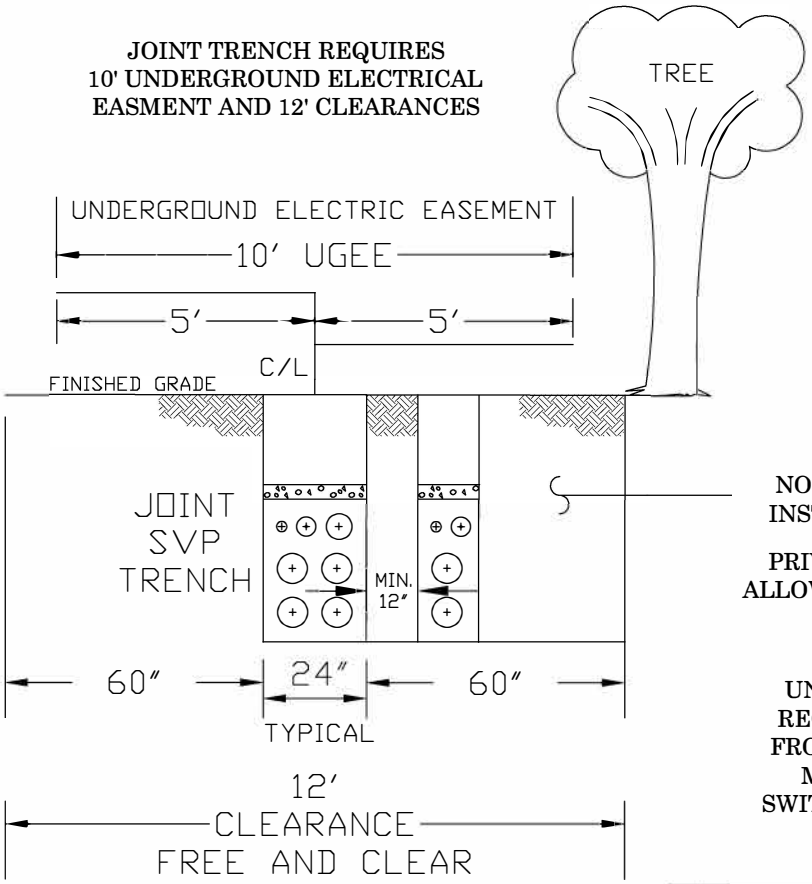
Joint Trench & Equipment Easement and Clearances

JOINT TRENCH REQUIRES
10' UNDERGROUND ELECTRICAL
EASMENT AND 12' CLEARANCES

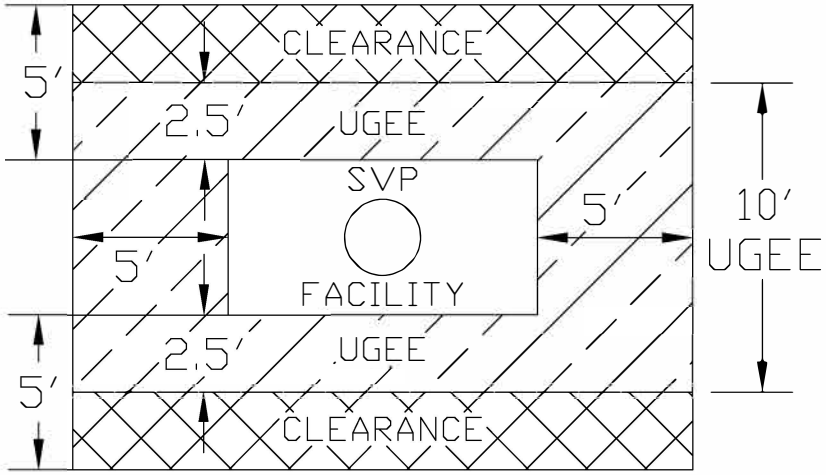


NOTE: TREES TO BE OUTSIDE
OF 5' CLEARANCE ZONE FROM
SVP JOINT TRENCH PER SD-1235

NON-SVP PUBLIC UTILITIES
INSTALLED CONCURRENTLY

PRIVATE UTILITIES ARE NOT
ALLOWED IN THE JOINT TRENCH

UNDERGROUND ELECTRICAL EASEMENTS
REQUIRED MINIMUM 5' IN ALL DIRECTIONS
FROM ELECTRICAL EQUIPMENT INCLUDING:
MANHOLES, CAPACITOR PADS, REMOTE
SWITCH PADS, VAULTS, TRANSFORMERS, ETC..



NOTES:

1. For joint trench details, refer to sheet 47: Joint Trench Configuration.
2. For transformer pad clearances, refer to sheet 12: Equipment Pad Clearances; sheet 13: Transformer Pad Clearances; sheet 16: Single Phase Transformer Pads, and sheet 17: Three Phase Transformer Pads.

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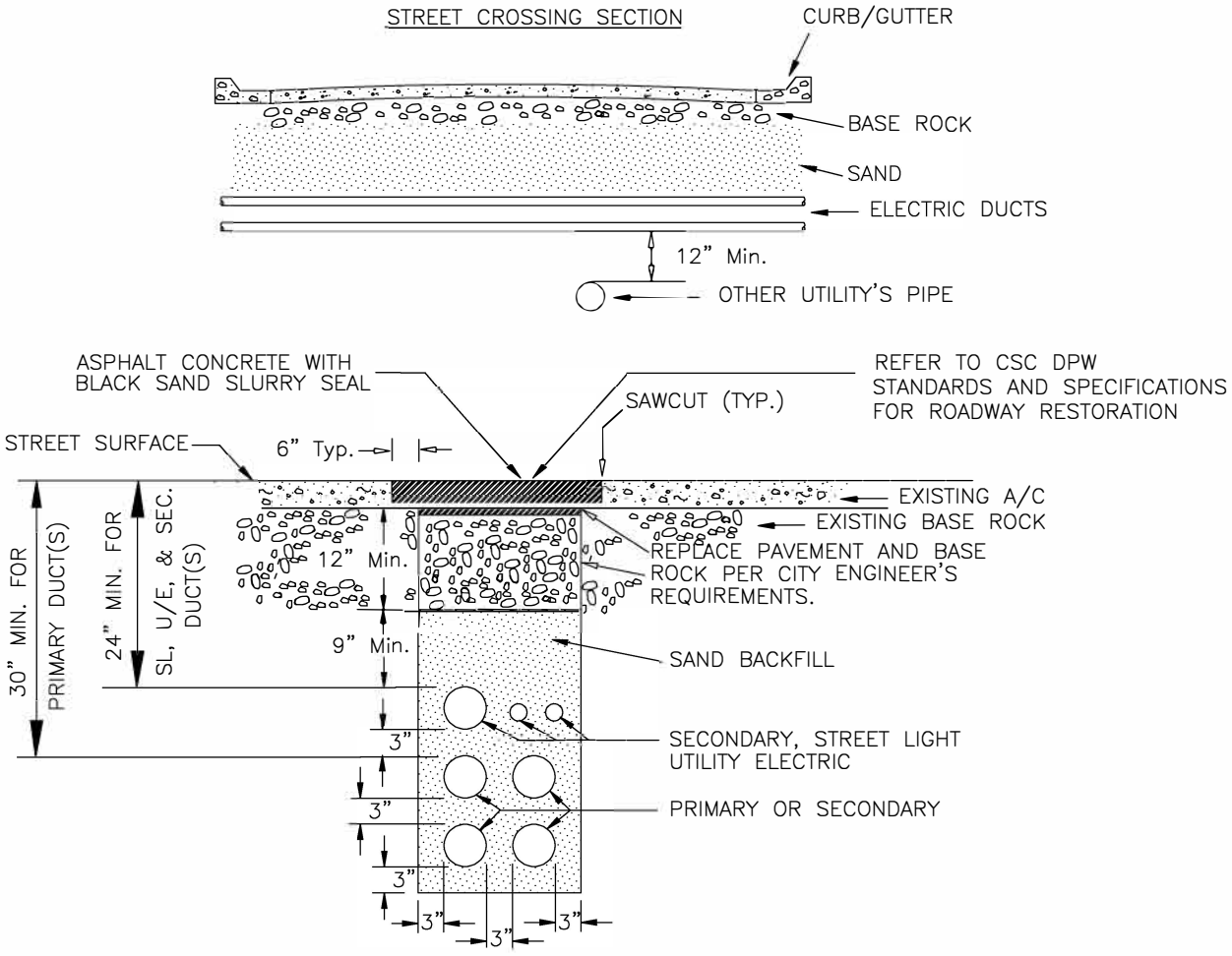
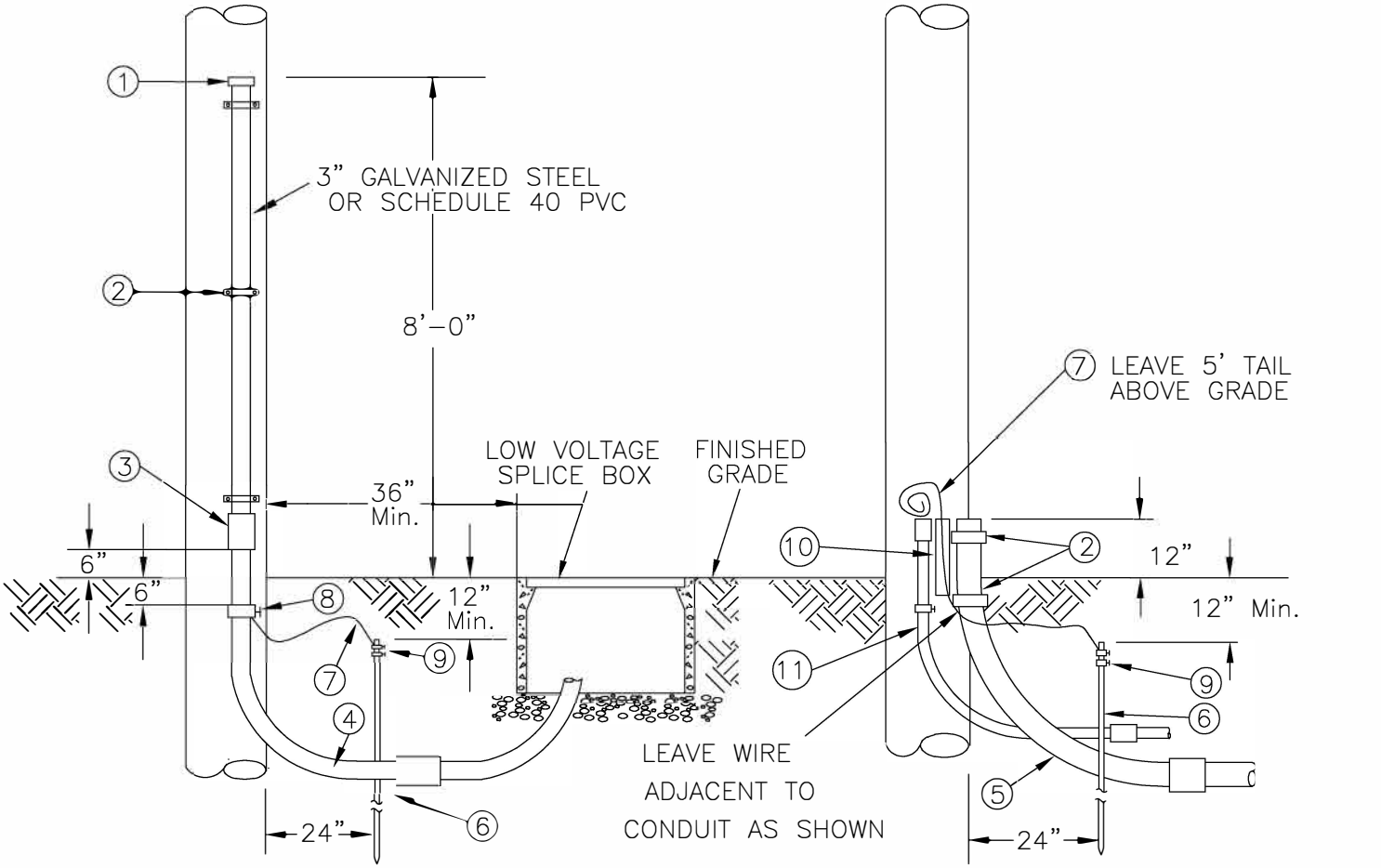
Street Crossing Trench Details



NOTES:

1. Backfill and compaction shall comply with City of Santa Clara Engineering Department Standard Specifications. See reference SVP standard UG-0345 Trench Backfill.
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.

Riser Pole Details



MIN. 3" SERVICE RISER

6" PRIMARY DUCT RISER AND 2" FIBER RISER

NOTES:

① 3" Threaded grounding bushing, galvanized steel / or 3" cap if using schedule 40 PVC.
② Galvanized steel straps for rigid conduit.
③ Threaded galvanized steel coupling / or schedule 40 coupling if using PVC.
④ 3" x 36" radius, galvanized steel bend / or schedule 40 PVC bend.
⑤ 6" x 90° x 36" minimum radius, PVC schedule 40 bend. Consult with SVP if spare conduit is required.
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.
⑪ 2" fiber conduit riser for padmount transformer services. Stub out and cap fiber conduit outside of the underground pull section.

Note: See SVP riser quadrant detail for conduit placement on utlility pole. Secondary conduit to terminate in new splice box; unless exception given by SVP. Consult with SVP on location and size of low voltage splice box.
No private risers. SVP will install the riser and cable to the service point at the low voltage pullbox.

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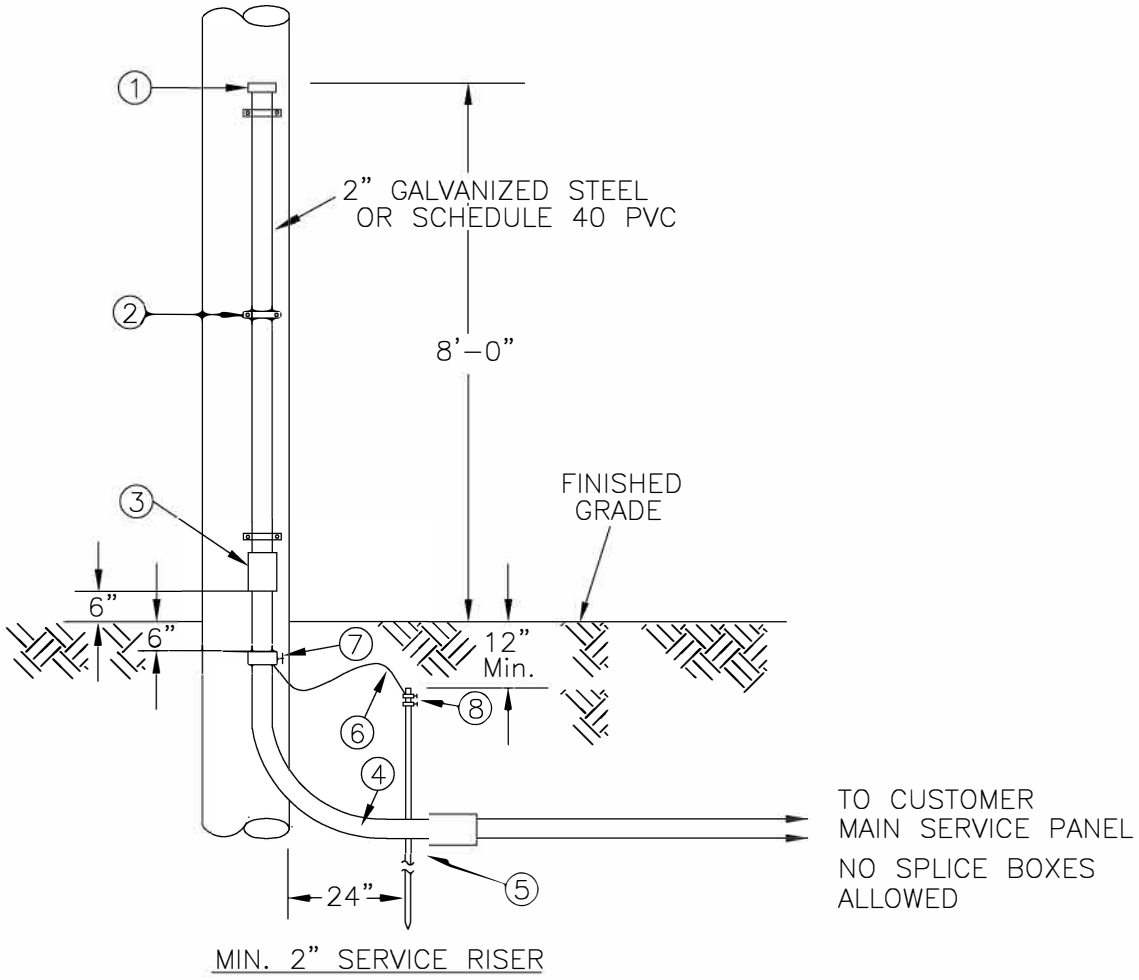
Customer Riser Pole Details



NOTES:

① 2" Threaded grounding bushing, galvanized steel / or 2" cap if using schedule 40 PVC.
② Galvanized steel straps for rigid conduit.
③ Threaded galvanized steel coupling / or schedule 40 coupling if using PVC.
④ 2" x 36" radius, galvanized steel bend / or schedule 40 PVC bend.
⑤ 5/8" x 8'-0" copper ground rod.
⑥ #2 AWG stranded bare copper ground wire.
⑦ Bronze ground pipe clamp; Burndy GAR, Penn-Union type GPL, or equal.
⑧ Install two copper ground rod clamps per "Materials" section.

See SVP riser quadrant detail for conduit placement on utlility pole.
Private risers are to be installed per City of Santa Clara Building Inspection Division Codes.
A Private Riser Agreement is required.

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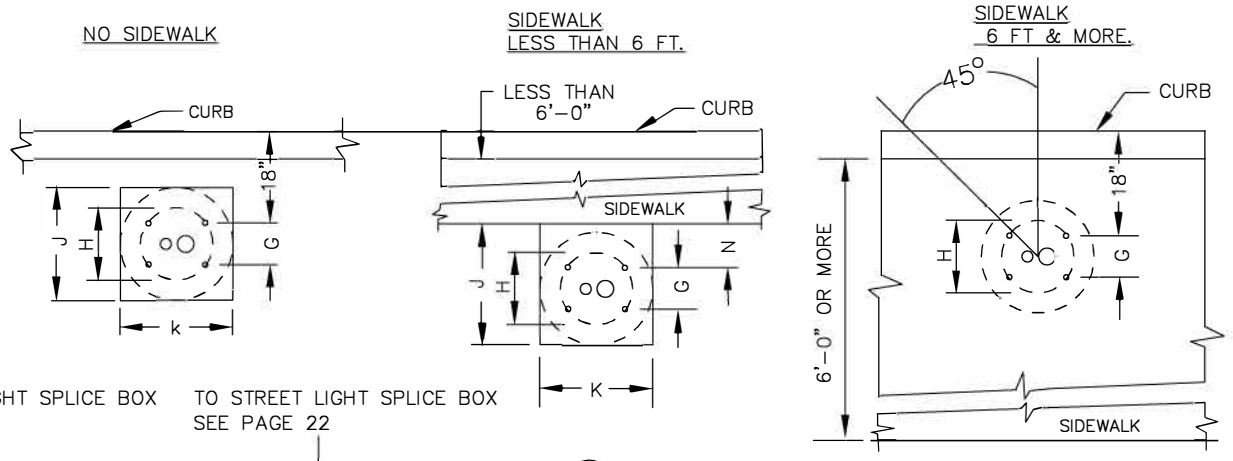
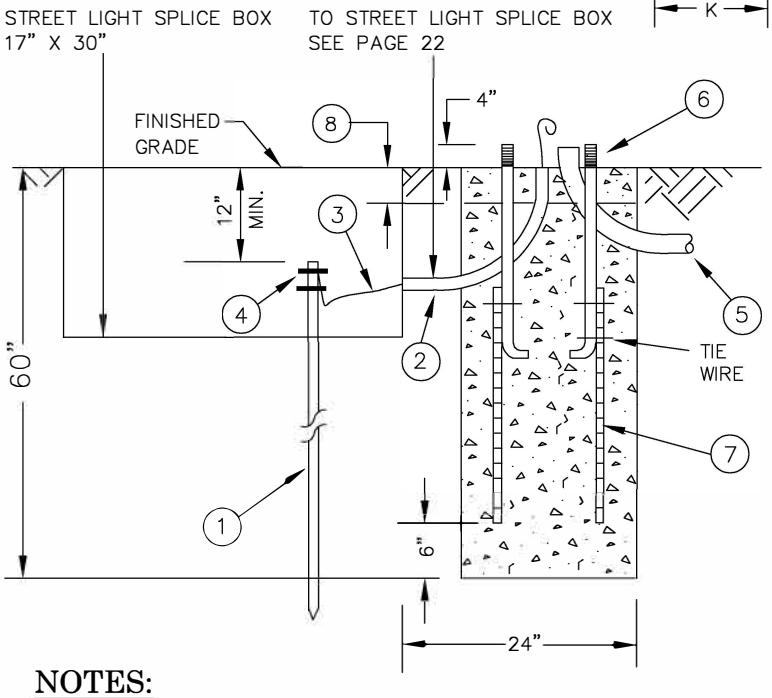
Street Light Foundation Details





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.

Type B is not for new construction unless called out in the SVP developer's work drawing.
Shown here for existing installation reference only.

NOTES:

① Install 5/8" x 8'-0" Ground Rod in adjacent street light pullbox with the top 2" exposed above ground.
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 the foundation is installed in the 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.

Note: Consult with SVP on location of foundation - ADA sidewalk clearance requirements to be met.
Note: For El Camino decorative street light foundations, refer to UG-1540.

Appendix A

Other Relevant SVP Standards:

OH-1230 - Tree Clearances From Overhead ElectricLines
SD-1235 - Tree Planting Requirements Near Underground Electric Facilities
UG-0315 - Base Material for Boxes, Vaults, Manholes and Pads
UG-0334 - Padmount Capacitor Bank Pad
UG-0335 - Electric Trench Backfill
UG-0337 - Concrete Aprons for Manhole Frames and Covers
UG-0339 - Remote Switch Pad
UG-0340 - Conduit Spacers
UG-0345 - Trench Backfill
UG-0349 - 8' X 10' Manhole Full Traffic
UG-0350 - 8' X 14' Manhole Full Traffic
UG-1225 - Pad-mounted Equipment Clearances and Protection
UG-1250 - Encroachment Permit Clearances from Electric Facilities
UG-1540 - El Camino Streetlight Foundations
UG-1630 - Marking of Underground Electric Lines